

Automatic Transmission/Transaxle - 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
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



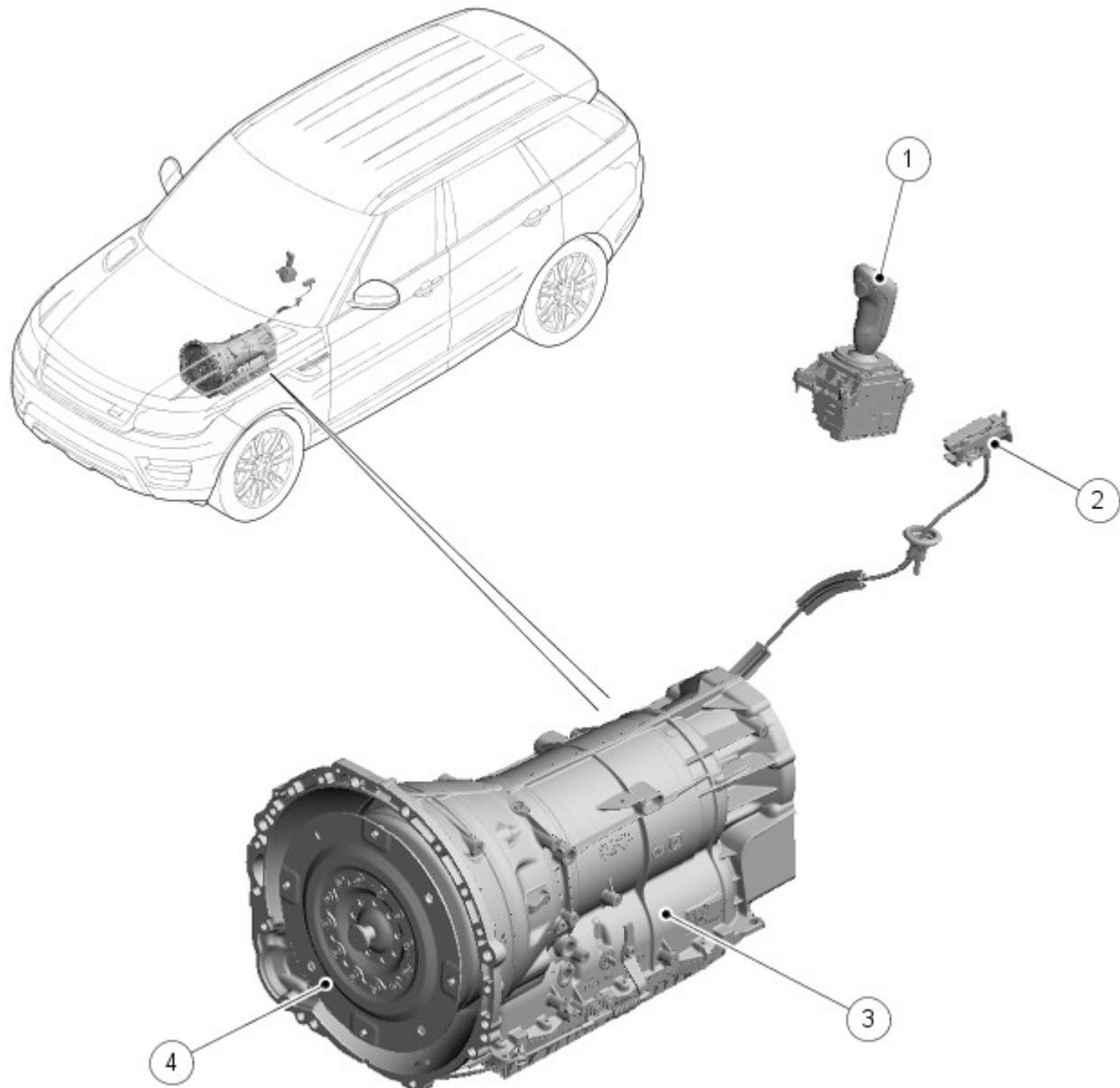
NOTE: *refer to the procedure for correct torque sequence.

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	-	53
Torque converter retaining bolts	63	46	-
Transmission fluid cooler tube retaining bolt	22	16	-
Transmission fluid drain plug	8	-	53
*Transmission fluid pan, gasket and filter retaining bolts	10	7	-

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Description

Description and Operation

COMPONENT LOCATION



E152432

Item	Part Number	Description
1	-	Transmission Control Switch (TCS)
2	-	Emergency Park Release (EPR) 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) Powertrain bus for communications
- Default mode if major faults occur
- Diagnostics available from the TCM via the High speed CAN Powertrain 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 TCS (Transmission Control Switch) in the floor console.

For additional information, refer to: [External Controls](#) (307-05A Automatic Transmission/Transaxle External Controls - 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 TCS 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.

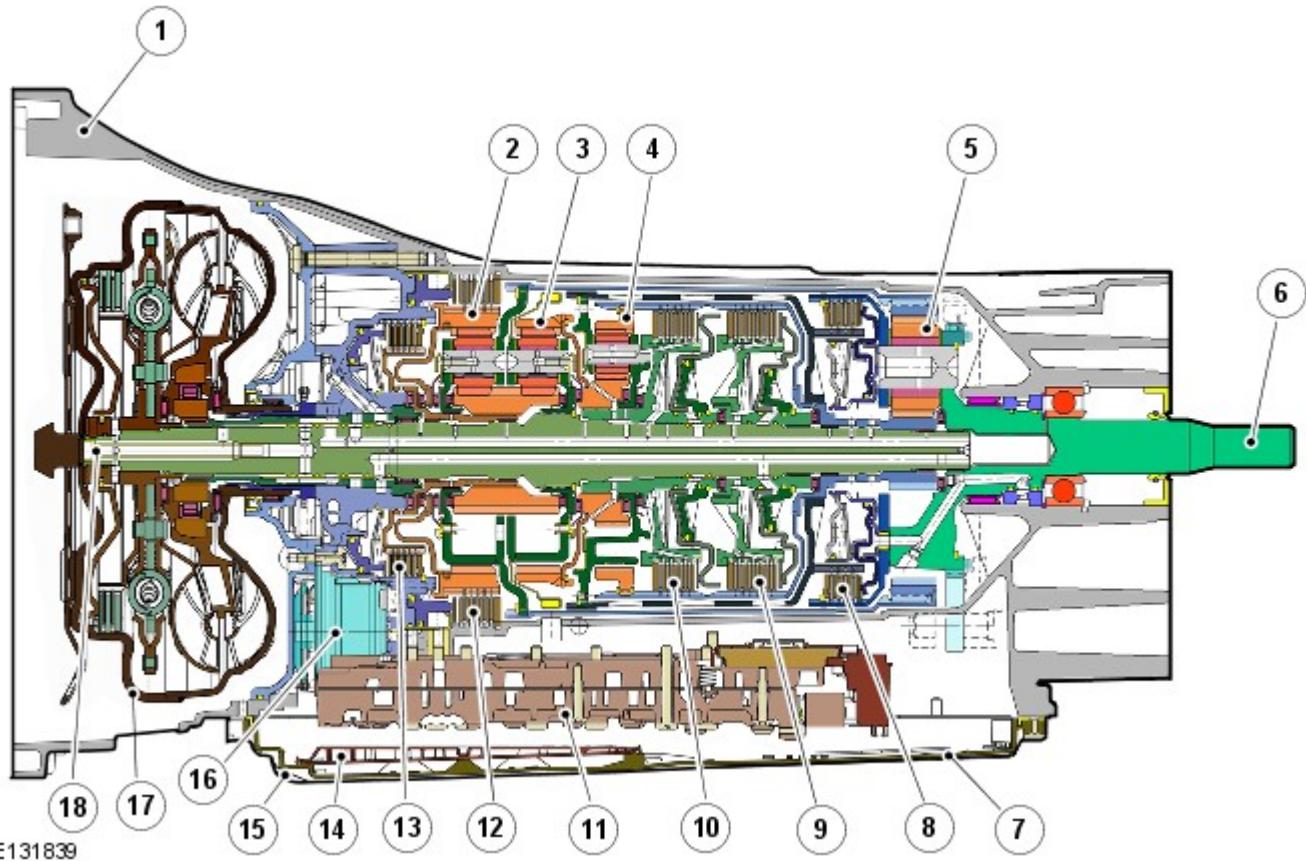
The internal oil pump is driven by a simplex chain and 2 drive gears from the input shaft. The oil pump is a double stroke vane cell pump which delivers 50 cm² of transmission fluid per revolution.

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:

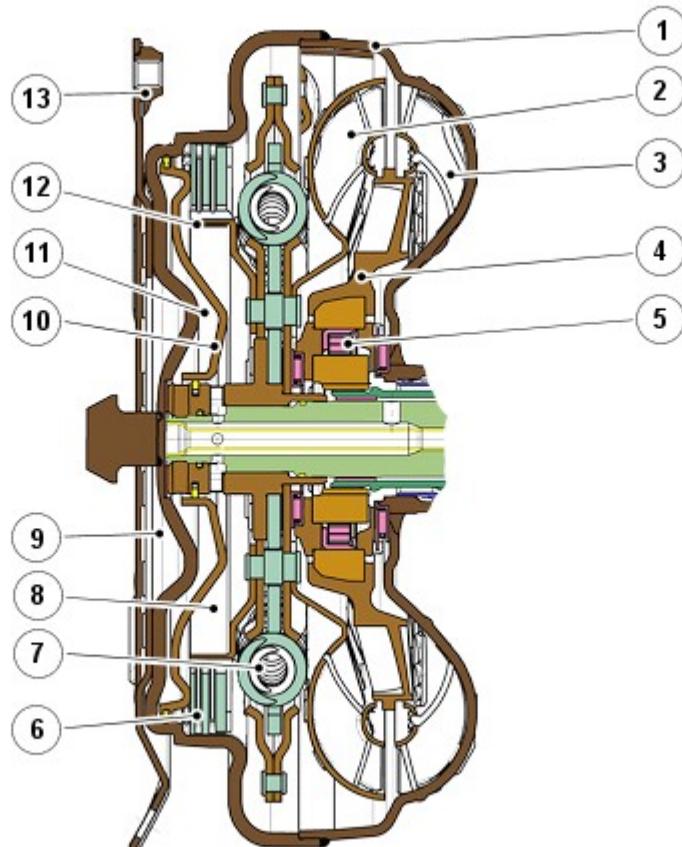
- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the TCM
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- Four planetary gear trains.

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



E 131838

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.

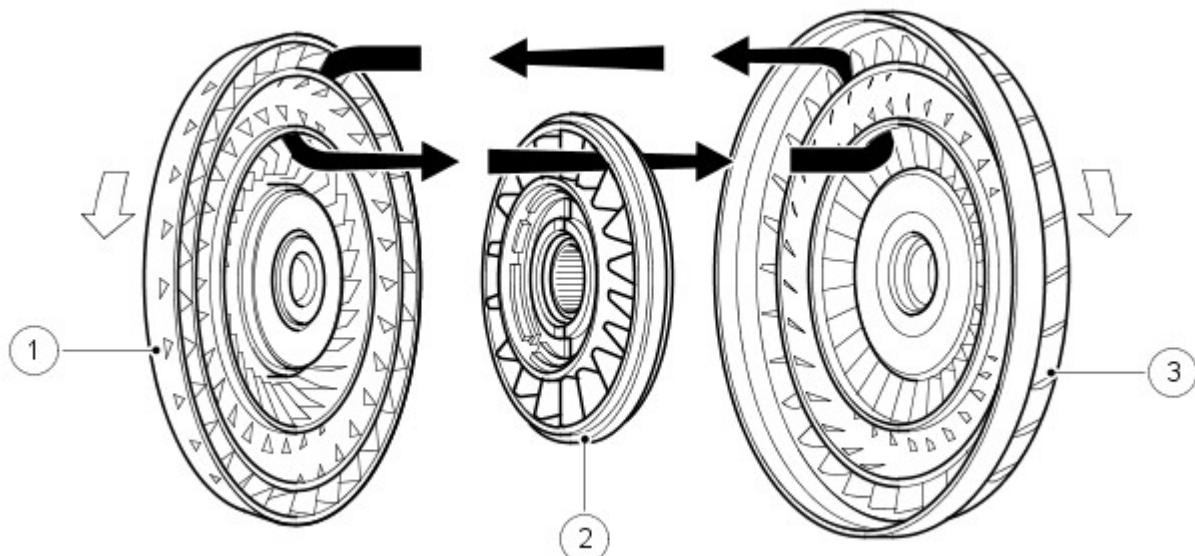
The converter housing drive plate has four threaded bosses, which provide for attachment of the engine flex plate. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the torque converter housing.

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

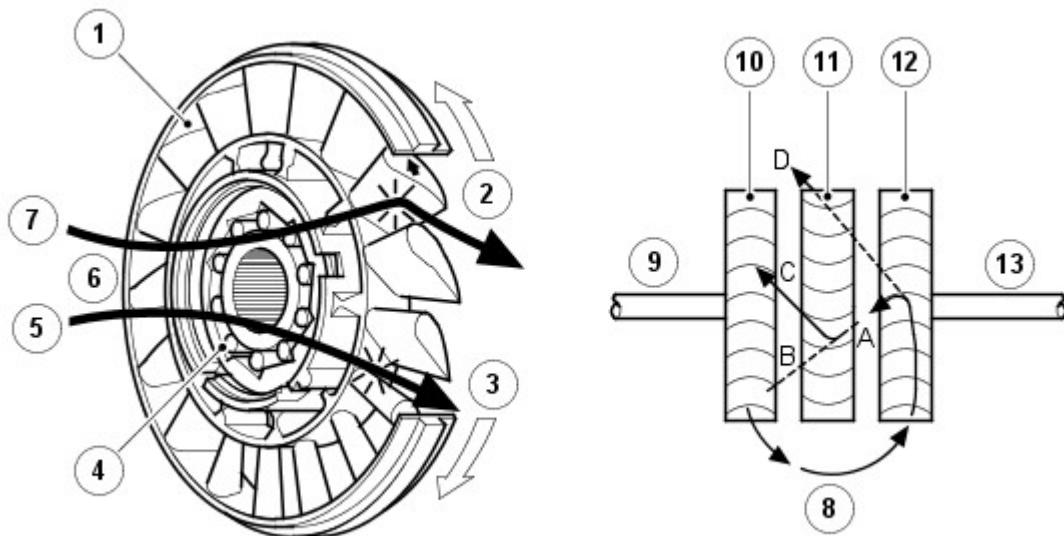
The stator is located on the splined transmission stator shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing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

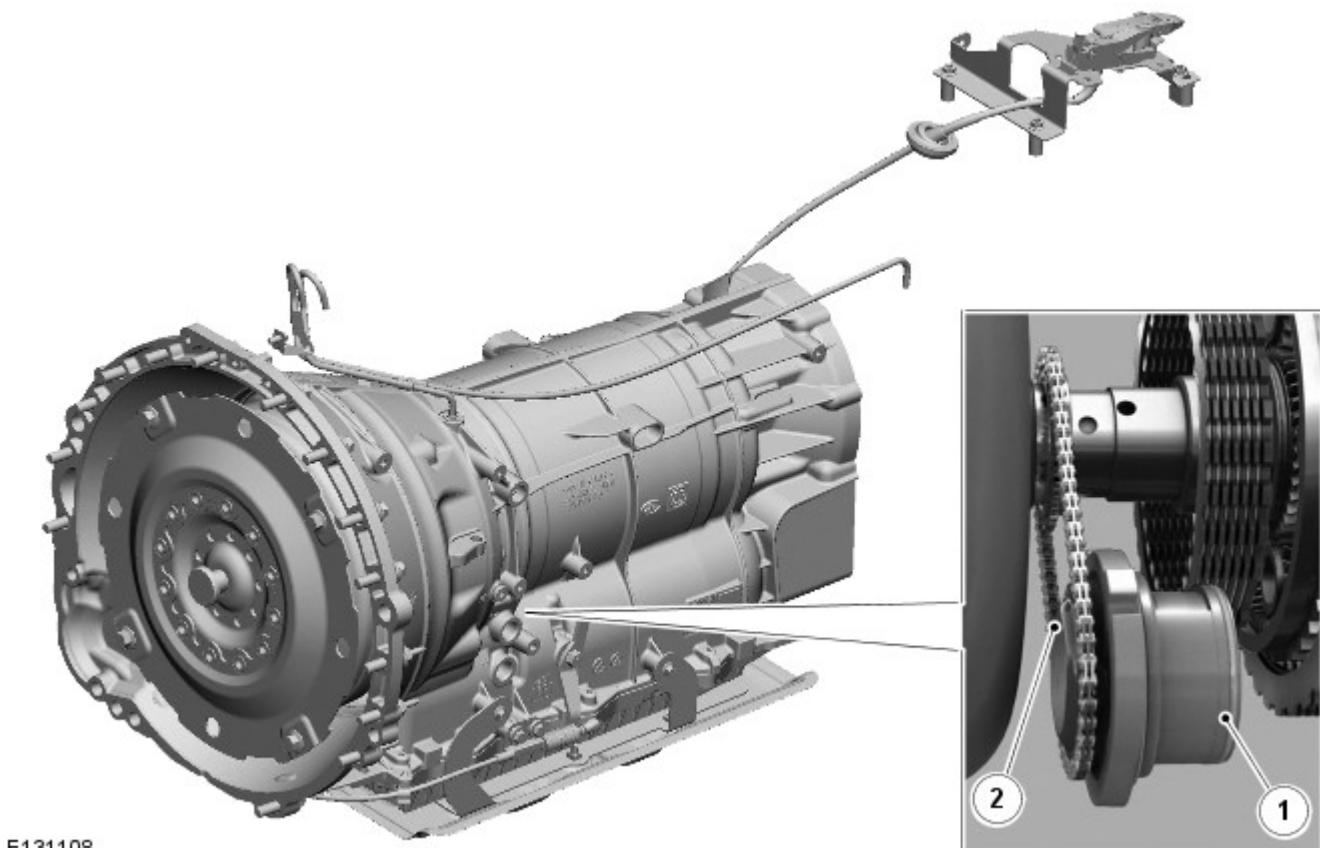
The standstill decoupling feature is new for the 8 speed transmission. When the vehicle comes to a standstill (with the brakes applied), the converter is disconnected from the driveline so that only a slight residual load remains. This further reduces fuel consumption. Decoupling is by actuating clutch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

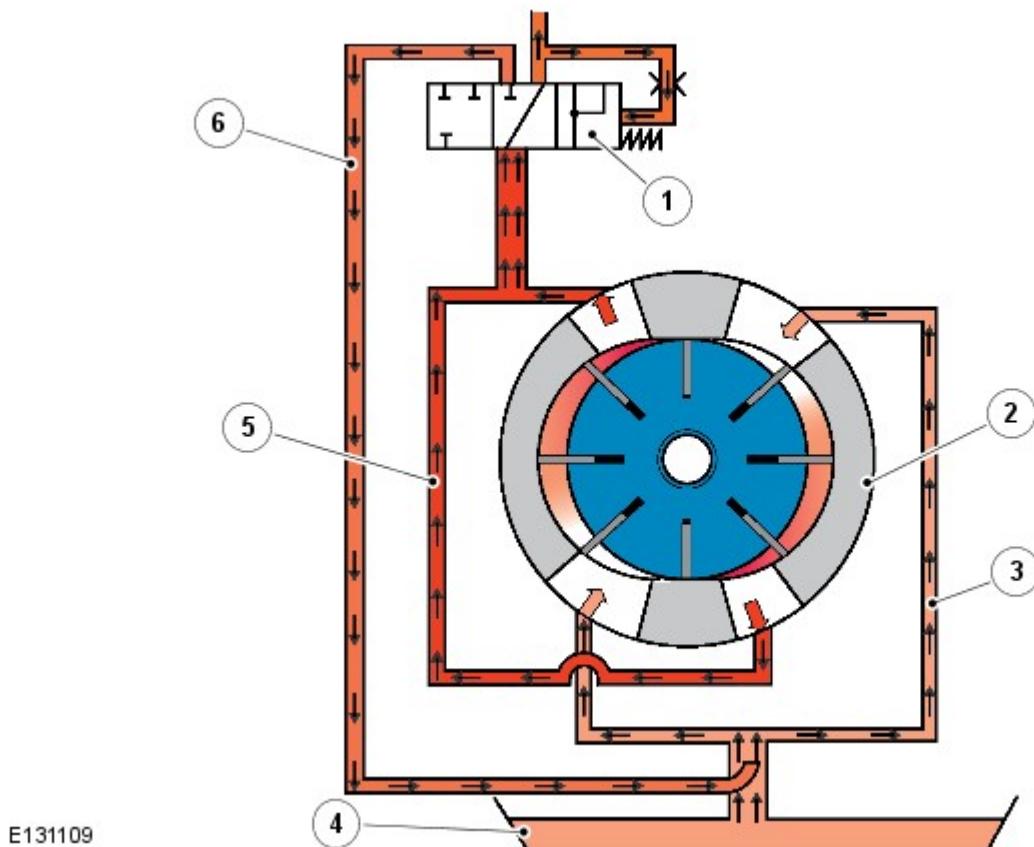
The ZF 8HP70 fluid pump is a double stroke, vane type pump and is located below the transmission input shaft. The pump is driven by a chain drive from a sprocket located on the torque converter. The pump has a delivery rate of 50 cm³ per revolution. The drive sprocket is driven at engine speed through a splined connection in the torque converter shell.

Double Vane Fluid Pump Location



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.

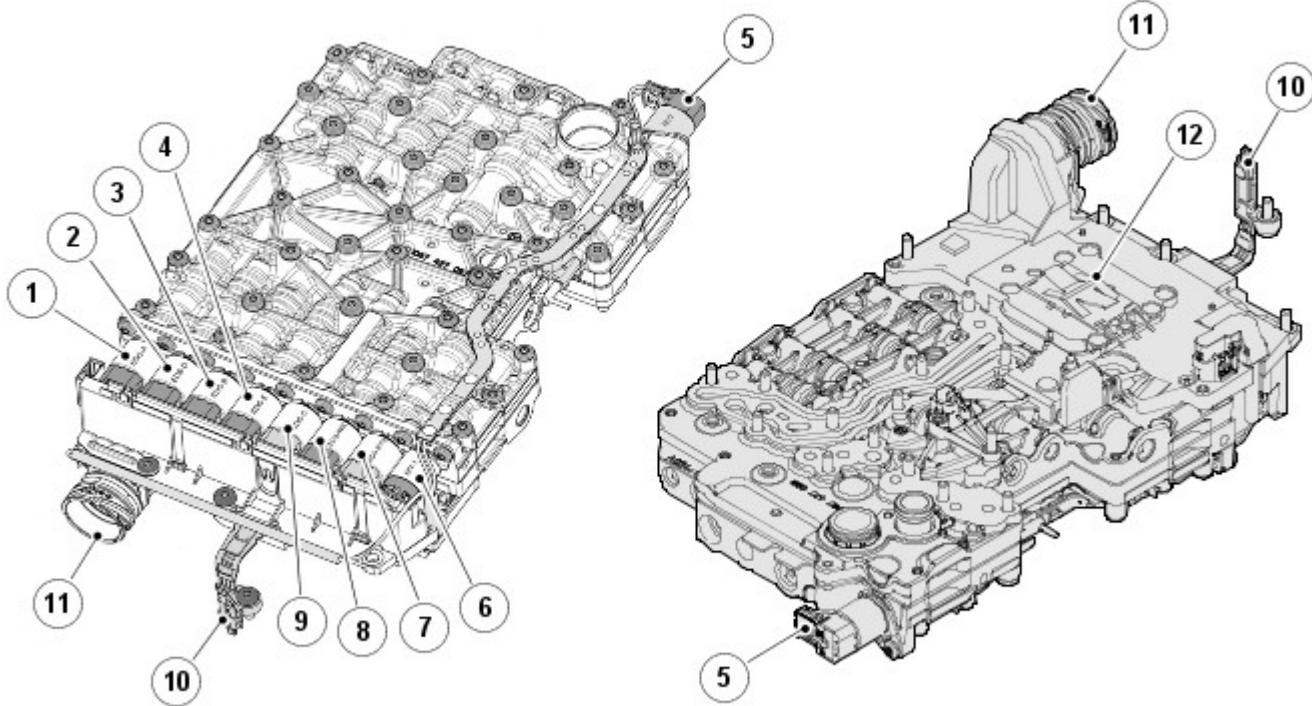
The pressure relief valve controls the pressure and flow of fluid delivered to the transmission valve block, torque converter and other components. Pressure is controlled by a relief valve which limits the maximum system pressure to 32 bar (464 lbf/in²). The pressure control maintains a constant pressure 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 pressurised 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.

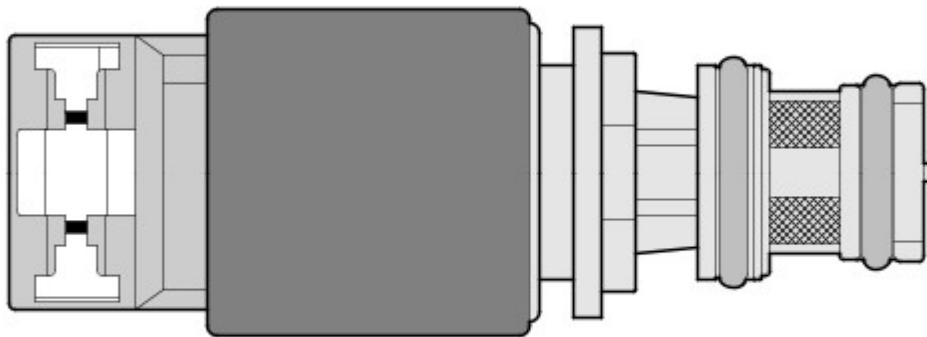
Mechatronic Valve Block



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 output shaft speed sensor
11	-	Electrical connector
12	-	Transmission Control Module (TCM) - hidden

Electronic Pressure Regulator Solenoids (EPRS)



E42713

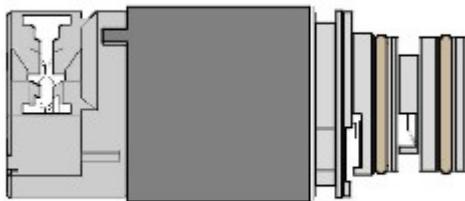
Seven EPRS are located in the valve block. The solenoids are controlled by PWM signals from the TCM. The solenoids convert the electrical signals into hydraulic control pressure proportional to the signal to actuate the spool valves for precise transmission operation.

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.in²).

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.in²).

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

Control Solenoid (MV 1)



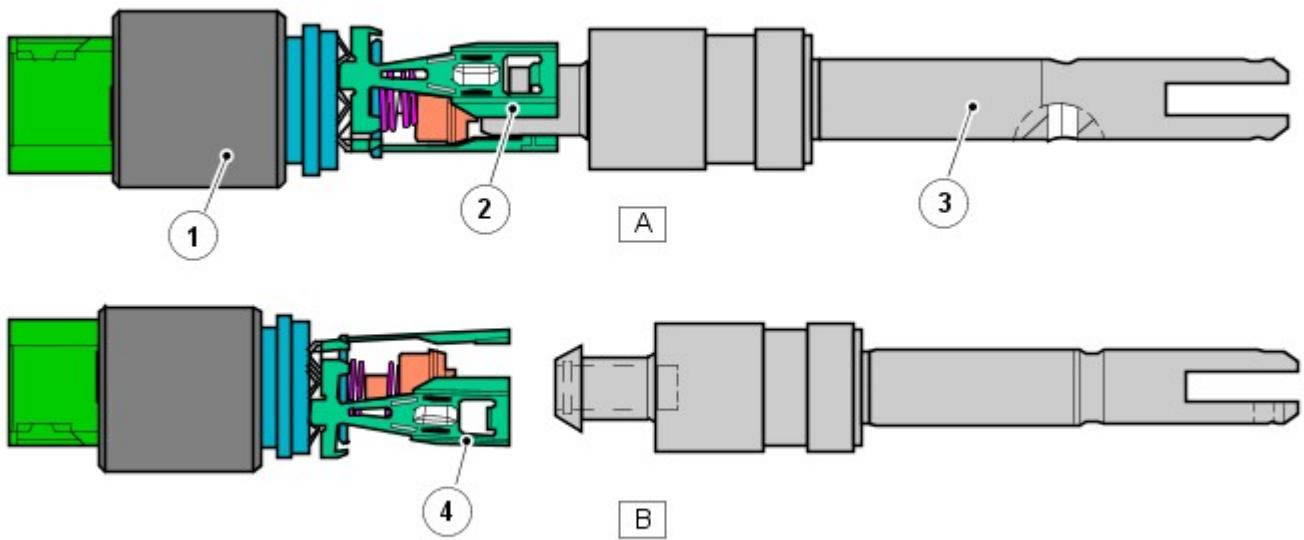
E42714

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 energises 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 the TCM and compared to engine speed signals received on the high speed CAN Powertrain 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

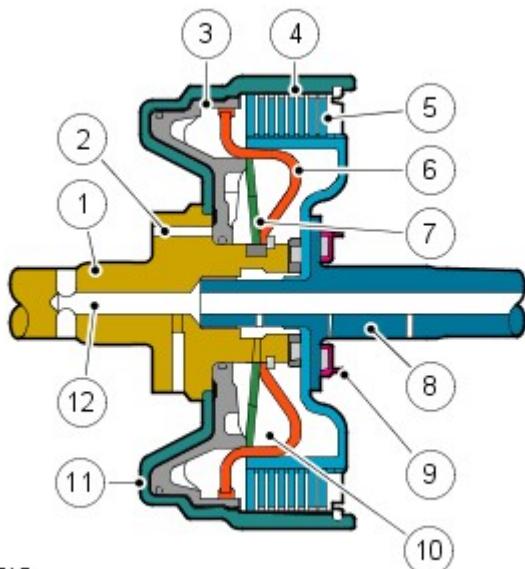
The valve block contains spool valves which control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

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.

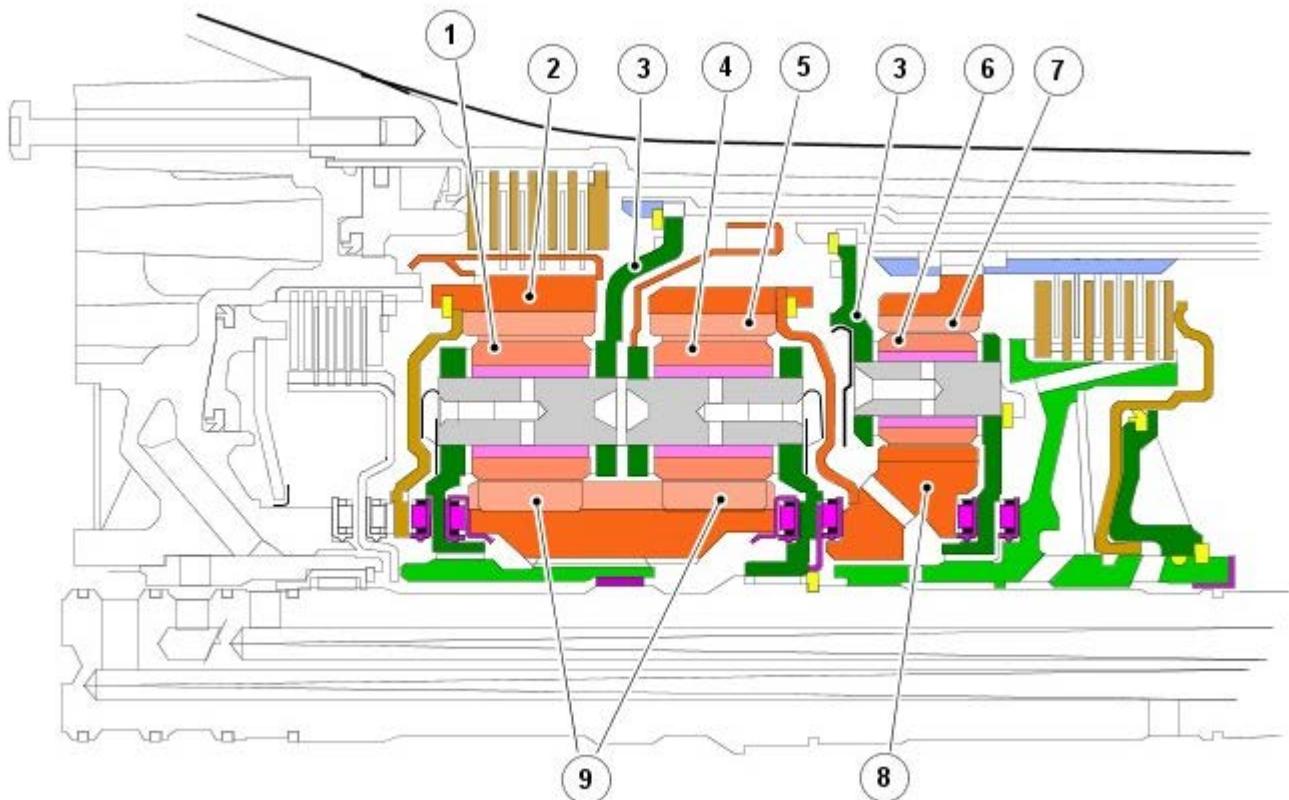
Planetary Gear Sets 1, 2 and 3

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.



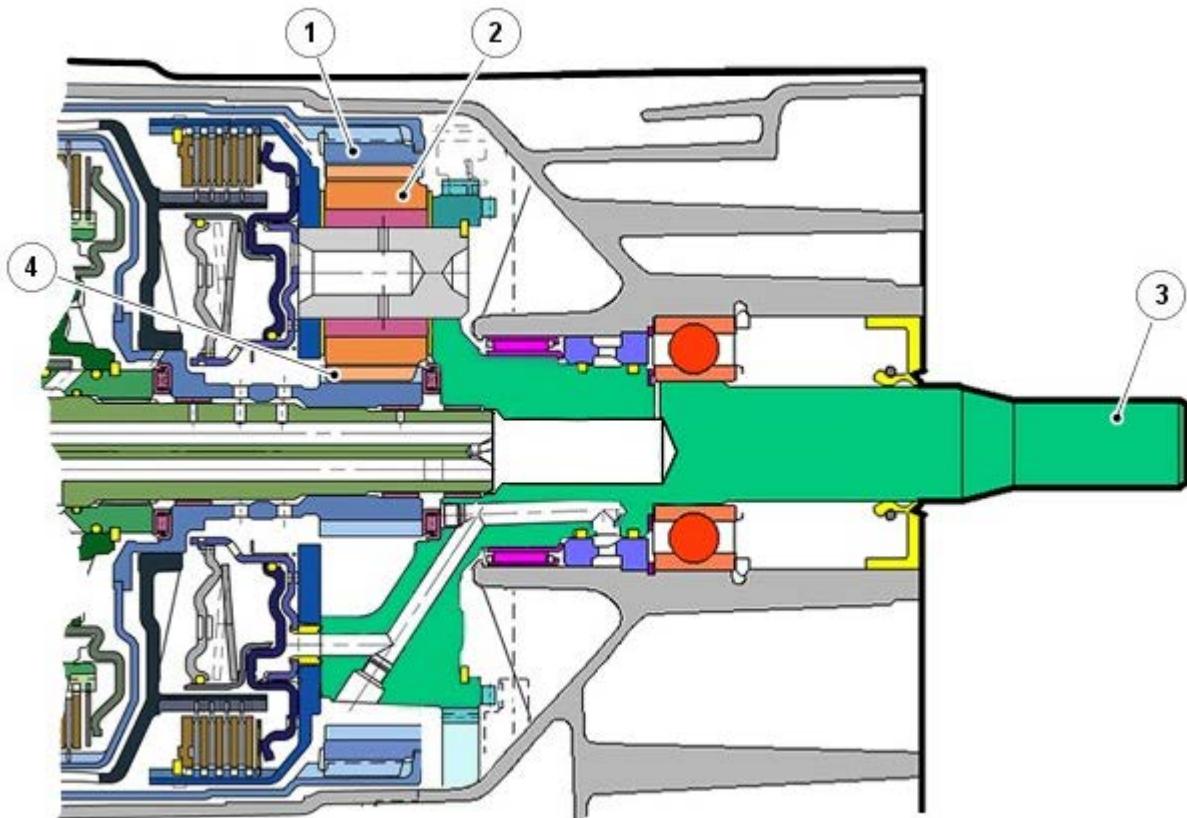
E131255

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

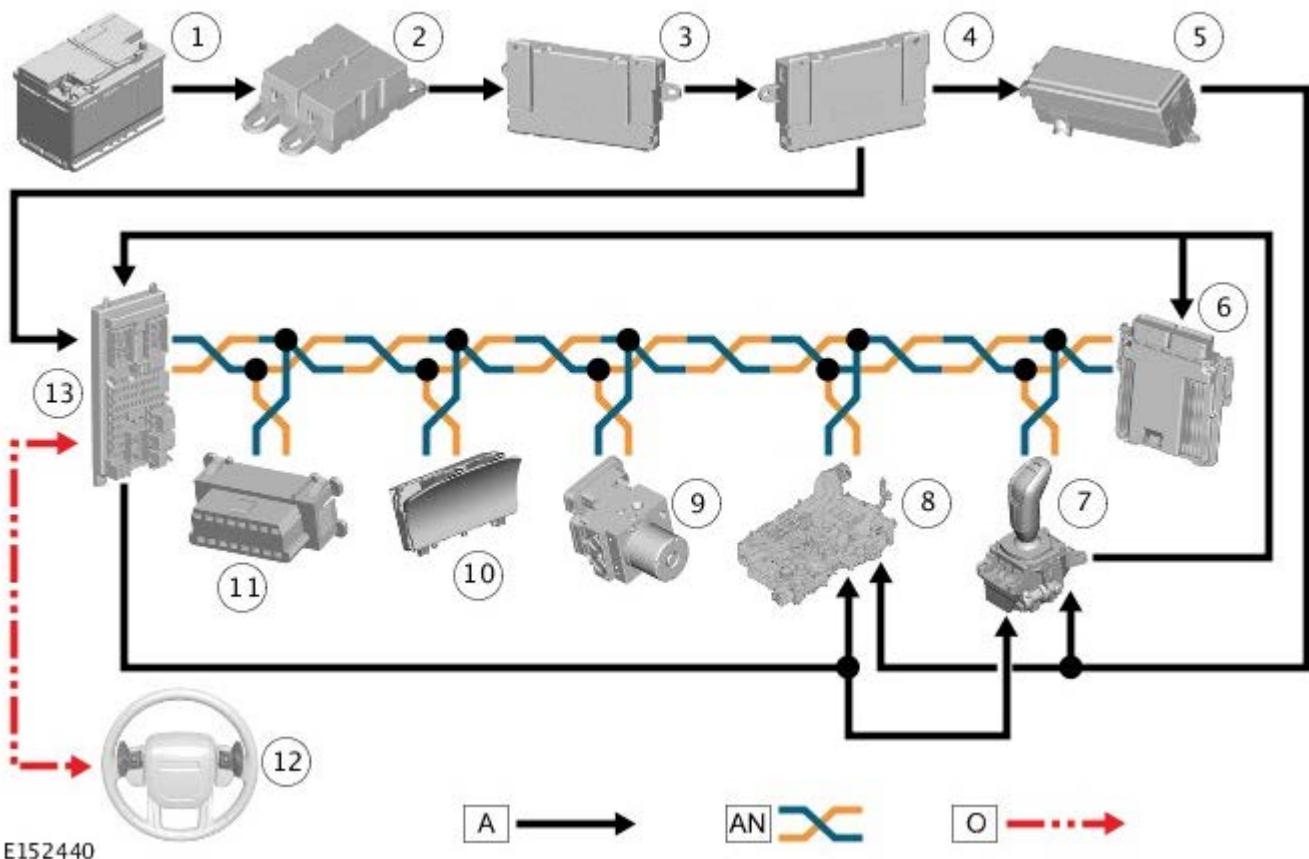
The TCM is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The TCM is the main controlling component of the transmission.

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, AN = High speed CAN (Controller Area Network) Powertrain bus, O = LIN (Local Interconnect Network) bus.



E152440

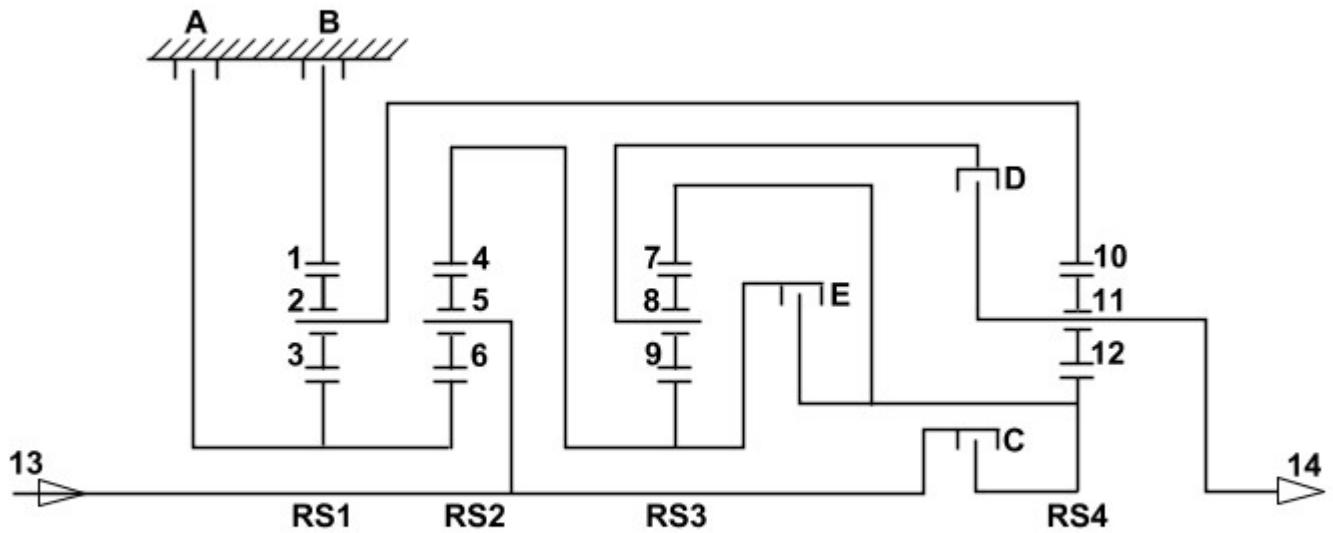
Item	Part Number	Description
1	-	Battery
2	-	Battery Junction Box (BBJ2) (250 A megafuse)
3	-	Battery Junction Box (BBJ)
4	-	Auxiliary Junction Box (AJB)
5	-	Engine Junction Box (EJB)
6	-	Engine Control Module (ECM)
7	-	Transmission Control Switch (TCS)
8	-	Transmission Control Module (TCM)
9	-	Anti-lock Brake System (ABS) control module
10	-	Instrument Cluster (IC)
11	-	Diagnostic connector
12	-	Steering wheel paddle switches
13	-	Central Junction Box (CJB)

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.



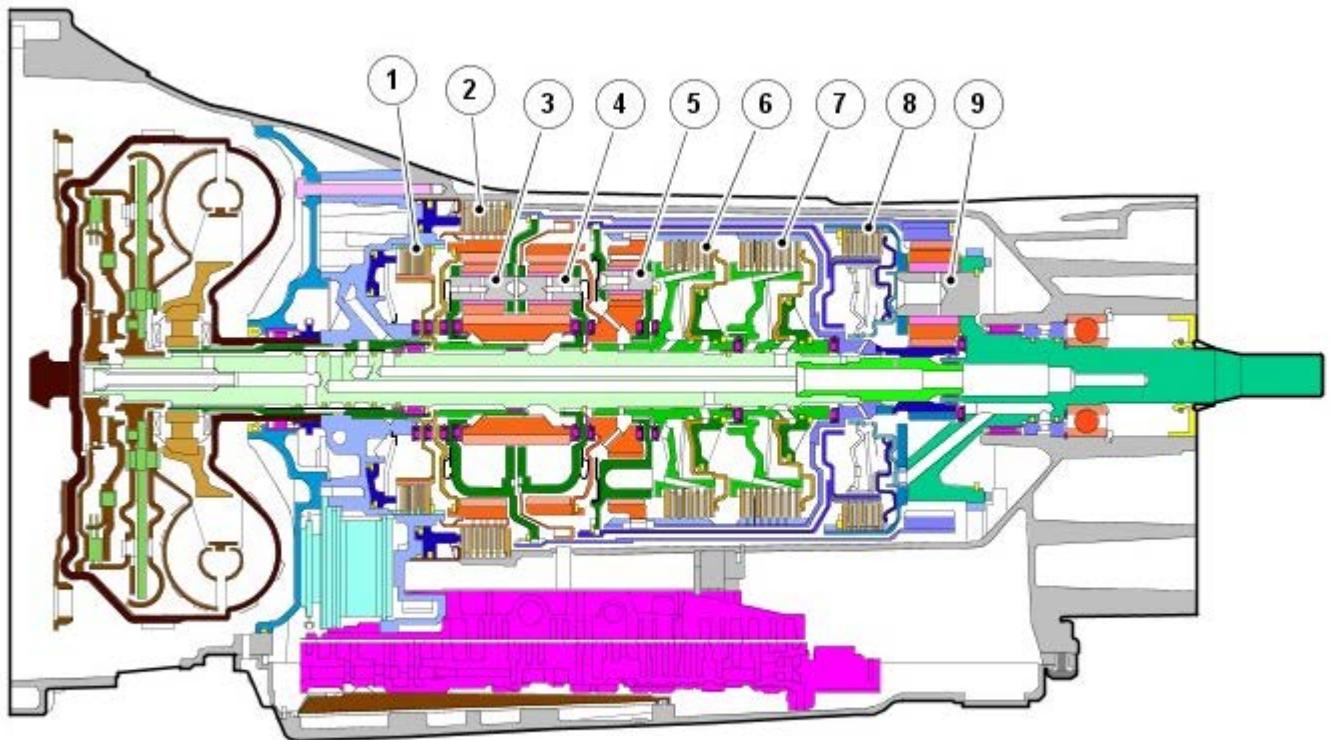
E131258

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

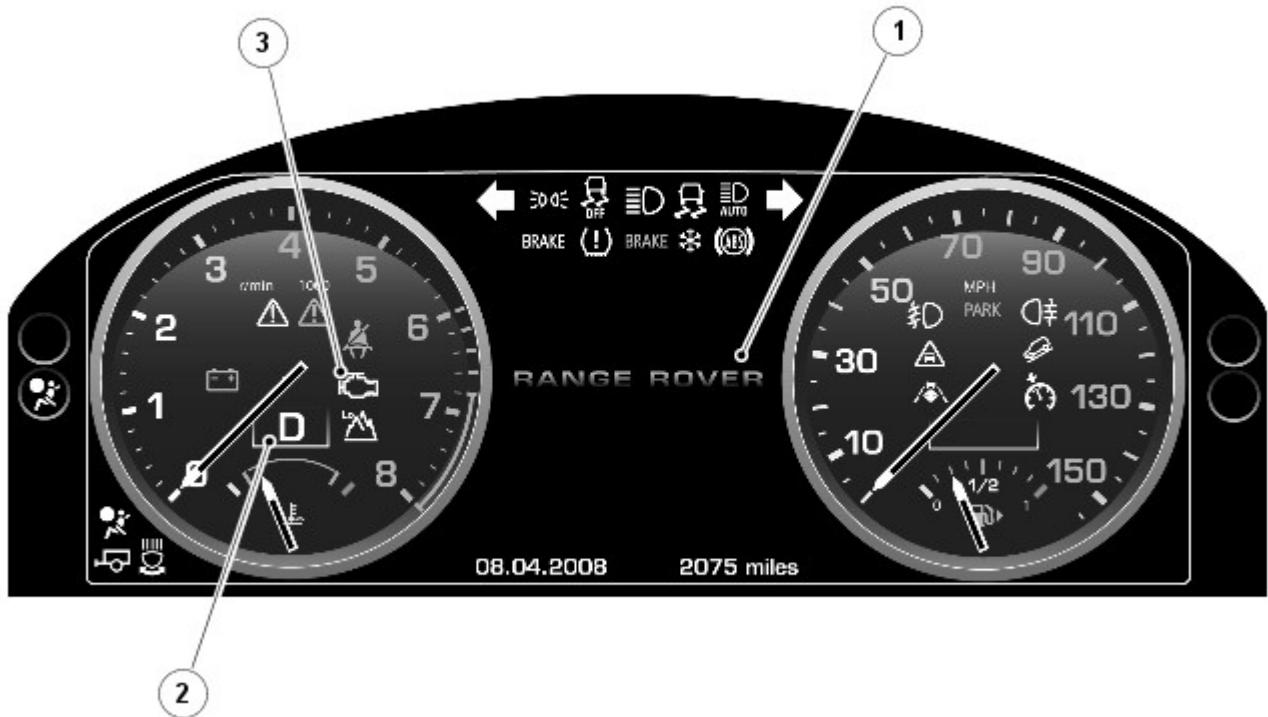


E131259

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



E119473

Item	Part Number	Description
1	-	Message center
2	-	Transmission status display
3	-	Malfunction Indicator Lamp (MIL)

The TFT (Thin Film Transistor) display IC (Instrument Cluster) is connected to the TCM via the high speed CAN Powertrain bus. Transmission status is transmitted by the TCM and displayed to the driver in one of two displays in the IC.

For additional information, refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp

The MIL (Malfunction Indicator Lamp) is located in the tachometer of the IC. Transmission related faults which may affect the vehicle emissions will illuminate the MIL.

The MIL is illuminated by the ECM on receipt of a relevant fault message from the TCM on the high speed CAN Powertrain bus. 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 IC. 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 is located in the IC. The message center is a TFT display that relays vehicle status and operating information to the driver and can display 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 TCS, 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 Powertrain 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) control module also supply data to the TCM on the high speed CAN Powertrain 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 Powertrain 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 high speed CAN Powertrain bus.

The TCM determines the position of the selector lever using signals from the TCS on the high speed CAN Powertrain bus and LIN (Local Interconnect Network) bus

The TCM transmits the position of the TCS and any manual gear selected on the high speed CAN Powertrain bus. This information is shown in the gear selector display in the IC.

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 IC. The driver needs to select neutral or park and then press the brake pedal to restart the engine.

If the start/stop switch is pressed when driving, the message ENGINE STOP SWITCH 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 switch 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.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Diagnostics

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](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, 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 the relevant section in the workshop manual.

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.

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 Specification section in the workshop manual.

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
<ul style="list-style-type: none">• Damaged/stuck shift mechanism• Damaged automatic transmission casing	<ul style="list-style-type: none">• Blown fuse(s)• Damaged, loose or corroded connectors• Wiring harness	<ul style="list-style-type: none">• 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.

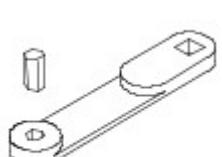
DTC Index

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

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Level Check V8 5.0L Petrol/V8 S/C 5.0L Petrol

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug
307-452	

Check

WARNINGS:

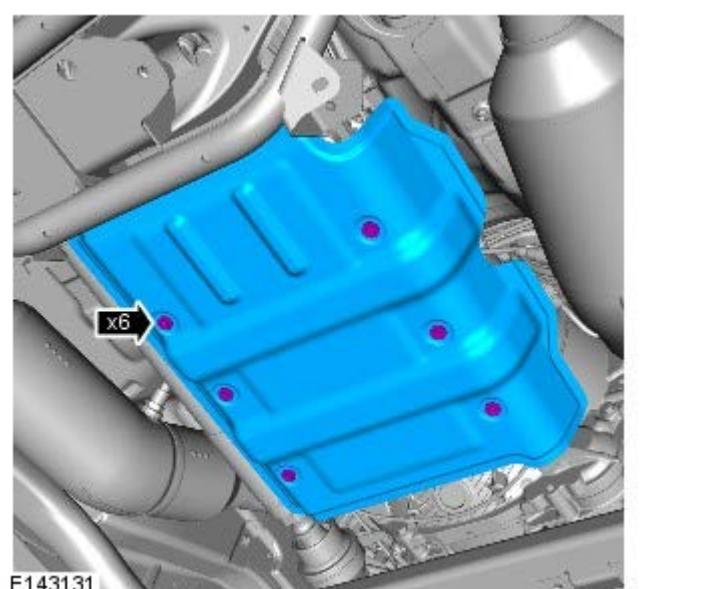
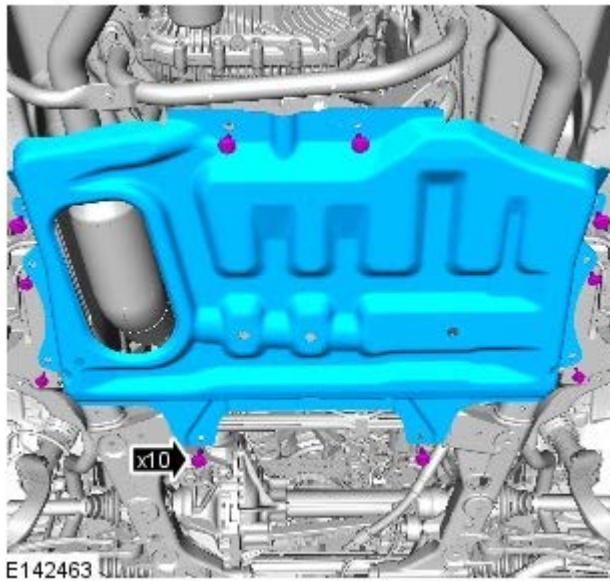


Observe due care when draining, as the fluid can be very hot.



Observe due care when working near a hot exhaust system.

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 2000rpm for a minimum of 30 seconds. Move the TCS to the park and allow the engine to idle between 600rpm and 750rpm.
4.  CAUTION: Make sure that the transmission fluid temperature is below 30 degrees before starting the fluid level check.
5.  WARNING: Make sure to support the vehicle with axle stands.
- Raise and support the vehicle.
- 6.



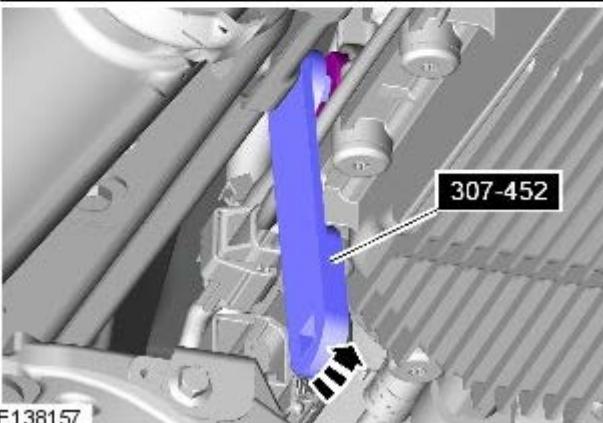
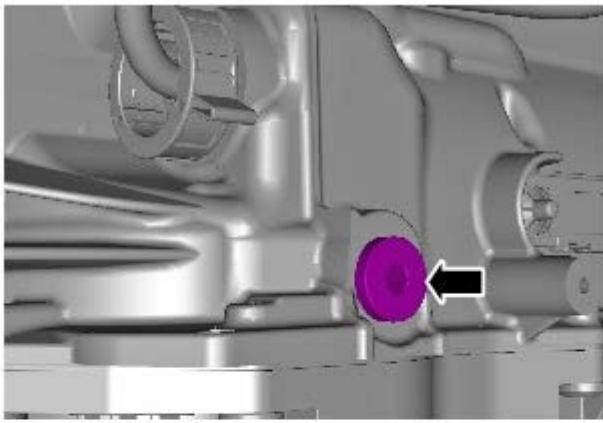
7.

8. Place a suitable container under the transmission fluid fill plug.

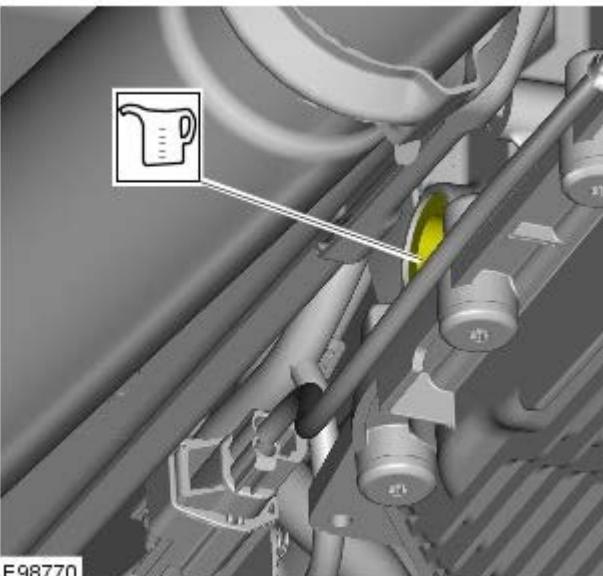
9. **CAUTION:** The transmission fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

Clean the area around the transmission fluid level plug.

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



E138157



E98770

Adjustment

1. **NOTE:** Use transmission fluid meeting Land Rover specification.

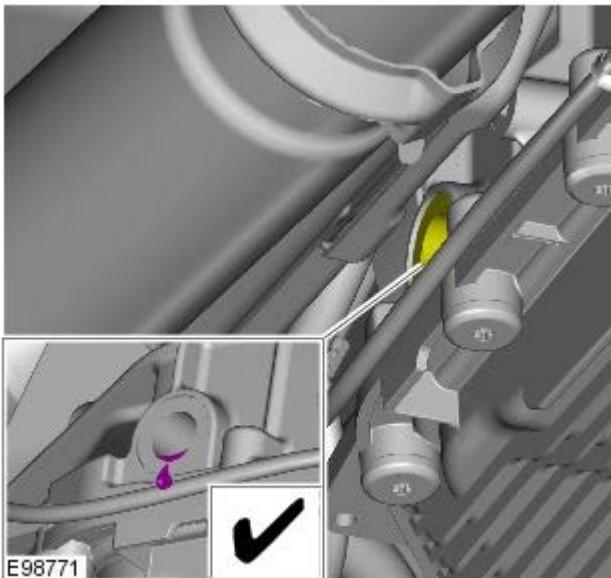
- Refer to: [Specifications](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Specifications).
- Start the engine and idle between 600 rpm and 750 rpm.
- Remove the oil fill plug.
- If the transmission fluid does not come out of the transmission 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.
- Refit the plug.
- Confirm that the transmission oil temperature is still below 30 deg C. This will ensure that the transmission is overfilled, which is necessary to prevent air suction.

2.

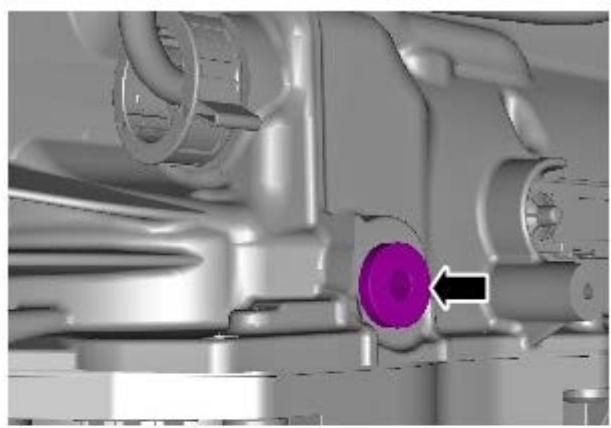
- All clutches and brakes must be filled, output speed must be 0 rpm, therefore:
- Apply and hold the footbrake.
- Engage Pos. R and wait 5 seconds.
- Engage Pos. D and wait 5 seconds.
- Tip Up to second gear and wait 5 seconds.
- Engage Pos. N.

3. To ensure that the torque converter is filled with oil, rev up the engine in Pos. N to 2000 RPM for a minimum of 30 seconds, then engage Pos. P and ensure that the engine is idling between 600 RPM and 750 RPM.

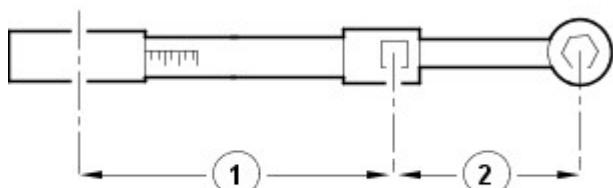
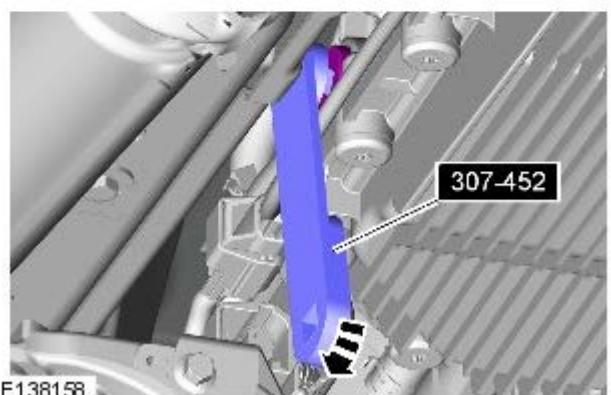
4. **NOTE:** If the temperature has exceeded 50°C (ideally 40°) before the plug was re-fitted you must start again with the procedure.



With oil sump temperature between 30°C and 50°C (target 40°C) open lateral filling plug again. If the temperature is still below 40°C, allow oil to drain until 40°C are reached. If the temperature is between 40°C and 50°C, allow oil to drain, until the stream becomes a slow dribbling, then re-fit the plug.



5. **NOTE:** Install a new fluid level filler plug.
Special Tool(s): [307-452](#)



E37107

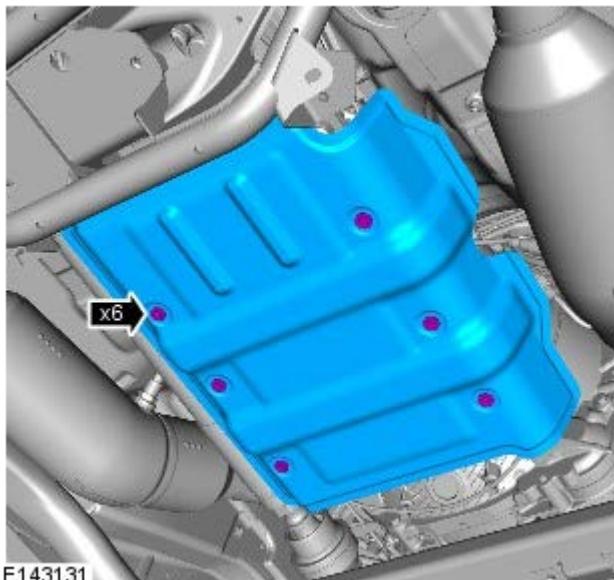
6. **CAUTION:** Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.

- 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.

7. Remove the special tool.

8. Remove the container.

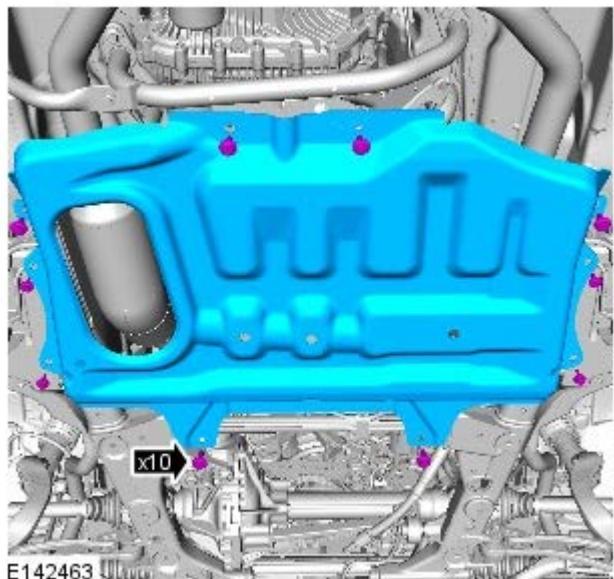
9. *Torque: 10 Nm*



10. *Torque:*

M10 60 Nm

M6 10 Nm



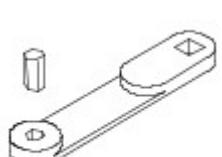
11. Lower the vehicle.

12. Disconnect the diagnostic tool.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Level Check TDV6 3.0L Diesel /TDV8 4.4L Diesel

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug
307-452	

Check

WARNINGS:



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



Observe due care when working near a hot exhaust system.

All vehicles



1. **NOTE:** For vehicles with oil cooler thermostat, ensure that transmission oil temperature, at least once has exceeded the opening temperature of the thermostat, which is 69°C. After that allow the oil temperature to drop below 30°C.

- 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 2000rpm for a minimum of 30 seconds. Move the TCS to the park and allow the engine to idle between 600rpm and 750rpm.

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

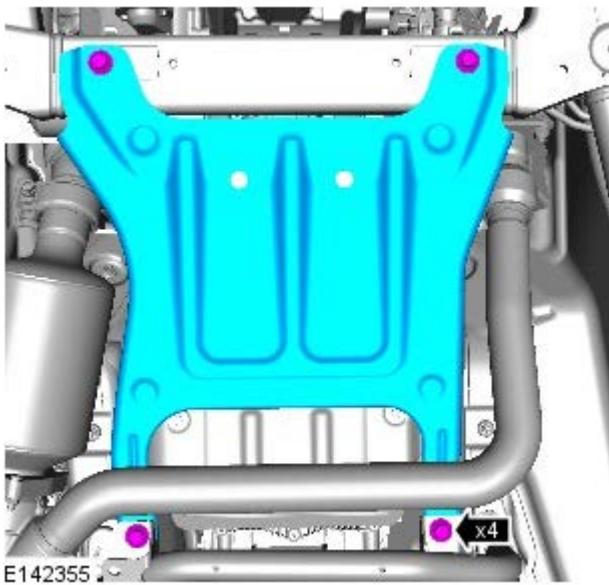
Connect the diagnostic tool to the vehicle.

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.

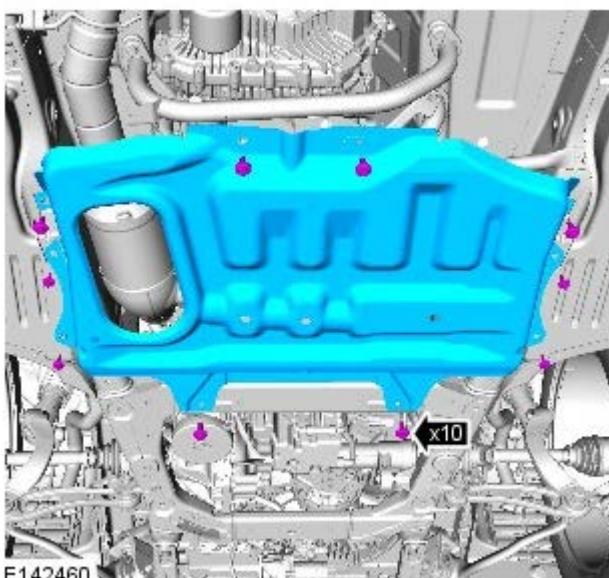
Raise and support the vehicle.

Vehicles with 4.4L diesel engine



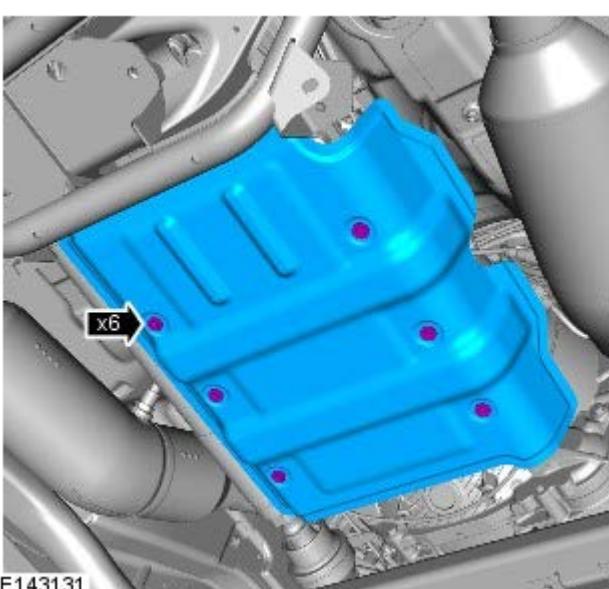
Vehicles with 3.0L diesel engine

8.

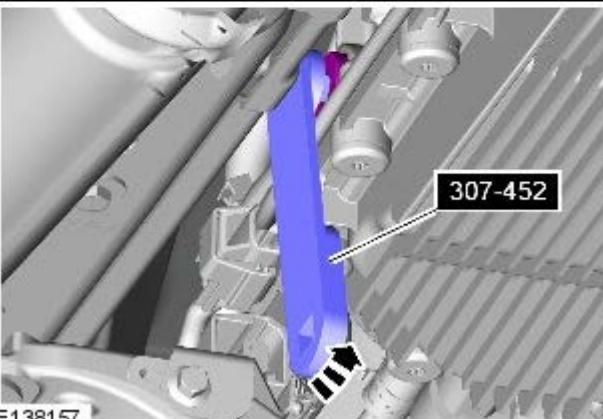
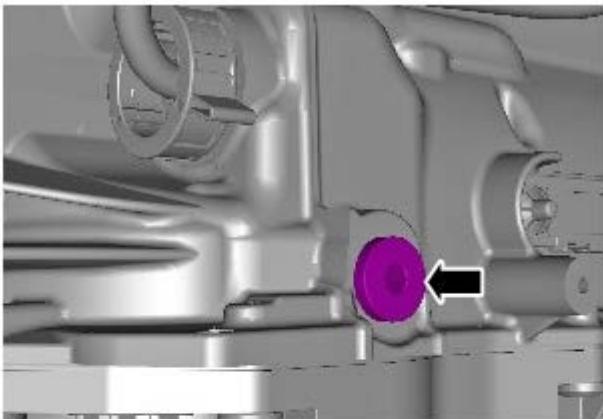


All vehicles

9.



10. Place a suitable container under the transmission fluid fill plug.

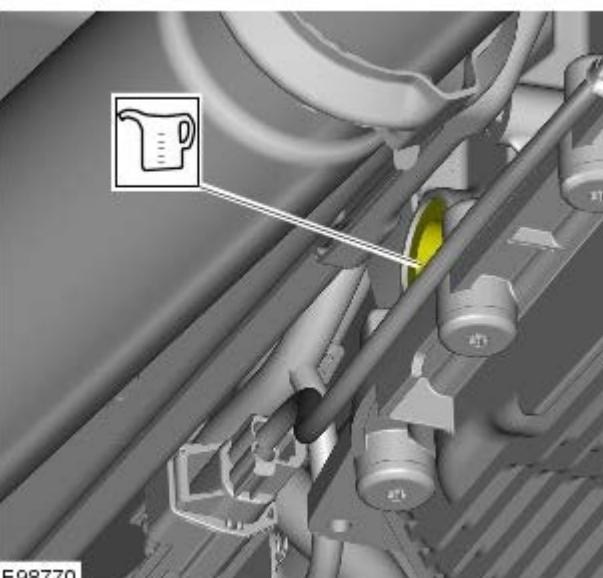


E138157

11.  **CAUTION:** 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.

Clean the area around the transmission fluid level plug.

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



E98770

Adjustment

All vehicles

1.  **NOTE:** Use transmission fluid meeting Land Rover specification.

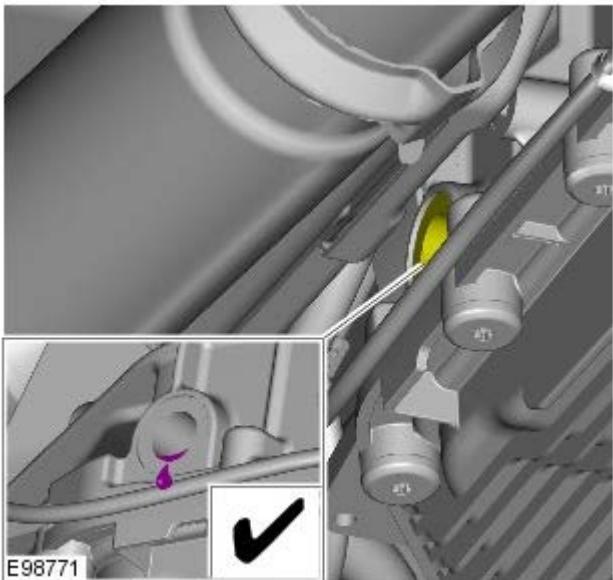
- Refer to: [Specifications](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Specifications).
- Start the engine and idle between 600 rpm and 750 rpm.
- Remove the oil fill plug.
- If the transmission fluid does not come out of the transmission 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.
- Refit the plug.
- Confirm that the transmission oil temperature is still below 30 deg C. This will ensure that the transmission is overfilled, which is necessary to prevent air suction.

2.

- All clutches and brakes must be filled, output speed must be 0 rpm, therefore:
- Apply and hold the footbrake.
- Engage Pos. R and wait 5 seconds.
- Engage Pos. D and wait 5 seconds.
- Tip Up to second gear and wait 5 seconds.
- Engage Pos. N.

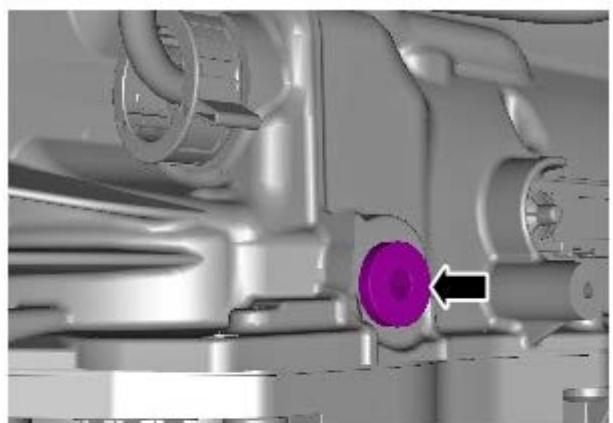
3.

- To ensure that the torque converter is filled with oil, rev up the engine in Pos. N to 2000 RPM for a minimum of 30 seconds, then engage Pos. P and ensure that the engine is idling between 600 RPM and 750 RPM.



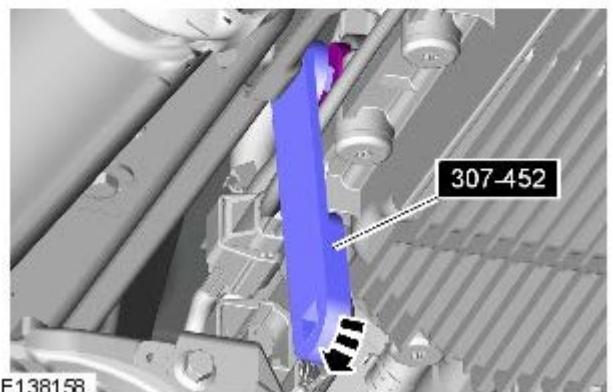
4.  **NOTE:** If the temperature has exceeded 50°C (ideally 40°) before the plug was re-fitted you must start again with the procedure.

With oil sump temperature between 30°C and 50°C (target 40°C) open lateral filling plug again. If the temperature is still below 40°C, allow oil to drain until 40°C are reached. If the temperature is between 40°C and 50°C, allow oil to drain, until the stream becomes a slow dribbling, then re-fit the plug.



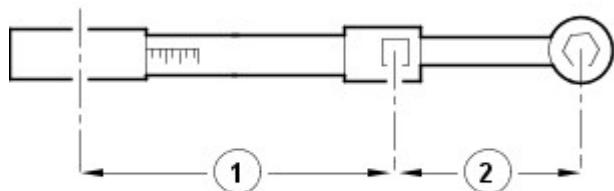
5.  **NOTE:** Install a new fluid level filler plug.

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



6.  **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.

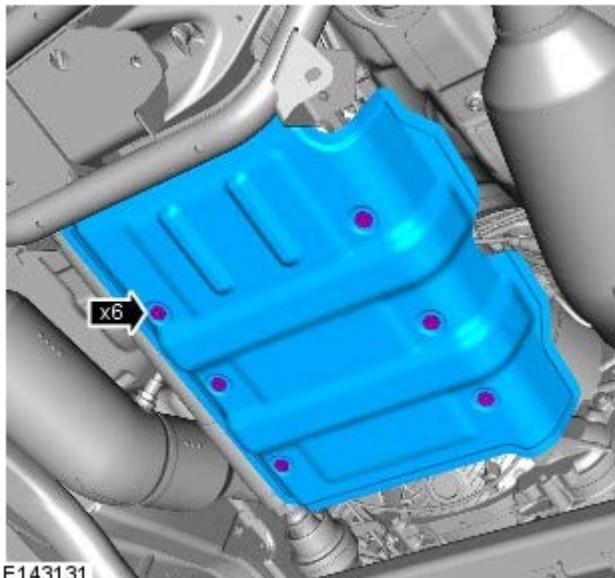


E37107

7. Remove the special tool.

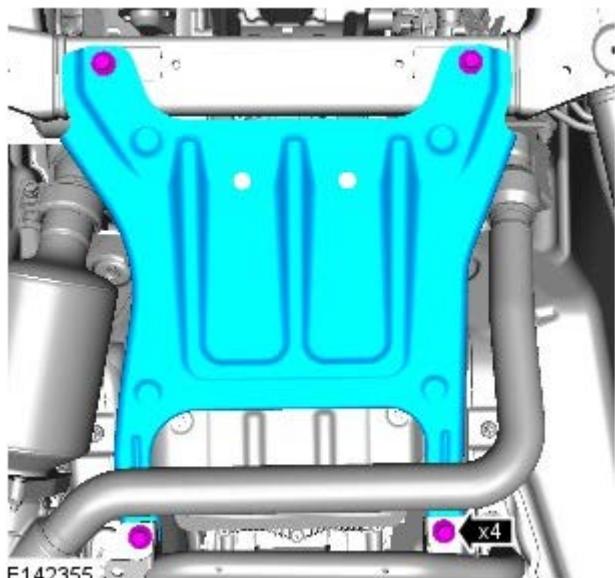
8. Remove the container.

9. *Torque: 10 Nm*



Vehicles with 4.4L diesel engine

10. *Torque: 60 Nm*

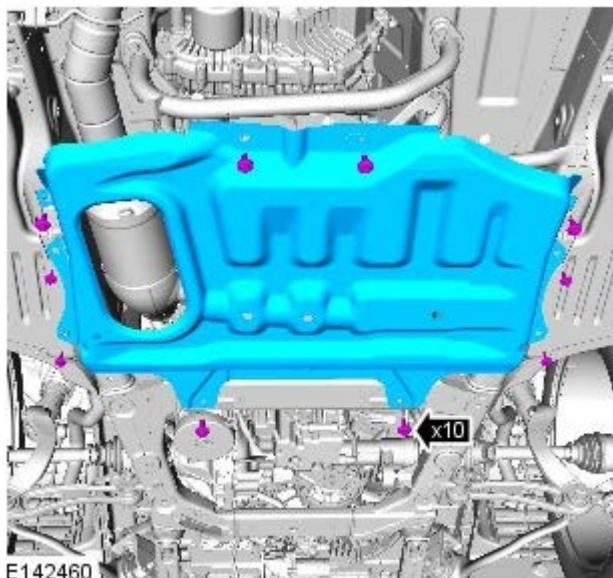


Vehicles with 3.0L diesel engine

11. *Torque:*

M10 60 Nm

M6 10 Nm



E142460

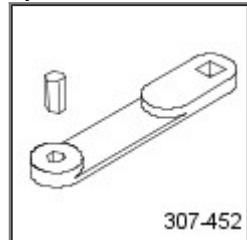
12. Lower the vehicle.

13. Disconnect the diagnostic tool.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Drain and Refill V8 5.0L Petrol/V8 S/C 5.0L Petrol

General Procedures

Special Tool(s)

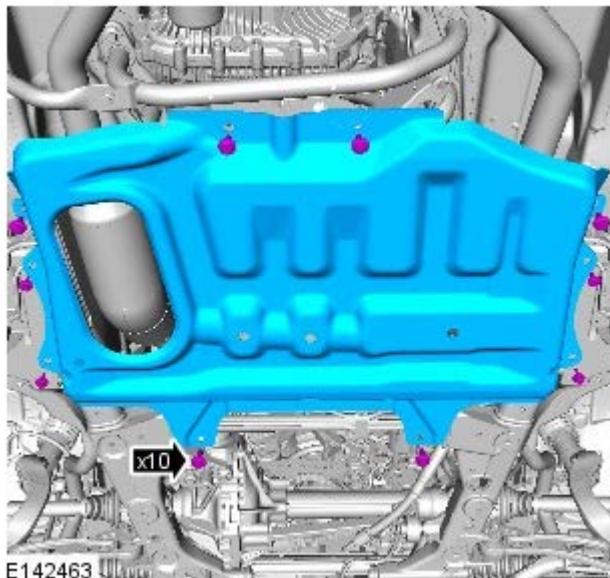
	307-452 Wrench, Transmission Filler Plug
--	---

WARNINGS:

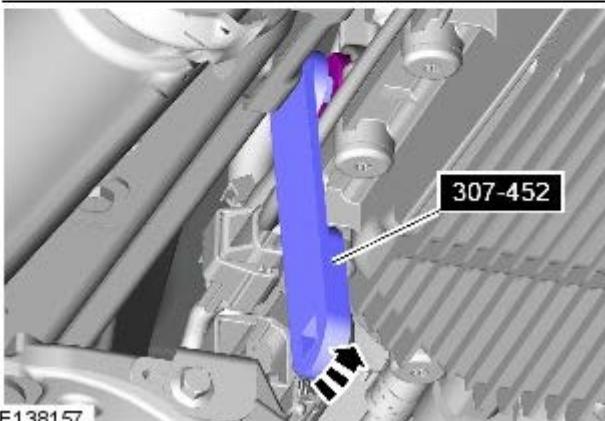
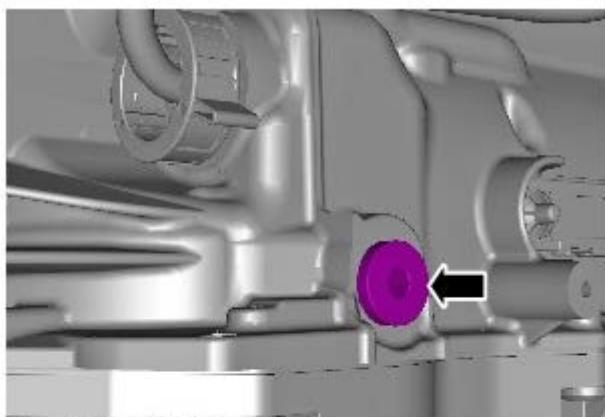
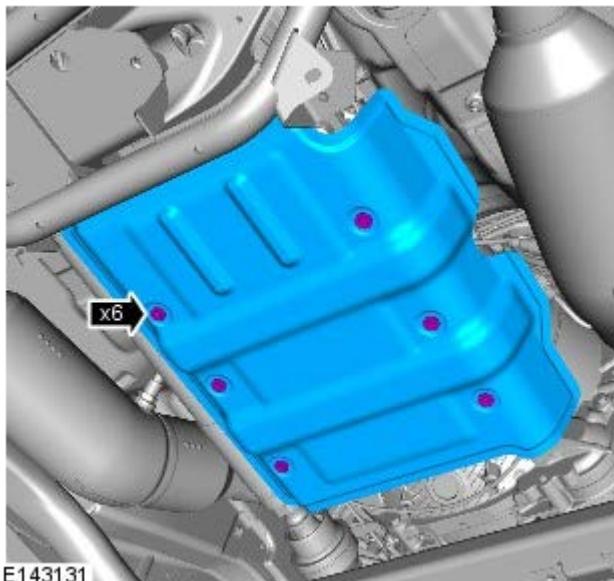
-  Observe due care when draining, as the fluid can be very hot.
-  Observe due care when working near a hot exhaust system.

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

2.



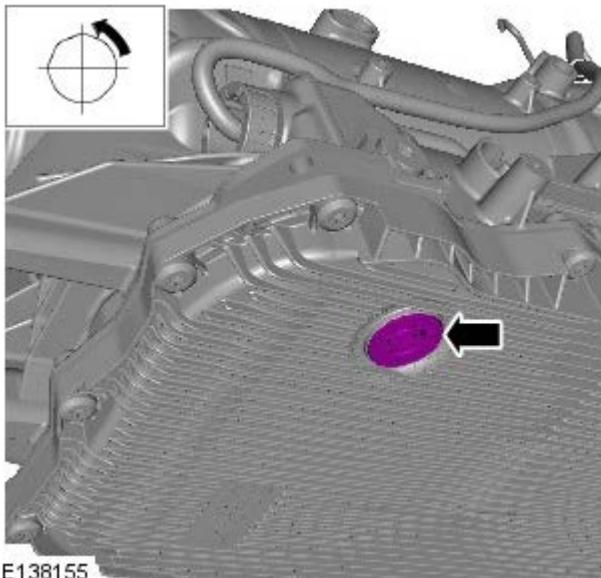
3.



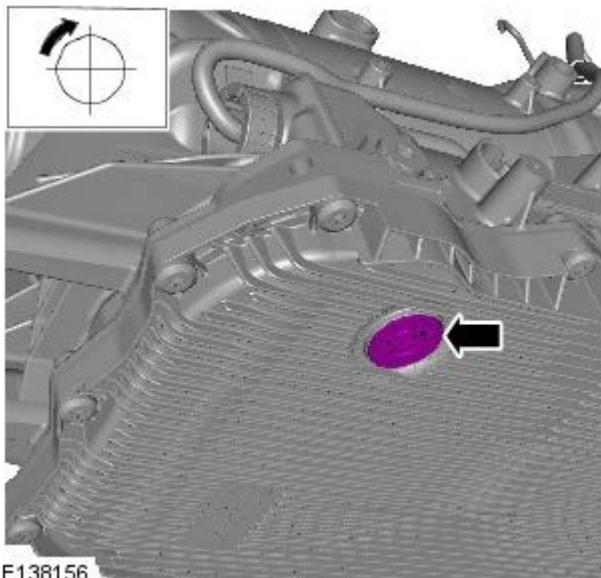
4. **NOTE:** Drain the fluid into a suitable container.
Clean the area around the transmission fluid level plug.

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

- 5.
- Allow the fluid to drain.
 - Discard the component.



6. *Torque: 8 Nm*



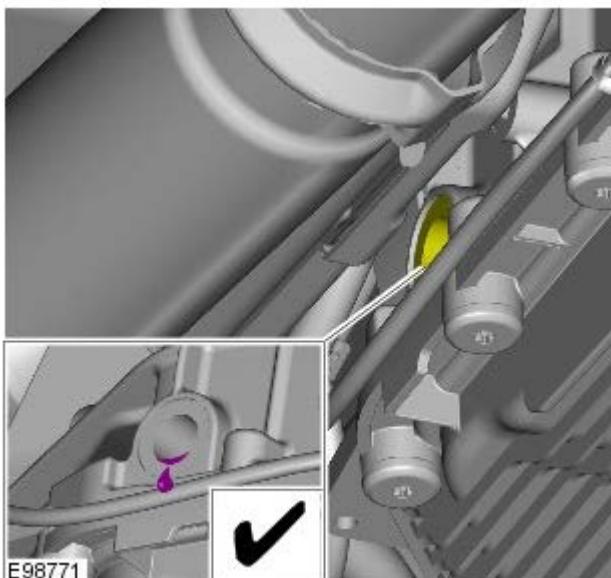
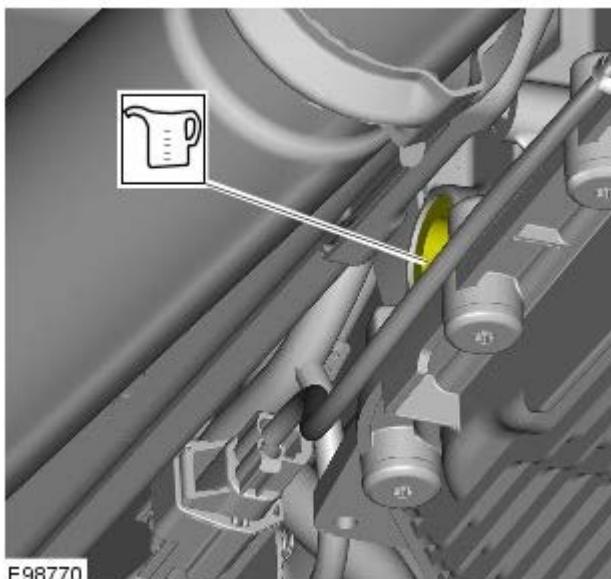
7. Carry out a transmission fluid level check.

Refer to: [Transmission Fluid Level Check - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

8.  **CAUTION:** Make sure the correct specification and quantity of oil is used.

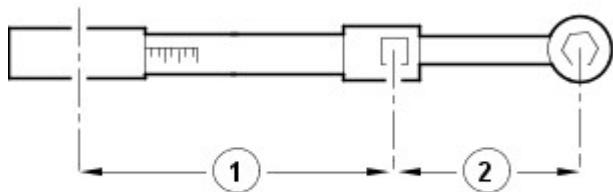
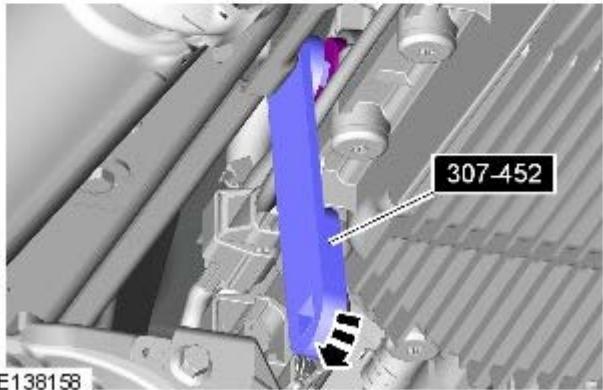
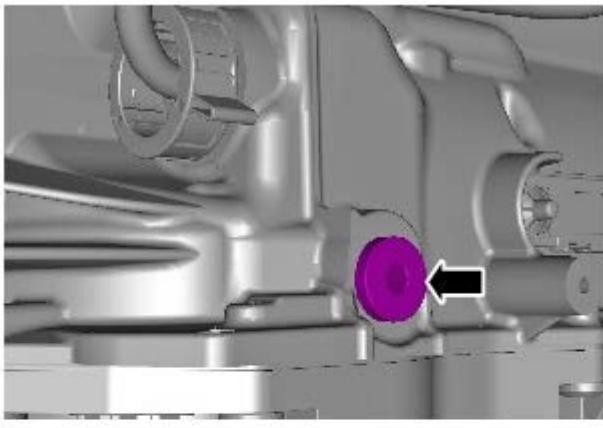
 **NOTE:** Use transmission fluid meeting Land Rover specification.

- Refill the transmission with fluid.



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

10.  **NOTE:** Install a new fluid level filler plug.
Special Tool(s): [307-452](#)

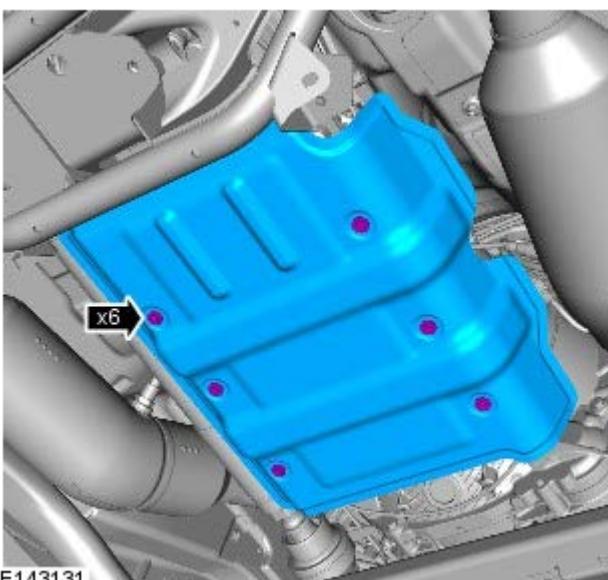


E37107

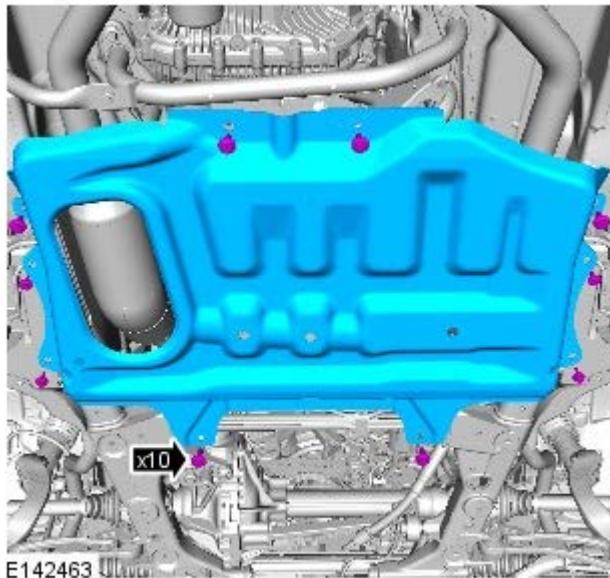
11.  **CAUTION:** Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.

- Carry out a transmission fluid level check.
- 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.

12. **Torque:** 10 Nm



13. *Torque:*
M10 60 Nm
M6 10 Nm

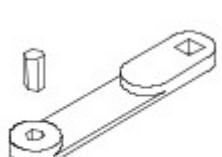


14. Lower the vehicle.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Drain and Refill TDV6 3.0L Diesel /TDV8 4.4L Diesel

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug
307-452	

Draining

WARNINGS:



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



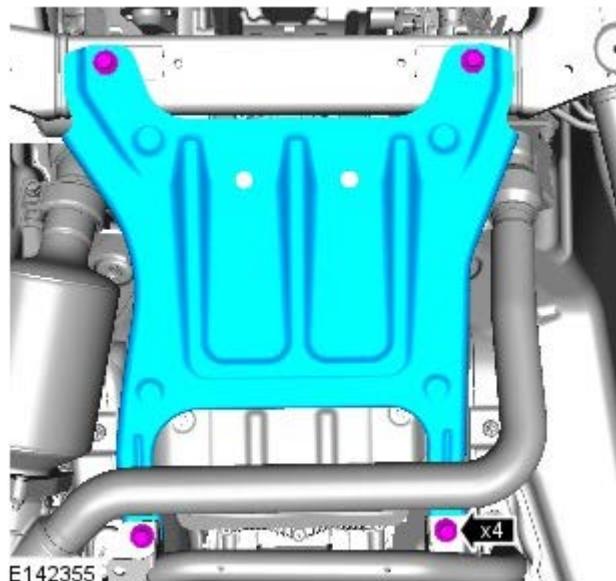
Observe due care when working near a hot exhaust system.

All vehicles

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

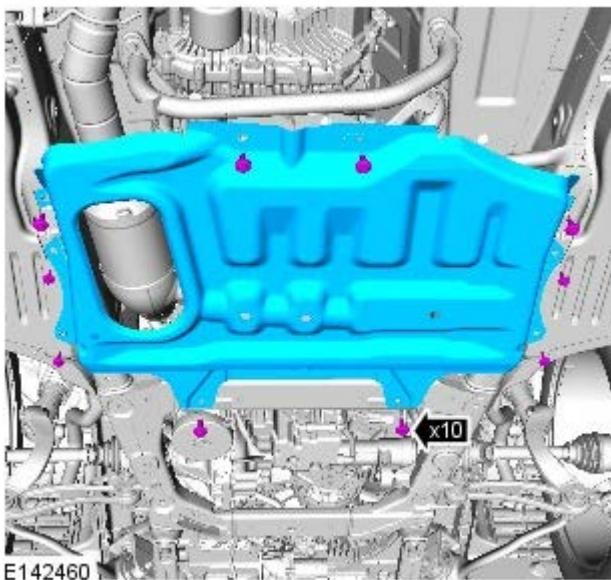
Vehicles with 4.4L diesel engine

2.



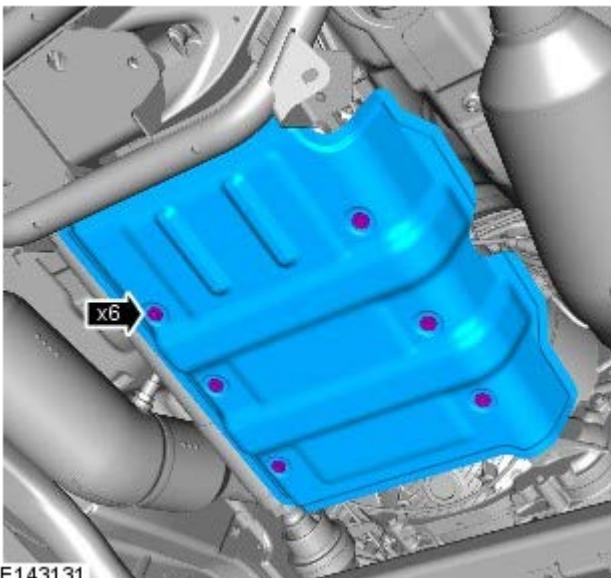
Vehicles with 3.0L diesel engine

3.



All vehicles

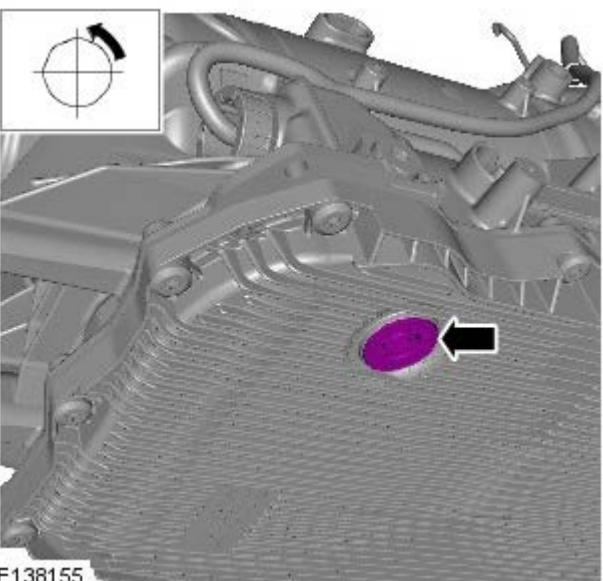
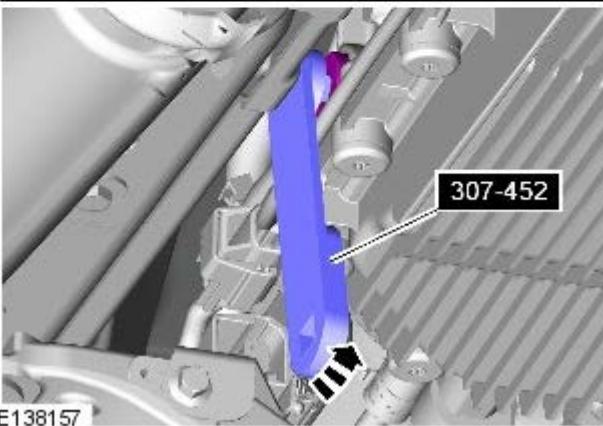
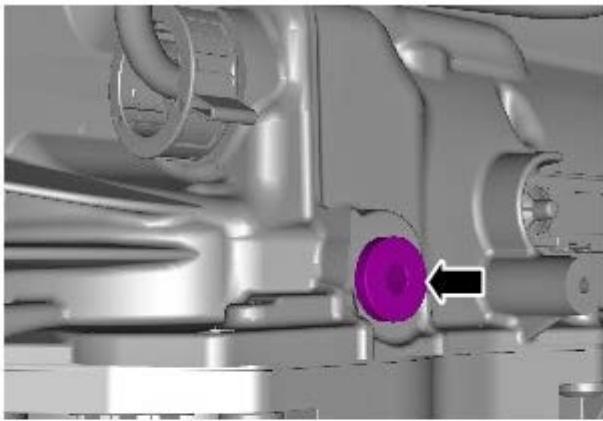
4.



5.  **NOTE:** Drain the fluid into a suitable container.

Clean the area around the transmission fluid level plug.

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



6.

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

Filling

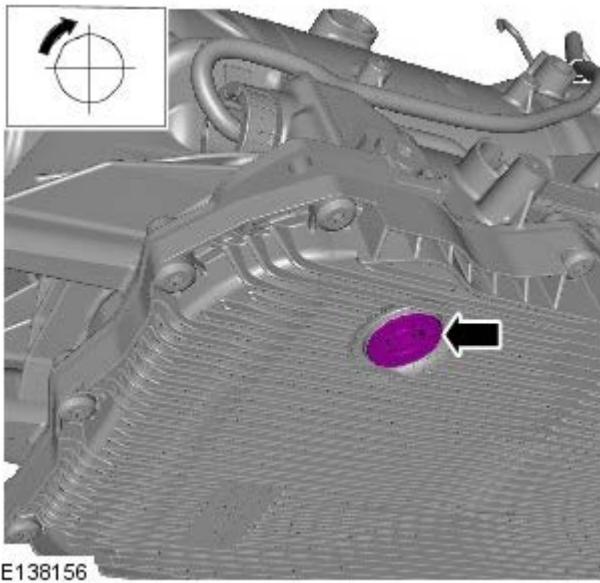
WARNINGS:

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

 Observe due care when working near a hot exhaust system.

All vehicles

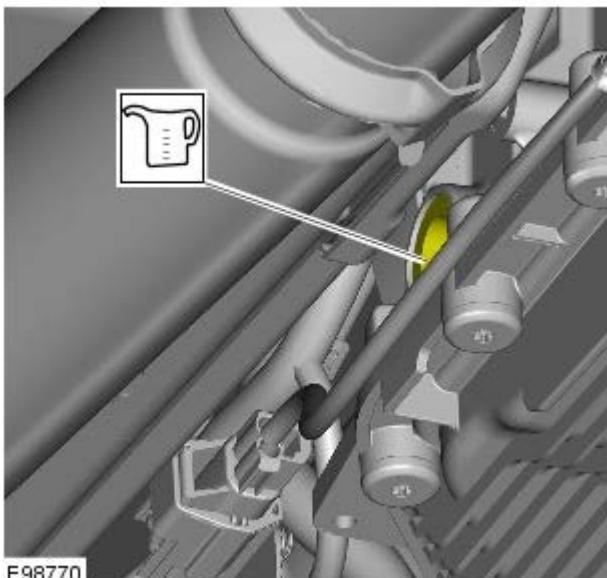
1. *Torque: 8 Nm*



E138156

2. Carry out a transmission fluid level check.

Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).



E98770

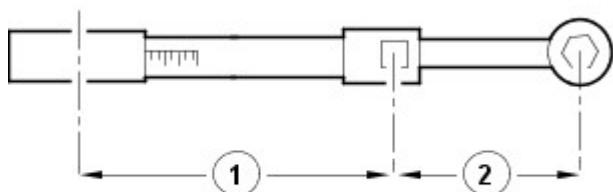
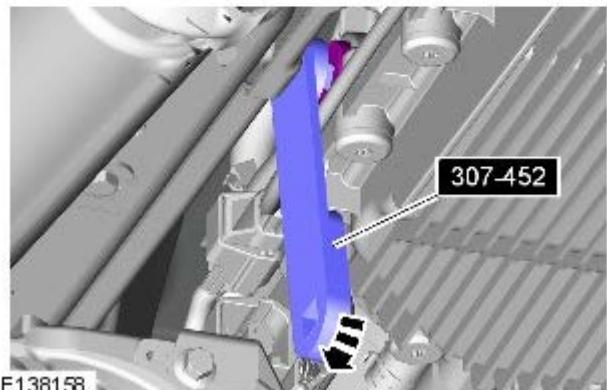
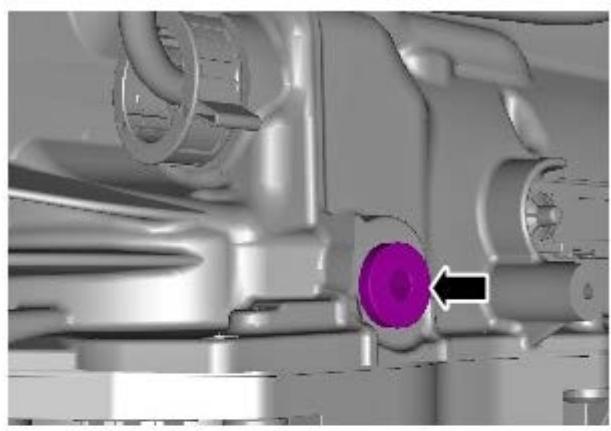
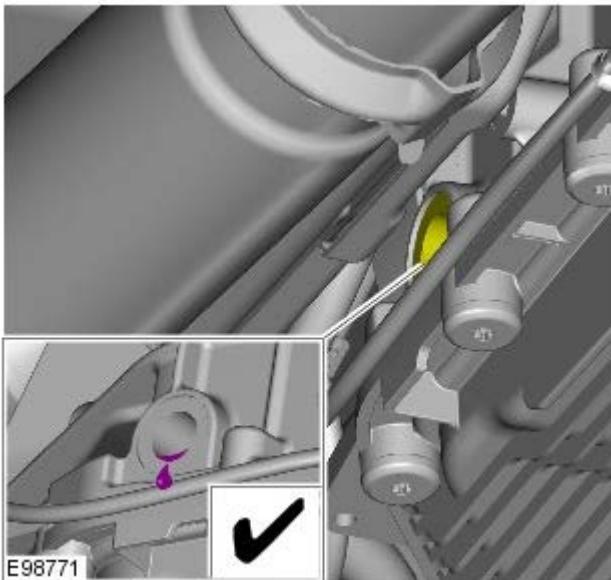
3.  **CAUTION:** Make sure the correct specification and quantity of oil is used.



NOTE: Use transmission fluid meeting Land Rover specification.

- Refill the transmission with fluid.

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



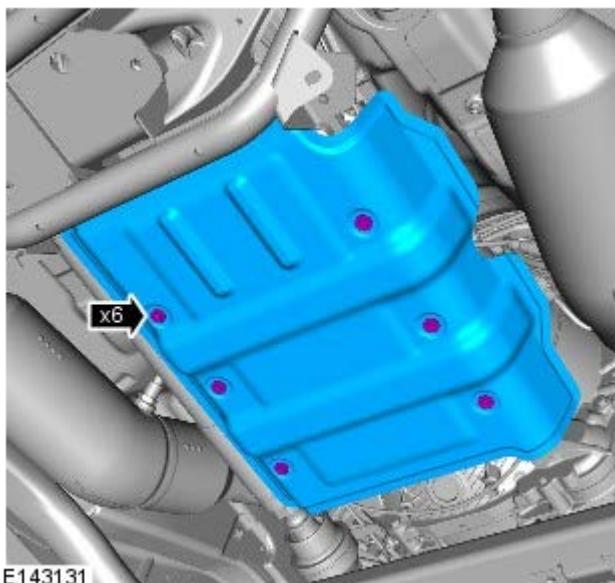
E37107

5. **NOTE:** Install a new fluid level filler plug.
Special Tool(s): [307-452](#)

6. **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.

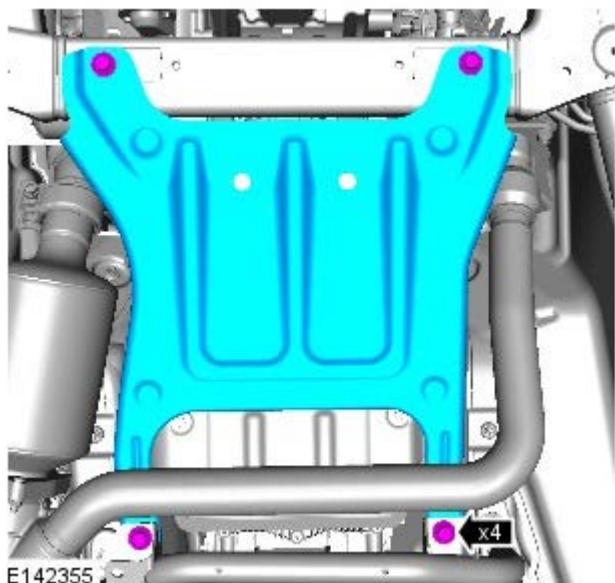
- Carry out a transmission fluid level check.
- To make sure the transmission fill plug is torqued to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
- Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
- Step 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.

7. *Torque: 10 Nm*



Vehicles with 4.4L diesel engine

8. *Torque: 60 Nm*

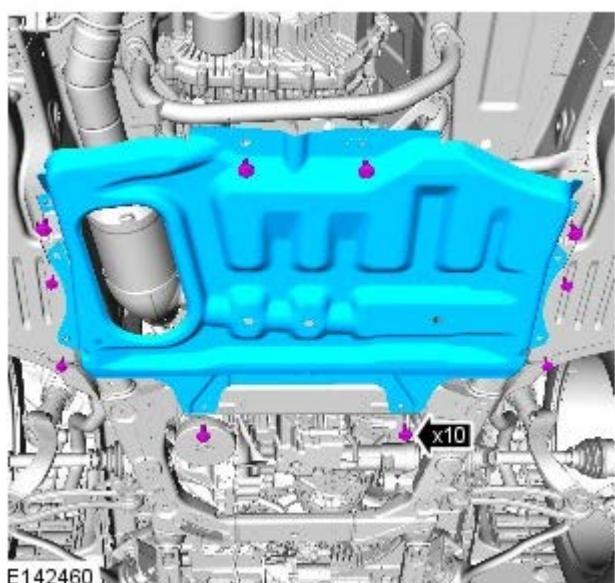


Vehicles with 3.0L diesel engine

9. *Torque:*

M10 60 Nm

M6 10 Nm



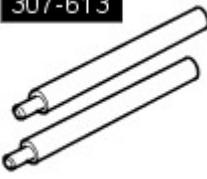
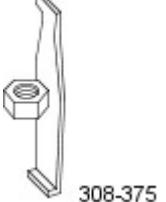
All vehicles

10. Lower the vehicle.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Input Shaft Seal

Removal and Installation

Special Tool(s)

 100-012 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 307-613 E84067	307-613 Holding Pins, Torque Converter
 308-375	308-375 Remover, Input and Output Seal
 E131592	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, Specifications).

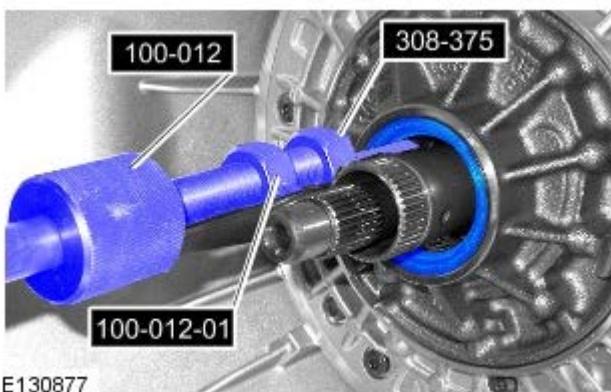
2.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
3. Refer to: [Transmission - TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal).

4.  **CAUTION:** Be prepared to collect escaping fluids.

Special Tool(s): [307-613](#)



E149764



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

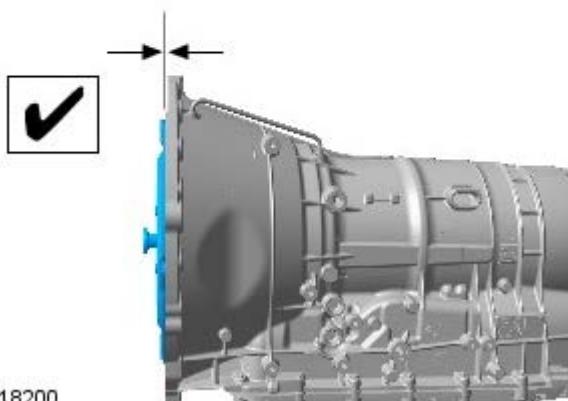
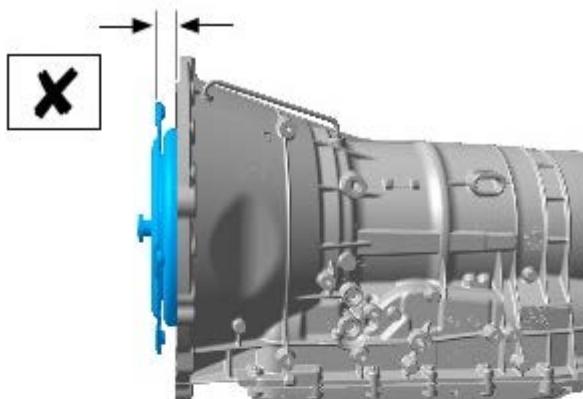


E130980

1.  **CAUTION:** Install a new seal.

Special Tool(s): [JLR-308-845](#)

2.  **CAUTION:** Make sure the torque converter is fully located into the oil pump drive.



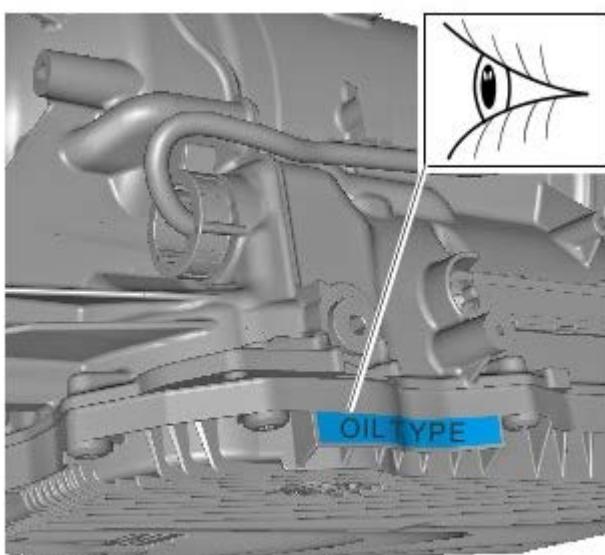
E118200

3. Install the transmission and transfer gearbox.

Refer to: [Transmission - TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal).

4. Connect the battery ground cable.

Refer to: [Specifications \(414-00, Specifications\)](#).



E138154

5. CAUTIONS:



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



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.



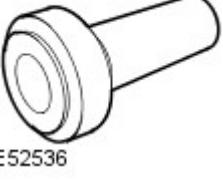
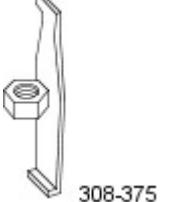
NOTE: Install a new fluid level filler plug.

- Carry out a transmission fluid level check.
- 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.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Extension Housing Seal

Removal and Installation

Special Tool(s)

 100-012 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 307-520 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



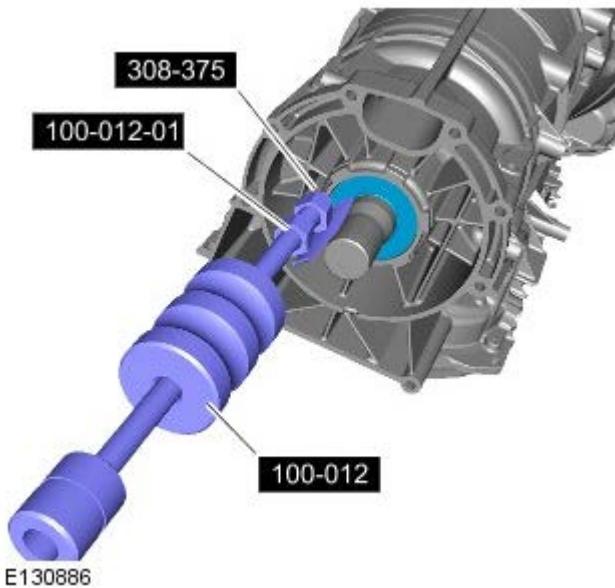
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Transfer Case - TDV6 3.0L Diesel](#) (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Removal).
Refer to: [Transfer Case - TDV8 4.4L Diesel](#) (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Removal).
Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07 Transfer Case, Removal).

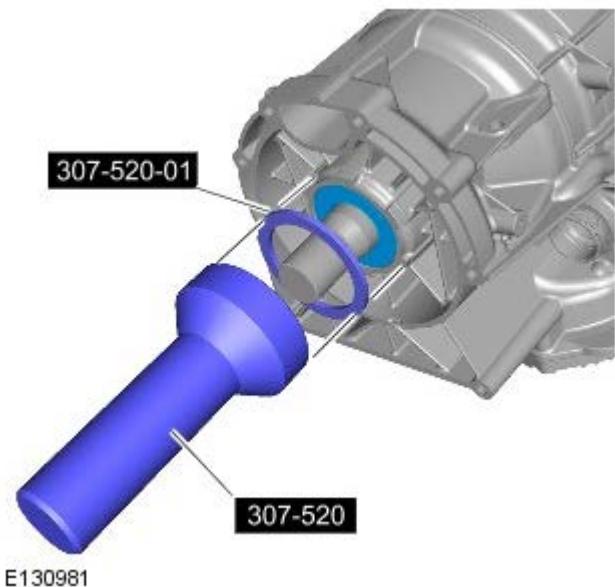


2. **CAUTION:** Care must be taken to avoid damage to the seal register and running surface.

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](#)

- Refer to: [Transfer Case - TDV6 3.0L Diesel](#) (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Installation).
 Refer to: [Transfer Case - TDV8 4.4L Diesel](#) (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Installation).
 Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07 Transfer Case, Installation).
- Carry out a transmission fluid level check.

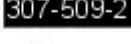
Refer to: [Transmission Fluid Level Check - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Selector Shaft Seal

Removal and Installation

Special Tool(s)

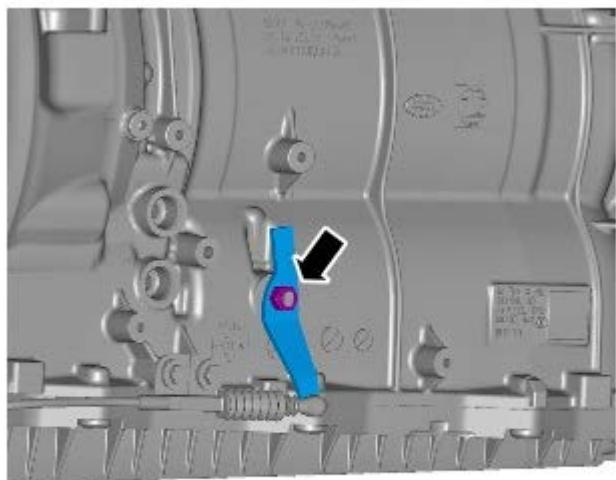
 E50766	Seal extractor 307-509-1(LRT-44-033/1)
 E50767	Seal extractor 307-509-2(LRT-44-033/2)
 E50768	Seal installer 307-509-3(LRT-44-033/3)

Removal

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

Raise and support the vehicle.

2. TORQUE: 12 Nm



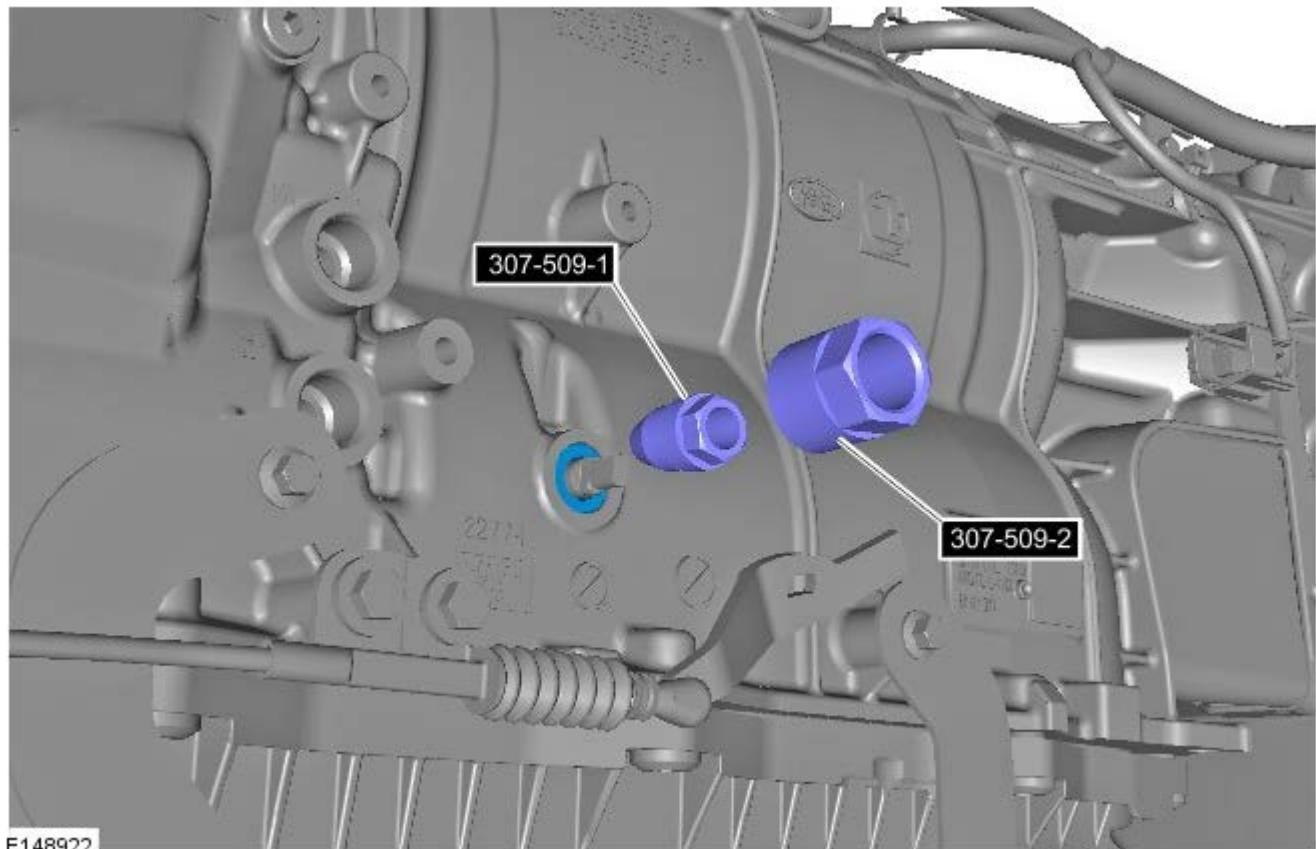
E149590

3. Release the selector cable and lever.
• Remove the nut.

4.  **CAUTION:** Before the disconnection or removal of any components, make sure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

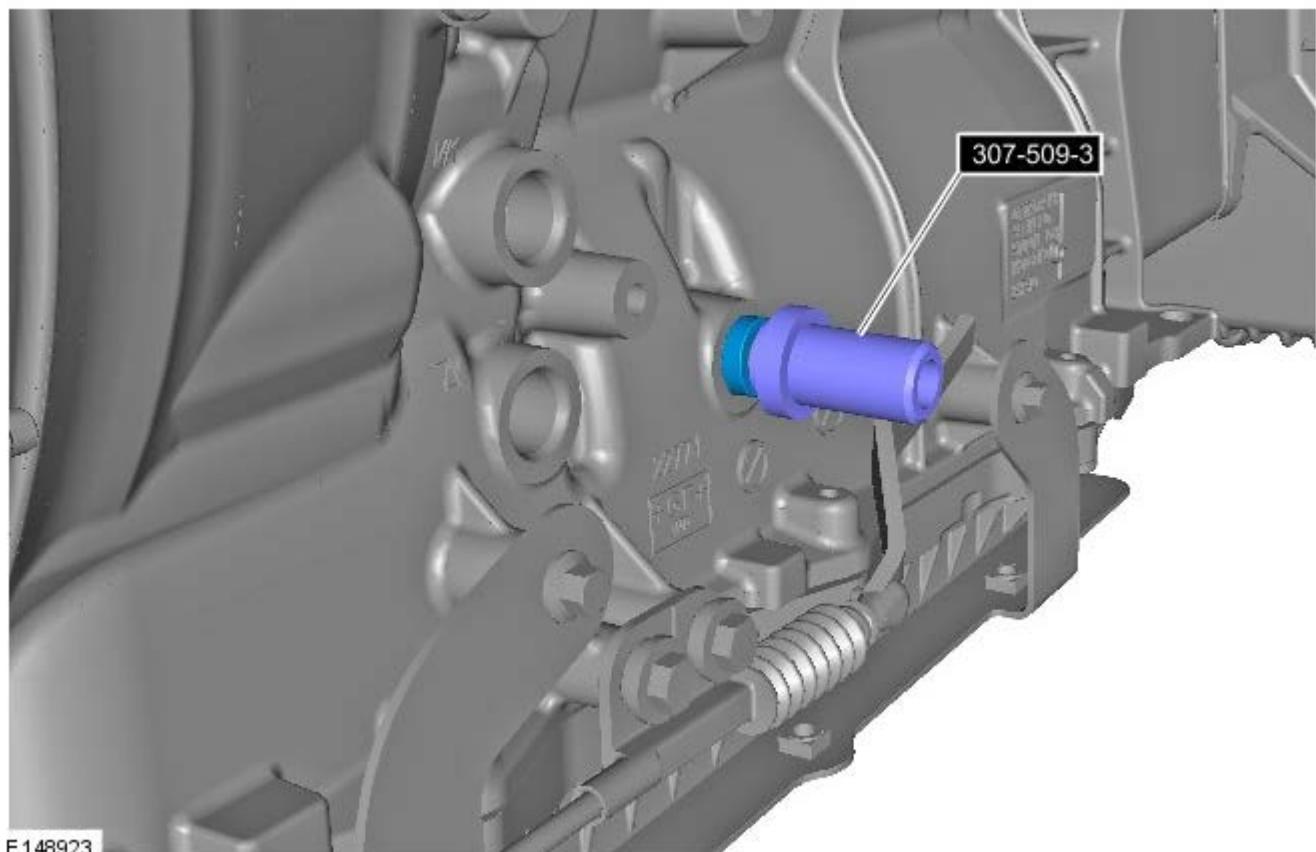
Remove the selector shaft seal.

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



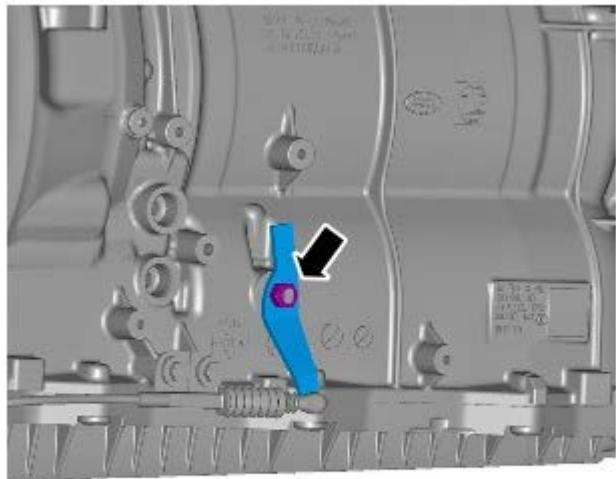
Installation

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



2. Install the selector cable and lever.

- Secure with the clip.
- TORQUE: 12 Nm

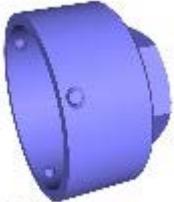


E149590

Automatic Transmission/Transaxle - 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.

NOTES:



The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.



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

All vehicles

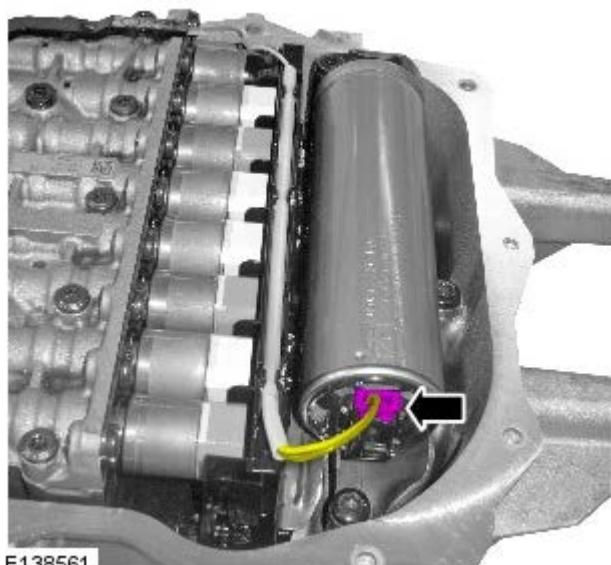
1. Remove the transmission fluid pan.

Refer to: [Transmission Fluid Pan, Gasket and Filter \(307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal and Installation\)](#).

Vehicles with Stop/Start

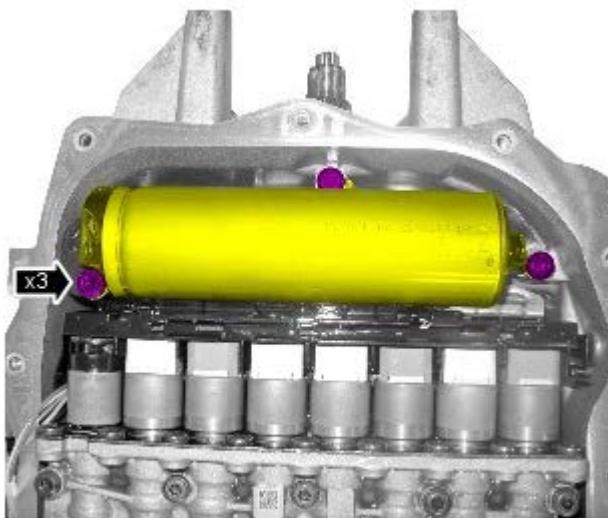


2. **CAUTION:** Take precautions to avoid any electrostatic charging, which could damage this component.



E138561

- 3.

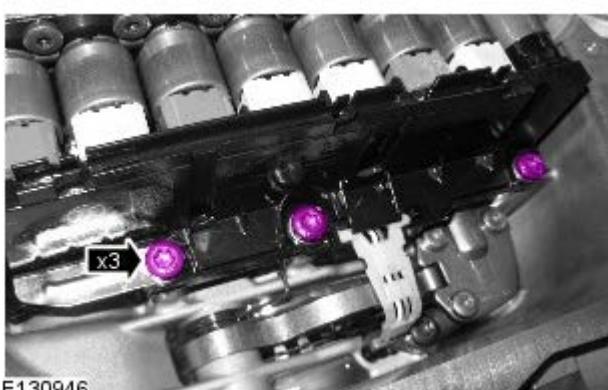


E138562



E138563

4.  **CAUTION:** Remove and discard the O-ring seals.



E130946

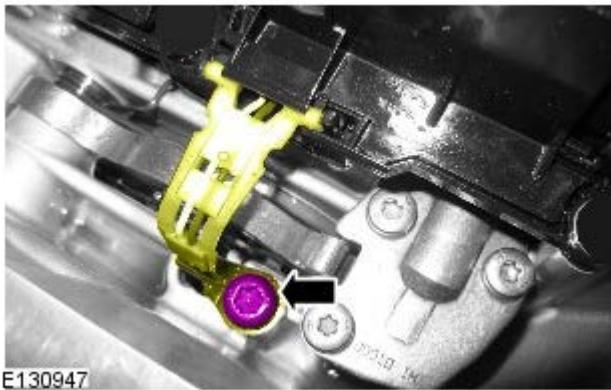
All vehicles

5. **CAUTIONS:**

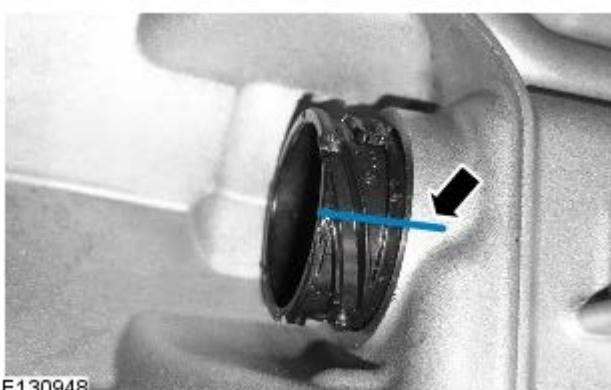
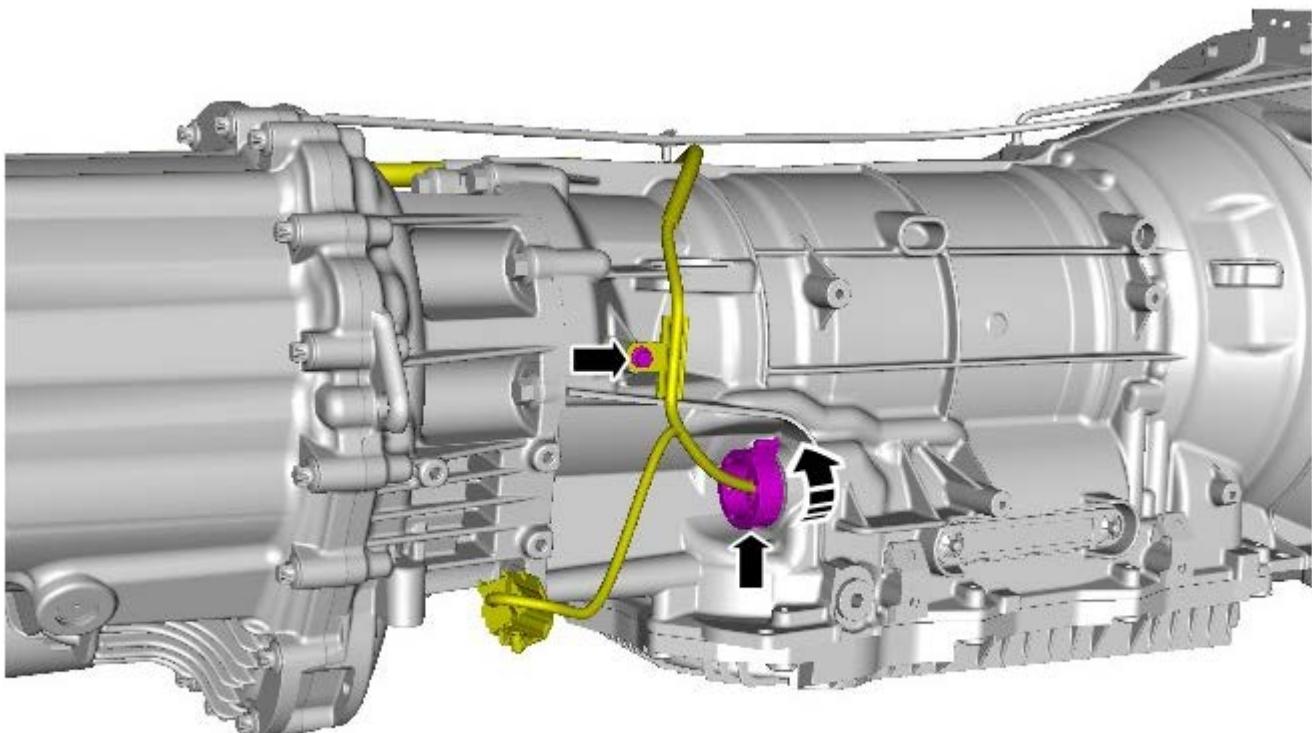
 Discard the bolts.

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

6.  **CAUTION:** Discard the bolt.



7.



8.  **NOTE:** Note the orientation of the component prior to removal.

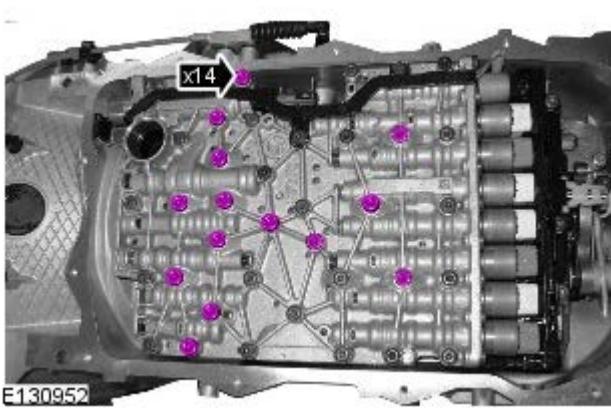
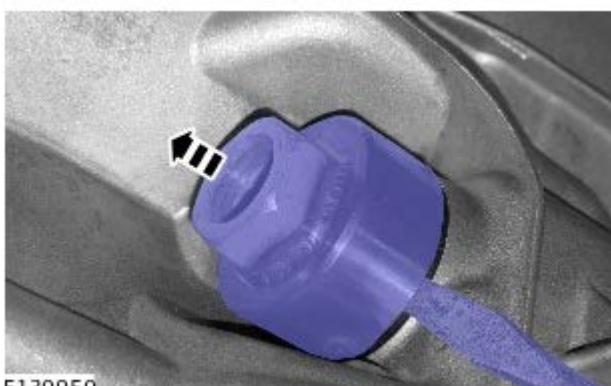
9.



10. Special Tool(s): [JLR-308-844](#)



11.



12.  CAUTION: Discard the bolts.

Torque: 8 Nm

13.  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 —

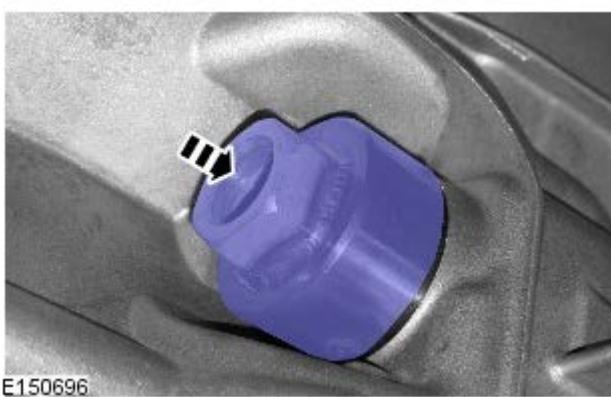
3.

- *Special Tool(s): [JLR-308-844](#)*



E150812

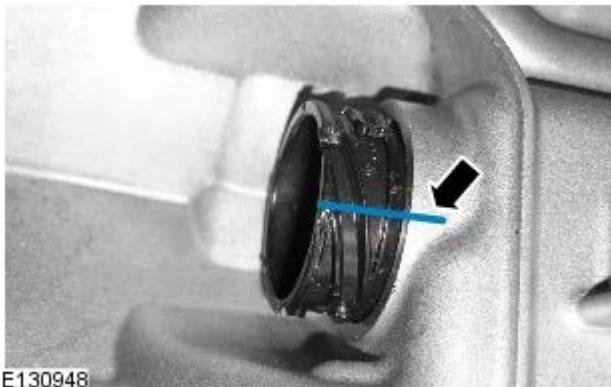
4.



E150696



5. **CAUTION:** Make sure that the electrical connector is installed in the correct orientation as noted in the

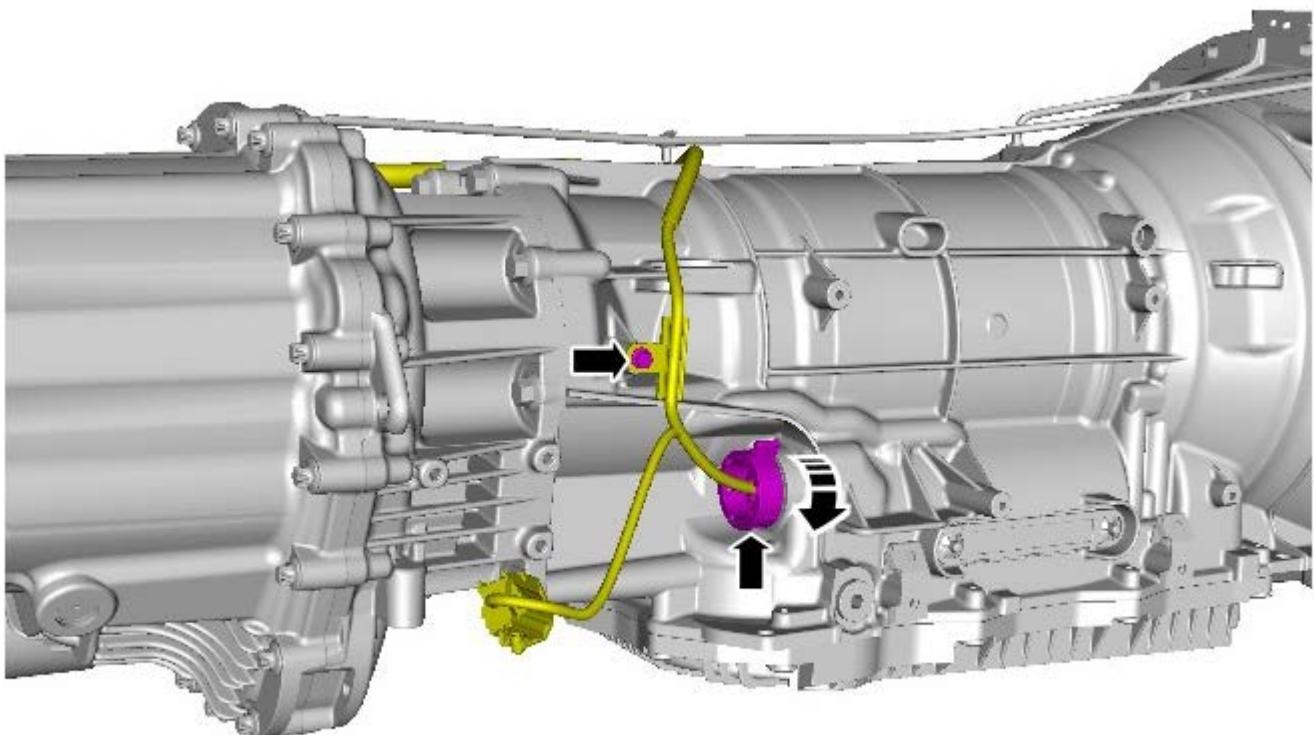


removal step.



6.

7. *Torque: 10 Nm*

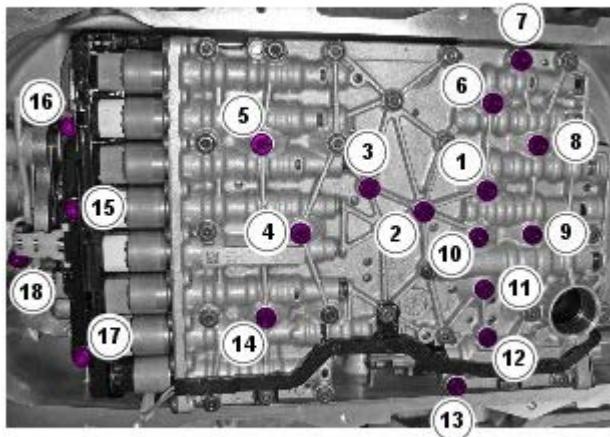


8. **CAUTION:** Make sure that new bolts are installed.



NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 8 Nm



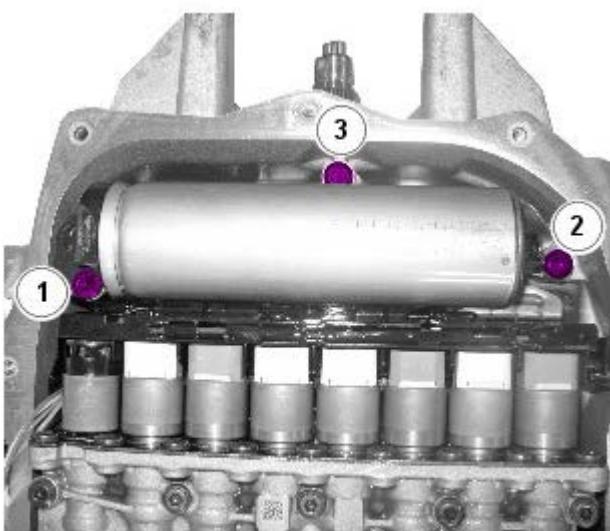
E130933

Vehicles with Stop/Start



E138563

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

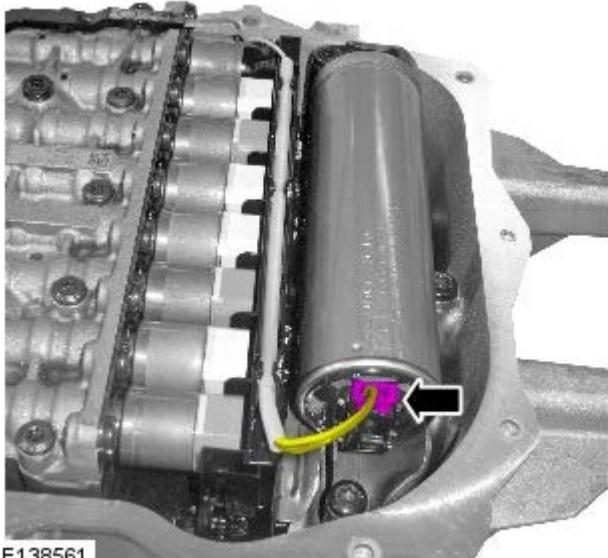


E138566

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

 NOTE: Tighten the retaining bolts evenly and progressively.

11.



All vehicles

12. Refer to: [Transmission Fluid Pan, Gasket and Filter](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal and Installation).
13. Using the diagnostic tool, calibrate the main control valve body and the transmission control module (TCM).

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Pan, Gasket and Filter

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

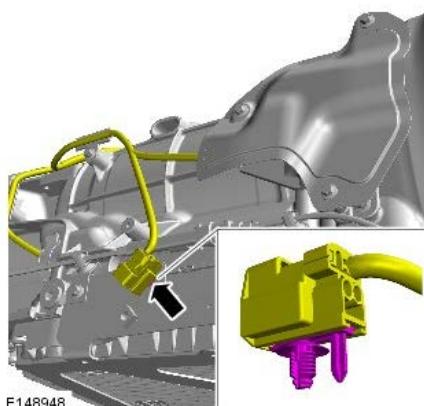
1. Disconnect the battery ground cable.

Refer to: Specifications (414-00, Specifications).

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

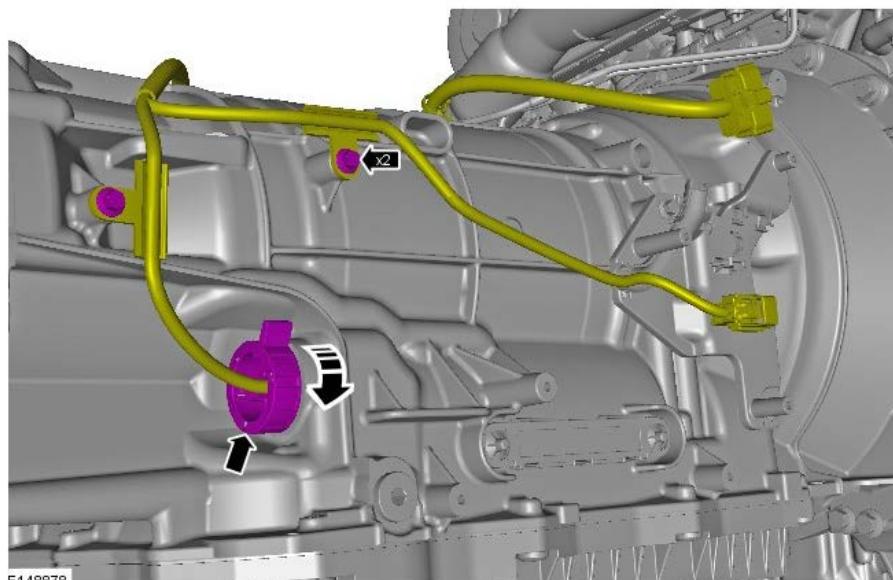
3. Refer to: [Transmission Fluid Drain and Refill - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).
Refer to: [Transmission Fluid Drain and Refill - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

4.



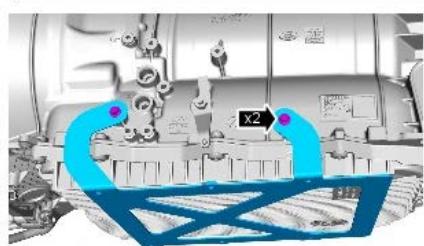
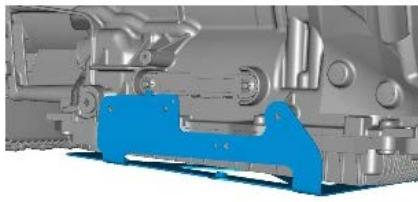
E148948

5.



E148878

6. *Torque: 10 Nm*

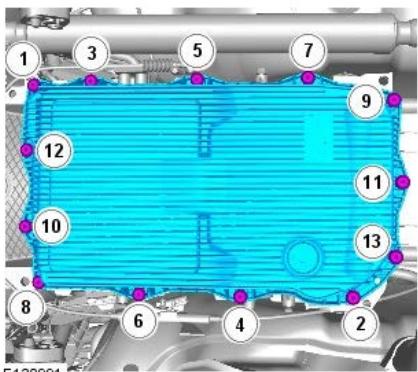


E148881

7. CAUTIONS:

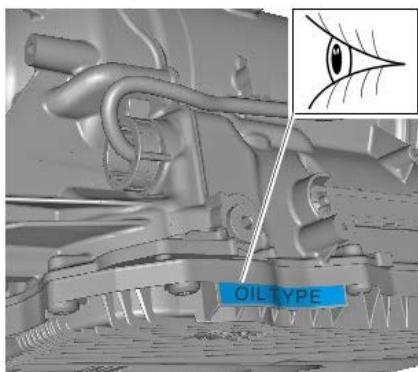
-  Take extra care when removing the component, prevent damage to the mating faces.
-  Make sure that the area around the component is clean and free of foreign material.
-  Be prepared to collect escaping fluids.
-  Discard the components.

Torque: 10 Nm



E130991

Installation



E138154

1. CAUTIONS:

-  Make sure that new components are installed.
-  Make sure that the mating faces are clean and free of foreign material.
-  Make sure the correct specification and quantity of oil is used.

To install, reverse the removal procedure.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Support Insulator

Removal and Installation

Removal

NOTES:



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



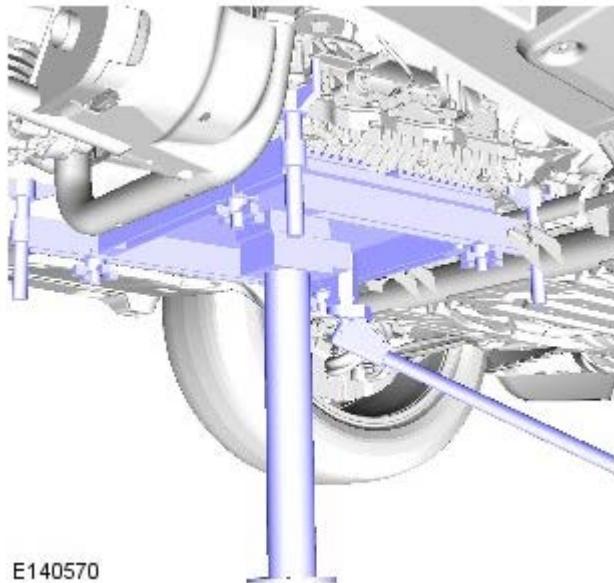
Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00, Specifications).

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

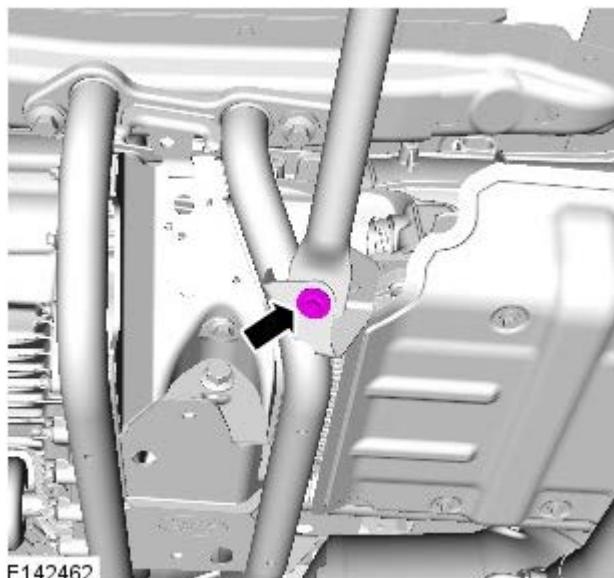
Raise and support the vehicle.

3. Using a suitable hydraulic jack, support the transmission.



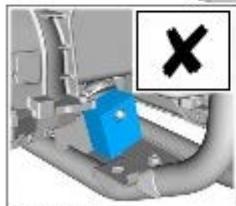
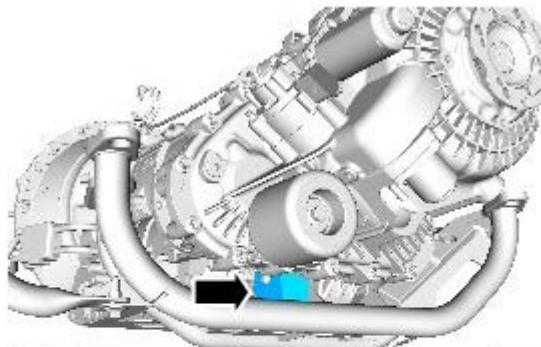
E140570

4. TORQUE: 24 Nm

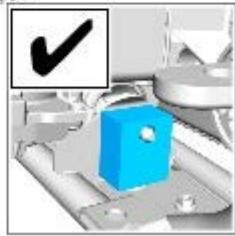


E142462

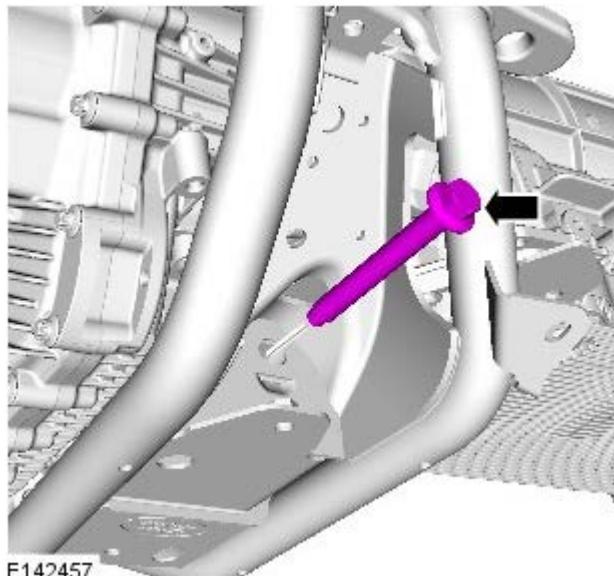
5.  **CAUTION:** Note the fitted position of the component prior to removal.



E150667

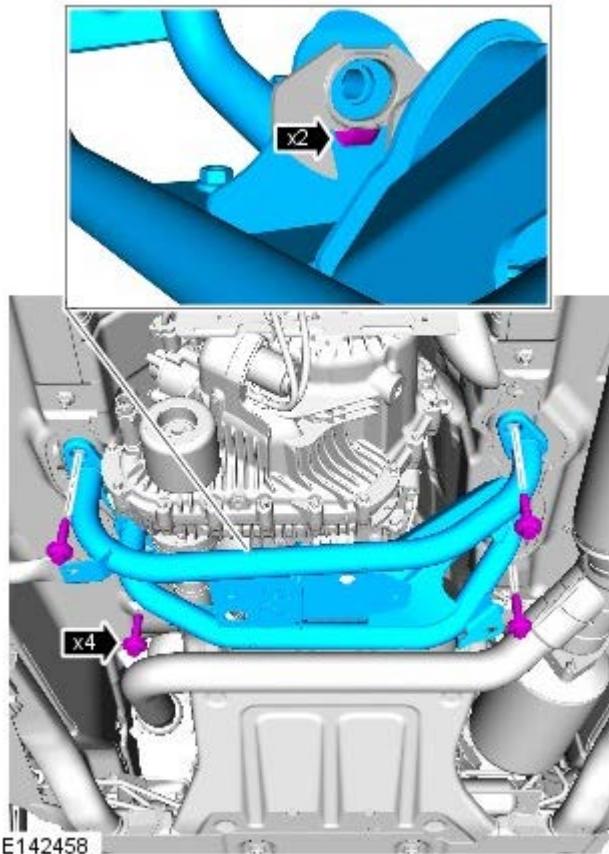


6. TORQUE: 175 Nm



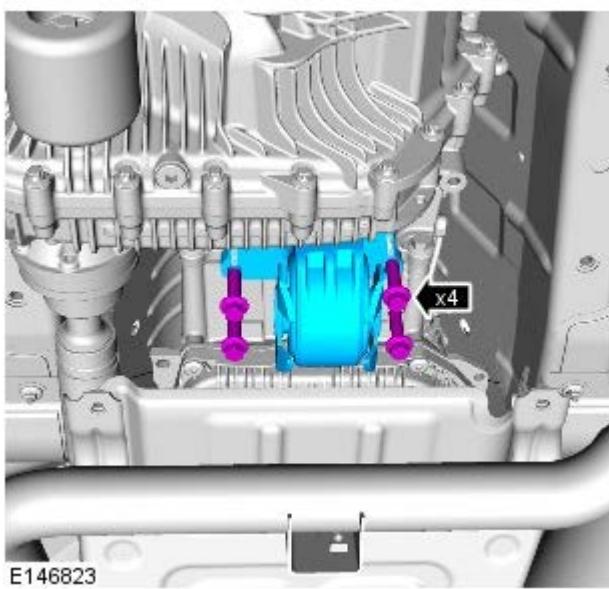
E142457

7. TORQUE: 110 Nm



E142458

8. TORQUE: 60 Nm



E146823

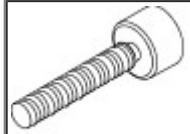
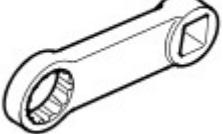
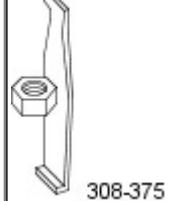
Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV6 3.0L Diesel

Removal

Special Tool(s)

 100-012 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 303-1069 E53727	303-1069 Adapter, Wrench
 308-375	308-375 Remover, Input and Output Seal

NOTES:



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



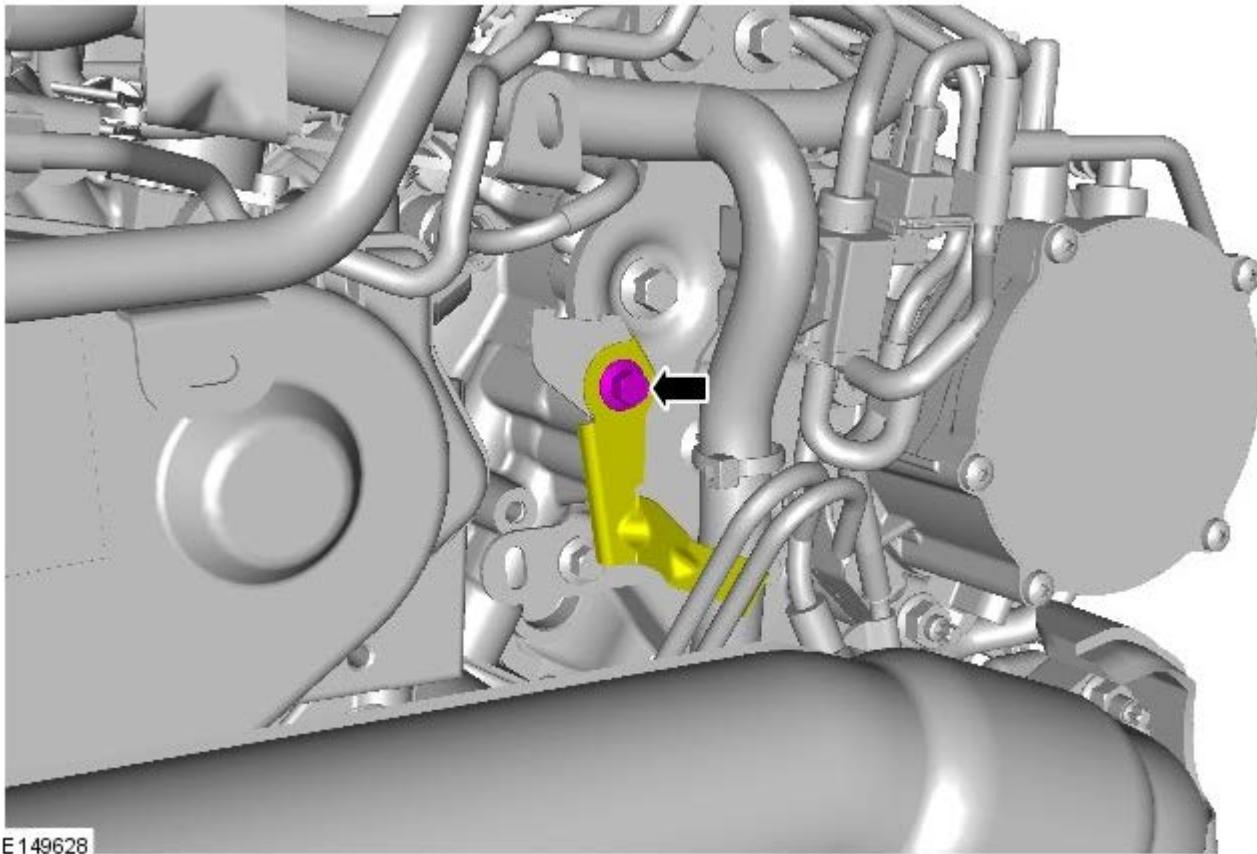
Some illustrations may show the transmission removed for clarity.

1. Disconnect the battery earth lead.

Refer to: Specifications (414-01, Specifications).

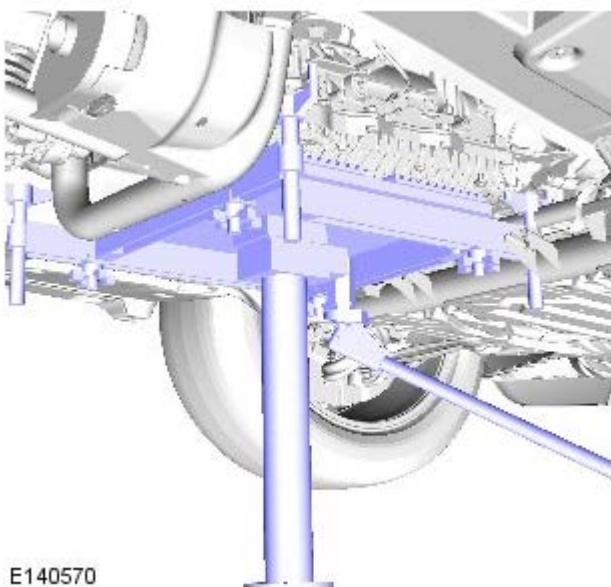
2. Refer to: Secondary Bulkhead Center Panel - TDV6 3.0L Diesel (501-02, Removal and Installation).

- 3.



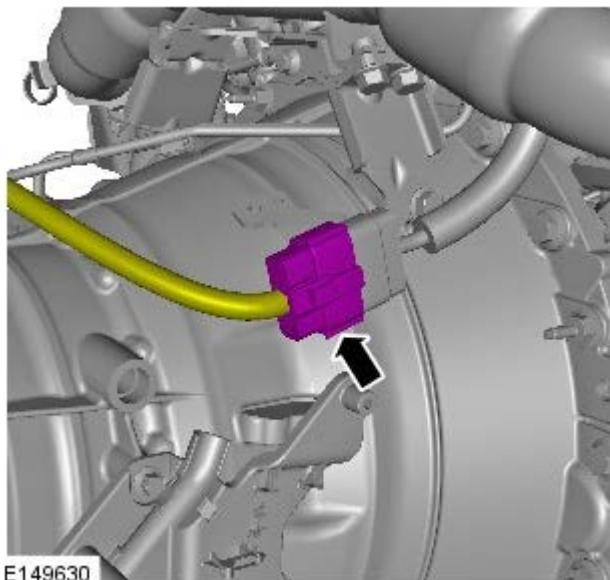
E149628

4. Refer to: [Front Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).
5. Refer to: [Rear Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).
6. Using a transmission jack, support the transmission.

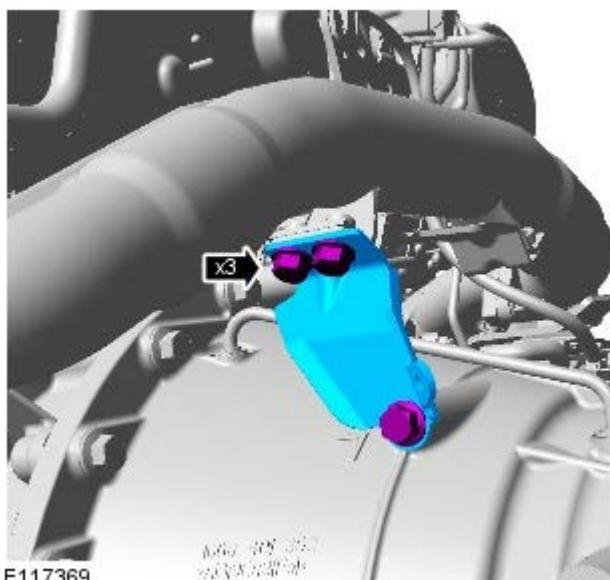


E140570

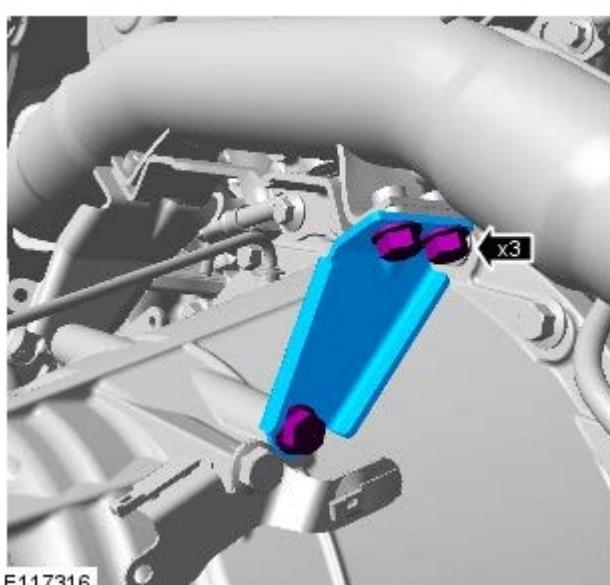
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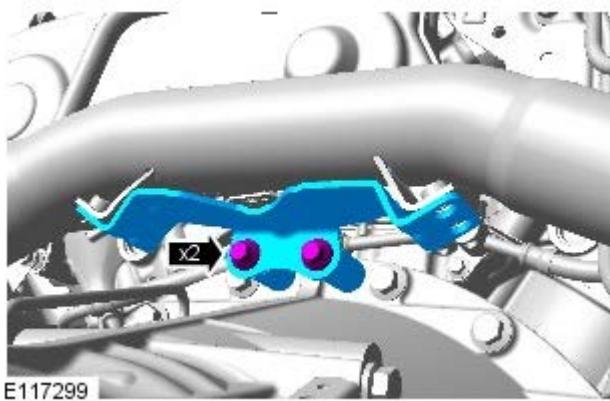
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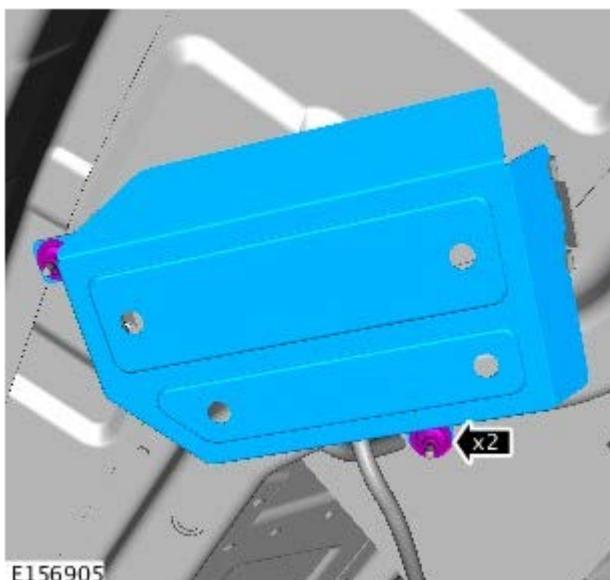
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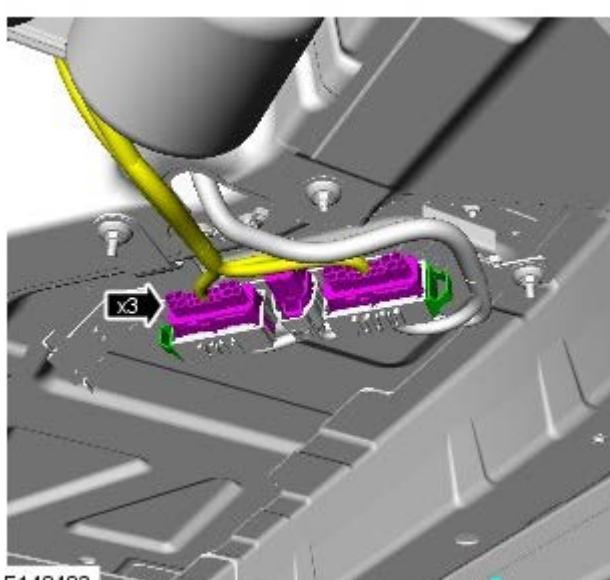
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11.

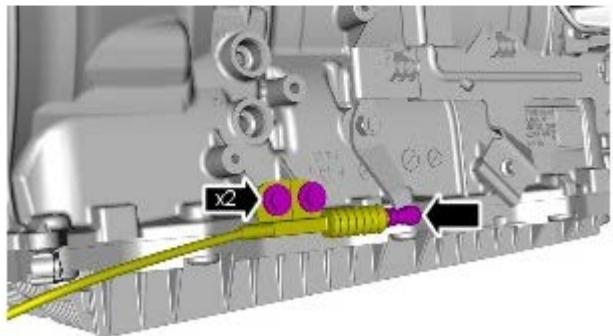
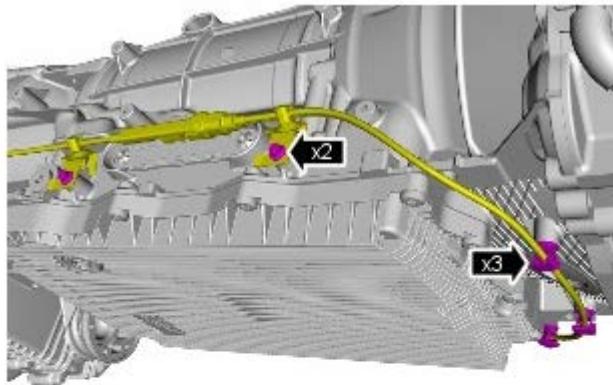


12.



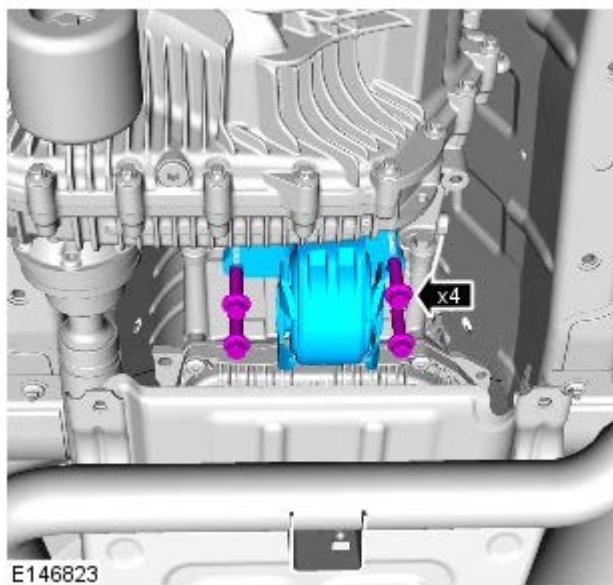
13.

- Secure the cable to the floor.



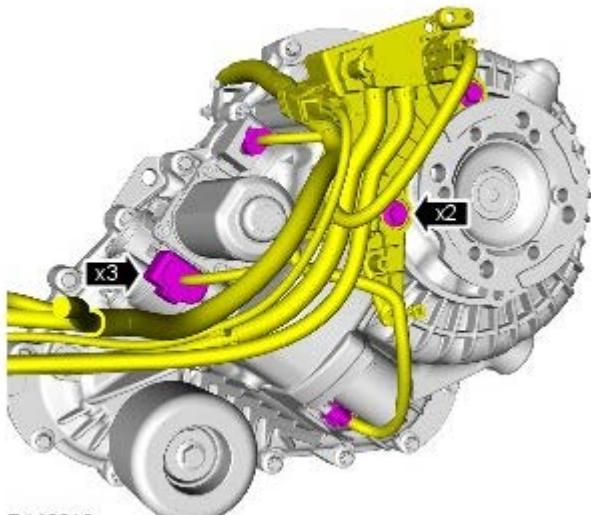
E150353

14.



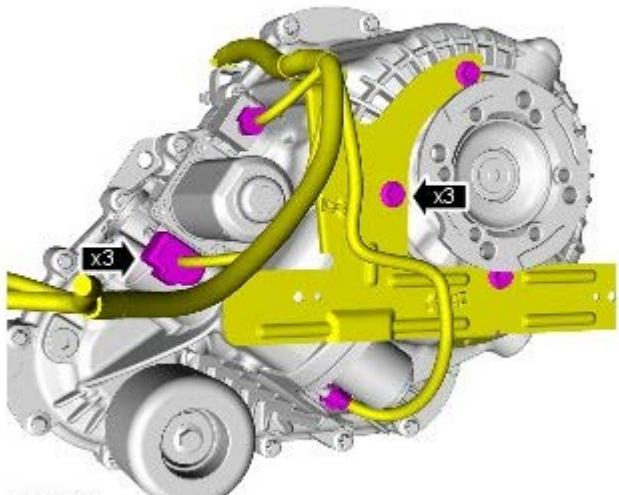
E146823

15.  **NOTE:** Vehicles with DPF (Diesel Particulate Filter) installed only.



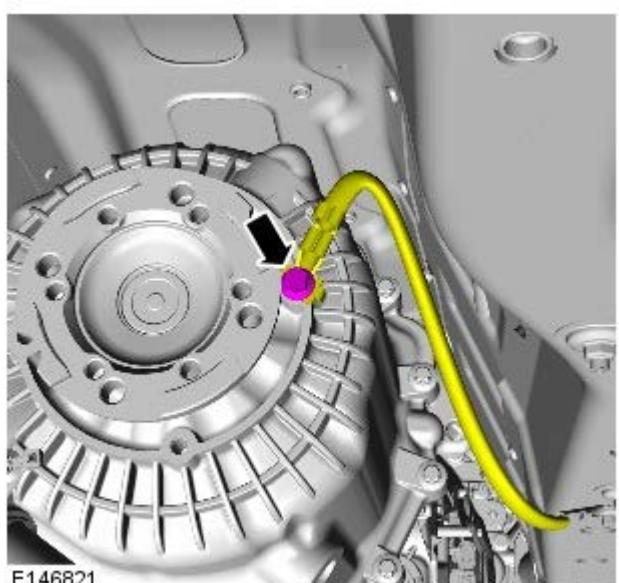
E 146819

16.  **NOTE:** Vehicles without diesel particulate filter (DPF).



E 146820

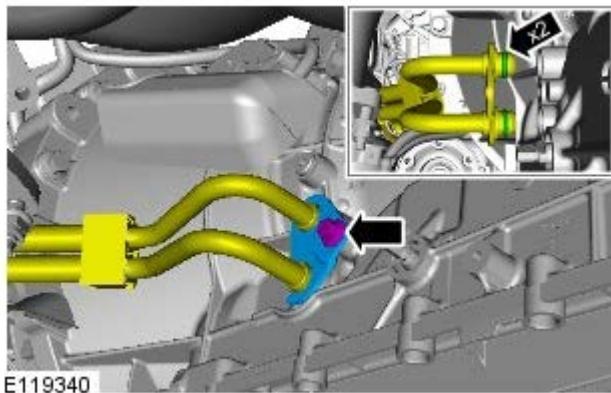
17.



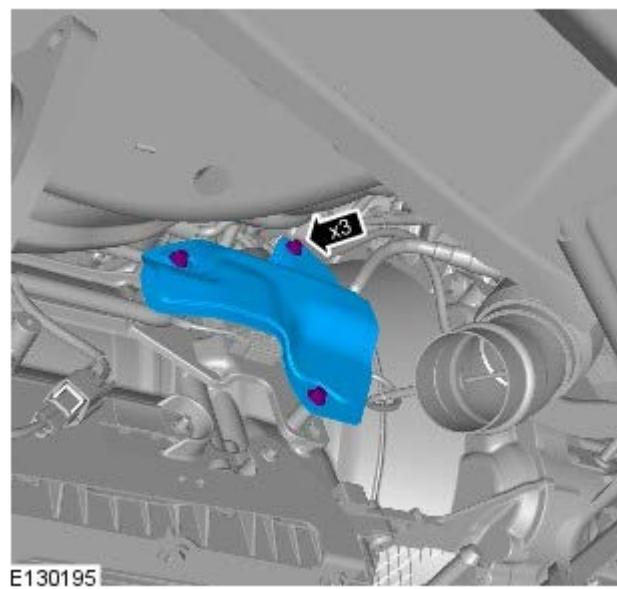
E 146821

18.  **WARNING:** Be prepared to collect escaping fluids.

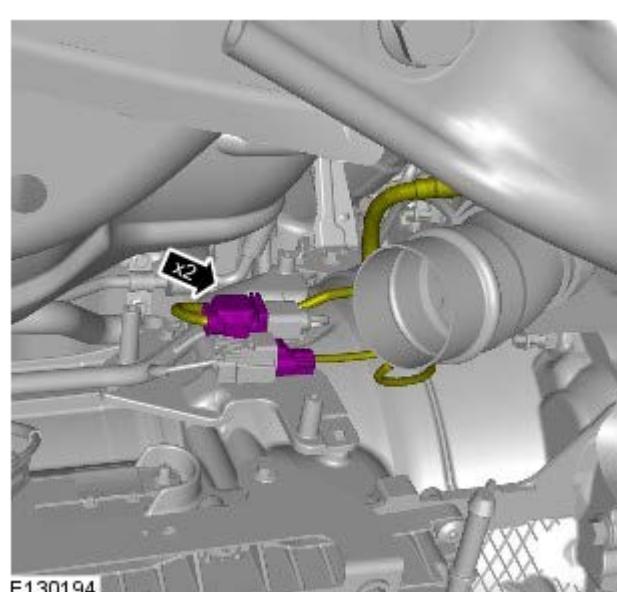
 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



NOTE: Remove and discard the O-ring seals.

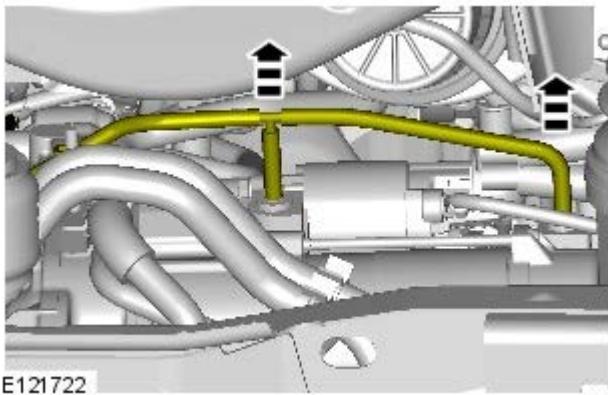


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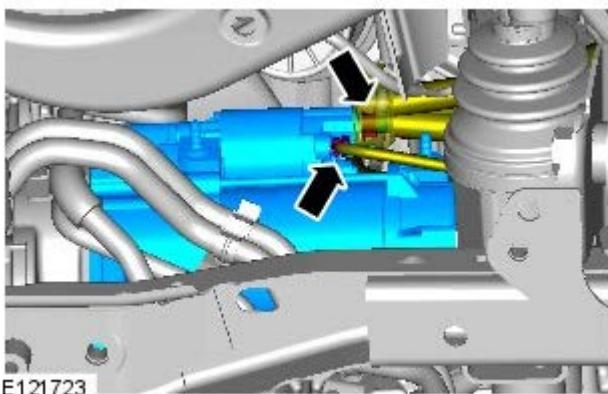


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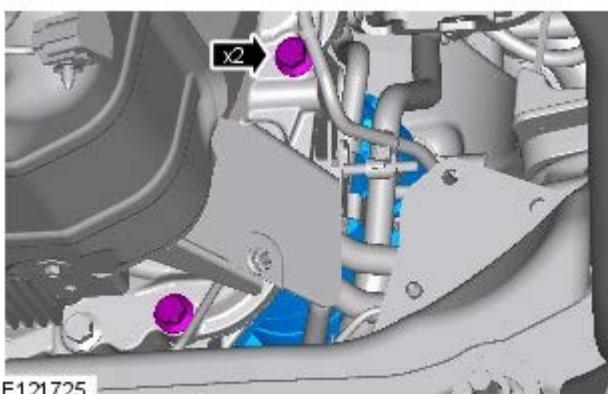
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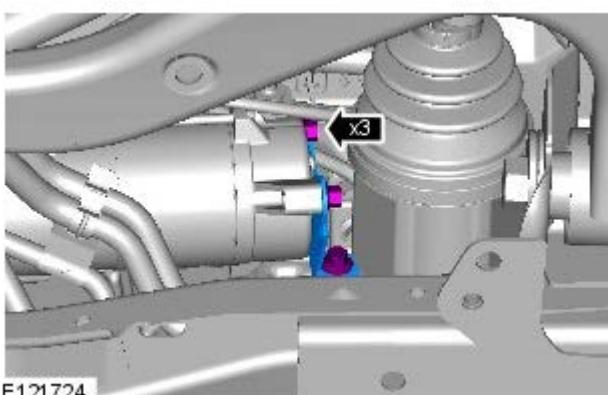
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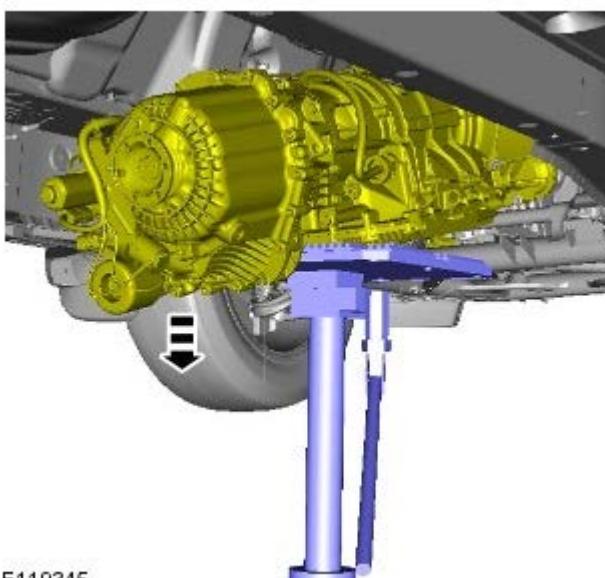
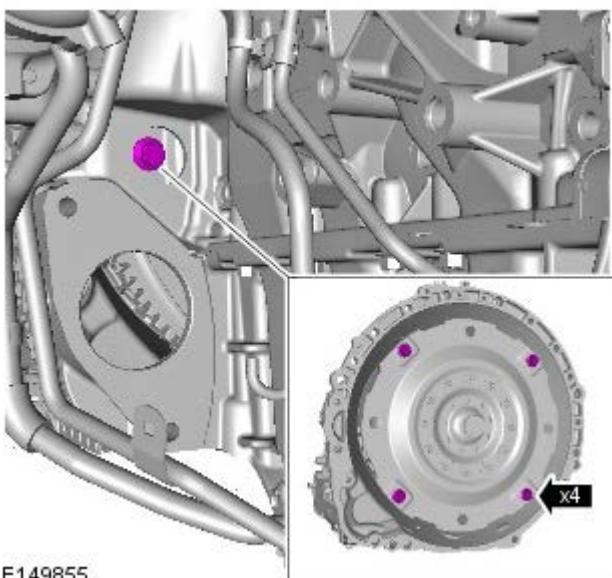
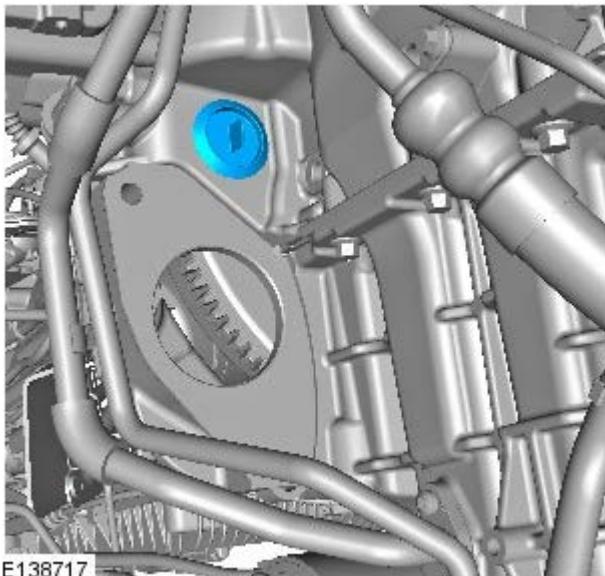
23.



24.



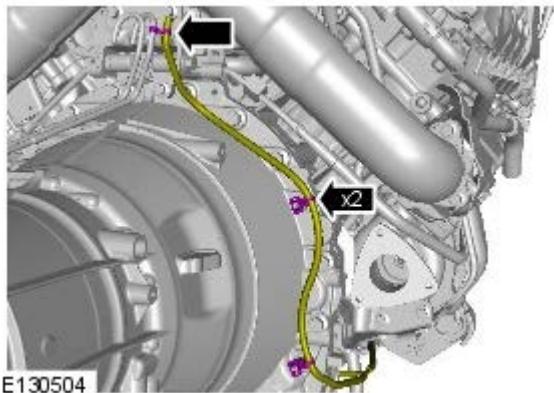
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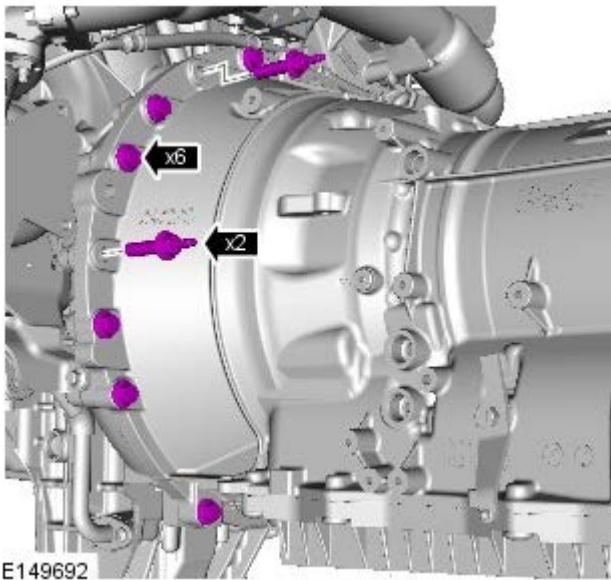
26. **CAUTION:** Only rotate the crankshaft clockwise.

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

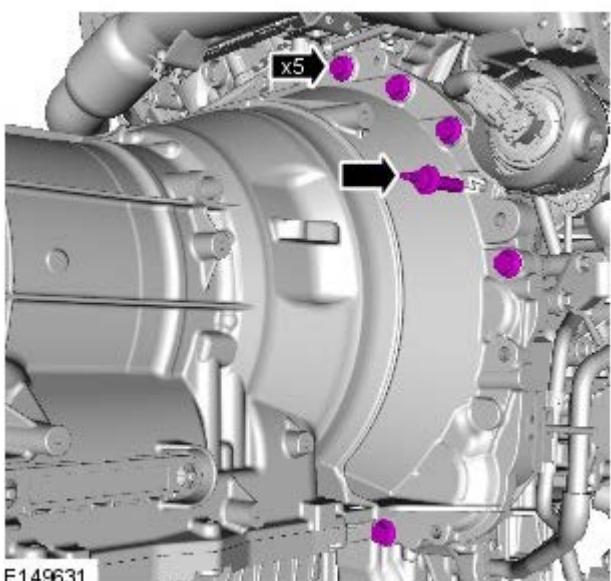
Lower the rear of the transmission for access.



29.



30.



31. **WARNINGS:**



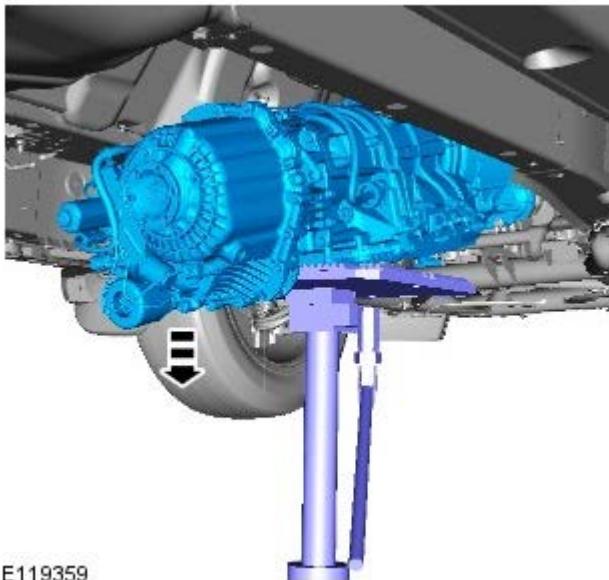
This step requires the aid of another technician.



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



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



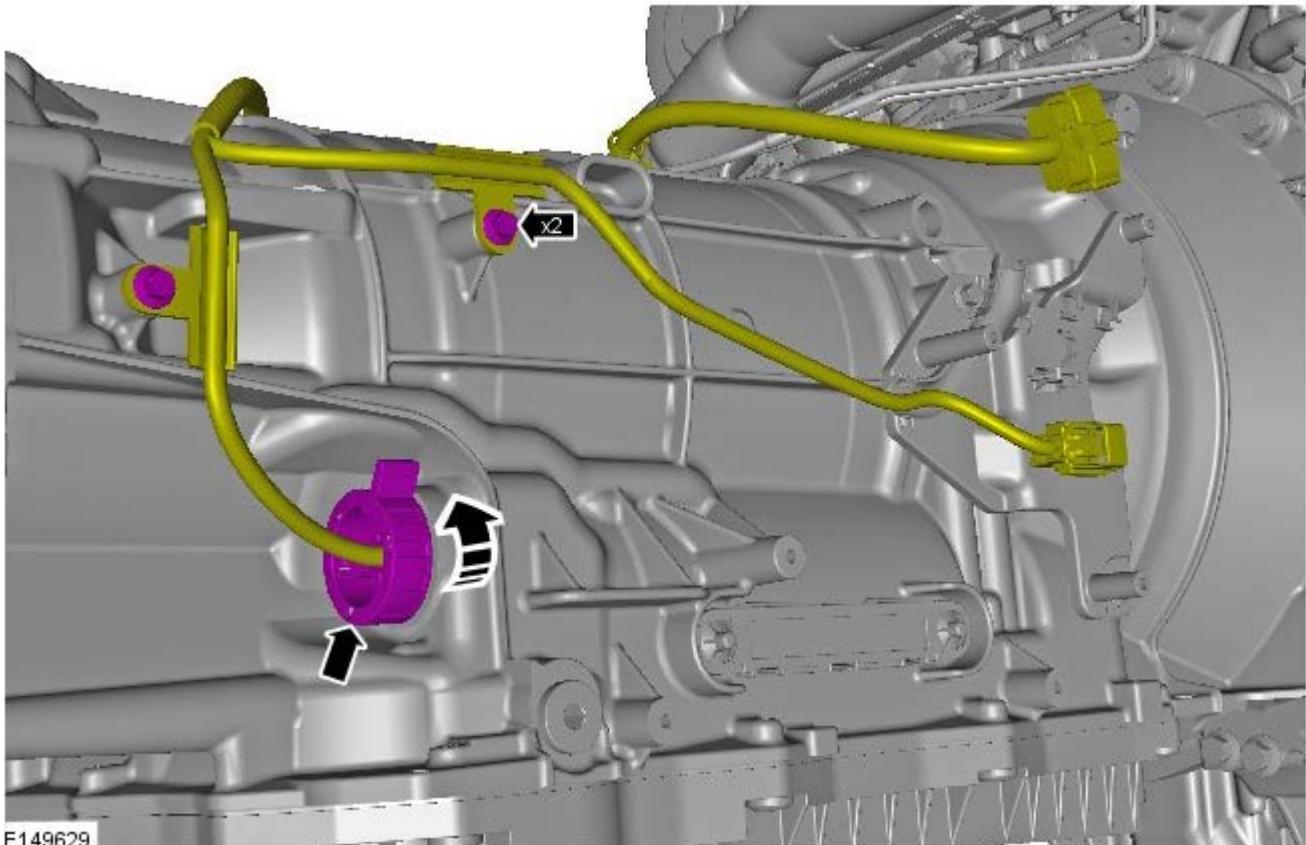
E119359

NOTES:

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

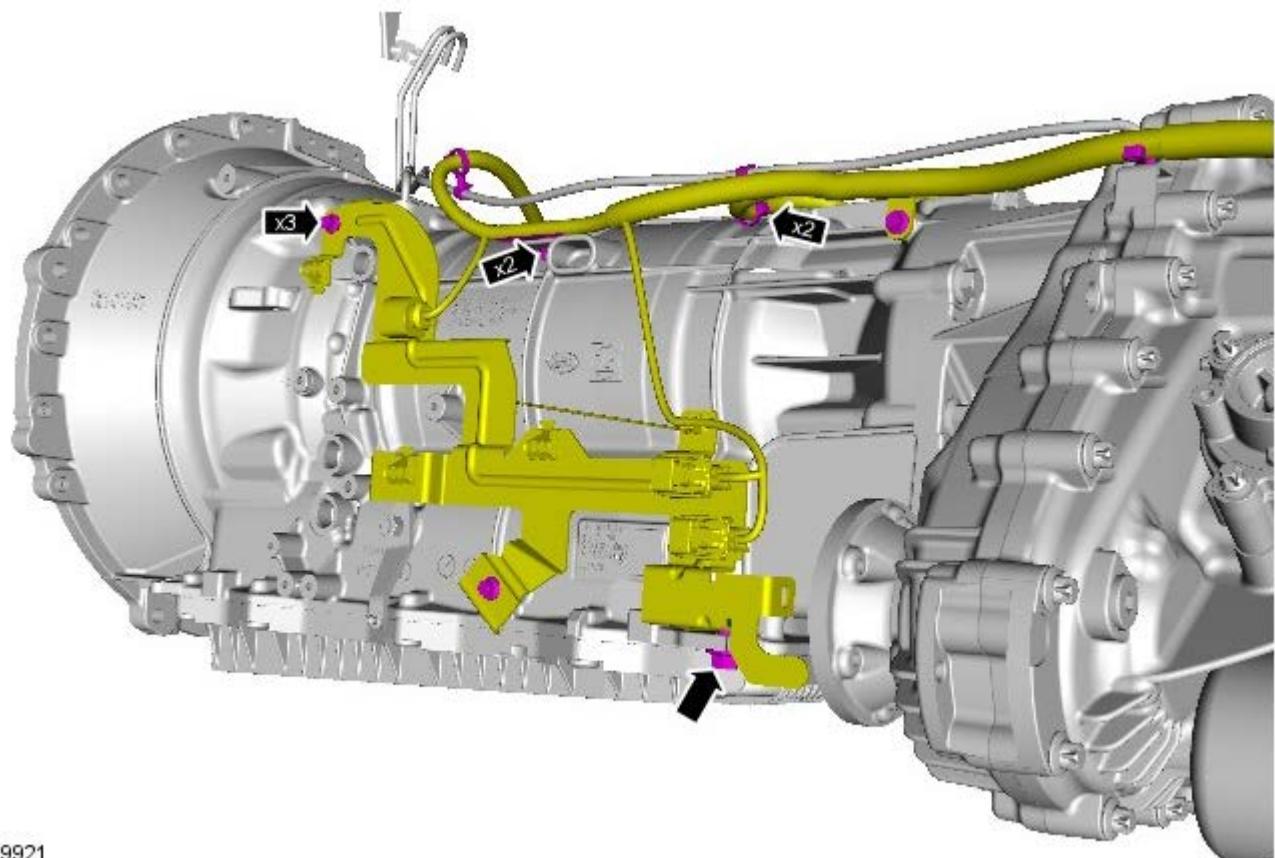
⚠ Secure the torque converter to the transmission using suitable cable ties.

32.



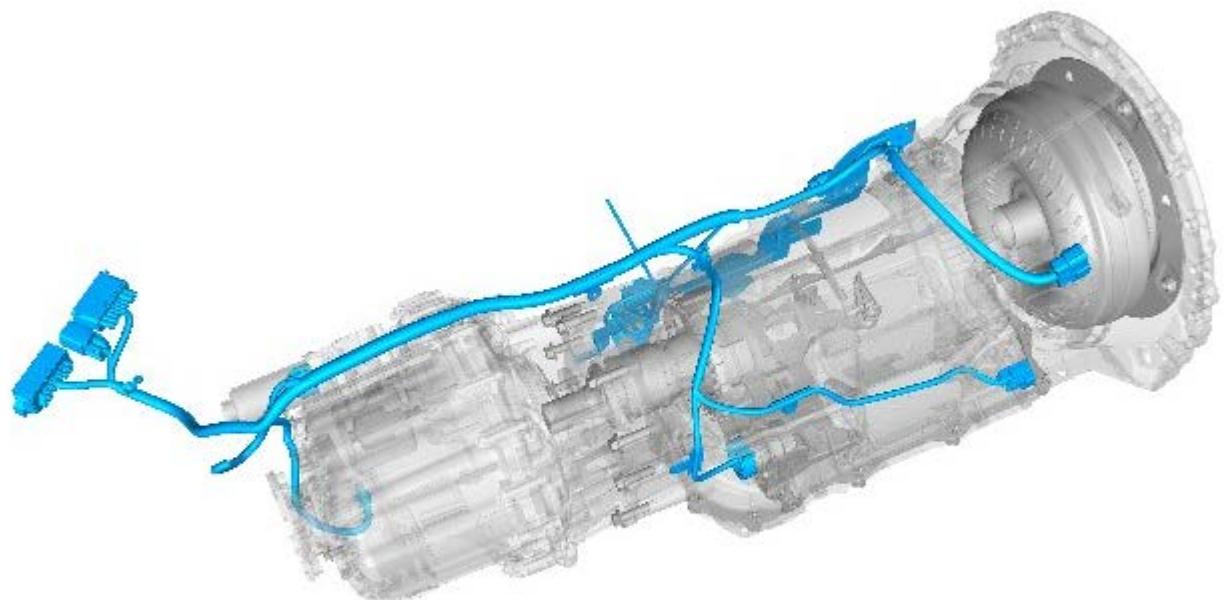
E149629

33.



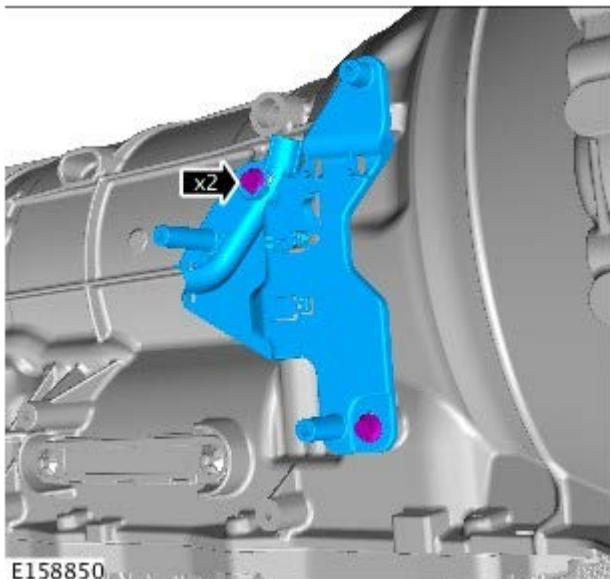
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34.

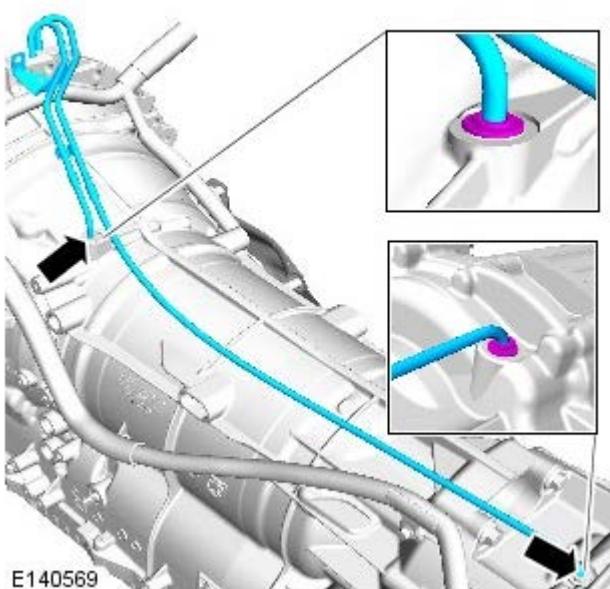


E158851

35.

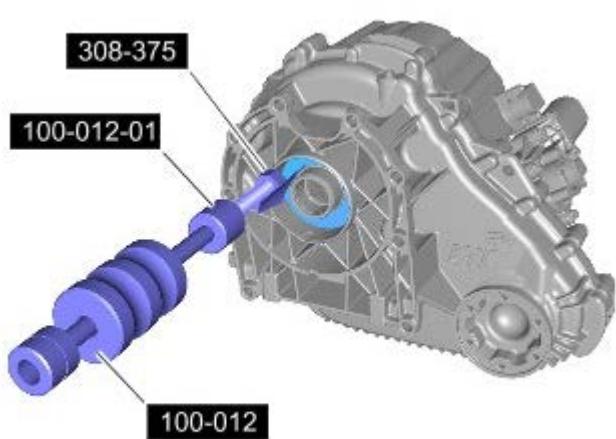
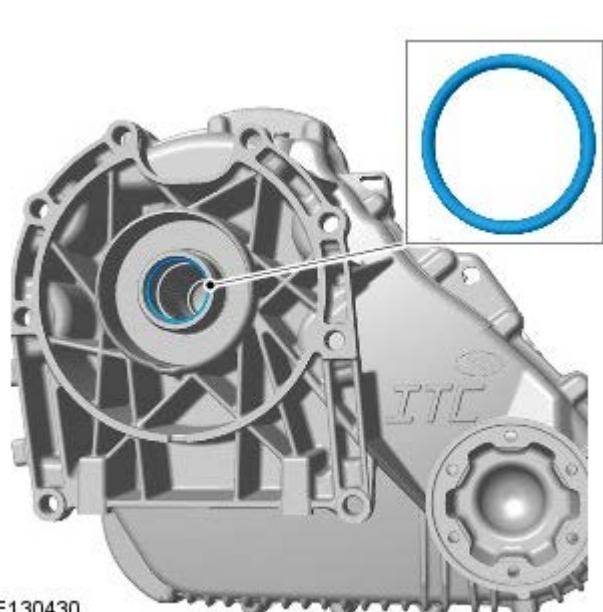
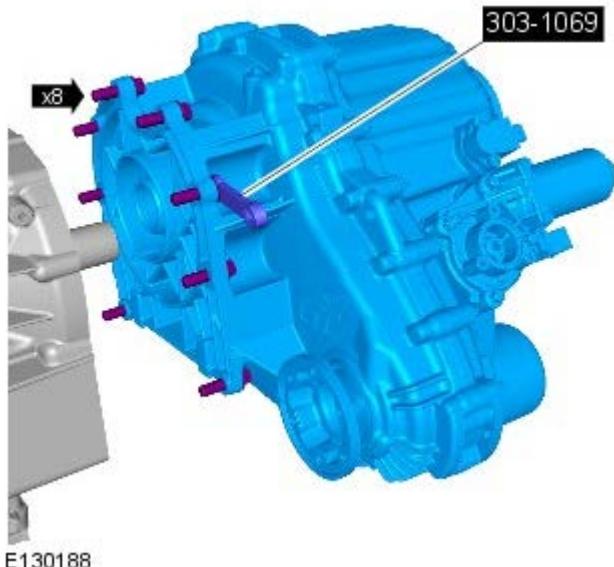


36.



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

38. Special Tool(s): [303-1069](#)



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

40. CAUTIONS:

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

 Do not carry out this step if a new transfer box is to be installed.

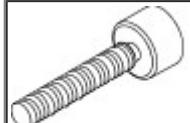
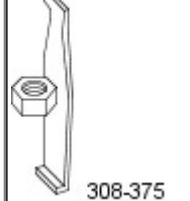
 Note the fitted position of the component prior to removal.

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

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV8 4.4L Diesel

Removal

Special Tool(s)

 100-012 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 303-1069 E53727	303-1069 Adapter, Wrench
 308-375	308-375 Remover, Input and Output Seal

NOTES:



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



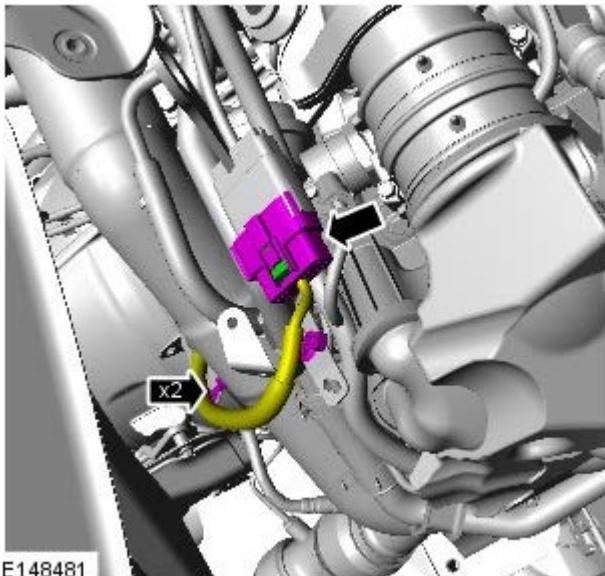
Some illustrations may show the transmission removed for clarity.

1. Disconnect the battery ground cable.

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

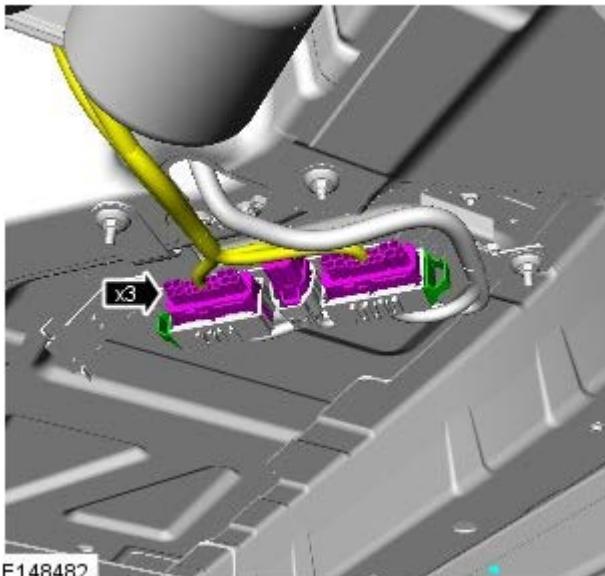
2. Refer to: Secondary Bulkhead Center Panel - TDV8 4.4L Diesel (501-02, Removal and Installation).

- 3.



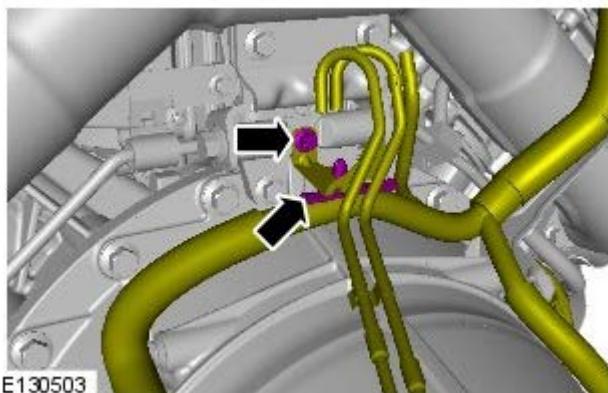
4.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

5.

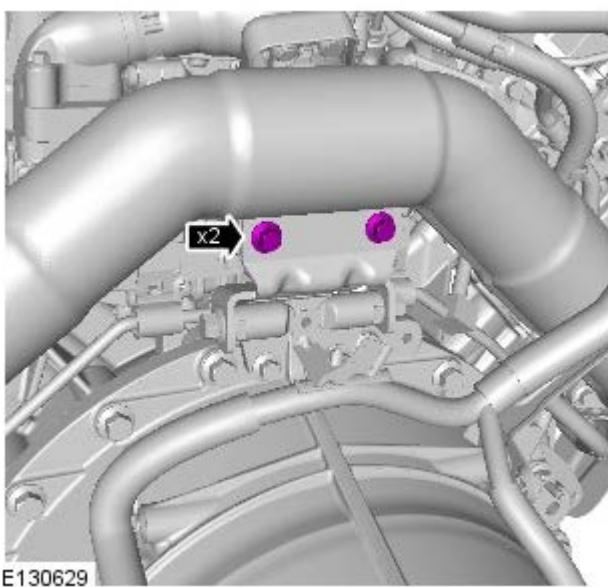


6. Refer to: [Front Driveshaft - TDV8 4.4L Diesel](#) (205-01 Driveshaft, Removal and Installation).
7. Refer to: [Exhaust System - Vehicles With: Diesel Particulate Filter \(DPF\)](#) (309-00D Exhaust System - TDV8 4.4L Diesel, Removal and Installation).
Refer to: [Exhaust System - Vehicles Without: Diesel Particulate Filter \(DPF\)](#) (309-00D Exhaust System - TDV8 4.4L Diesel, Removal and Installation).
8. Refer to: [Rear Driveshaft - TDV8 4.4L Diesel](#) (205-01 Driveshaft, Removal and Installation).

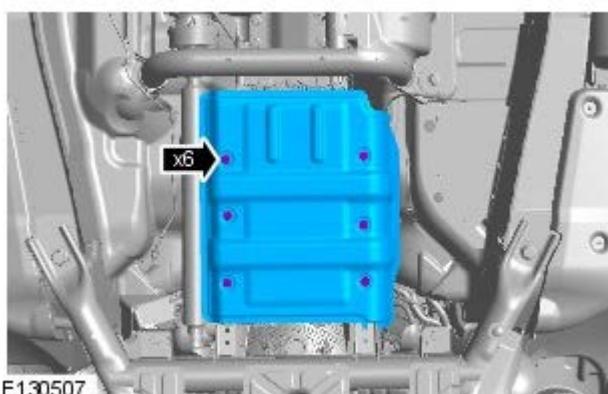
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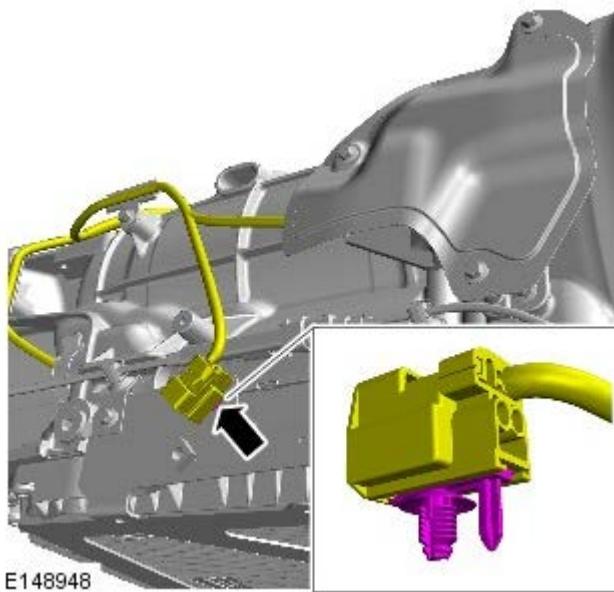
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11.

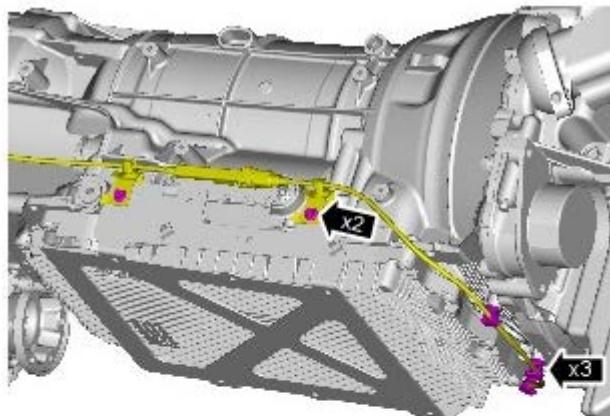


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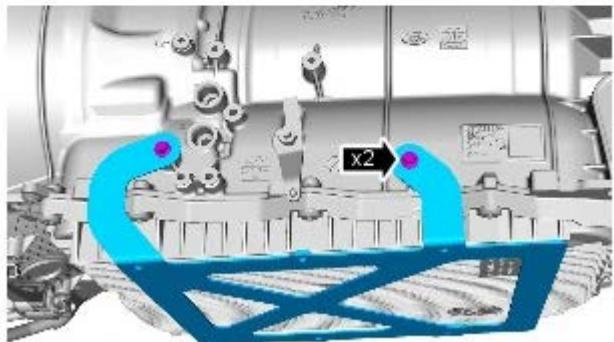
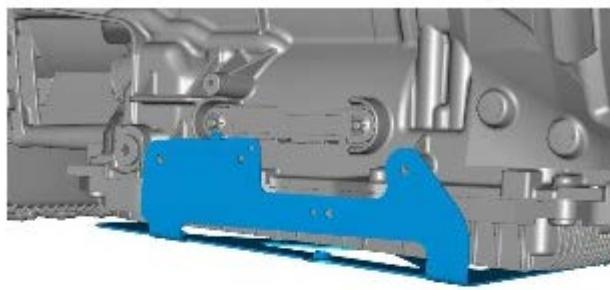


13.

- Secure the cable to the floor using suitable cable ties.

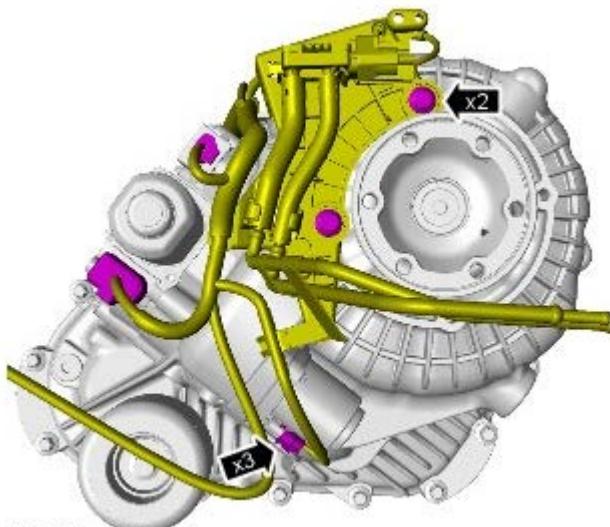


14.



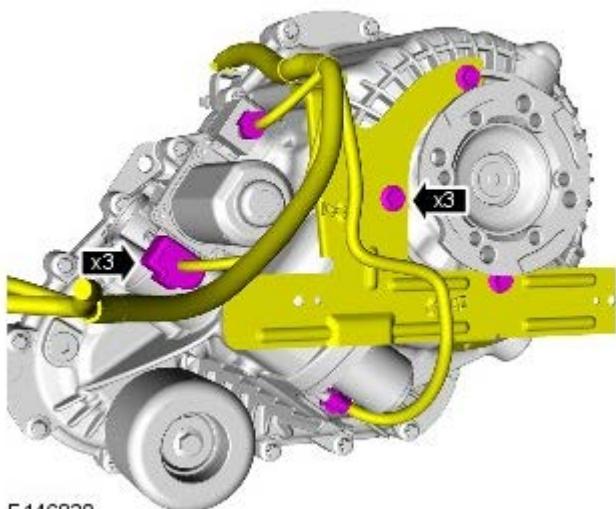
E148881

15.  **NOTE:** Vehicles with diesel particulate filter (DPF).



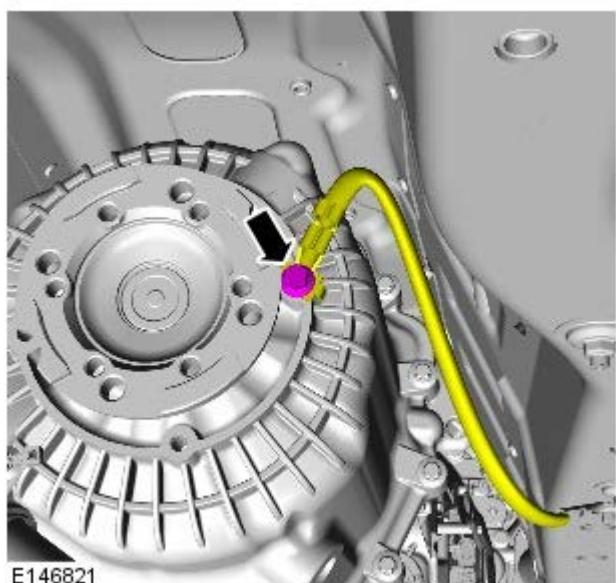
E130171

16.  **NOTE:** Vehicles without diesel particulate filter (DPF).



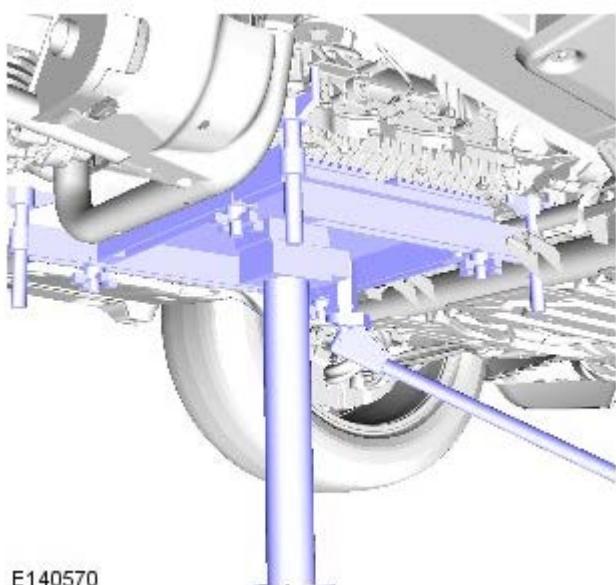
E146820

17.



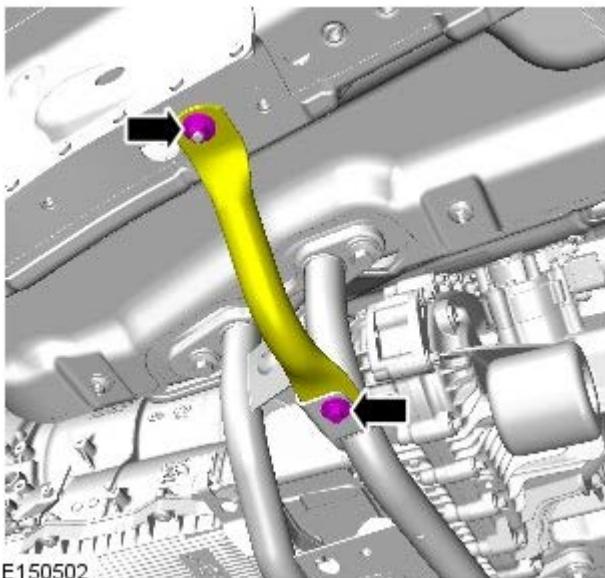
E146821

18. Using a transmission jack, support the transmission.

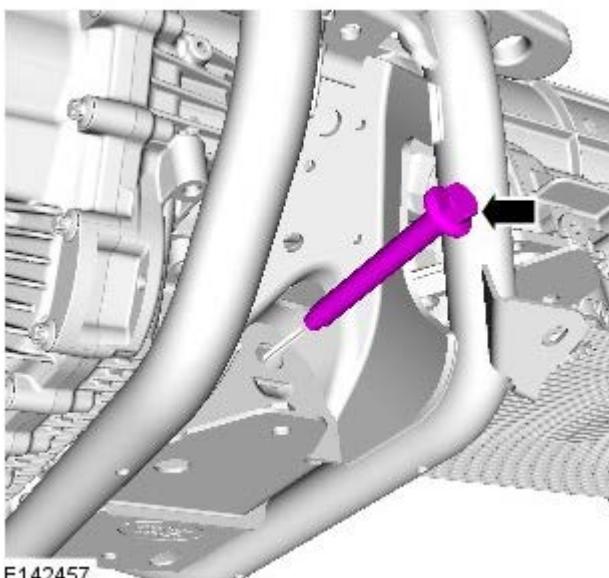


E140570

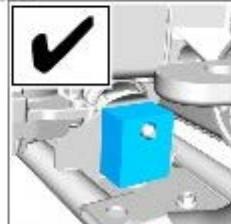
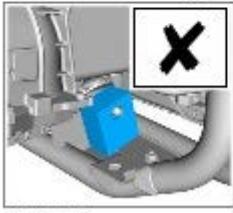
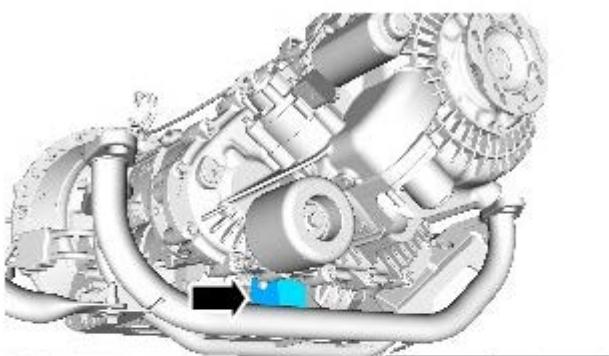
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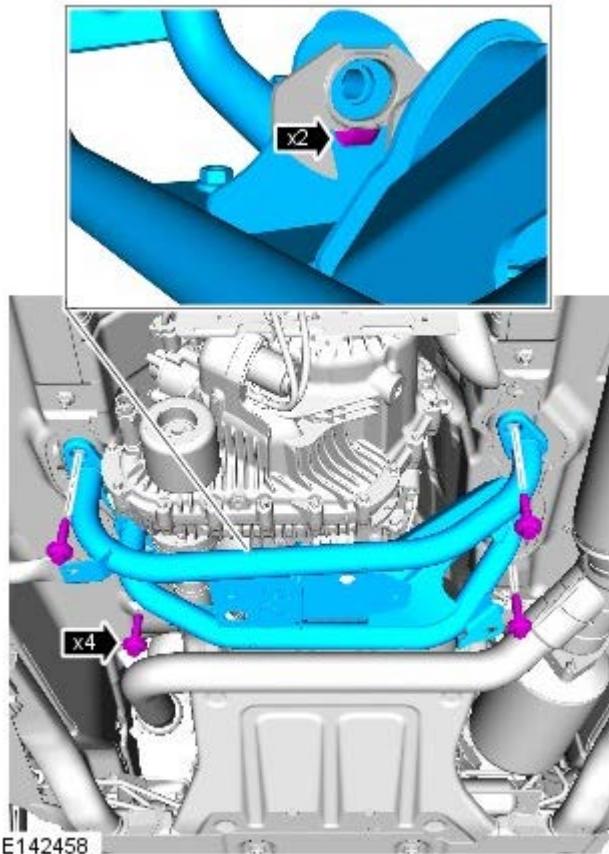
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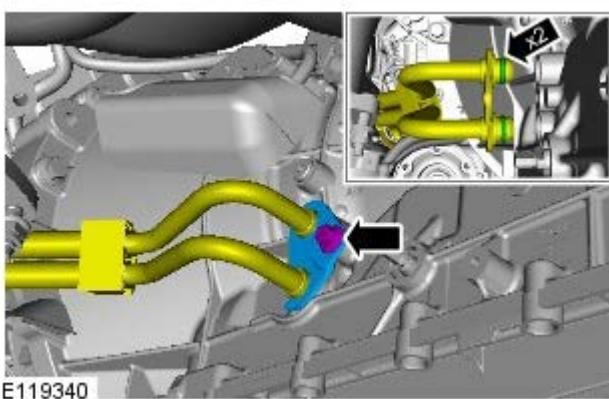
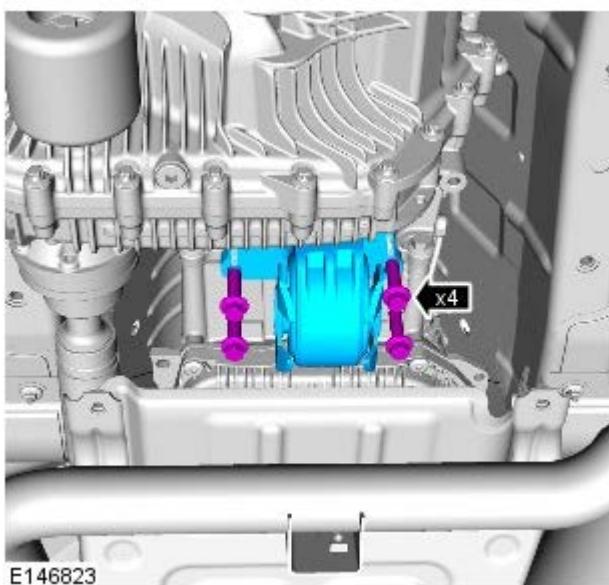
21. **NOTE:** Note the orientation of the component prior to removal



22.



23.

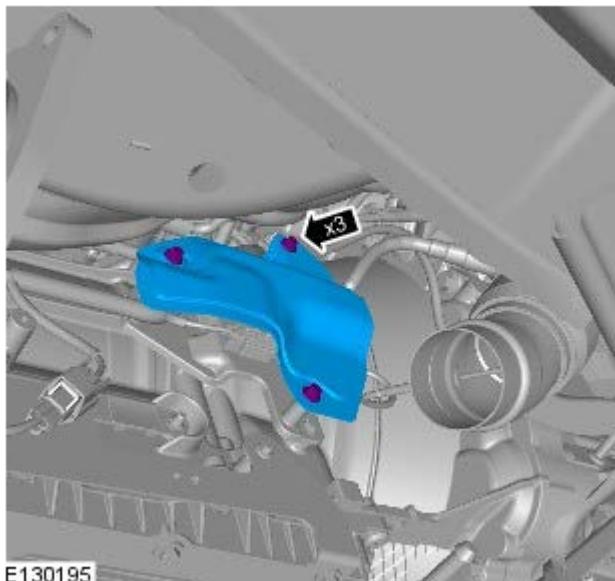


24.  **WARNING:** Be prepared to collect escaping fluids.

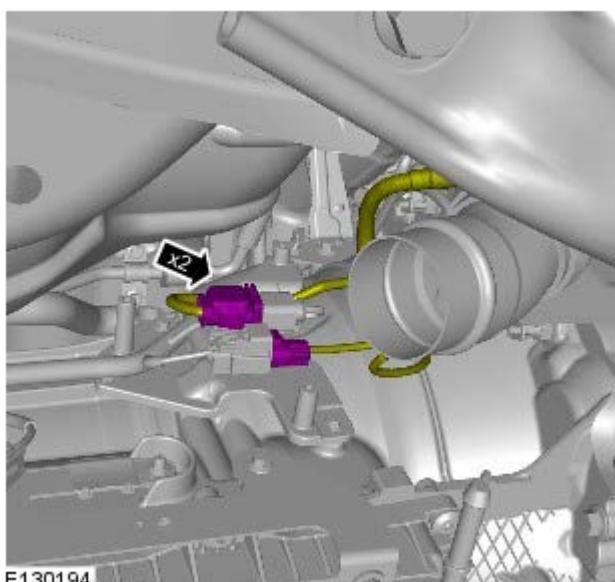
 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.

 **NOTE:** Remove and discard the O-ring seals.

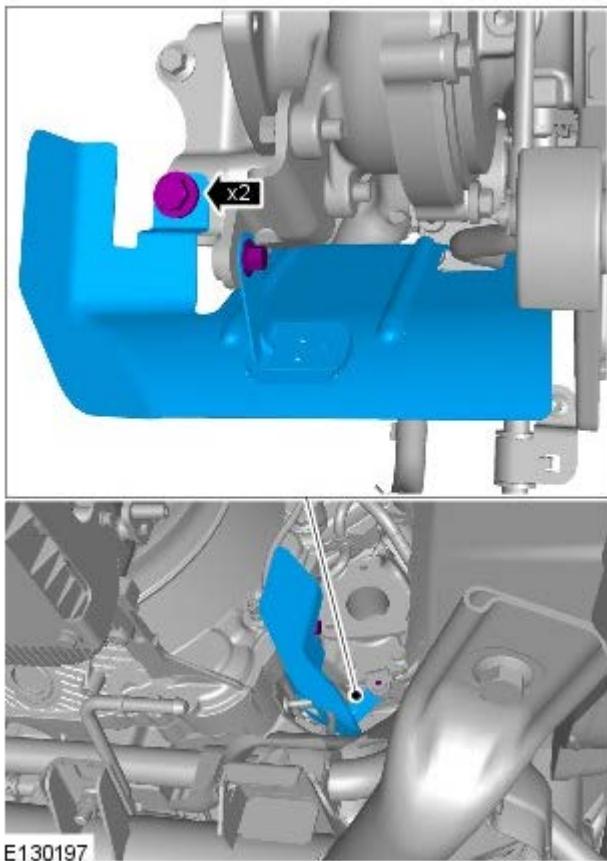
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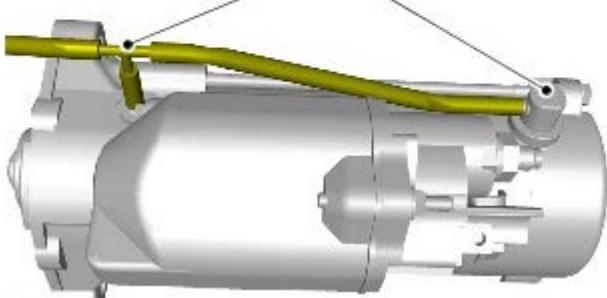
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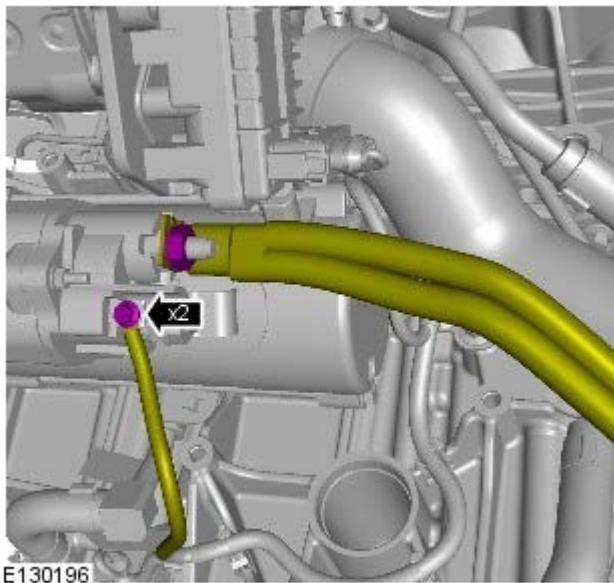
27.



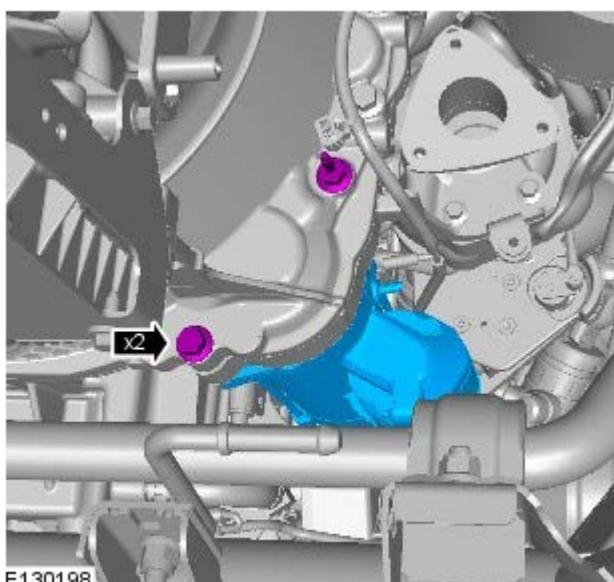
28.



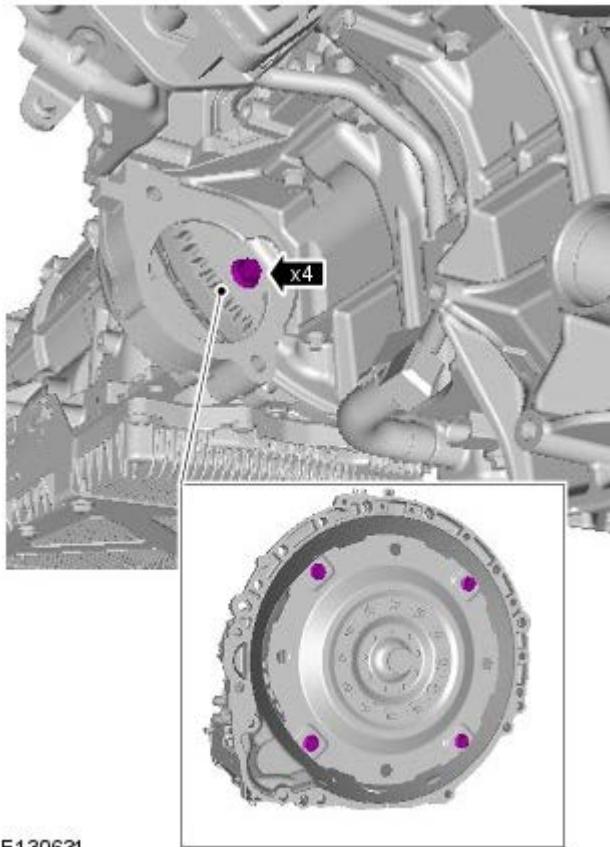
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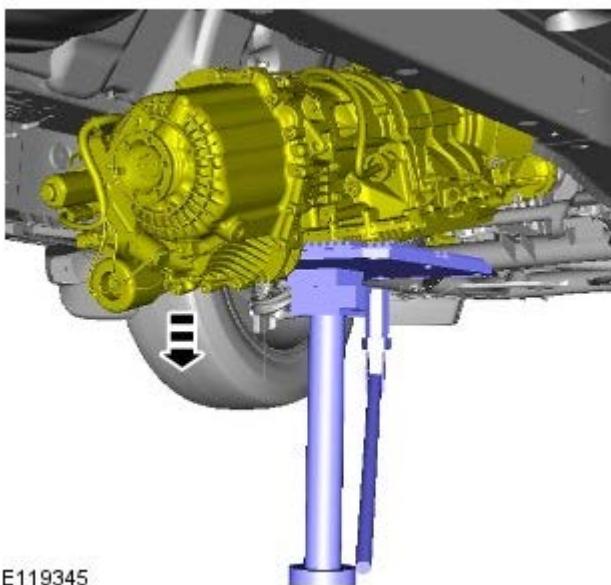
30.



31.  CAUTION: Only rotate the crankshaft clockwise.



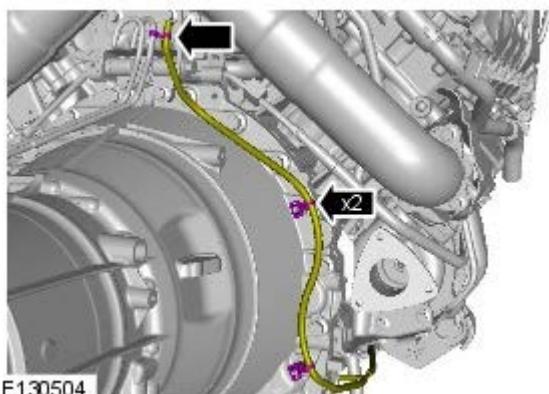
E130631



E119345

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

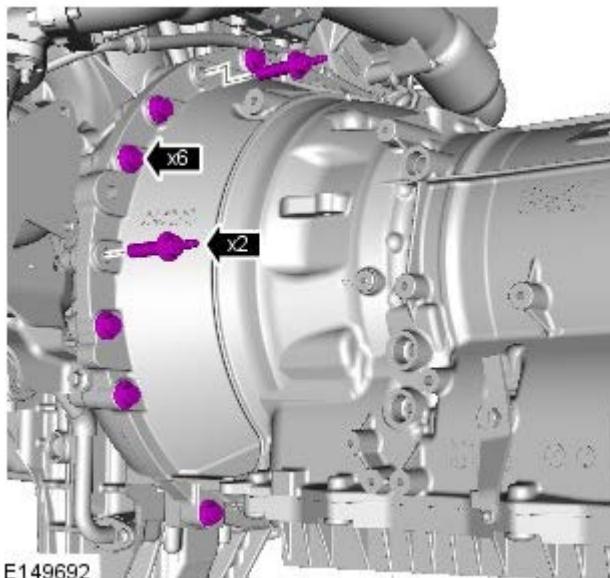
- Using a suitable wooden block, support the engine on the subframe.
- Lower the engine and transmission avoiding any contact with the bulkhead and body panels.



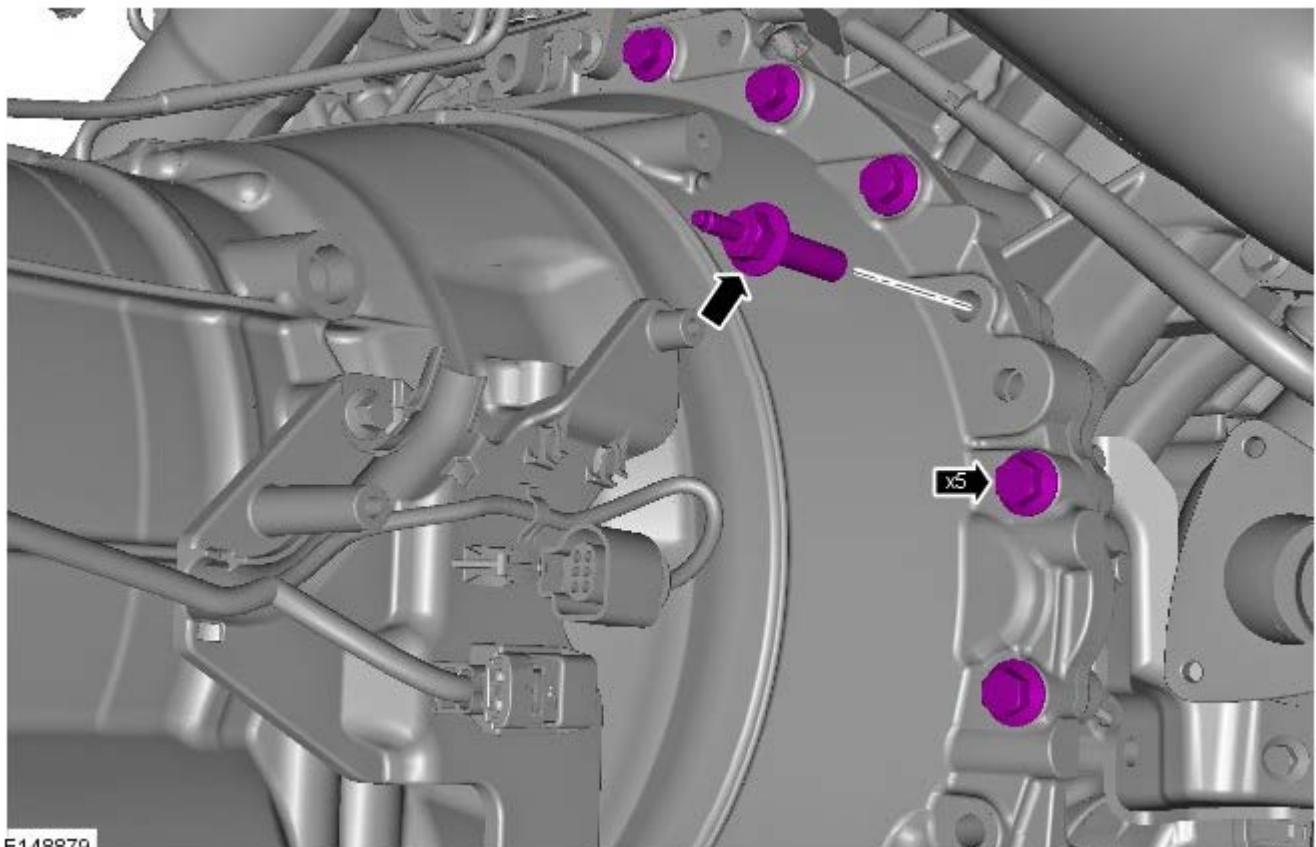
E130504

33.

34.



35.

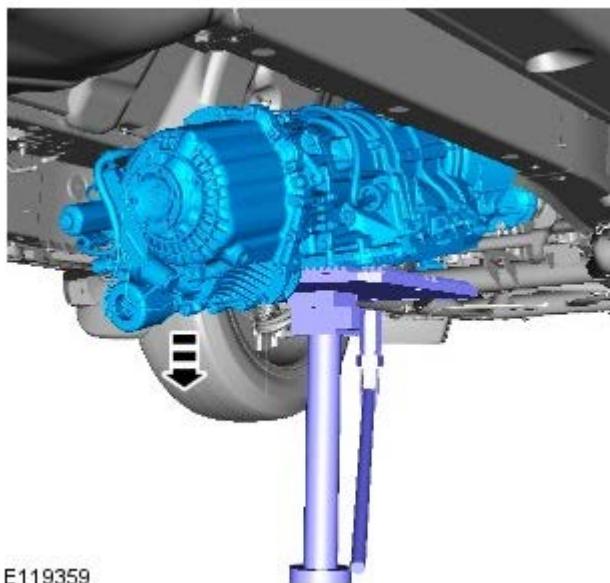


36.  **WARNING:** This step requires the aid of another technician.

CAUTIONS:

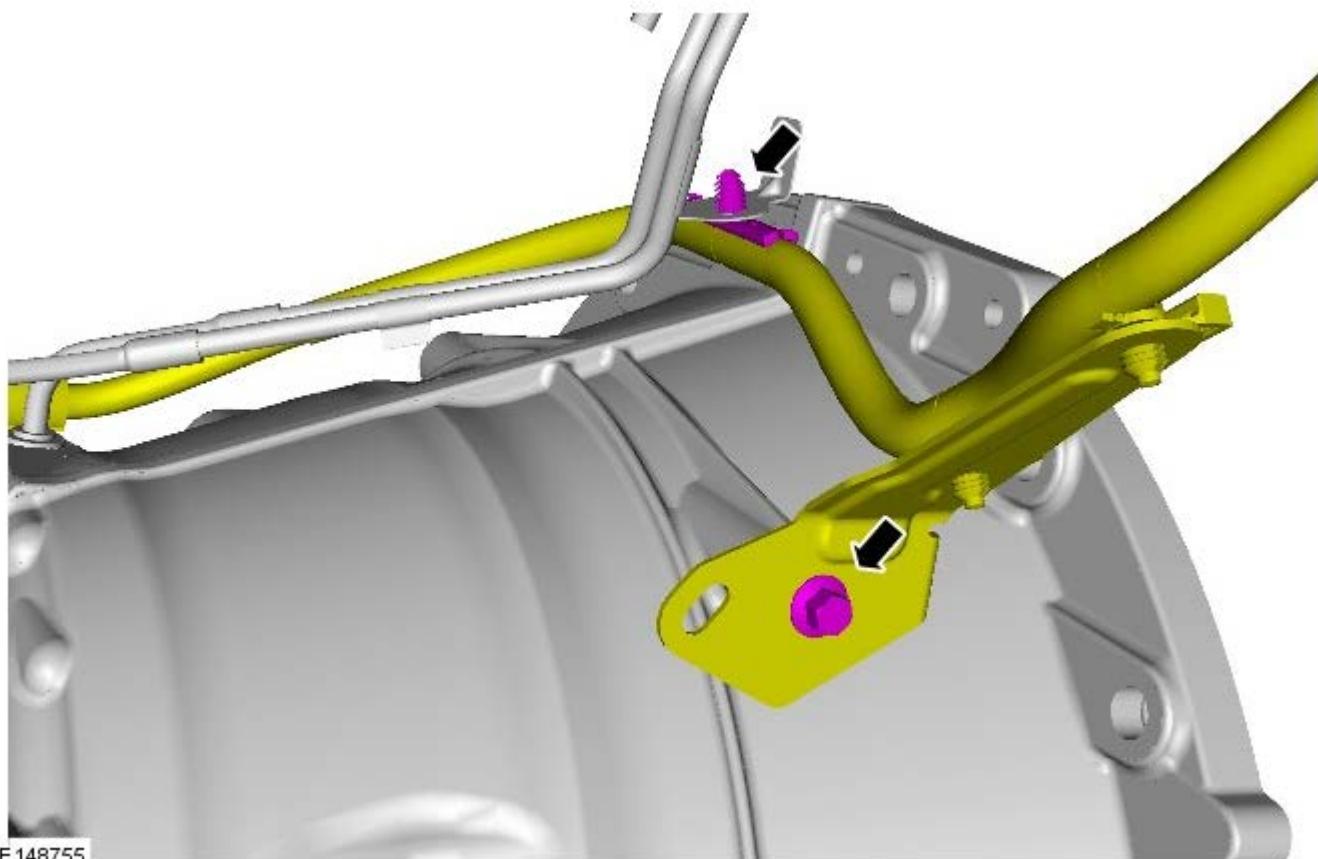
 Make sure that the torque converter remains in the transmission.

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



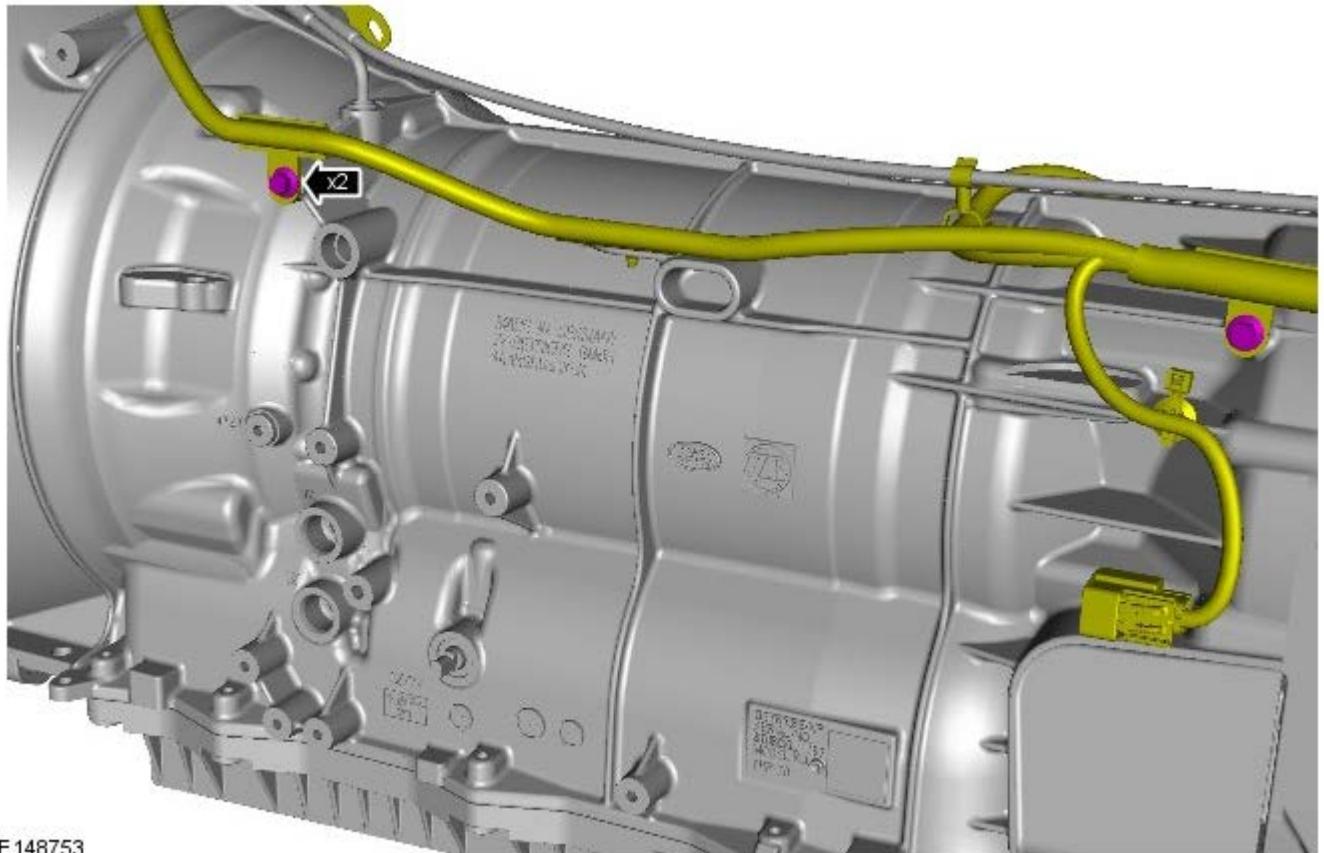
E119359

37. Do not disassemble further if removed for access only.



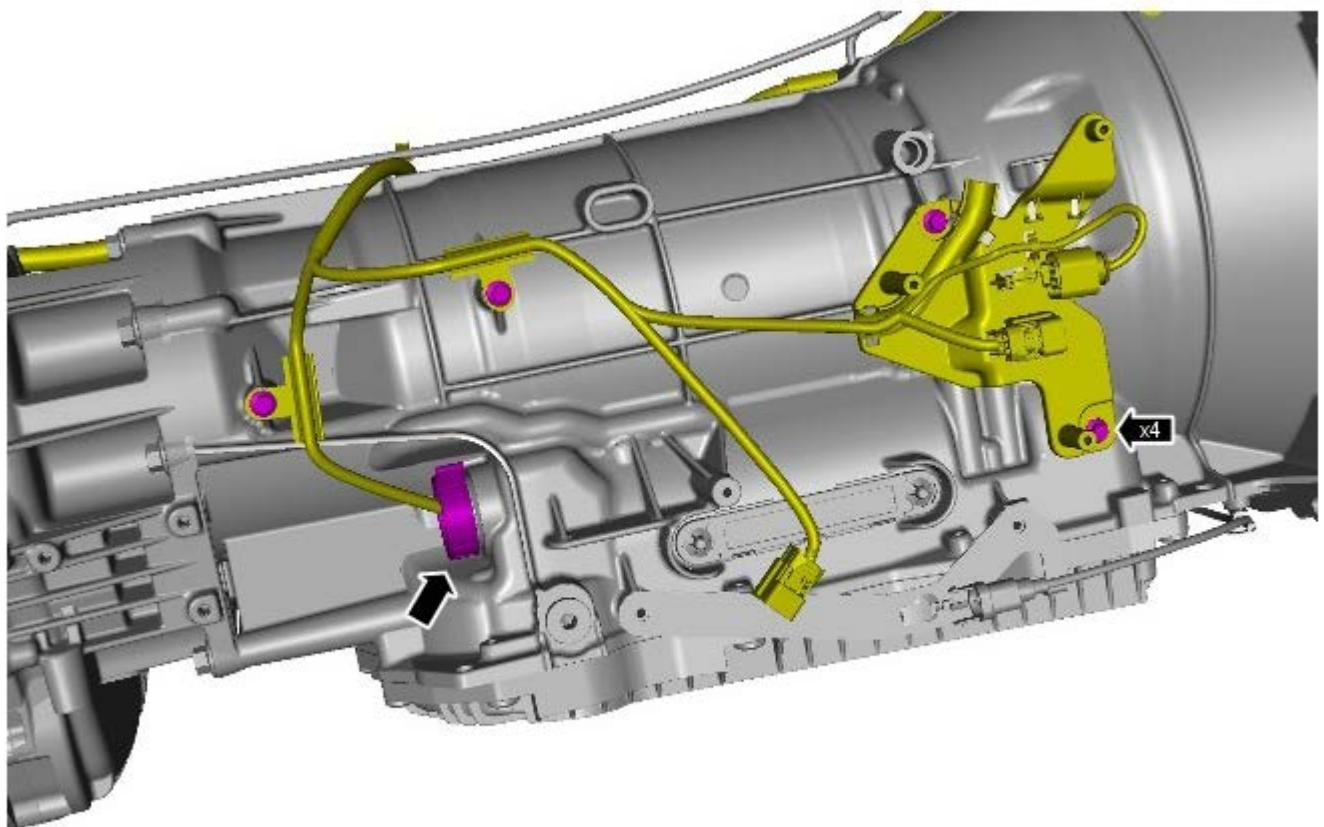
E148755

38.



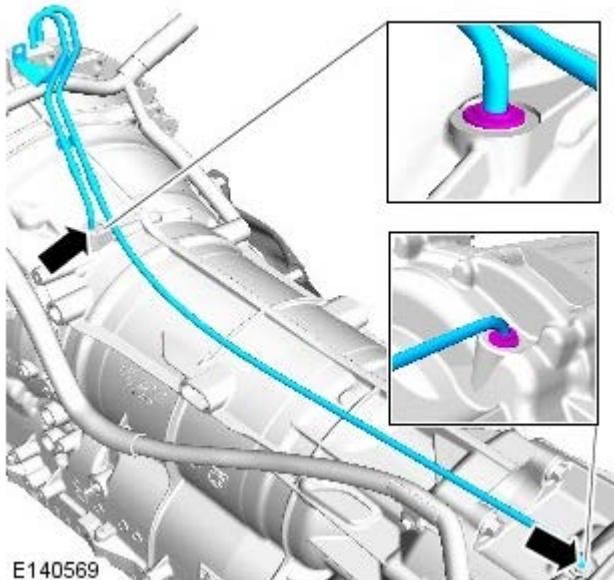
E148753

39.

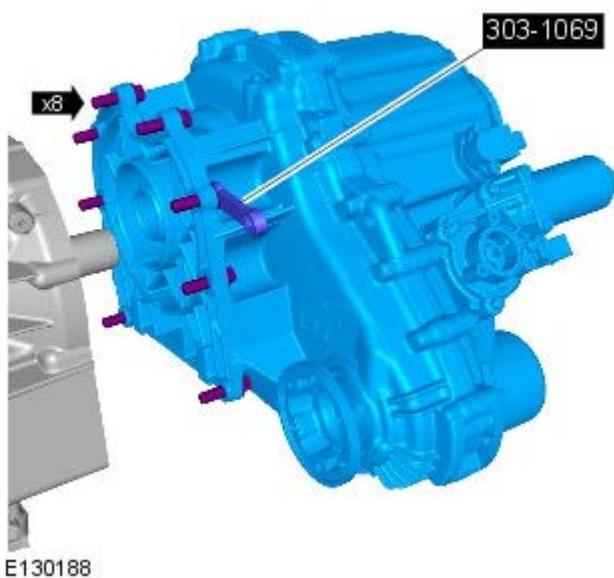


E148754

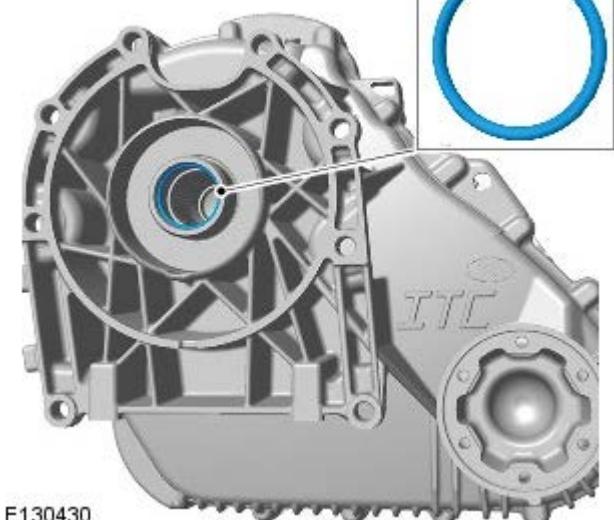
40.  CAUTION: Always plug any open connections to prevent contamination.



41. Special Tool(s): [303-1069](#)

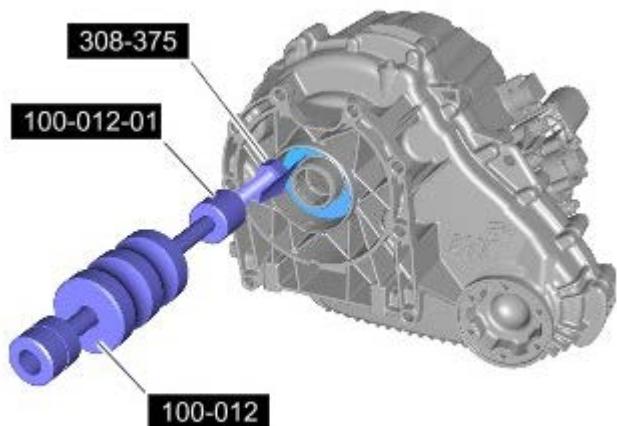


42.  CAUTION: Do not carry out this step if a new transfer box is to be installed.



43. CAUTIONS:

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



Do not carry out this step if a new transfer box is to be installed.



Note the fitted position of the component prior to removal.

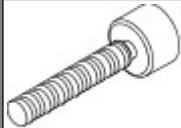
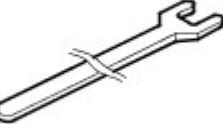
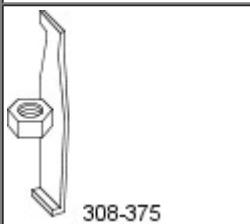
- *Special Tool(s):* [100-012](#), [100-012-01](#), [308-375](#)

E131138

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission V6 S/C 3.0L Petrol /V8 S/C 5.0L Petrol

Removal

Special Tool(s)

 100-012 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 303-1069 E53727	303-1069 Adapter, Wrench
 303-1142 E46076	303-1142 Viscous Coupling Wrench
 303-1143 E55382	303-1143 Viscous Coupling Holding Tool
 308-375	308-375 Remover, Input and Output Seal

NOTES:



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

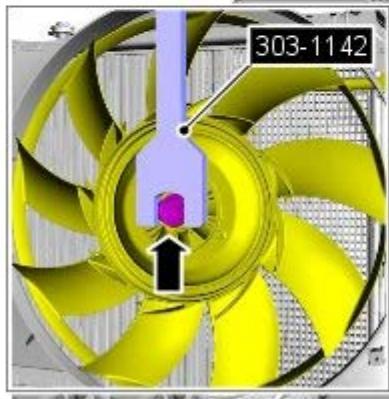
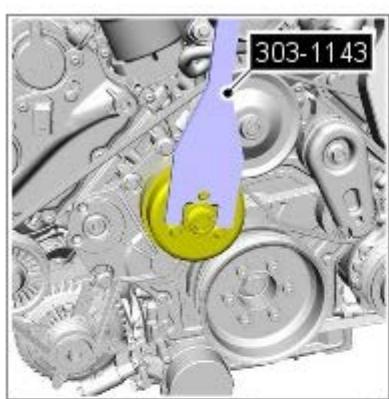


Some illustrations may show the transmission removed for clarity.

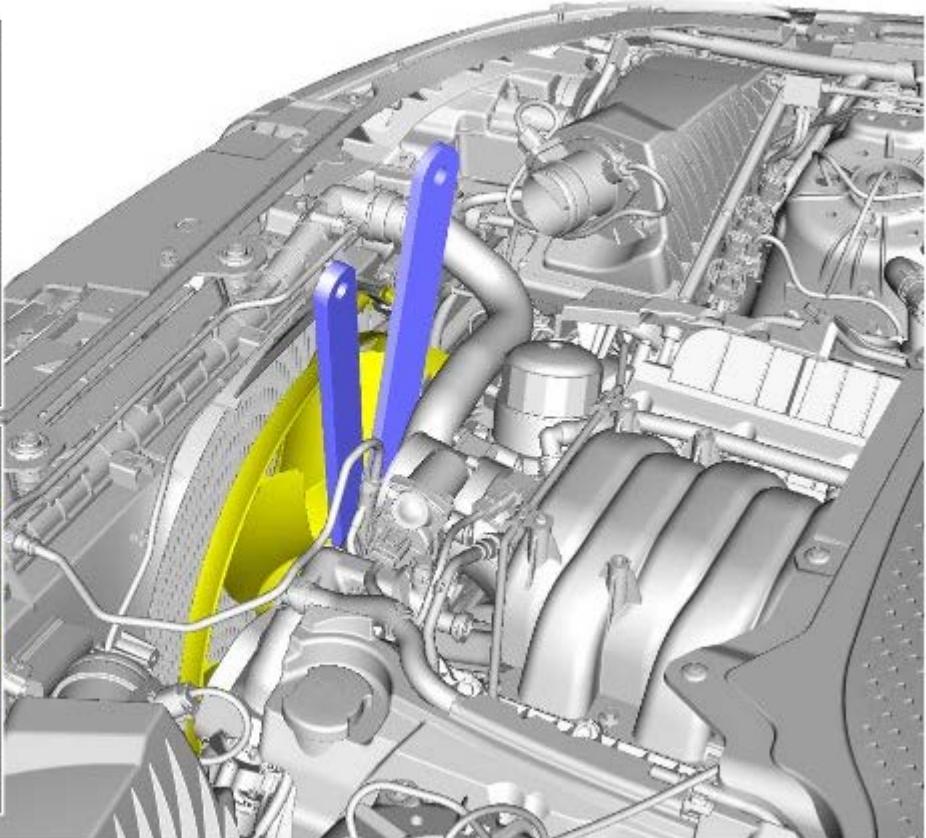
1. Disconnect the battery ground cable.

Refer to: Specifications (414-01, Specifications).

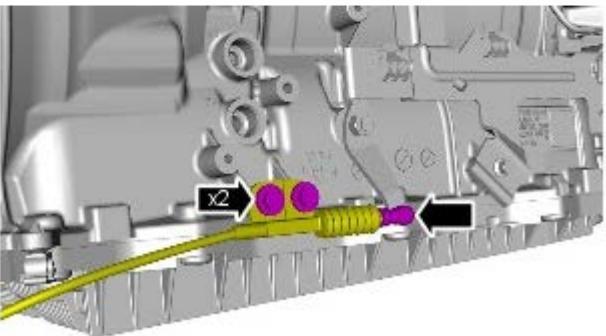
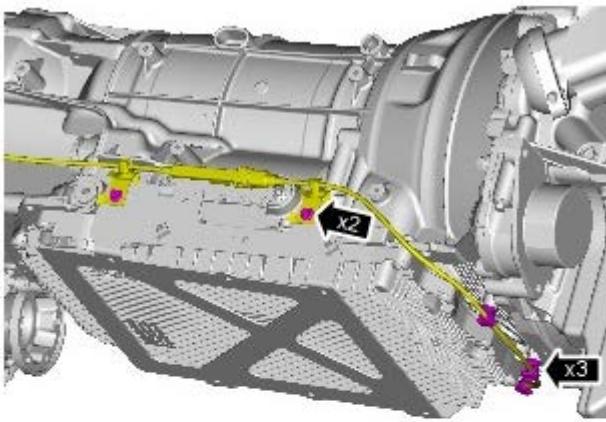
2. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12C Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3.
 - *Special Tool(s):* [303-1143](#)
 - *Special Tool(s):* [303-1142](#)
 - *Torque:* [65 Nm](#)



E143622

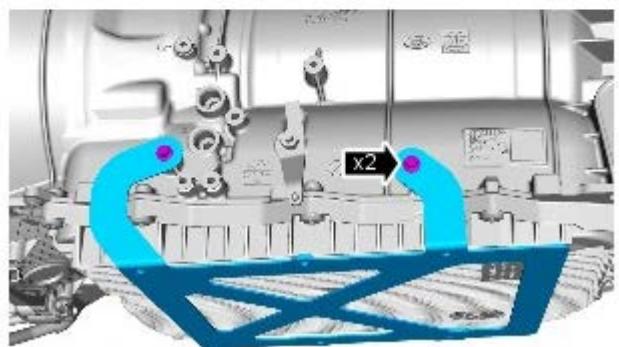
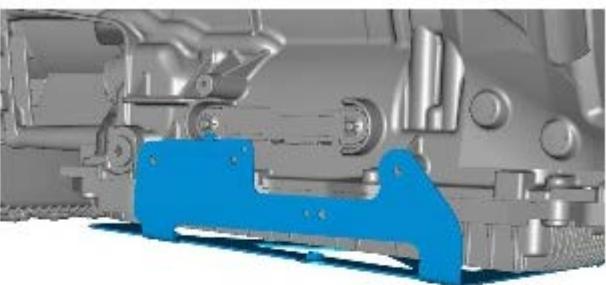


4. Refer to: [Front Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol \(205-01, Removal and Installation\).](#)
5. Refer to: [Rear Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol \(205-01, Removal and Installation\).](#)
6.
 - Secure with 2 cable ties.



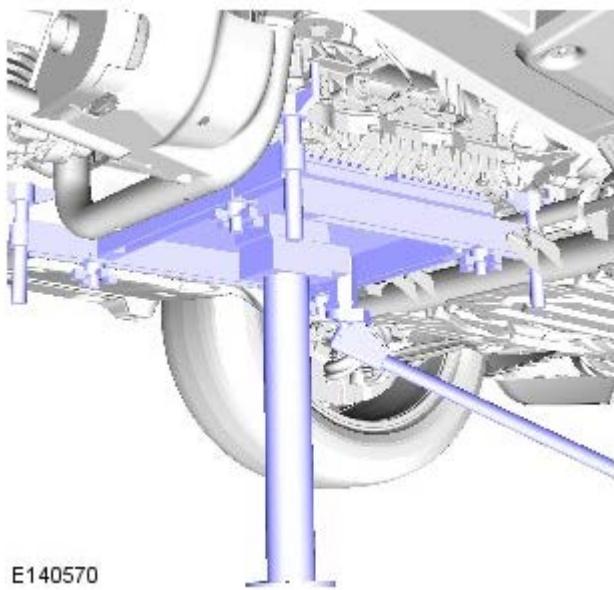
E150358

7.

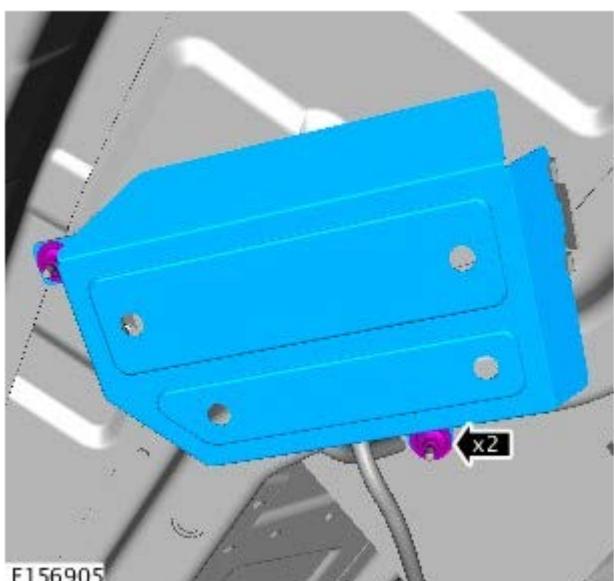


E148881

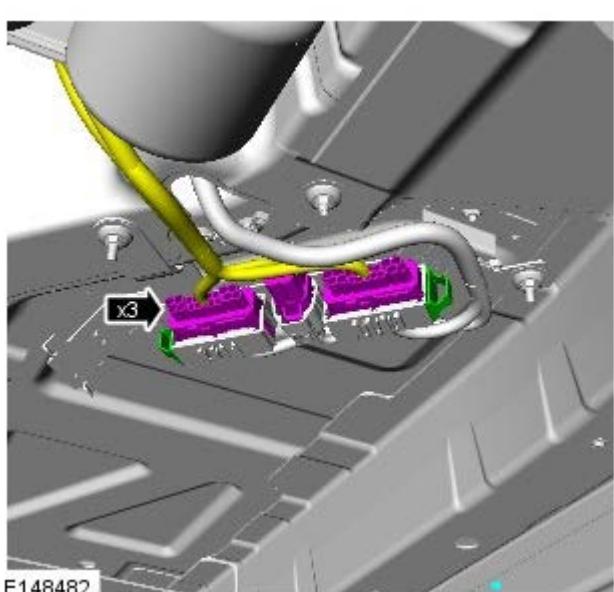
8. **NOTE:** Using a suitable transmission jack support the differential case.



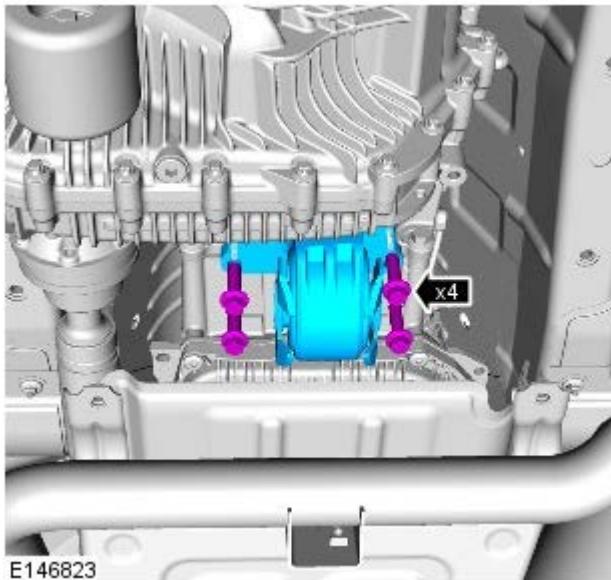
9.



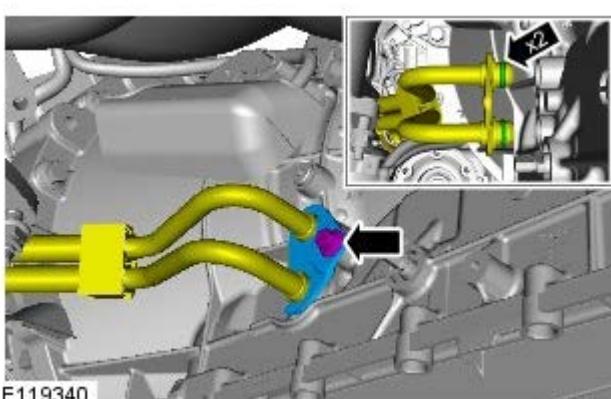
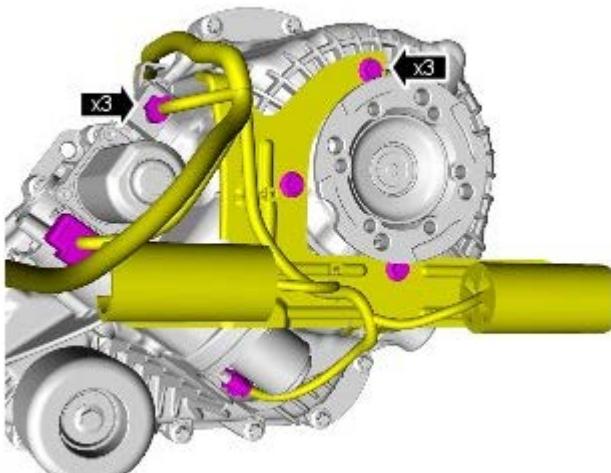
10.



11.



12.



13. CAUTIONS:



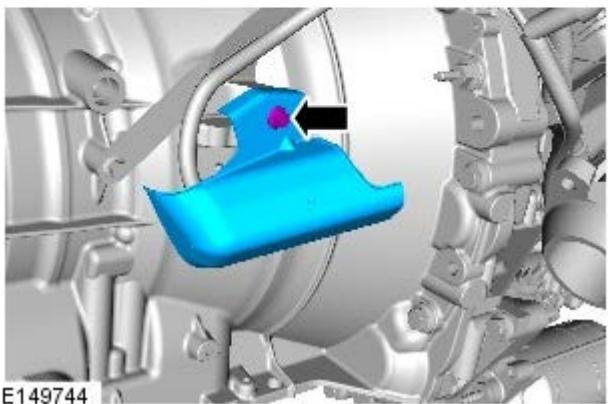
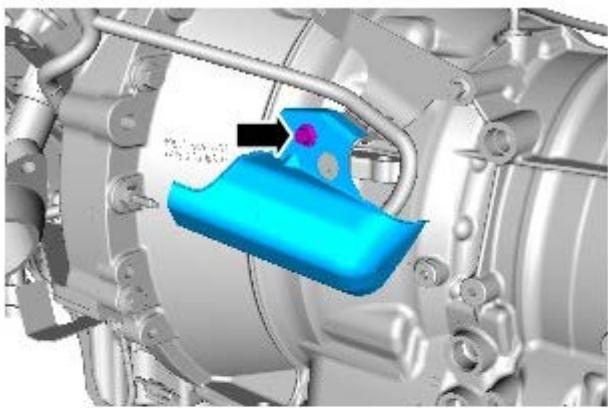
Be prepared to collect escaping fluids.



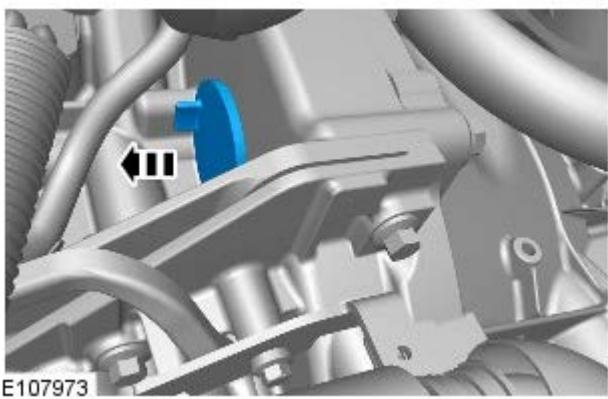
Make sure that all openings are sealed. Use new blanking caps.

- Discard the O-ring seals.

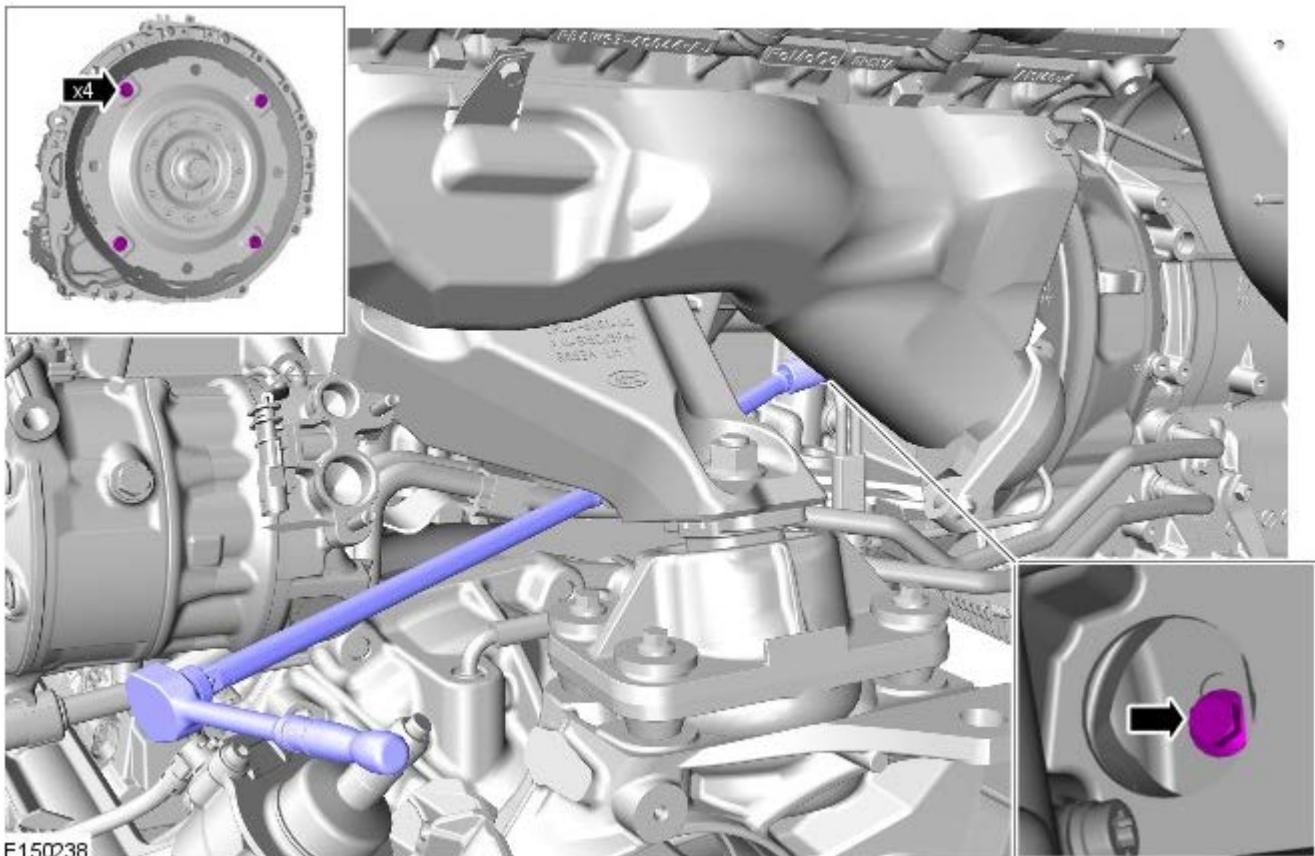
14.



15.

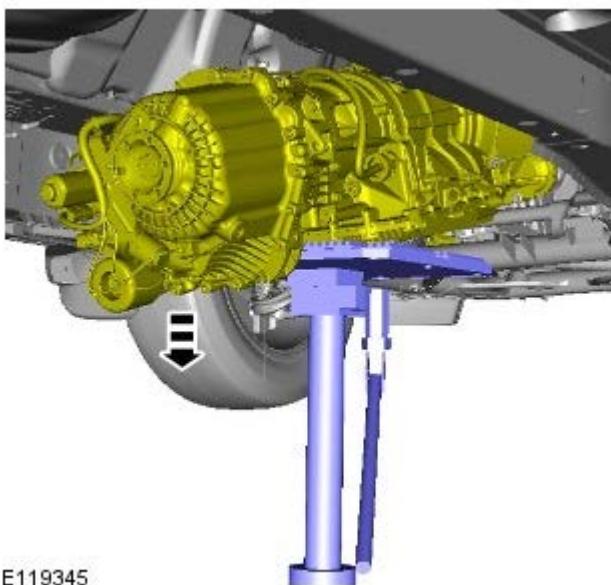


16.  CAUTION: Only rotate the crankshaft clockwise.

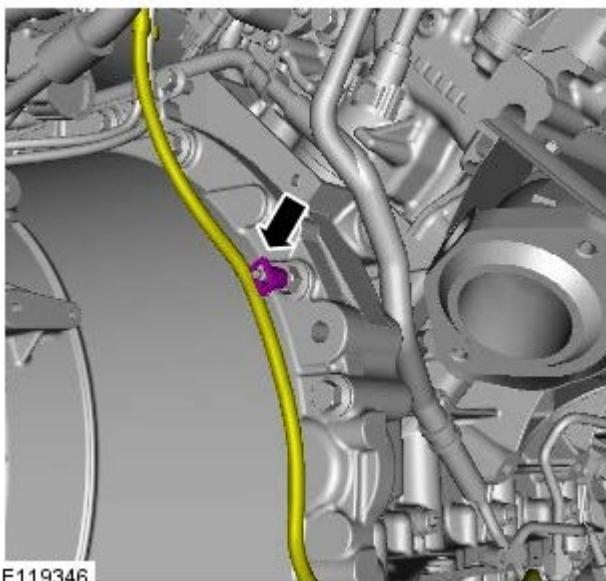


17.  **WARNING:** Make sure that the transmission is secured with suitable retaining straps.

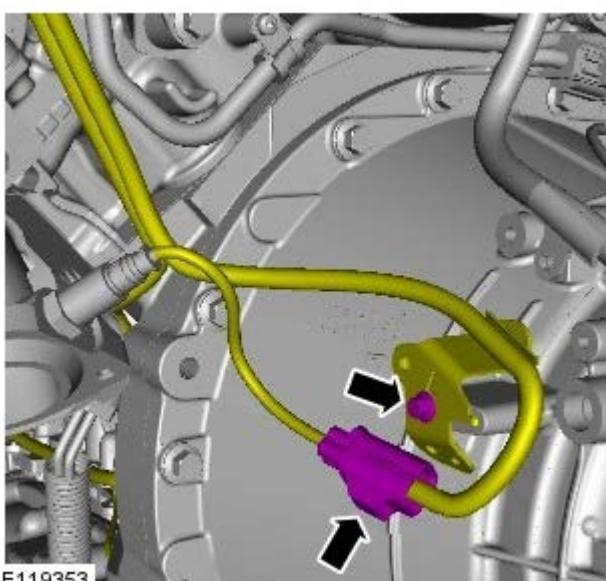
Lower the rear of the transmission for access.



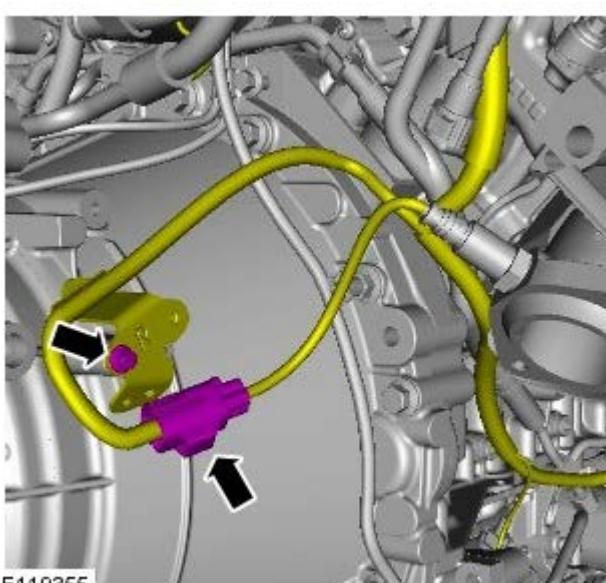
- 18.



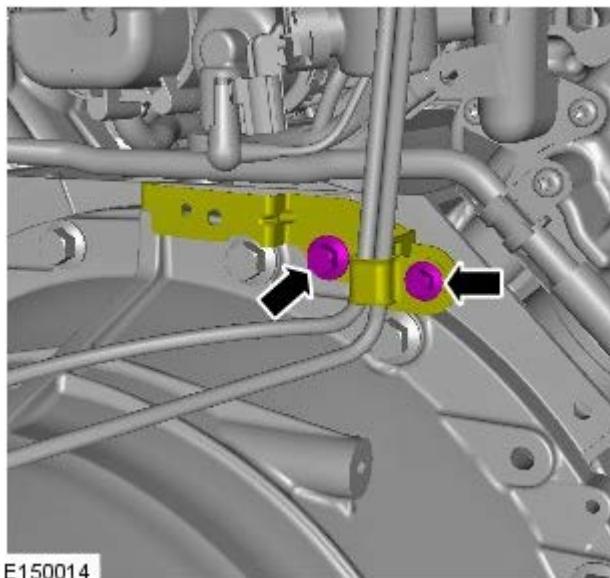
19.



20.

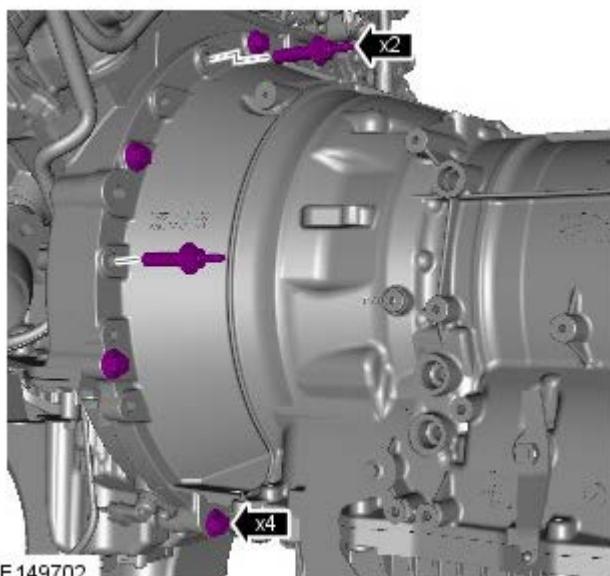


21.



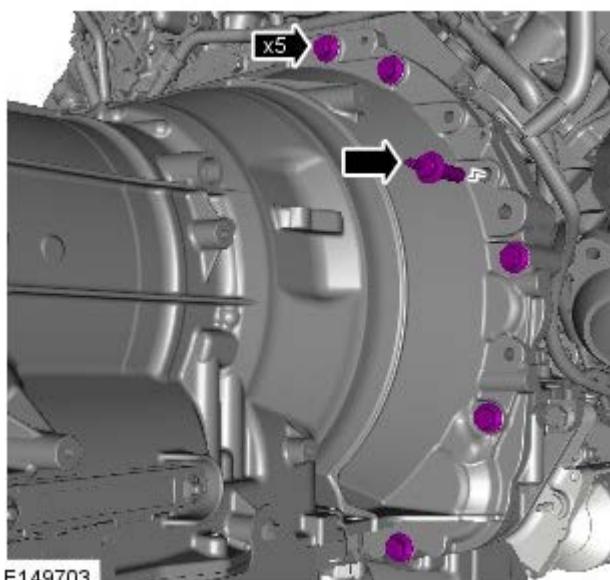
E150014

22.



E149702

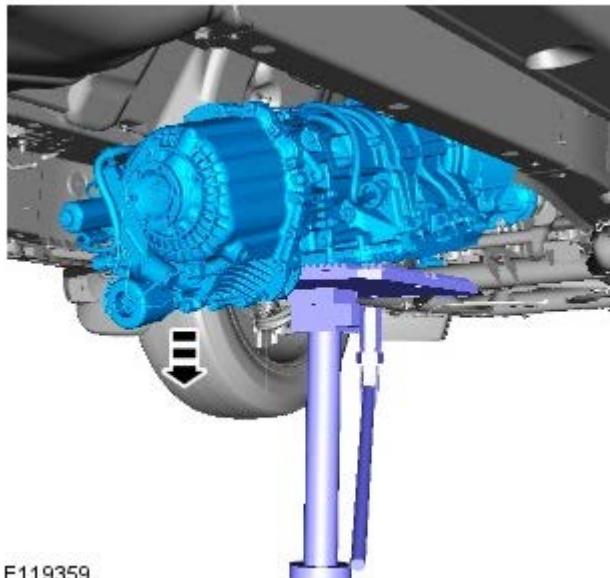
23.



E149703

24.  **WARNING:** This step requires the aid of another technician.

 **CAUTION:** Make sure that the torque converter



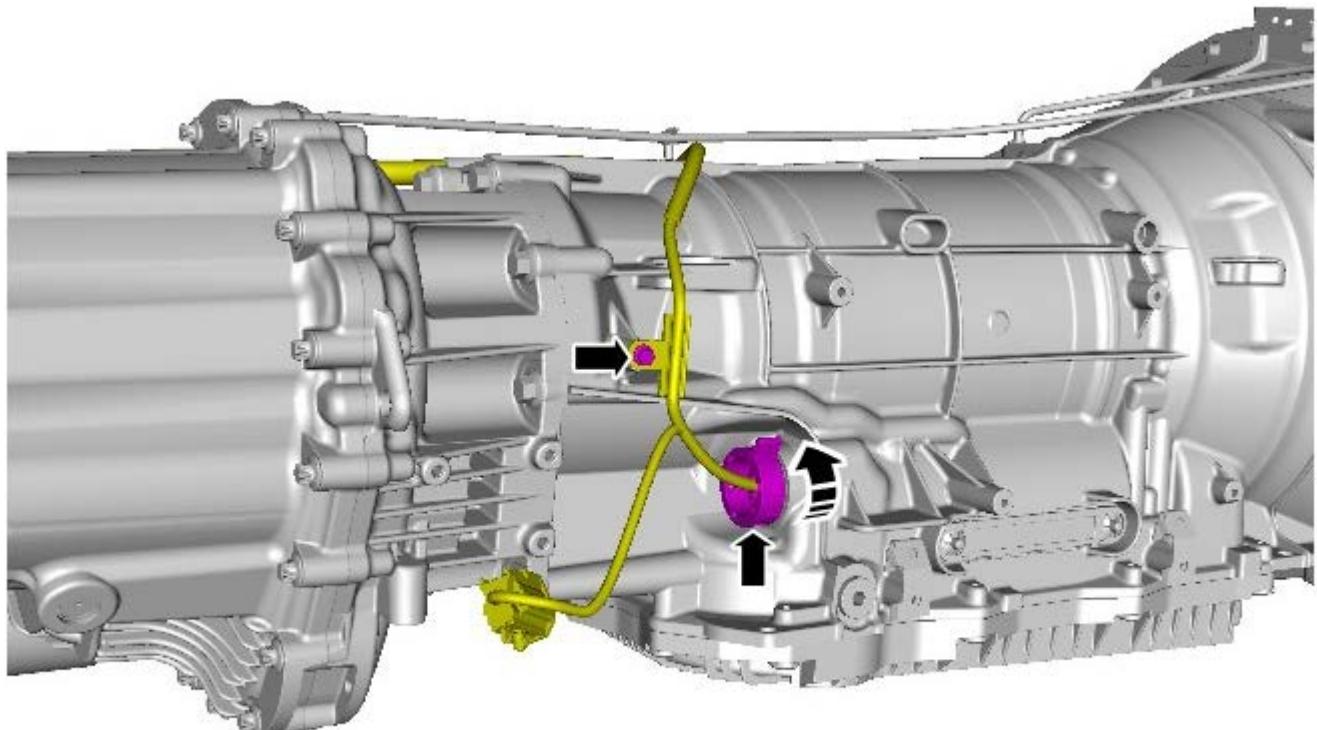
E119359

remains in the transmission.



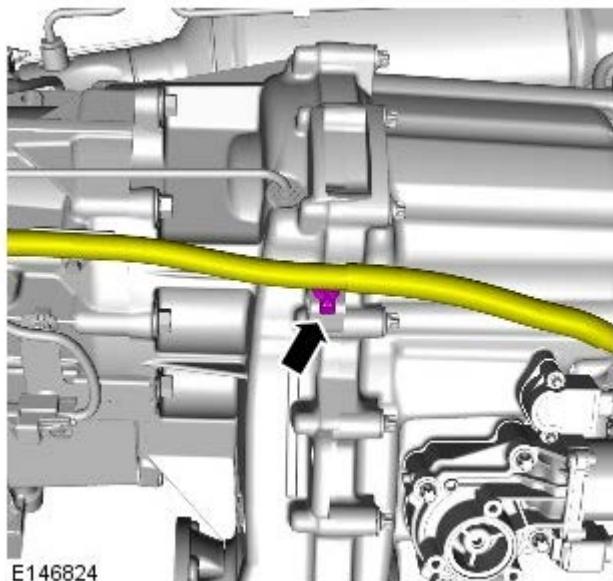
NOTE: Secure the torque converter to the transmission using suitable cable ties.

- 25.
- NOTE: Do not disassemble further if the component is removed for access only.

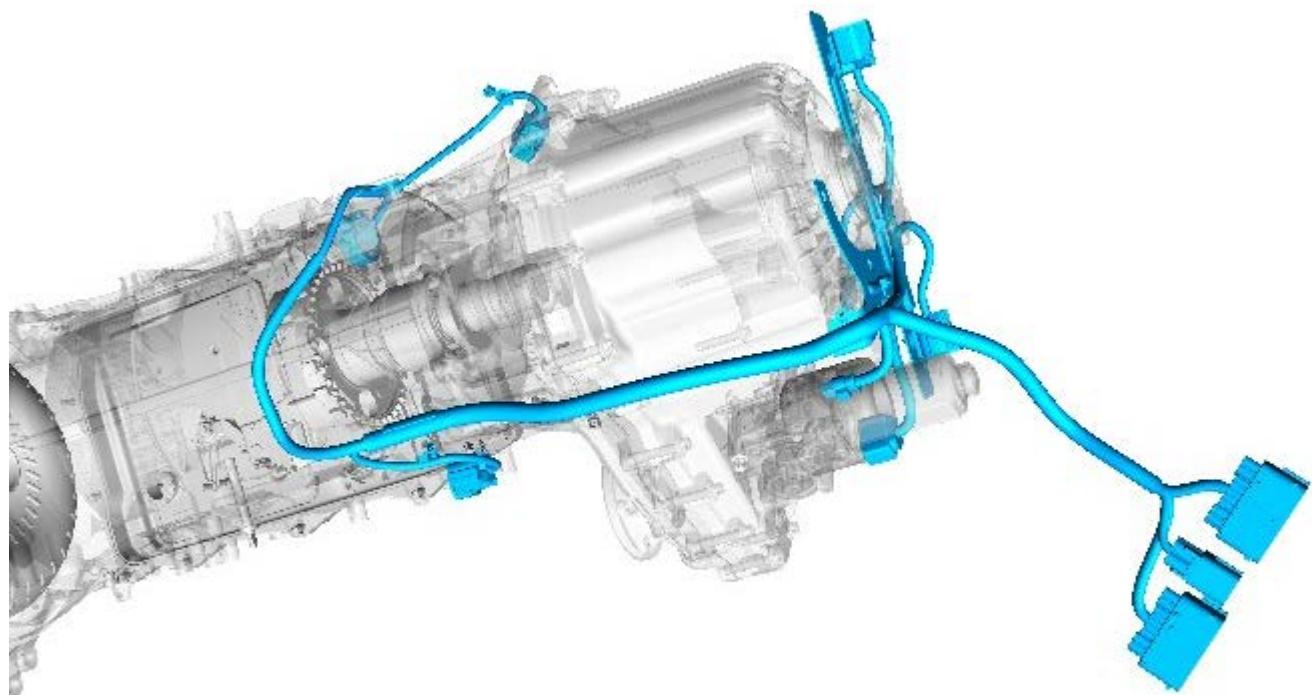


E149706

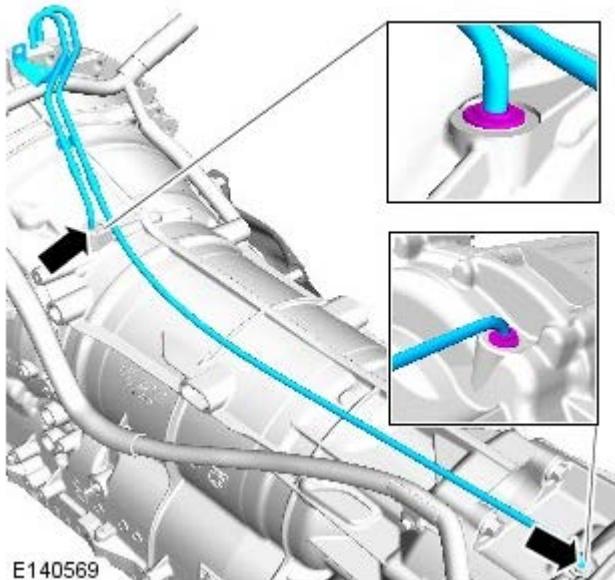
26.



27.



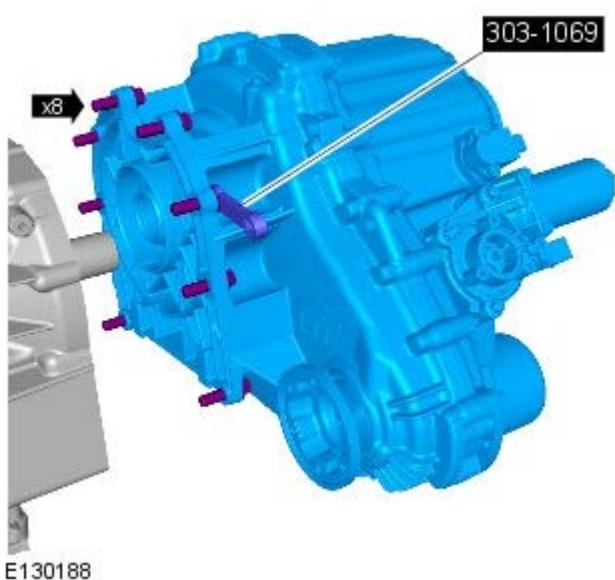
28.  CAUTION: Always plug any open connections to prevent contamination.



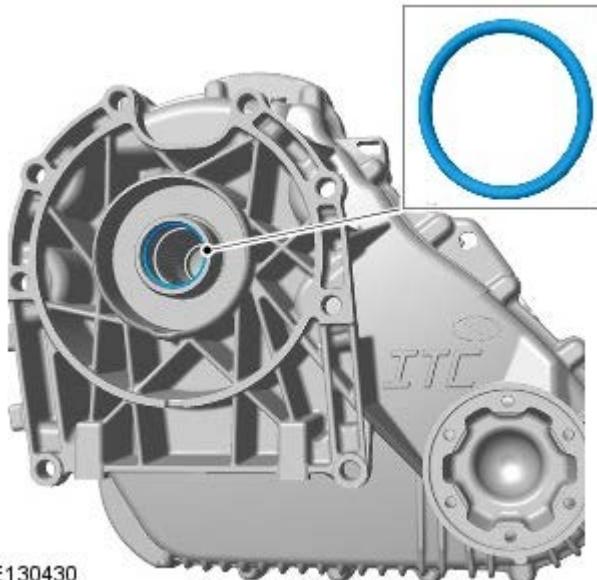
29.



30. *Special Tool(s): [303-1069](#)*



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



E130430

32. CAUTIONS:

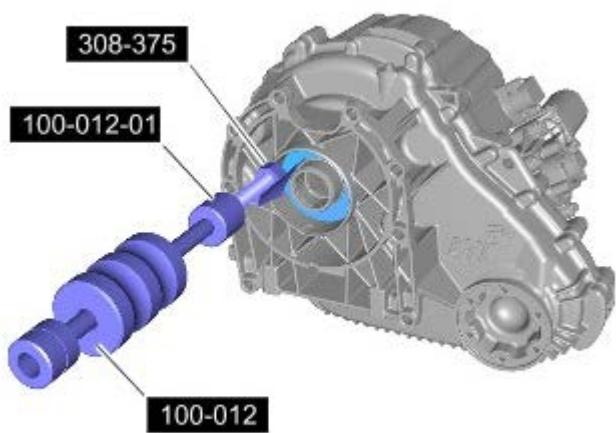


Care must be taken to avoid damage to the seal register and running surface.



Note the fitted position of the component prior to removal.

- *Special Tool(s):* [100-012](#), [100-012-01](#), [308-375](#)



E131138

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV6 3.0L Diesel

Installation

Special Tool(s)

303-1069  E53727	303-1069 Adapter, Wrench
308-598  E50941	308-598 Installer, Oil Seal

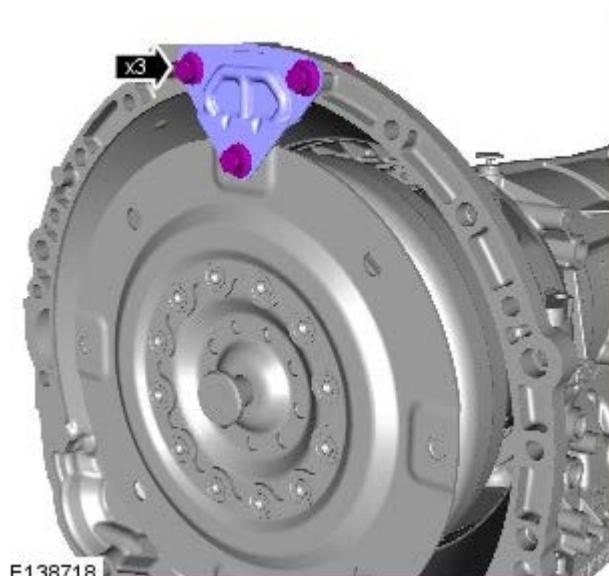
NOTES:



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



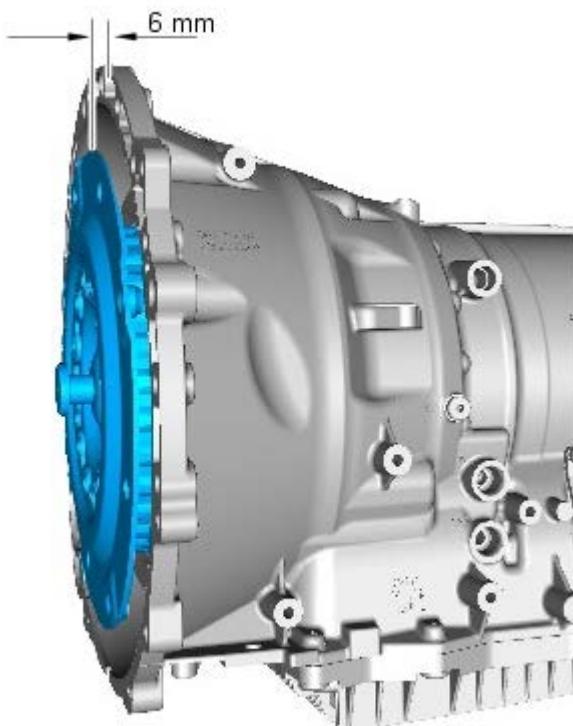
Some illustrations may show the transmission removed for clarity.



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

Remove the torque converter retainer.

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



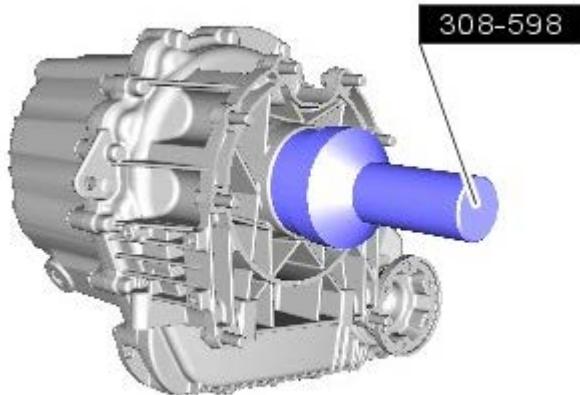
E138283

3.  **CAUTION:** Oil seals must be fitted dry.

NOTES:

-  This step is only required if previously removed.
-  Make sure that this component is installed to the noted removal position.

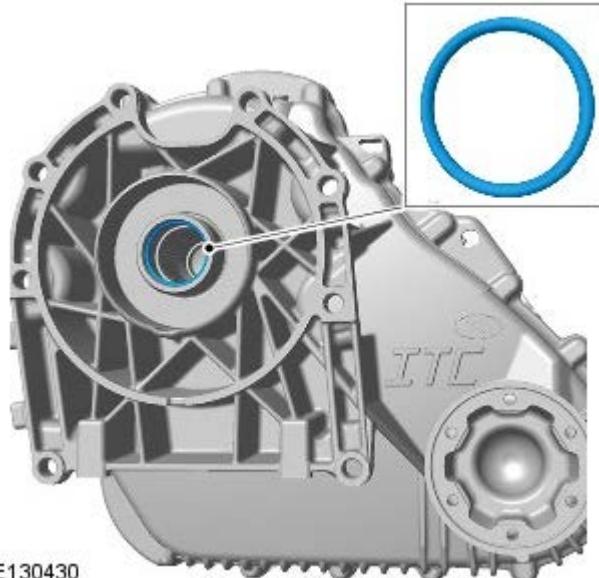
Special Tool(s): [308-598](#)



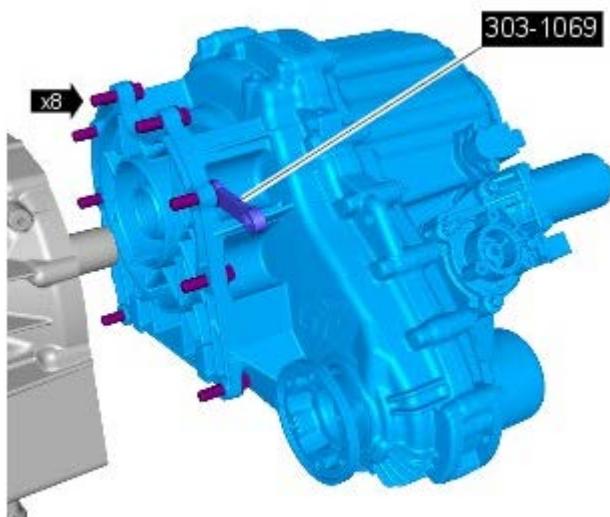
E50943

4.  **NOTE:** This step is only required if previously removed.

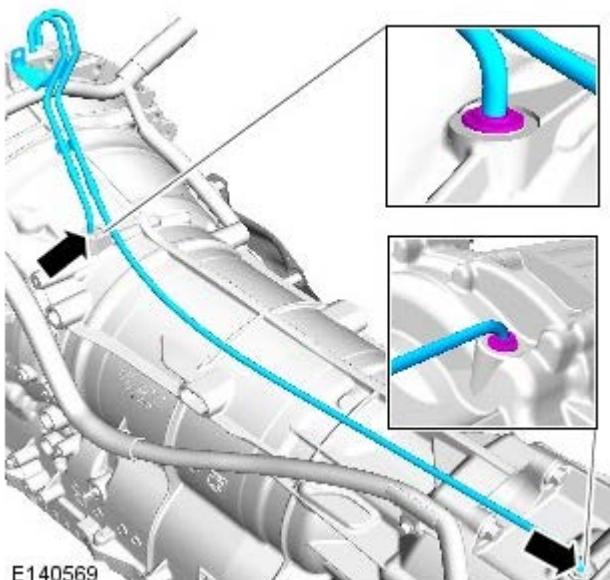
Install a new O-ring seal.



E130430



E130188



E140569

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

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

6. **CAUTIONS:**

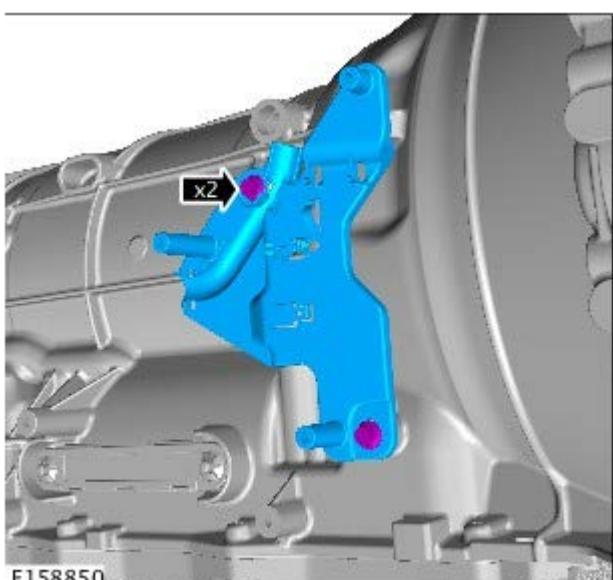
To prevent water ingress and subsequent transmission damage, make sure that the breather is fully pushed home into the transmission casing. The white line around the circumference of the pipe should not be visible when correctly installed.

Remove the blanking plugs.

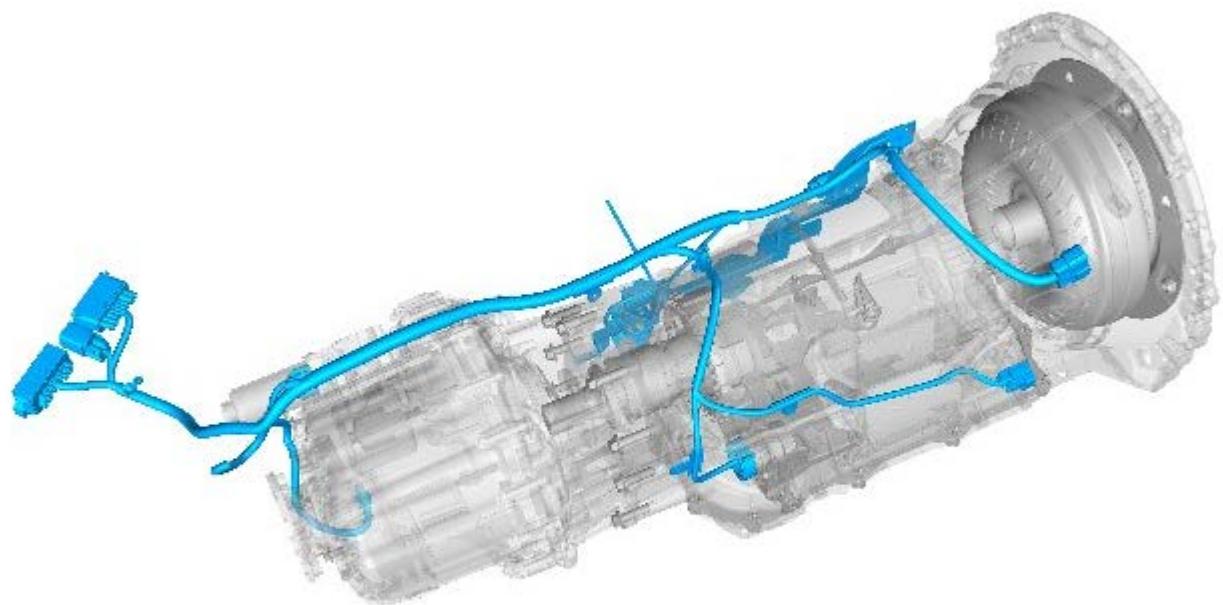
NOTE: This step is only required if a new component is installed.



8. *Torque: 9 Nm*



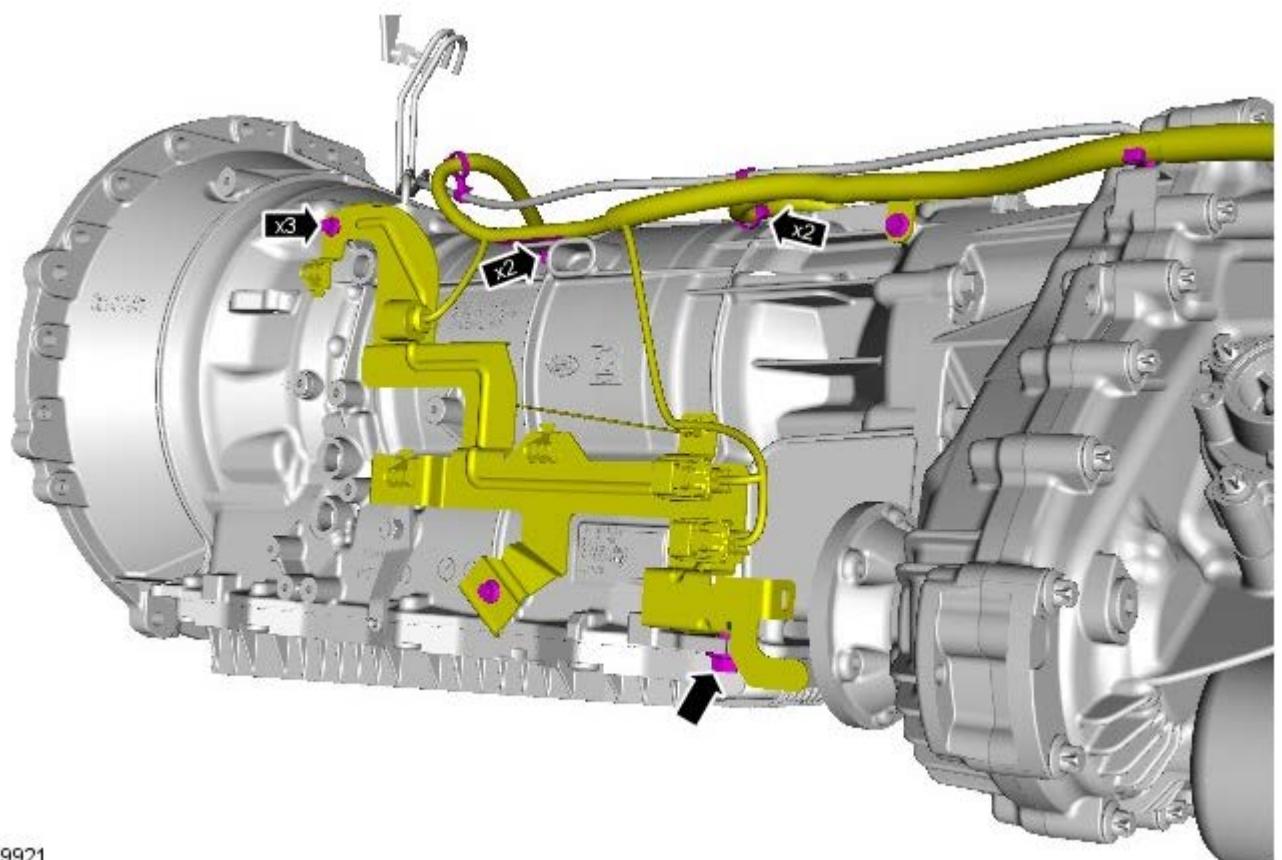
9.



E158851

10. **NOTE:** This step is only required if previously removed.

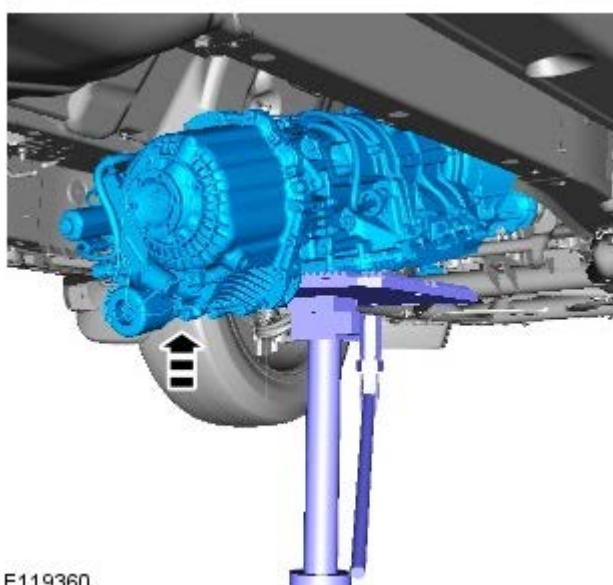
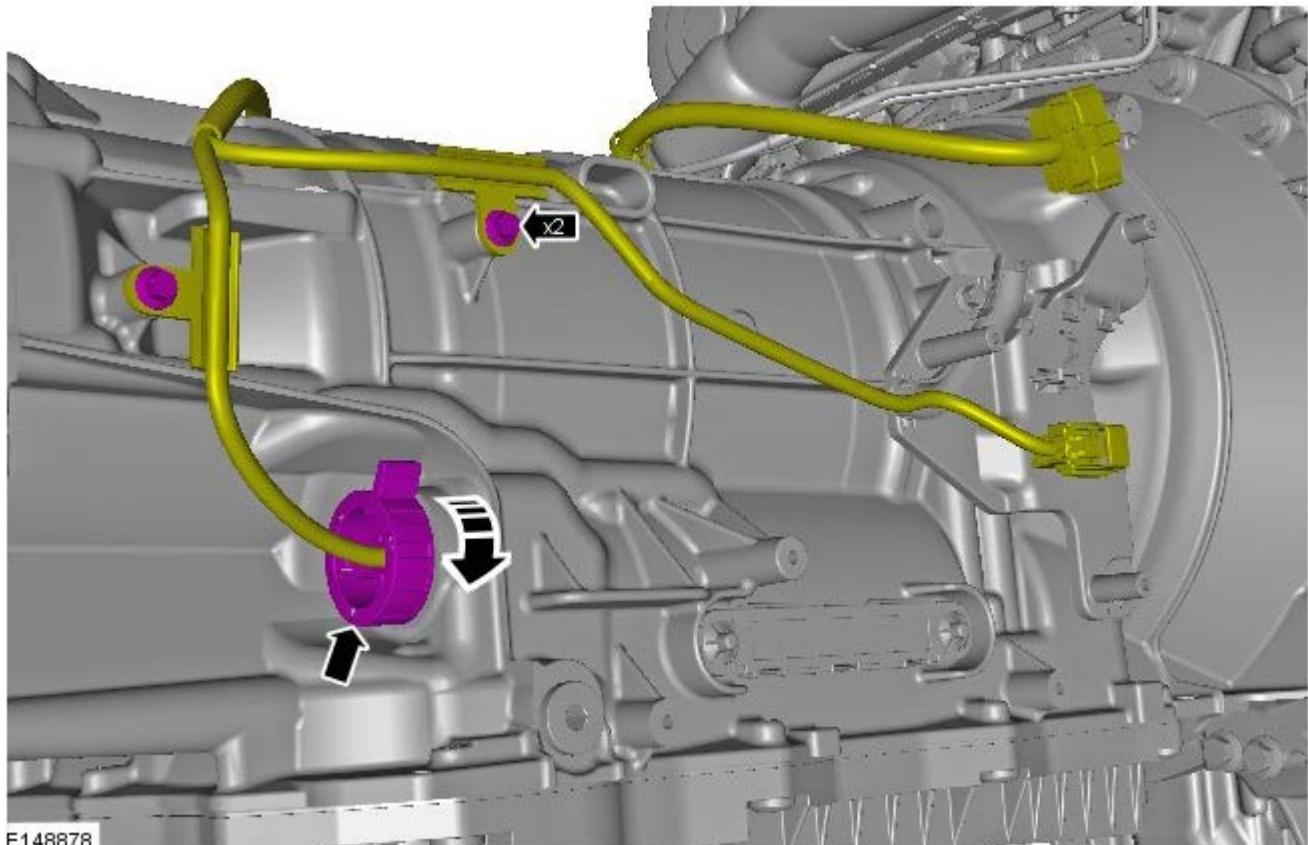
Torque:
M8 25 Nm
M6 10 Nm



E149921

11. **NOTE:** This step is only required if previously removed.

Torque: 10 Nm



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

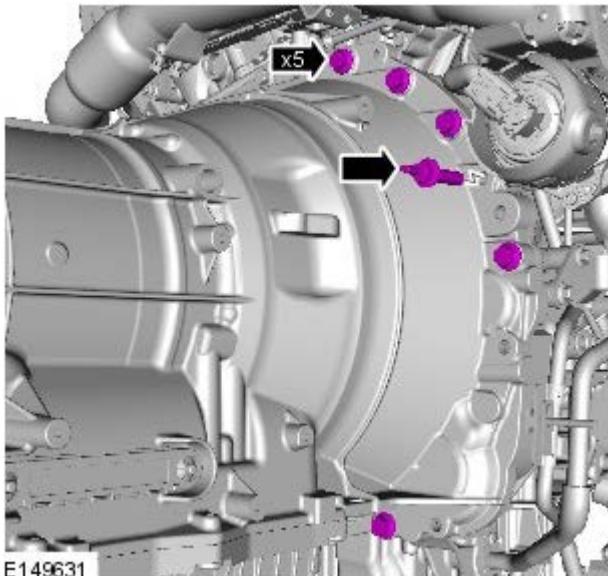
CAUTIONS:

-  Apply grease of the correct specification to the torque converter spigot.
-  Make sure that the torque converter remains in the transmission.
-  Remove and discard the cable ties securing the torque converter.

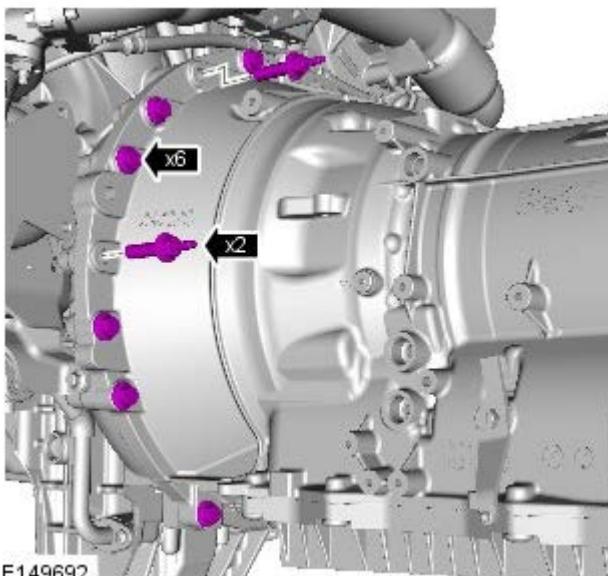
 **NOTE:** This step requires the aid of other technicians.

Using a suitable hydraulic jack, support the transmission.

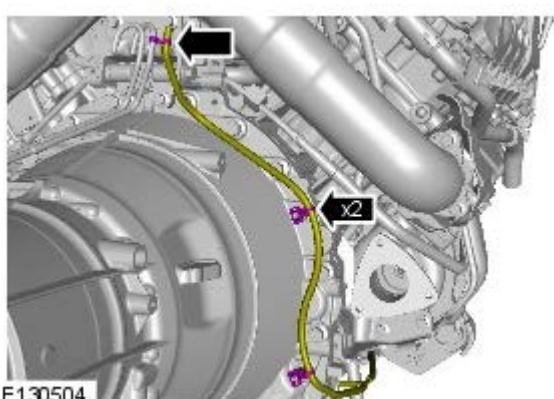
13. *Torque: 40 Nm*



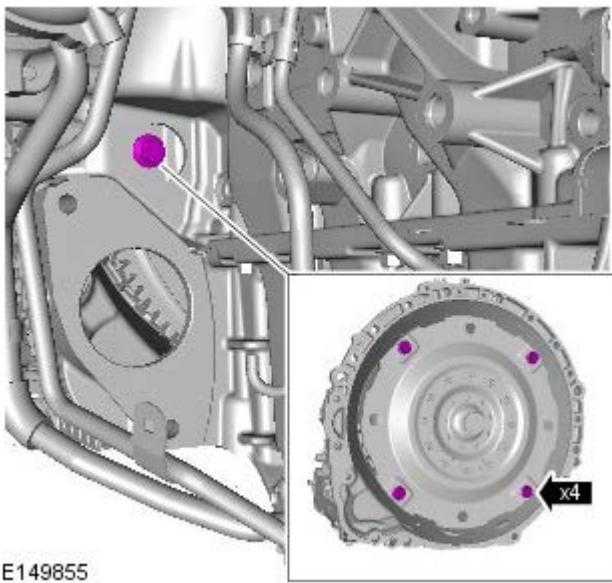
14. *Torque: 40 Nm*



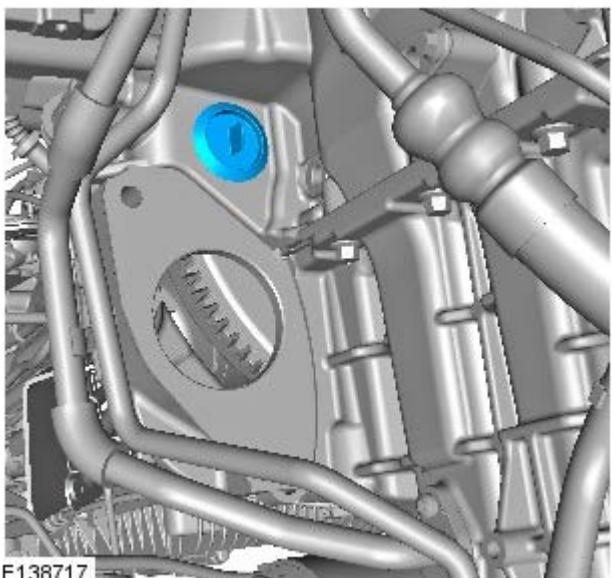
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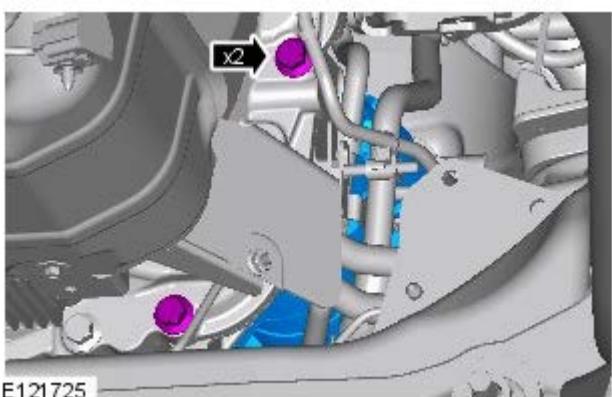
16.  **CAUTION:** Only rotate the crankshaft clockwise.
Torque: 63 Nm



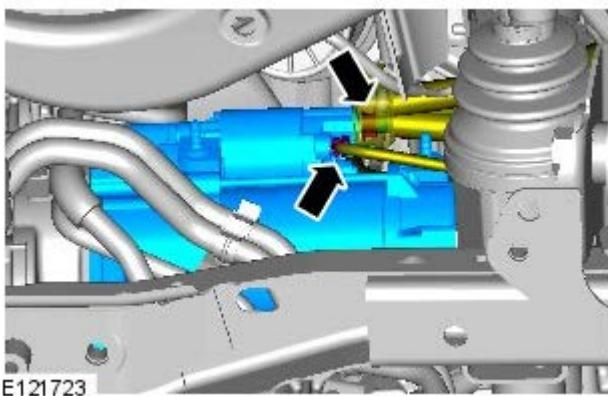
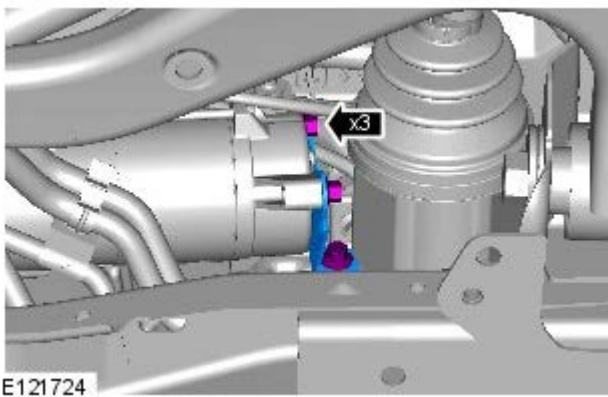
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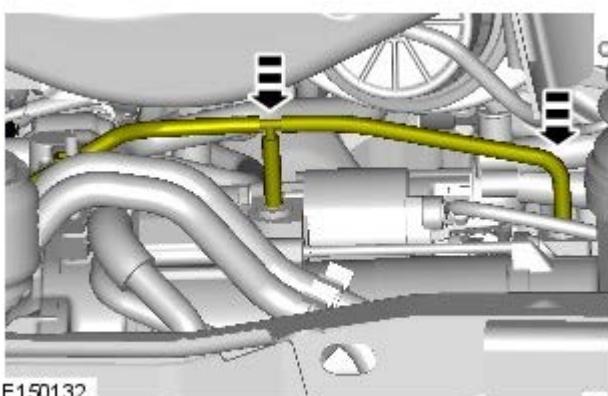
18. Torque: 45 Nm



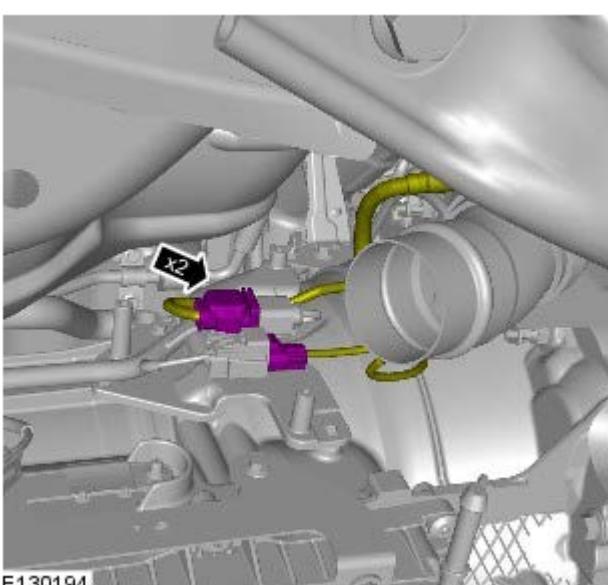
19. Torque: 30 Nm



20. *Torque:*
M8 10 Nm
M6 7 Nm

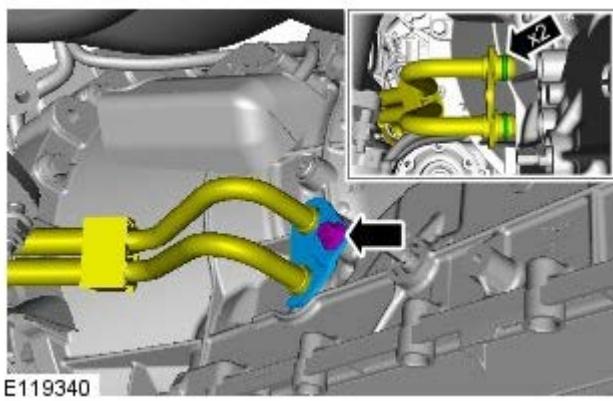
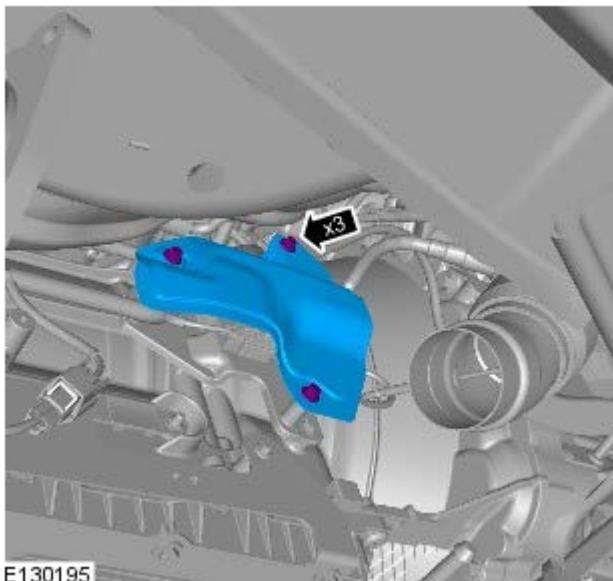


21.



22.

23. *Torque:* 10 Nm

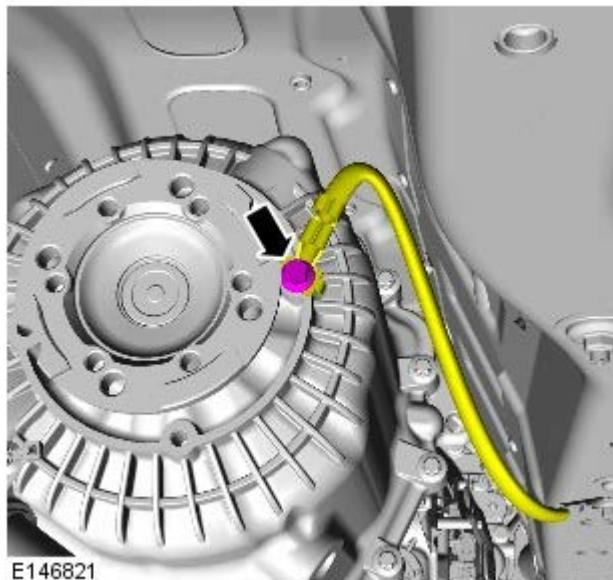


24. **CAUTION:** Be prepared to collect escaping fluids.

NOTE: Install new O-ring seals.

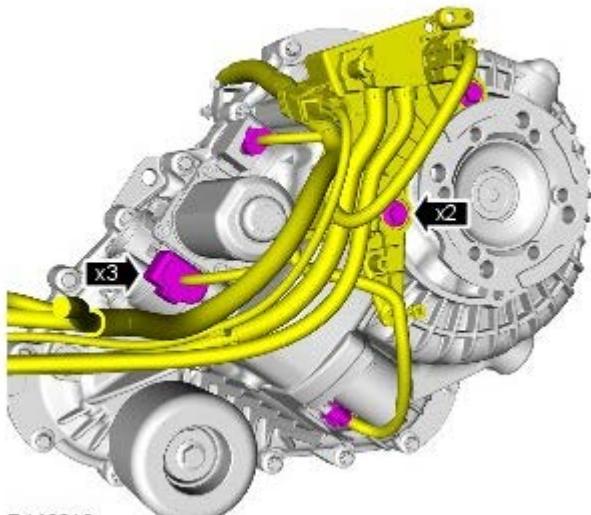
Torque: 22 Nm

25. *Torque: 25 Nm*



26. **NOTE:** Vehicles with DPF (Diesel Particulate Filter) installed only.

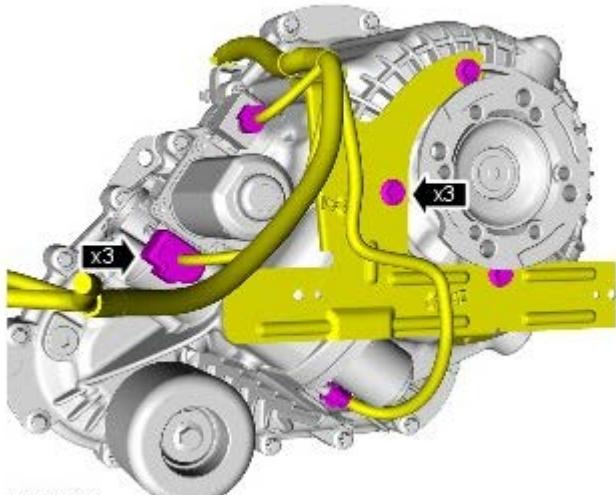
Torque: 25 Nm



E 146819

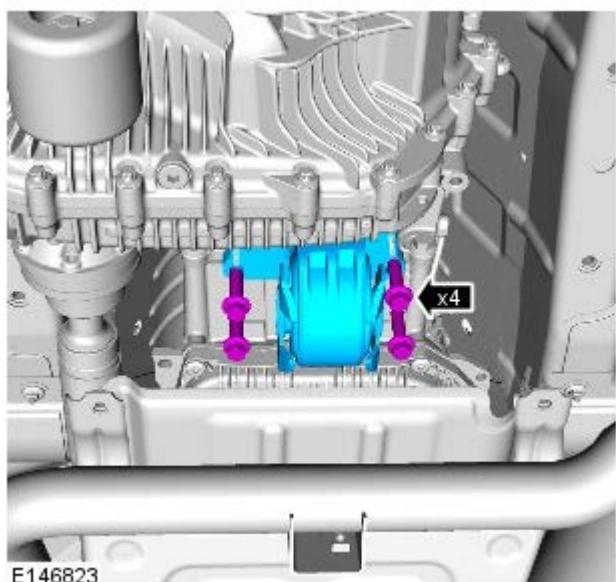
27.  **NOTE:** Vehicles without diesel particulate filter (DPF).

Torque: 25 Nm



E 146820

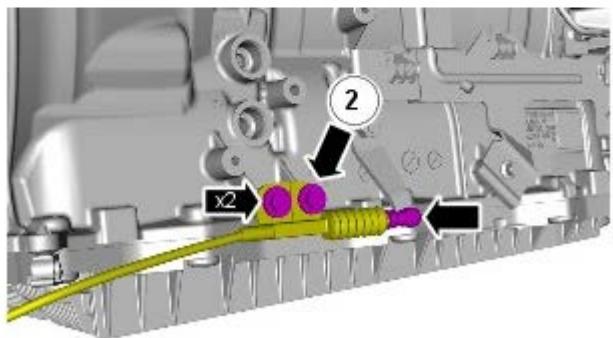
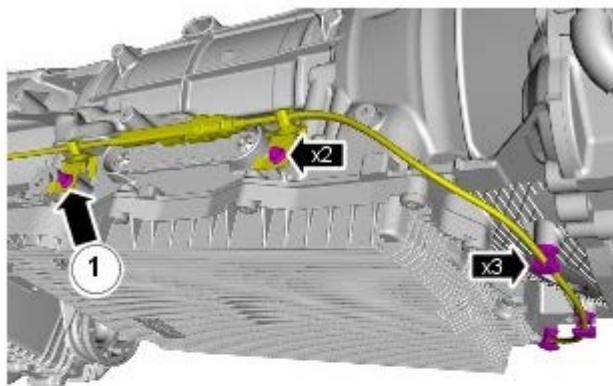
28. *Torque: 60 Nm*



E 146823

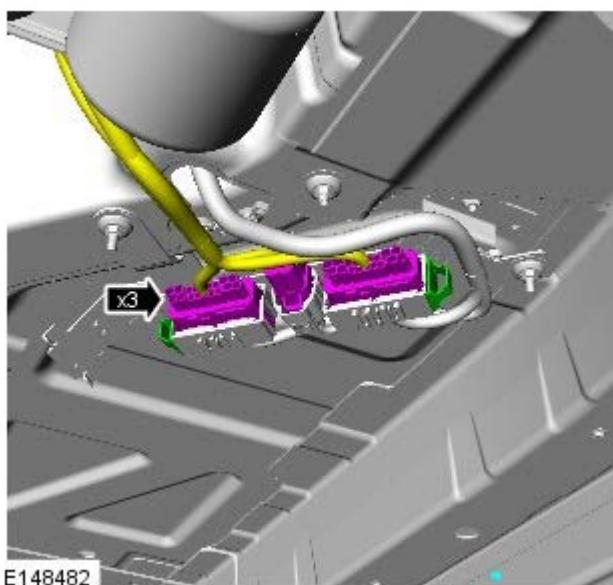
- 29.

• *Torque: 10 Nm*



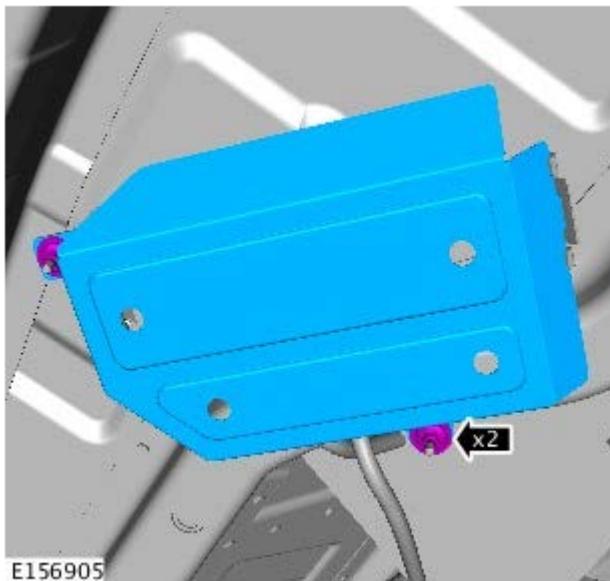
E149962

30.

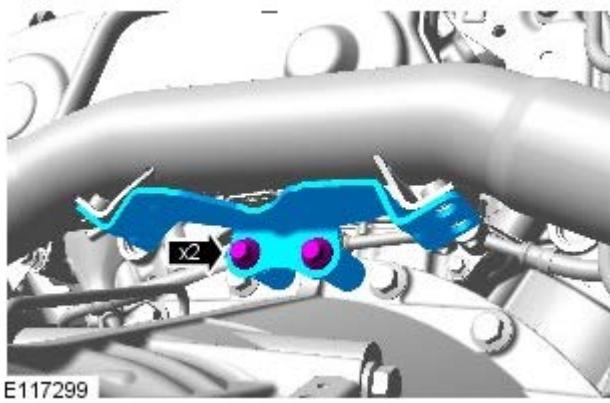


E148482

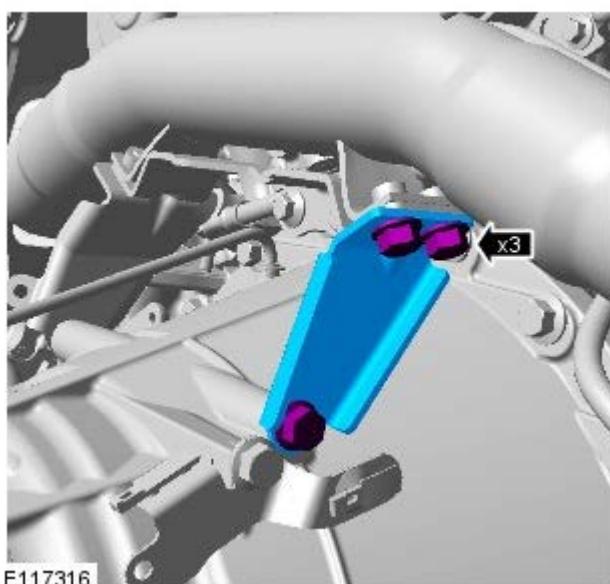
31. *Torque: 9 Nm*



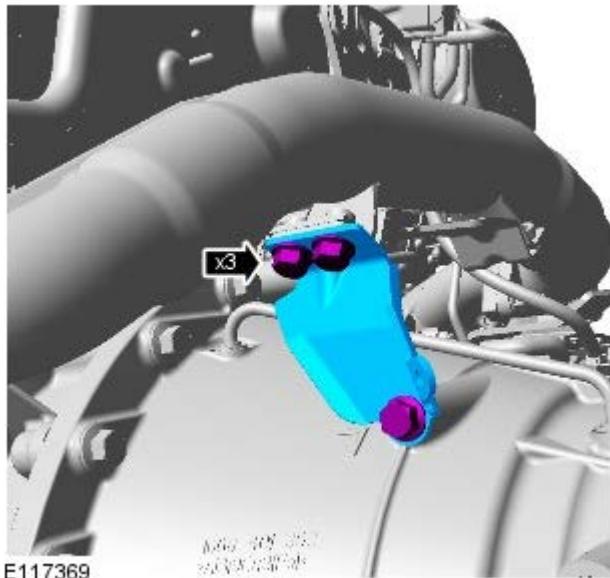
32. *Torque: 23 Nm*



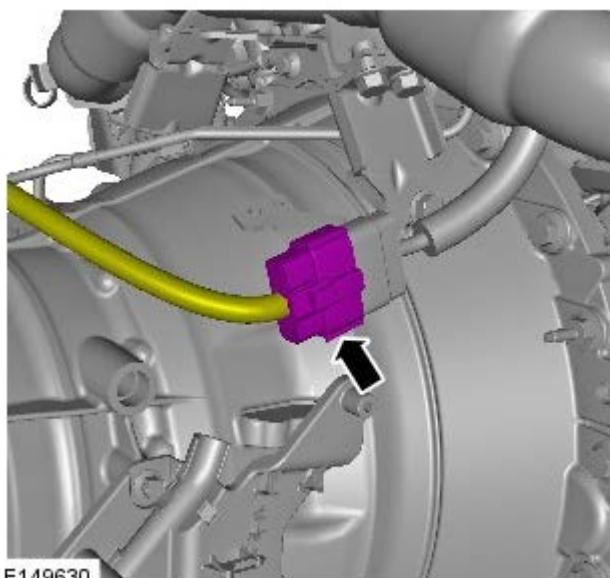
33. *Torque: 23 Nm*



34. *Torque: 23 Nm*



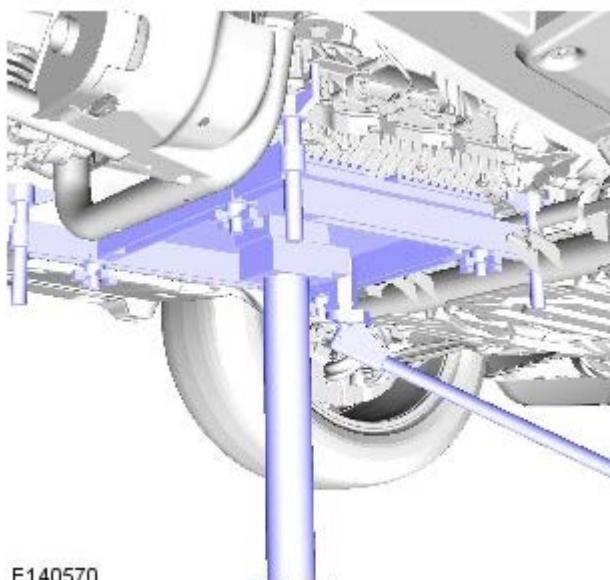
35.



36. Refer to: [Rear Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

37. Refer to: [Front Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

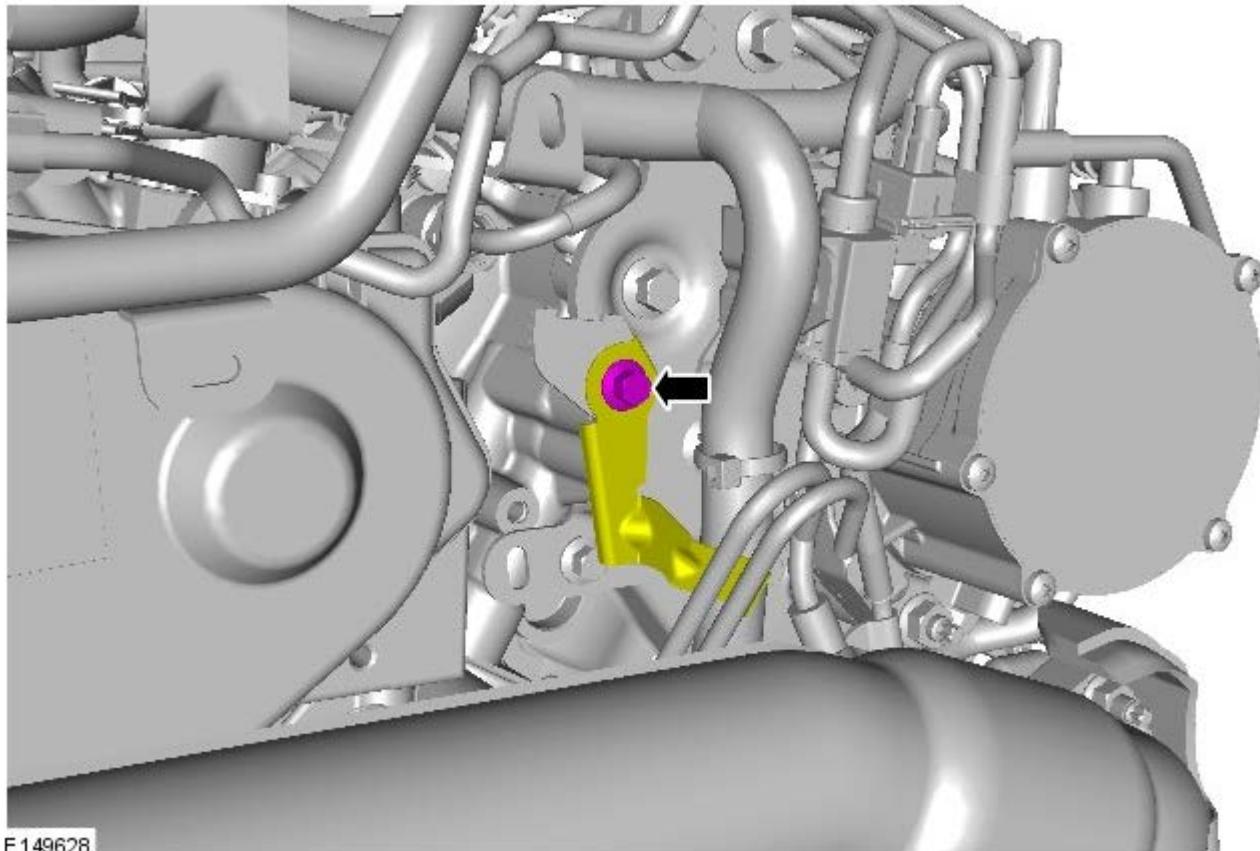
38. Remove the jack supporting the transmission.



39. Lower the vehicle.

40. Refer to: Secondary Bulkhead Center Panel - TDV6 3.0L Diesel (501-02, Removal and Installation).

41. *Torque: 12 Nm*



42. Refer to: Secondary Bulkhead Center Panel - TDV6 3.0L Diesel (501-02, Removal and Installation).

43. Connect the battery ground cable.

Refer to: Specifications (414-01, Specifications).

44. Carry out a transmission fluid level check.

Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV8 4.4L Diesel

Installation

Special Tool(s)

303-1069  E53727	303-1069 Adapter, Wrench
308-598  E50941	308-598 Installer, Oil Seal

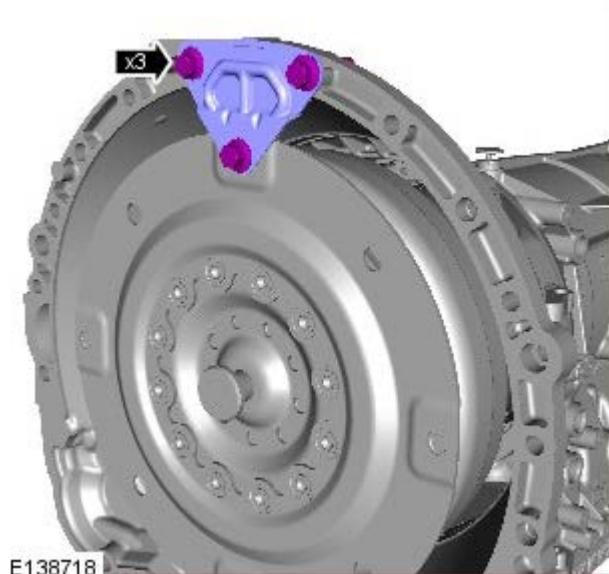
NOTES:



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

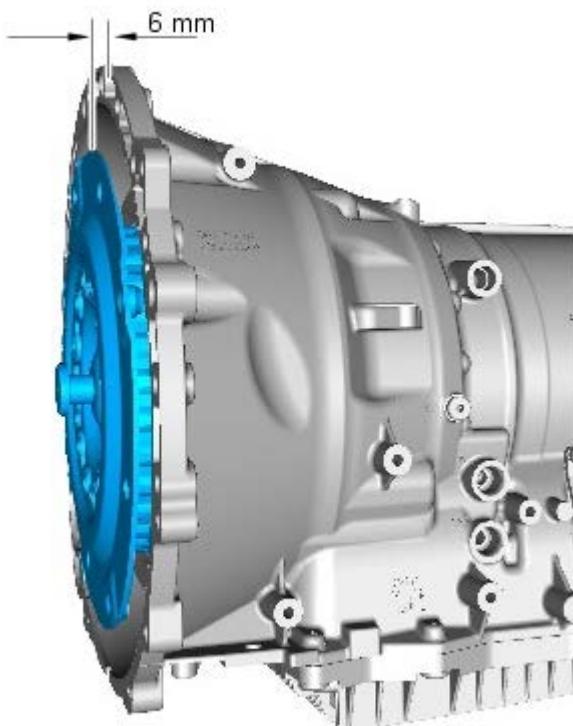


Some illustrations may show the transmission removed for clarity.

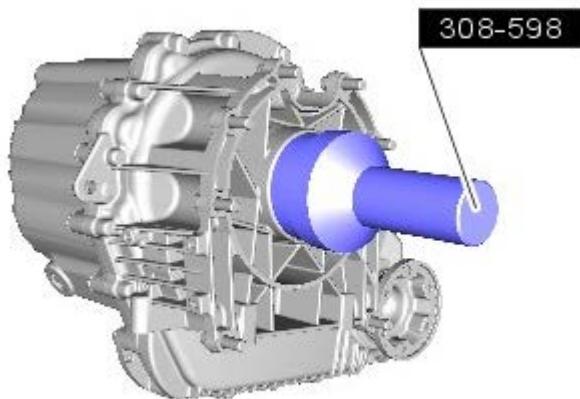


1.  **NOTE:** This step is only required if a new component is installed.

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



E138283



E50943

3.  **CAUTION:** Oil seals must be fitted dry.

NOTES:



This step is only required if previously removed.

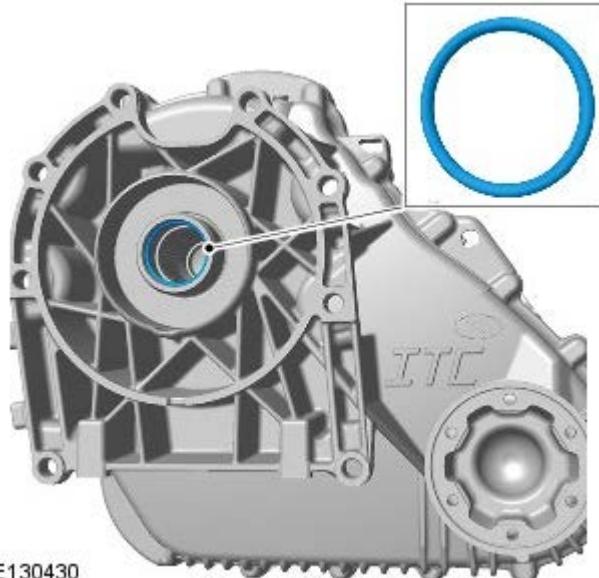


Make sure that this component is installed to the noted removal position.

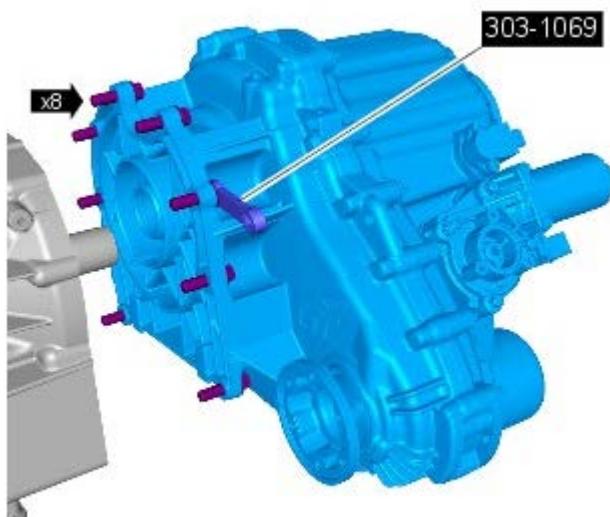
Special Tool(s): [308-598](#)

4.  **NOTE:** This step is only required if previously removed.

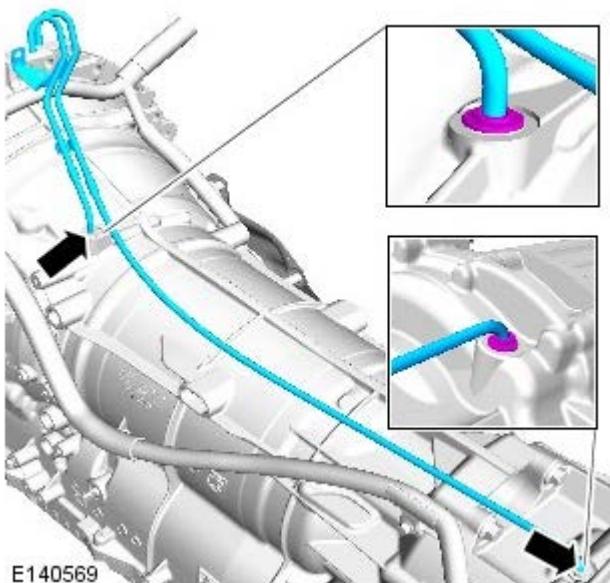
Install a new O-ring seal.



E130430



E130188



E140569

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

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

6. **CAUTIONS:**

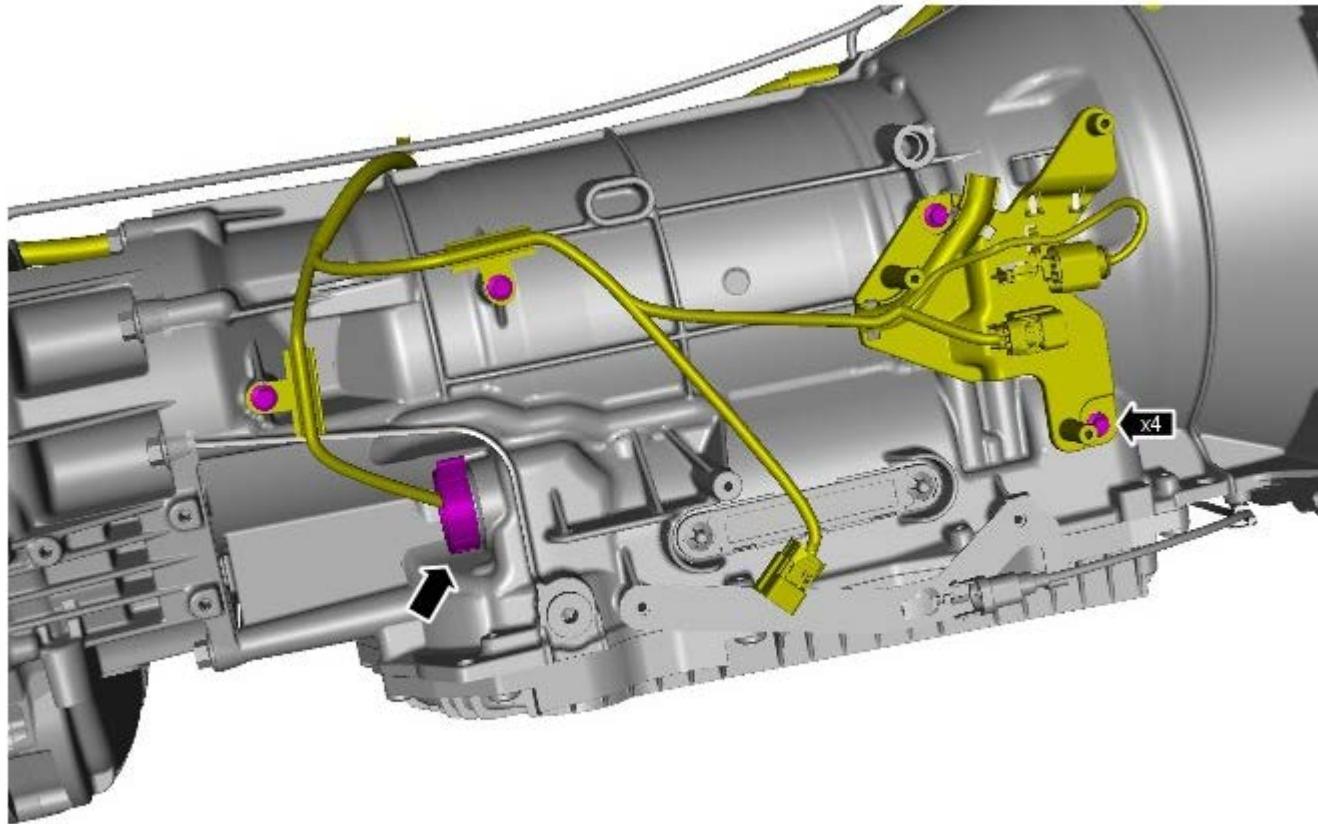
- Remove the blanking plugs.

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

- NOTE:** This step is only required if previously removed.

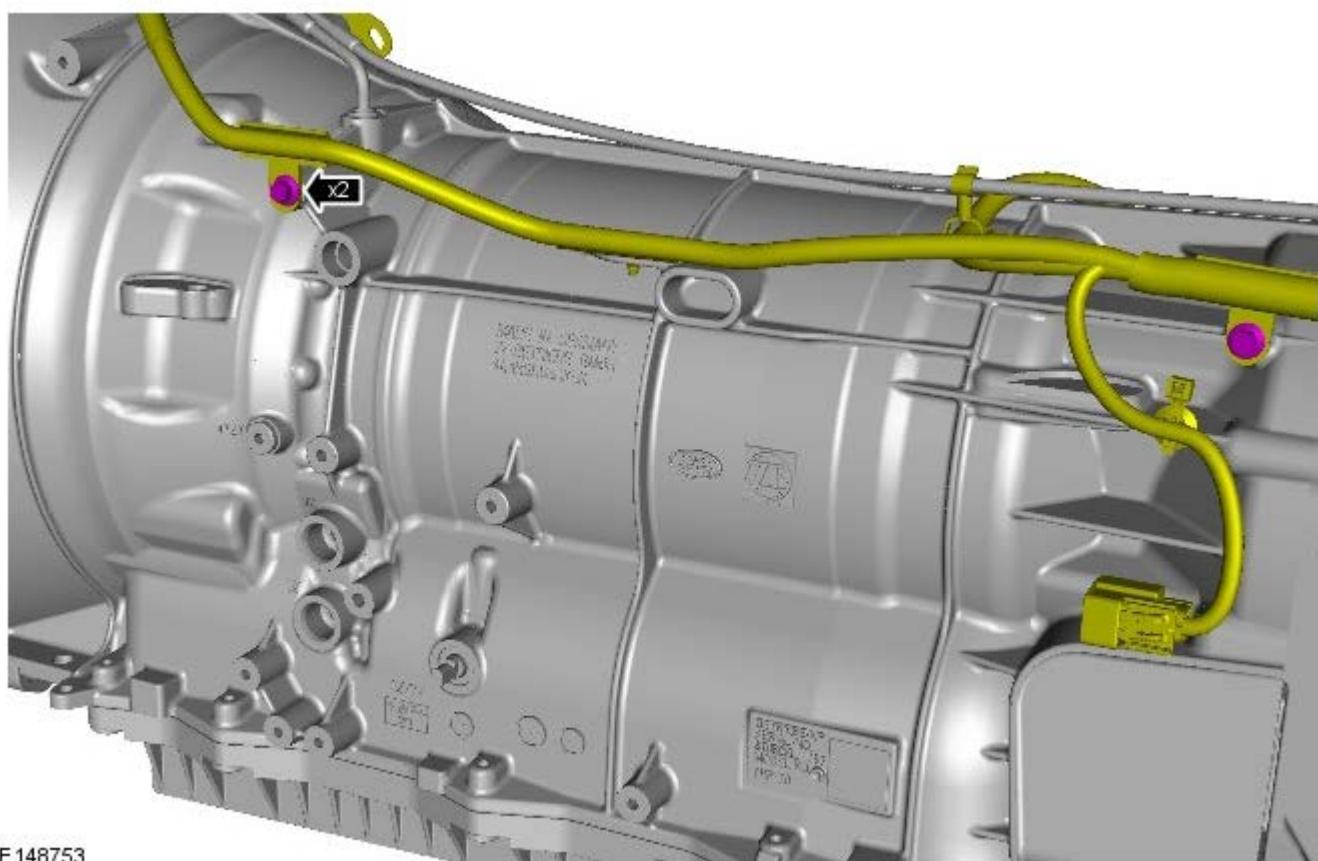
7. **NOTE:** This step is only required if previously removed.

Torque: [8 Nm](#)



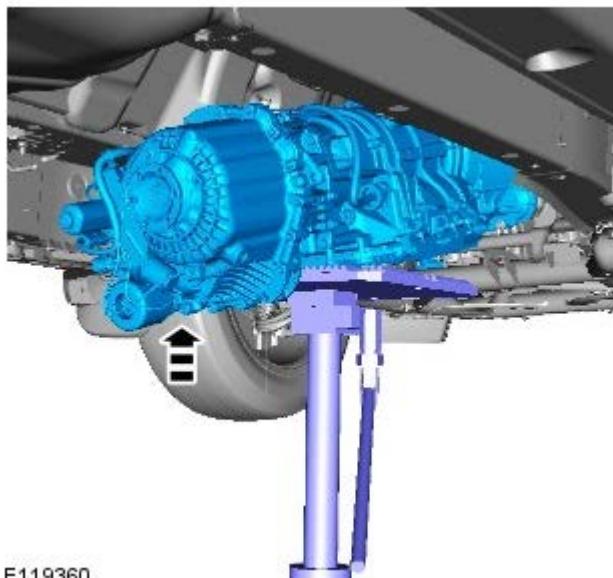
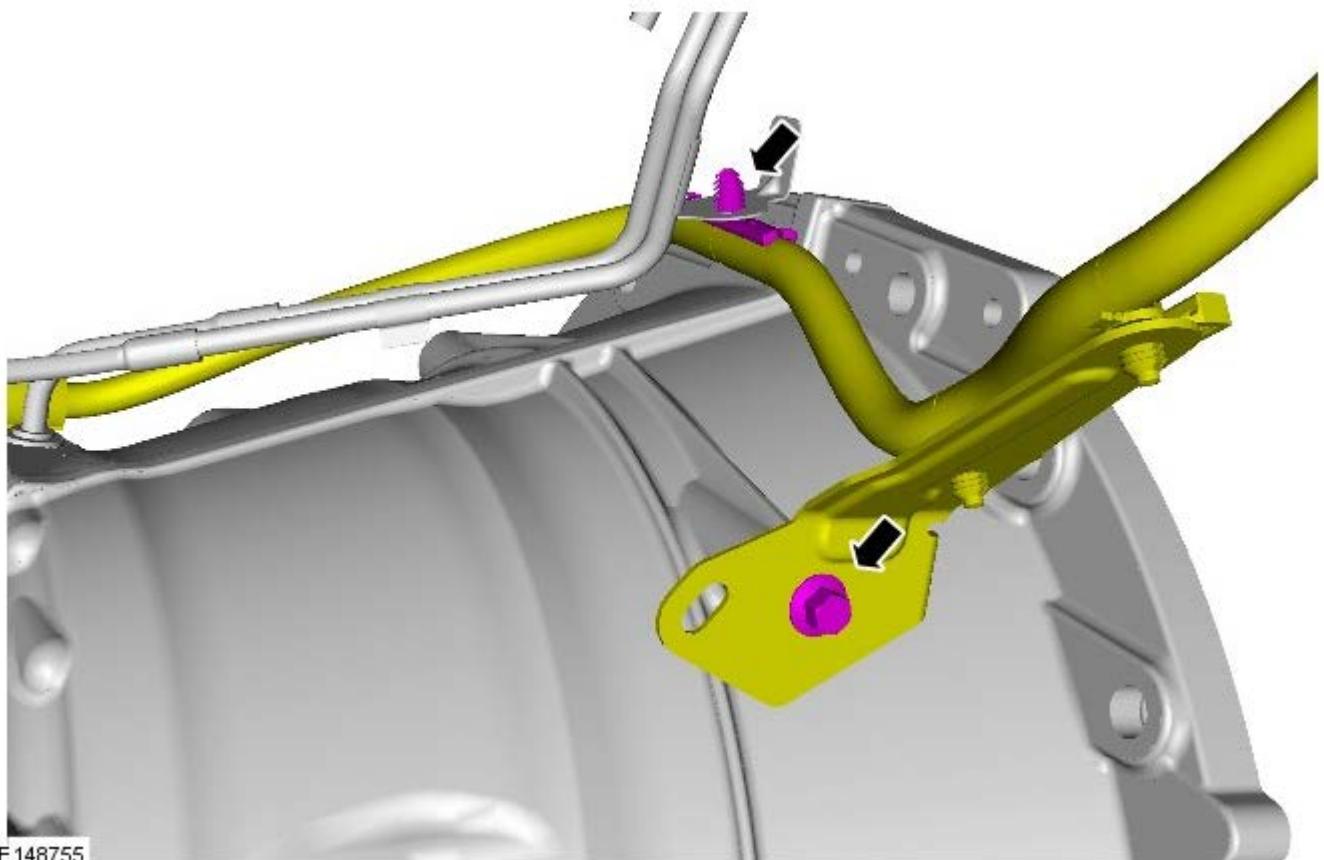
E148754

8.  **NOTE:** This step is only required if previously removed.
Torque: 10 Nm



E148753

9.  **NOTE:** This step is only required if previously removed.
Torque: 12 Nm



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

CAUTIONS:

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

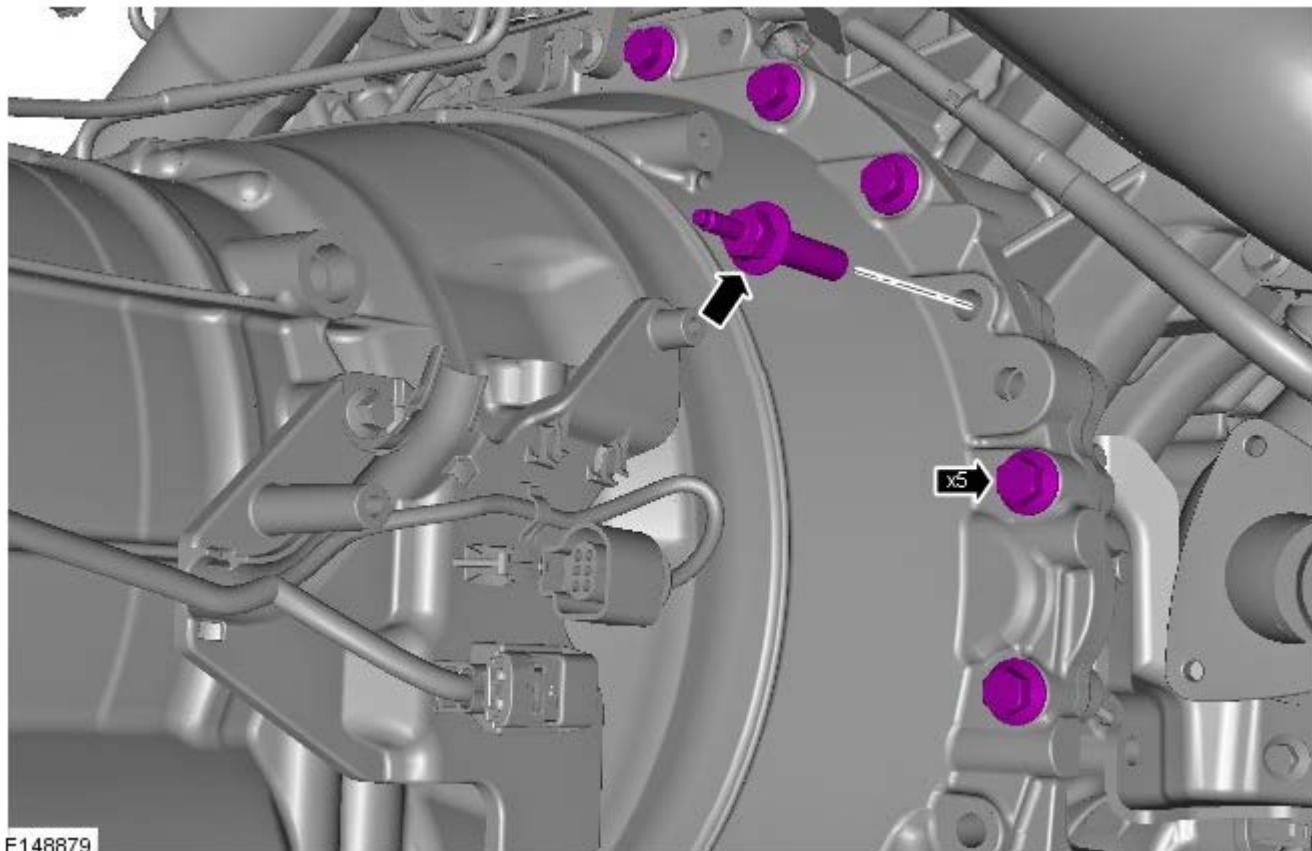
 Make sure that the torque converter remains in the transmission.

 Remove and discard the cable ties securing the torque converter.

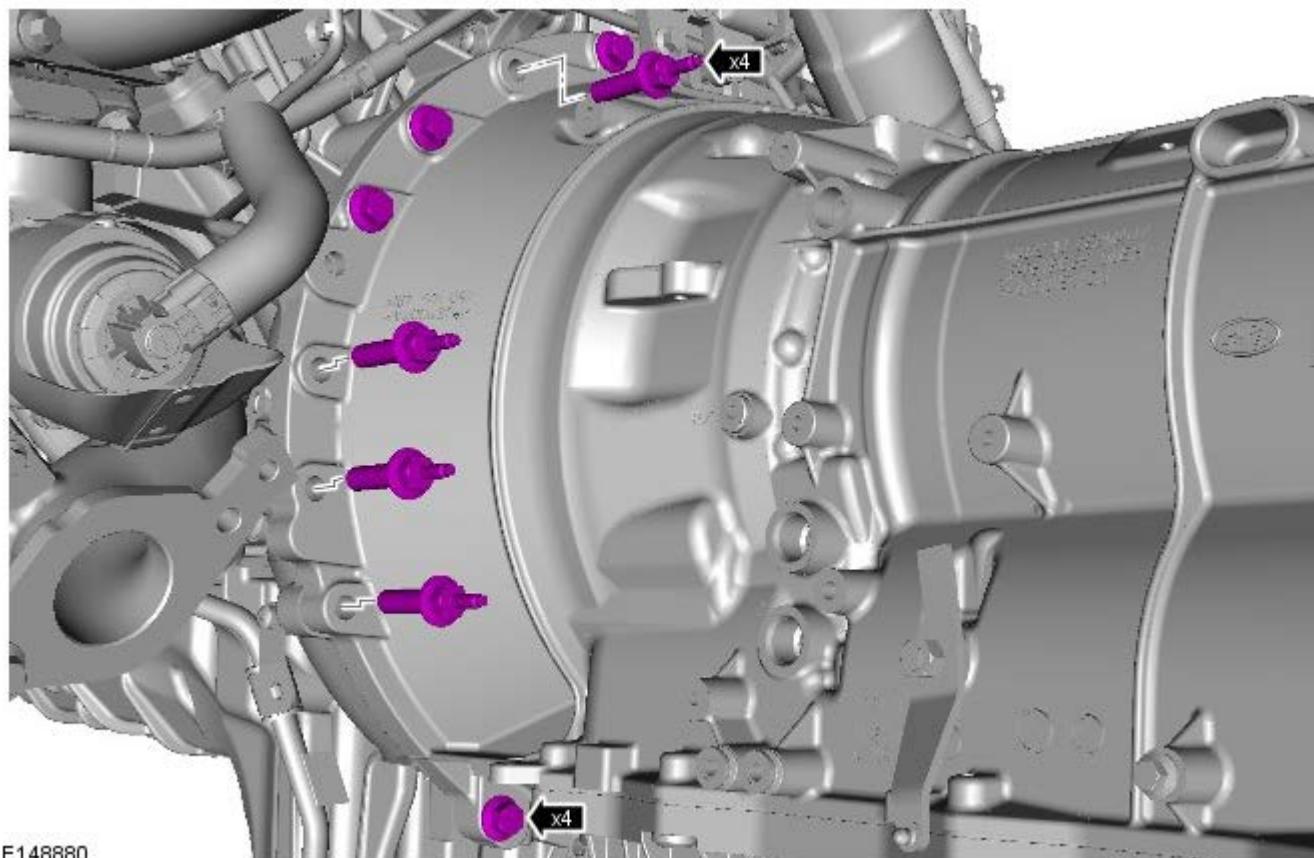
 **NOTE:** This step requires the aid of other technicians.

Using a suitable hydraulic jack, support the transmission.

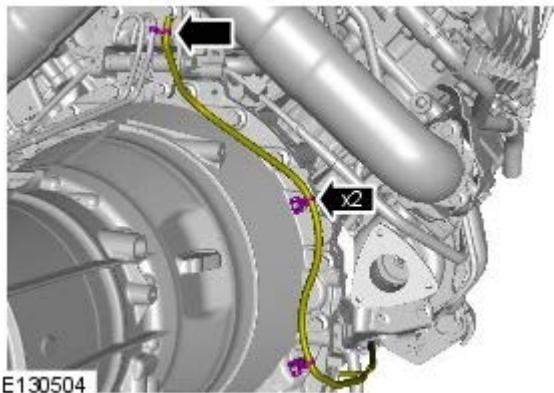
11. *Torque: 40 Nm*



12. Torque: 40 Nm

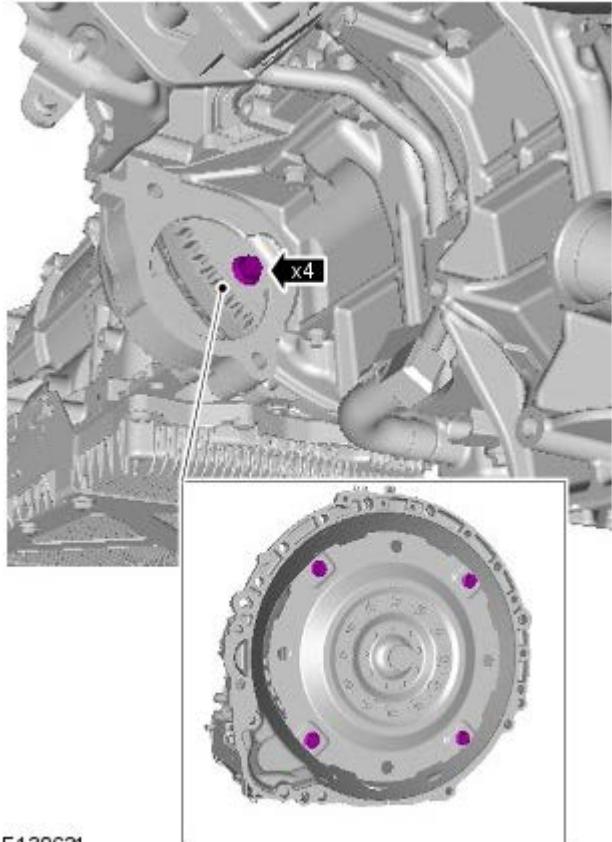


13.



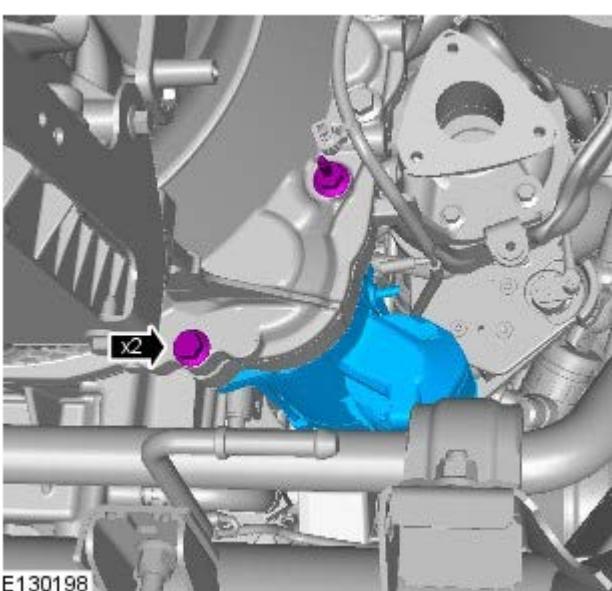
E130504

14.  **CAUTION:** Only rotate the crankshaft clockwise.
Torque: 63 Nm



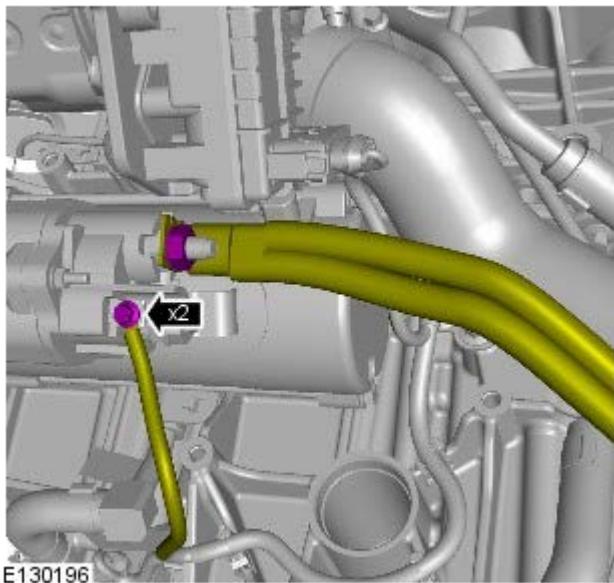
E130631

15. Torque: 45 Nm

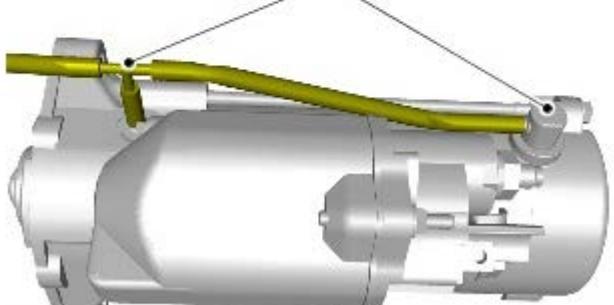
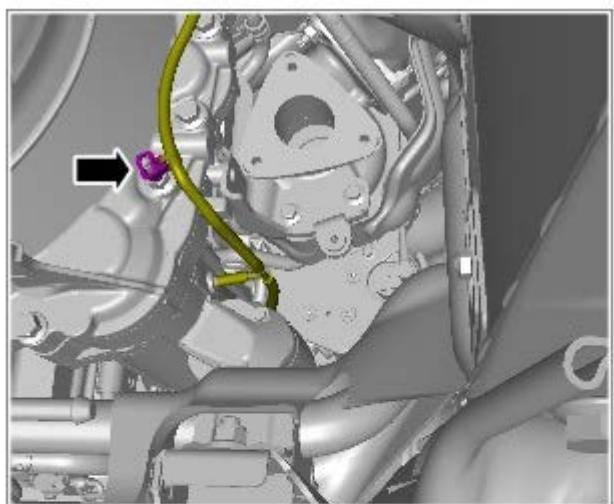


E130198

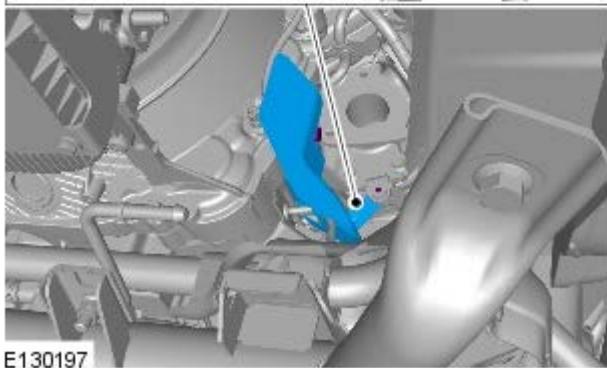
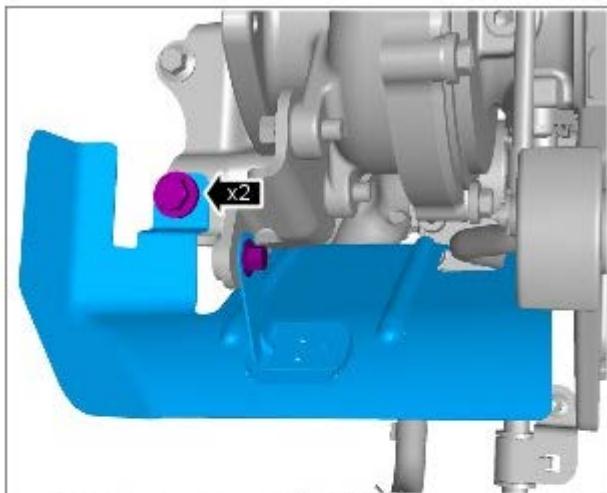
16. Torque:
M8 25 Nm
M5 3 Nm



17.

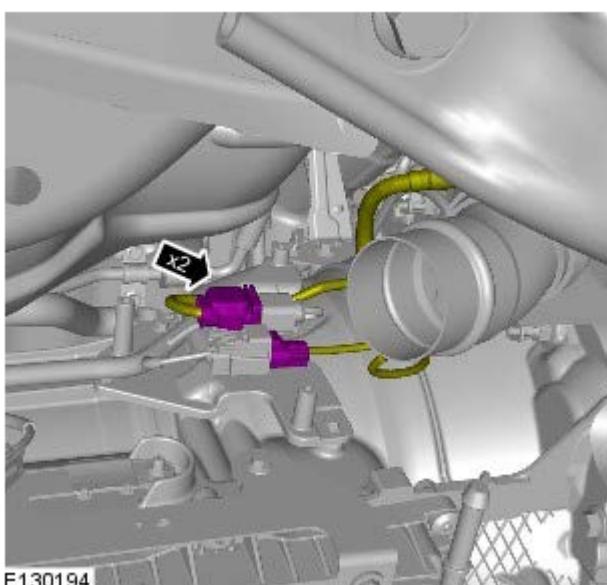


18. *Torque: 10 Nm*



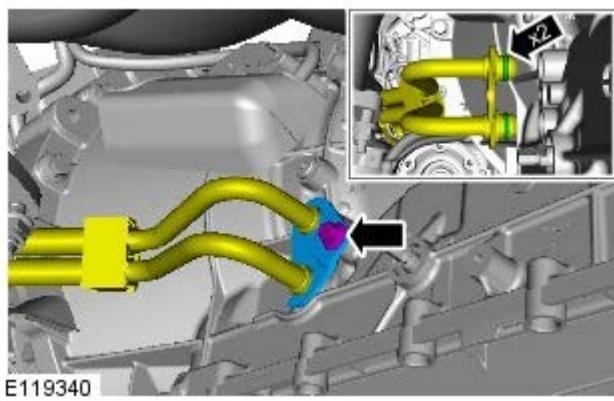
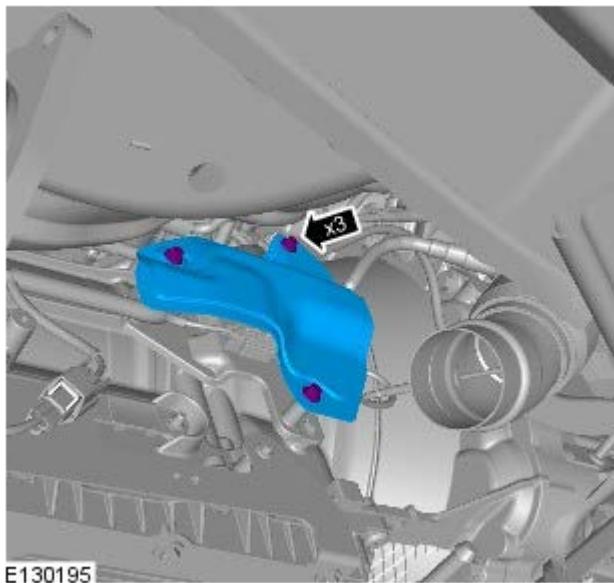
E130197

19.



E130194

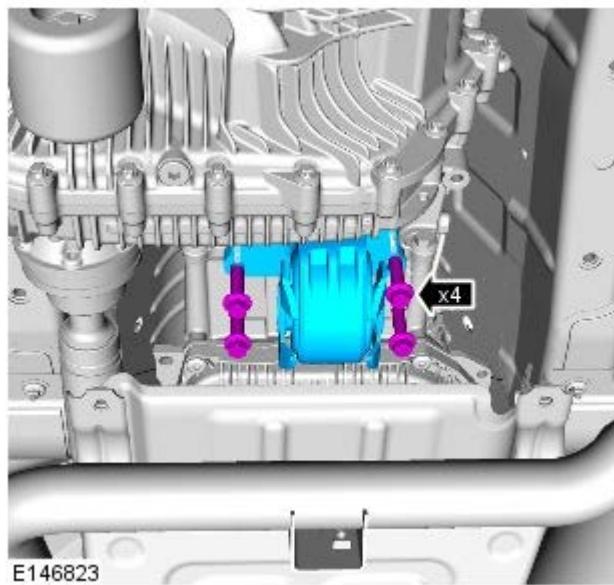
20. *Torque: 10 Nm*



21.  **WARNING:** Be prepared to collect escaping fluids.

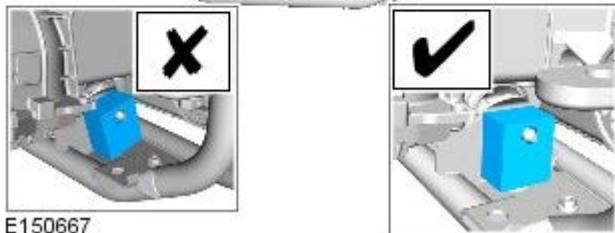
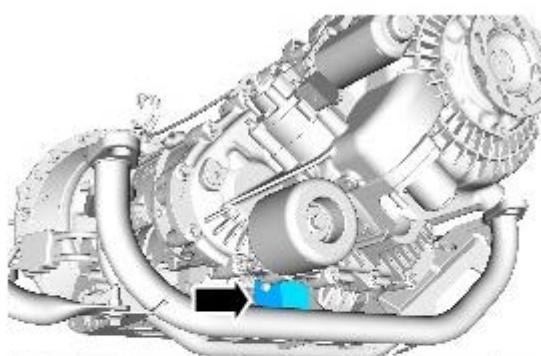
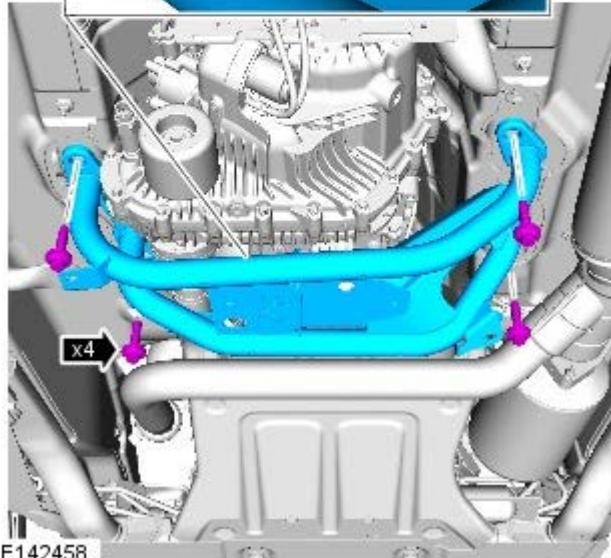
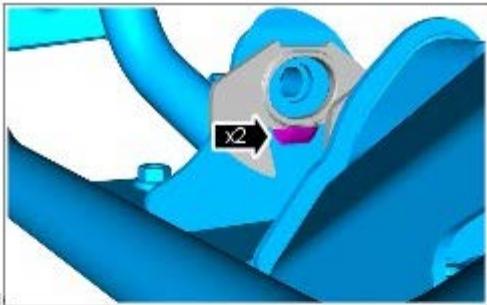
 **CAUTION:** Install new O-ring seals.

Torque: 22 Nm



22. *Torque: 60 Nm*

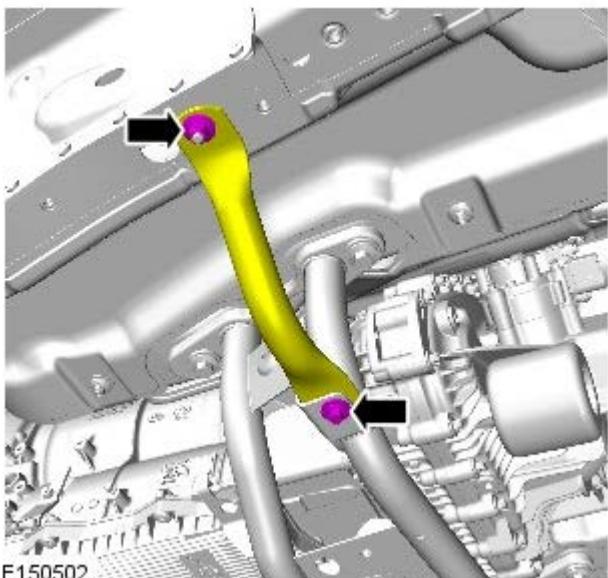
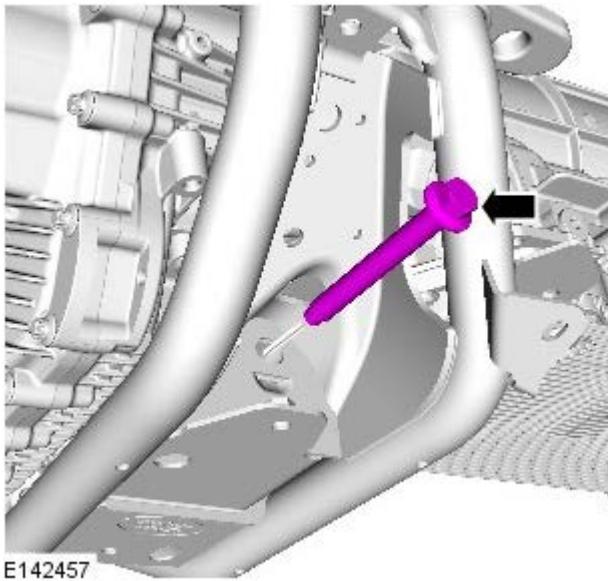
23. *Torque: 110 Nm*



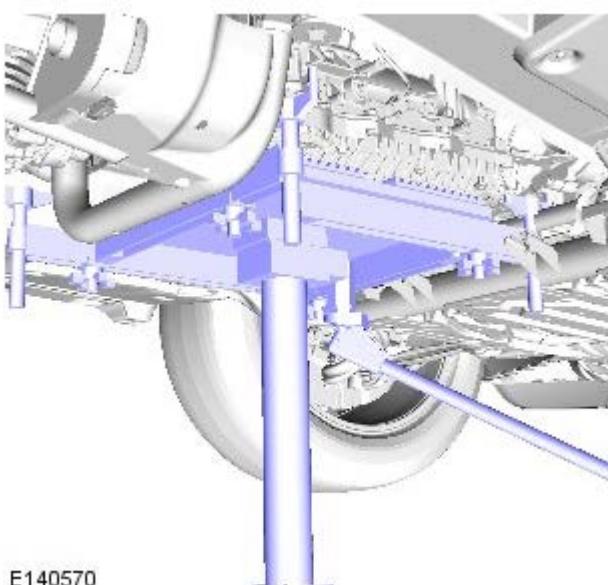
E150667

24.  CAUTION: Make sure that the components are installed to the noted position in the removal steps.

25. *Torque: 175 Nm*

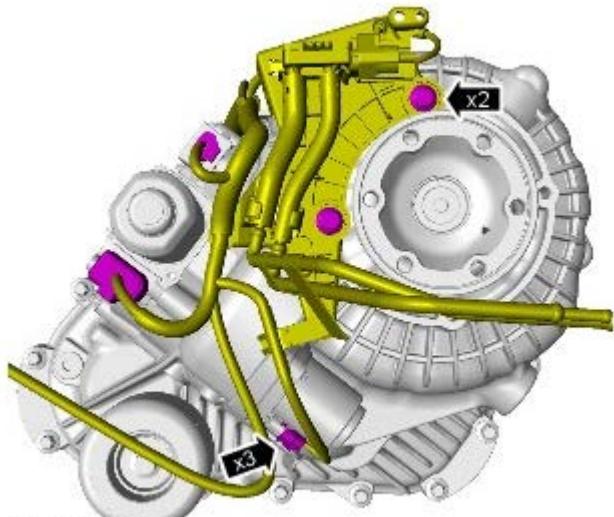


26. *Torque:*
M8 nut 20 Nm
M8 bolt 24 Nm



27. Remove the jack supporting the transmission.

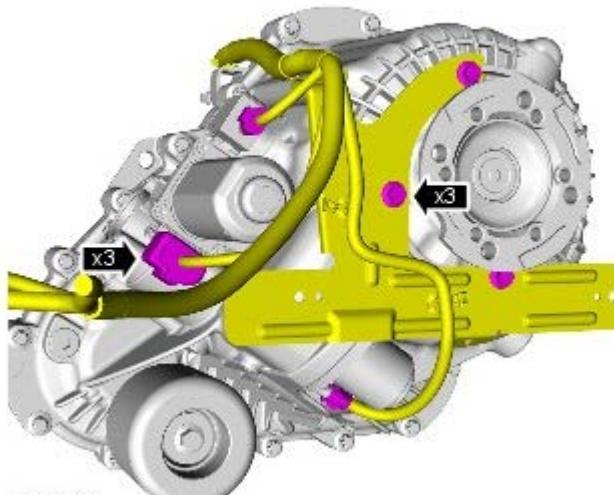
28.  **NOTE:** Vehicles with diesel particulate filter (DPF).
Torque: 25 Nm



E130171

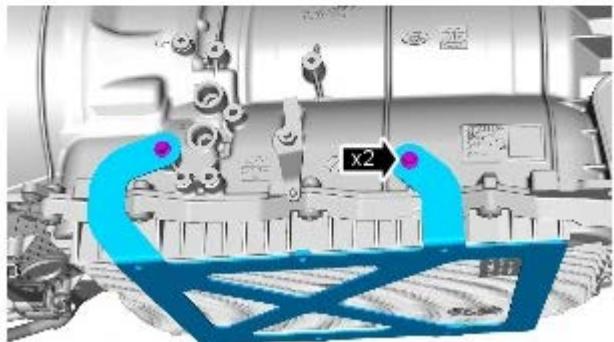
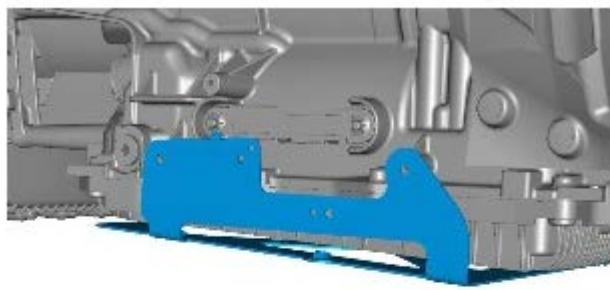
29.  **NOTE:** Vehicles without diesel particulate filter (DPF).

Torque: 25 Nm



E 146820

30. *Torque: 10 Nm*

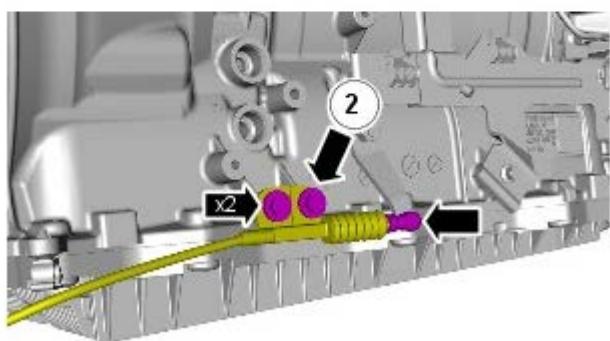
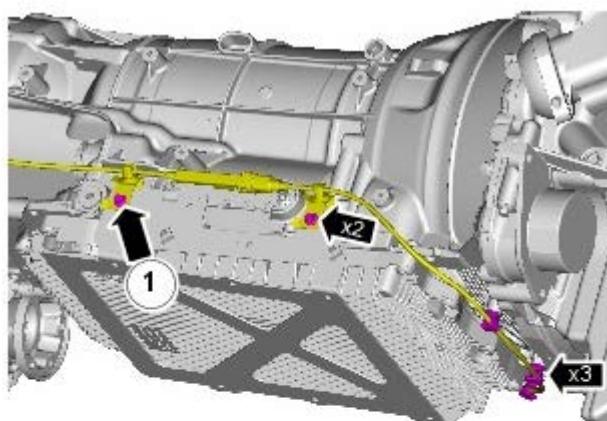


E148881

31.

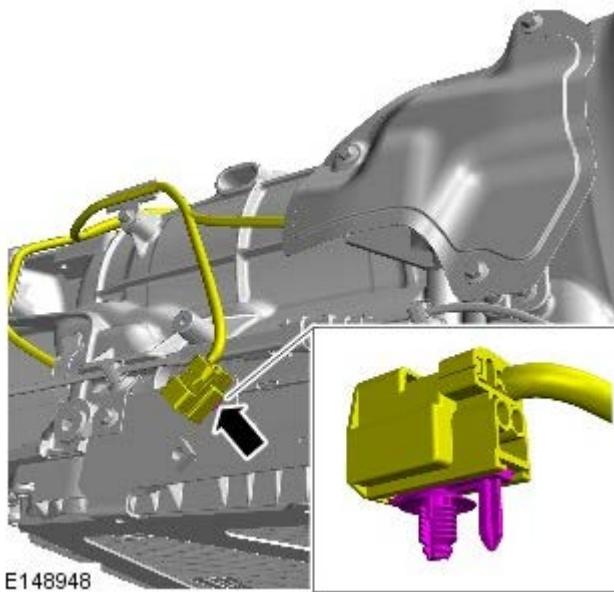
- *Torque:*

Upper bolts (1) 10 Nm
Lower bolts (2) 11 Nm

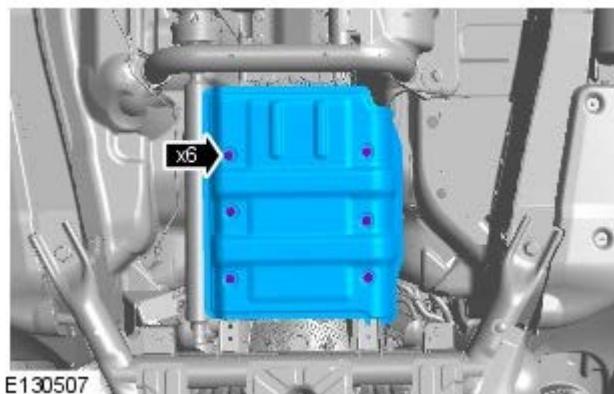


E150013

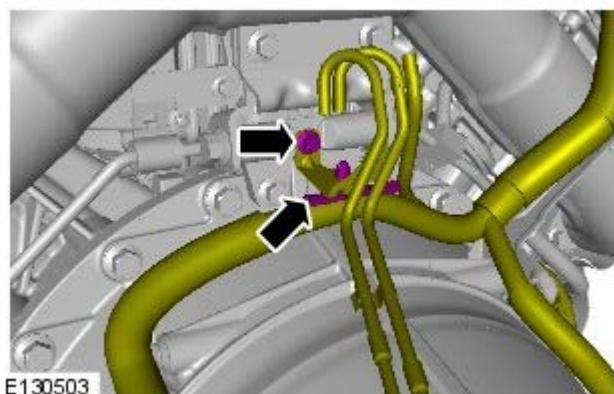
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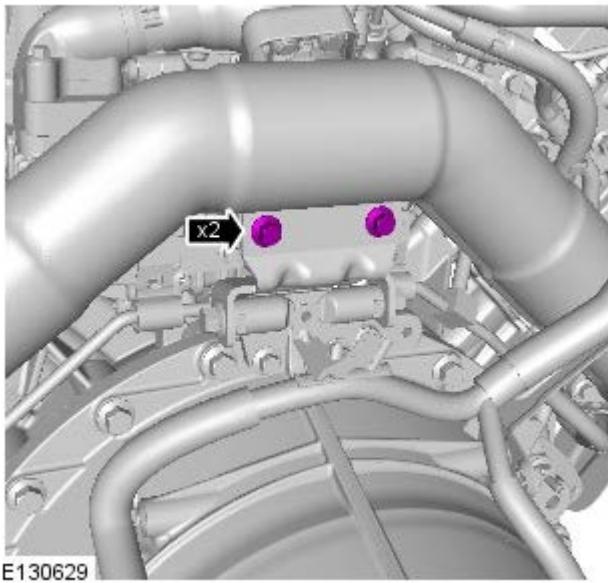
33. *Torque: 10 Nm*



34. *Torque: 8 Nm*

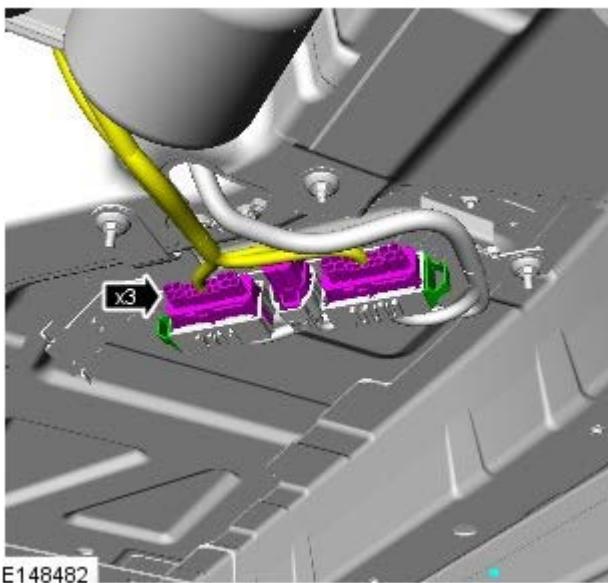


35. *Torque: 10 Nm*

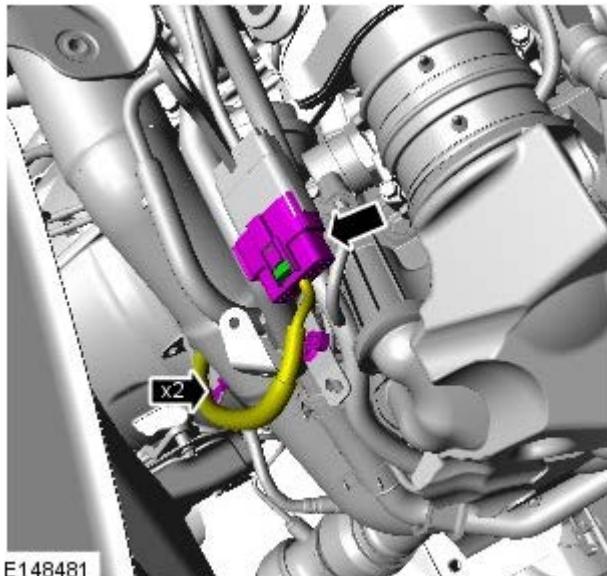


36. Refer to: [Rear Driveshaft - TDV8 4.4L Diesel](#) (205-01 Driveshaft, Removal and Installation).
37. Refer to: [Exhaust System - Vehicles With: Diesel Particulate Filter \(DPF\)](#) (309-00D Exhaust System - TDV8 4.4L Diesel, Removal and Installation).
Refer to: [Exhaust System - Vehicles Without: Diesel Particulate Filter \(DPF\)](#) (309-00D Exhaust System - TDV8 4.4L Diesel, Removal and Installation).
38. Refer to: [Front Driveshaft - TDV8 4.4L Diesel](#) (205-01 Driveshaft, Removal and Installation).

39.



40.



41. Refer to: Secondary Bulkhead Center Panel - TDV8 4.4L Diesel (501-02, Removal and Installation).

42. Connect the battery ground cable.

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

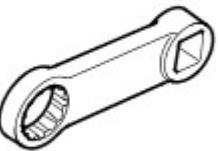
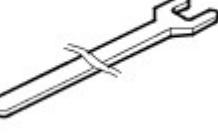
43. Carry out a transmission fluid level check.

Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission V6 S/C 3.0L Petrol /V8 S/C 5.0L Petrol

Installation

Special Tool(s)

303-1069  E53727	303-1069 Adapter, Wrench
303-1142  E46076	303-1142 Viscous Coupling Wrench
303-1143  E55382	303-1143 Viscous Coupling Holding Tool
308-598  E50941	308-598 Installer, Oil Seal

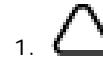
NOTES:



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

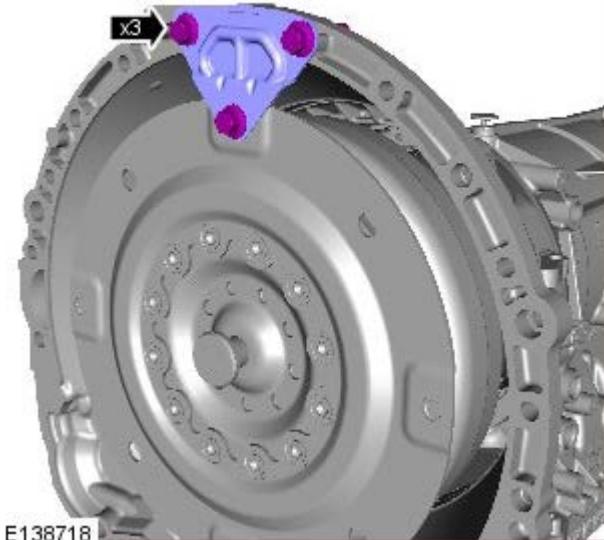


Some illustrations may show the transmission removed for clarity.

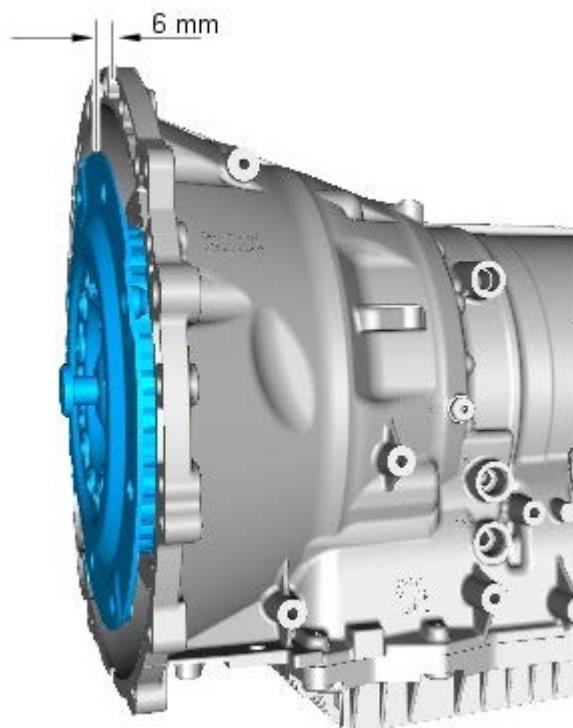


1.  NOTE: This step is only required if a new component is installed.

Remove the torque converter retainer.



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



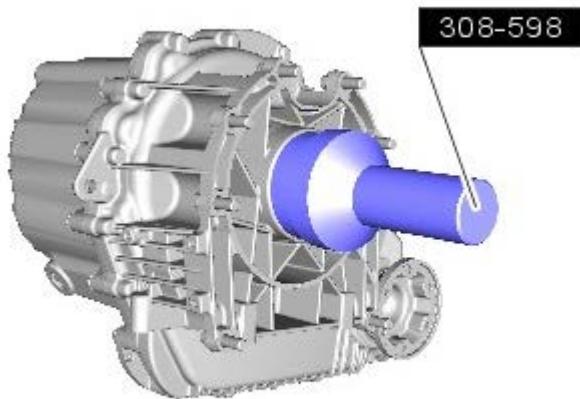
E138283

3.  **CAUTION:** Oil seals must be fitted dry.

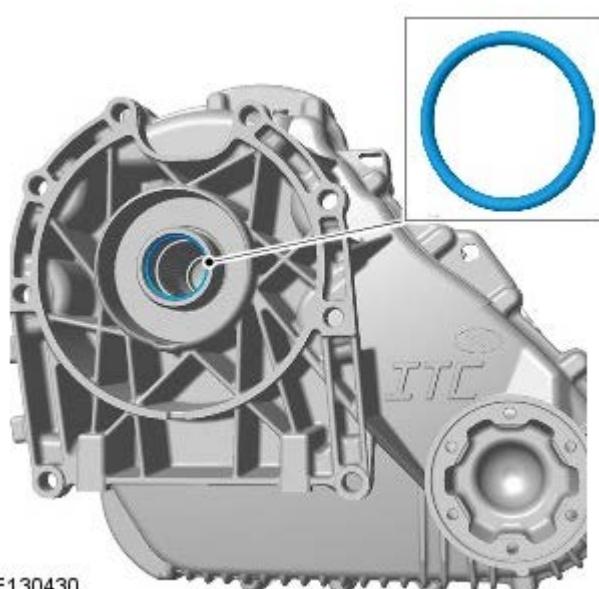
NOTES:

-  This step is only required if previously removed.
-  Make sure that this component is installed to the noted removal position.

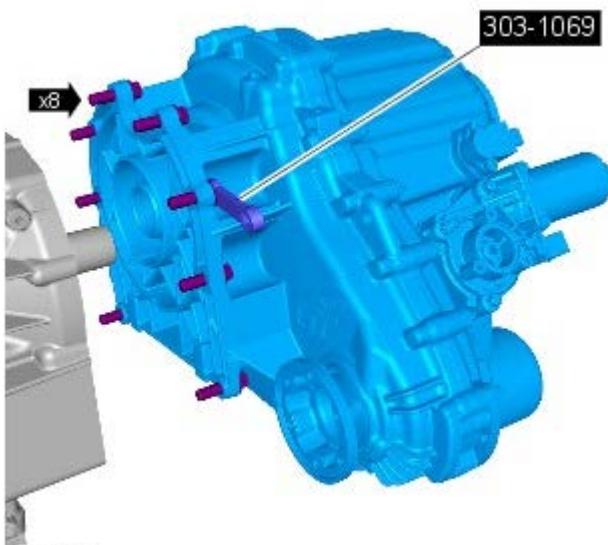
Special Tool(s): [308-598](#)



E50943



E130430



E130188

4. NOTES:



Install a new O-ring seal.



This step is only required if a new component is installed.



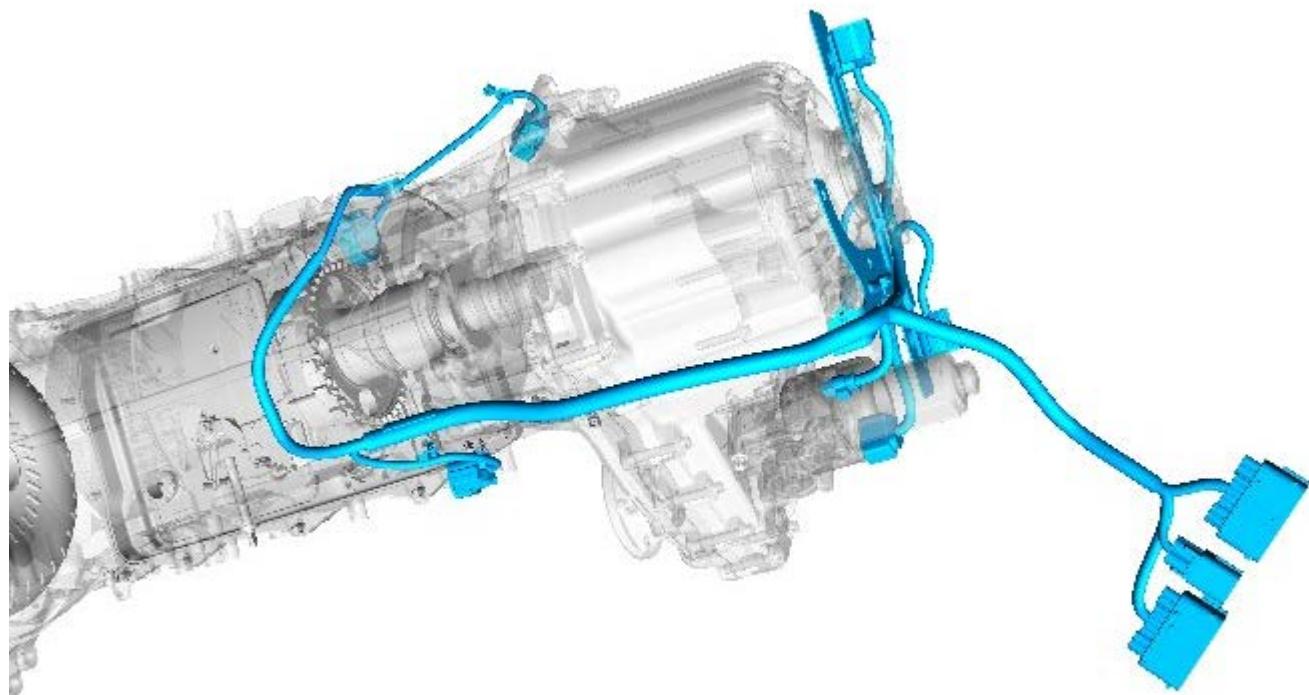
5. NOTE: This step is only required if a new component is installed.

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

6.

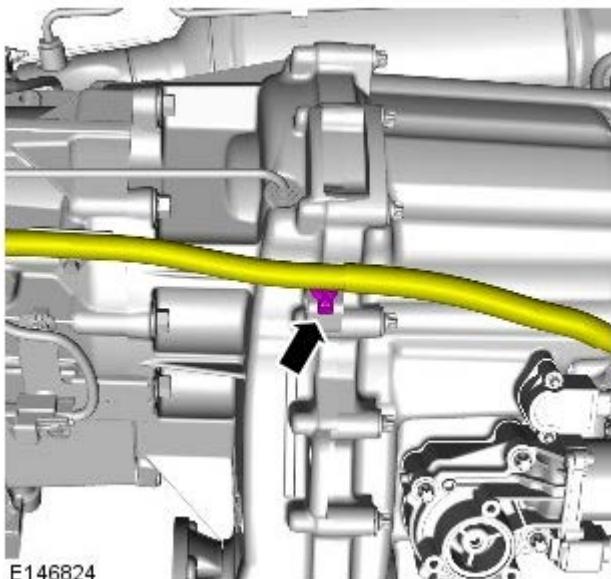


7.  NOTE: This step is only required if a new component is installed.



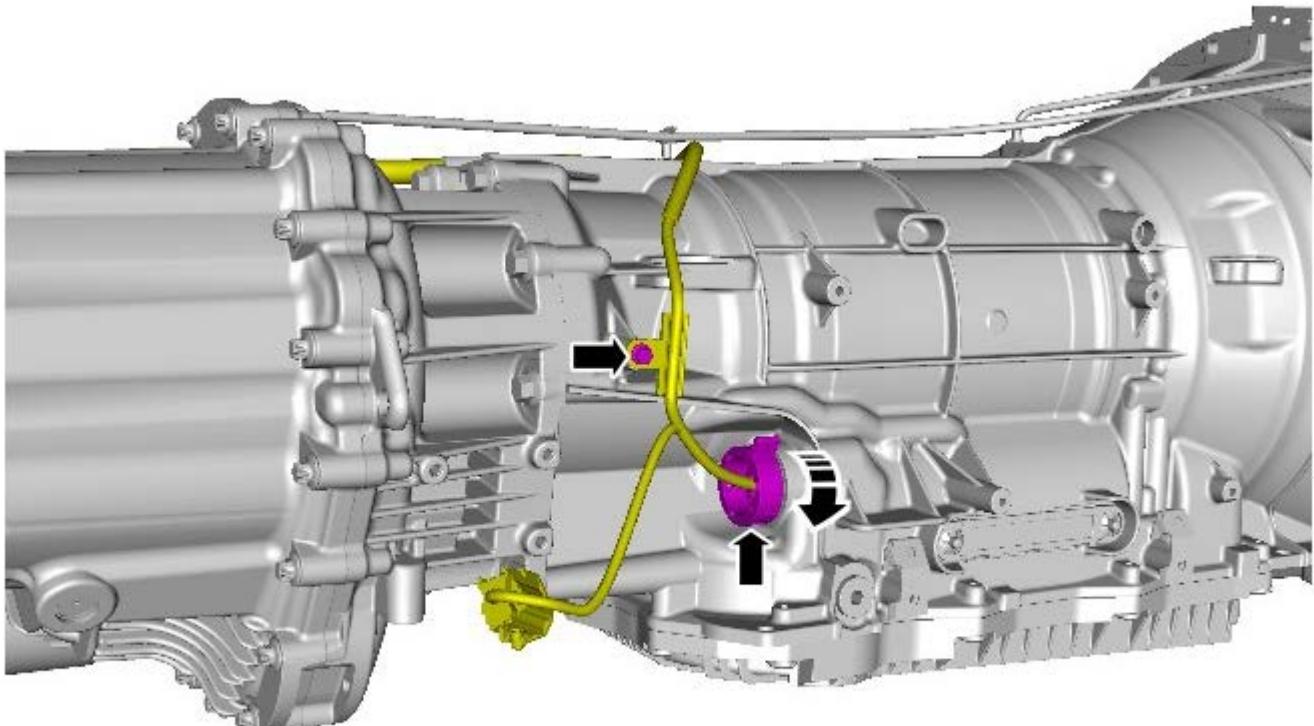
E158845

8.  NOTE: This step is only required if a new component is installed.



9.  **NOTE:** This step is only required if a new component is installed.

Torque: 8 Nm

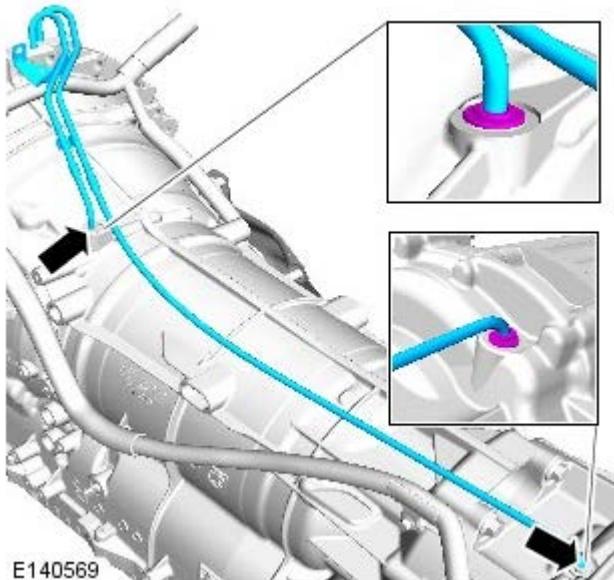


10. **CAUTIONS:**

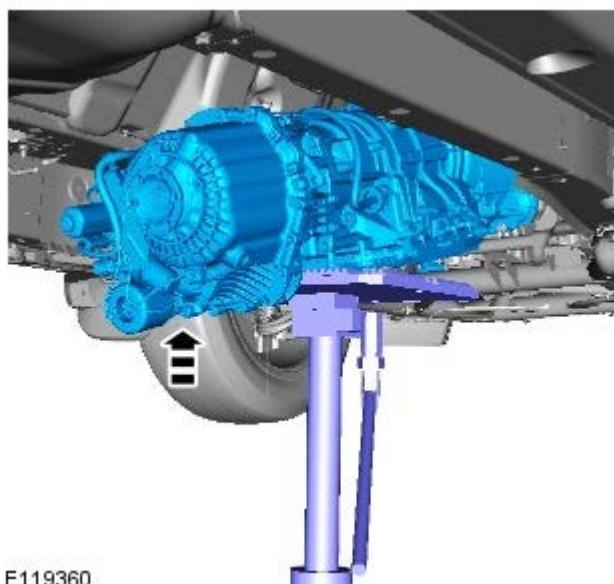
 To prevent water ingress and subsequent transmission damage, make sure that the breather is fully pushed home into the transmission casing. The white line around the circumference of the pipe should not be visible when correctly installed.

 Remove the blanking plugs.

 **NOTE:** This step is only required if a new



component is installed.



E119360

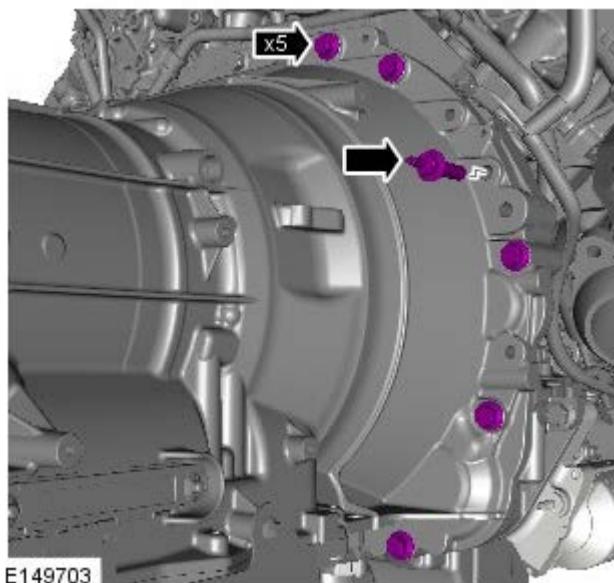
11.  **WARNING:** Make sure that the transmission is secured with suitable retaining straps.

CAUTIONS:

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

 Make sure the torque converter remains connected to the transmission.

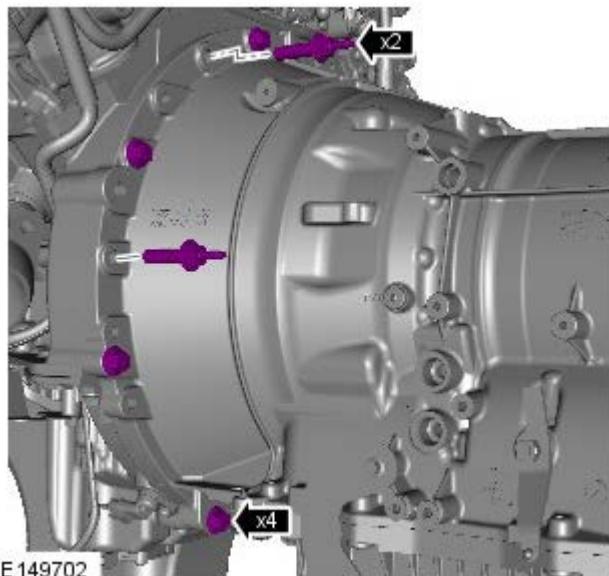
Using a suitable hydraulic jack, support the transmission.



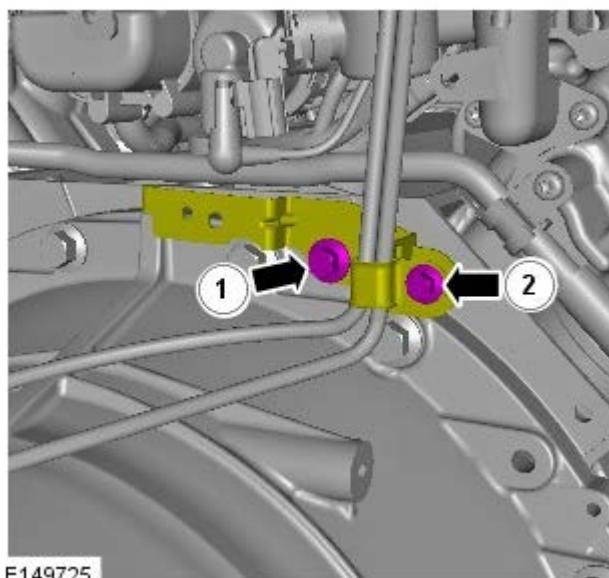
E149703

12. *Torque: 40 Nm*

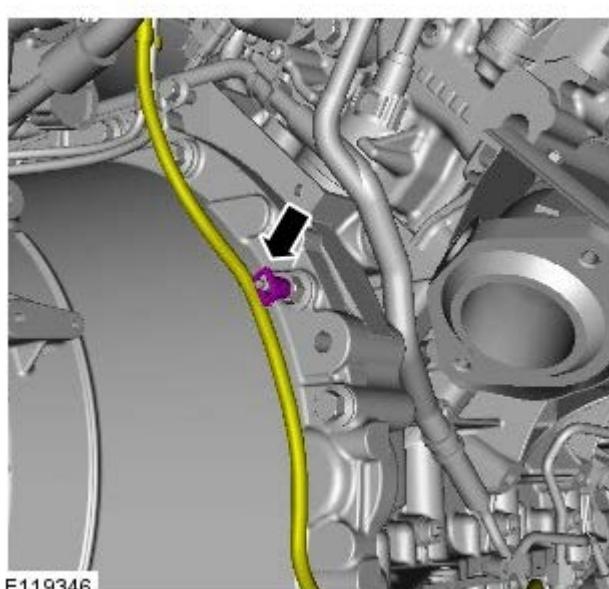
13. *Torque: 40 Nm*



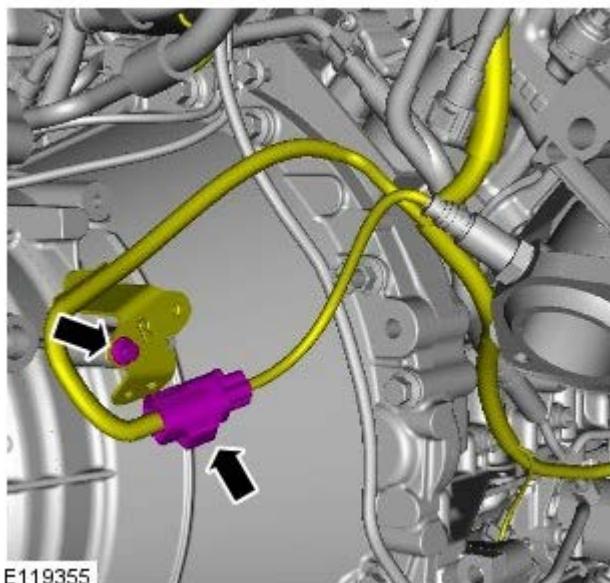
14. *Torque:*
M8 20 Nm
M6 10 Nm



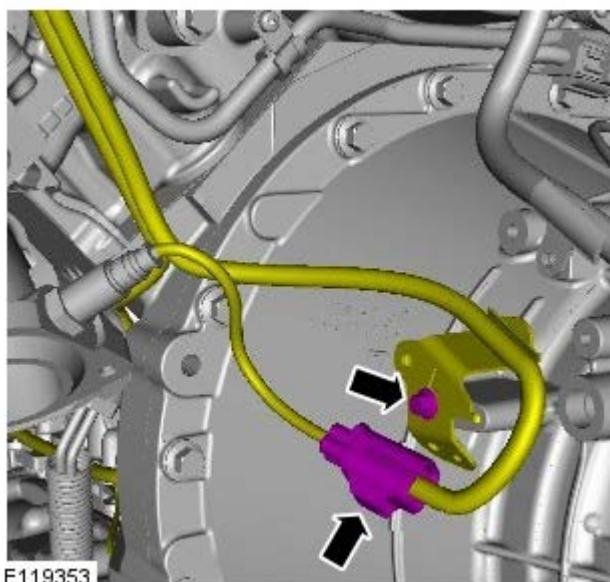
15.



16. *Torque:* 10 Nm

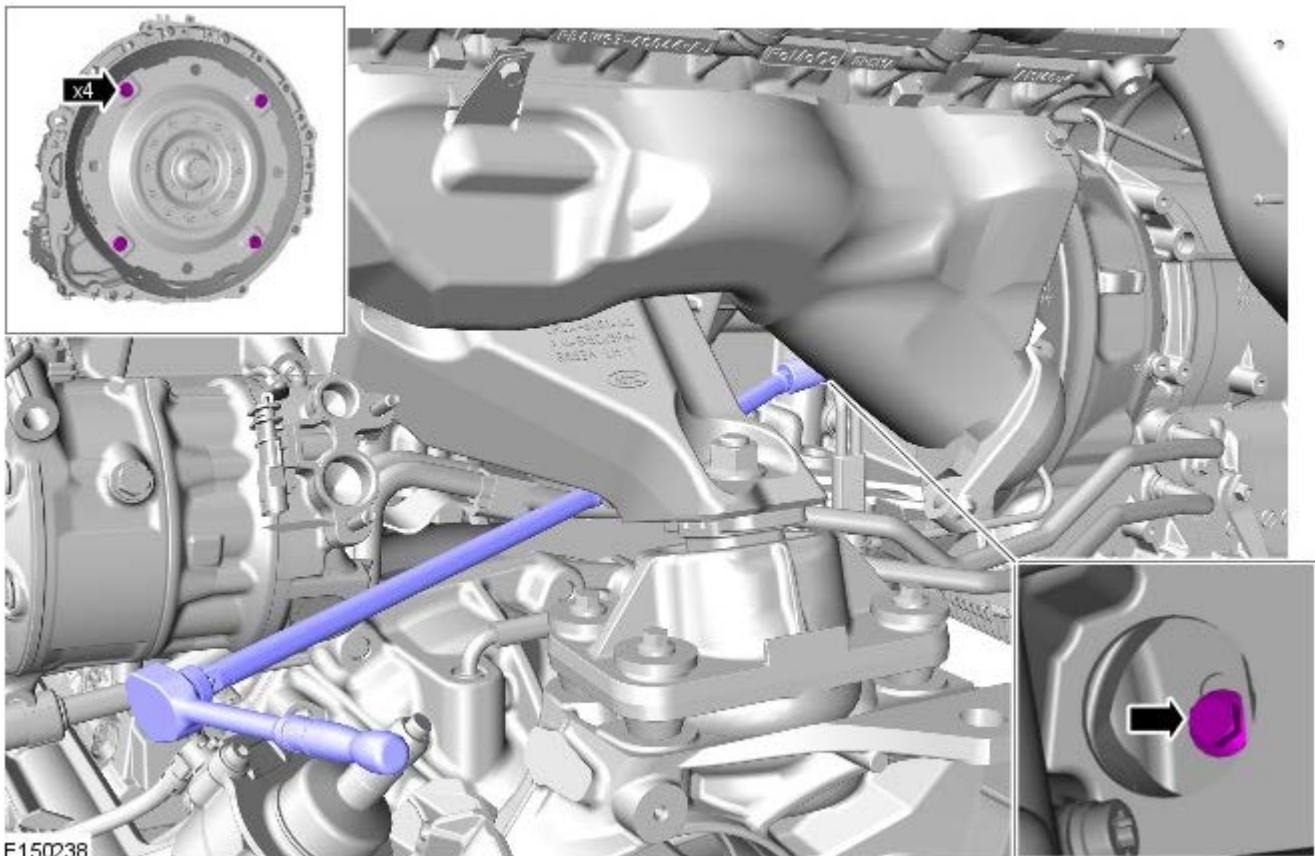


17. *Torque: 10 Nm*

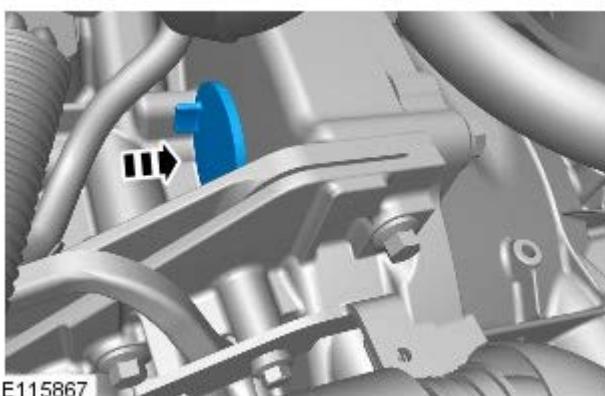


18. **CAUTION:** Only rotate the crankshaft clockwise.

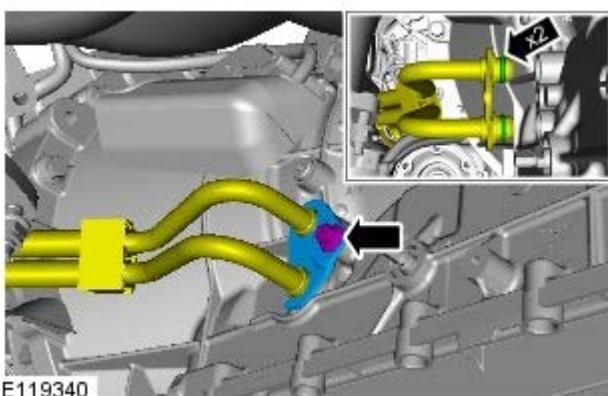
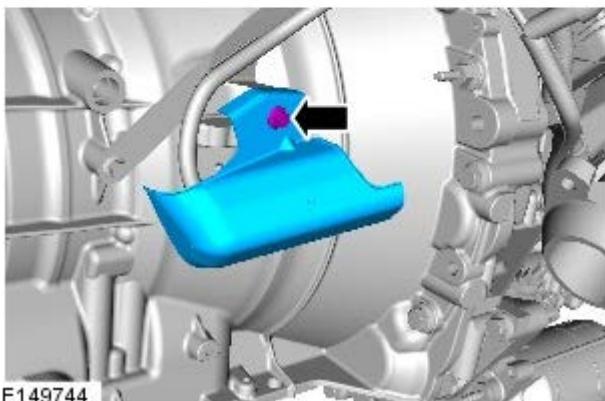
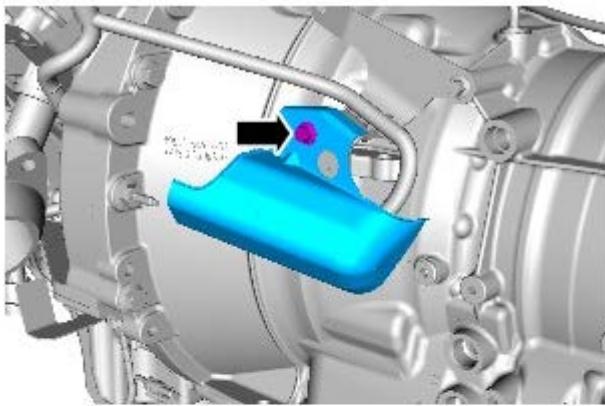
Torque: 63 Nm



19.



20. *Torque: 15 Nm*



21. CAUTIONS:



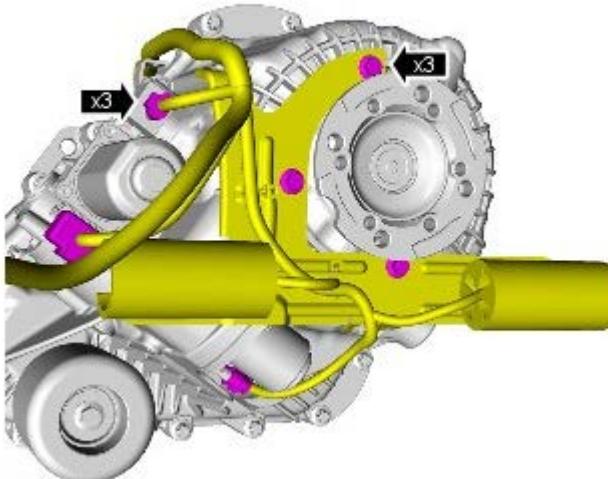
Be prepared to collect escaping fluids.



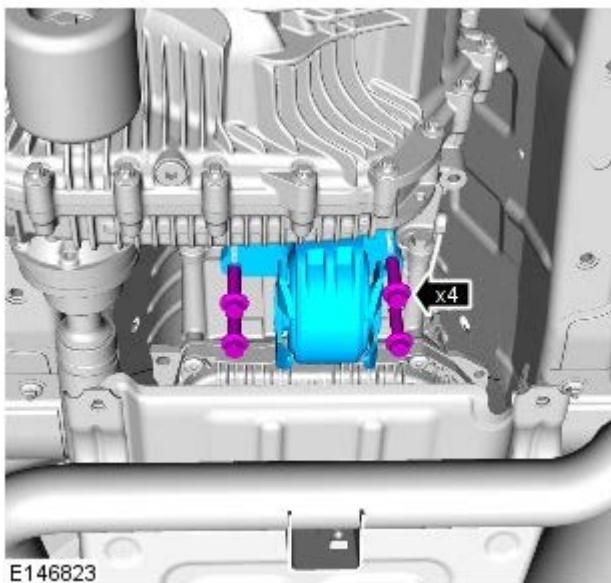
Install new o-ring seals

Torque: 22 Nm

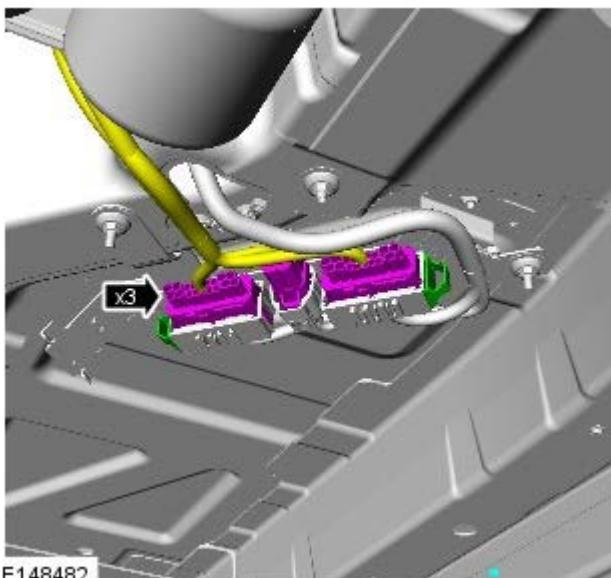
22. Torque: 25 Nm



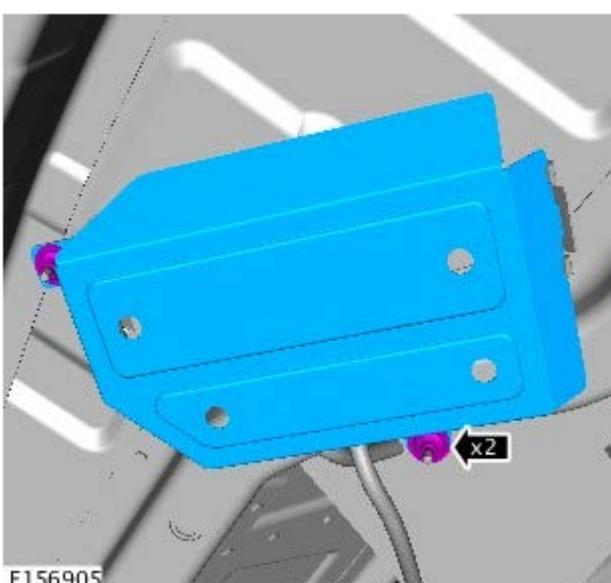
23. Torque: 60 Nm



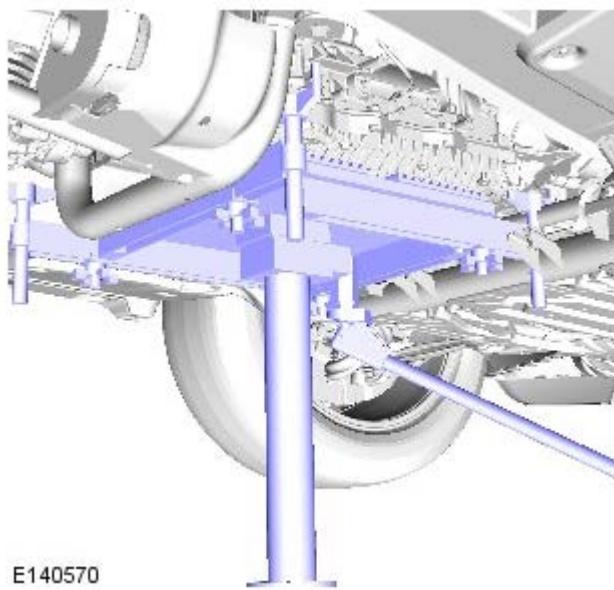
24.



25. *Torque: 9 Nm*

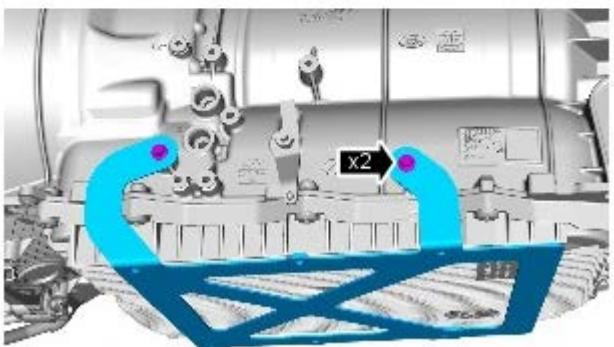
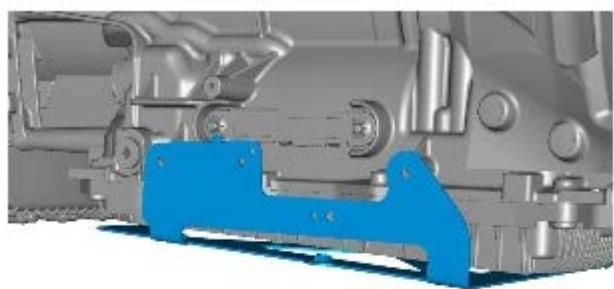


26. Support the transmission.



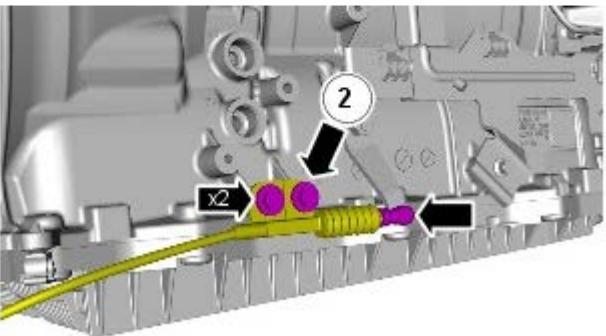
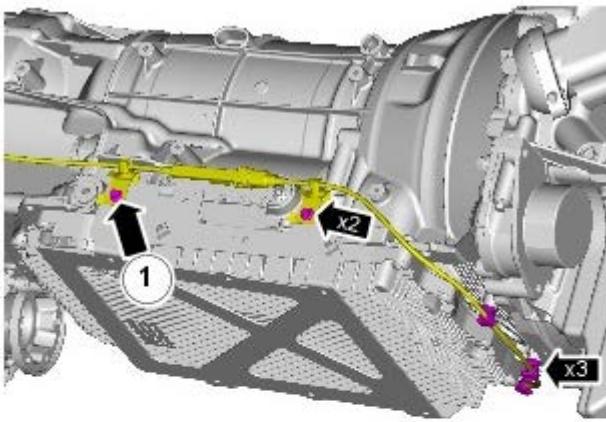
E140570

27. *Torque: 9 Nm*



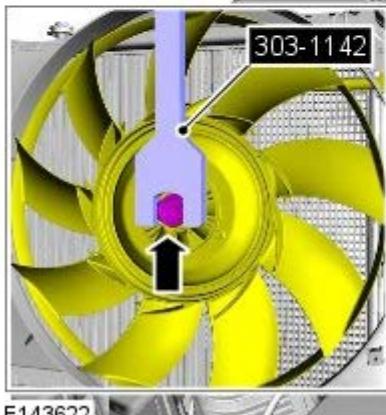
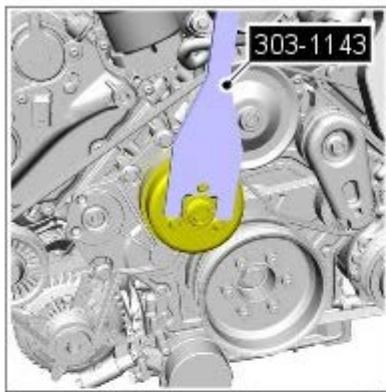
E148881

28.  **NOTE:** Install new retaining clips.
Torque: 9 Nm

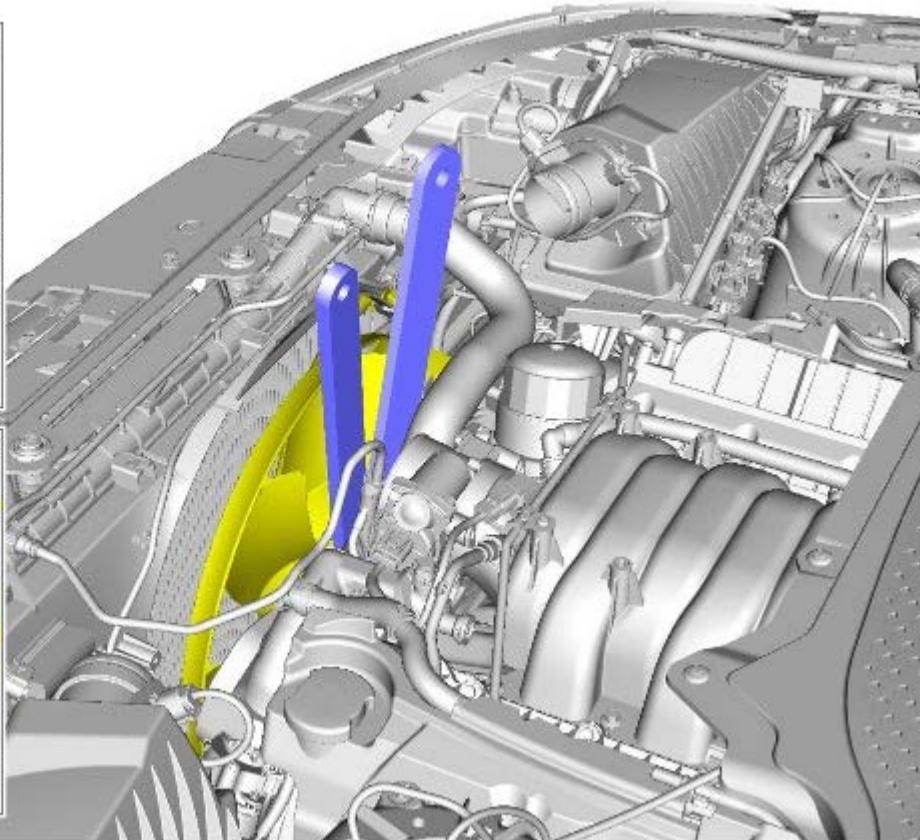


E150013

29. Refer to: Rear Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01, Removal and Installation).
30. Refer to: Front Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01, Removal and Installation).
31. Lower the vehicle.
32.
 - *Special Tool(s):* [303-1143](#)
 - *Special Tool(s):* [303-1142](#)
 - *Torque:* 65 Nm



E143622



33. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12C Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

34. Install the battery ground cable.

Refer to: [Specifications \(414-01, Specifications\)](#).

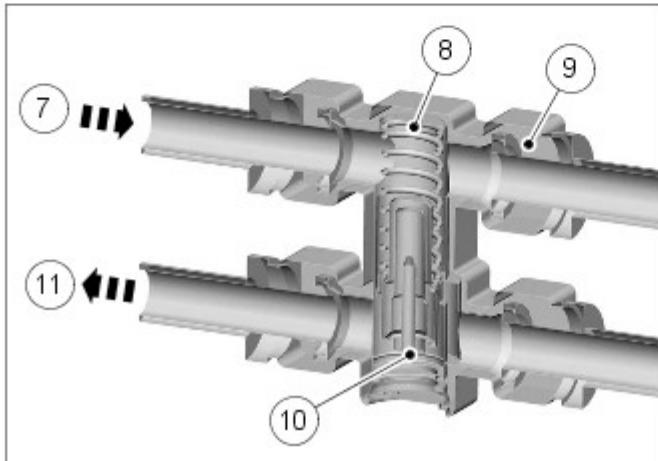
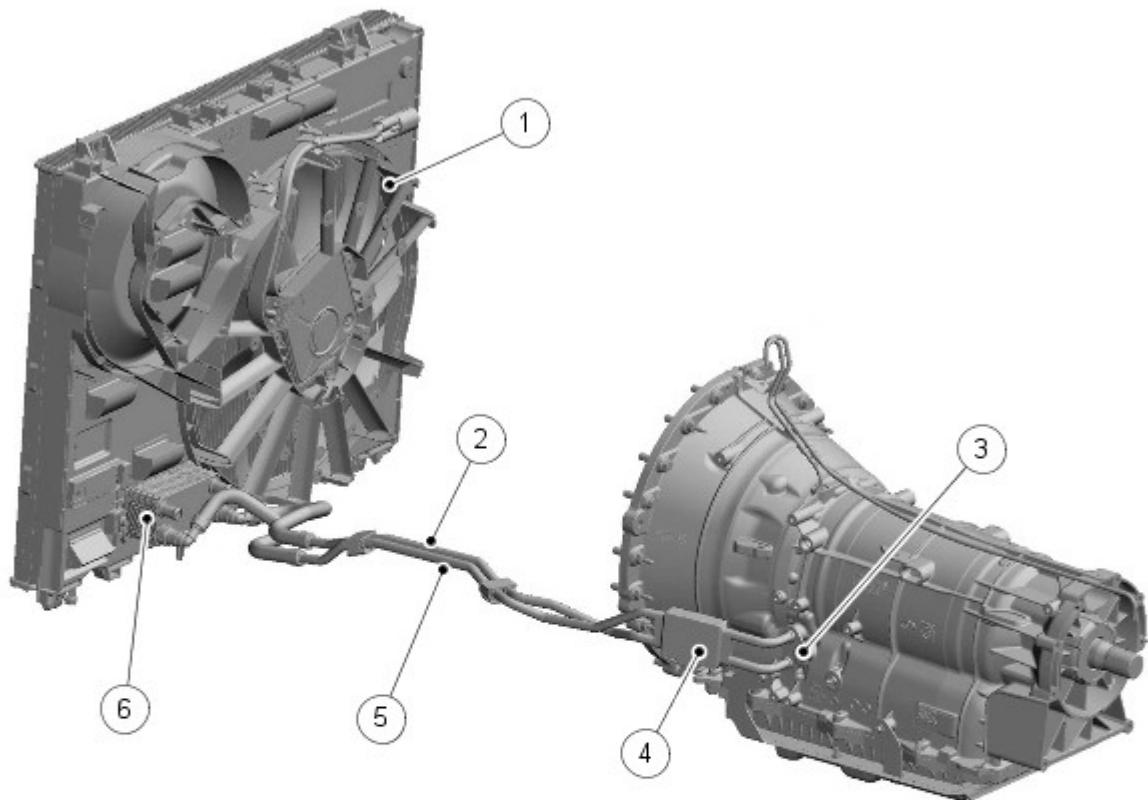
35. Carry out a transmission fluid level check.

Refer to: [Transmission Fluid Level Check - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Cooling

Description and Operation

4.4L TDV8 FLUID COOLING COMPONENT LOCATION



E152496

Item	Part Number	Description
1	-	Engine cooling radiator
2	-	Return pipe (To transmission)
3	-	Transmission cooling pipe connection
4	-	Thermostatic valve
5	-	Supply pipe (From transmission)
6	-	Automatic Transmission Fluid (ATF) cooler
7	-	Fluid return flow
8	-	Spring
9	-	Thermostatic valve body
10	-	Thermostatic wax element
11	-	Fluid supply flow

INTRODUCTION

The ATF cooler is a separate cooling unit located behind the engine cooling radiator. The unit is attached, via a bracket, to the cooling pack protection subframe. The transmission is connected to the fluid cooler via flexible hoses and metal pipes.

The ATF cooler is a dedicated cooler which is connected into the engine cooling system circuit. The ATF is cooled by the temperature differential between the ATF and the engine coolant flowing through the cooler.

Fluid is supplied from the ATF pump, through the thermostatic valve (if open) into the cooler. After passing through the cooler, the fluid passes out of the cooler and is returned to the transmission fluid pan.

The thermostatic valve is located in the transmission cooler fluid supply and return lines. The valve contains a wax element which is closed when ATF temperatures are below 69 °C (156.2 °F). At temperatures of 69 °C (156.2 °F) and above, the valve begins to open allowing the fluid to flow around the cooler. The valve is fully open at temperatures of 79 °C (174.2 °F).

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Cooling

Diagnosis and Testing

Principle of Operation

For a detailed description of the automatic transmission cooling system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: [Transmission Cooling](#) (307-02A Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Description and Operation).

Inspection and Verification

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

Visual Inspection

Mechanical	
• Feed and return tubes	• Connections to the automatic transmission and the automatic transmission fluid cooler

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, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Condition	Possible Causes	Action
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid cooler	Flush out the automatic transmission fluid cooler with new automatic transmission fluid. If the flushing is unsuccessful, install a new transmission fluid cooler.
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid tubes	Flush out the automatic transmission fluid cooler tubes with new automatic transmission fluid. If the flushing is unsuccessful install new automatic transmission fluid cooler tubes.
Loss of automatic transmission fluid	Connections to the automatic transmission and the automatic transmission fluid cooler	Check the integrity of the tubes, connections and seals. Check the torque of the tube fixings.
Loss of automatic transmission fluid	Leak at oil cooler	Check the integrity of tubes, connections and seals. Check the torque of the tube fixings.

DTC Index

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

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler TDV6 3.0L Diesel

Removal and Installation

Removal

CAUTIONS:



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



Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.



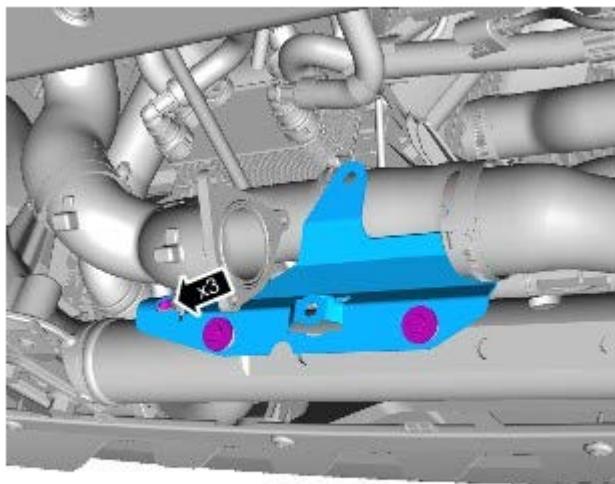
Be prepared to collect escaping fluids.



NOTE: Removal steps in this procedure may contain installation details.

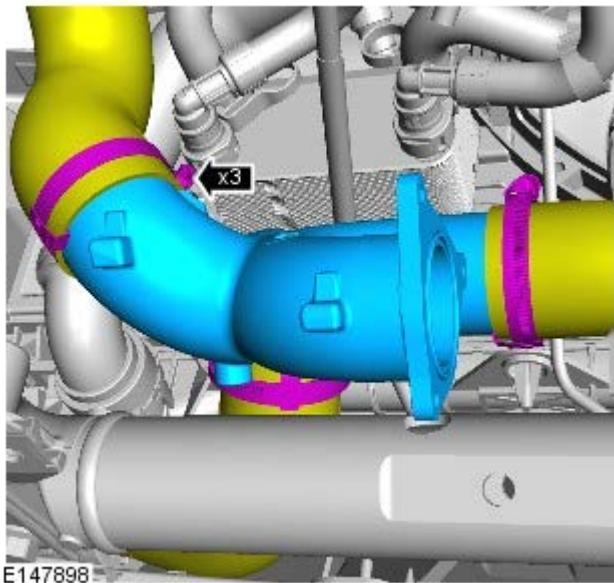
1. **WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.
2. Refer to: [Cooling System Partial Draining, Filling and Bleeding](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).
3. Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).
4. Refer to: [Turbocharger Bypass Valve](#) (303-04B Fuel Charging and Controls - Turbocharger - SDV6 3.0L Diesel - Hybrid Electric Vehicle/TDV6 3.0L Diesel, Removal and Installation).

5. *Torque: 9 Nm*

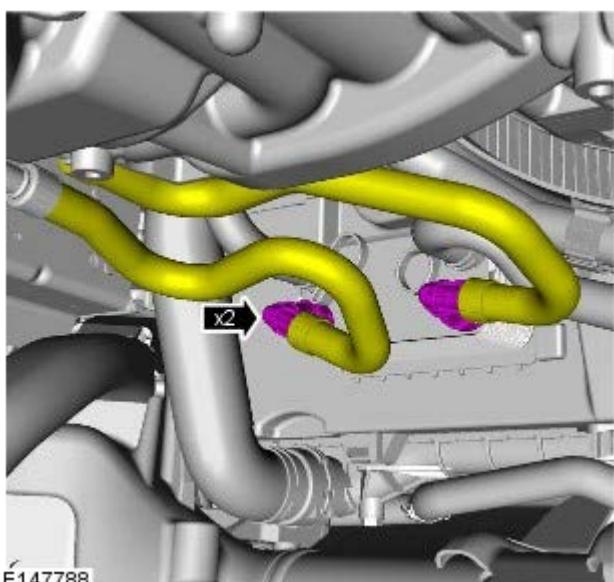


E147897

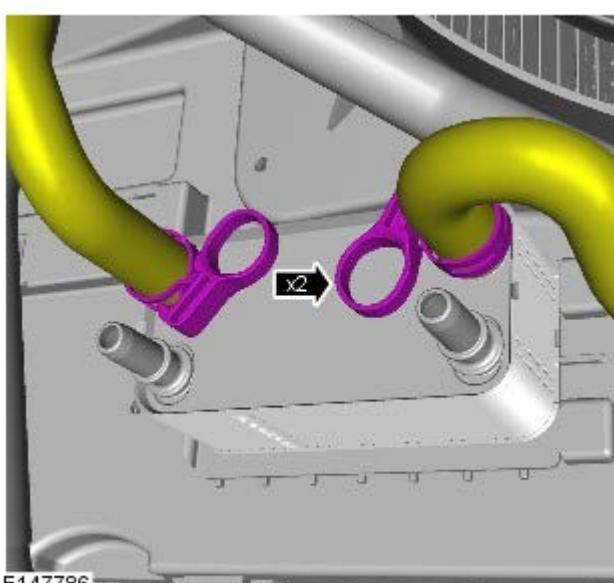
6.



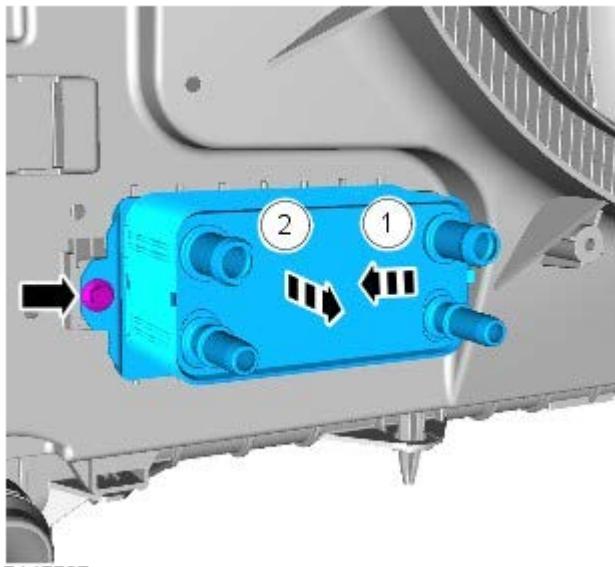
7.



8.



9. *Torque: 6 Nm*



E147787

Installation

1. To install reverse the removal procedure.

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler TDV8 4.4L Diesel

Removal and Installation

Removal

CAUTIONS:



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



Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



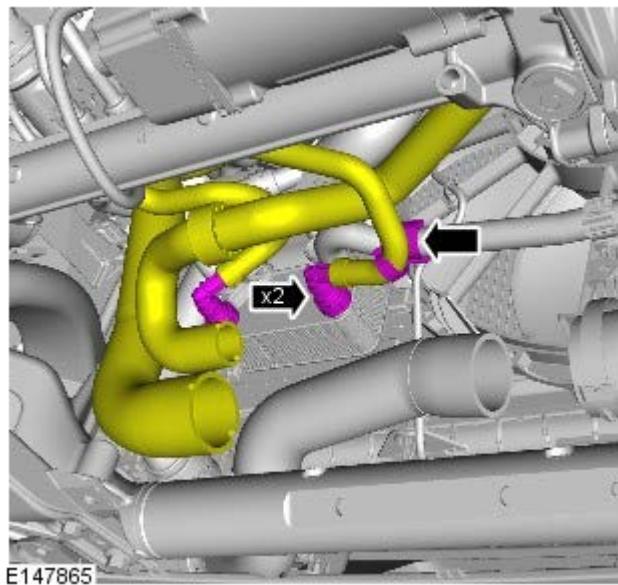
Be prepared to collect escaping fluids.



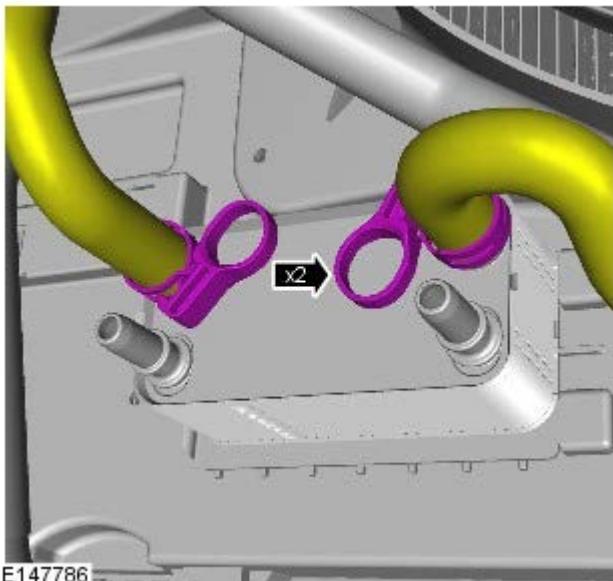
NOTE: Removal steps in this procedure may contain installation details.

1. **WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.
2. Refer to: [Cooling System Partial Draining, Filling and Bleeding](#) (303-03F Engine Cooling - TDV8 4.4L Diesel, General Procedures).
3. Refer to: [Transmission Fluid Level Check - TDV6 3.0L Diesel /TDV8 4.4L Diesel](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).
4. Refer to: [Turbocharger Bypass Valve](#) (303-04F Fuel Charging and Controls - Turbocharger - TDV8 4.4L Diesel, Removal and Installation).

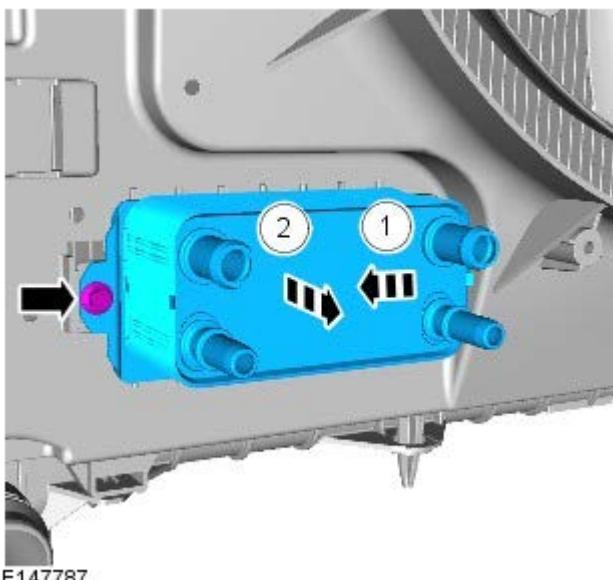
5.



6.



7. *Torque: 6 Nm*



Installation

1. To install reverse the removal procedure.

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler V6 S/C 3.0L Petrol /V8 S/C 5.0L Petrol

Removal and Installation

Removal



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



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



NOTE: Removal steps in this procedure may contain installation details.

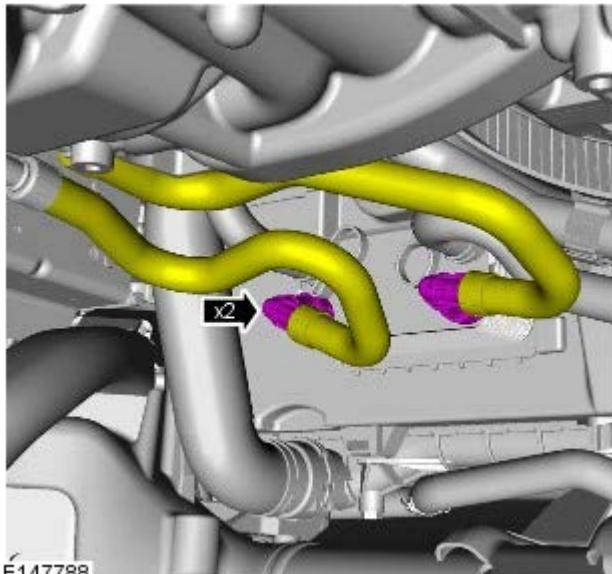


WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

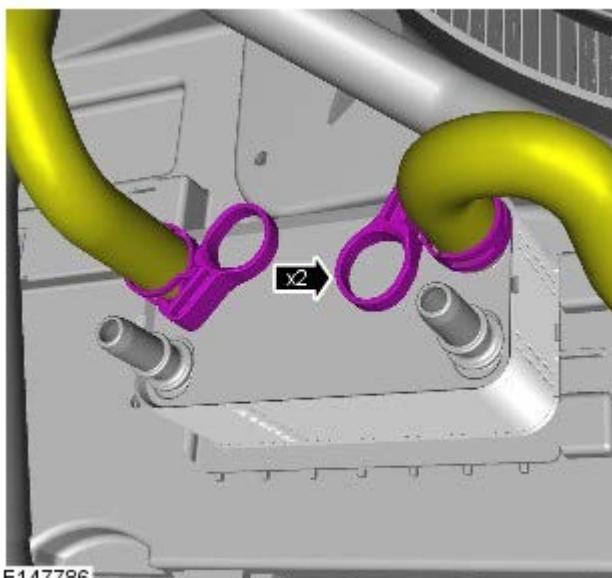
2. Refer to: Cooling System Partial Draining, Filling and Bleeding - V8 5.0L Petrol (303-03C, General Procedures).
Refer to: Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol (303-03, General Procedures).

3.



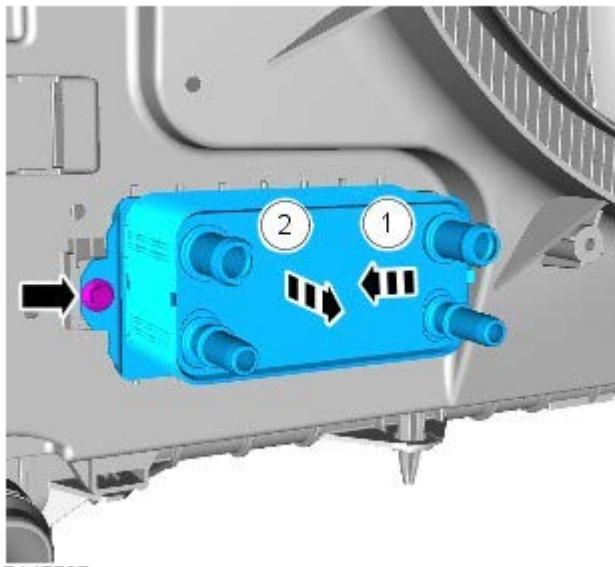
E147788

4.



E147786

5. *Torque: 7 Nm*



Installation

1. To install reverse the removal procedure.
2. Refer to: [Transmission Fluid Level Check - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01A Automatic Transmission/Transaxle - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler Tubes TDV6 3.0L Diesel

Removal and Installation

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.



Some components shown removed for clarity.

1. Disconnect the battery ground cable.

Refer to: Specifications (414-00, Specifications).

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

Raise and support the vehicle.

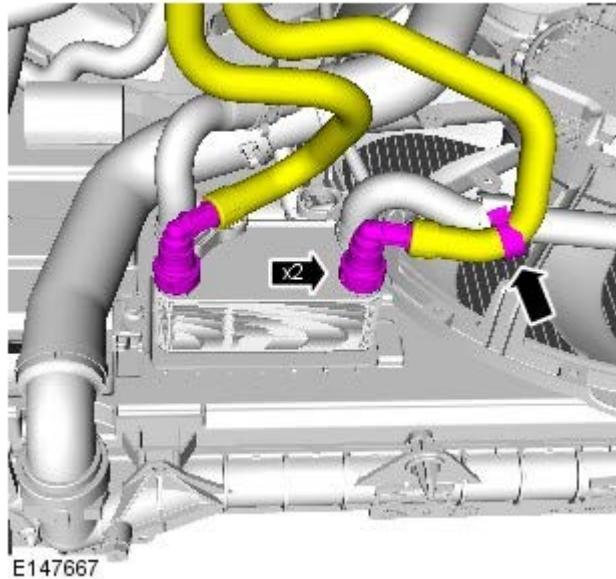
3. Refer to: Engine Undershield (501-02, Removal and Installation).

4. Refer to: Front Driveshaft - TDV6 3.0L Diesel (205-01, Removal and Installation).

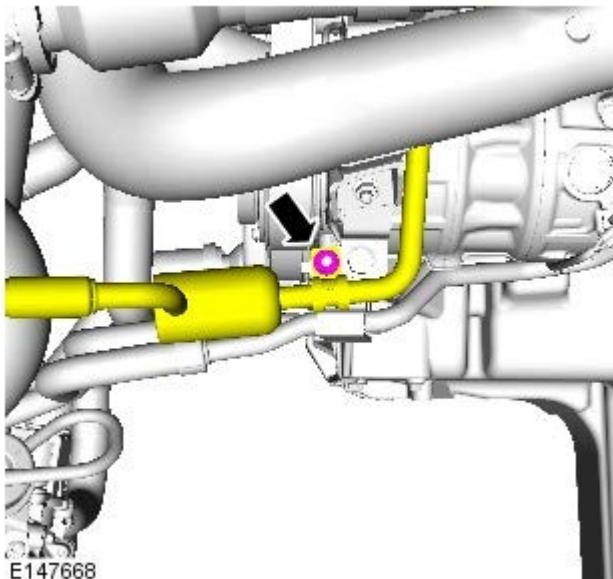
5. **WARNING:** Be prepared to collect escaping fluids.



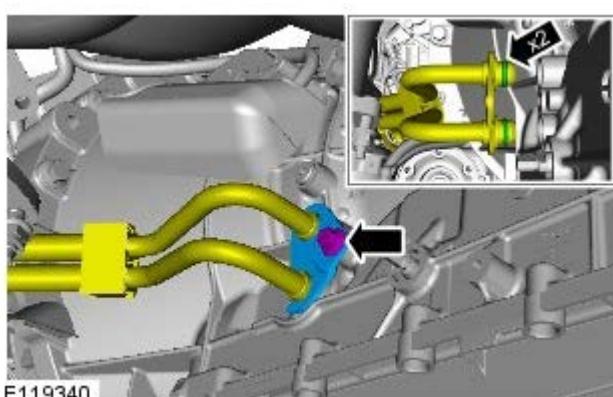
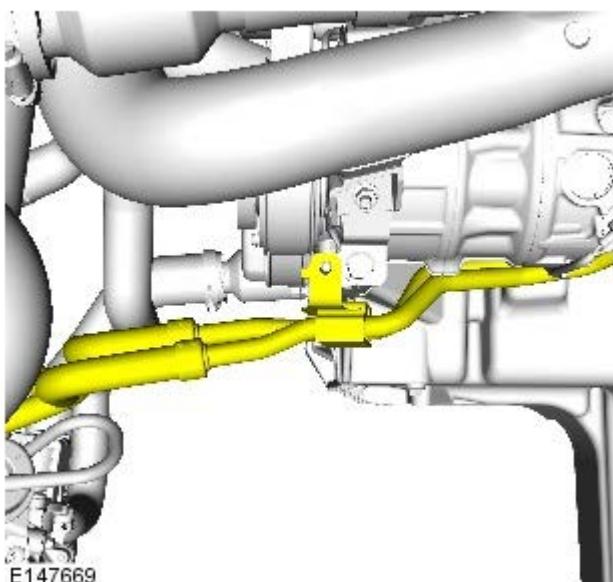
CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



6. *Torque: 9 Nm*



7.



8. CAUTIONS:



Be prepared to collect escaping fluids.



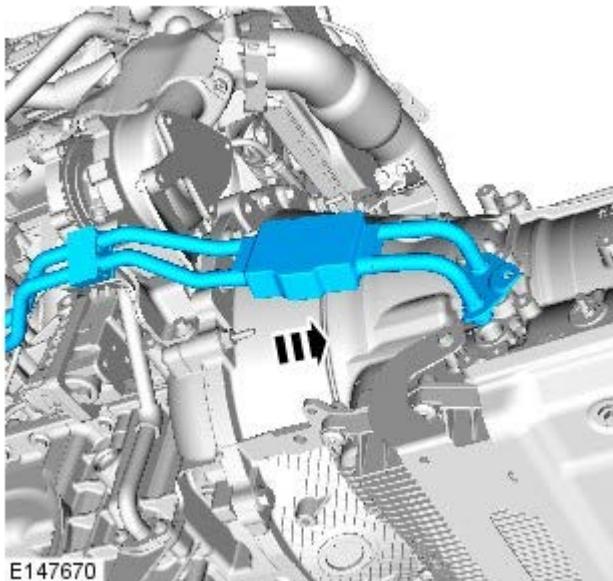
Make sure that all openings are sealed. Use new blanking caps.



Remove and discard the O-ring seals.

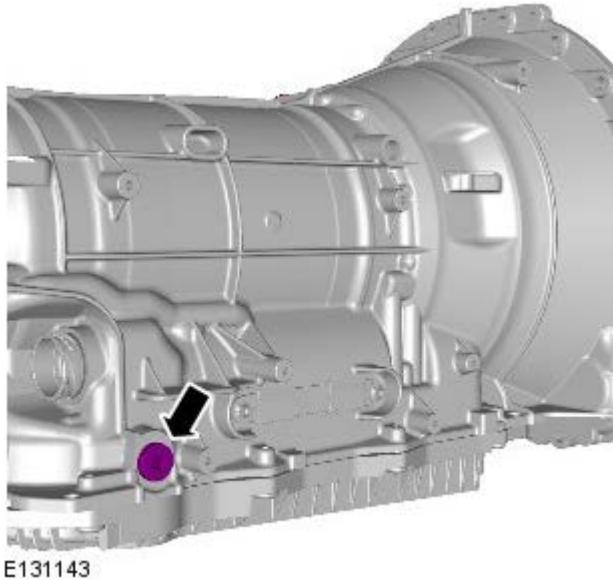
Torque: 25 Nm

9.



Installation

1. To install, reverse the removal procedure.
2.
 - Check and top-up the transmission fluid level.
 - *Torque: 35 Nm*



Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler Tubes TDV8 4.4L Diesel

Removal and Installation

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.



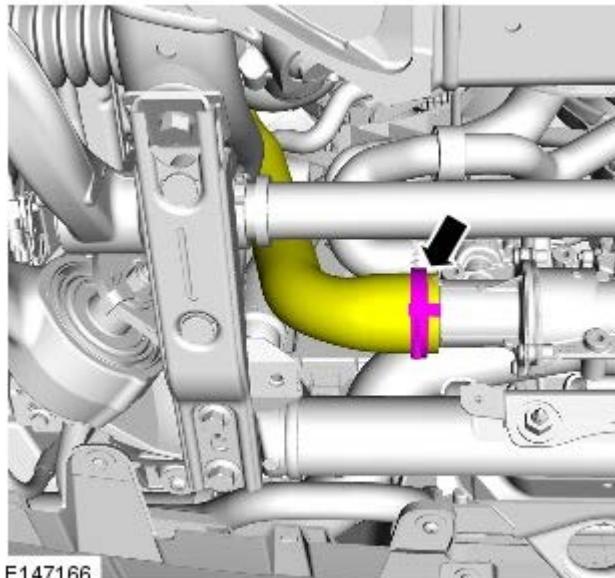
Some components shown removed for clarity.

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: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Front Driveshaft - TDV8 4.4L Diesel](#) (205-01 Driveshaft, Removal and Installation).

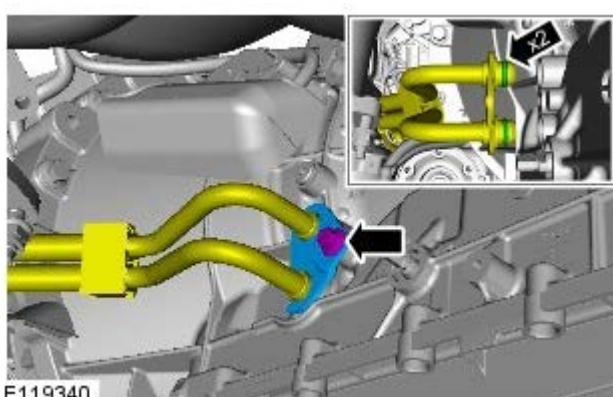
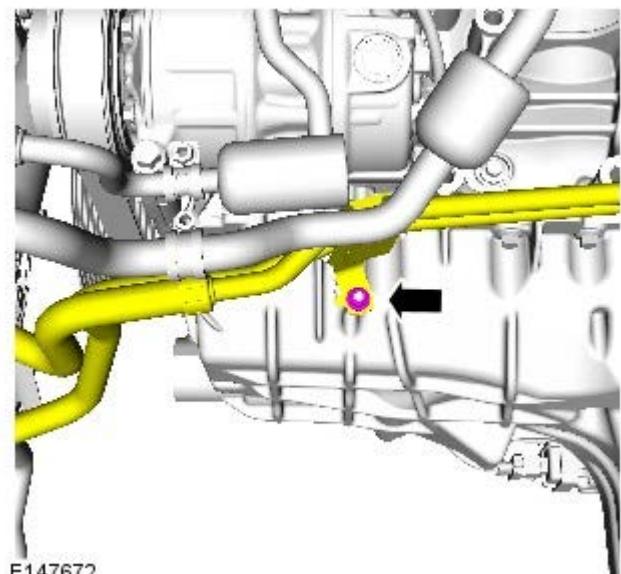
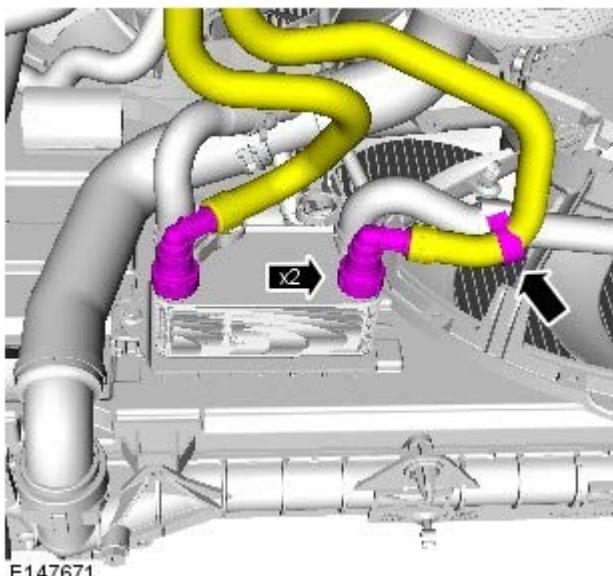
5. *Torque: 3.5 Nm*



6.  **WARNING:** Be prepared to collect escaping fluids.



- CAUTION:** Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



7. *Torque: 9 Nm*

8. **CAUTIONS:**



Be prepared to collect escaping fluids.



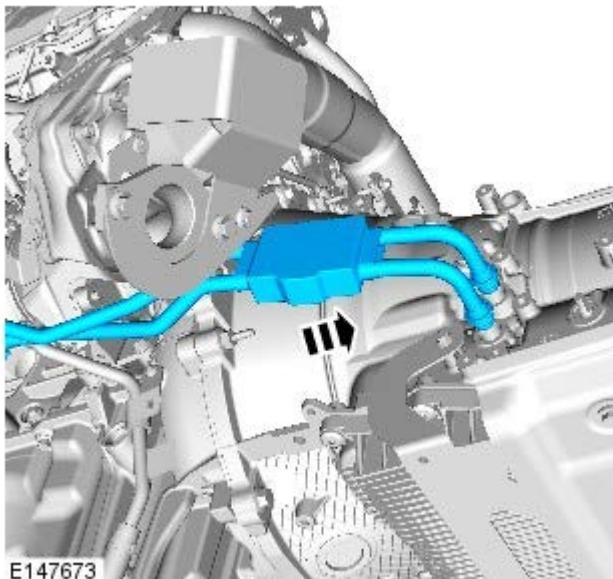
Make sure that all openings are sealed. Use new blanking caps.



Remove and discard the O-ring seals.

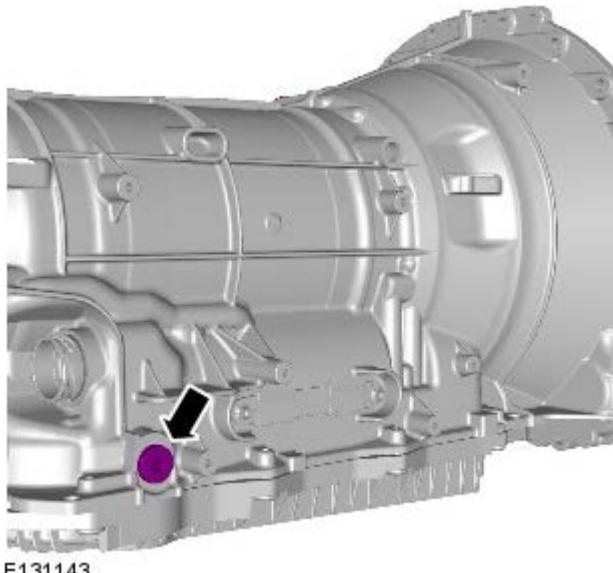
Torque: 25 Nm

9.



Installation

1. To install, reverse the removal procedure.
2.
 - Check and top-up the transmission fluid level.
 - *Torque: 35 Nm*



Transmission/Transaxle Cooling - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Cooler Tubes V6 S/C 3.0L Petrol /V8 S/C 5.0L Petrol

Removal and Installation

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.



Some components shown removed for clarity.

1. Disconnect the battery ground cable.

Refer to: Specifications (414-00, Specifications).

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

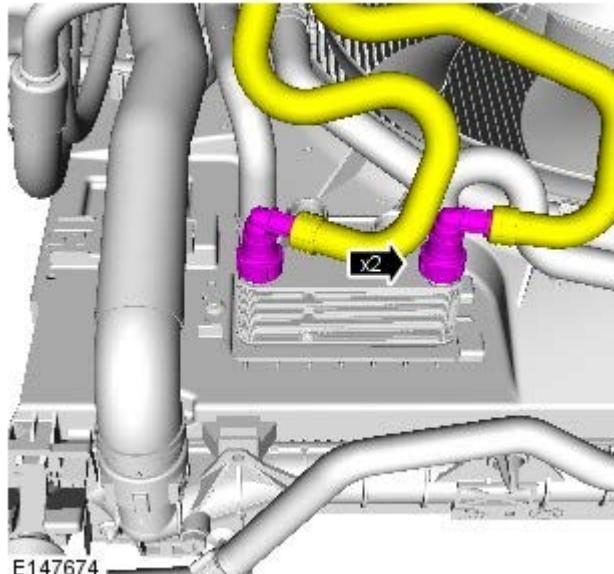
Raise and support the vehicle.

3. Refer to: Engine Undershield (501-02, Removal and Installation).

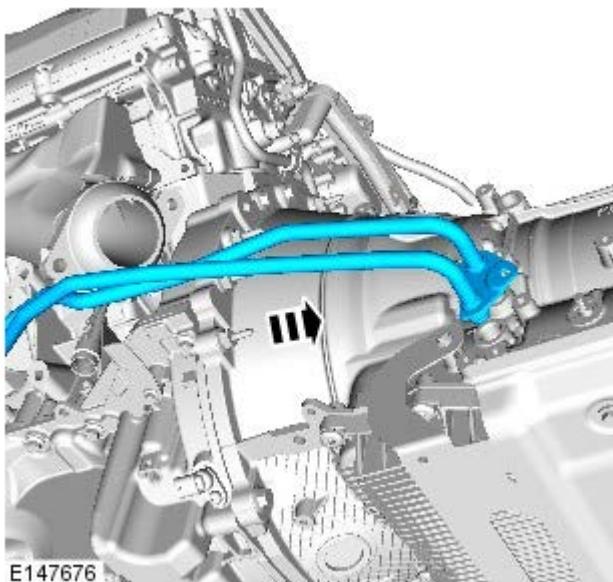
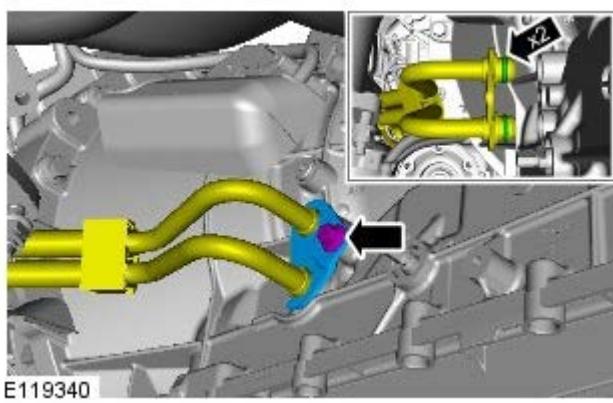
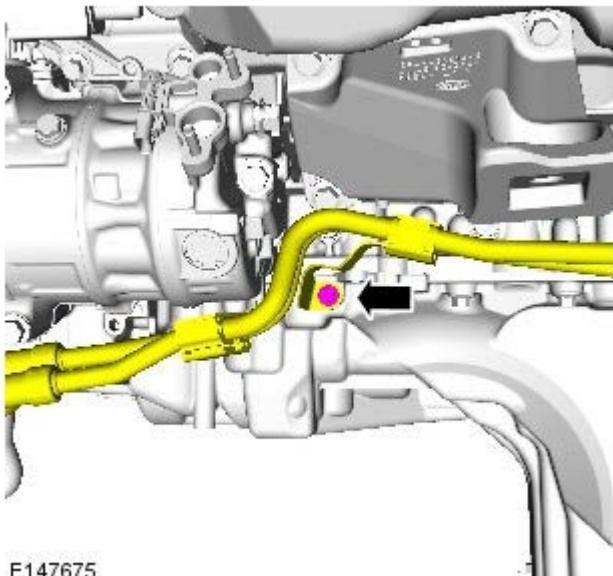
4. Refer to: Front Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol (205-01, Removal and Installation).

5. **WARNING:** Be prepared to collect escaping fluids.

CAUTION: Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



6. *Torque: 9 Nm*



Installation

1. To install, reverse the removal procedure.

2.

- Check and top-up the transmission fluid level.
- *Torque: 35 Nm*

8.

7. CAUTIONS:

⚠ Be prepared to collect escaping fluids.

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

⚠ Remove and discard the O-ring seals.

Torque: 25 Nm

Automatic Transmission/Transaxle External Controls - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD -

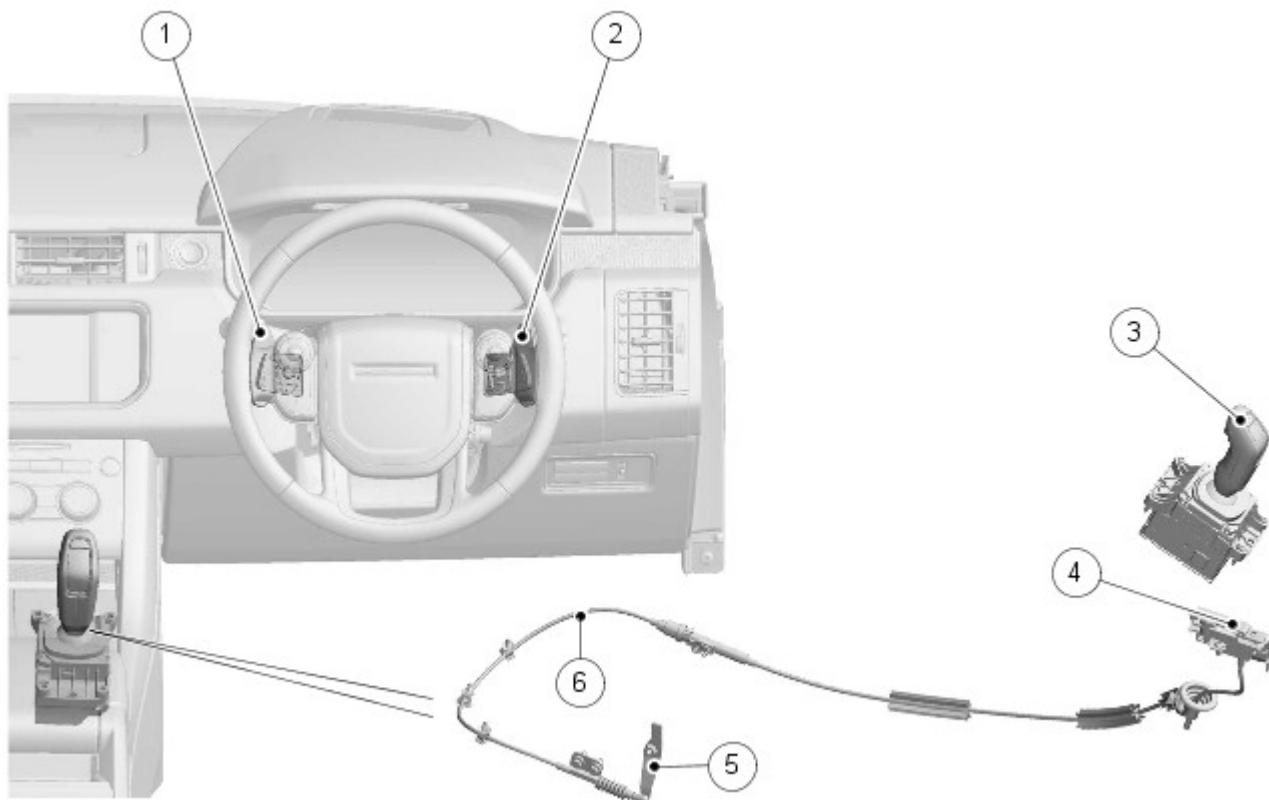
Torque Specifications

Description	Nm	Ib·ft	Ib·in
Emergency park position release lever cable bracket to floor console bolt	3	-	27

Automatic Transmission/Transaxle External Controls - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - External Controls

Description and Operation

TRANSMISSION EXTERNAL CONTROLS COMPONENT LOCATION



E152578

Item	Part Number	Description
1	-	Downshift paddle switch
2	-	Upshift paddle switch
3	-	Transmission Control Switch (TCS)
4	-	Emergency Park Release (EPR) lever
5	-	Emergency park lock transmission lever
6	-	Cable

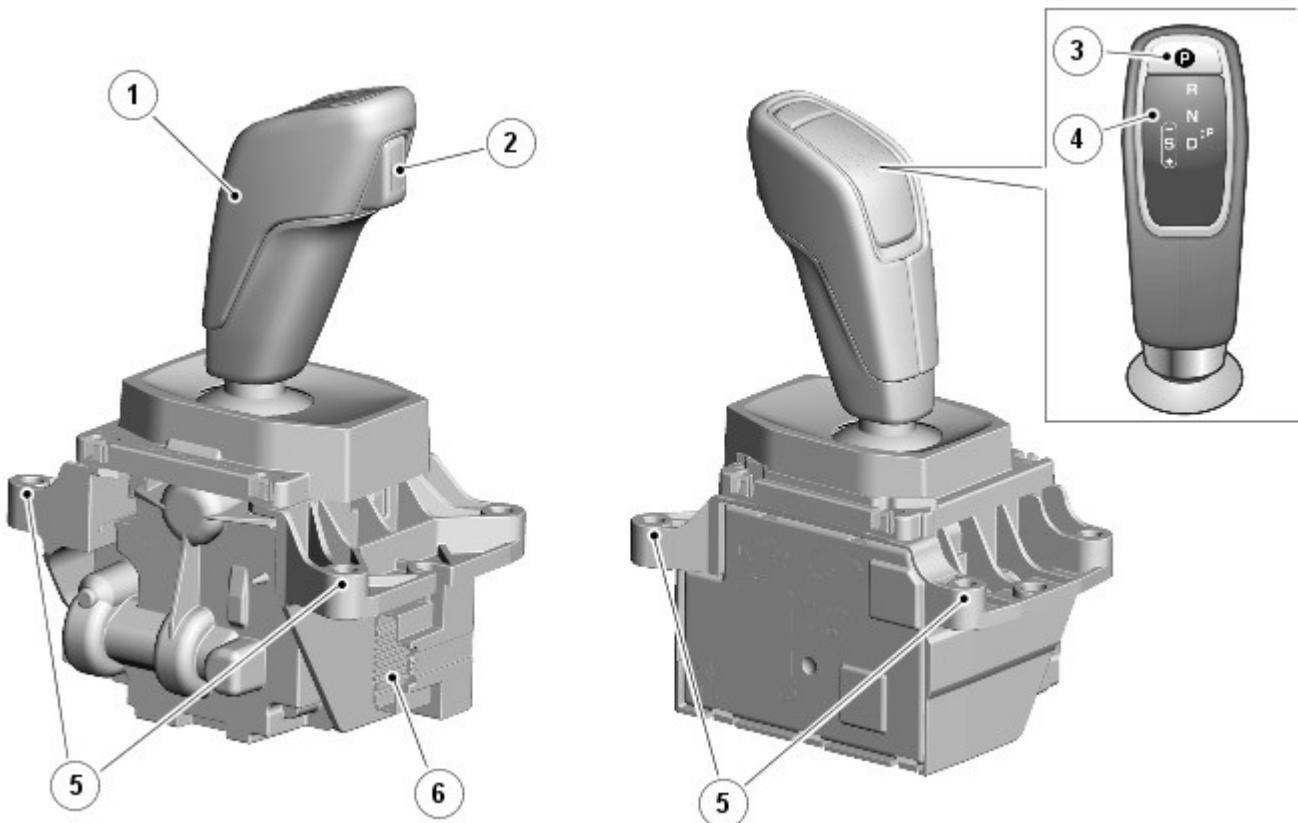
OVERVIEW

The external controls for the transmission consist of a TCS (transmission control switch), two paddle switches and an Emergency Park Release (EPR).

The linear TCS transmits driver transmission selections to the TCM (transmission control module) on the high speed CAN (controller area network) powertrain bus. The steering wheel mounted paddle switches can be used to initiate gear changes, with the TCS in either the D or S position, causing a change of operating mode from automatic gear selection to manual gear selection.

The EPR cable ensures the transmission park lock remains disengaged during vehicle recovery operations.

DESCRIPTION



E153113

Item Part Number Description

1	-	Lever
2	-	Unlock trigger
3	-	Park 'P' switch
4	-	LED display
5	-	Mounting holes
6	-	Electrical connector

The TCS is installed in the floor console and controls the driver transmission selections.

The TCM allows the transmission to be operated as a conventional automatic unit by selecting P, R, N, D on the TCS. Shifting with the TCS allows the selection of P, R, N and D. The TCS is fully electronic stick transmission selector with no mechanical connection to the transmission.

Movement of the TCS to any of the four positions or operation of the 'Park' switch is sensed by the TCS. The sensed position is passed to the TCM via the high speed **CAN** powertrain bus. The TCM then reacts according to the new selection request made by the driver. The linear movement of the TCS is sensed by a magnetic system using multiple Hall effect sensors to determine the position of the selector. The TCS (P) park and the unlock trigger use double pole pill switches

The S (sport) position selection allows the TCM to operate the transmission using the semi-automatic sequential shift. Gear selections are sensed by the TCM when the driver operates the steering wheel paddle switches or moves the TCS to the '+' or '-' positions. The TCS allows the driver to operate the transmission similar to a sequential transmission. Once the TCS position is confirmed, the TCM outputs appropriate information on the high speed **CAN** powertrain bus which is received by the instrument cluster to display the gear selection information in the message center.

UNLOCK TRIGGER

The TCS unlock trigger must be pressed to select any gear, including (N) neutral, from the (P) park position.

The unlock trigger must also be pressed to select any driving gear from the (R) reverse, (N) neutral or (D) drive positions. Pressing the unlock trigger is not required to select (P) park.

PADDLE SWITCHES

Two gear change 'paddle' switches are fitted at the rear of the steering wheel and allow the driver to operate the transmission as a semi-automatic manual gearbox using the 'Commandshift' feature. Each paddle switch has three connections; ground, illumination PWM (Pulse Width Modulation) supply and ground switch signal.

The paddles can also be used on a temporary basis when the TCS is in the 'D' (drive) position to override the automatic gear selection if required.

EMERGENCY PARK RELEASE



WARNING: The vehicle must be suitably restrained either by use of the EPB (electronic parking brake) or wheel

chocks before operation of the EPR mechanism in order to prevent vehicle roll-away.

If the vehicle requires recovery/transportation, the EPR mechanism is used to manually disengage the park lock and engage the transmission in neutral. The EPR mechanism consists of an operating lever that is connected to a park interlock lever on the transmission by a cable assembly. The operating lever is installed in the floor console, under the trim panel in the base of the drinks holder. To access the lever, the trim panel must be removed. The park interlock lever is attached to the transmission selector shaft via a Bowden cable.

OPERATION

Shifting of the TCS selector to any of the five positions is sensed by the TCM via the high speed **CAN** powertrain bus. The TCM then reacts according to the selected position.

The TCS is a magnetic system using Hall effect sensors to determine the position of the selector. The S (sport) position selection allows the TCM to operate the transmission using the semi-automatic 'Commandshift' system. Gear selections are sensed by the TCM when the driver operates the steering wheel paddle switches. Once the TCS position is confirmed, the TCM outputs appropriate information on the high speed **CAN** powertrain bus which is received by the IC (Instrument Cluster) to display the gear selection information in the message center. The paddles can also be used on a temporary basis when the TCS is in the D (Drive) position to override the automatic gear selection if required.

PARK INTERLOCK AND NEUTRAL LOCK

Neutral lock is a requirement for the TCS. The selector is always locked at ignition on when the engine is not running, except after an engine stall when the selector is not in P (park) or N (neutral). If, when driving with the TCS in S, D or R (reverse) at a speed of more than 5 km/h (3 mph), the driver selects P or N: Without the brake pedal pressed, the TCS will be immediately locked once the vehicle speed falls to below 5 km/h (3 mph).

With the brake pedal pressed, the TCS will remain unlocked for as long as the brake pedal remains pressed, regardless of vehicle speed. The transmission will only engage park once the vehicle speed is less than 2 km/h (1 mph). If the driver selects N and releases the brake pedal with a vehicle speed of less than 5 km/h (3 mph), the TCS will be locked 2 seconds after N is selected. The selector will remain locked until the driver presses the brake pedal again.

To ensure that a driver request to change from a non-driving range (N for example) to a driving range (D for example), the park interlock and neutral lock features are used in conjunction with the intermediate position. If the transmission receives a range change request without the brake pedal pressed, the TCM initiates a soft lock function. The transmission will remain in park or neutral, depending on the starting position.

If a transmission position letter is flashing in the message center and the vehicle has no drive, the driver must:

- Press the brake pedal
- Reselect N or P on the TCS
- Select the required driving range, ensuring that the brake pedal is pressed

Rocking Function

The rocking function complements the neutral lock function. For all changes from a non-driving range to a driving range, it is necessary to press the brake pedal (to release either the park interlock or neutral lock). In situations where the driver will require to change the gear selection from R to D, or from D to R, without brake pedal input (car park manoeuvring, 3 point turns or 'rocking' the vehicle from a slippery surface for example), the rocking function gives a 2 second lock delay when N is selected on the TCS and the brake pedal is not pressed.

Intermediate Position

If the TCS is shifted slowly from P to S and back to position P with the brake pedal pressed, the R or D position display letter in the message center will flash and the transmission will remain in park or neutral depending on the previous starting position of the selector. If the brake pedal is released when R or D is flashing in the message center and the TCS is shifted to the R or D position, the required range will not be selected and the transmission will remain in park or neutral, depending on the previous starting position. This feature is known as soft lock. If the driving range letter in the message center is flashing and the vehicle has no drive, the driver should depress the brake pedal to reselect N or P, and then select the required driving range while the brake pedal remains pressed.

PADDLE SWITCHES

The paddle switches are hardwired to the steering wheel audio switches. Operation of the paddle switch completes a ground path to the audio switch assembly. The audio switch assembly converts the completed ground signal into a LIN (Local Interconnect Network) bus signal which is passed via the clockspring to the CJB (Central Junction Box). The CJB converts the signal into a high speed **CAN** powertrain bus signal to the TCM.

Pulling the left downshift - paddle provides down changes and pulling the right upshift (+) paddle provides up changes. The first operation of either paddle, after sport mode is selected, puts the transmission into permanent manual Commandshift. Rotation of the TCS back to the D position, returns the transmission to conventional automatic operation. Temporary operation of Commandshift mode can also be operated with the TCS in the D position. Operation of either the upshift or downshift paddles activates the manual mode operation. If the TCS is in D, Commandshift will cancel after a time period or can be cancelled by pressing and holding the + paddle for approximately 2 seconds.

EMERGENCY PARK RELEASE

One end of the operating lever is attached to a base by a hinge pin. A locking cylinder is installed in the other end of the operating lever, to secure the operating lever to the base. The operating lever is raised by pulling on a strap. When operated, the EPR mechanism turns the transmission selector shaft.



WARNING: Before disengaging the park lock, apply the EPB if electrical power is available or apply restraints to the

vehicle, for example wheel chocks, to prevent vehicle roll-away. Ensure that the ignition is turned off.

To disengage the park lock: Open the cubby box lid and the drinks holder lid. Remove the trim panel from between the drinks holder and the cubby box. Rotate the locking mechanism of the EPR lever 90 degrees counterclockwise. Apply the footbrake, pull the operating lever upwards and ensure it locks in the vertical position. Raising the operating lever causes the EPR cable to rotate the park interlock lever on the transmission, which disengages the parking pawl and engages neutral. This allows the vehicle to freewheel.

To re-engage the park lock: Hold the strap on the operating lever, release the latch and lower the operating lever to the horizontal position. Lock the operating lever by turning the locking mechanism 90 degrees clockwise. Install the trim panel. Close the cubby box lid and the drinks holder lid.

Automatic Transmission/Transaxle External Controls - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - External Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the automatic transmission/transaxle external controls system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: [External Controls](#) (307-05A Automatic Transmission/Transaxle External Controls - Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Description and Operation).

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.

NOTES:

 If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

 Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none">• Check for stuck/jammed switches and buttons• Visibly damaged or worn components• Loose or missing fasteners	<ul style="list-style-type: none">• Fuse(s)• Loose or corroded electrical connector(s)

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 Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code Index: Transmission Control Switch](#) (100-00 General Information, Description and Operation).

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