Published: 16-Apr-2013

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission -

Lubricants, Fluids, Sealers and Adhesives

CAUTIONS:

* Do not use any lubricant other than that specified

+ Do not over lubricate

Item	Specification
Recommended lubricant *	Nippon AW-1. Land Rover Part No LR022460
Torque converter nose+	Molykote FB180
Driveshaft spline grease *	IYX500050
Fluid pan to transmission sealant	LR002912

Capacities

CAUTION: * A final oil level/check/top-up must be carried out when the unit has been installed

Item	Capacity (liters / pints / US quarts)
Initial dry fill*	7.0/12.3/7.4

General Specification

Item	Specification
Automatic transmission	Generation 2, Aisin AWF21 (6 speed auto)
Torque - Maximum:	
2.0 Petrol	340 Nm (251 lb-ft)
2.2 Diesel	420 Nm (310 lb-ft)
Gear ratios:	
First	4.148:1
Second	2.370:1
Third	1.556:1
Fourth	1.155:1
Fifth	0.859:1
Sixth	0.686:1
Reverse	3.394:1
Final drive ratio:	
2.0 Petrol	3.750:1
2.2 Diesel	3.329:1
Torque converter:	
2.0 Petrol	D241 207K
2.2 Diesel	D260 186K2
Transmission control module:	
Location	Integrated onto top of transmission casing
Type	SH 7058 (generation 2)

Torque Specifications

Description	Nm	lb-ft
3 way solenoid S1	10	7
3 way solenoid S2	10	7
Cover plate bolt - power transfer unit (PTU) side - 2.2 Diesel only	24	18
Cover plate bolt- starter side - 2.2 Diesel only	24	18
Drain plug bolt	47	35
Fill plug Torx bolt	39	29
Flexplate to torque converter bolts	60	44
Fluid pan Torx bolts	13	10
Lock plate bolt - oil temperature sensor	10	7
Main control valve body bolts	10	7
Overflow Torx bolt	7	5
Suction cover - valve body assy	10	7
Gear shift module (GSM) bolts	10	7
GSM support bracket		
M8	24	7
M10	47	18
Transmission control module (TCM) bolts	25	7
Speed Sensor - Input	5	3.7
Front subframe		
Stage 1	140	103
Stage 2	240°	
Subframe cross-brace		
M10	45	33
Transmission to engine bolts - M10:		
2.0 Petrol	48	35

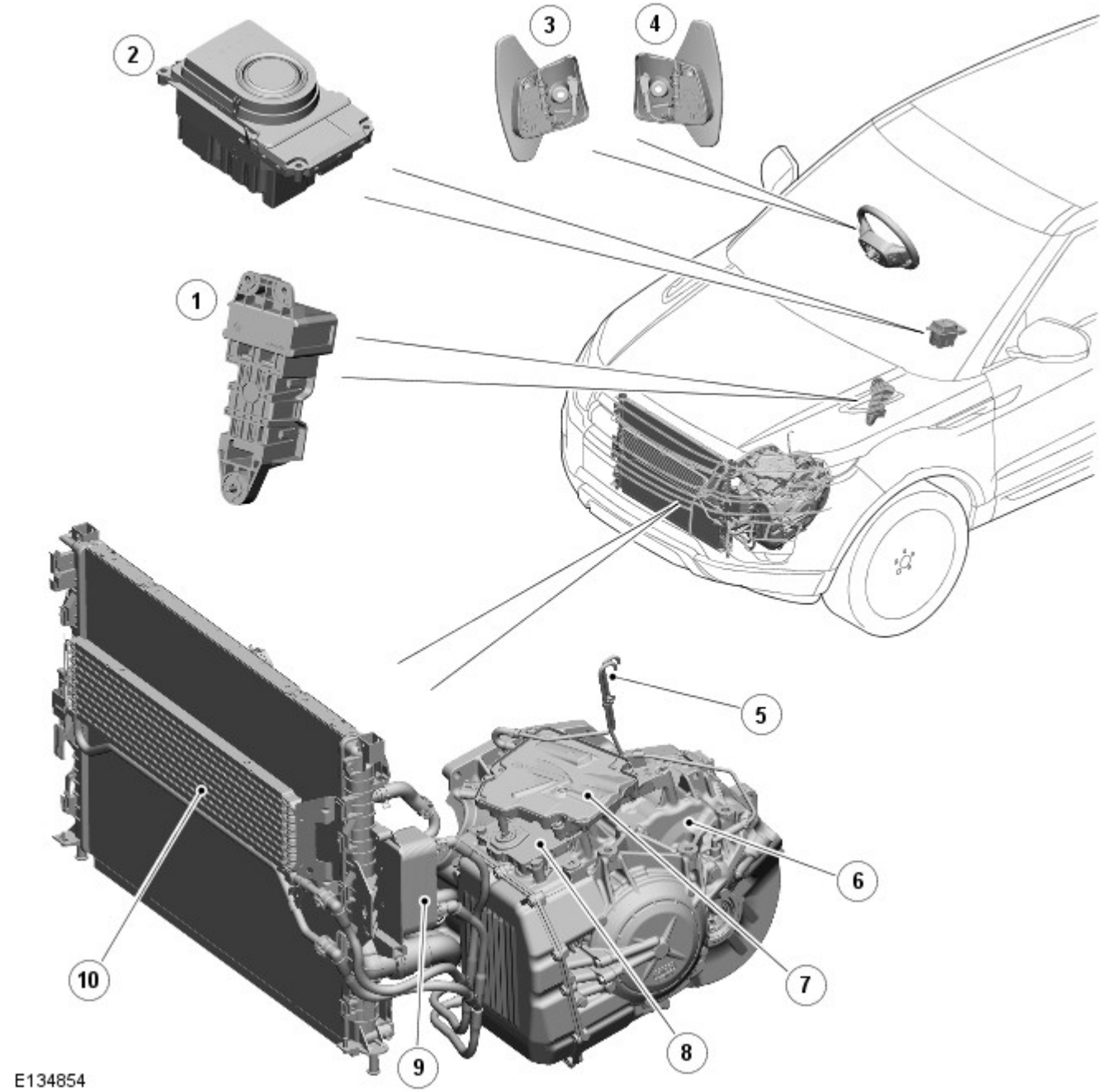
Description	Nm	lb-ft
2.2 Diesel	65	48

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Description - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Auxiliary battery module
2	Transmission Control Switch (TCS)
3	Upshift (+) paddle switch
4	Downshift (-) paddle switch
5	Transmission and Gear Shift Module (GSM) breathers
6	Automatic transmission
7	Gear Shift Module (GSM)
8	Transmission Control Module (TCM)
9	Transmission fluid cooler (all markets)
10	Transmission fluid cooler (hot climate markets)

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Description - Overview

Description and Operation

OVERVIEW

The AW F21 automatic transmission is a 6 speed, electronically controlled unit manufactured by Aisin AW in Japan. The transmission represents the latest in automatic transmission technology for a transverse, AWD (all-wheel drive) unit. The transmission features lock-up slip control, 'CommandShift™' functions and automatic and driver selectable modes to give the optimum on and off road performance.

The transmission is controlled by a TCM (transmission control module) which contains software to provide operation as a semi-automatic 'CommandShift™' transmission and a Gear Shift Module (GSM). The GSM is a rotary actuator which converts driver selections for P, R, N, D and S on the rotary TCS (transmission control switch) into rotary movement of the transmission selector shaft allowing the system to operate as a 'shift by wire' system, with no mechanical link to the transmission for drive selections.

The TCM allows the transmission to be operated as a conventional automatic unit by selecting P, R, N, D, S on the TCS. Rotation of the TCS to the 'S' position puts the transmission into electronic 'Sport' mode. Operation of the steering wheel mounted + or – paddle switches puts the transmission into electronic manual 'CommandShift™' mode.
Refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: AWF21 6-Speed Automatic Transmission, Description and Operation).

The transmission system uses an auxiliary battery module which powers a failsafe system to allow the engagement of 'Park' in the event of vehicle power failure.

The AW F21 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 lock-up control on gears 2 to 6
- Shift programs controlled by the TCM
- TCM has an adaptive capability to ensure efficient gear shift quality throughout the service life of the transmission
- Diagnostics available from the TCM and the GSM via the high speed CAN (controller area network) bus.

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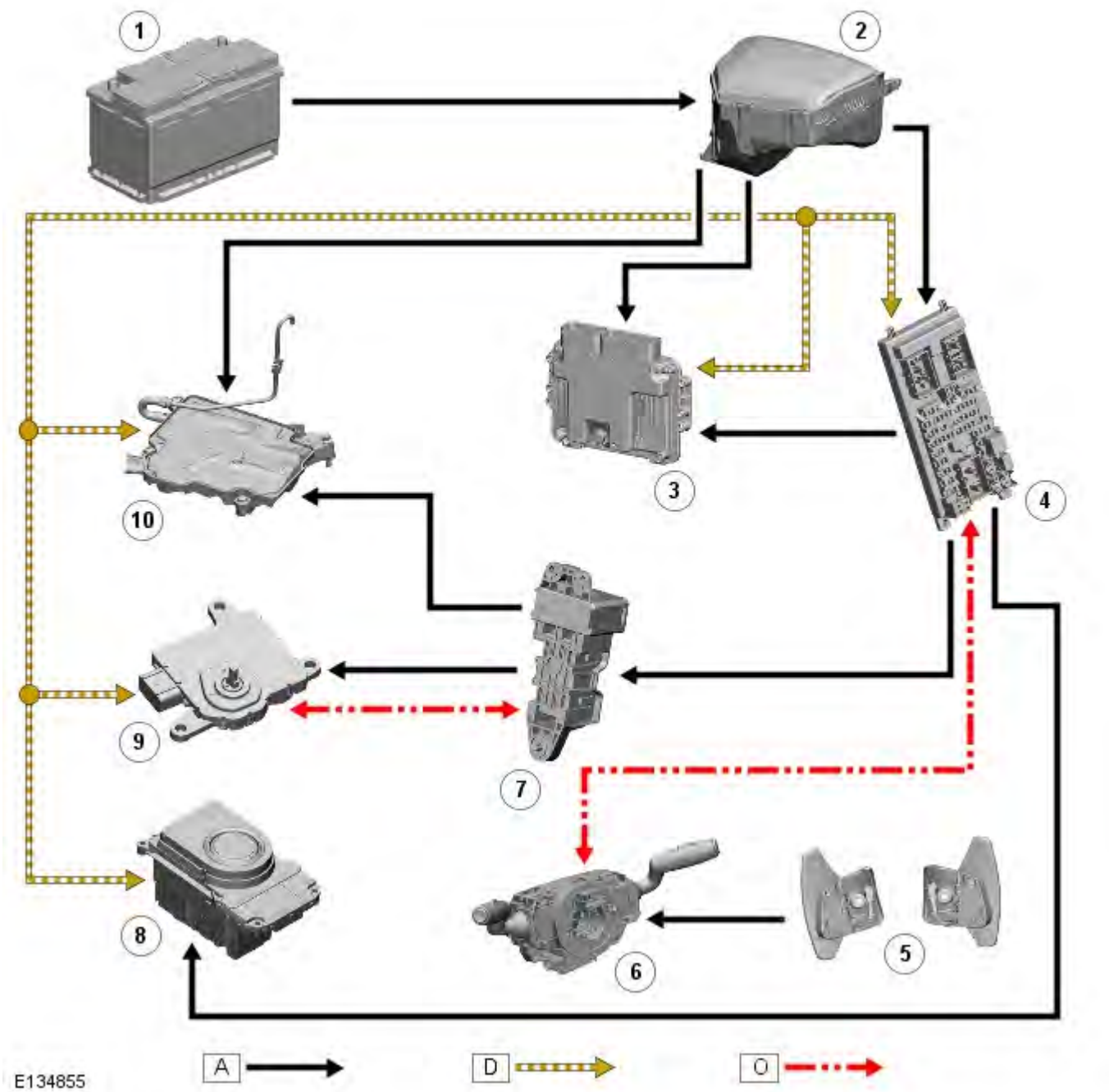
Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Description - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired; **D** = High Speed Controller Area Network (CAN) bus; **O** = Local Interconnect Network (LIN)



Item	Description
1	Battery
2	Battery Junction Box (BJB)
3	Engine Control Module (ECM)
4	Central Junction Box (CJB)
5	Transmission paddle switches
6	Clockspring
7	Auxiliary battery module
8	Transmission Control Switch (TCS)

9	Transmission Control Module (TCM)
10	Gear Shift Module (GSM)

System Operation

OPERATION

Operation of the transmission is controlled by the TCM (transmission control module), 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 rotary TCS (transmission control switch) position.

Engine torque is transferred, via operation of single or combinations of clutches to the planetary gear trains. The gear trains are controlled by reactionary inputs from brake clutches to produce the 6 forward gears and 1 reverse gear.

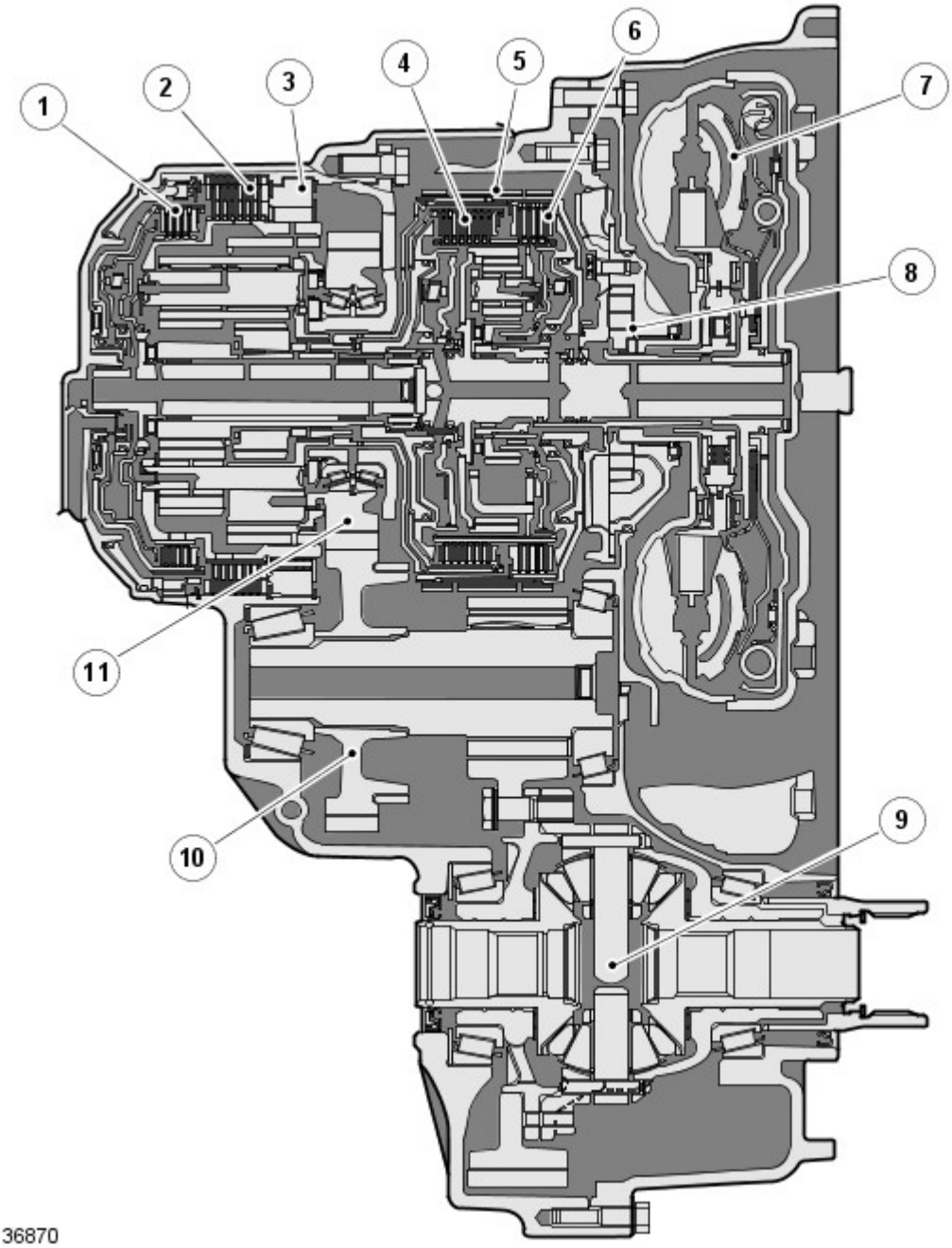
The shift elements (clutches and brakes) are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption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

Component Description

DESCRIPTION

The transmission comprises the main casing which houses all of the transmission components. The torque converter is located in a separate converter housing.

AW F21 Automatic Transmission - Sectional View



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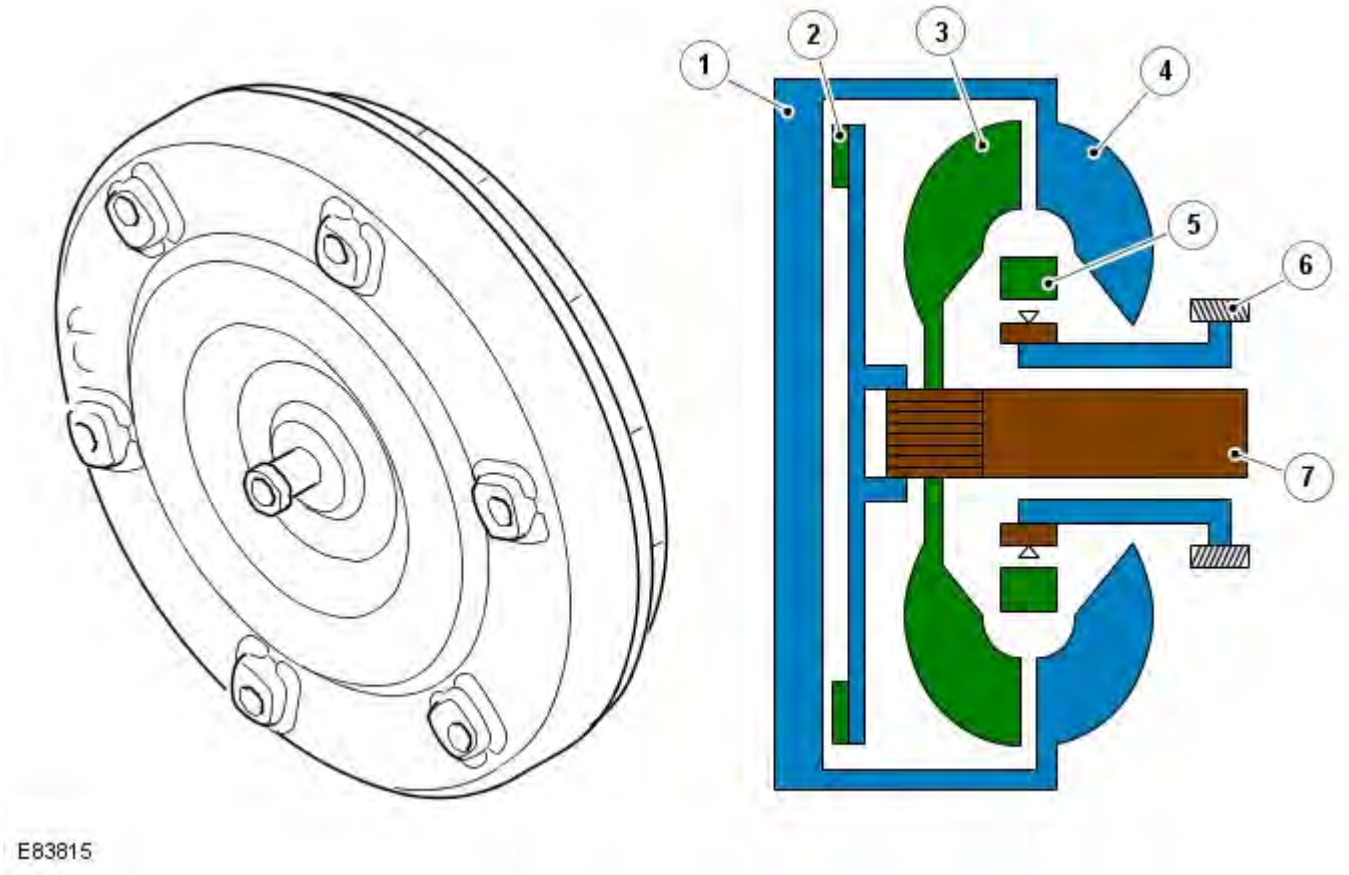
Item	Description
1	Clutch - C2
2	Brake - B2
3	One-way clutch - F1
4	Clutch - C1
5	Brake - B1
6	Clutch - C3
7	Torque converter
8	Fluid pump
9	Differential assembly
10	Counter driven gear
11	Counter drive gear

The main casing retains the fluid at the bottom. A combined drain/level plug is located in the bottom of the casing. The oil level is checked by removal of the inner level plug, with the engine running and the transmission fluid at a temperature of between 50 to 60°C (122 to 140°F). The level is correct when the oil flow becomes a drip from the level plug hole.

The transmission has a fluid cooler which is located on the LH (left-hand) end of the radiator. The cooler is connected to the transmission converter housing by 2 pipes. The fluid cooler is connected into the engine cooling system and cools the transmission fluid by heat transfer through the cooler to the engine coolant. In hot climate markets an additional fluid cooler is located in front of the radiator.
Refer to: Transmission Cooling (307-02 Transmission/Transaxle Cooling - Vehicles With: AWF21 6-Speed Automatic Transmission, Description and Operation).

TORQUE CONVERTER



Item	Description
1	Torque converter housing
2	Lock-up clutch
3	Turbine
4	Impeller
5	Stator
6	Fluid pump
7	Input shaft

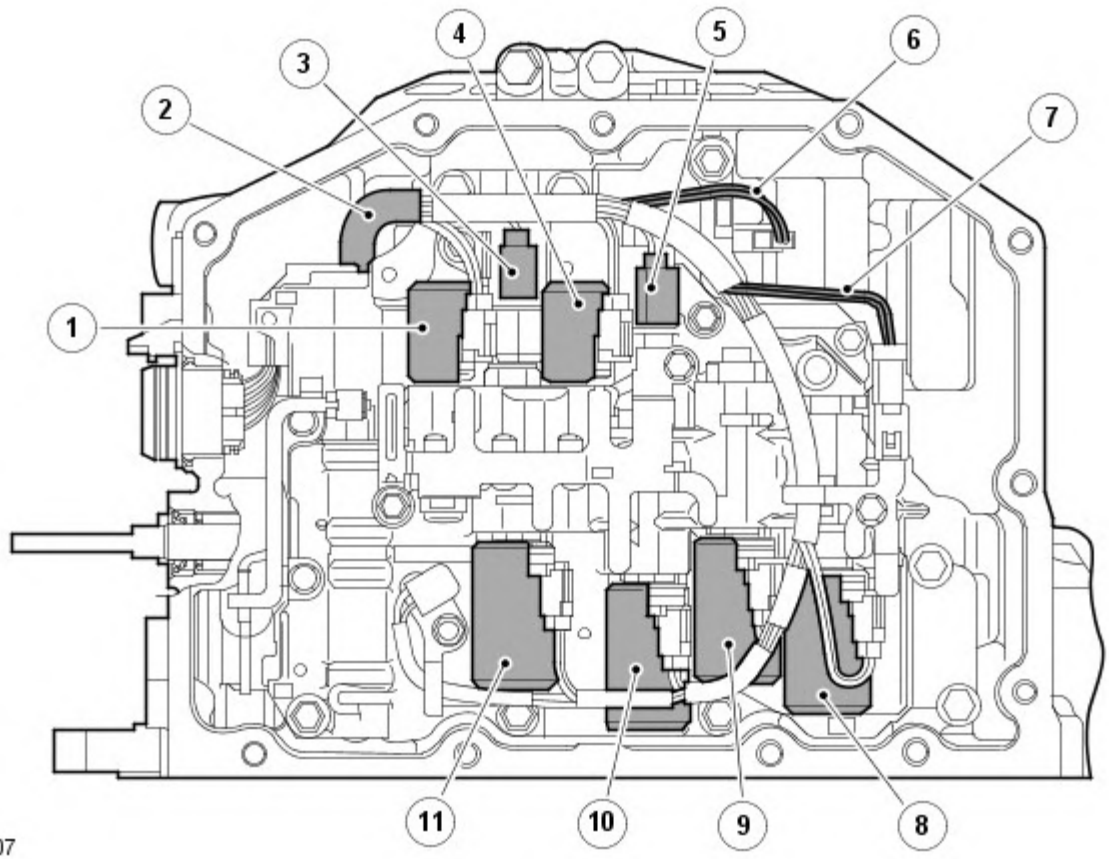
The torque converter is the coupling element between the engine and the transmission and is located in the transmission housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission.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

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 welded to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

The torque converter contains a hydraulically operated lock-up clutch which is controlled by the TCM via a solenoid in the valve block which actuates spool valves to control the hydraulic pressure applied to the clutch. This allows the TCM to provide 3 modes of converter operation; unlocked, partially locked and fully locked.

VALVE BLOCK

The valve block is located in a vertical position at the front of the transmission main casing, behind a sealed cover. The valve block contains a number of solenoids, dampers and spool valves to control the transmission operation. The solenoids are controlled by the TCM to provide gear changes and smooth transition between ratio changes.



Item	Description
1	Lock-up control solenoid - SLU
2	Transmission harness
3	3-Way solenoid - S2
4	Line pressure control solenoid - SLT
5	3-Way solenoid - S1
6	Input speed sensor wires
7	Output speed sensor wires
8	Shift control solenoid - SLB1
9	Shift control solenoid - SLC3
10	Shift control solenoid - SLC2
11	Shift control solenoid - SLC1

Shift Control Solenoids - SLC1, SLC2, SLC3, SLB1

The shift control solenoids (SLC1, SLC2, SLC3 and SLB1) are installed on the front valve body. The solenoids respond to inputs from the TCM and control the hydraulic pressure applied to the clutches (C1, C2 and C3) and to the brake B1 to provide smooth shifting. The TCM uses a single or a combination of these solenoids to provide shifts from 1st to 6th gear.

If a solenoid fails, the TCM will remove the current to the shift control solenoids and the transmission will use limp home mode, to prevent damage to the transmission.

Line Pressure Control Solenoid - SLT

The line pressure control solenoid (SLT) is installed on the front valve body. The solenoid is controlled in a linear manner by the TCM which uses throttle opening degree signals and engine torque information from the ECM (engine control module) to determine the solenoid operation. The solenoid controls the line pressure applied to the clutches and brakes to provide smooth shifting.

If the solenoid fails, the TCM will remove the current supplied to the solenoid. Maximum line pressure will be applied to the clutches and brakes unless the failure is due to the solenoid valve sticking, which may result in low line pressure.

Lock-Up Control Solenoid - SLU

The lock-up control solenoid is installed on the front valve body. The solenoid is controlled in a linear manner by the TCM which uses engine speed, throttle opening degree signals and transmission speed sensor signals to determine the solenoid operation. The solenoid controls the amount of lock-up or slip required for the torque converter lock-up clutch.

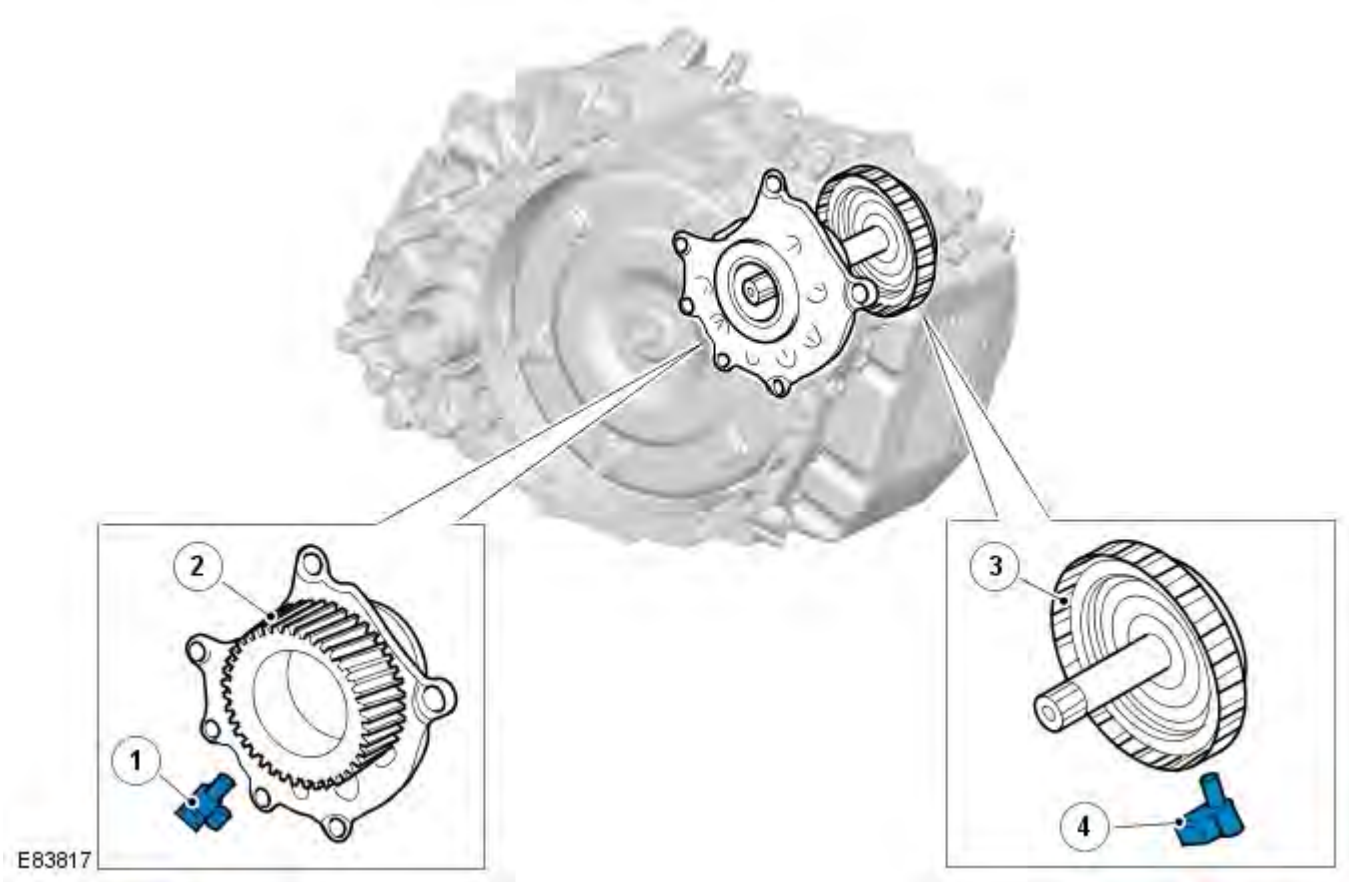
If the solenoid fails, the TCM removes the current supplied to the solenoid which results in no torque converter lock-up being applied.

3-Way Solenoid - S1, S2

The 3-way solenoid (S1) is located on the center valve body and solenoid (S2) is located on the front valve body. The solenoids are on/off solenoids controlled by the TCM. A combination of the 2 solenoids is used to operate either the 1st gear engine braking or enable gear shifts.

If a solenoid fails, the TCM will remove the current supplied to both solenoids.

Speed Sensors



Item	Description
1	Speed Sensor (SP) - Output shaft speed
2	Counter drive gear
3	C2 clutch drum
4	Speed sensor (NIN)

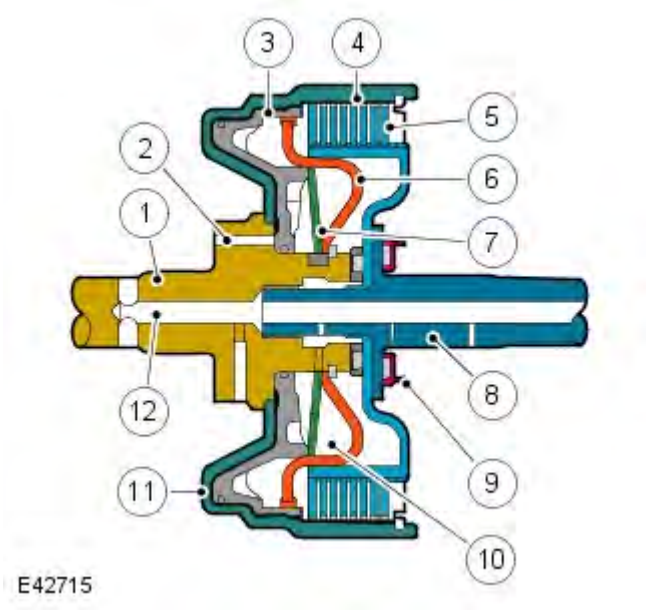
Two speed sensors (NIN and SP) are used in the transmission and are located within the transmission housing. Speed sensor (SP) is located adjacent to the counter drive gear and reads from the gear teeth to provide an output shaft speed signal. Speed sensor (NIN) is located adjacent to the clutch C" drum and reads off teeth on the outer circumference of the drum to provide an input shaft speed. Both speed signals are received by the TCM which uses the 2 signals to calculate engine torque output, shift timing and torque converter lock-up.

Fluid Temperature Sensor

The fluid temperature sensor is integrated into the internal wiring harness within the transmission. It detects the fluid temperature in the hydraulic pressure control circuit and transmits a signal corresponding to the temperature to the TCM. The TCM monitors the temperature and provides smooth gear shifts across a wide range of temperatures.

DRIVE CLUTCHES

Multiplate Drive or Brake Clutch – Typical



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

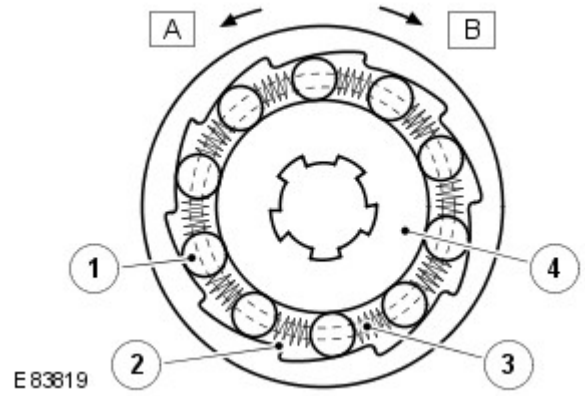
There are three drive clutches and two brake clutches (B2 is a multiplate brake clutch & B1 is a double wrap brake band) used in the AW F21 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

Clutch / Brake	Operation
C1 Clutch	Connects the front planetary carrier to the rear planetary rear sun gear
C2 Clutch	Connects the intermediate shaft to the rear planetary carrier
C3 Clutch	Connects the front planetary carrier to the rear planetary middle sun gear
B1 Brake	Locks the rear planetary middle sun gear
B2 Brake	Locks the rear planetary carrier

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

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

One-Way Clutch

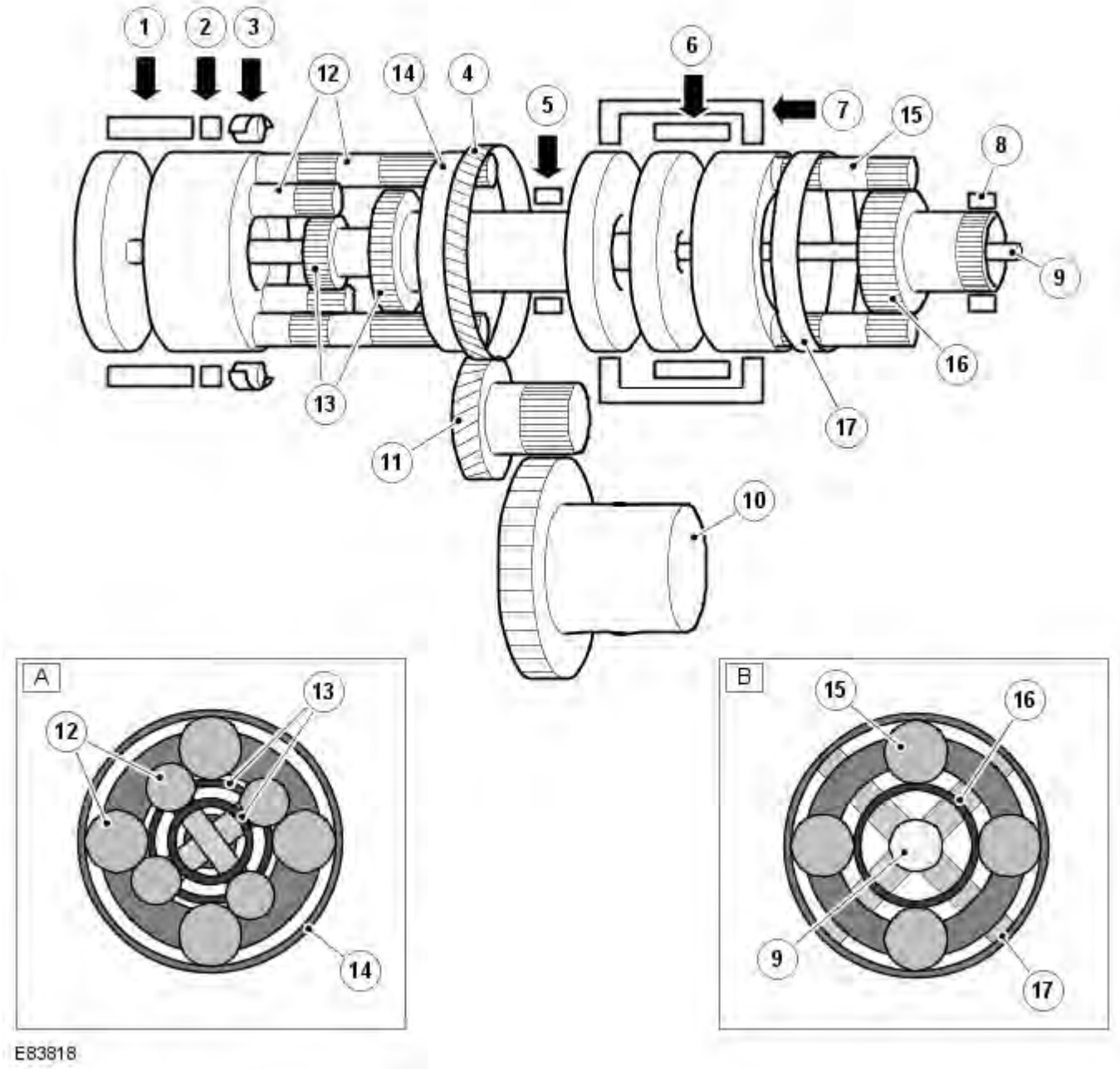


Item	Description
1	Roller
2	Cage
3	Spring
4	Inner race

The roller clutch used on the one-way clutch uses parallel rollers, located between the smooth, cylindrical inner race and the inclined cam faces of the clutch body. Springs are used to hold the rollers in position between the two contact faces.

When the clutch is rotated in a clockwise direction, the rollers become trapped between the inner race and the inclined cam faces of the clutch body, providing positive (locked) rotation of the inner race, locking the counter-clockwise rotation of the rear planetary carrier. When the clutch is rotated in a clockwise direction, the rollers are moved away from the inclined cam faces and can rotate freely (unlocked) with the clutch body, providing no drive from the clutch to the rear planetary carrier. In this condition the clutch can rotate freely on the inner race.

PLANETARY GEAR TRAIN



Item	Description
A	Double web planetary gear train - Rear
B	Single web planetary gear train - Front
1	Clutch C2
2	Brake B2
3	Free wheel clutch F2
4	Counter drive gear
5	Brake B1
6	Clutch C1
7	Clutch C3
8	Fluid pump
9	Input shaft
10	Differential gear assembly
11	Counter gear assembly
12	Pinion gears
13	Sun gears
14	Ring gear
15	Pinion gear

16	Sun gears
17	Ring gear

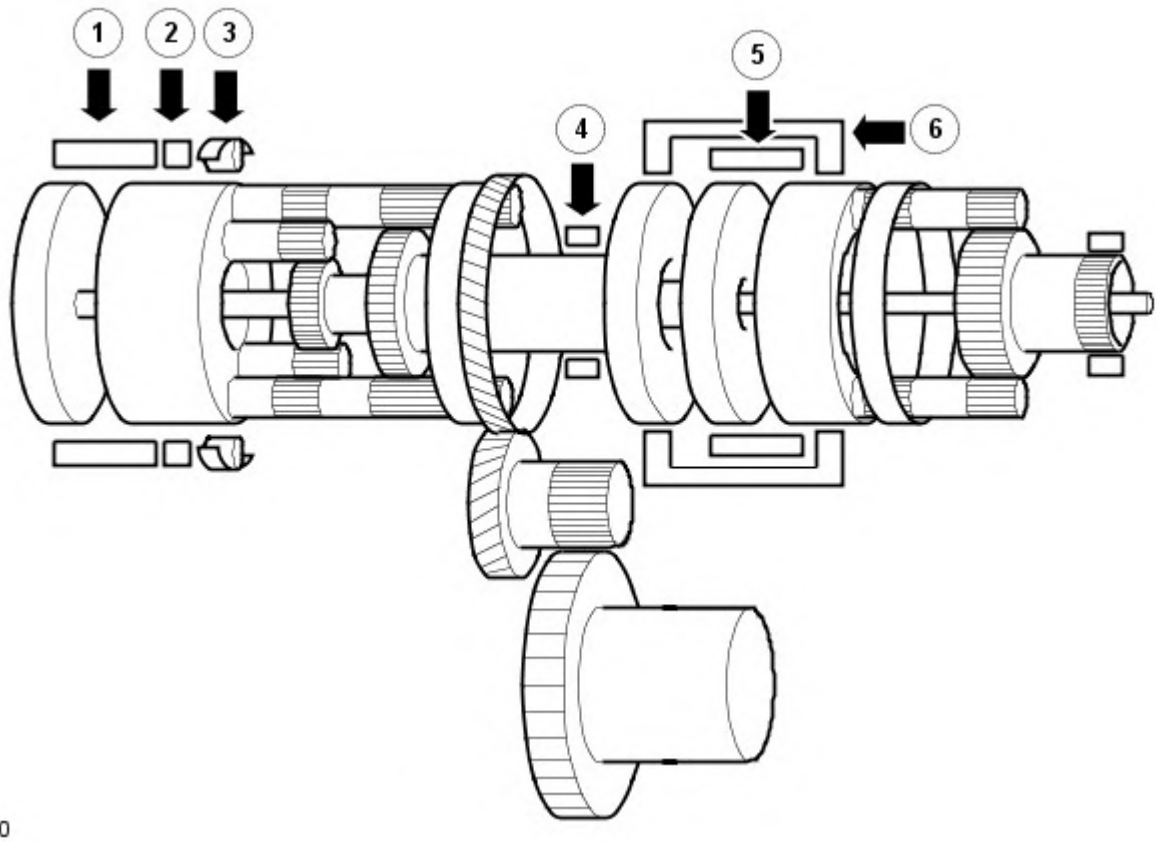
The planetary gear trains used on the AW F21 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Ravignaux type gear trains and together produce the six forward gears and the one reverse gear.

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

Gear	1st	2nd	3rd	4th	5th	6th	Reverse
Ratio	4.148	2.370	1.556	1.155	0.859	0.686	3.394

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 the TCS position.



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Item	Description
1	Clutch - C2
2	Brake - B2
3	One-way clutch - F1
4	Brake - B1
5	Clutch - C1
6	Clutch - C3

Power Flow - 1st Gear Engine Braking

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	Engine Brake	-	X	X	X	X	X

X = Operating

When the engine brake is active, driving force is transmitted to the transmission from the road wheels, via the power transfer unit. The rear planetary carrier is locked from clockwise rotation by the one-way clutch (F1) and brake (B2). This results in torque from the wheels being transmitted directly to the engine, providing engine braking.

Solenoid Operation

Transmission TCS Position	Solenoid					
	SLC 1	SLC 2	SLC 3	SLB 1	S1	S2

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	1st Gear	-	X	X	X	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	1st Gear	X	-	-	-	-	X

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Rear sun gear
- Locked: Carrier
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates in a clockwise direction along with the planetary pinion gear which also rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis.

The front planetary carrier rotates clockwise in the same direction as the planetary pinion gear. The clutch (C1) is activated and locks the planetary carrier to the rear planetary sun gear.

Rear Planetary Gear Train

The planetary sun gear rotates in a clockwise direction. The planetary short pinion gear rotates in a counter-clockwise direction. The planetary carrier attempts to rotate in the same direction but is restrained by the one-way clutch (F1).

The long pinion gear rotates clockwise on its axis and the middle sun gear rotates counter-clockwise while idling. The ring gear is rotated by the long pinion gear and drives the counter drive gear in a clockwise direction.

The counter driven gear is driven in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

Power Flow - 2nd Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	2nd Gear	-	X	X	-	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	2nd Gear	X	-	-	X	-	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Rear sun gear
- Locked: Middle sun gear
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates in a clockwise direction along with the planetary pinion gear which also rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis.

The front planetary carrier rotates clockwise in the same direction as the planetary pinion gear. The clutch (C1) is activated and locks the planetary carrier to the rear planetary sun gear.

Rear Planetary Gear Train

The planetary sun gear and the carrier rotate in a clockwise direction. The middle sun gear is locked by the brake (B1). The short pinion gears rotate counter-clockwise on its axis and orbits in a clockwise direction. The long pinion gears rotates clockwise on its axis and its orbit.

The ring gear is rotated in a clockwise direction by the long pinion gear. The ring gear and the counter drive gear both rotate in a clockwise direction.

The counter driven gear is driven in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

 NOTE: Engine braking is available when this gear is selected.

Power Flow - 3rd Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	3rd Gear	-	X	-	X	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	3rd Gear	X	-	-	X	-	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Middle sun gear
- Locked: -
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates in a clockwise direction along with the planetary pinion gear which also rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis.

The front planetary carrier rotates clockwise in the same direction as the planetary pinion gear. The clutch (C1) is activated and locks the planetary carrier to the rear planetary sun gear. Clutch (C3) is also activated and locks the carrier to the middle sun gear.

Rear Planetary Gear Train

The planetary short pinion gear and the long pinion gear are engaged which causes both pinion gears to lock due to the different rotational directions. Torque from the sun gear and middle sun gear is transmitted to the planetary ring gear which rotates clockwise in the same direction as the planetary carrier.

The counter drive gear rotates in a clockwise direction with the ring gear.

The counter driven gear is rotated in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

 NOTE: Engine braking is available when this gear is selected.

Power Flow - 4th Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	4th Gear	-	-	X	X	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	4th Gear	X	X	-	-	-	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Rear sun gear, Carrier
- Locked: -
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates in a clockwise direction along with the planetary pinion gear which also rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis.

The front planetary carrier rotates clockwise in the same direction as the planetary pinion gear. The clutch (C1) is activated and locks the planetary carrier to the rear planetary sun gear. The intermediate shaft rotates in the same direction as the input shaft. Clutch (C2) is also activated rotates in the same direction as the intermediate shaft.

Rear Planetary Gear Train

The planetary carrier rotates in a clockwise direction with the intermediate shaft. The short pinion gear rotates clockwise on its axis and orbits at a faster speed than the sun gear. The long pinion gear rotates counter-clockwise on its axis and orbit. The rotation of the ring gear is in a clockwise direction and is slower than the rotation of the carrier due to the long pinion gear's rotation is counteracted by the planetary carrier.

The counter drive gear rotates in a clockwise direction with the ring gear.

The counter driven gear is rotated in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

 NOTE: Engine braking is available when this gear is selected.

Power Flow - 5th Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	5th Gear	X	-	-	X	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	5th Gear	-	X	X	-	-	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Middle sun gear
- Locked: -
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates in a clockwise direction along with the planetary pinion gear which also rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis.

The front planetary carrier rotates clockwise in the same direction as the planetary pinion gear. The clutch (C3) is activated and locks the planetary carrier to the rear planetary middle sun gear. The intermediate shaft rotates in the same direction as the input shaft. Clutch (C2) is also activated and rotates in the same direction as the intermediate shaft.

Rear Planetary Gear Train

The middle sun gear rotates clockwise in the same direction as clutch (C3). The deceleration of the front planetary gear slows the speed of the input shaft. The intermediate shaft rotates clockwise in the same direction as the input shaft. The planetary carrier also rotates clockwise in the same direction as the intermediate shaft.

The long pinion gear rotates clockwise on its axis and orbit. The carrier rotates faster than the middle sun gear which causes the middle pinion gear to be cancelled out by the speed difference. The middle pinion gear orbits and rotates on its axis in a clockwise direction.

The planetary ring gear rotates in a clockwise direction. The speed of the ring gear is faster than the planetary carrier because the long pinion gear's rotation is combined with the planetary carrier's speed. The counter drive gear rotates in a clockwise direction with the ring gear.

The counter driven gear is rotated in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

 NOTE: Engine braking is available when this gear is selected.

Power Flow - 6th Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
D	6th Gear	X	-	X	-	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
D	6th Gear	-	X	-	X	-	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: -
- Locked: -
- Output: -

- Rear planetary gear train
- Input: Carrier
- Locked: Middle sun gear
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The intermediate shaft rotates clockwise in the same direction as the torque converter. Clutch (C2) locks the intermediate shaft to the rear planetary carrier.

Rear Planetary Gear Train

The planetary carrier rotates clockwise in the same direction as the intermediate shaft. The planetary long pinion gear rotates clockwise on its axis and orbit. The rotational speed of the middle sun gear increases with input shaft speed because it is locked.

The planetary ring gear rotates in a clockwise direction. The speed of the ring gear is faster than the planetary carrier because the long pinion gear's rotation is combined with the planetary carrier's speed. The counter drive gear rotates in a clockwise direction with the ring gear.

The counter driven gear is rotated in a counter-clockwise direction which in turn drives the differential ring gear in a clockwise direction.

NOTE: Engine braking is available when this gear is selected.

Power Flow - Reverse Gear

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
R	Reverse Gear - Less than 11 volts	X	X	-	X	-	-
R	Reverse Gear - More than 11 volts	X	X	X	X	-	-

X = Operating

Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
R	Reverse Gear - Less than 11 volts	-	X	-	X	-	-
R	Reverse Gear - More than 11 volts	-	-	-	-	X	-

X = Operating

The planetary gear trains are in the following conditions:

- Front planetary gear train
- Input: Ring gear
- Locked: Sun gear
- Output: Carrier

- Rear planetary gear train
- Input: Middle sun gear
- Locked: Carrier
- Output: Ring gear

Front Planetary Gear Train

The input shaft rotates in a clockwise direction, driven by the torque converter. The planetary ring gear rotates clockwise with the input shaft.

The pinion gear rotates clockwise on its axis and orbit. The planetary sun gear is locked by the fluid pump which causes it to press against the planetary ring gear and orbit the sun gear, rotating on its axis. The planetary carrier rotates clockwise with the pinion gear orbit.

Clutch (C3) is activated and rotates clockwise and locks the planetary carrier to the rear planetary middle sun gear.

Rear Planetary Gear Train

The middle sun gear rotates clockwise with the clutch (C3), but at a lower speed than the input shaft. Brake (B2) is activated and locks the planetary carrier. The long pinion gear rotates counter-clockwise which in turn rotates the ring gear counter-clockwise.

The counter drive gear rotates in a counter-clockwise direction with the ring gear at the same speed.

The counter driven gear is rotated in a clockwise direction which in turn drives the differential ring gear in a counter-clockwise direction.

NOTE: Engine braking is available when this gear is selected.

Power Flow Neutral

Solenoid Operation

Transmission TCS Position		Solenoid					
		SLC 1	SLC 2	SLC 3	SLB 1	S1	S2
N	Neutral	X	X	X	X	-	-

X = Operating

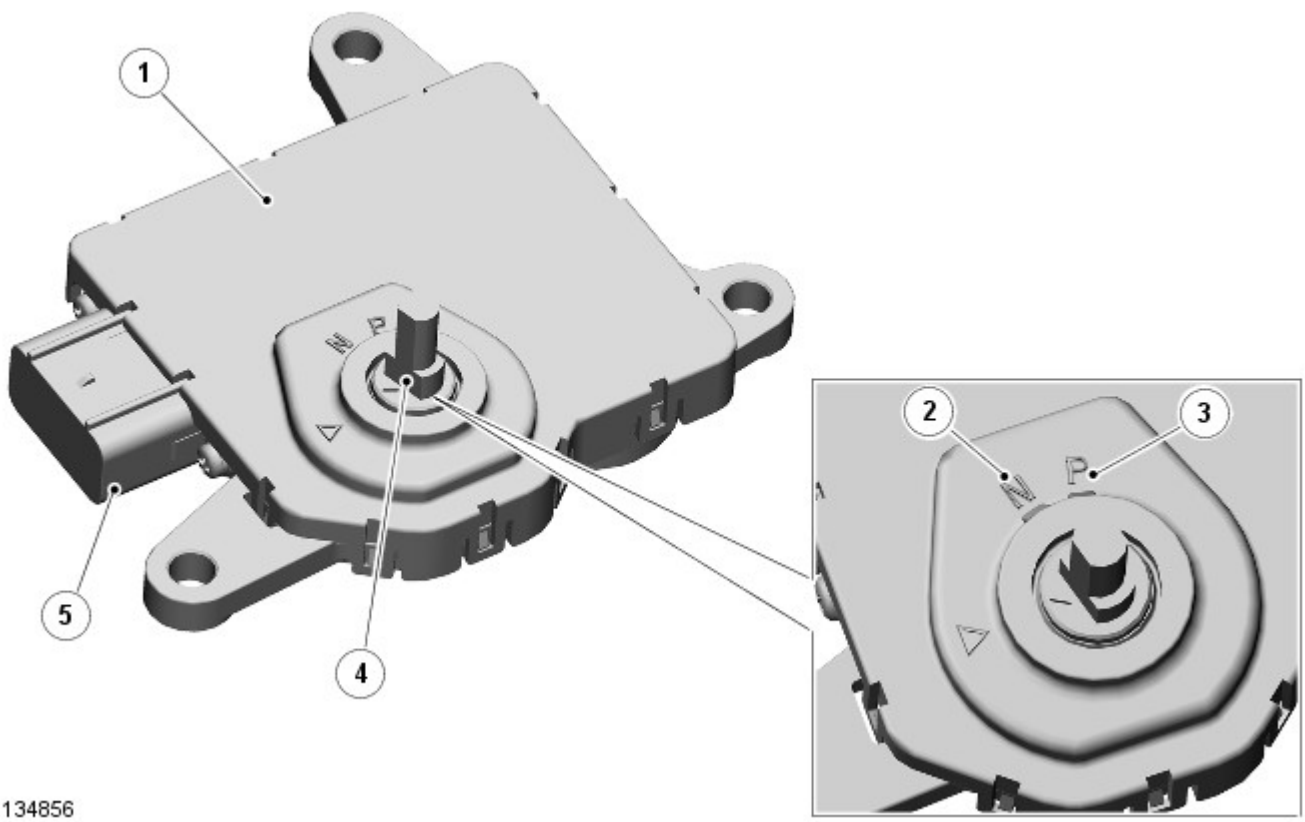
Clutch and Brake Operation

Transmission TCS Position		Clutch			Brake		One-Way clutch
		C1	C2	C3	B1	B2	F1
R	Reverse Gear	-	-	-	-	-	-

X = Operating

In neutral, all the solenoids, except the 3 way solenoids, are energised and the clutches and brakes are all disengaged. This allows rotation from the input shaft to rotate the front planetary gear train without transferring any drive to the differential ring gear.

TRANSMISSION CONTROL MODULE (TCM)



Item	Description
1	TCM
2	Neutral 'N' position
3	Park 'P' position
4	Position sensor/manual shaft
5	Electrical connector

The TCM is located on the top of the transmission casing and is connected on the high speed CAN (controller area network) bus to send and receive information to and from other system modules.

The TCM outputs signals to operate the transmission solenoid valves to control the hydraulic operation of the transmission.

The ECM supplies the engine management data on the high speed CAN bus system. The TCM requires engine data to efficiently control the transmission operation, using for example; crankshaft torque, engine speed, accelerator pedal angle, engine temperature etc.

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 TCM calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

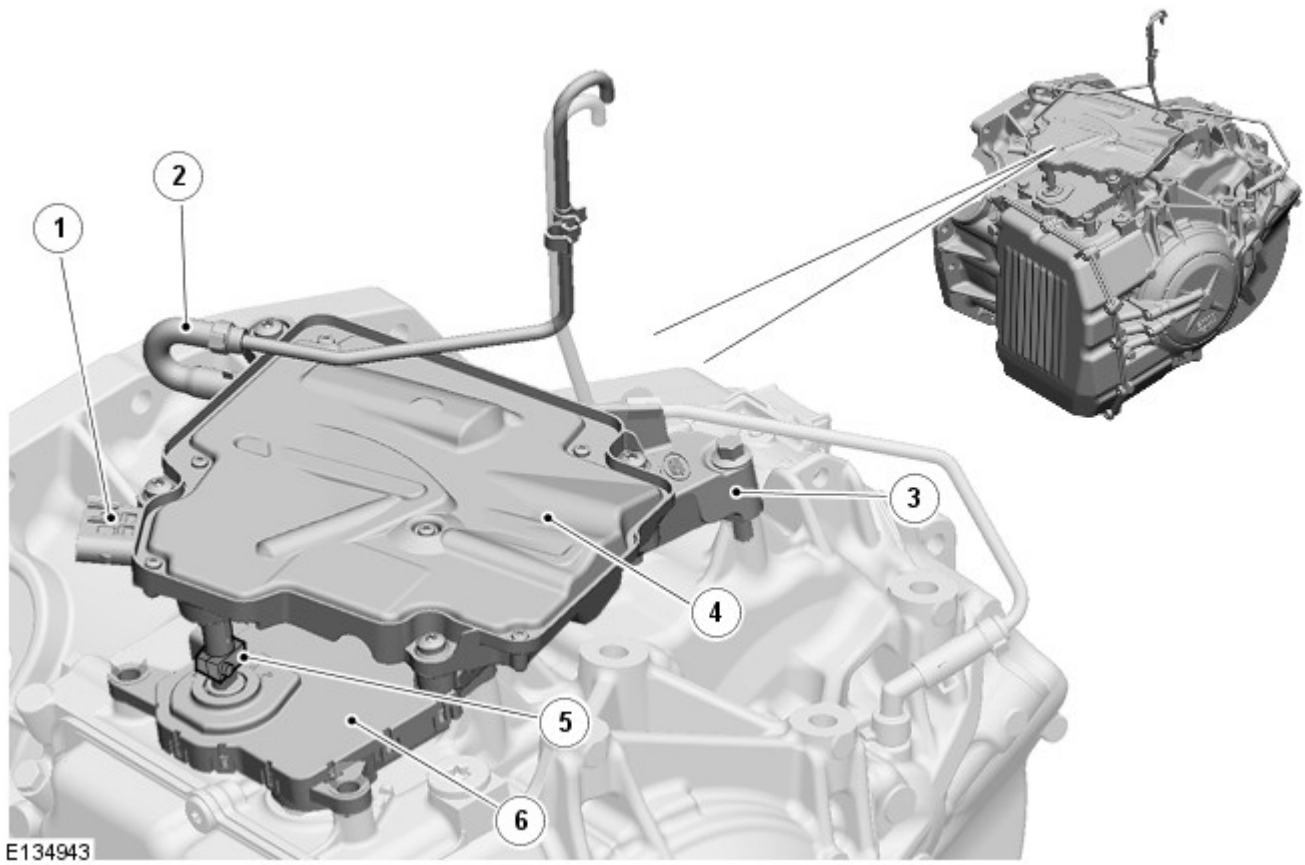
The steering angle sensor and the ABS (anti-lock brake system) module also supply data to the TCM on the high speed CAN bus system. The TCM uses data from these systems to suspend gear changes when the vehicle is cornering and/or the ABS module is controlling braking or traction control.

The TCM is positioned over the transmission selector shaft which protrudes through an oil seal on the top face of the main transmission casing. The shaft locates in a rotary position sensor and turns the sensor in the appropriate direction. The Gear Shift Module (GSM), located above the TCM, rotates the shaft when a selection is made by the driver using the rotary TCS. The rotary position sensor is a Hall effect sensor which outputs a specified voltage relating to the selected TCS position.

The transmission is controlled by a 'shift by wire' system. The TCS is connected to the TCM and the GSM on the high speed CAN bus. Driver selections made on the TCS are passed via CAN messages to the GSM and the TCM. The GSM contains a rotary actuator which responds to driver selections and rotates the selector shaft in the appropriate direction.

If the TCM, GSM or transmission requires replacement, a setting procedure must be performed using a Land Rover approved diagnostic system to allow the TCM to learn the neutral position of the transmission. The TCM uses the neutral position as a reference point for each of the gear positions P, R, N, and D.

GEAR SHIFT MODULE (GSM)



Item	Description
1	Electrical connector
2	Breather tube
3	Mounting bracket
4	Gear shift module
5	Selector shaft extension
6	Transmission control module

The GSM is mounted on a bracket on the top of the transmission, above the TCM. The GSM Is secured to the bracket with four bolts.

The GSM contains an integrated actuator which automatically controls the transmission gear selection in response to the 'gear selection' signal transmitted from the TCS. The GSM selects the requested gear based on all external parameter conditions being correct. The actuator drives a small connecting shaft which is located on top of the transmission selector shaft (above the TCM).

The GSM transmits a signal to inform the driver of the selected gear, illuminating the TCSLED (light emitting diode)

'PRNDS' and the instrument cluster displays. The gear position display in the instrument cluster has two modes; one mode displays P, R, N, D or S and the second mode displays the manual gear 1, 2, 3, 4, 5 or 6 when using the Land Rover CommandShift™ feature. The GSM monitors the TCS position, TCM engaged gear, lock status and the GSM actuator position to control the displays.

Emergency Park Engagement

The GSM has an emergency park engagement feature to place the transmission into 'Park' in the event of a system fault. This function provides an external power input from the auxiliary battery module to the GSM, operating a motor which in turn rotates a cam which releases a spring loaded mechanism, placing the transmission into 'Park'.

Park Lock Control Strategy

The GSM controls the park lock function via CAN messages to the TCS.

The park lock control strategy is processed by the GSM. Park lock is activated when the TCS is in Park unless the brake pedal is pressed and the engine is running.

Alternatively if the engine is running and the TCS is placed in Park while the vehicle speed is too high, the TCS remains unlocked. When the speed decreases below a set threshold or the engine is switched off, the TCS Park lock function is activated.

A brake pedal status signal is received by the GSM on the CAN bus from the ECM. If the ECM signal is not available the ABS module provides back up information.

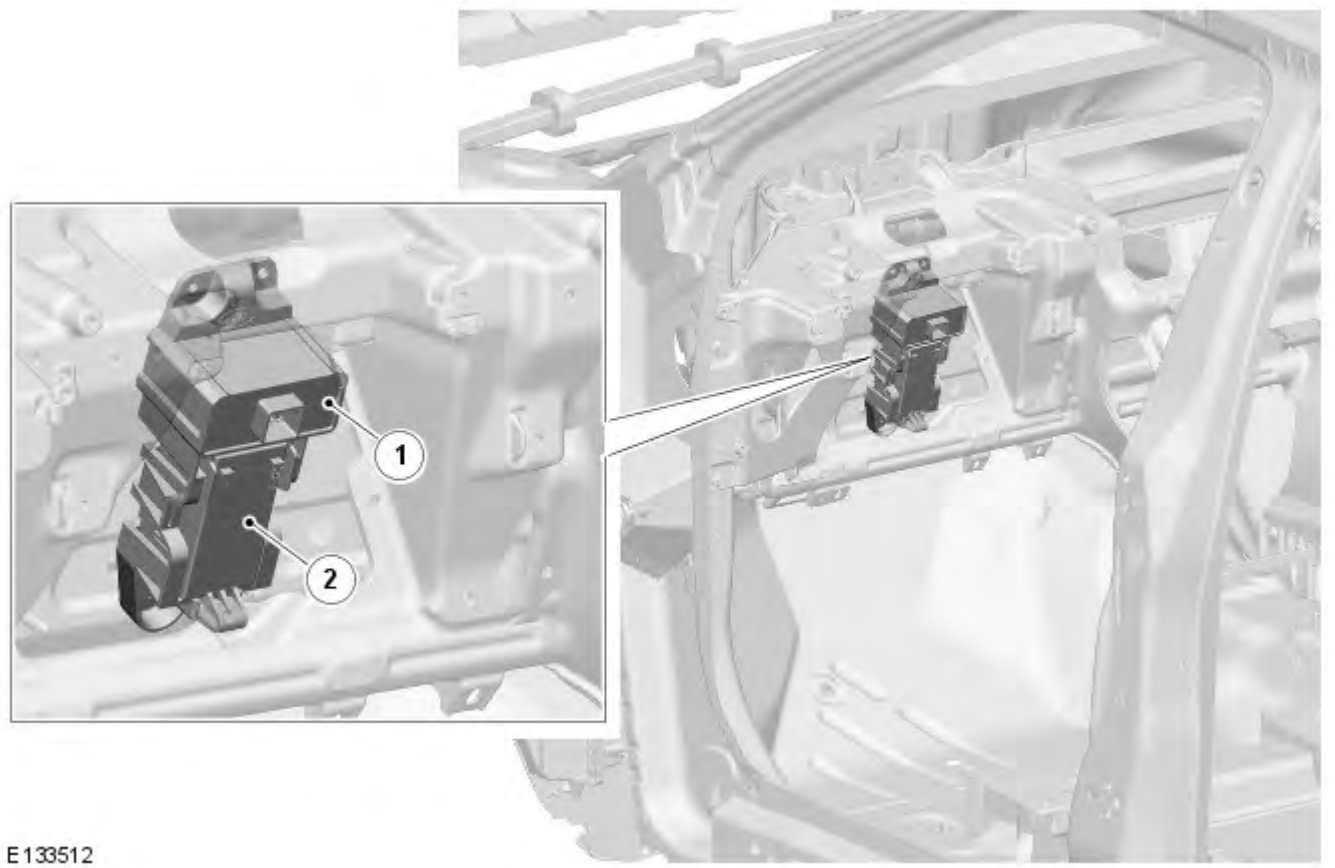
The GSM activates the Park lock when in Neutral unless the brake pedal is pressed. The lock request is ignored if the vehicle speed is greater than 6mph (10kph). When Neutral is selected, the lock is not activated for 2 seconds. This function allows the driver to move the TCS from R to D without the possibility of the Park lock being activated.

Manufacturing Mode

A new GSM is delivered in manufacturing mode. The module will function normally except Park selection is prevented.

In service, when replacing the GSM, the new module is supplied with manufacturing mode activated. The new module is programmed to the vehicle using a Land Rover Approved diagnostic system. Manufacturing mode is de-activated after the programming application learn process is complete.

Auxiliary Battery Module



Item	Description
1	Module
2	Battery

The auxiliary battery module is a back up power supply system which supports automatic transmission Park selection, in the event of a system failure, by controlling the emergency park engagement feature of the GSM.

The auxiliary battery module system consists of a reserve battery and a module. The module has the following primary functions:

- Determine when to deploy the emergency park engagement function
- Provide the input signal to the GSM to activate the emergency park engagement system
- Provide emergency power and communication to the TCM during an emergency park engagement event
- Reserve battery charging.

The auxiliary battery module manages the reserve battery charging process, keeping the voltage charge level within a narrow window. The charging strategy is designed to extend the reserve battery service life (approximately four years).

During a vehicle power interruption the auxiliary battery module supplies emergency power to the TCM maintaining a primary line of communication via the LIN (local interconnect network) bus. This function provides the auxiliary battery module with information to determine the selected gear of the vehicle transmission.

The auxiliary battery module activates the emergency park engagement feature in the event that the GSM is unable to select Park.

The emergency park engagement function activates under the following conditions:

- A mechanical problem within the primary drive in the GSM exists
- The power supply to the GSM is interrupted
- Power supply to the TCS is interrupted and the driver is unable to select Park

The auxiliary battery module monitors the following primary input signals to determine if emergency park engagement should be triggered:

- Power mode
- Vehicle speed
- Gear position

The input signals are transmitted on the high speed CAN network to the TCM which processes and sends the data to the auxiliary battery module via the LIN bus. If a fault exists on the LIN bus the auxiliary battery module uses the vehicle battery voltage as a trigger for emergency park engagement activation.

If the vehicle battery voltage drops below 10.5V, and the LIN communication is lost or corrupt, the auxiliary battery module activates the emergency park engagement function.

Diagnostics

GSM failure will primarily result in the system inability to perform gear shifts between the PRND positions. It will not be possible to complete the position learning process correctly. This will be reflected to the driver by either no LED activity or flashing of the PRND illumination position depending on the position in which the system has failed. The TCS may be locked to prevent the driver from attempting further shifts in the failure condition.

TCS failure will result in no LED activity of the PRND illumination position, refusal of the TCS to rise, or the TCS rising when the conditions are not correct. The TCS may become locked in any position.

Auxiliary battery module failure can result in a loss of LIN communication with the TCM and automatic selection of the emergency park engagement system.

All failure modes, which result in a loss of functionality, will cause a "Gearbox Fault" warning being displayed in the instrument cluster.

Emergency Park Release (Service Mode)

There is no mechanical provision to remove the vehicle from Park in the event of a system fault. However, a service mode is available which allows the TCS to rise without the engine running in order to permit Neutral selection in fault conditions.

The following procedure places the system into service mode:

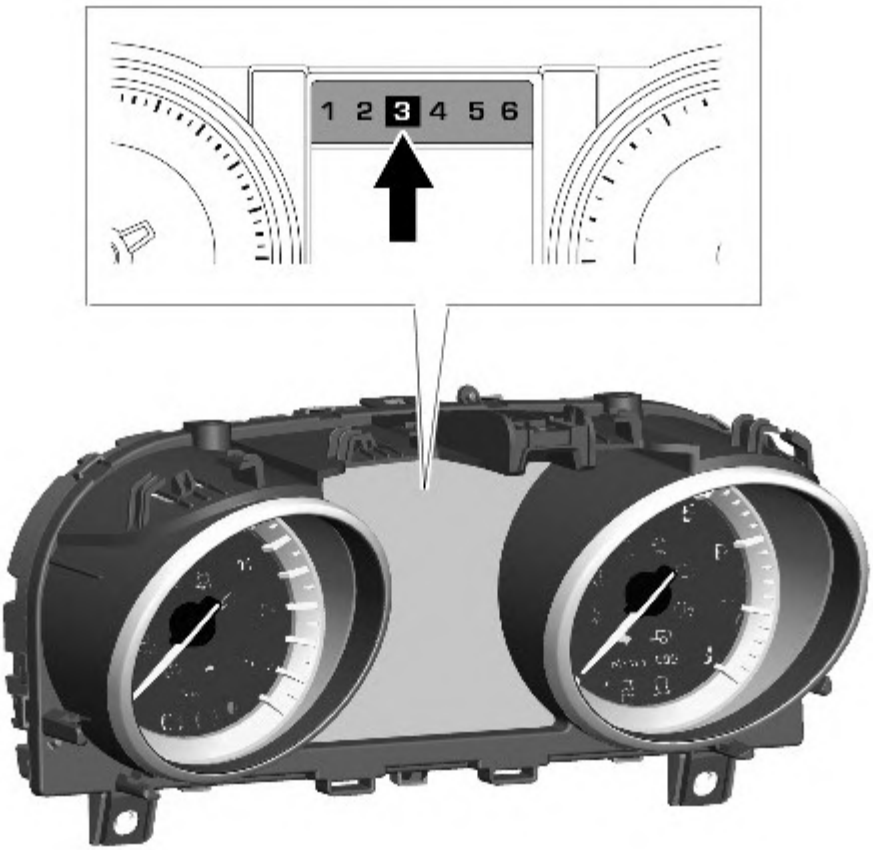
- Hold the '+' gear shift paddle and depress the brake pedal continually for 10 seconds after the ignition has been switched on
- The system will remain in service mode until the ignition is switched off or the engine is started

NOTE: If there is a system power failure and the service mode function cannot be activated the only option available to remove the vehicle from Park is to remove the GSM unit from the vehicle. Once the GSM is removed the selector shaft can be manually rotated to the Neutral position. Refer to the relevant service repair procedure for access details.

CAUTION: Before the vehicle is driven and returned to the customer, the GSM gear position learning process must be completed using a Land Rover Approved diagnostic system. This MUST be completed any time the GSM is removed or replaced to ensure that position selection accuracy is maintained. Premature wear to the transmission or failure to select Park may result if the learning process is not performed.

INSTRUMENT CLUSTER

NOTE: The following illustration shows the display when the transmission is in CommandShift™ mode. PRNDS is displayed during normal transmission operation.



E133511

The instrument cluster is connected to the TCM via the high speed CAN. Transmission status is transmitted by the TCM and displayed to the driver in the instrument cluster.
Refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp (MIL)

The MIL (malfunction indicator lamp) is located in the upper LH corner of the instrument cluster, within the tachometer. Transmission related faults which may affect the vehicle emissions output will illuminate the MIL.

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

Transmission Status Display

The transmission status display is located in the central LCD (liquid crystal display) message display in the instrument cluster. The display shows the selected P R N D S position and in the case of manual 'CommandShift™' mode, the selected gear.

DRIVING MODES

A number of different driving modes are available. Some can be selected by the driver and some are automatically initiated by the TCM to adapt to different driving conditions.

- Normal
- Sports
- Manual 'CommandShift™'
- Cooling
- Hill Descent Control (HDC)
- Cruise
- Limp home
- Coast
- Fast off recognition
- Uphill and Trailer
- Downhill
- Wide Throttle
- Terrain Response
- Reverse lock-out
- Kick-Down
- Shift Adapt Under Braking
- Corner Recognition
- Road Gradient Recognition
- Driver Type Recognition

Normal

Normal mode is automatically selected by the TCM when the ignition is switched on. In this mode all automatic and adaptive modes are active. Normal mode uses gear shift and lock-up maps which provide the optimum of fuel consumption,

emissions and driveability, depending on the driving style.

If the transmission is operated in sport mode or 'CommandShift™' mode and the TCS is moved back to the drive 'D' position, then normal mode operation is resumed.

Sports

Sports mode provides enhanced acceleration and responsiveness by the use of sports shift maps. This mode allows the transmission to down shift more readily and hold gears for longer at higher engine speeds.

Manual 'CommandShift™'

Manual 'CommandShift' mode allows the transmission to operate as a semi-automatic transmission. The driver can change up and down the six forward gears with the freedom of a manual transmission provided the requested gear is within the allowed engine and vehicle speed range.

Shift maps are provided to protect the engine at high speeds. The TCM will automatically change up to a higher gear ratio to prevent engine overspeed and change down to a lower gear ratio to avoid engine laboring and stalling.

When kick-down is requested the TCM shifts down to the lowest available gear. When the vehicle is stationary, the driver can select 1st or 2nd to start off.

Upshifts (+) are optimized for performance via the short shift function, resulting in firmer feeling shifts than in automatic mode. Downshift requests (-) utilize a throttle 'blip' during the shift, resulting in an improved shift feel.

Temporary Manual Gear Selection

With the TCS in the 'D' position, manual mode can be directly accessed by the single action of operating one of the steering wheel paddle switches. This allows immediate, but temporary use of the shift paddles when the TCS is in 'D'. If continued use of manual mode is required, the TCS must be moved to the Sport 'S' position to enter permanent manual mode in the currently selected gear.

If the TCS remains in the 'D' position, temporary manual mode will be held while the driver is accelerating, decelerating, cornering or continuing to request shifts using the paddle switches. The transmission will revert back to automatic operation after a short period of driving at a steady speed. Alternatively, the upshift (+) paddle can be held for approximately 2 seconds to return to automatic mode in TCS position 'D'.

Permanent Manual Gear Selection

Select the 'S' position on the TCS, permanent manual mode is then accessed by the operation of the steering paddle switches. The instrument cluster message center will show the currently selected gear. To exit from manual mode, pull and hold the upshift (+) paddle switch for approximately 2 seconds to return to automatic operation in Sport (S) mode. Alternatively, rotate the TCS to the 'D' position; the transmission will revert to 'D' automatic mode.

Manual Operation

Upshifts are performed using a brief operation of the upshift (+) paddle switch. Downshifts are performed using the downshift (-) paddle switch. The message center will display the selected gear.

The transmission will inhibit upshifts and downshifts if the requested shift would result in an engine speed outside the engine's operating range.

Commandshift™ - Additional Features

Kick-Down: - Operation of kick-down mode will override the currently selected gear. The lowest available gear will be selected for maximum acceleration and will be highlighted in the message center. Subsequent manual shifts may then be selected as usual.

Positive Torque: - Provides throttle 'blips' on downshifts, improving transmission shift quality and response.

Shift Assist: - The transmission will automatically upshift at the engine speed redline in CommandShift mode, as if operated manually. The transmission will automatically downshift, when the engine speed falls below the range for the currently selected gear. When the vehicle approaches, or comes to rest, second gear is automatically selected. Subsequent starts from standstill will occur in second gear, unless accelerator pedal demand is high or a downshift is manually selected, in which case first gear will be selected. In all cases the message center will show the currently selected gear.

During sustained braking, if a downshift is selected at a speed which would result in an engine speed outside the engine's operating range, the downshift will be delayed until the vehicle speed has reduced sufficiently for the gear selection to be made, without causing the engine speed to exceed its normal operating range.

Cooling

Cooling mode is activated when the TCM detects excessively high transmission fluid or engine coolant temperatures. When this mode is active, torque converter lock-up is activated earlier to minimize a further rise in fluid and/or engine coolant temperature and assist fluid cooling.

Hill Descent Control (HDC)

The HDC mode assists the ABS module in controlling the downhill speed of the vehicle. When HDC is active, the TCM selects the most appropriate gear for the descent to maximize engine braking.

Maximum engine braking is applied using a shift map which initiates later upshifts and early downshifts.

Cruise

When speed control is activated, the TCM receives a speed control active message on the high speed CAN bus. The TCM

activates a speed control map which minimizes up and down shifts.

Cruise mode is active when speed control is selected on and the transmission is in drive 'D', Sport 'S', HDC or a Terrain Response Grass/gravel/snow program. Unique cruise maps override the current mode to provide a smooth driving feel and mode reselection.

Limp home

If a transmission fault is detected by the TCM, the TCM adopts a limp home strategy and a message 'TRANSMISSION FAULT LIMITED GEARS AVAILABLE' is displayed in the message center. If the fault has an effect on engine emissions, the MIL in the instrument cluster will also be illuminated.

In limp home mode, P, R and N functions operate normally (if the fault allows these selections) and the TCM locks the transmission in 3rd gear to allow the driver to take the vehicle to a Land Rover dealer or approved repairer. Torque converter lock-up is disabled and reverse-lock-out will not function.

If the vehicle is stopped and subsequently restarted in the limp home mode condition, the TCM operates normally until the fault which caused the condition is detected again.

Coast

Coast mode provides earlier downshifts during coasting dependant on output shaft deceleration rate to improve driveability and refinement by avoiding negative to positive driveline torque reversal transmissions during the downshifts.

Fast Off Recognition

Fast off recognition is activated when the TCM detects that the driver has released the accelerator pedal quickly. This is detected by the TCM monitoring for a high level of negative pedal angle from ECM signals on the high speed CAN bus. If this condition is detected, the TCM holds the current gear ratio to allow the driver to complete the manoeuvre without the need for a downshift. The mode can remain active for a predetermined length of time or if the driving style remains passive.

Fast off recognition mode assists vehicle stability and is used in conjunction a lateral acceleration input during cornering to maintain the current gear until the corner is negotiated.

Uphill and Trailer

Uphill and trailer mode can be active when the transmission is operating in normal, sport or Terrain Response modes. When the vehicle is pulling a trailer or driving up an incline, the TCM detects the increased resistance by monitoring engine torque and speed signals received from the ECM on the high speed CAN bus and also transmission output shaft speed sensor signals. Uphill and trailer mode will provide downshifts to prevent a drop in transmission torque output and maintain driving force.

Downhill

Downhill mode can be active when the transmission is operating in normal, sport or Terrain Response modes. When the vehicle is descending an incline, the TCM detects a reduction in resistance by monitoring engine torque and speed signals received from the ECM on the high speed CAN bus and also transmission output shaft speed sensor signals. Downhill mode assists engine braking by selecting an appropriate gear reducing the load required on the brakes.

Wide Throttle

Wide open throttle mode operates for part throttle upshifts and kick-down upshifts. It provides consistent wide open throttle upshift performance under all driving conditions. The full engine speed range is used in all driving modes; normal, sport, hill modes and CommandShift™. Compensation is used for delays (hydraulic and electronic) in gear change request to gear change start to provide smooth changes and correct shift point correction.

Terrain Response

The Terrain Response system has a unique set of shift maps for each of the Terrain Response programs. These programs override existing modes; for example when HDC is active and the 'Sand', 'Mud and Ruts' or 'Grass/Gravel/Snow' programs are selected, a specific Terrain Response map is used, not the HDC mode shift map detailed previously.

Reverse Lock-Out

If the TCS is moved from N to R and the vehicle is travelling forwards, reverse selection is prevented if the vehicle speed is 5 km/h (3 mph) or more. When reverse lock-out is activated, the clutch (C3) is released without energizing solenoid (SLC3), preventing the transmission from selecting reverse gear.

The same strategy is applied if the vehicle is moving backwards and D or S are selected on the TCS, the selection will be prevented if the vehicle speed is 5 km/h (3 mph) or more.

Kick-Down

When D is selected and the accelerator pedal is fully depressed, the transmission will down-shift to the lowest appropriate gear. Once the accelerator pedal is returned to a normal driving position, the transmission will upshift to the highest appropriate gear. Kick-down will vary according to road speed, current gear selection and accelerator pedal movement.

Shift Adapt Under Braking

Under braking, the transmission will vary the downshift point in proportion to braking effort and road gradient. This feature works in conjunction with the positive torque function, resulting in a smoother down-shift. If Sport mode S is selected, driver type recognition will vary the activation of this feature according to driving style.

Corner Recognition

Corner recognition inhibits up-shifts during cornering to provided improved vehicle balance. If Sport mode S is selected, driver type recognition will vary the activation of this feature according to driving style.

Road Gradient Recognition

When the vehicle is driven on an uphill gradient, the transmission adapts the shift pattern to make better use of the engine power.

When the vehicle is driven on a long downhill gradient, the transmission may automatically select a lower gear to increase engine braking. Selecting Sport mode S will increase the tendency of the transmission to select a lower gear in these conditions, further increasing engine braking.

It is also possible to select a lower gear to increase engine braking using the gear shift - paddle switch.

Driver Type Recognition

In Sport mode S, the transmission monitors driving style and in combination with other vehicle systems, varies the shift schedule, fast off, corner recognition and shift adapt under braking functions according to the driving style.

TRANSMISSION FAULT STATUS

If the TCM detects a fault with the transmission system, it will enter a default (limp home) mode to prevent further damage to the transmission and allow the vehicle to be driven. If possible reverse gear will be available and also 3rd gear only.

When a fault is detected, a high speed CAN message is sent from the TCM and is received by the instrument cluster. The instrument cluster illuminates the MIL (if required) and displays an applicable message in the message center.
Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Some transmission faults may not illuminate the MIL or display a fault message, but the driver may notice a reduction in shift quality.

ENGINE SPEED AND TORQUE MONITORING

The ECM constantly supplies the TCM with information on engine speed and torque through messages on the CAN bus. The TCM uses this information to calculate the correct and appropriate timing of shift changes.

If the messages are not received by the ECM, the TCM will implement a back-up strategy to protect the transmission from damage and allow the vehicle to be driven.

In the event of an engine speed or torque signal failure, the transmission will adopt the electrical limp home mode with the transmission operating in a fixed gear.

TOWING FOR RECOVERY

WARNING: Ensure that the remote handset remains in the vehicle whilst the vehicle is being towed. Removing the remote handset will engage the steering lock, which will prevent the vehicle from steering correctly.

If the engine cannot be run whilst the vehicle is being towed, there will be no power assistance for the steering or brakes. This will result in greater effort being required to steer or slow the vehicle, and greatly increased stopping distances.

CAUTION: The vehicle should only be towed with four wheels on the ground. Towing with two wheels on the ground will result in serious damage to the transmission.

The vehicle should only be towed for a maximum of 80 km (50 miles), at a maximum speed of 80 km/h (50 mph). Towing for a greater distance, or at a higher speed may result in serious damage to the transmission.

NOTE: The recommended recovery method is by trailer or recovery vehicle.

Secure the towing attachment from the recovery vehicle to the front towing eye.

Ensure the remote handset is in the vehicle and switch on the ignition by pressing the start/stop button once.

NOTE: Leaving the ignition switched on for extended periods will cause the battery to drain.

Apply the foot brake, and move the TCS to the neutral 'N' position. With the footbrake still applied, release the park brake. If electrical power to the TCS is not available, the emergency park release procedure can be used.

The vehicle can be towed a maximum of 80 km (50 miles) at a maximum speed of 80 km/h (50 mph).

Park the vehicle on firm, level ground. Apply the park brake and move the TCS to the park 'P' position.

Switch off the ignition and remove the remote handset.

CAUTION: The vehicle cannot be towed in a reverse direction.

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Fluid Level Check

General Procedures

Check

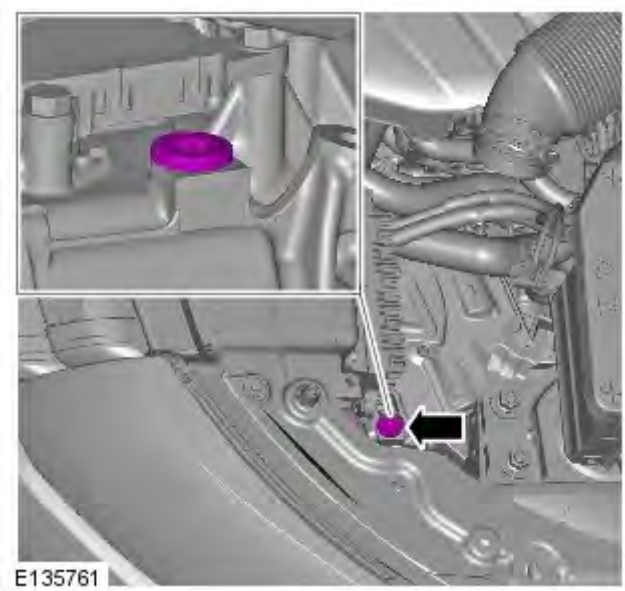
WARNING: Observe due care when draining, as the fluid can be very hot.

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

1. Make sure that the automatic transmission is in the PARK position and the handbrake is fully applied.
2. WARNING: Make sure to support the vehicle with axle stands.

   NOTE: Make sure that the vehicle is standing on a level surface.

   Raise and support the vehicle.
3. Refer to: Gear Shift Module (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).



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

   NOTE: Remove and discard the O-ring seal.

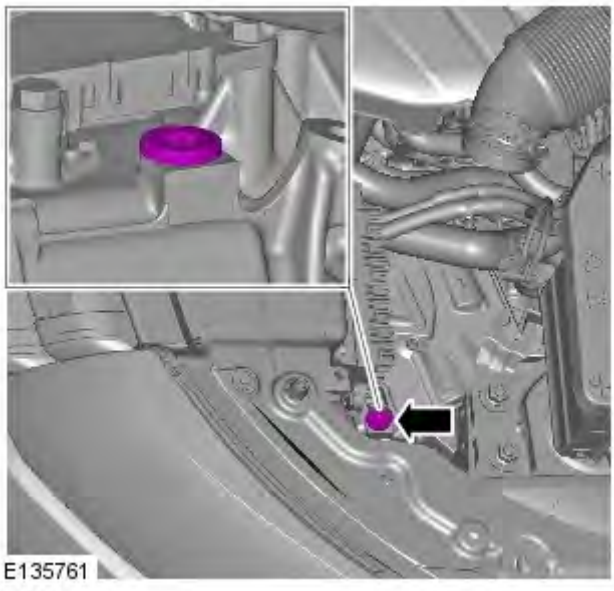
Adjustment

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

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

1. Add 0.5 litres of transmission fluid.

   Refer to: Specifications (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Specifications).



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

   Torque: 40 Nm

3. Refer to: Gear Shift Module (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

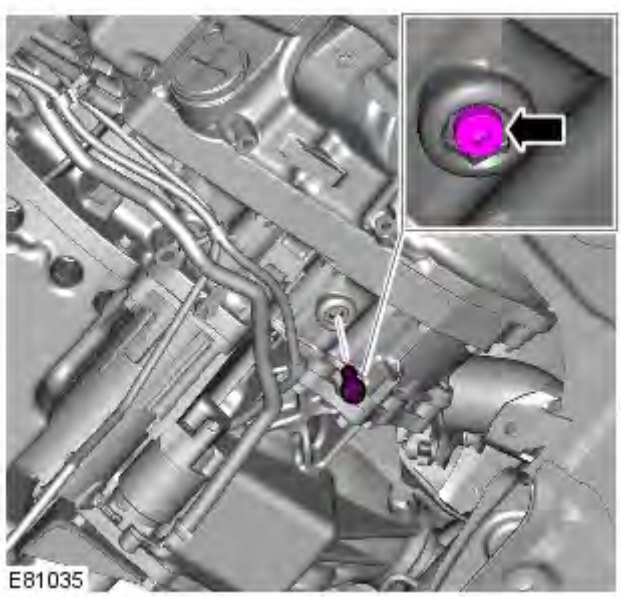
4. Connect the Land Rover approved diagnostic equipment. Start and run the engine.

5. Using the diagnostic equipment to monitor the transmission fluid temperature, allow the temperature to reach 50 to 60 degrees C.

6. Move the selector lever from the PARK position, through all the gear positions, pausing in each gear position for 2-3 seconds and return to the PARK position.

7. Raise the vehicle.

8. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

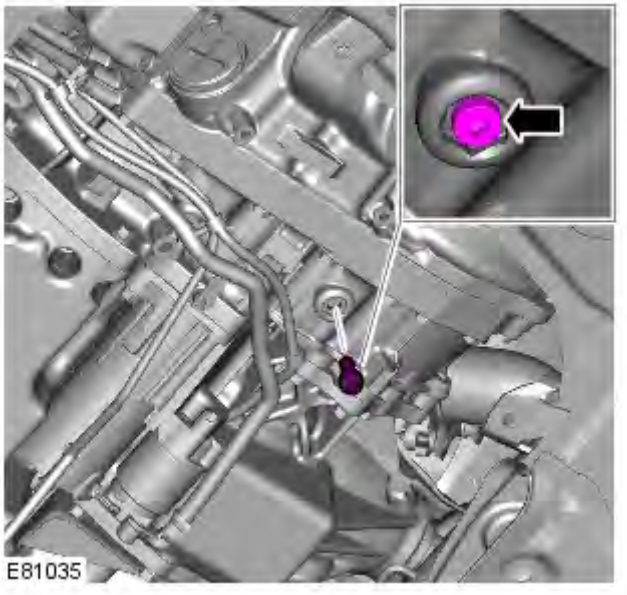


9. CAUTION: The fluid level plug and drain plug both use the same point on the transmission. The inner plug is for level indication and the outer plug is to drain the fluid.

   NOTES:

   With the engine running a small amount of automatic transmission fluid should drip out of the level plug.

   Remove and discard the O-ring seal.



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

    Torque: 7 Nm

11. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Fluid Drain and Refill

General Procedures

Draining

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

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

1. Make sure that the automatic transmission is in the PARK position and the handbrake is fully applied.

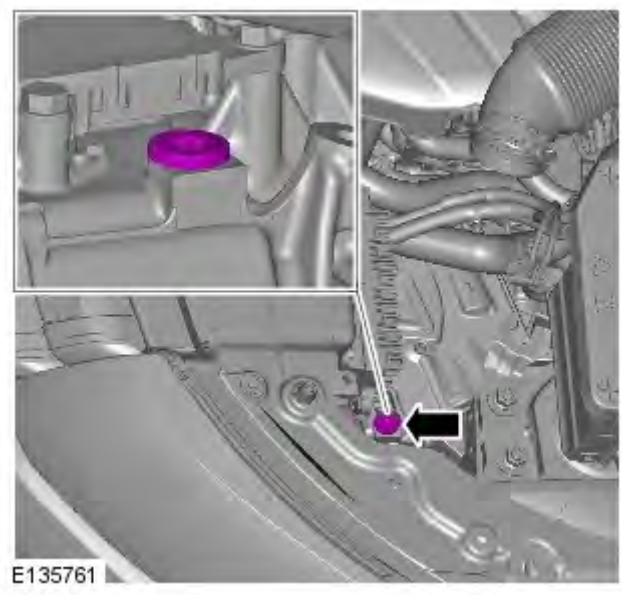
2. Refer to: Gear Shift Module (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

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

   NOTE: Make sure that the vehicle is standing on a level surface.

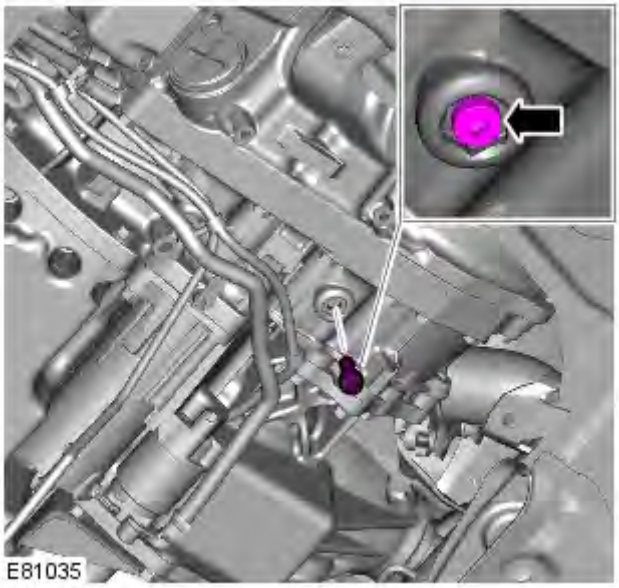
   Raise and support the vehicle.

4. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

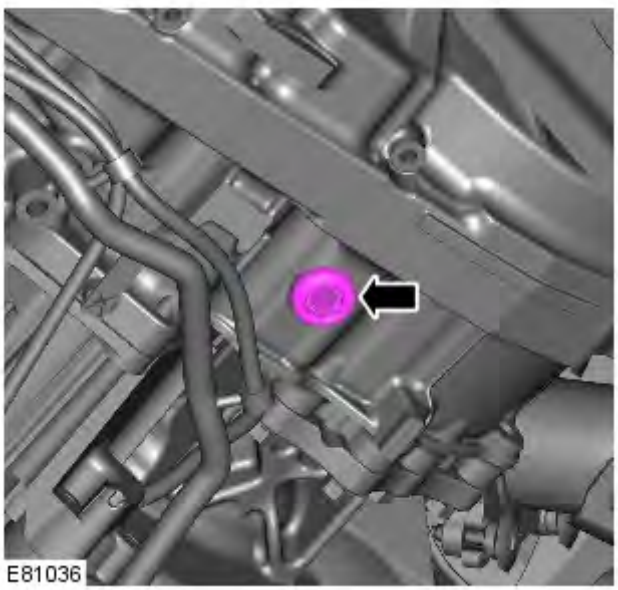


5. CAUTION: Make sure that the area around the component is clean and free of foreign material.

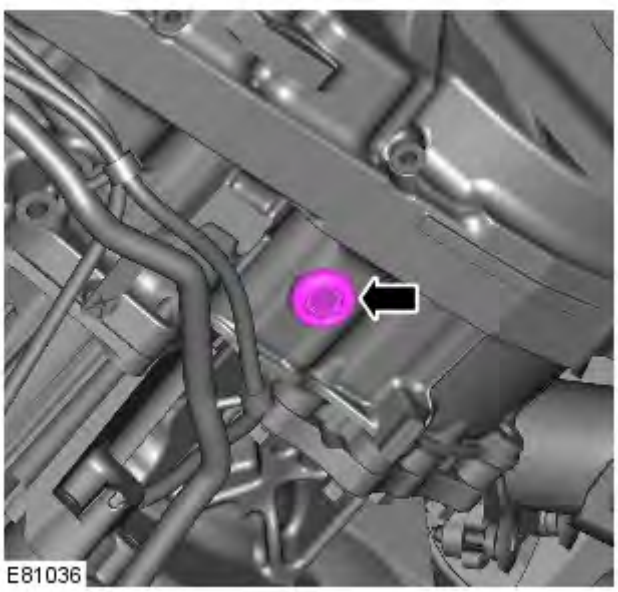
   NOTE: Remove and discard the O-ring seal.



6. CAUTION: The fluid level plug and drain plug both use the same point on the transmission. The inner plug is for level indication and the outer plug is to drain the fluid.



7. NOTE: Remove and discard the sealing washer.



8. NOTE: Install a new sealing washer.

Torque: 47 Nm

Filling

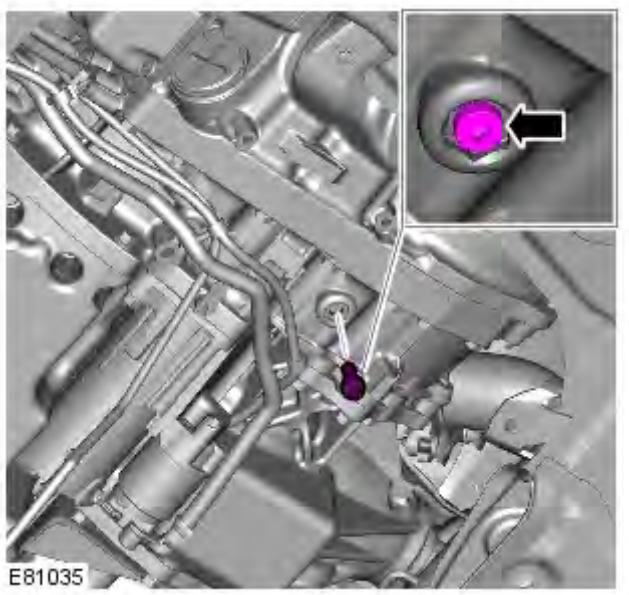
WARNING: Observe due care when draining, as the fluid can be very hot.

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

1. Lower the vehicle.
2. Fill the transmission with the correct fluid until it runs from the level plug.

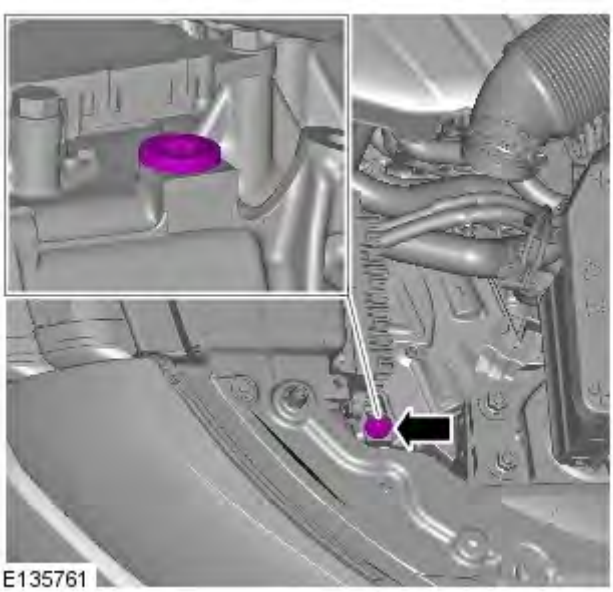
   Refer to: Specifications (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Specifications).

3. Raise the vehicle.



4. *Torque:* 7 Nm

5. Lower the vehicle.
6. Add an additional 0.5 litres of transmission fluid.



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

   Torque: 40 Nm

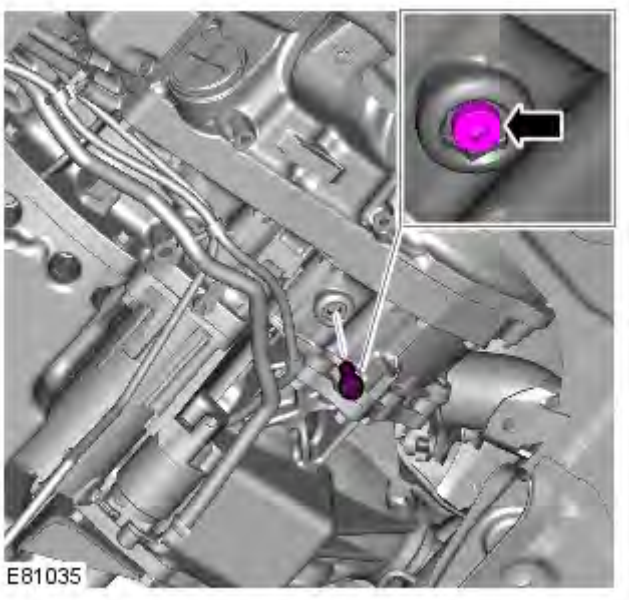
8. Refer to: Gear Shift Module (307-05 Automatic Transmission/Transaxle External Controls - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

9. Connect the Land Rover approved diagnostic equipment. Start and run the engine.

10. Using the diagnostic equipment to monitor the transmission fluid temperature, allow the temperature to reach 50 to 60 degrees C.

11. Move the selector lever from the PARK position, through all the gear positions, pausing in each gear position for 2-3 seconds and return to the PARK position.

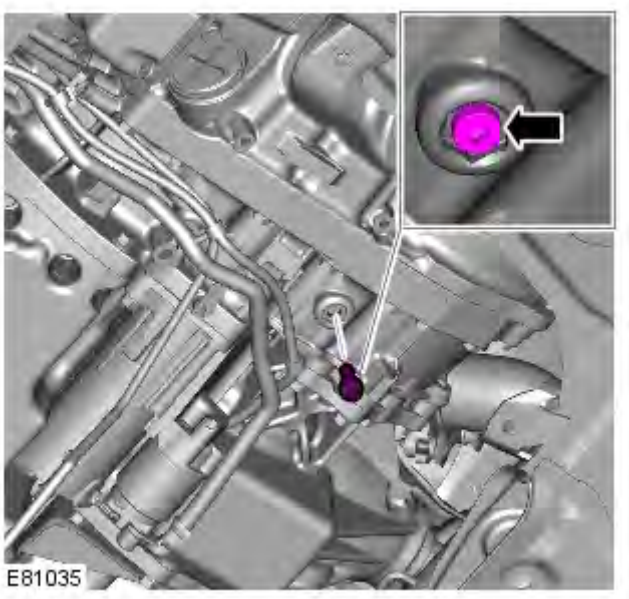
12. Raise the vehicle.



13. NOTES:

With the engine running a small amount of automatic transmission fluid should drip out of the level plug.

Remove and discard the O-ring seal.



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

Torque: 7 Nm

15. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Selector Shaft Seal GTDi 2.0L 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.

1. Disconnect the battery ground cable.

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

2. Refer to: Transmission Control Module (TCM) - GTDi 2.0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

3. CAUTIONS:

   Take extra care not to damage the mating faces.

   Make sure that a new component is installed.

Installation

1. CAUTIONS:

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

   Install the seal, flush with the transmission case.

   To install, reverse the removal procedure.

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Control Module (TCM) GTDi 2.0L Petrol

Removal and Installation

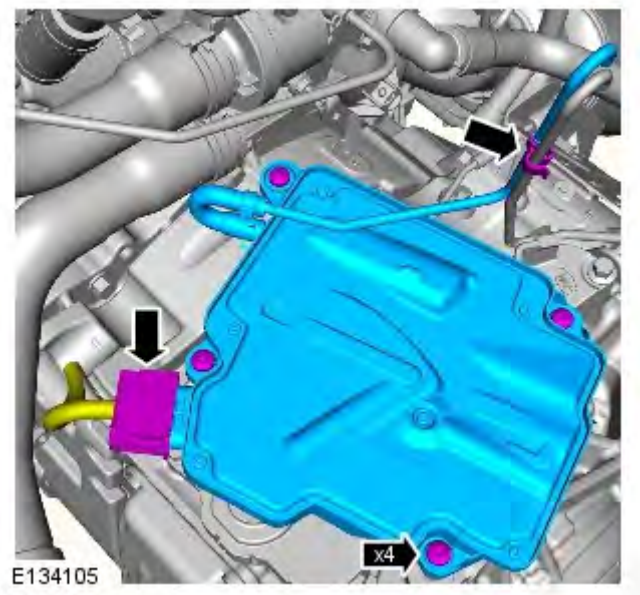
Removal

1. Disconnect the battery ground cable.

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

2. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TD4 2.2L Diesel, Removal and Installation).

3.



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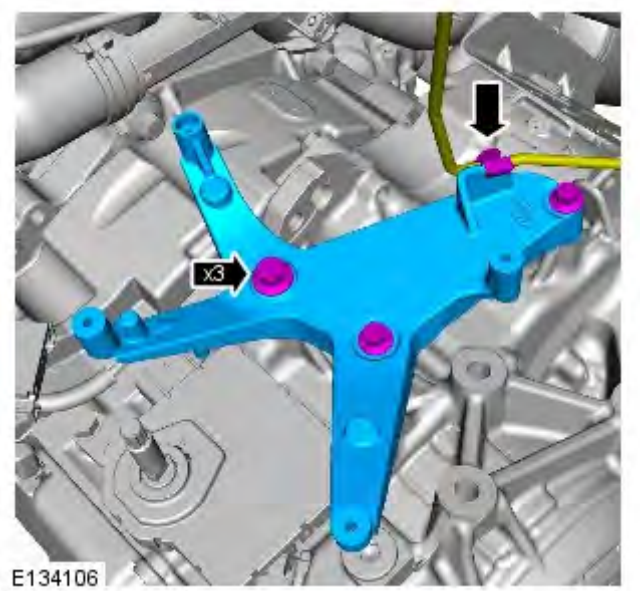
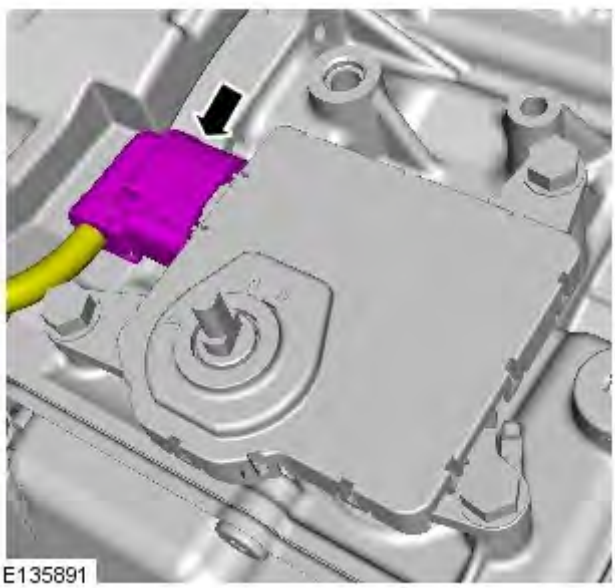
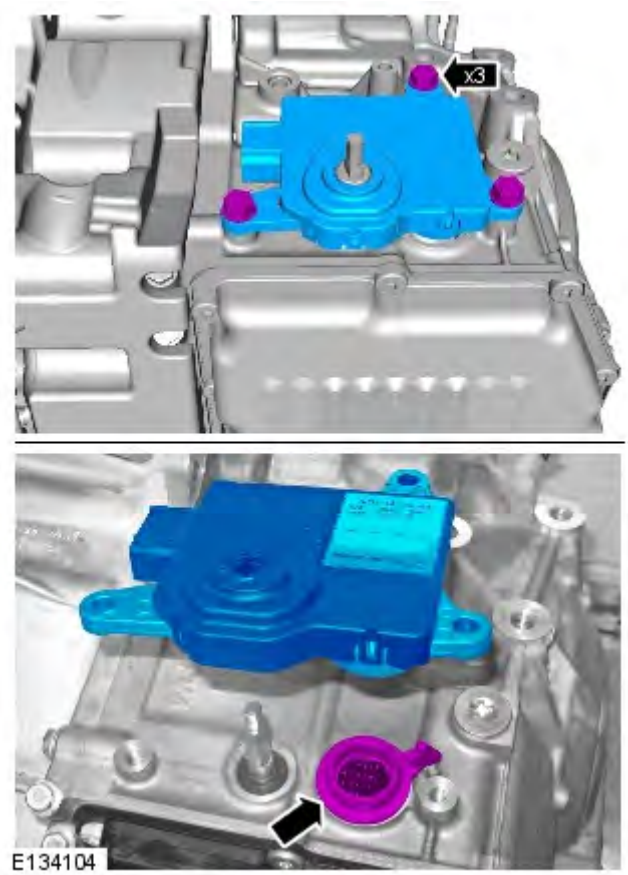


E134101

5. CAUTION: Discard the component.

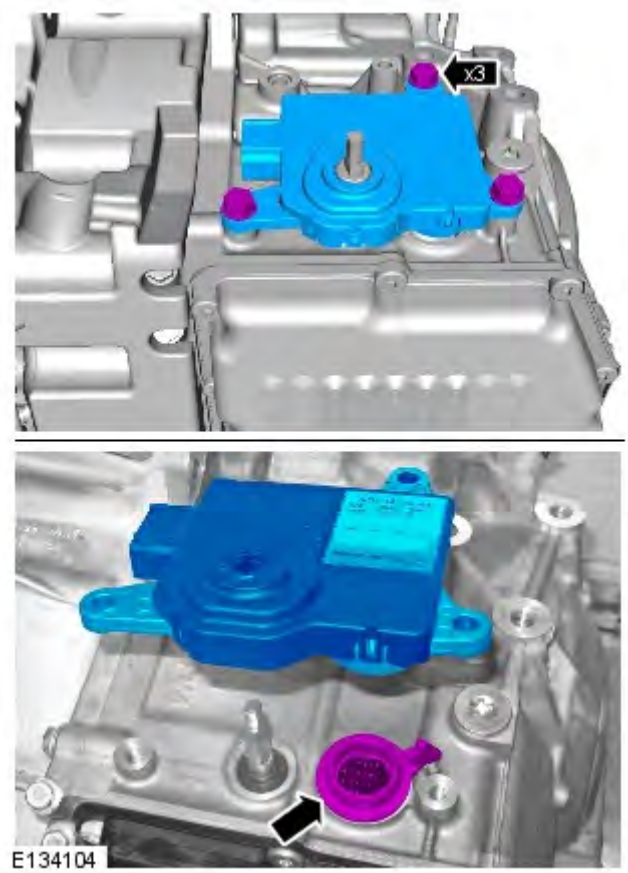

E135891

6.

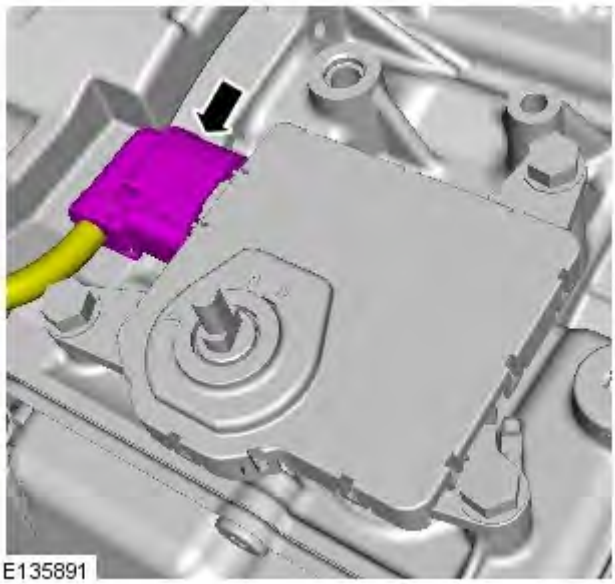


7.

Installation



1. *Torque:* 25 Nm



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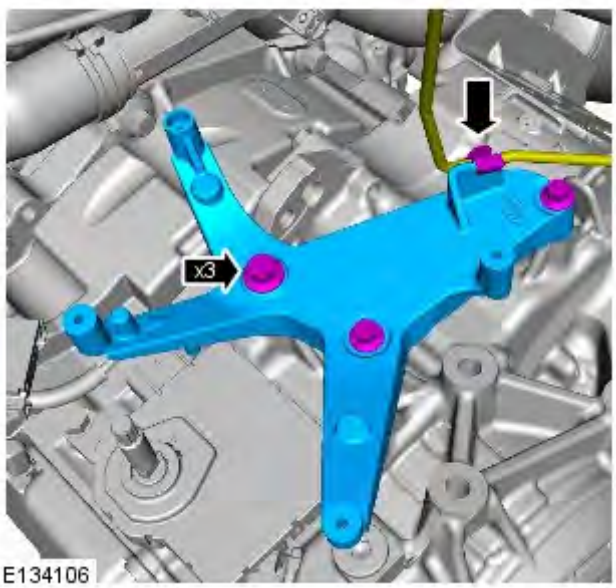
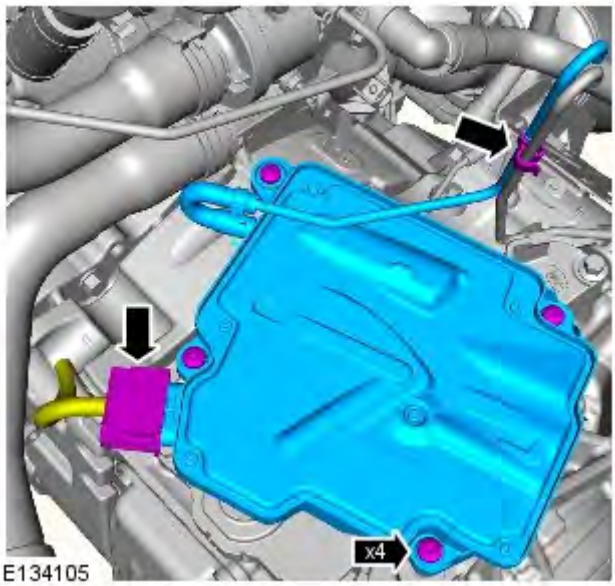


3. *Torque:*
   M10 47 Nm
   M8 24 Nm

4. CAUTION: Make sure that new components are installed.

NOTE: Do not fully tighten the clamp at this stage.



5. *Torque:* 10 Nm

6. *Torque:* 10 Nm

7. Refer to: Air Cleaner (303-12A Intake Air Distribution and Filtering - TD4 2.2L Diesel, Removal and Installation).

8. Reconnect the battery ground cable.

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

9.
   - Using the diagnostic tool, calibrate the transmission control module (TCM).
   - Using the diagnostic tool, re-calibrate the gear shift module (GSM).

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Torque Converter Seal GTDi 2.0L Petrol

Removal and Installation

Special Tool(s)

	307-597 Installer, Torque Converter Seal
	307-613 Holding Pins, Torque Converter

Removal

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

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

   Raise and support the vehicle.

2. Disconnect the battery ground cable.

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

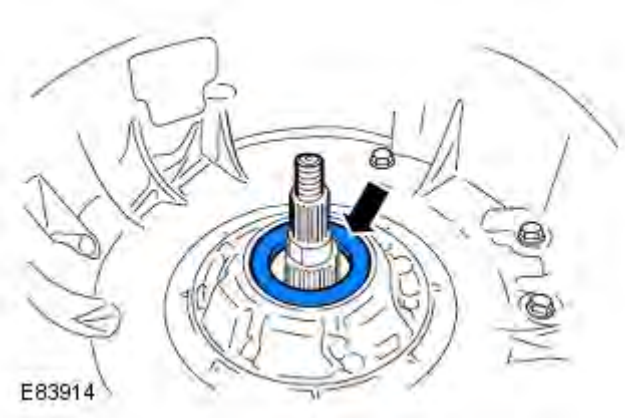
3. Refer to: Transmission - GTDi 2.0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal).

4. CAUTIONS:

   Be prepared to collect escaping oil.

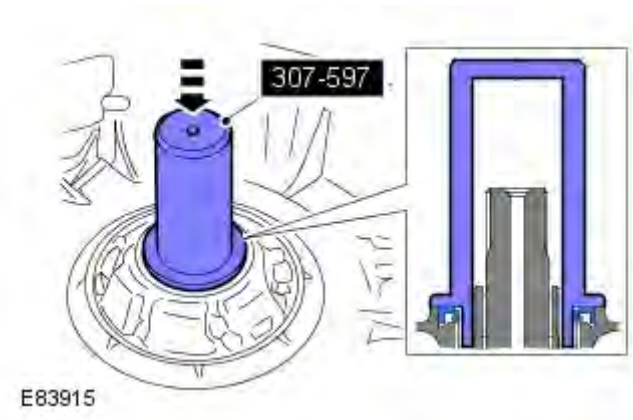
   Make sure that all openings are sealed.

   - *Special Tool(s):* 307-613



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

Installation



1. CAUTIONS:

   Extreme cleanliness must be exercised when handling this component.

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

   - *Special Tool(s):* 307-597

2. CAUTIONS:

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

   Take extra care when handling the component.

   Align the torque converter and oil pump drive before installing the torque converter.

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

   - *Special Tool(s):* 307-613

3. Refer to: Transmission - GTDi 2.0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Installation).

4. Connect the battery ground cable.

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

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Torque Converter GTDi 2.0L Petrol

Removal and Installation

Special Tool(s)

	307-613 Holding Pins, Torque Converter

Removal

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

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

   Raise and support the vehicle.

2. Disconnect the battery ground cable.

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

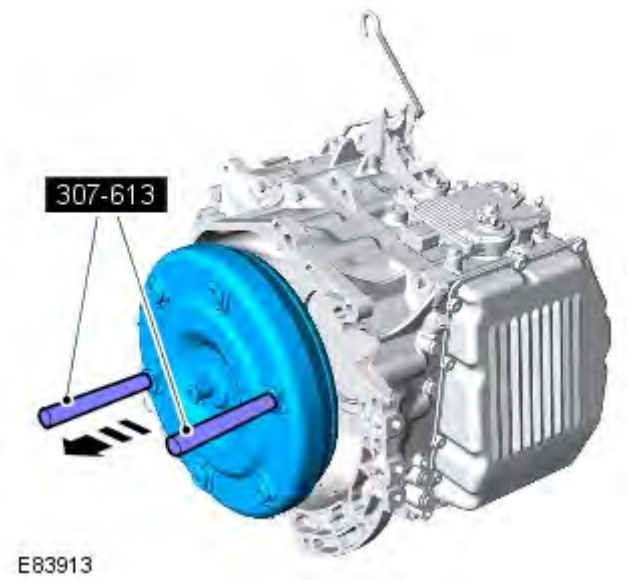
3. Refer to: Transmission - GTDi 2.0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal).

4. CAUTIONS:

   Be prepared to collect escaping oil.

   Make sure that all openings are sealed.

   - *Special Tool(s):* 307-613



Installation

1. CAUTIONS:

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

   Take extra care when handling the component.

   Align the torque converter and oil pump drive before installing the torque converter.

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

   - *Special Tool(s):* 307-613

2. Refer to: Transmission - GTDi 2.0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Installation).

3. Connect the battery ground cable.

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

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Input Shaft Speed (ISS) Sensor GTDi 2.0L Petrol

Removal and Installation

Removal

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.

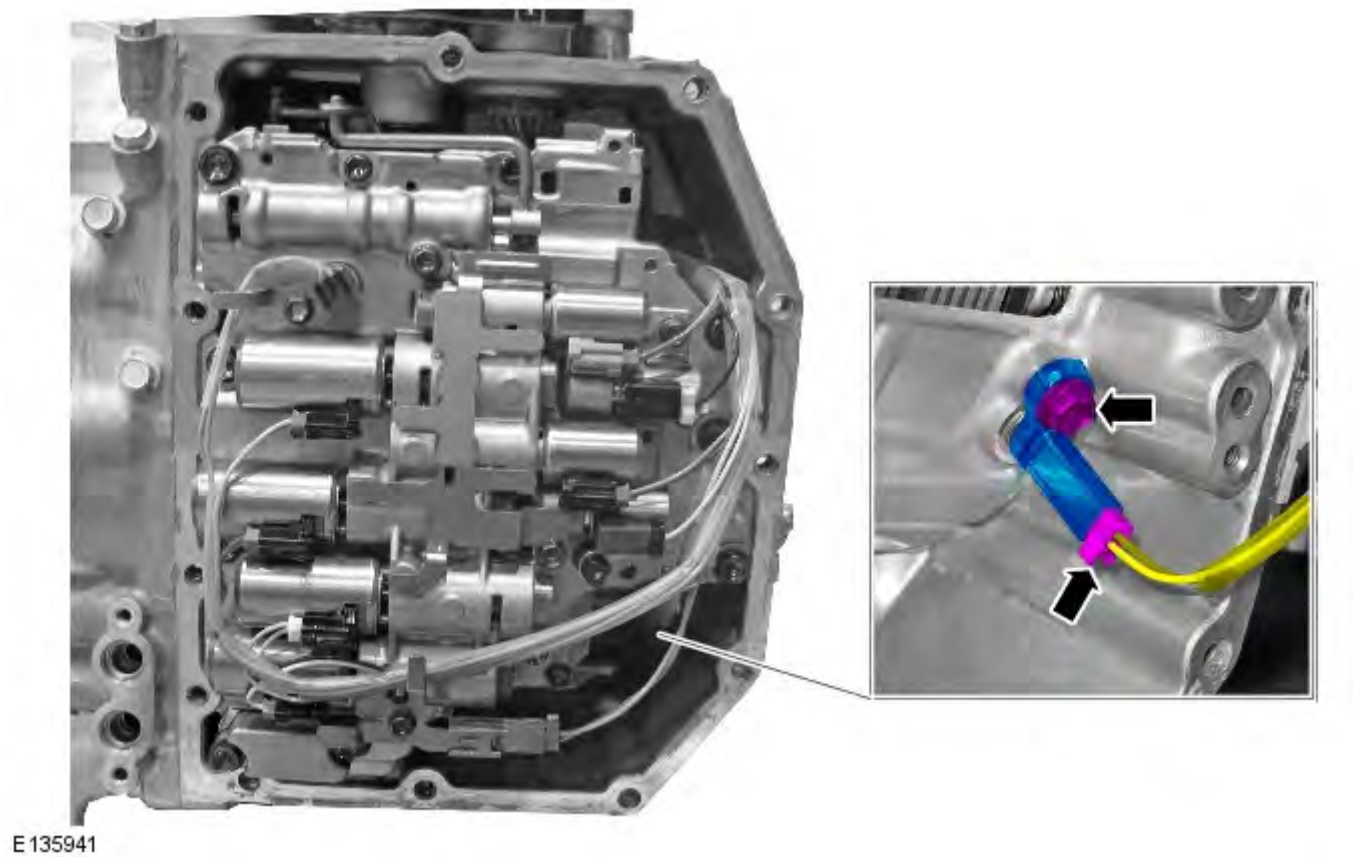
2. Disconnect the battery ground cable.

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

3. Refer to: Transmission Fluid Pan - GTDi 2 0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

4. CAUTION: Extreme cleanliness must be exercised when handling this component.

   Torque: 6 Nm



E135941

Installation

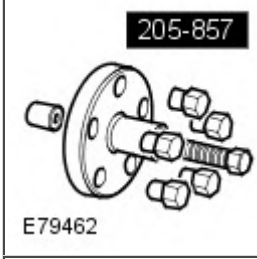
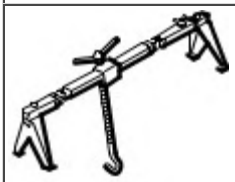
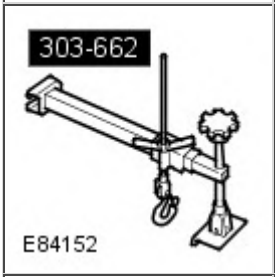
1. To install, reverse the removal procedure.

Published: 16-Apr-2013

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission GTDi 2.0L Petrol

Removal

Special Tool(s)

 E79462	205-857 Remover, Halfshaft
 303-021	303-021 Engine support bracket
 E84152	303-662 Support Beam Arm and Hook Assembly, Engine
 E136268	JLR-303-1591 Lifting Bracket, Engine - Rear

General Equipment

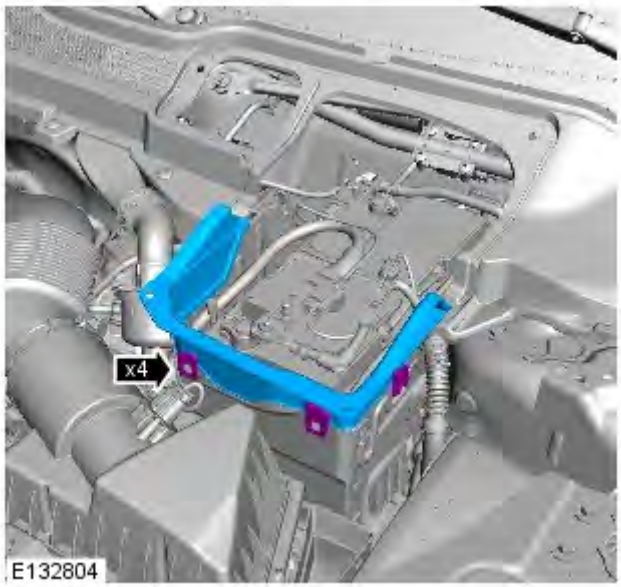
Transmission jack

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

1. Refer to: Plenum Chamber (412-01 Climate Control, Removal and Installation).

2. Refer to: Starter Motor (303-06B Starting System - GTDi 2.0L Petrol, Removal and Installation).

3.



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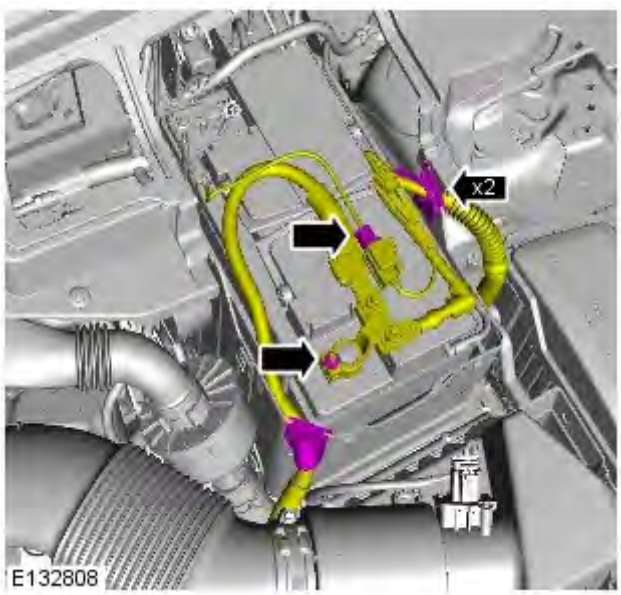

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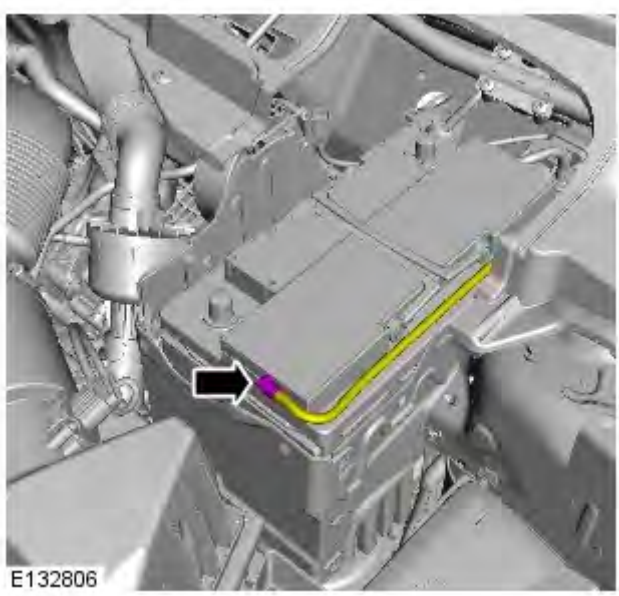
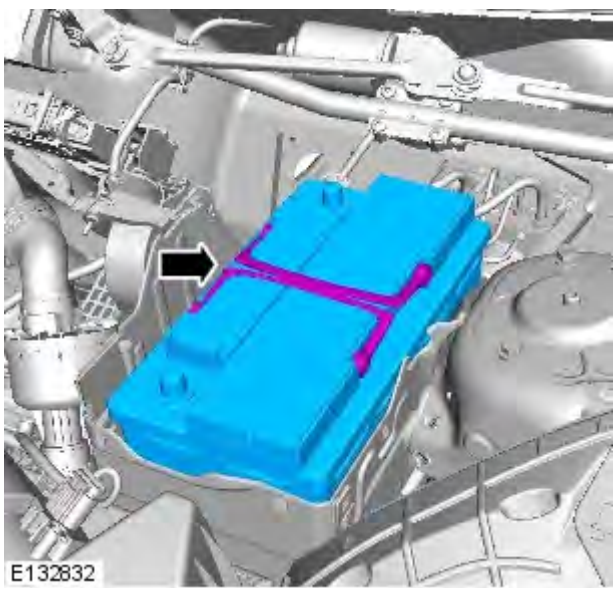


6.

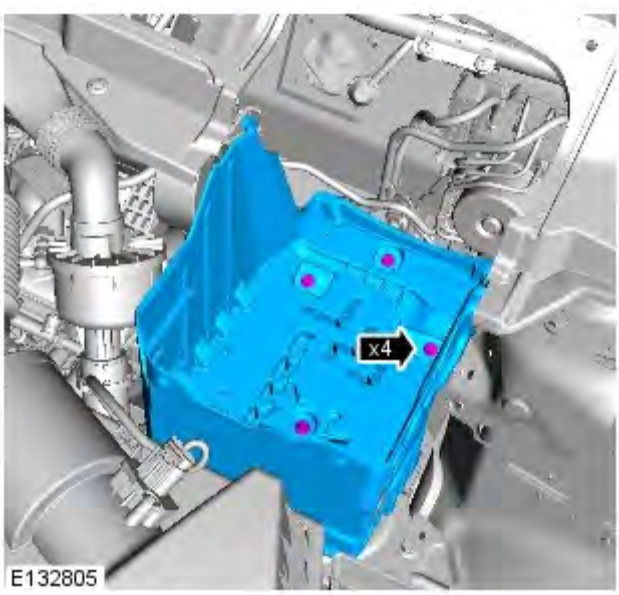
E132809

7.



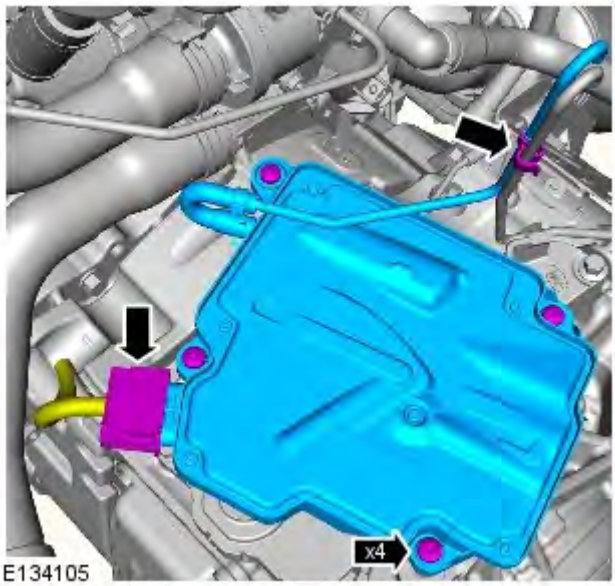
E132832

8.

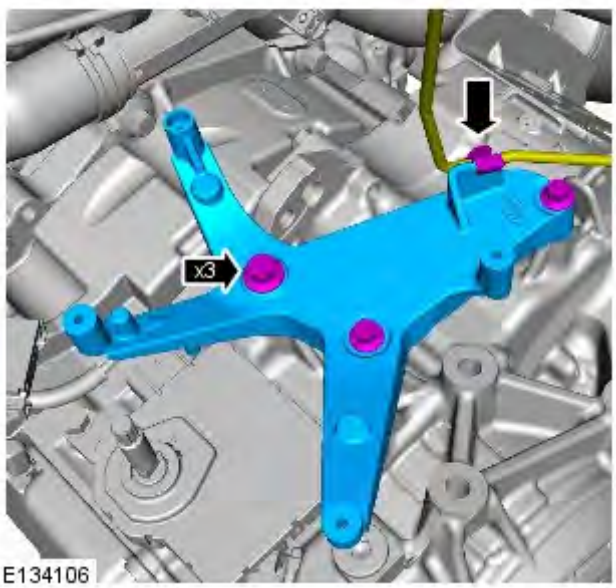


E132805

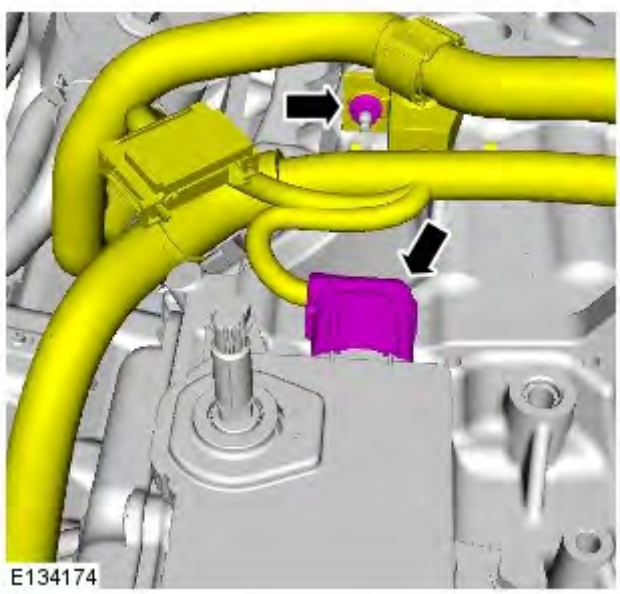
9.



10.



11.



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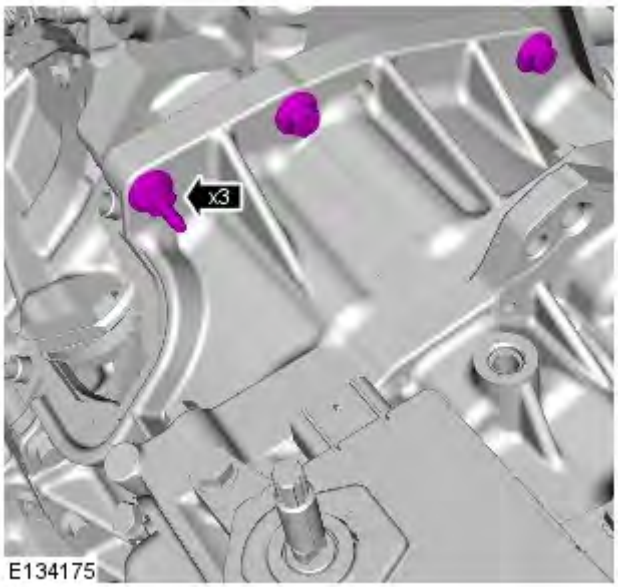
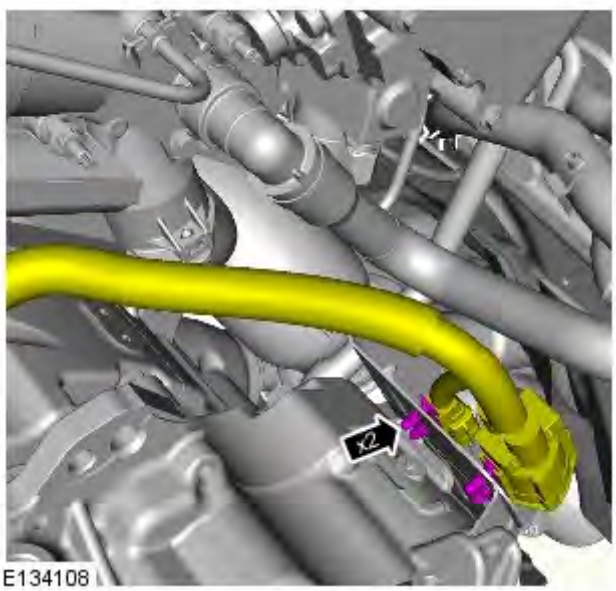
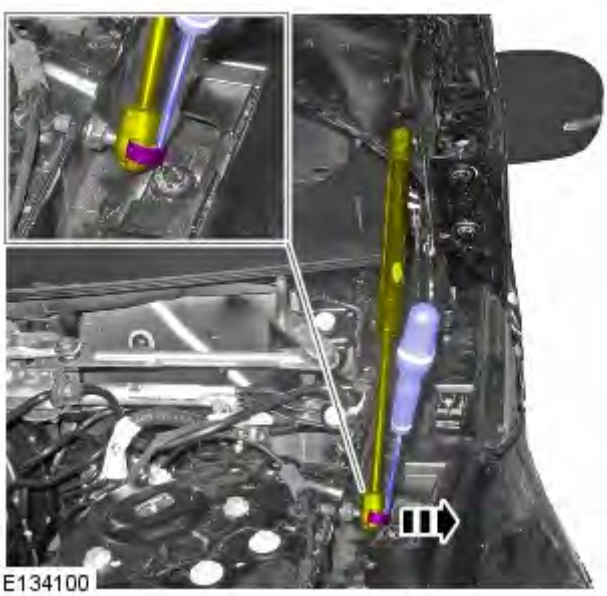


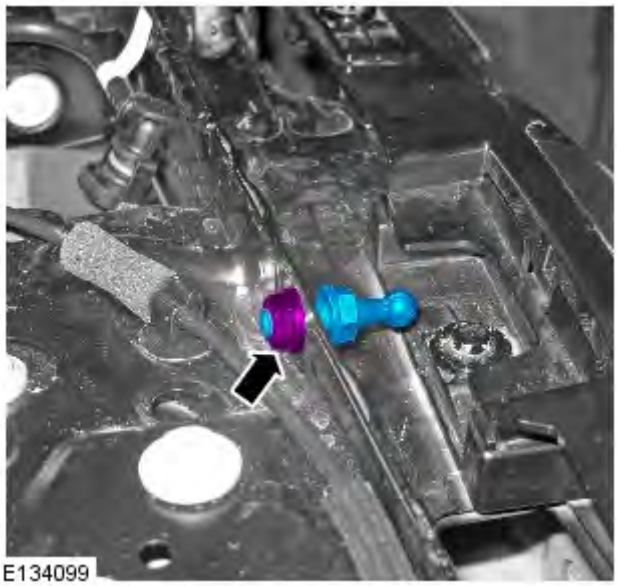
13.



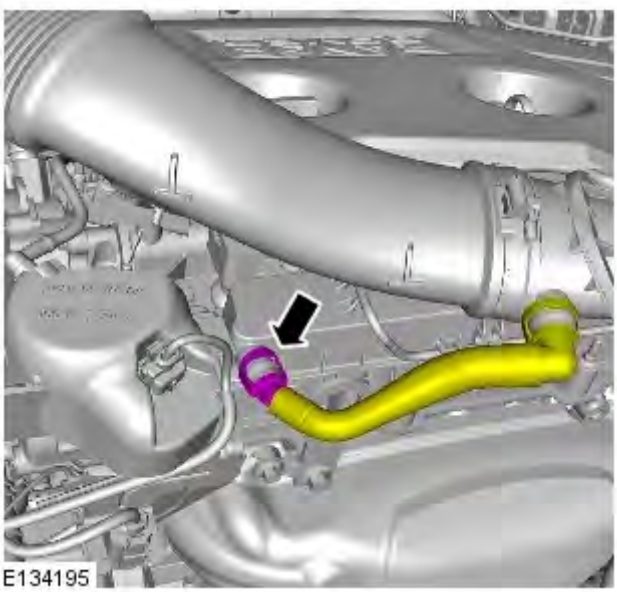
14.



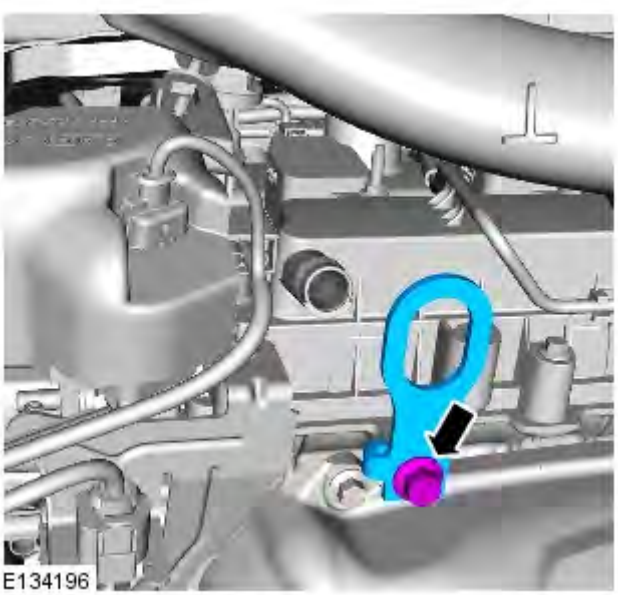
- Repeat the above step for the other side.
- Secure the hood at the highest position.


E134099

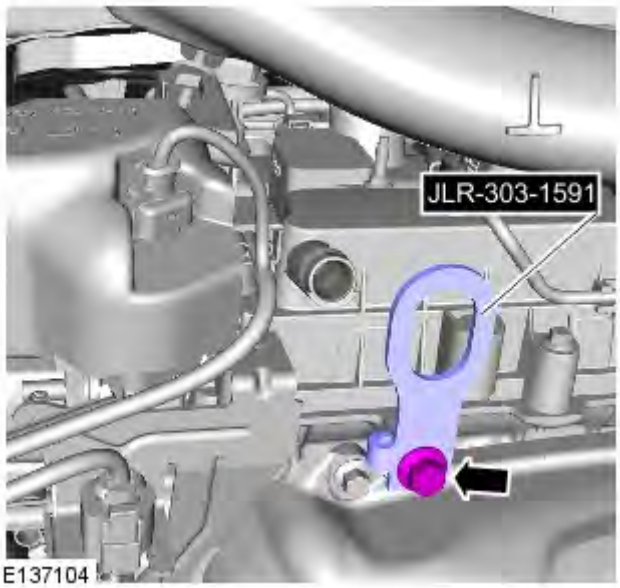
15. Repeat the above step for the other side.


E134195

16.

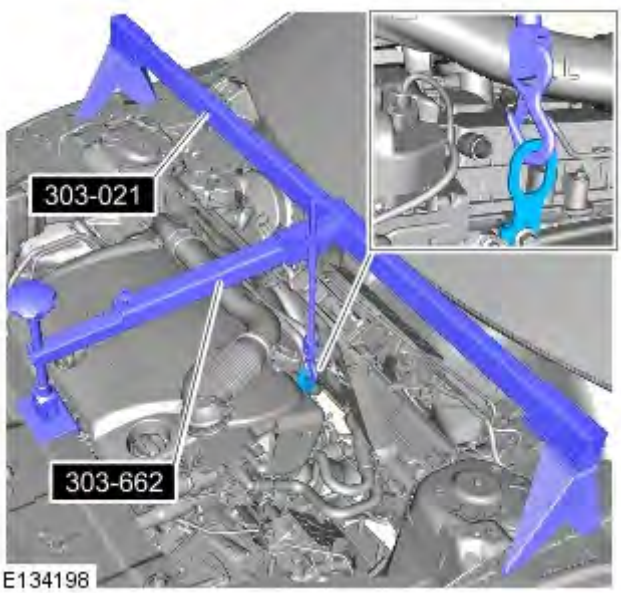

E134196

17.



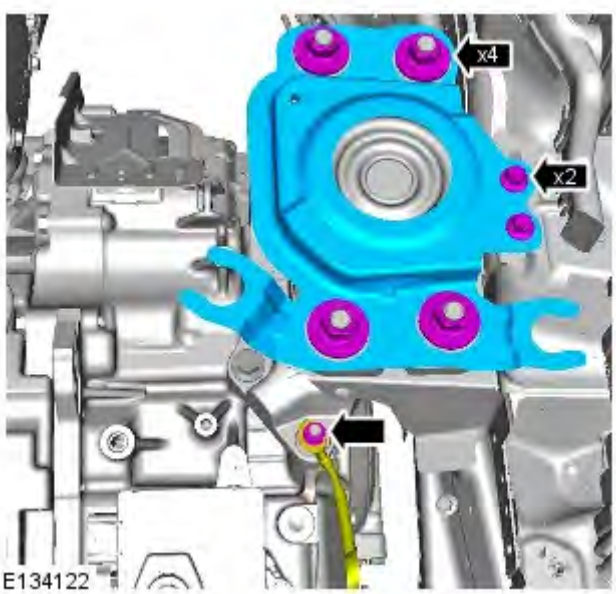
18.

- *Special Tool(s):* JLR-303-1591
  Torque: 24 Nm



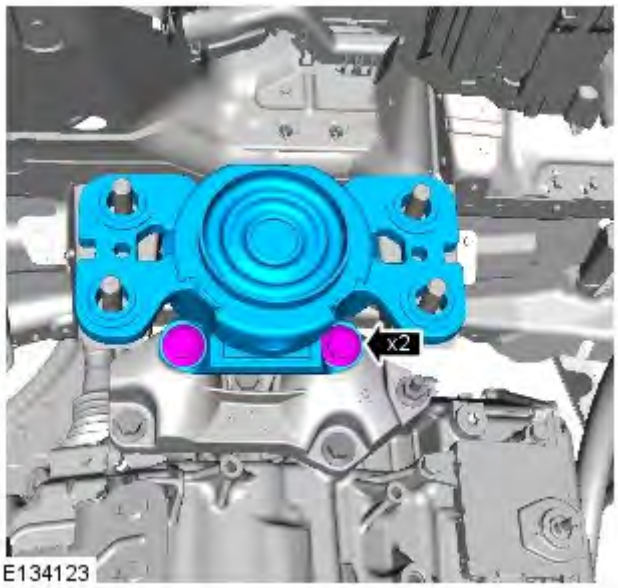
19. Support the engine.

Special Tool(s): 303-021, 303-662

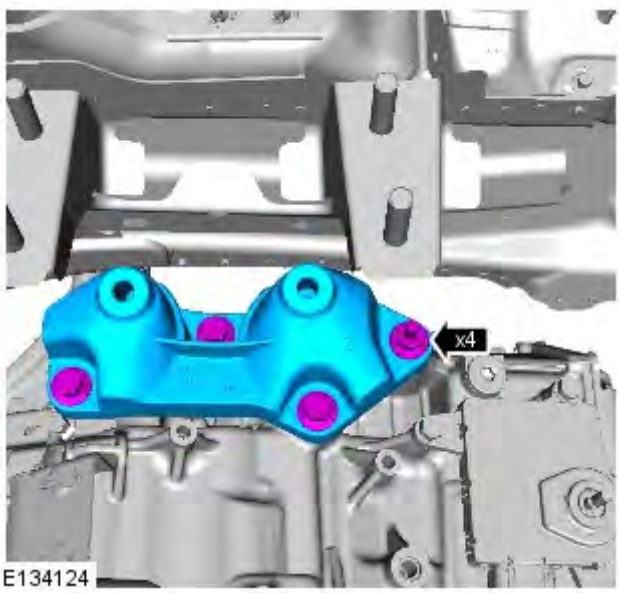


20.

21.



22.



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

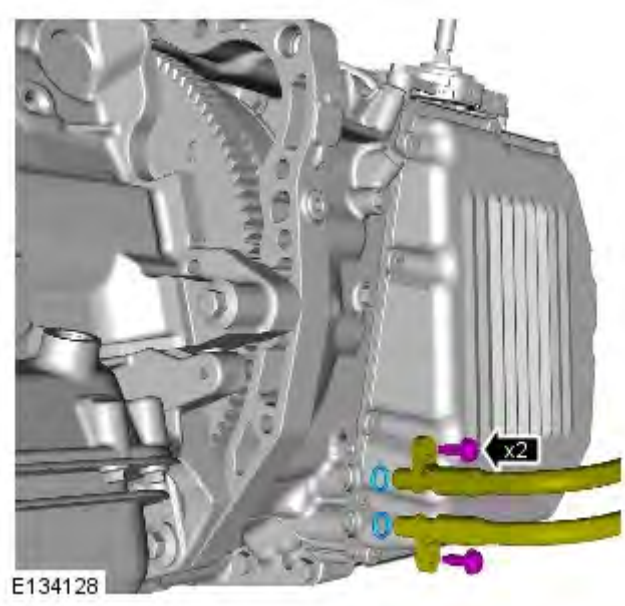
Raise and support the vehicle.

24. Remove the front wheels and tires.

Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

25. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

26. Refer to: Front Subframe (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

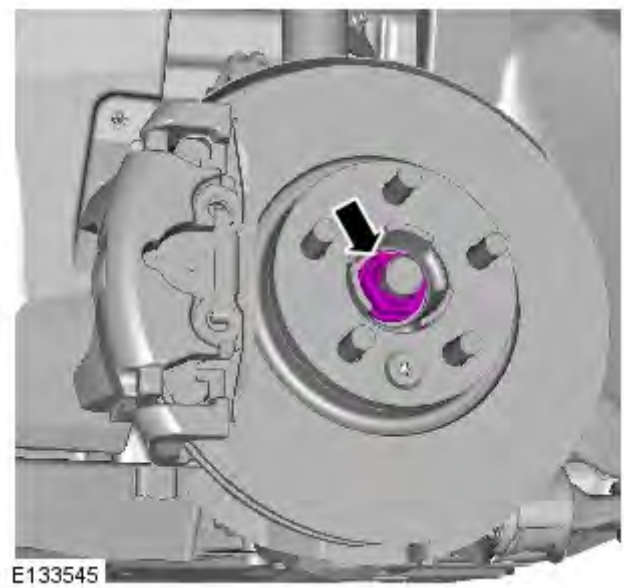


27. CAUTIONS:

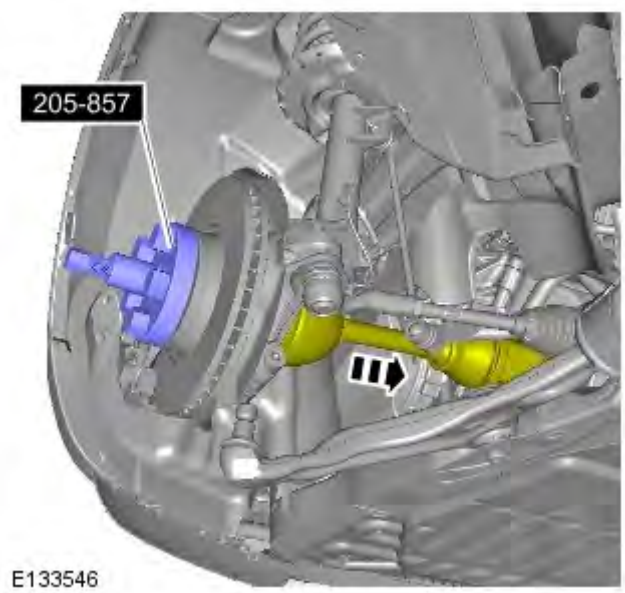
Be prepared to collect escaping fluids.

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

NOTE: Remove and discard the O-ring seals.



28. CAUTION: Discard the nut.

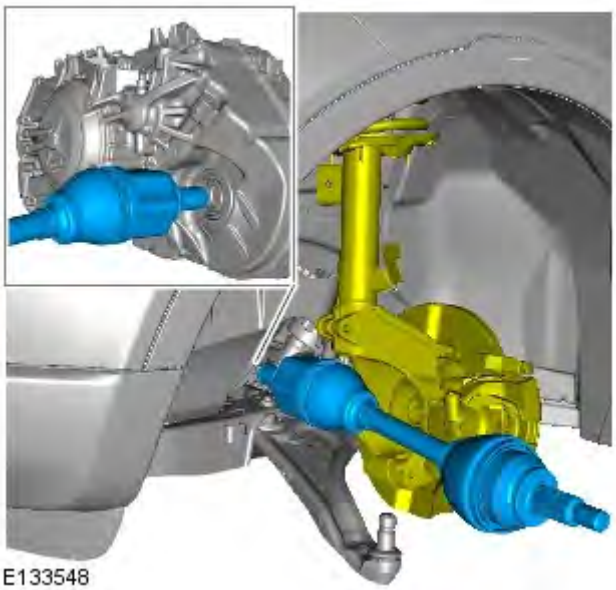


29. CAUTIONS:

Make sure that the driveshaft is supported with suitable retaining straps.

Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Special Tool(s): 205-857

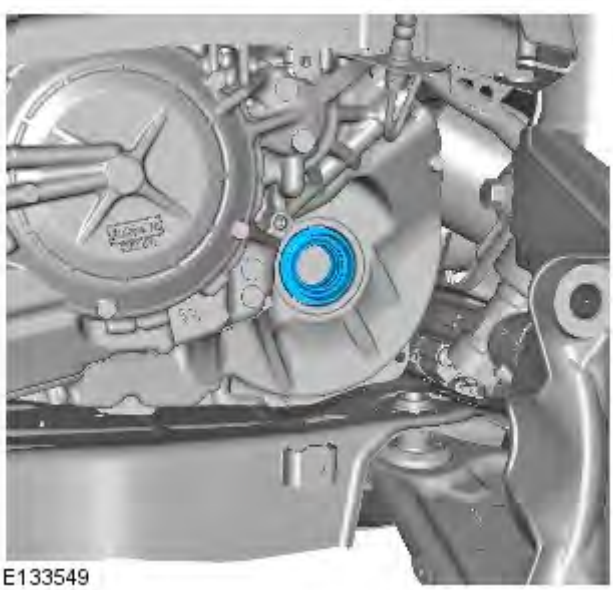

E133548

30. WARNING: Be prepared to collect escaping fluids.

CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

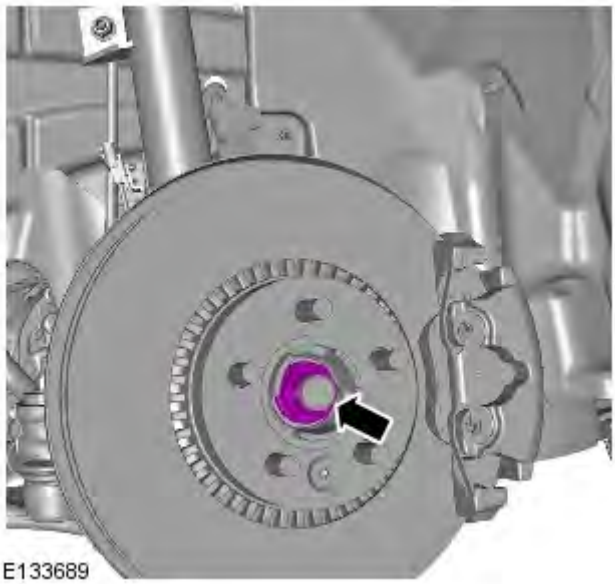
31.


E133550

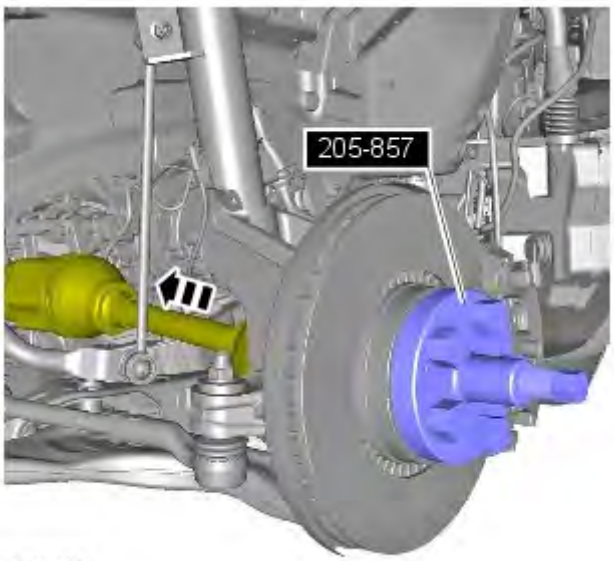

E133549

32. CAUTION: Inspect the seal, replace if damaged

If removed for access only.


E133689

33. CAUTION: Discard the nut.



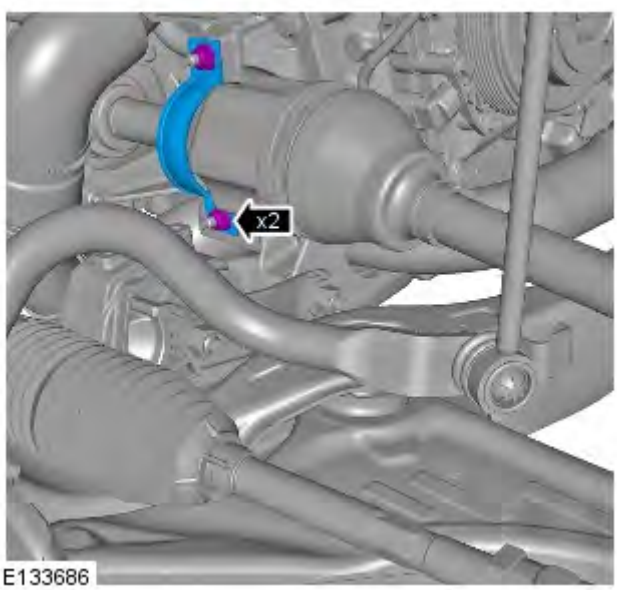
E133690

34. CAUTIONS:

Make sure that the driveshaft is supported with suitable retaining straps.

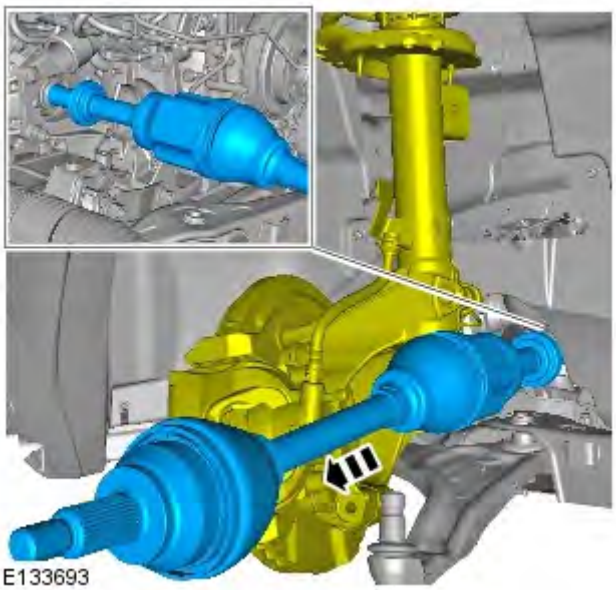
Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Special Tool(s): 205-857



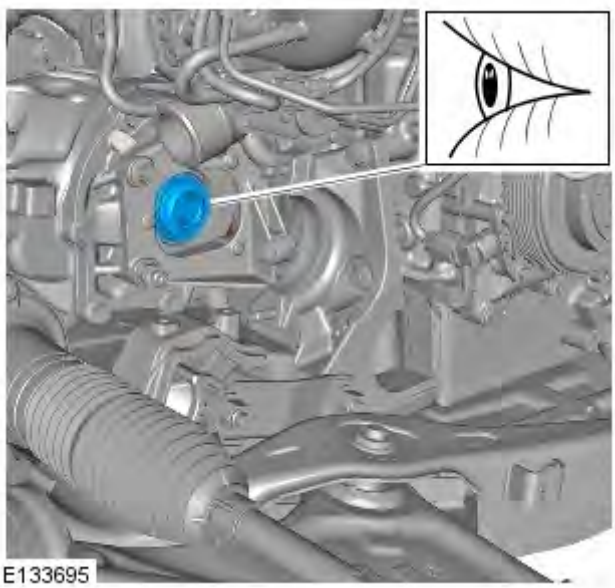
E133686

35.

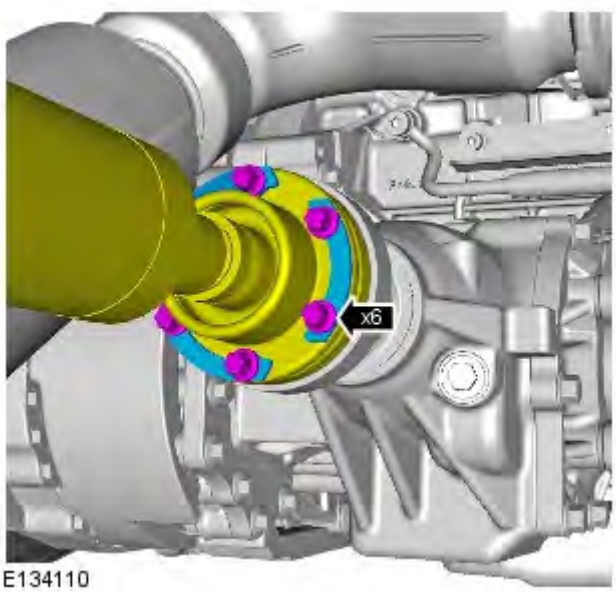

E133693

36. WARNING: Be prepared to collect escaping fluids.

CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.


E133695

37.

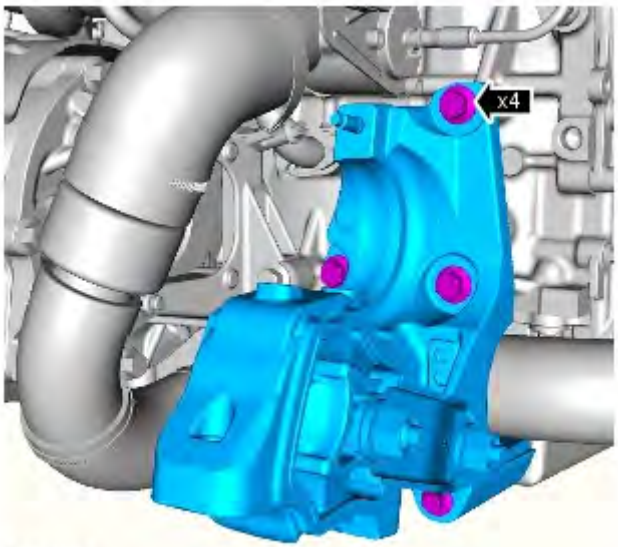


E134110

38. CAUTION: Discard the bolts.

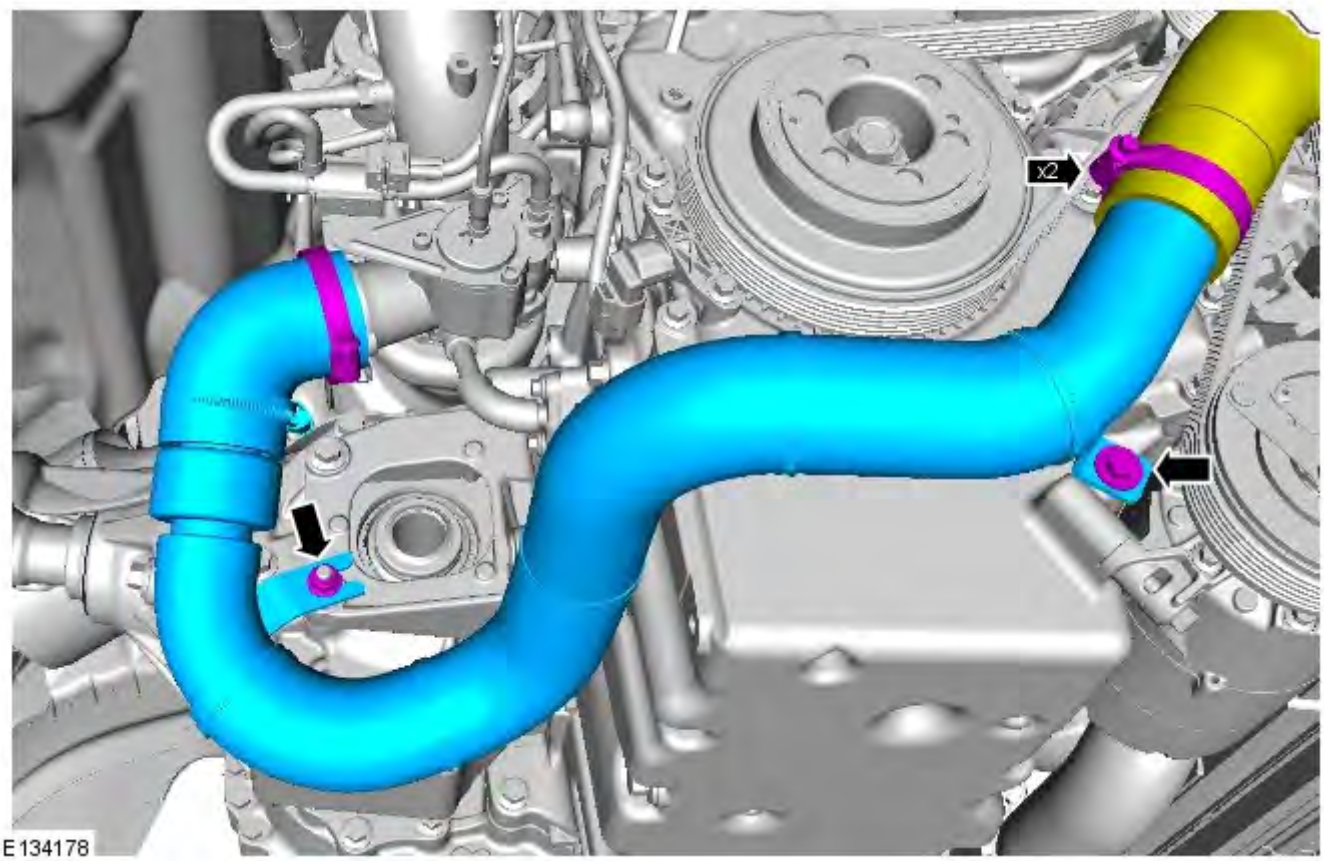
Tie aside.

39.



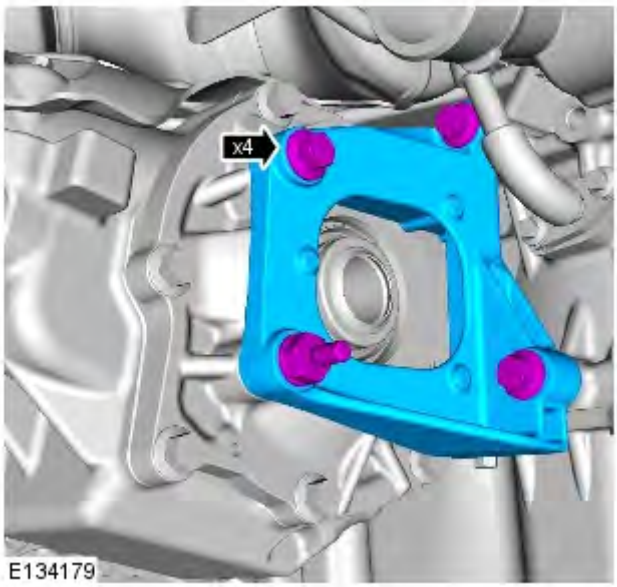
E134177

40.

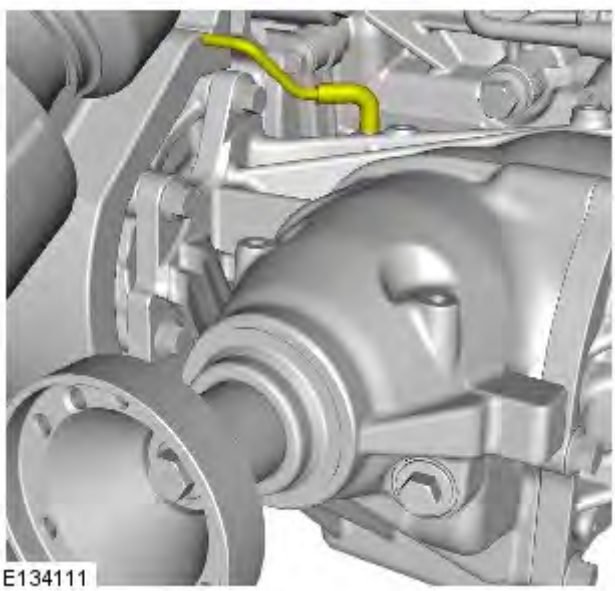


E134178

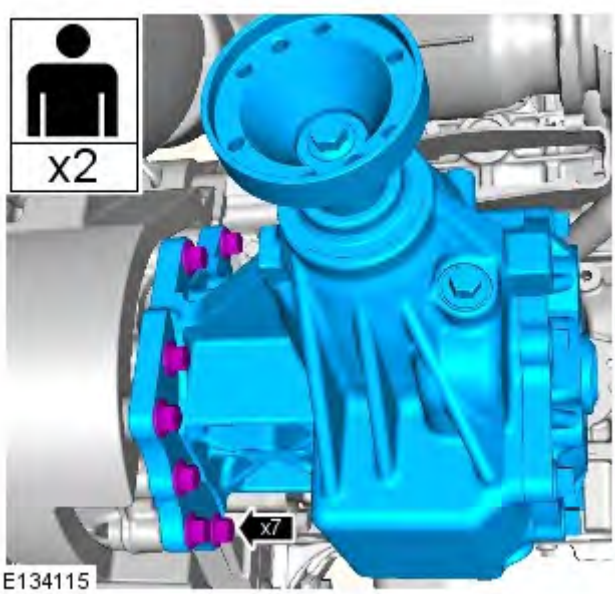
41.

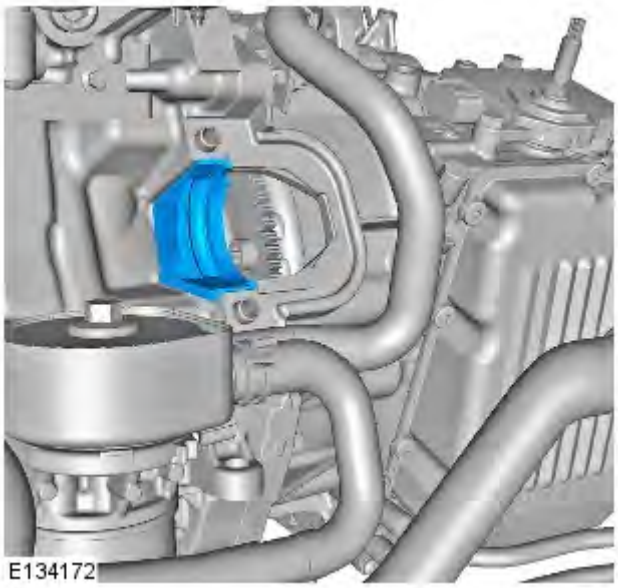


42.

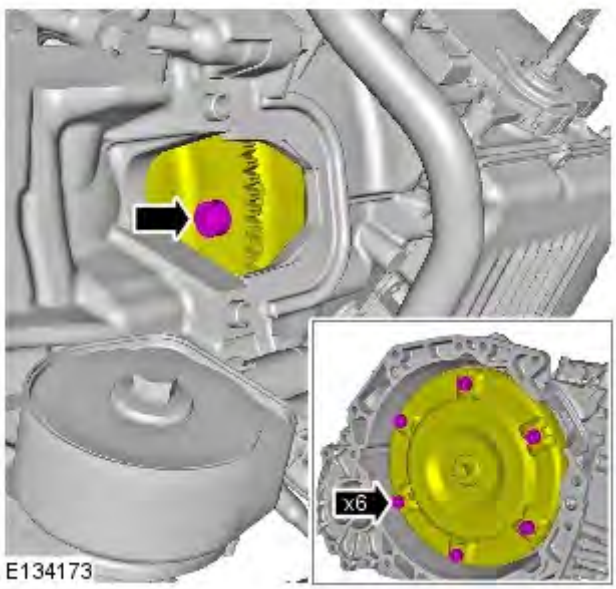


43.





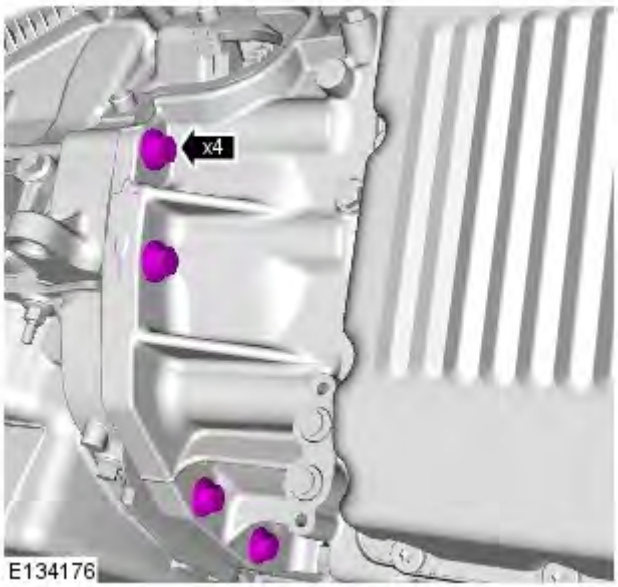
44.



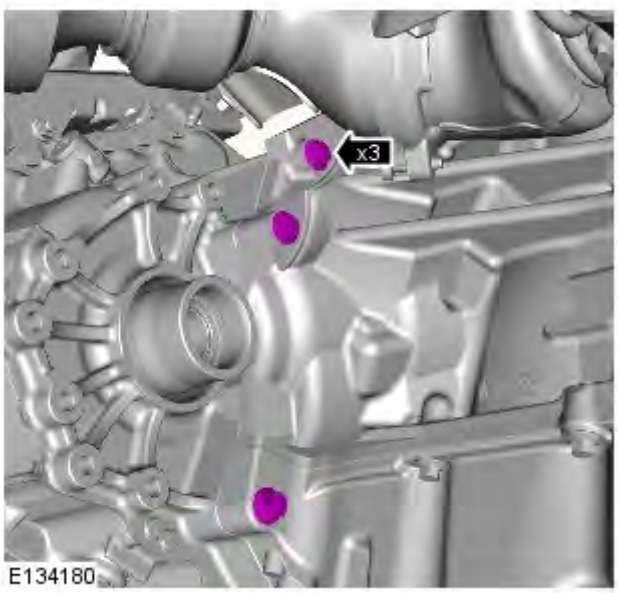
45. CAUTION: Discard the bolts.

46. *General Equipment:* Transmission jack

47.



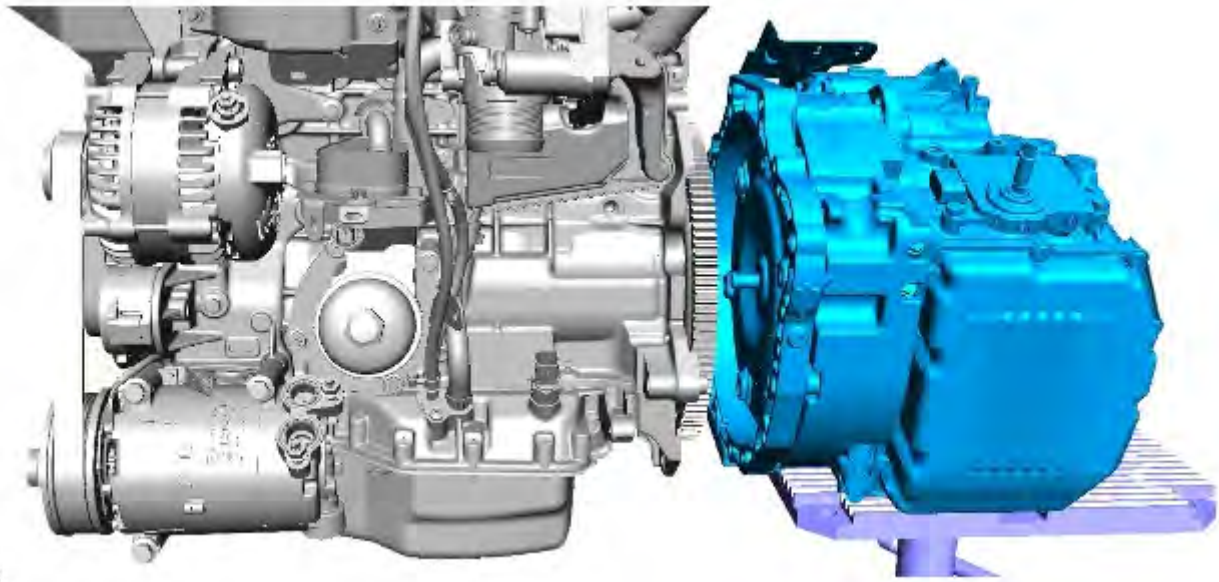
48.



49. CAUTIONS:

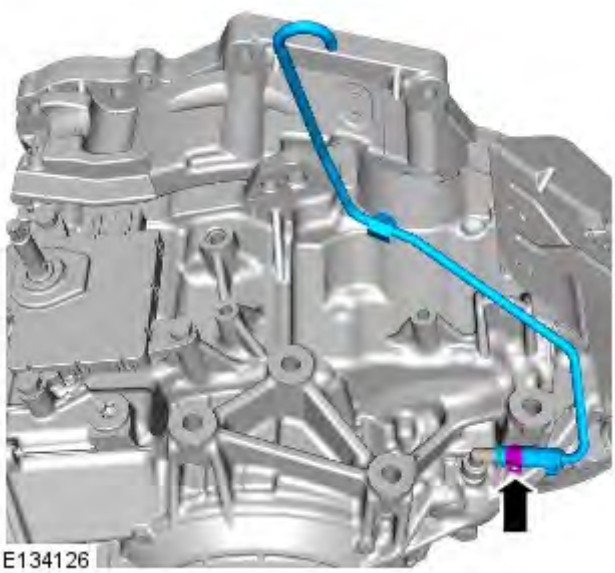
Make sure that the torque converter remains in the transmission.

Make sure that the dowels are still located on the engine and not the transmission.



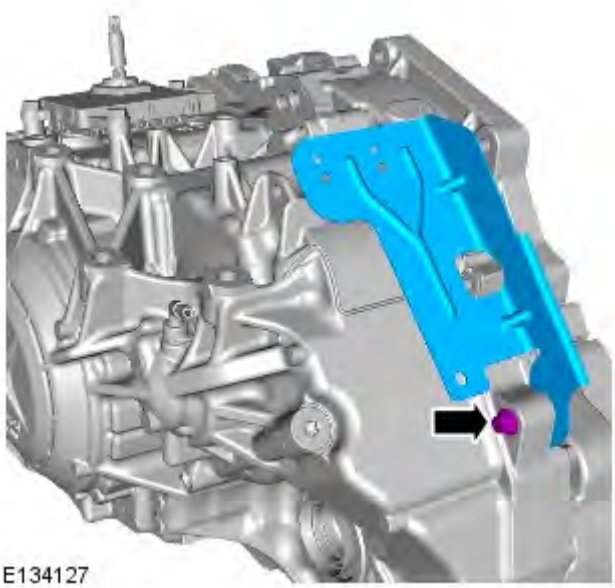
E134118

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



E134126

51.



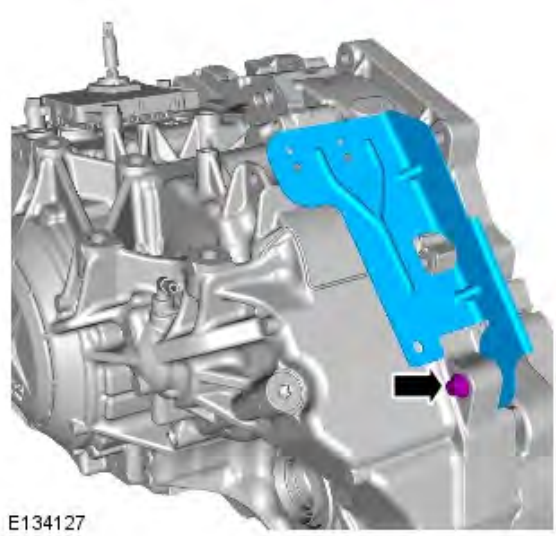
E134127

Published: 16-Apr-2013

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission GTDi 2.0L Petrol

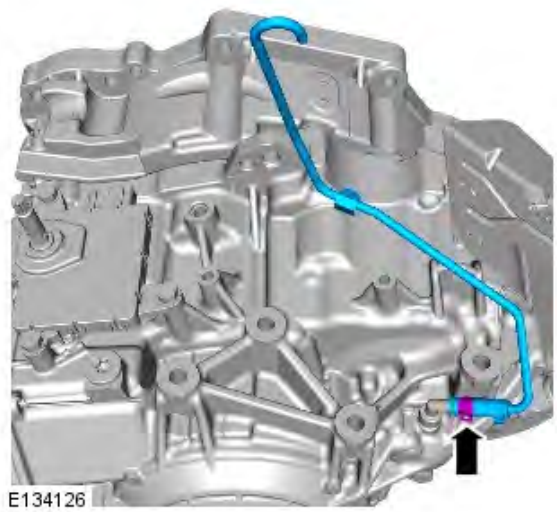
Installation

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

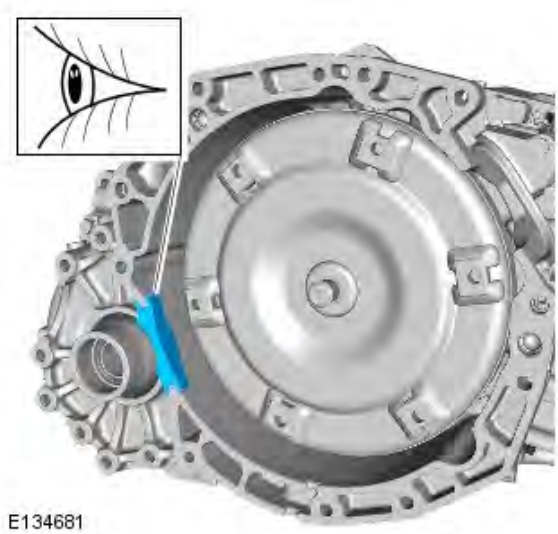

E134127

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

   Torque: 12 Nm


E134126

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


E134681

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

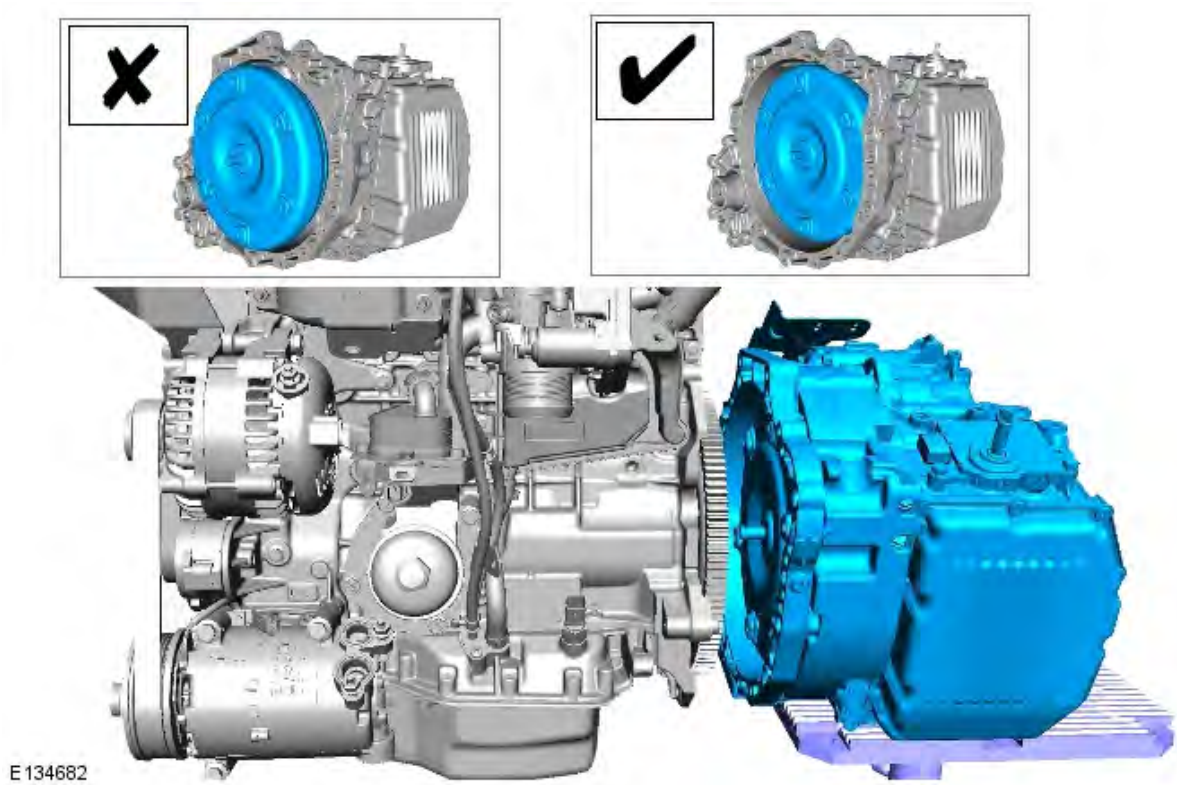
4. CAUTIONS:

   Make sure that the component is correctly located on the locating dowels.

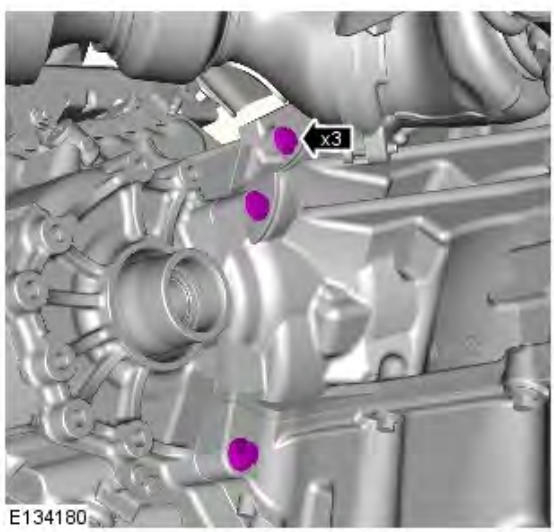
   Make sure that the mating faces are clean and free of corrosion and foreign material.

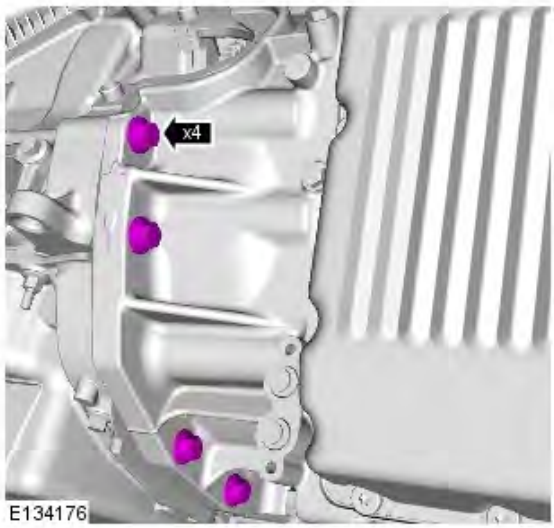
   Apply grease of the correct specification to the torque converter spigot.

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

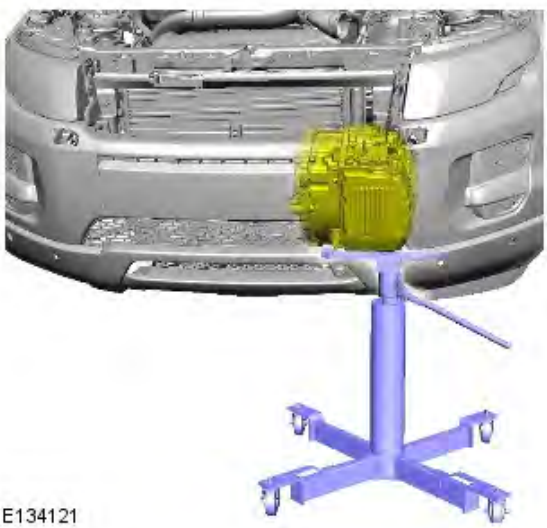


5. *Torque:* 48 Nm

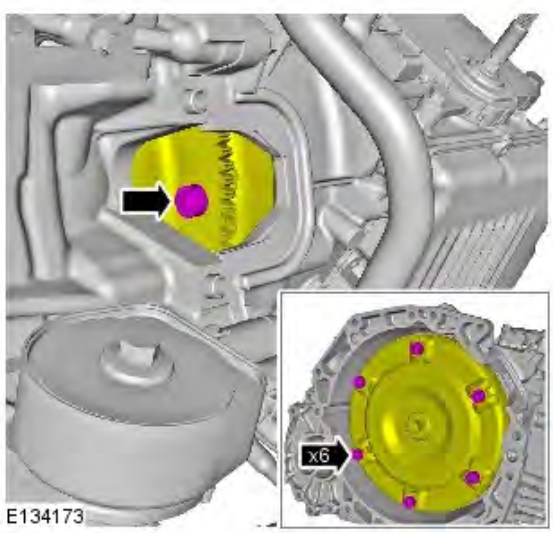




6. *Torque:* 48 Nm



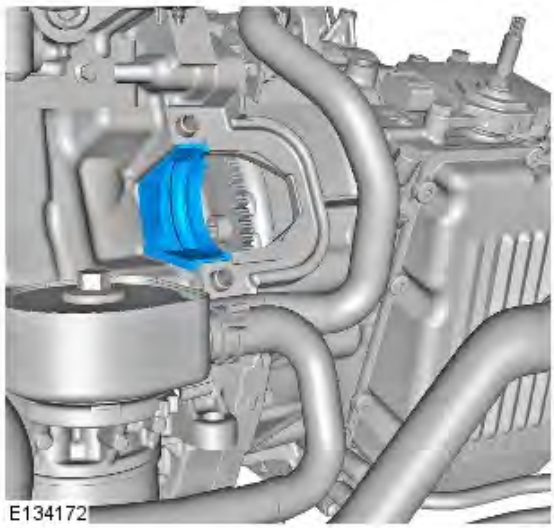
7. Remove the transmission jack.



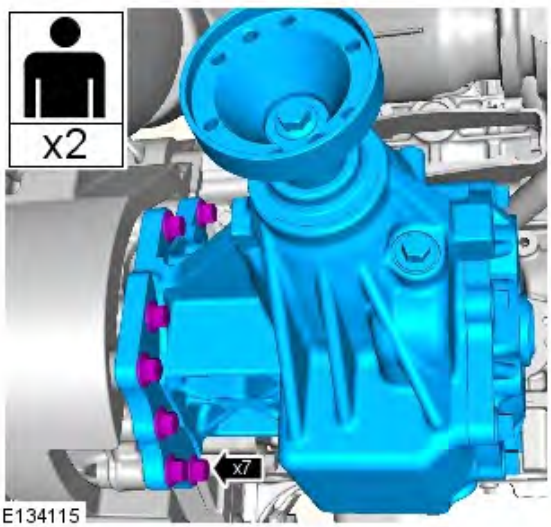
8. CAUTION: Make sure that new bolts are installed.

Torque: 60 Nm

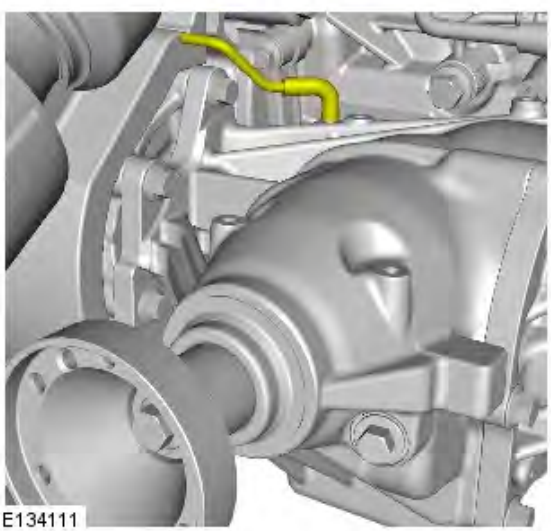
9.



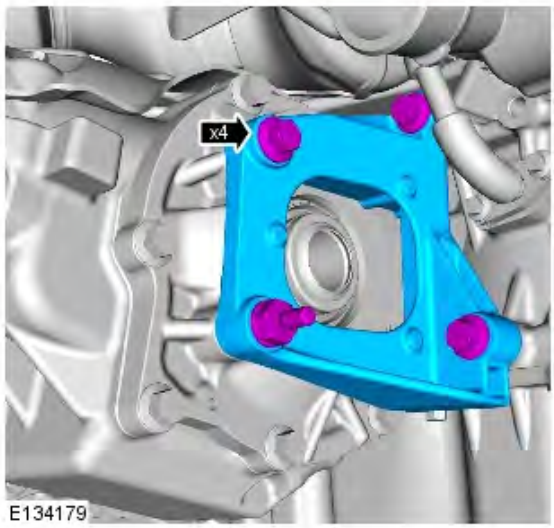
10. *Torque:* 65 Nm



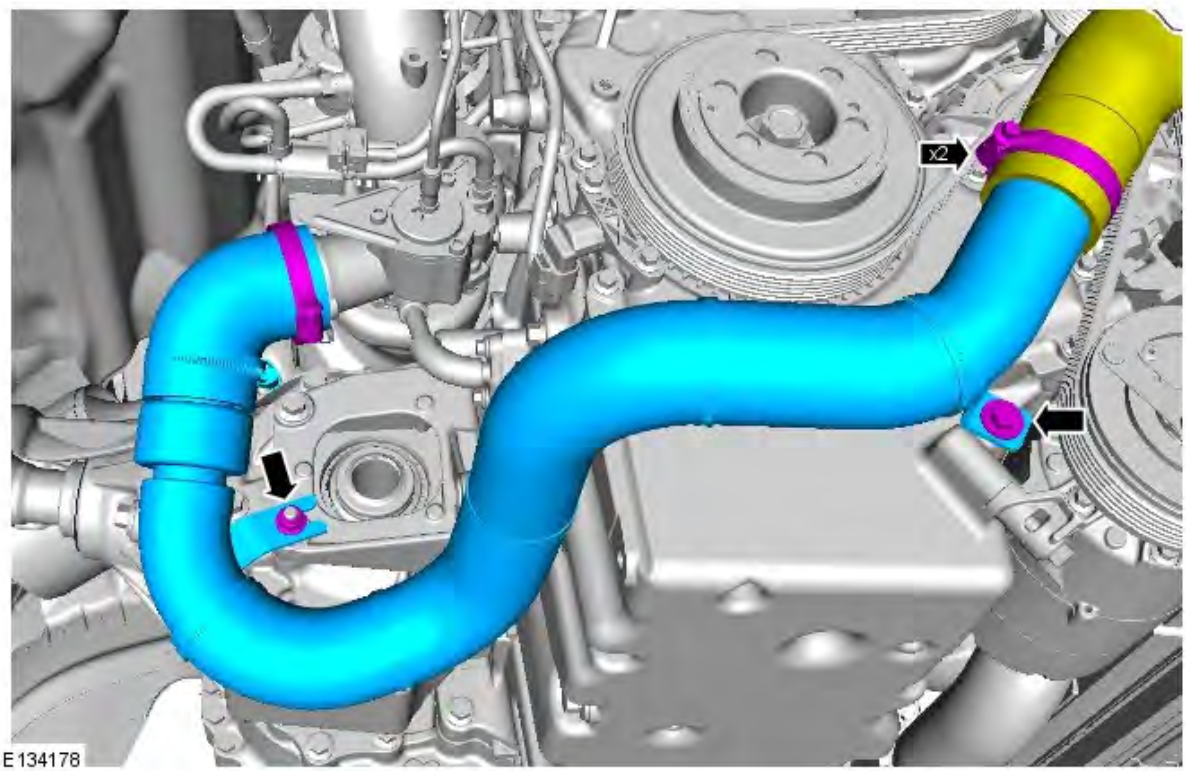
11.

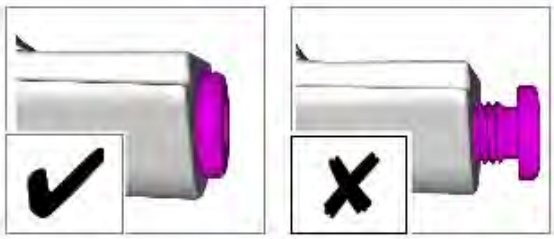


12. *Torque:* 65 Nm



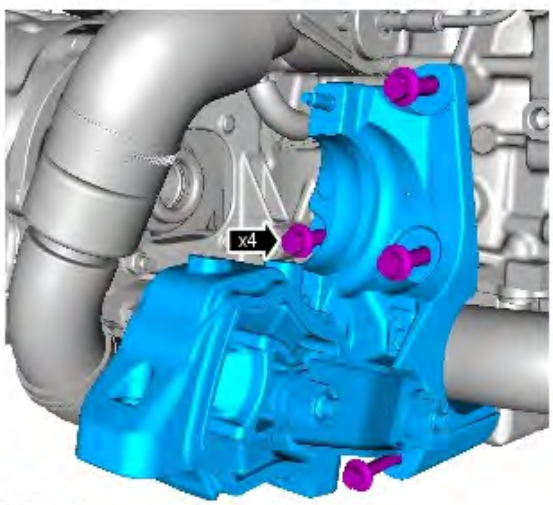
13. *Torque:* 12 Nm





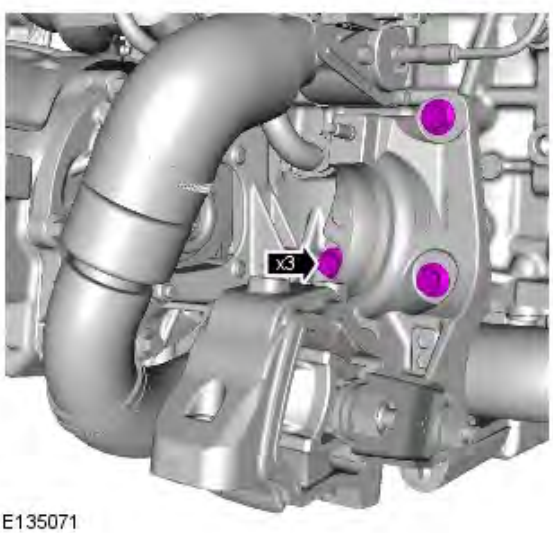
14. CAUTION: Tighten the component finger tight first.

E135069



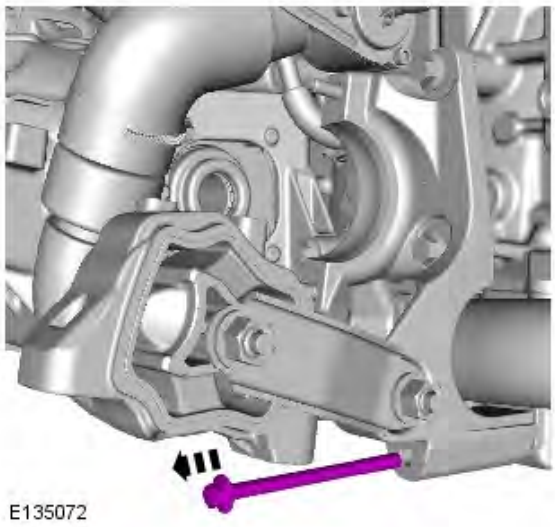
E135070

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

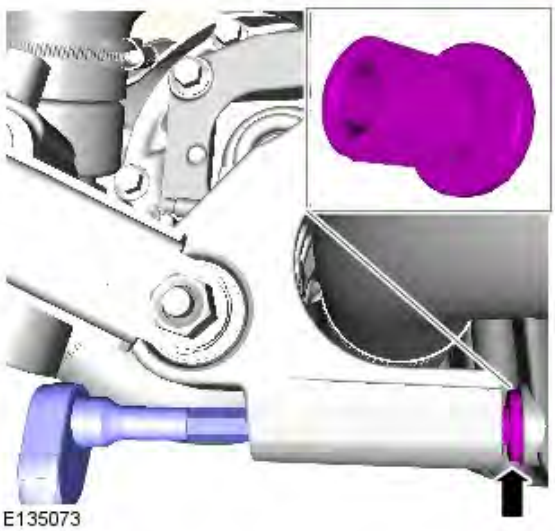


E135071

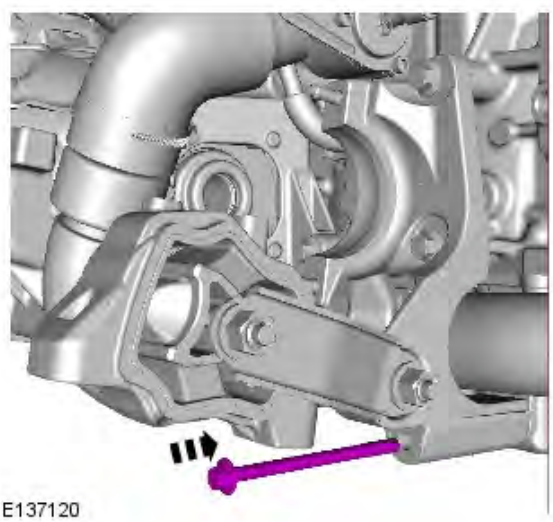
16. *Torque:* 65 Nm


E135072

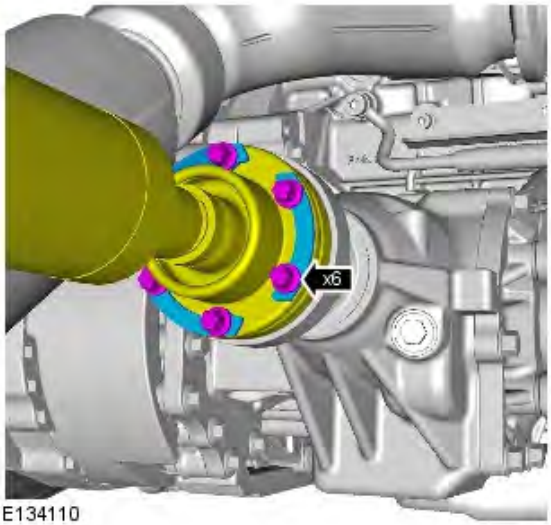
17.


E135073

18. *Torque:* 4 Nm


E137120

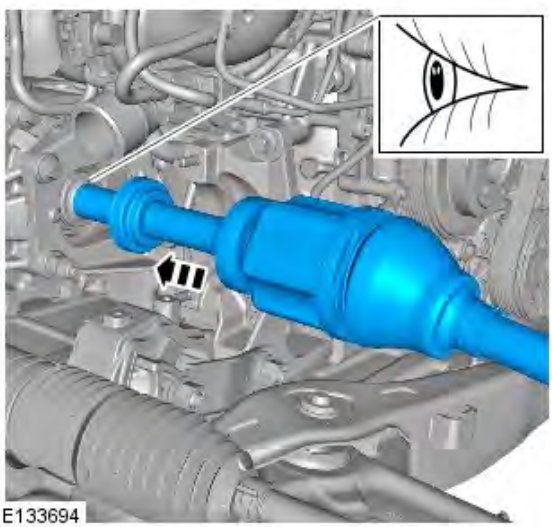
19. *Torque:* 35 Nm



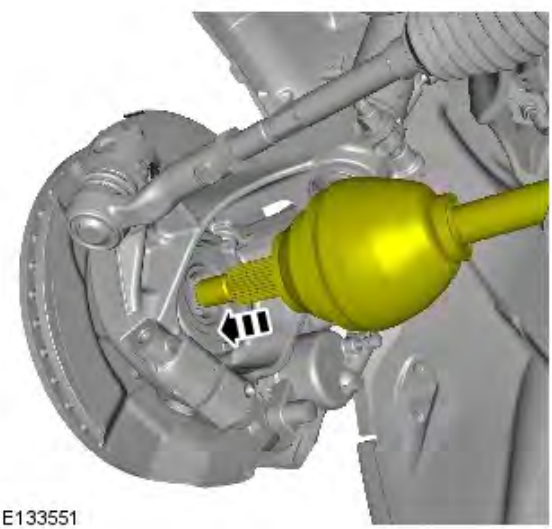
E134110

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

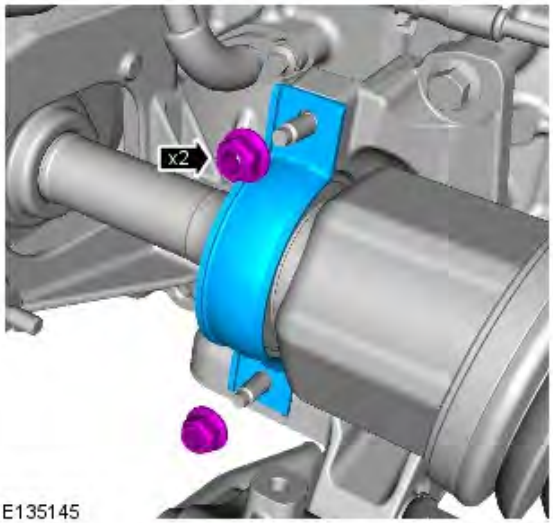
Torque: 40 Nm


E133694

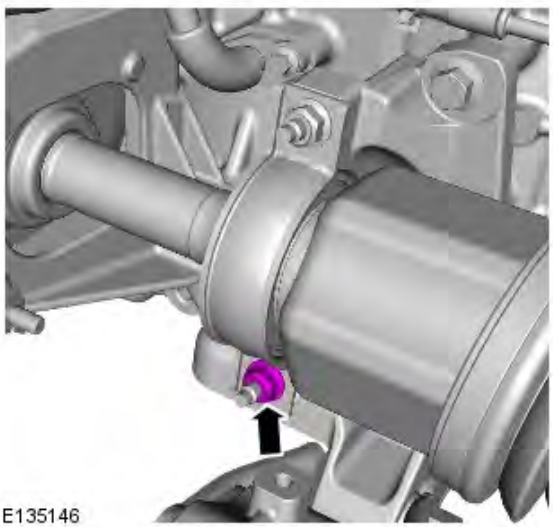
21. CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.


E133551

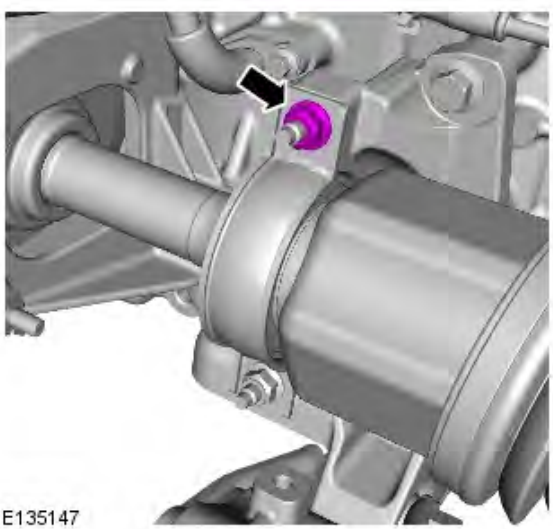
22. CAUTION: LH illustration shown, RH is similar.



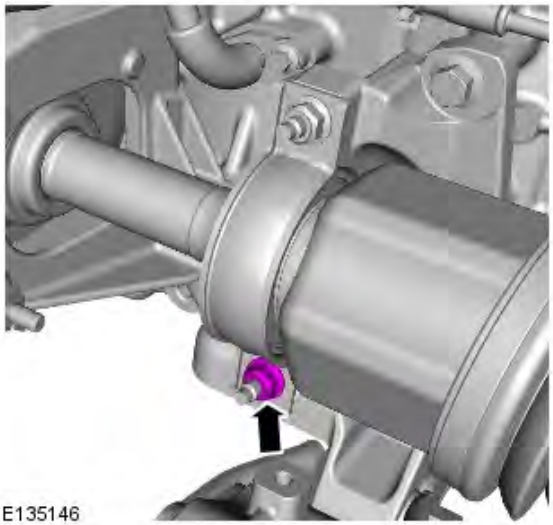
23. CAUTION: Only tighten the nuts finger-tight at this stage.



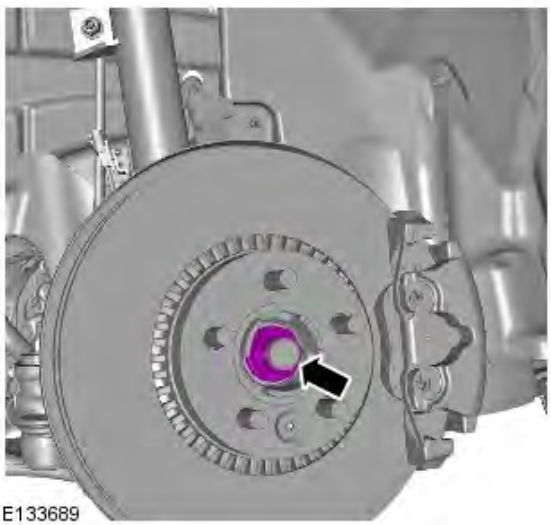
24. *Torque:* 2 Nm



25. *Torque:* 24 Nm


E135146

26. *Torque:* 24 Nm


E133689

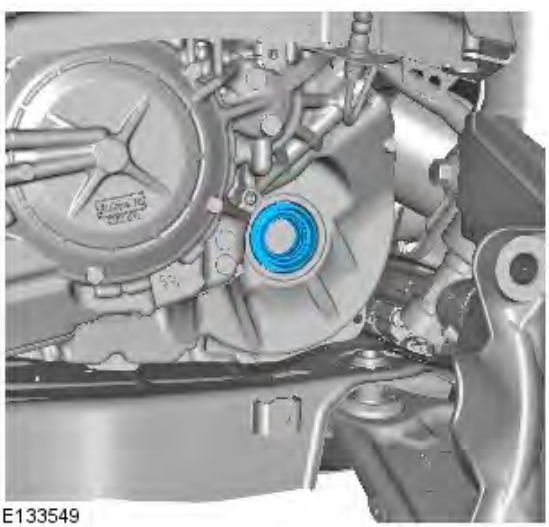
27. WARNING: Make sure that a new nut is installed.

CAUTIONS:

Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Install the halfshaft nut finger tight.

Torque: 120 Nm


E133549

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

29.


E133550

30. To prevent oil seal damage use the protector when installing the shaft into the transmission. It is not a special tool but is available from the Parts Catalogue.

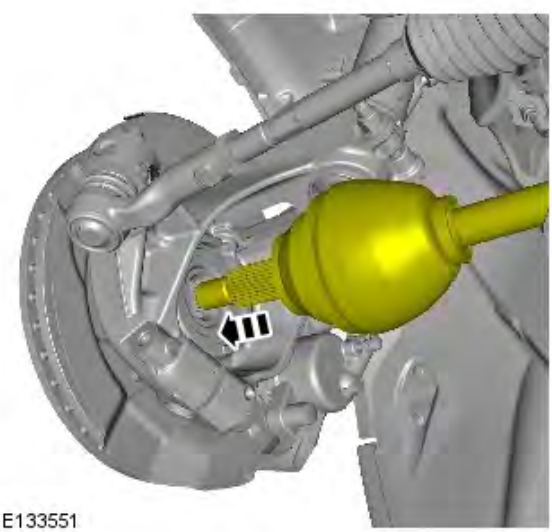

E133647

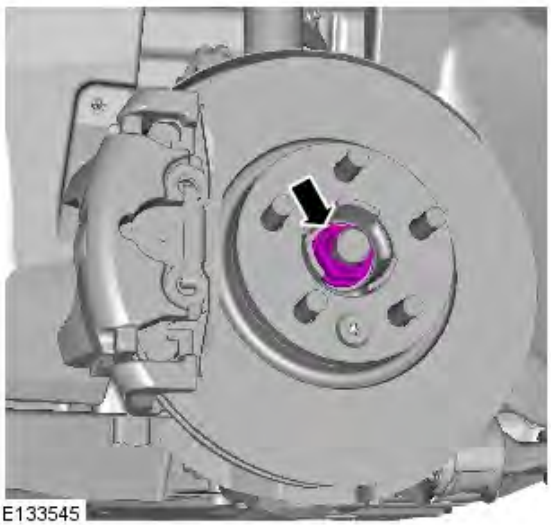
31. CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.

E133646

32.


E133551



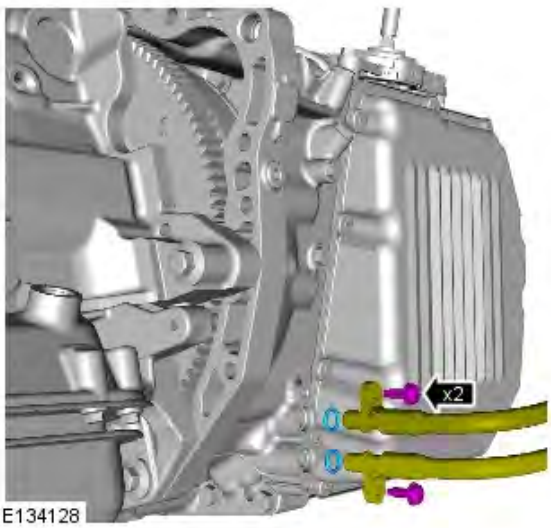
33. WARNING: Make sure that a new nut is installed.

    CAUTIONS:

    Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

    Install the halfshaft nut finger tight.

    Torque: 120 Nm



34. CAUTIONS:

    Install new o-ring seals

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

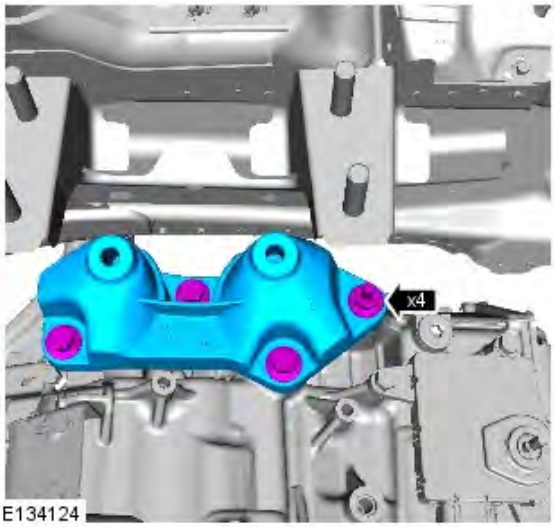
    Torque: 10 Nm

35. Refer to: Front Subframe (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

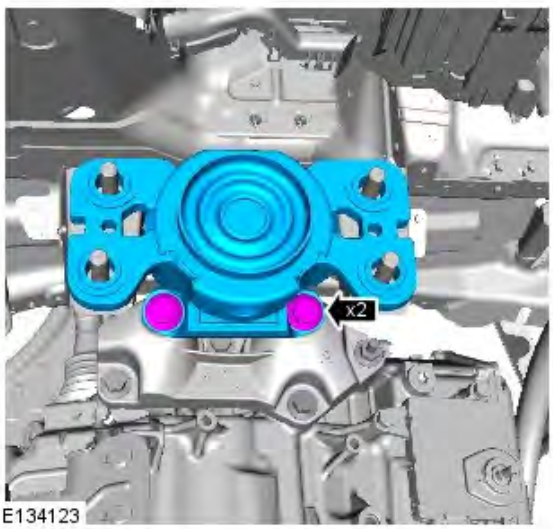
36. Install the front wheels and tires.

    Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

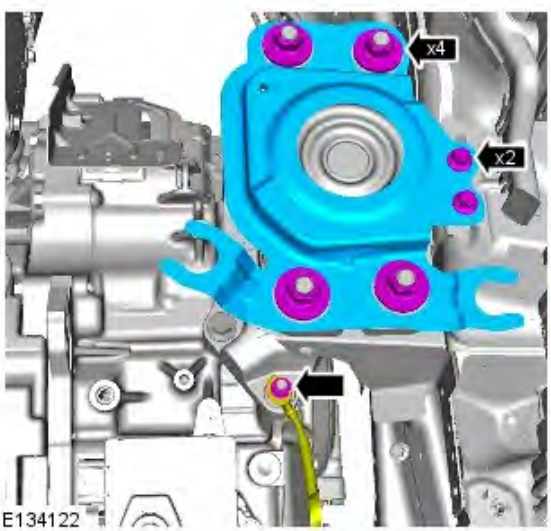
37. Lower the vehicle.



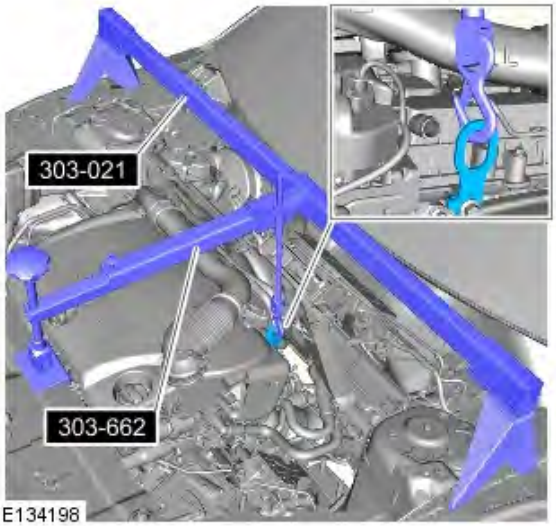
38. *Torque:* 80 Nm



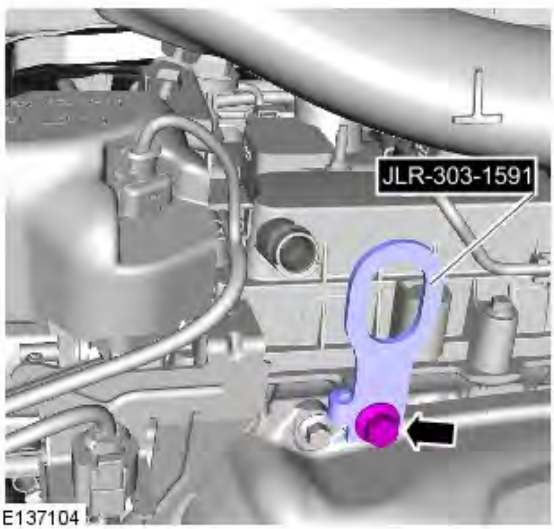
39. *Torque:* 175 Nm



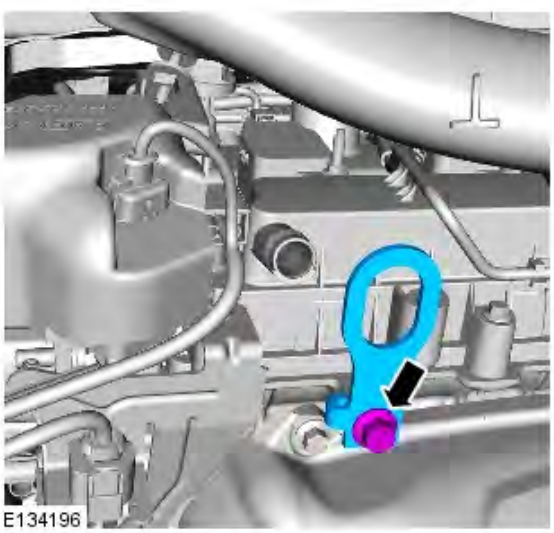
40. *Torque:*
M8 24 Nm
M12 80 Nm



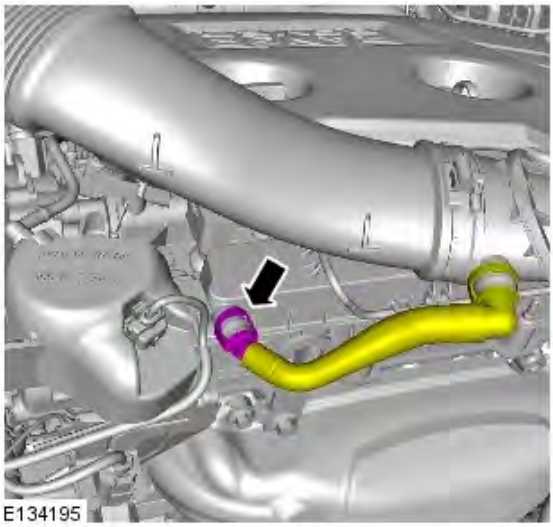
41. Remove the special tools.



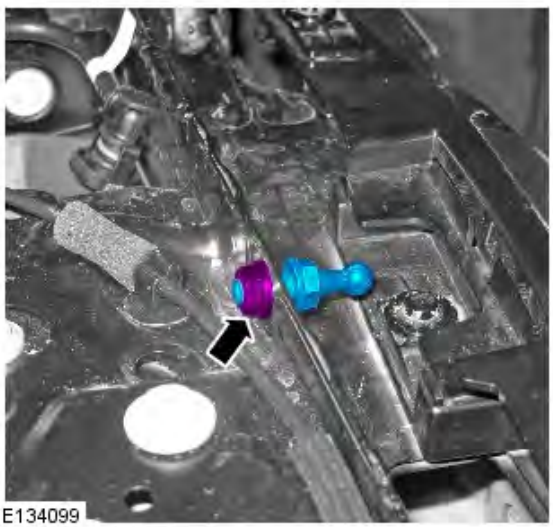
42. Remove the special tool.



43. *Torque:* 24 Nm

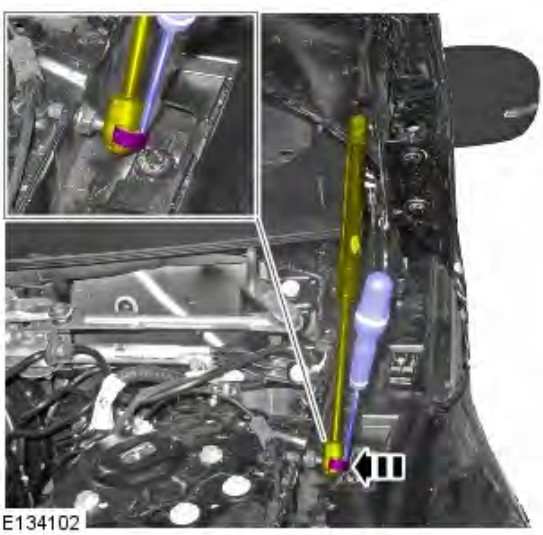

E134195

44.


E134099

45.

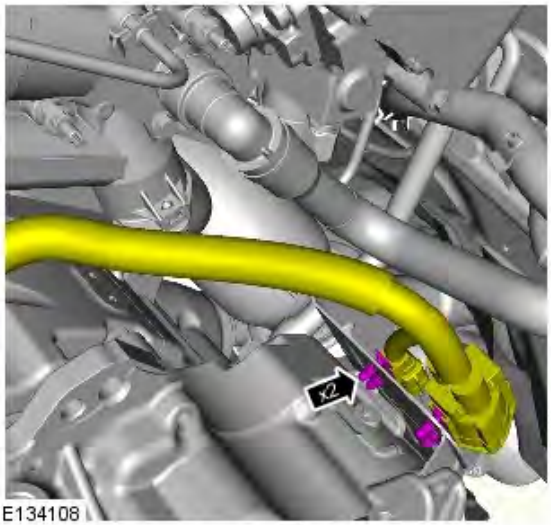
- *Torque:* 12 Nm
- Repeat the above step for the other side.


E134102

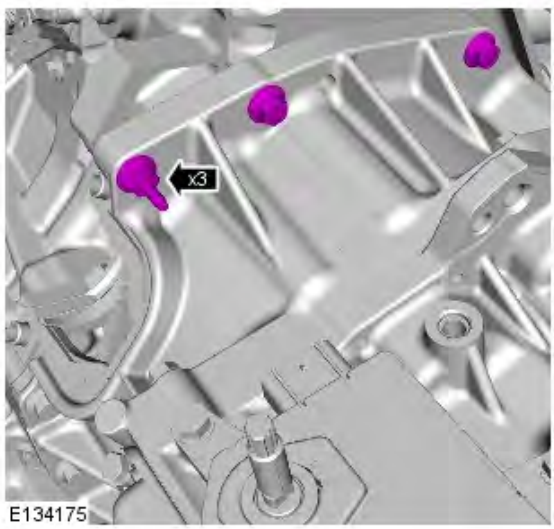
46.

- Repeat the above step for the other side.

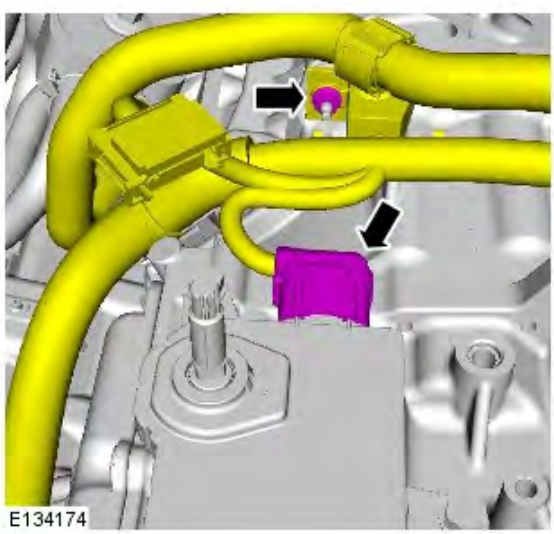
47.

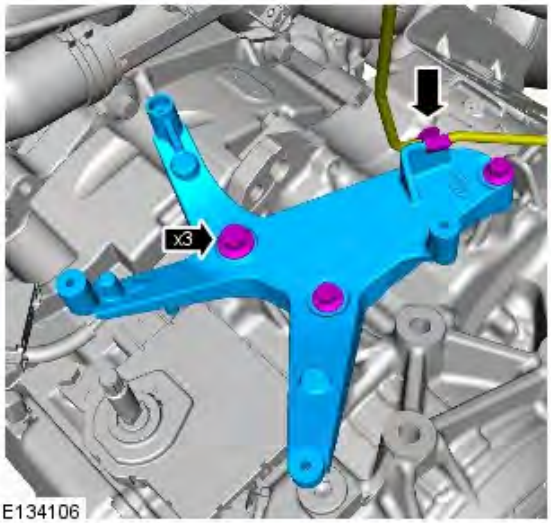


48. *Torque:* 48 Nm



49. *Torque:* 25 Nm

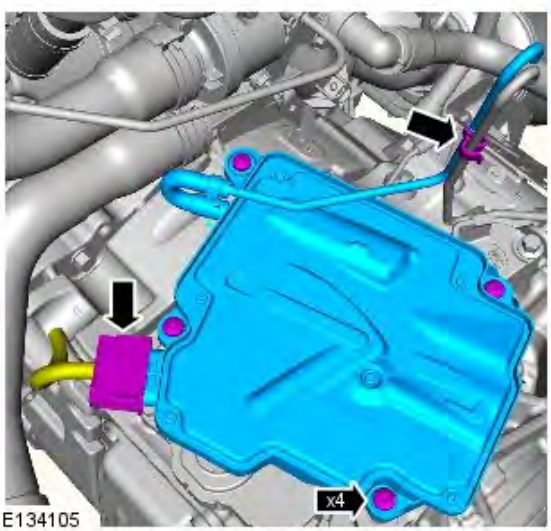




50. *Torque:*
M10 47 Nm
M8 24 Nm

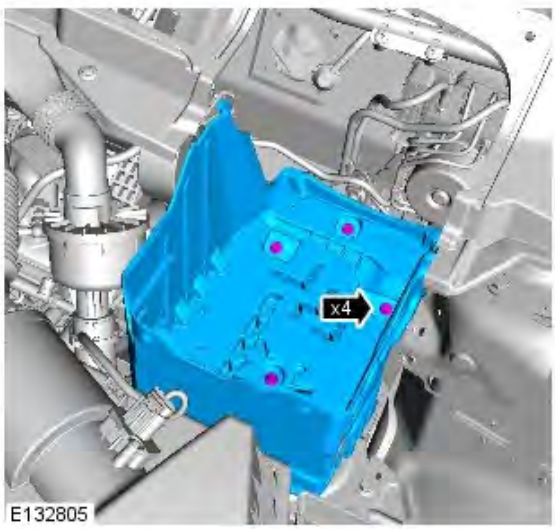
51. CAUTION: Make sure that new components are installed.

NOTE: Do not fully tighten the clamp at this stage.

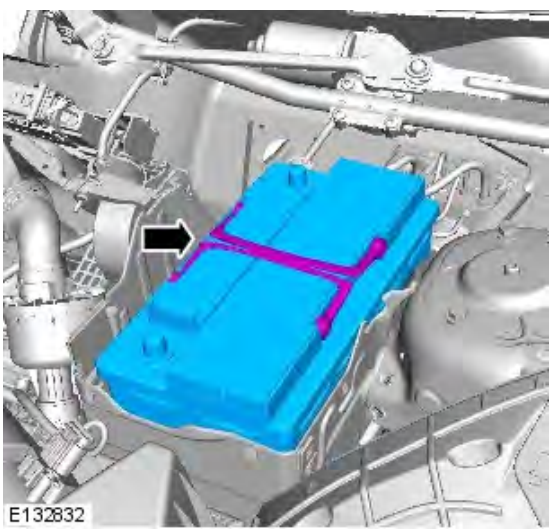


52. *Torque:* 10 Nm

53. *Torque:* 10 Nm



54. *Torque:* 10 Nm

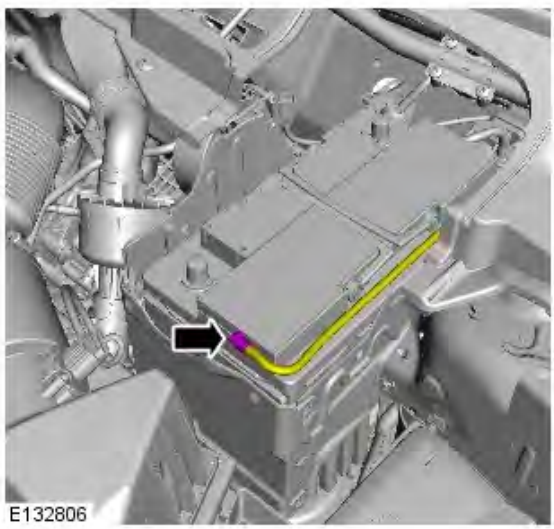


55.

56. *Torque:* 12 Nm

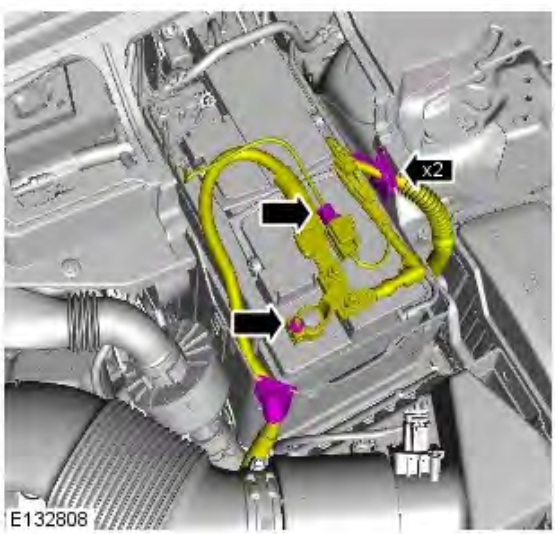
E134165

57.

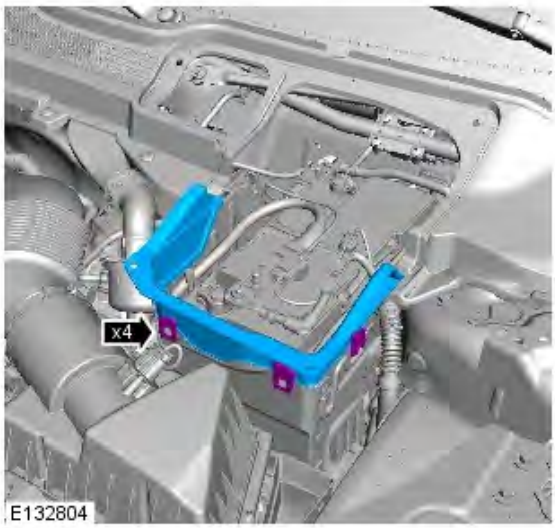


E132806

58.



E132808



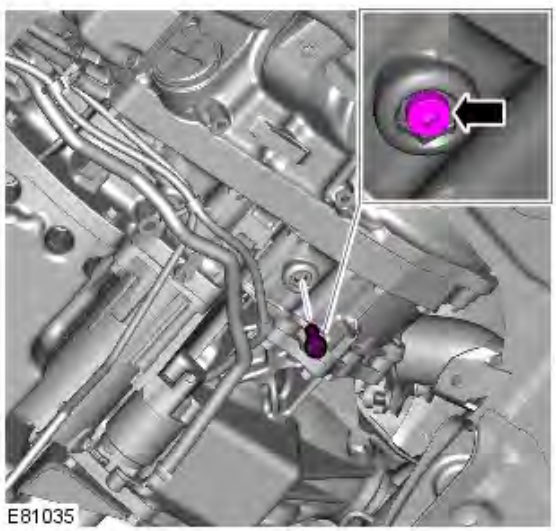
59.

60. Refer to: Starter Motor (303-06B Starting System - GTDi 2.0L Petrol, Removal and Installation).

61. Refer to: Plenum Chamber (412-01 Climate Control, Removal and Installation).

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

    Raise and support the vehicle.



63. CAUTION: The fluid level plug and drain plug both use the same point on the transmission. The inner plug is for level indication and the outer plug is to drain the fluid.

    - Carry out a transmission fluid level check.
    - With the engine running a small amount of fluid should drip out of the level plug.
    - If the transmission fluid does not come out of the transmission fluid level 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.
    - *Torque:* 7 Nm

64. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

65. Lower the vehicle.

66.

    - Using the diagnostic tool, calibrate the transmission control module (TCM).
    - Using the diagnostic tool, re-calibrate the gear shift module (GSM).

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Selector Shaft Seal TD4 2.2L 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.

1. Disconnect the battery ground cable.

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

2. Refer to: Transmission Control Module (TCM) - TD4 2.2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

3. CAUTIONS:

   Take extra care not to damage the mating faces.

   Make sure that a new component is installed.

Installation

1. CAUTIONS:

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

   Install the seal, flush with the transmission case.

   To install, reverse the removal procedure.

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Control Module (TCM) TD4 2.2L Diesel

Removal and Installation

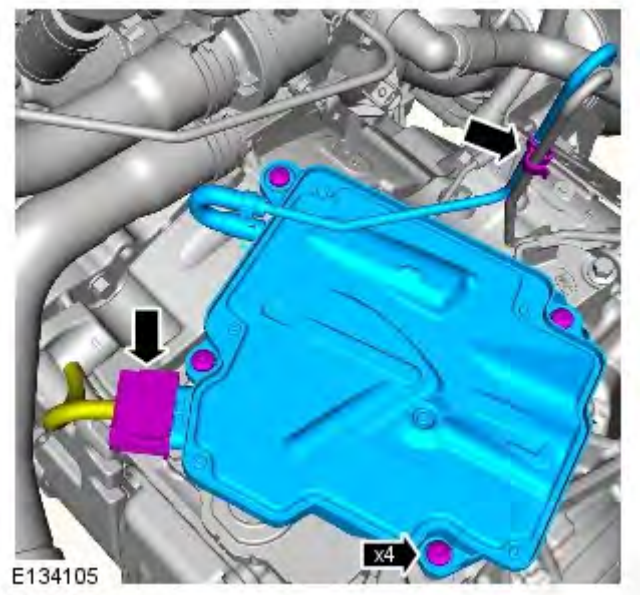
Removal

1. Disconnect the battery ground cable.

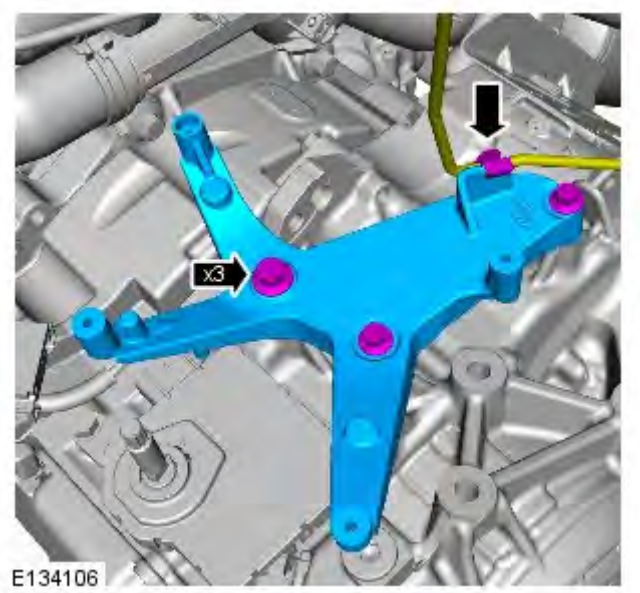
   Refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).

2. Refer to: Air Cleaner (303-12, Removal and Installation).

3.

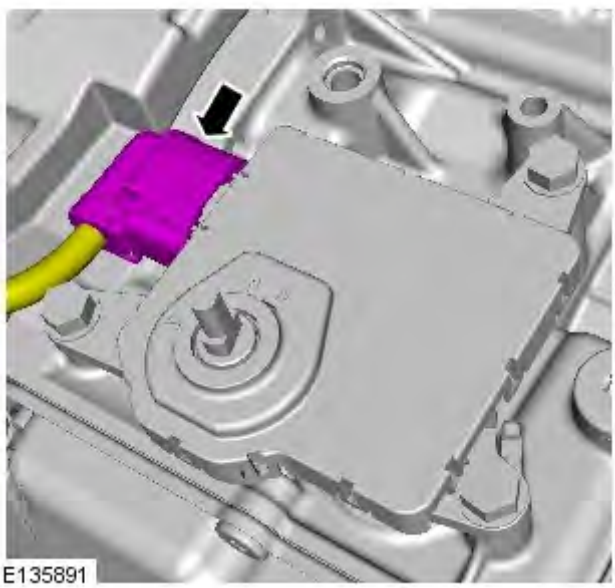


4.

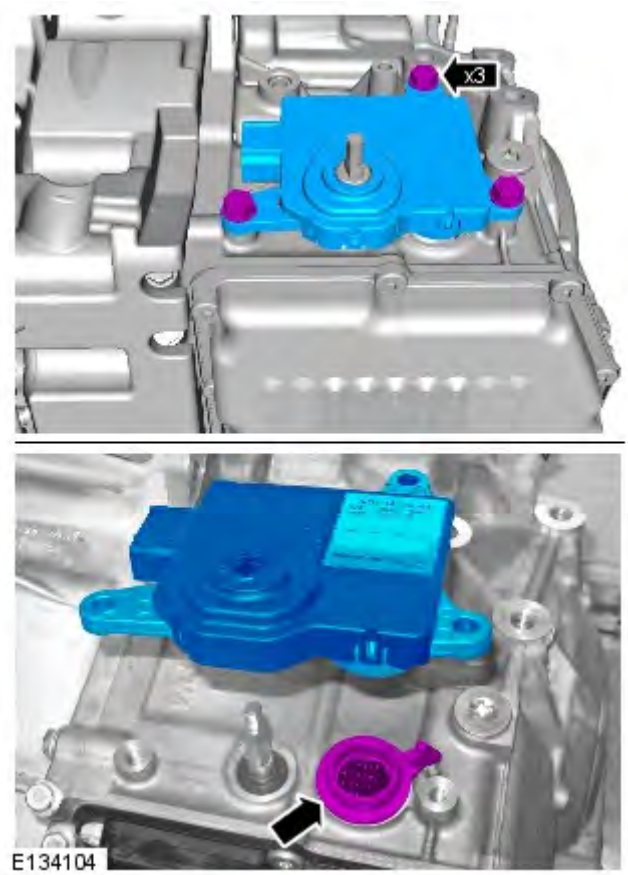


E134101

5. CAUTION: Discard the component.

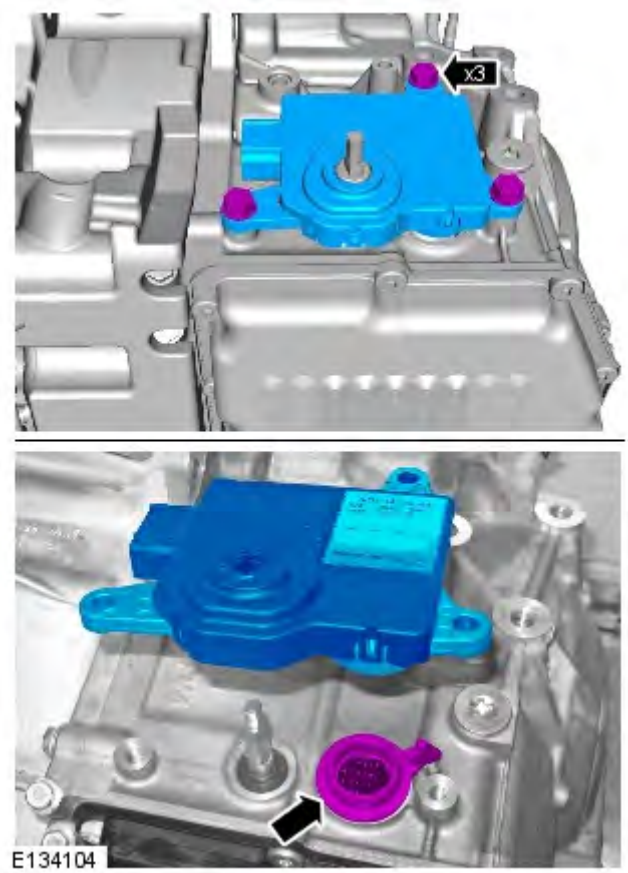

E135891

6.

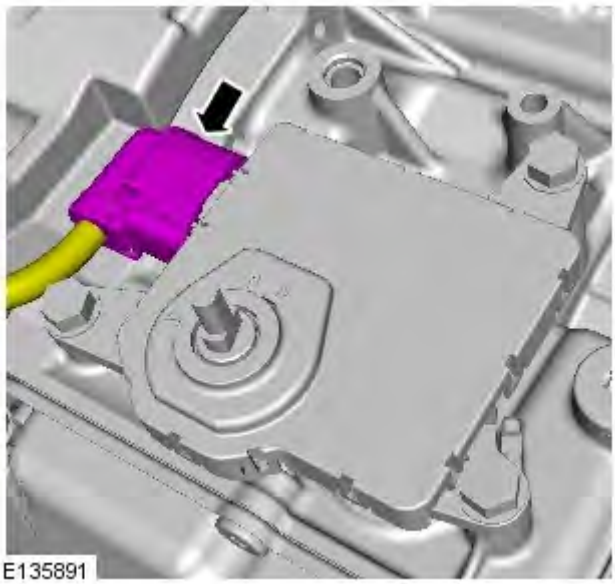


7.

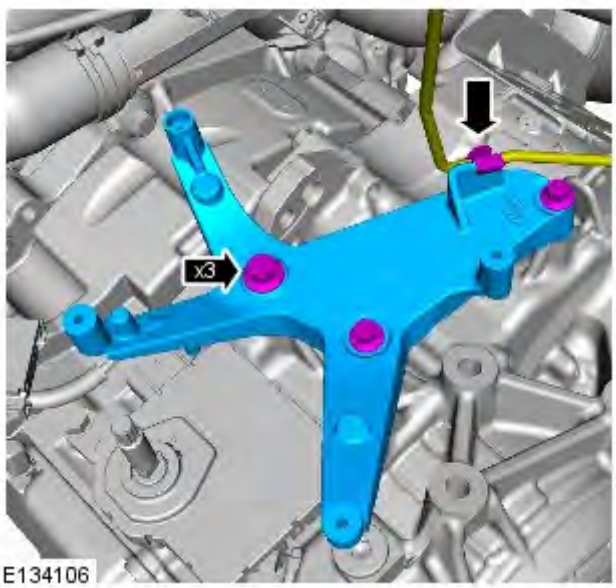
Installation



1. *Torque:* 25 Nm



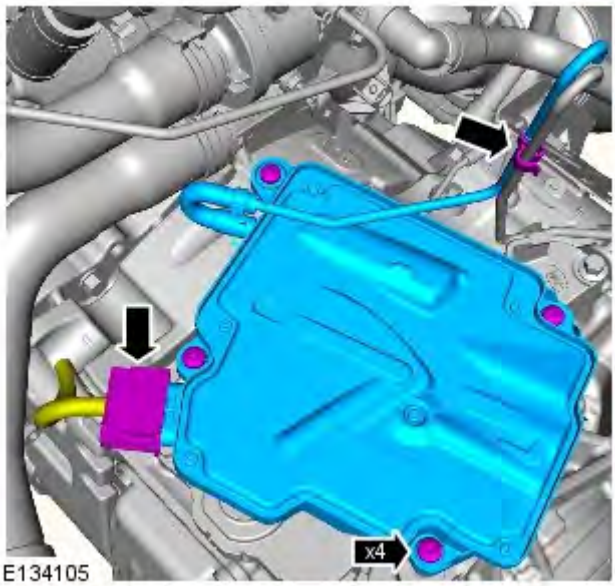
2.



3. *Torque:*
   M10 47 Nm
   M8 24 Nm

4. CAUTION: Make sure that new components are installed.

NOTE: Do not fully tighten the clamp at this stage.



5. *Torque:* 10 Nm

6. *Torque:* 10 Nm

7. Refer to: Air Cleaner (303-12, Removal and Installation).

8. Reconnect the battery ground cable.

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

9.
   - Using the diagnostic tool, calibrate the transmission control module (TCM).
   - Using the diagnostic tool, re-calibrate the gear shift module (GSM).

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Torque Converter Seal TD4 2.2L Diesel

Removal and Installation

Special Tool(s)

	307-597 Installer, Torque Converter Seal
	307-613 Holding Pins, Torque Converter

Removal

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

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

   Raise and support the vehicle.

2. Disconnect the battery ground cable.

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

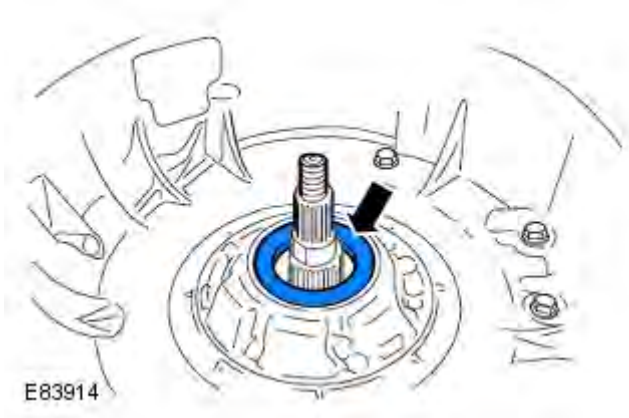
3. Refer to: Transmission - TD4 2.2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal).

4. CAUTIONS:

   Be prepared to collect escaping oil.

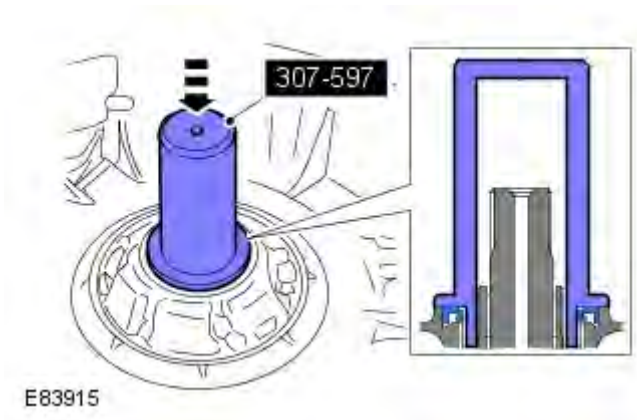
   Make sure that all openings are sealed.

   - *Special Tool(s):* 307-613



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

Installation



1. CAUTIONS:

   Extreme cleanliness must be exercised when handling this component.

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

   - *Special Tool(s):* 307-597

2. CAUTIONS:

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

   Take extra care when handling the component.

   Align the torque converter and oil pump drive before installing the torque converter.

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

   - *Special Tool(s):* 307-613

3. Refer to: Transmission - TD4 2.2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Installation).

4. Connect the battery ground cable.

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

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Torque Converter TD4 2.2L Diesel

Removal and Installation

Special Tool(s)

	307-613 Holding Pins, Torque Converter

Removal

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

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

   Raise and support the vehicle.

2. Disconnect the battery ground cable.

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

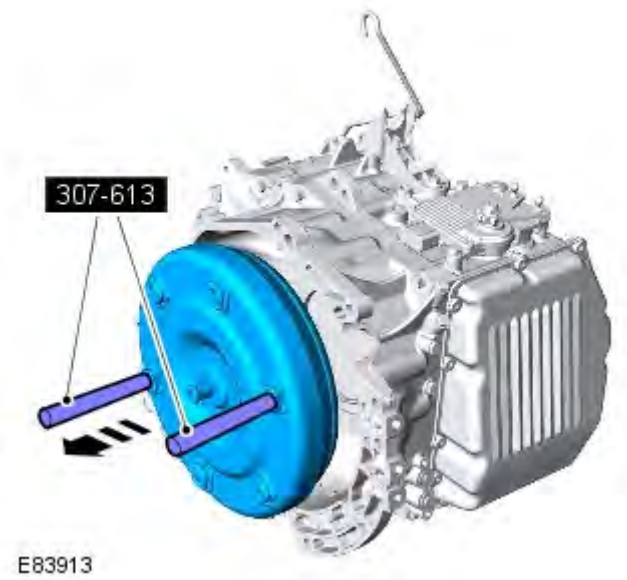
3. Refer to: Transmission - TD4 2.2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal).

4. CAUTIONS:

   Be prepared to collect escaping oil.

   Make sure that all openings are sealed.

   - *Special Tool(s):* 307-613



Installation

1. CAUTIONS:

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

   Take extra care when handling the component.

   Align the torque converter and oil pump drive before installing the torque converter.

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

   - *Special Tool(s):* 307-613

2. Refer to: Transmission - TD4 2.2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Installation).

3. Connect the battery ground cable.

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

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Input Shaft Speed (ISS) Sensor TD4 2.2L Diesel

Removal and Installation

Removal

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.

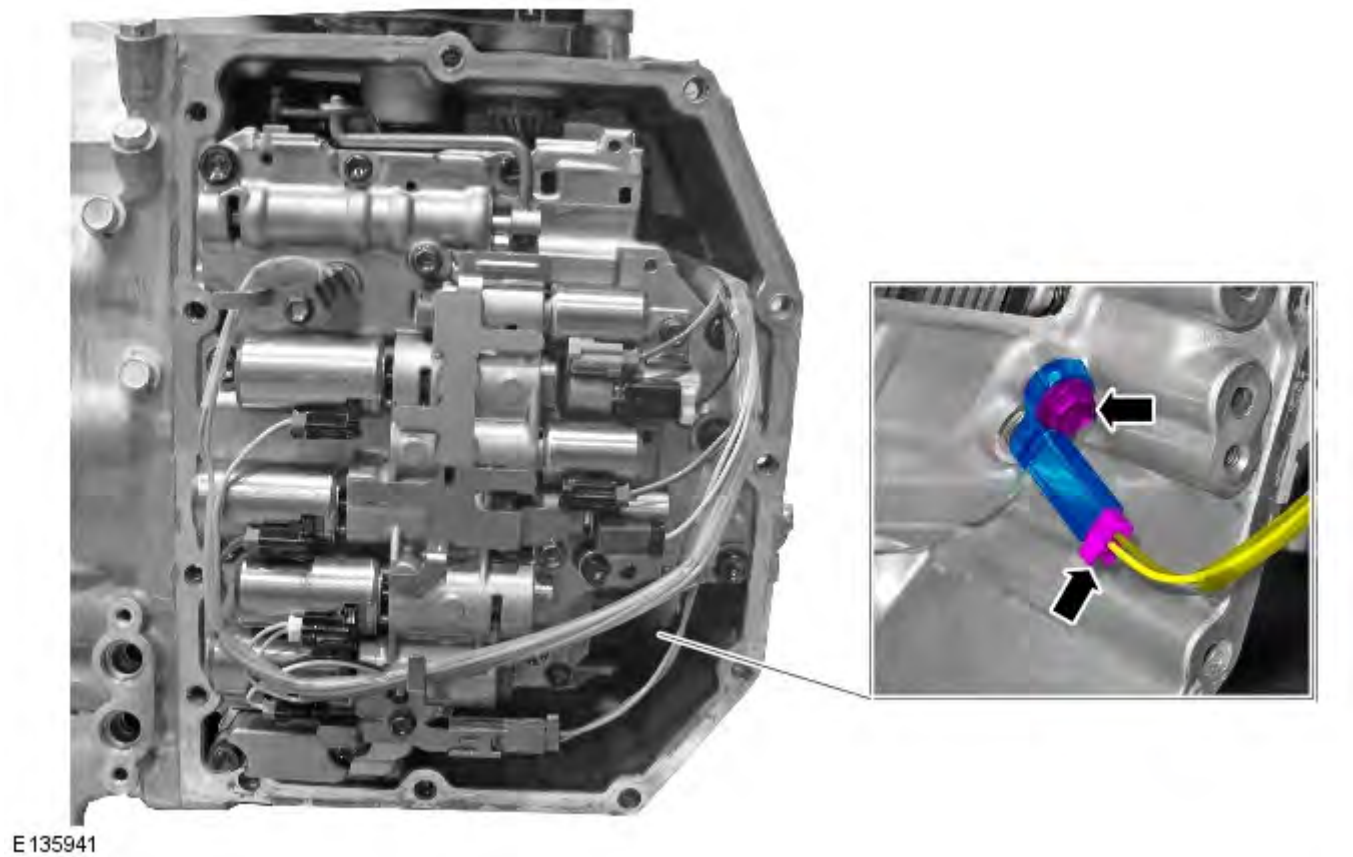
2. Disconnect the battery ground cable.

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

3. Refer to: Transmission Fluid Pan - TD4 2 2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

4. CAUTION: Extreme cleanliness must be exercised when handling this component.

   Torque: 6 Nm



E135941

Installation

1. To install, reverse the removal procedure.

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Fluid Pan TD4 2.2L Diesel

Removal and Installation

Removal

CAUTION: Extreme cleanliness must be exercised when handling this component.

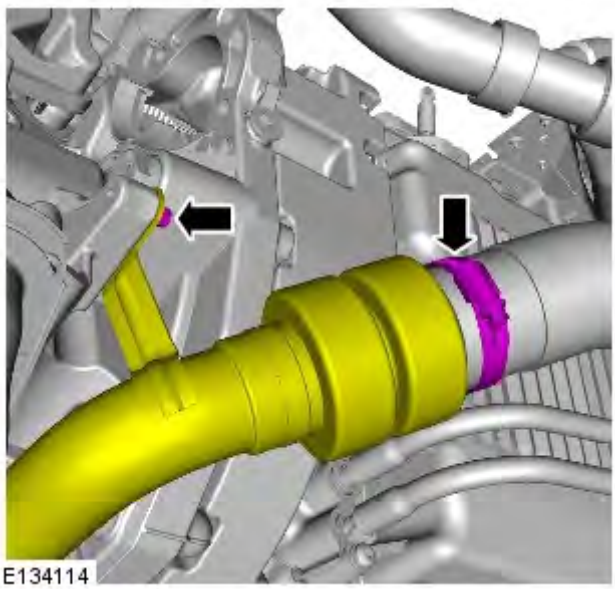
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

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

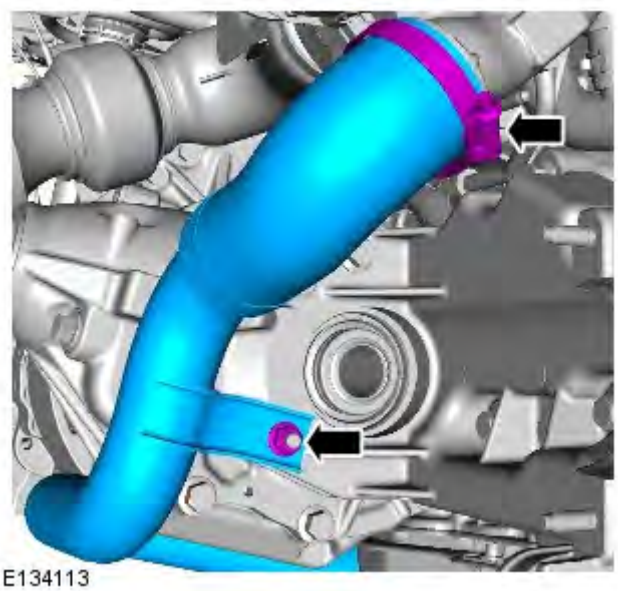
   Raise and support the vehicle.

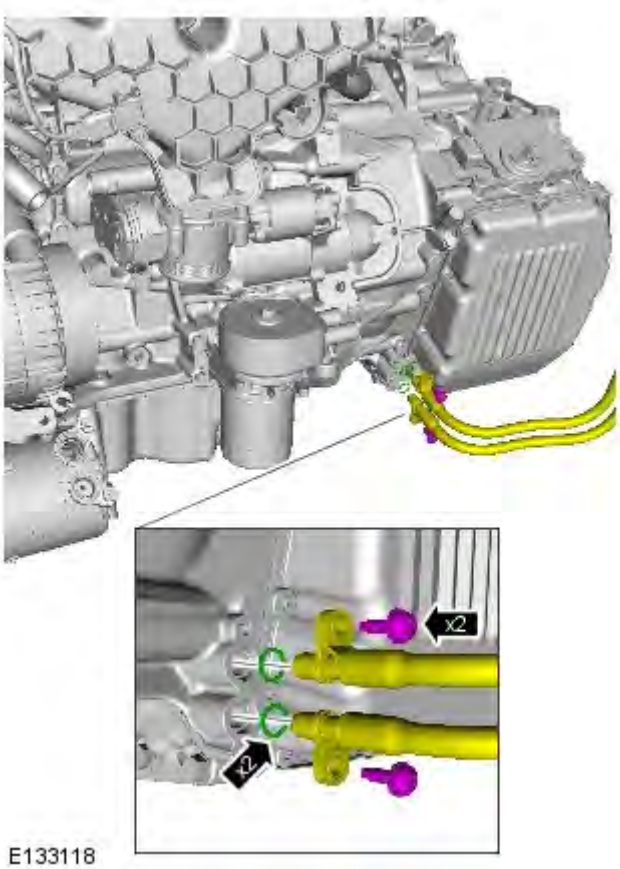
2. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, General Procedures).

3.



4.





5. CAUTION: Be prepared to collect escaping oil.

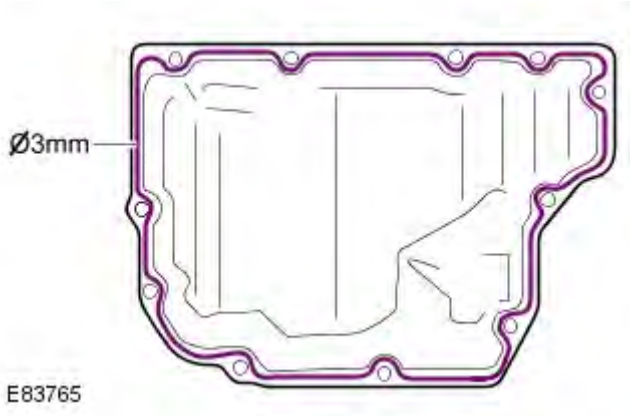
6. CAUTION: Be prepared to collect escaping oil.

7. Carefully remove the sealant.

Installation

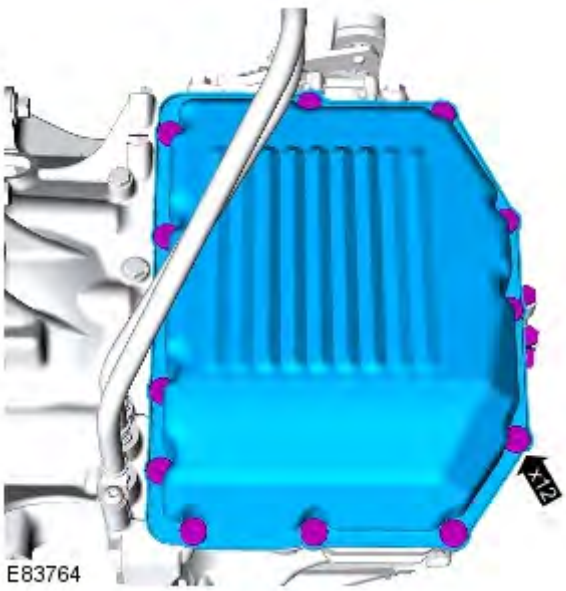
1. For sealant specification, refer to the specifications section.

   Refer to: Specifications (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Specifications).

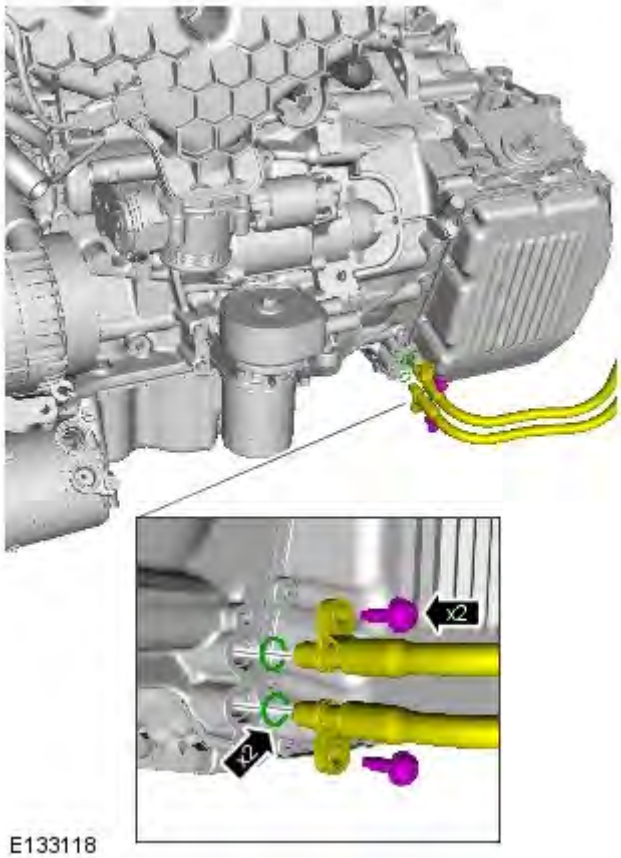


2. CAUTION: Make sure that the mating faces are clean and free of foreign material.

   Apply a bead of sealant, 3 mm diameter, to the area indicated.

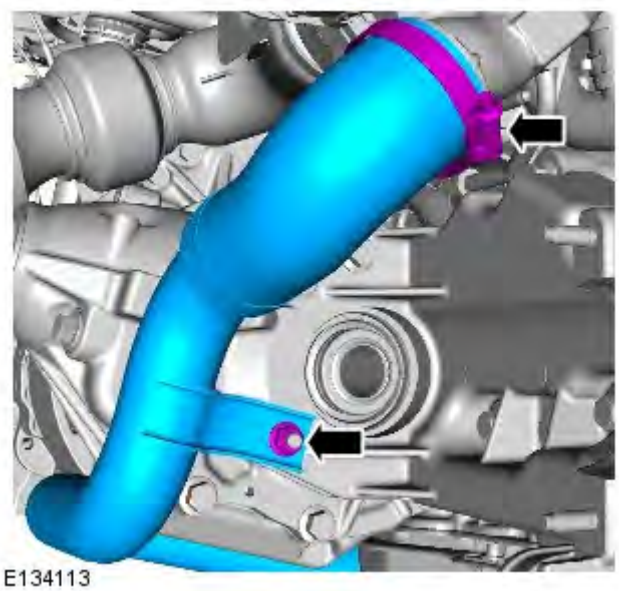


3. *Torque:* 14 Nm

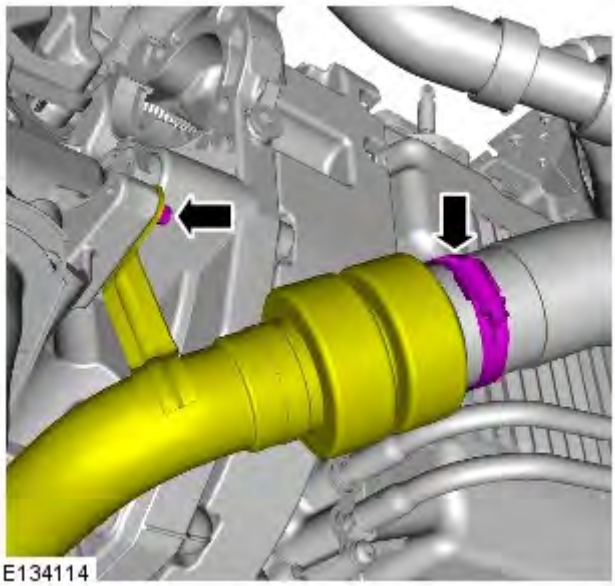


E133118

4. *Torque:* 10 Nm


E134113

5. *Torque:* 12 Nm



6. *Torque:* 12 Nm

7. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, General Procedures).

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Main Control Valve Body GTDi 2.0L Petrol

Removal and Installation

Removal

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. Disconnect the battery ground cable.

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

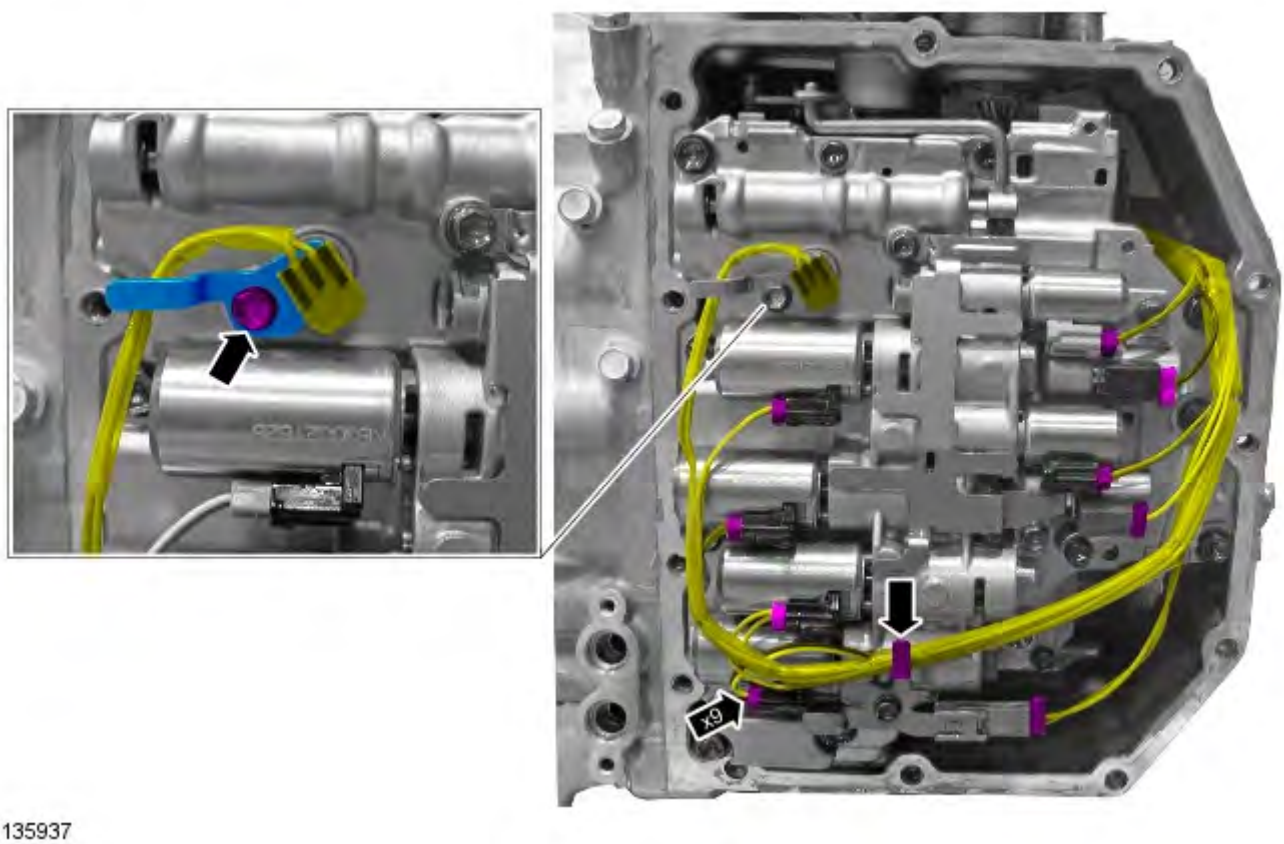
3. Refer to: Transmission Fluid Pan - GTDi 2 0L Petrol (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

4. CAUTIONS:

   Take extra care not to damage the wiring harnesses.

   Note the fitted position of the component prior to removal.

   Torque: 10 Nm



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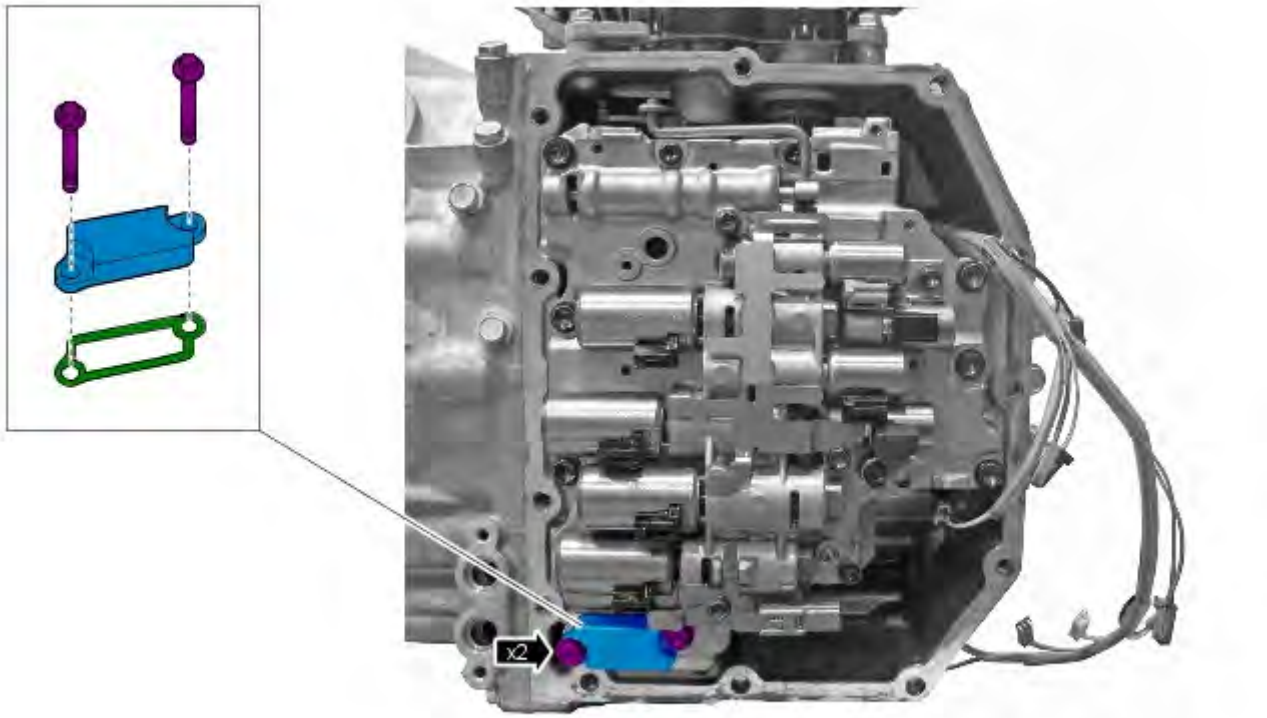
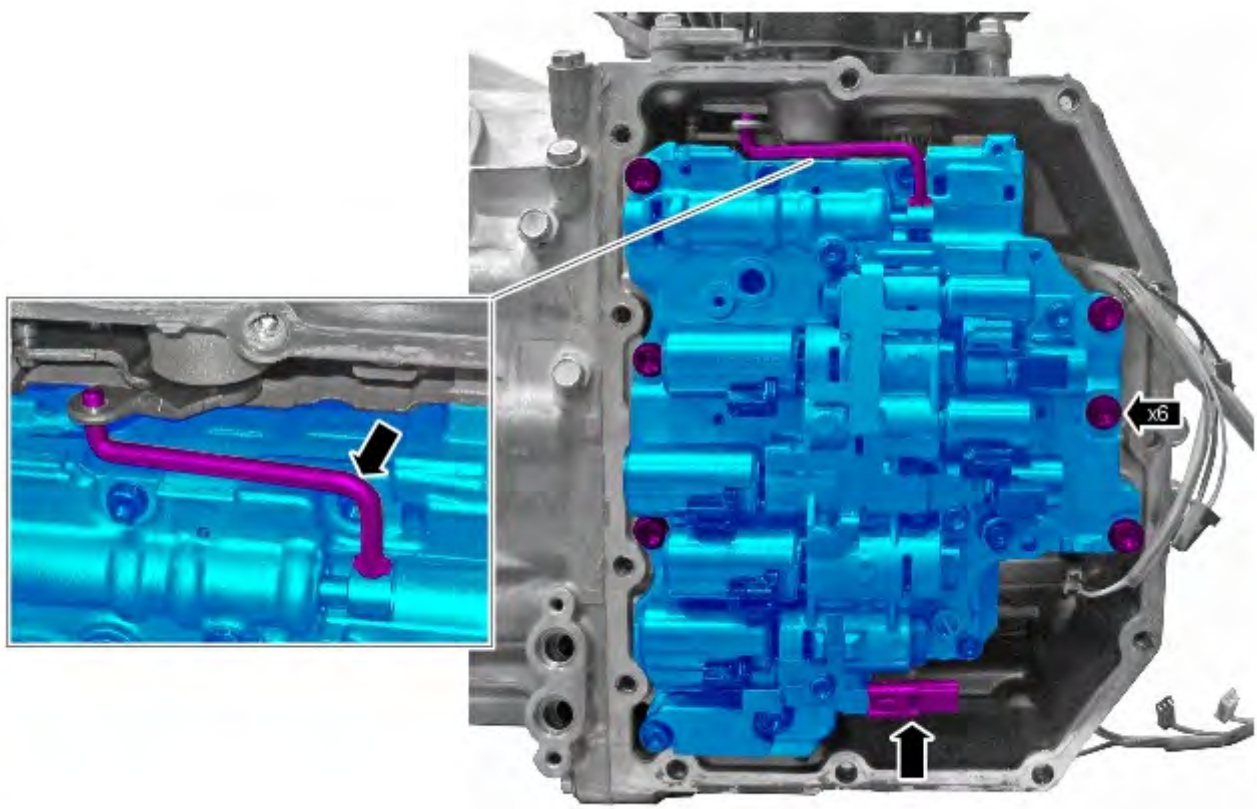


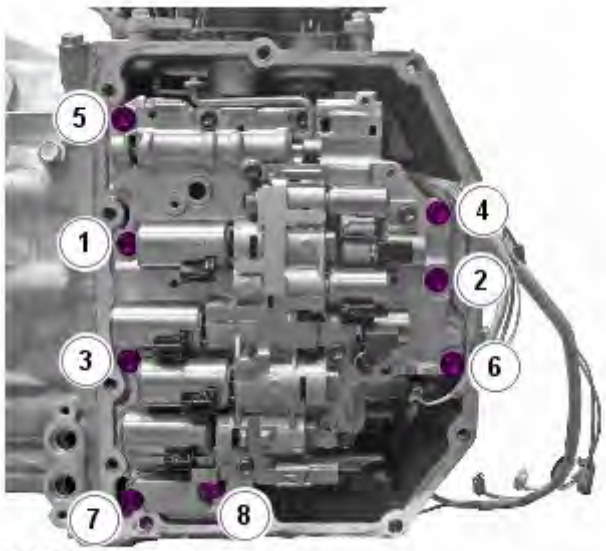
E135938

6.



E135939

Installation



E135940

1. CAUTION: Tighten the bolts in the sequence shown.

   Torque: 10 Nm

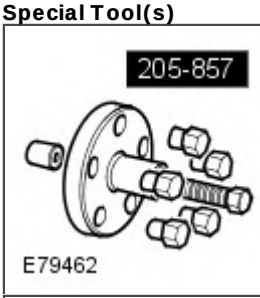
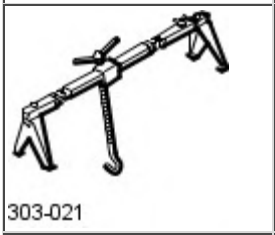
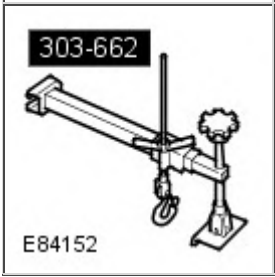
2. To install, reverse the removal procedure.

Published: 16-Apr-2013

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission TD4 2.2L Diesel

Removal

Special Tool(s)

	205-857 Remover, Halfshaft
	303-021 Engine support bracket
	303-662 Support Beam Arm and Hook Assembly, Engine

General Equipment

Transmission jack

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

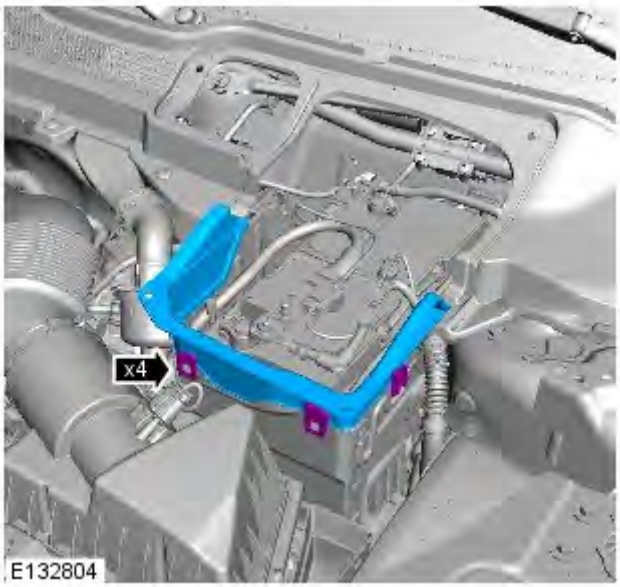
1. Disconnect the battery ground cable.

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

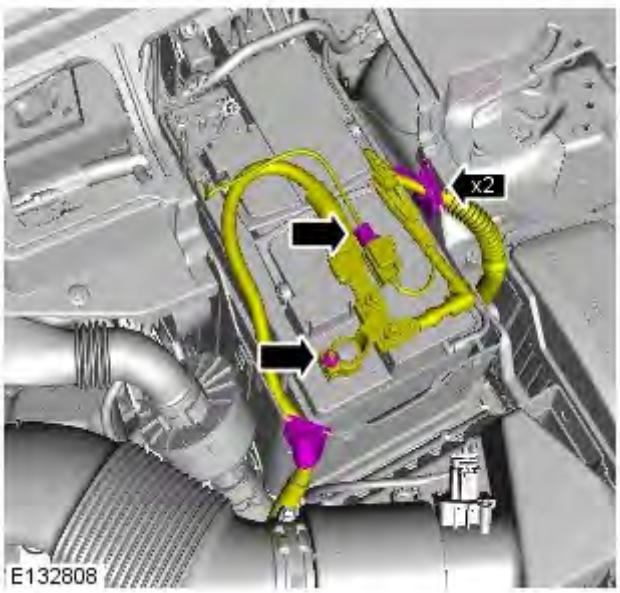
2. Refer to: Plenum Chamber (412-01 Climate Control, Removal and Installation).

3. Refer to: Starter Motor (303-06A Starting System - TD4 2.2L Diesel, Removal and Installation).

4.



5.



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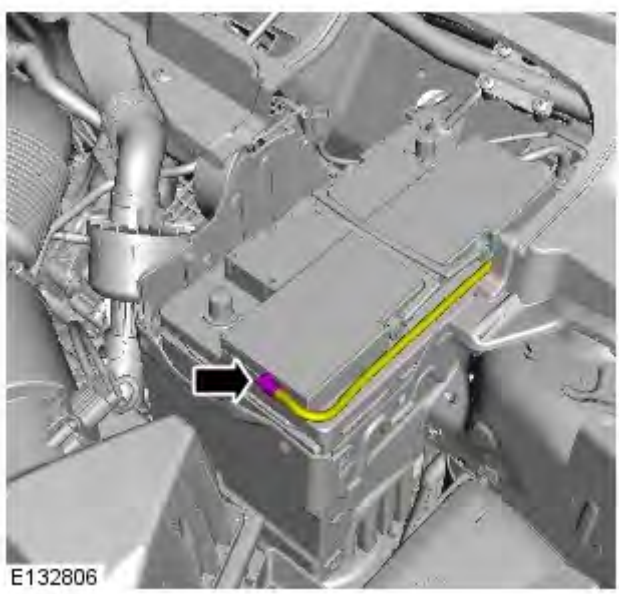
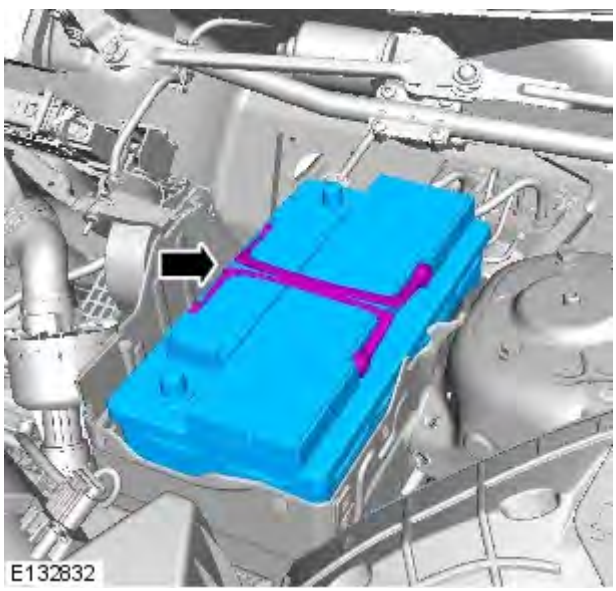


7.

8.



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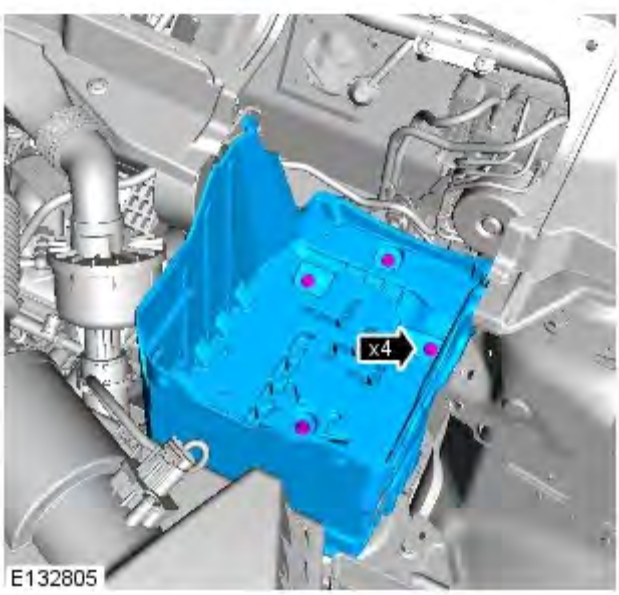

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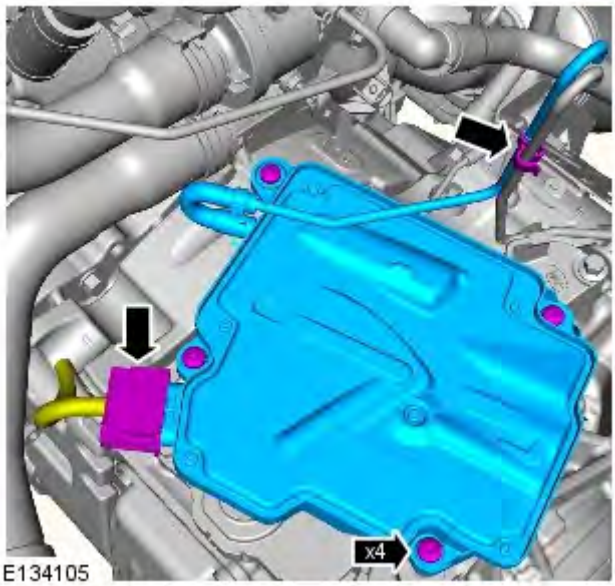

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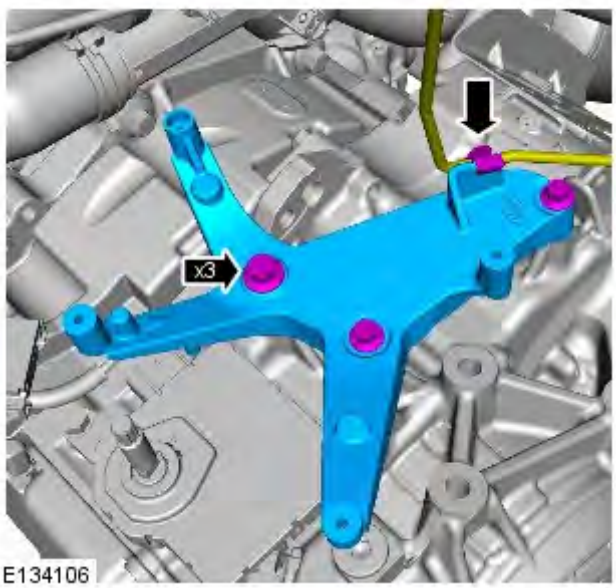

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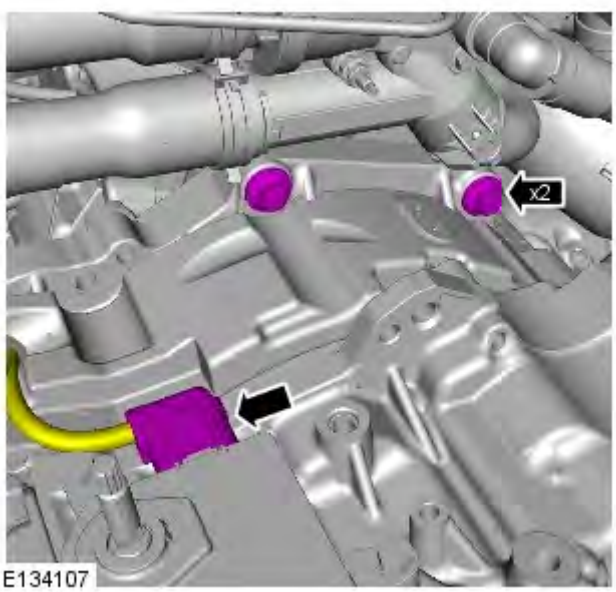
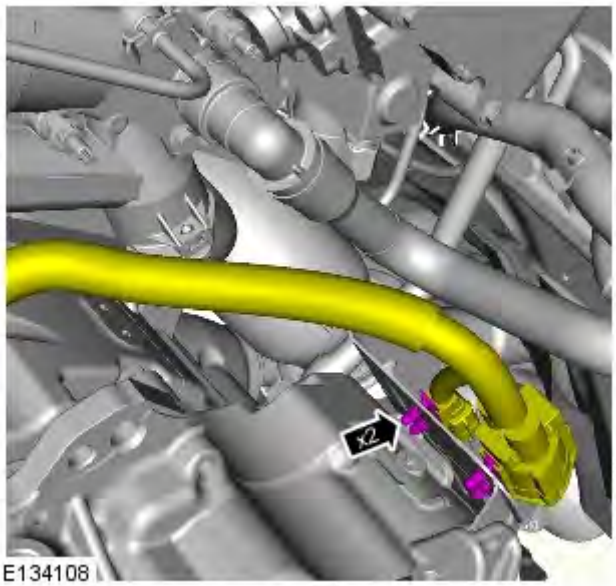
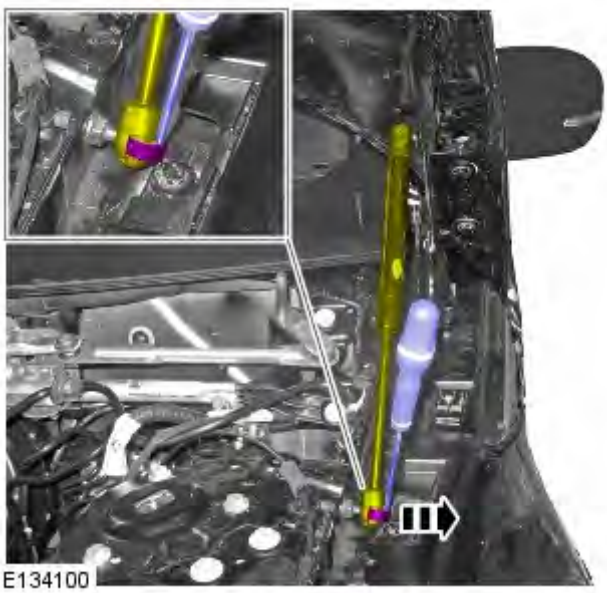


13.



E134108

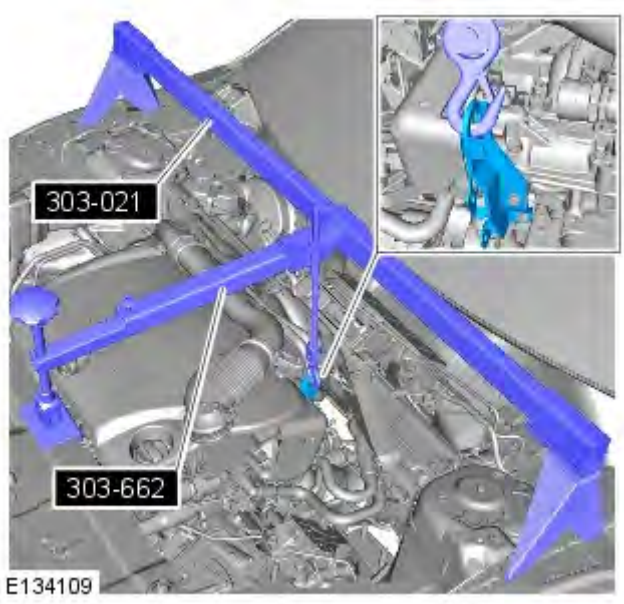
14.


E134100

- Repeat the above step for the other side.
- Secure the hood at the highest position.

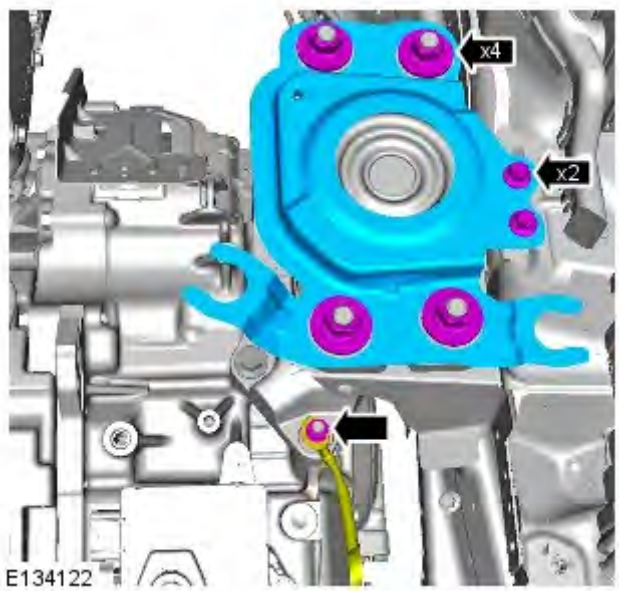
15. Repeat the above step for the other side.


E134099

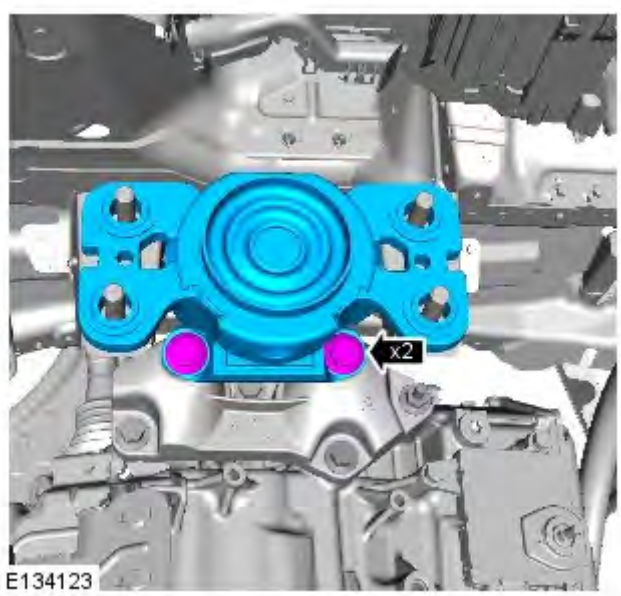


16. Support the engine.

Special Tool(s): 303-021, 303-662



17.



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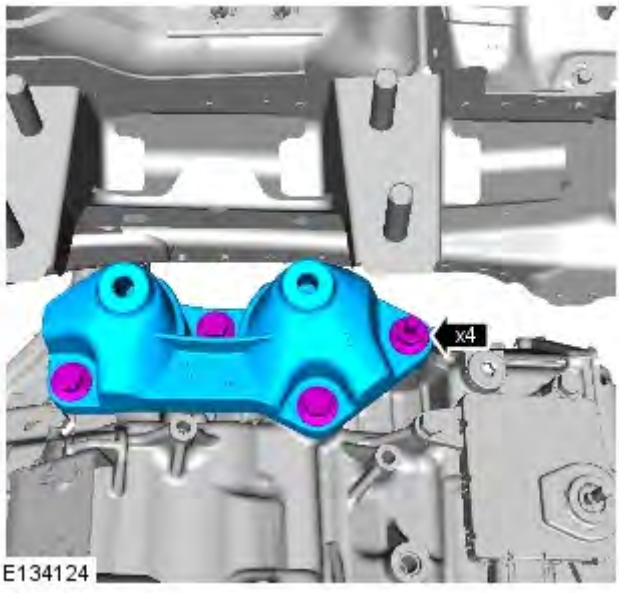


19.

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

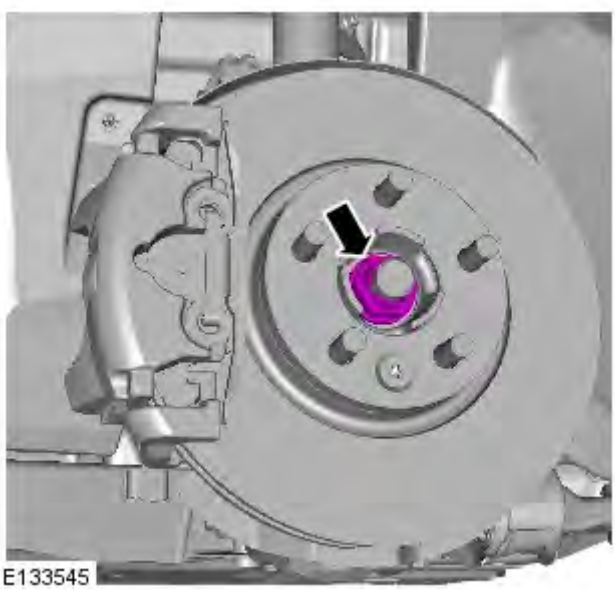
    Raise and support the vehicle.

21. Remove the front wheels and tires.

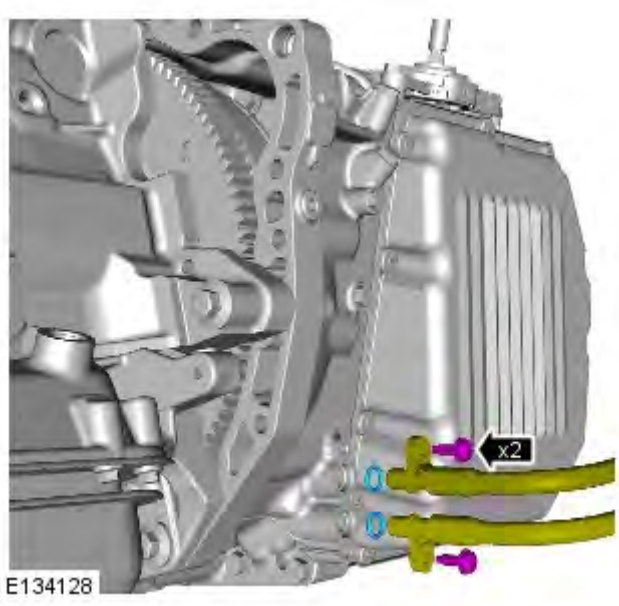
    Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

22. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

23. Refer to: Front Subframe (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).



24. CAUTION: Discard the nut.

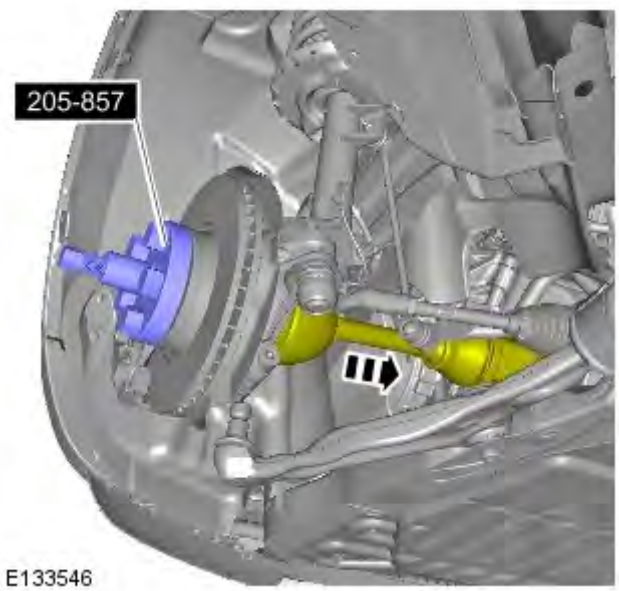


25. CAUTIONS:

Be prepared to collect escaping fluids.

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

NOTE: Remove and discard the O-ring seals.

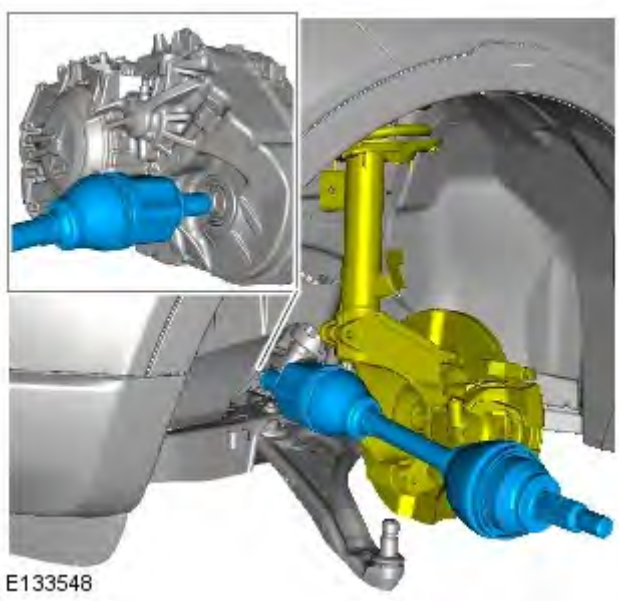


26. CAUTIONS:

Make sure that the driveshaft is supported with suitable retaining straps.

Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Special Tool(s): 205-857

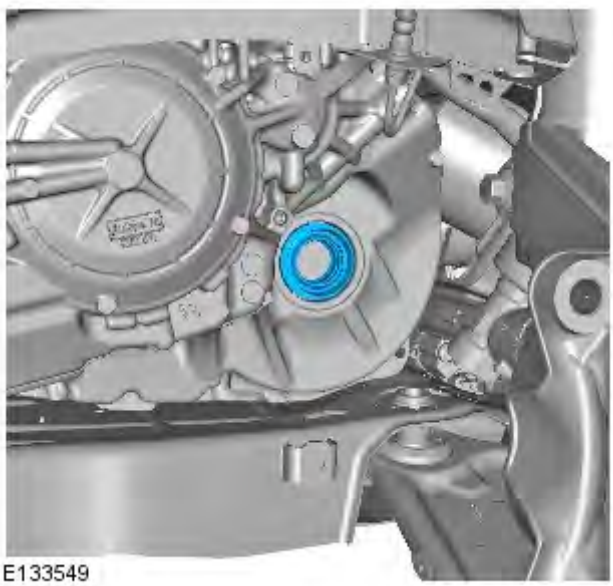


27. WARNING: Be prepared to collect escaping fluids.

CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

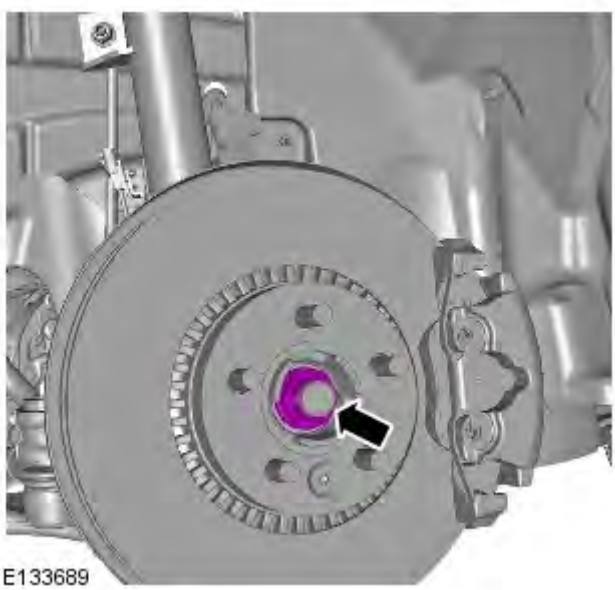

E133550

28. CAUTION: Discard the component.

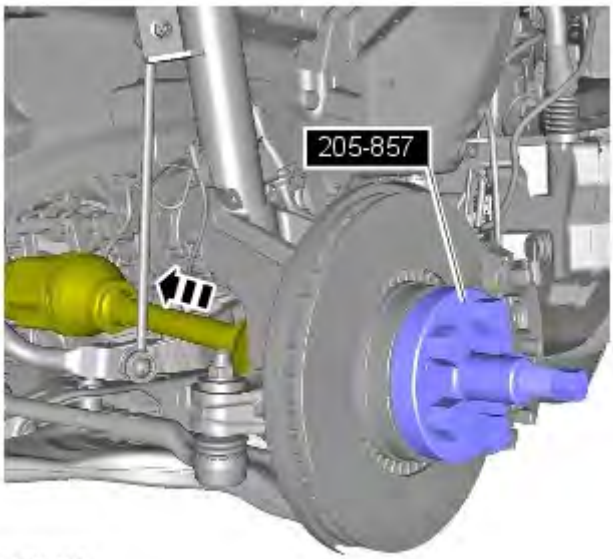

E133549

29. CAUTION: Inspect the seal, replace if damaged

If removed for access only.


E133689

30. CAUTION: Discard the nut.



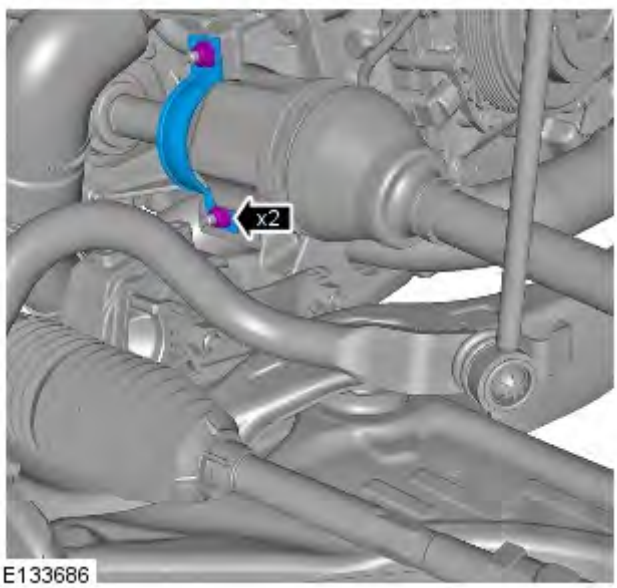
E133690

31. CAUTIONS:

Make sure that the driveshaft is supported with suitable retaining straps.

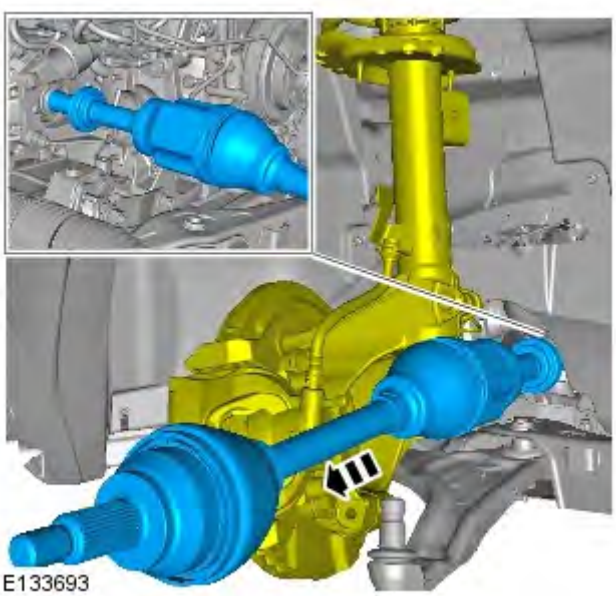
Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Special Tool(s): 205-857



E133686

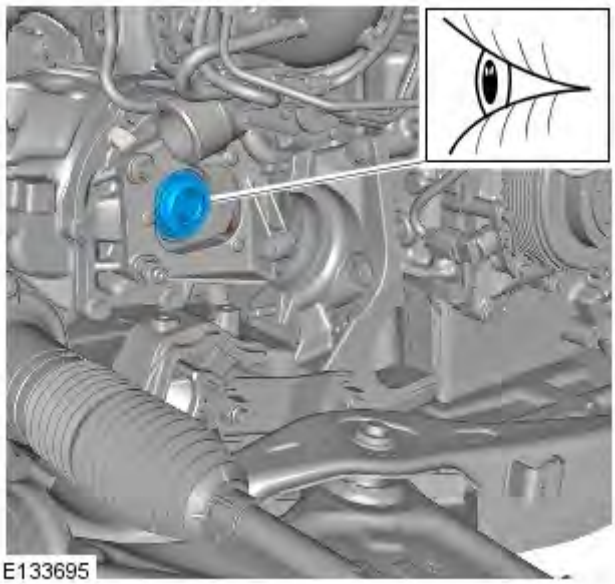
32.


E133693

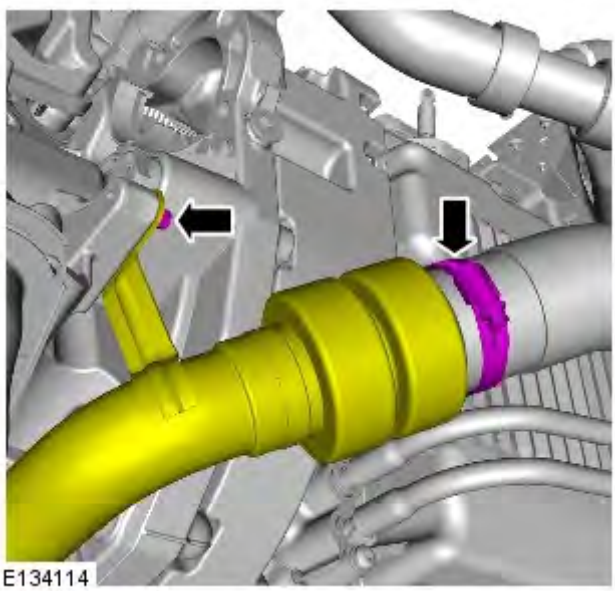
33. WARNING: Be prepared to collect escaping fluids.

CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

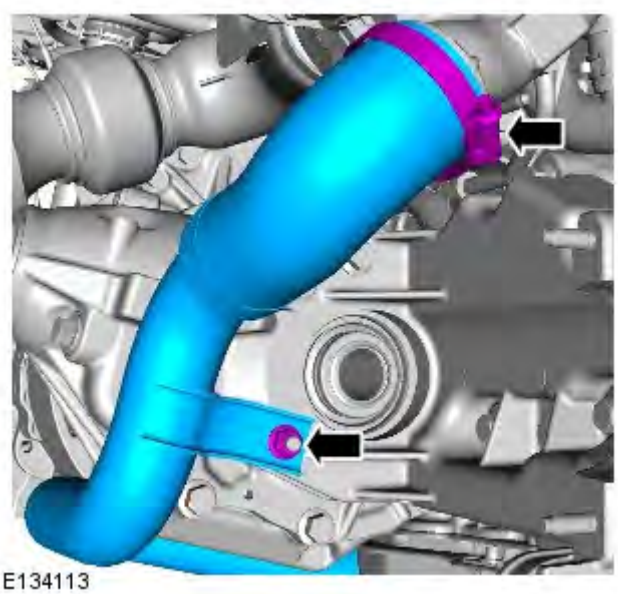
34.

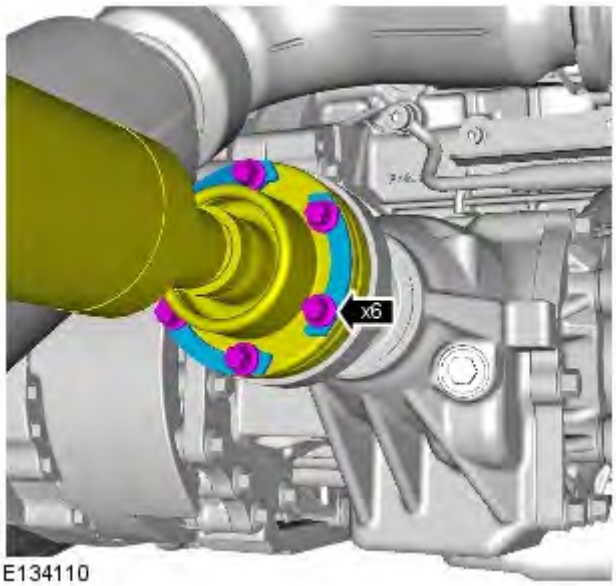

E133695

35.


E134114

36.

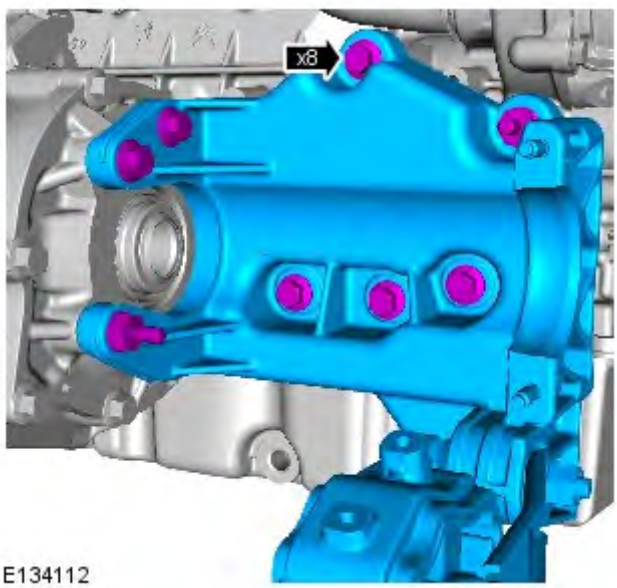

E134113



E134110

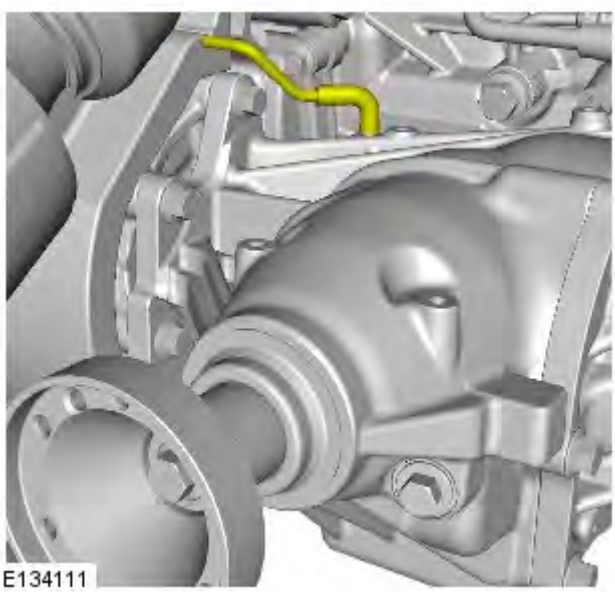
37. CAUTION: Discard the bolts.

Tie aside.



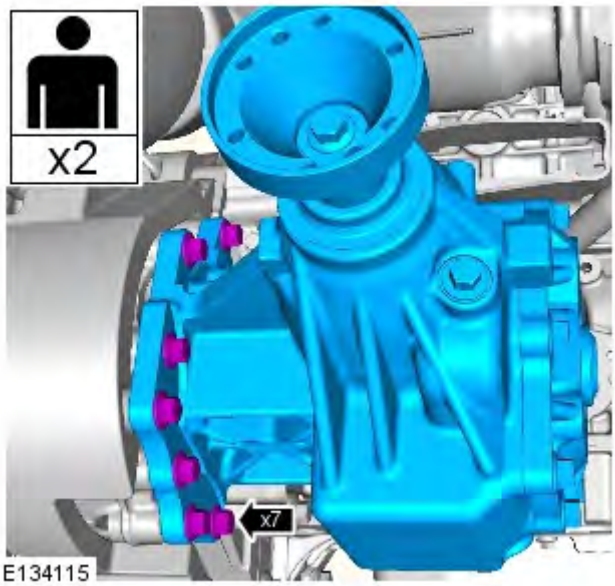
E134112

38.

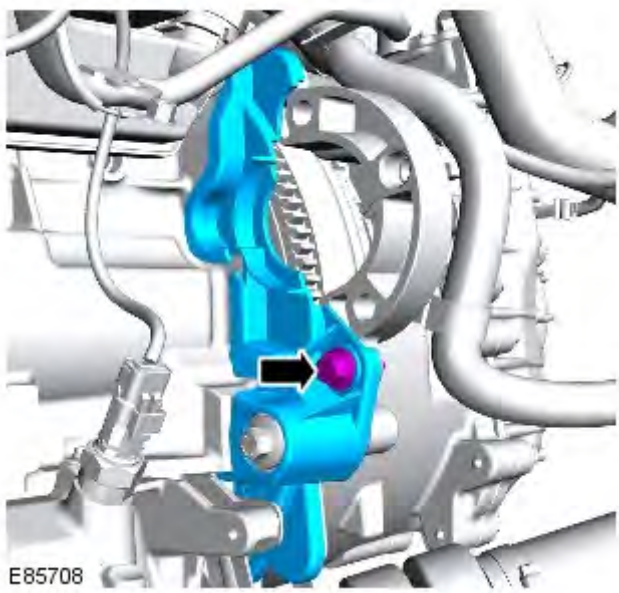

E134111

39.

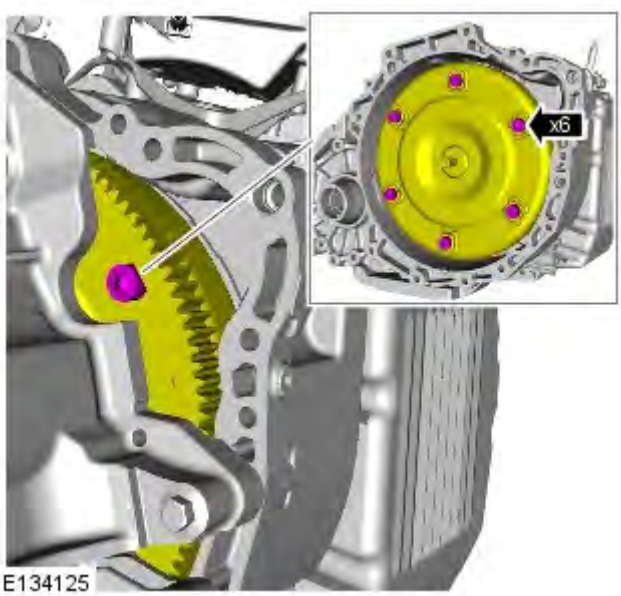
40.



41.



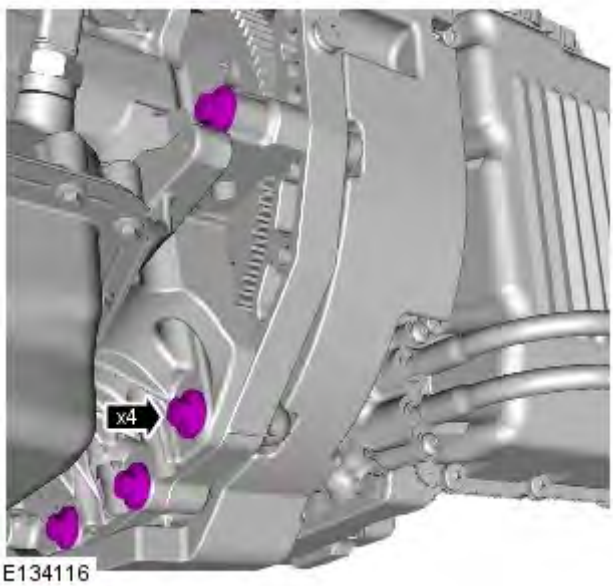
42. CAUTION: Discard the bolts.



43. *General Equipment:* Transmission jack

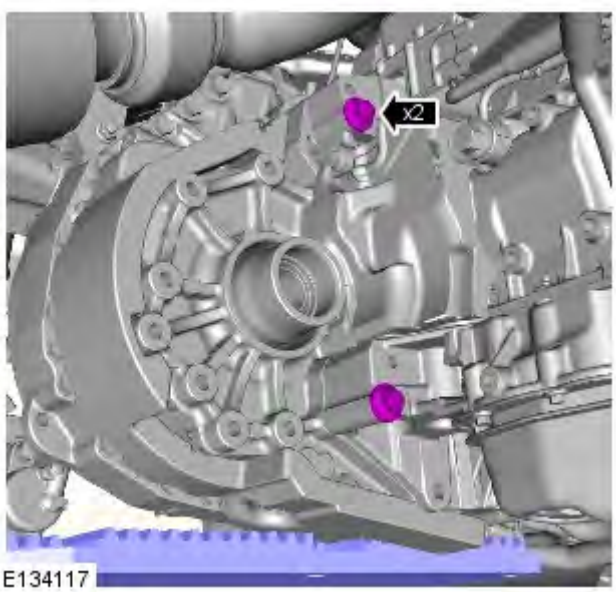

E134121

44.



E134116

45.

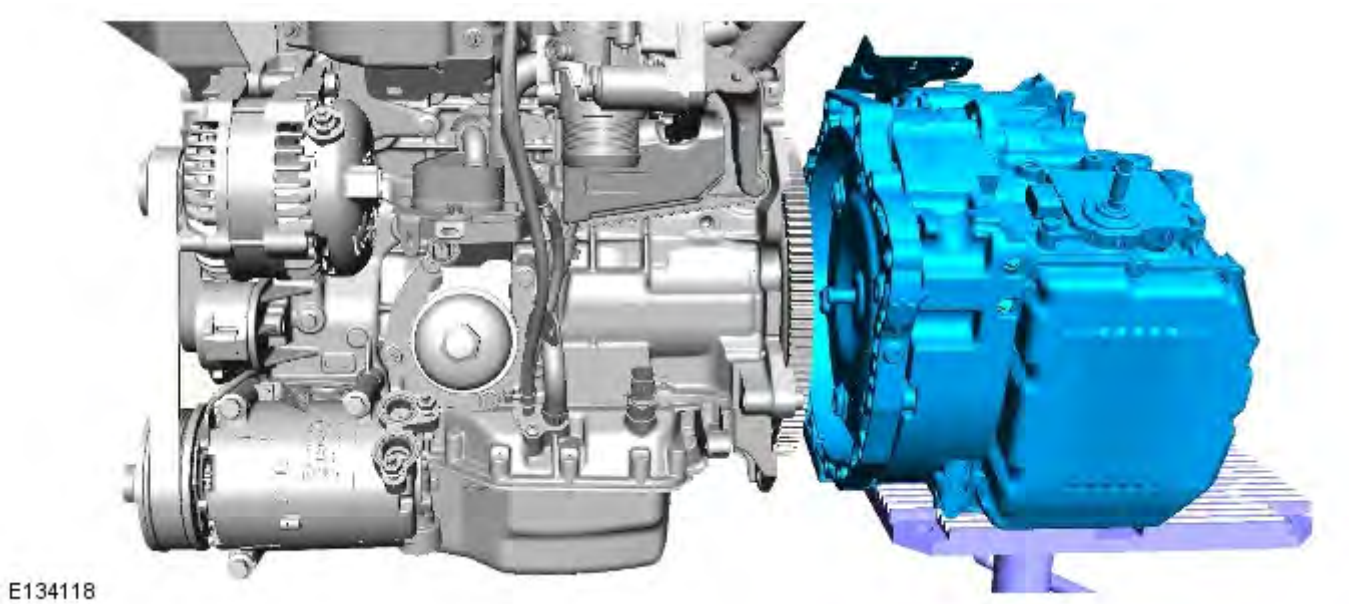


E134117

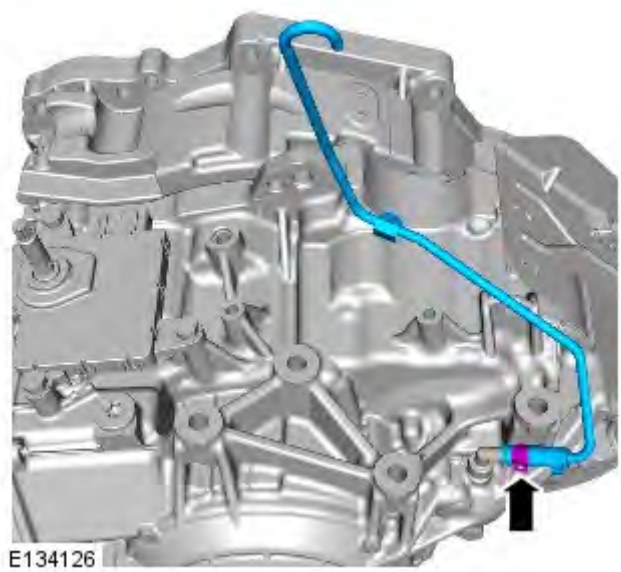
46. CAUTIONS:

Make sure that the torque converter remains in the transmission.

Make sure that the dowels are still located on the engine and not the transmission.



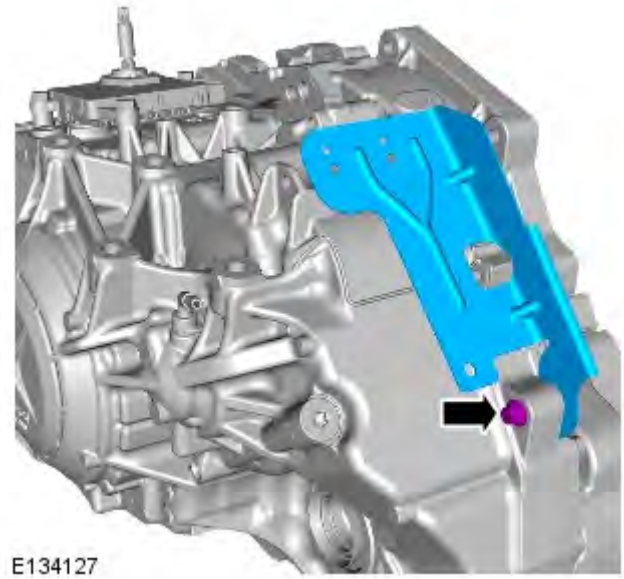
E134118



E134126

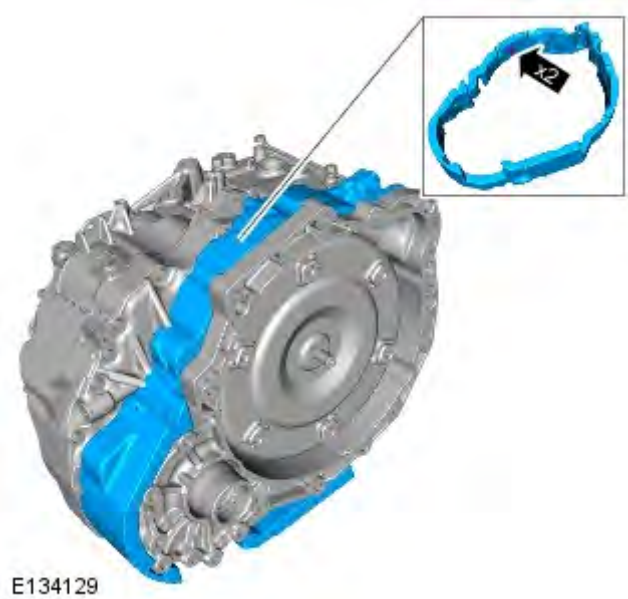
47. NOTE: Do not disassemble further if the component is removed for access only.

48.



E134127

49.



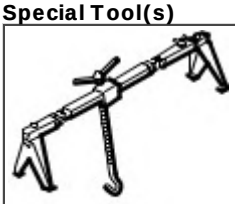
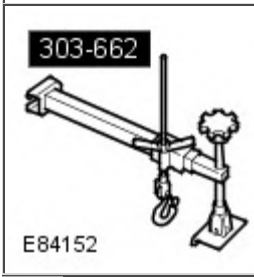
E134129

Published: 16-Apr-2013

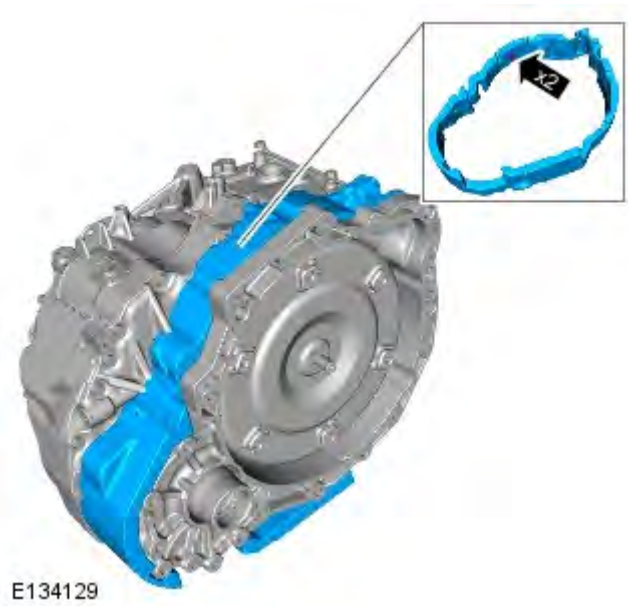
Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission TD4 2.2L Diesel

Installation

Special Tool(s)

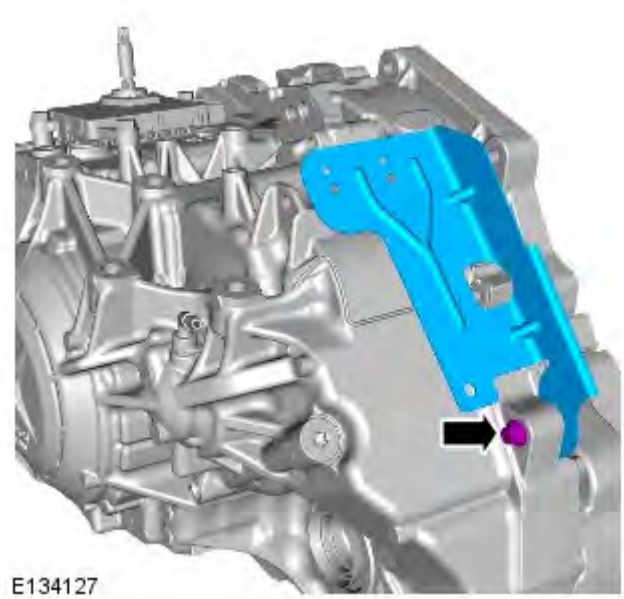
 303-021	303-021 Engine support bracket
 E84152	303-662 Support Beam Arm and Hook Assembly, Engine

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



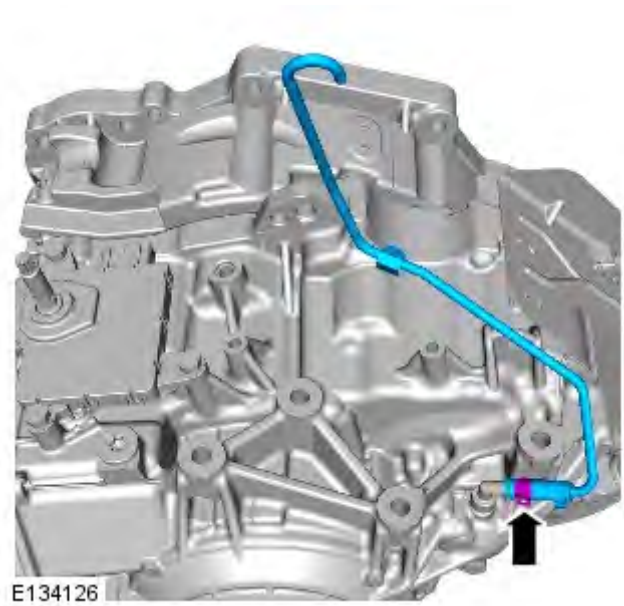
E134129

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


E134127

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

   Torque: 12 Nm


E134126

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

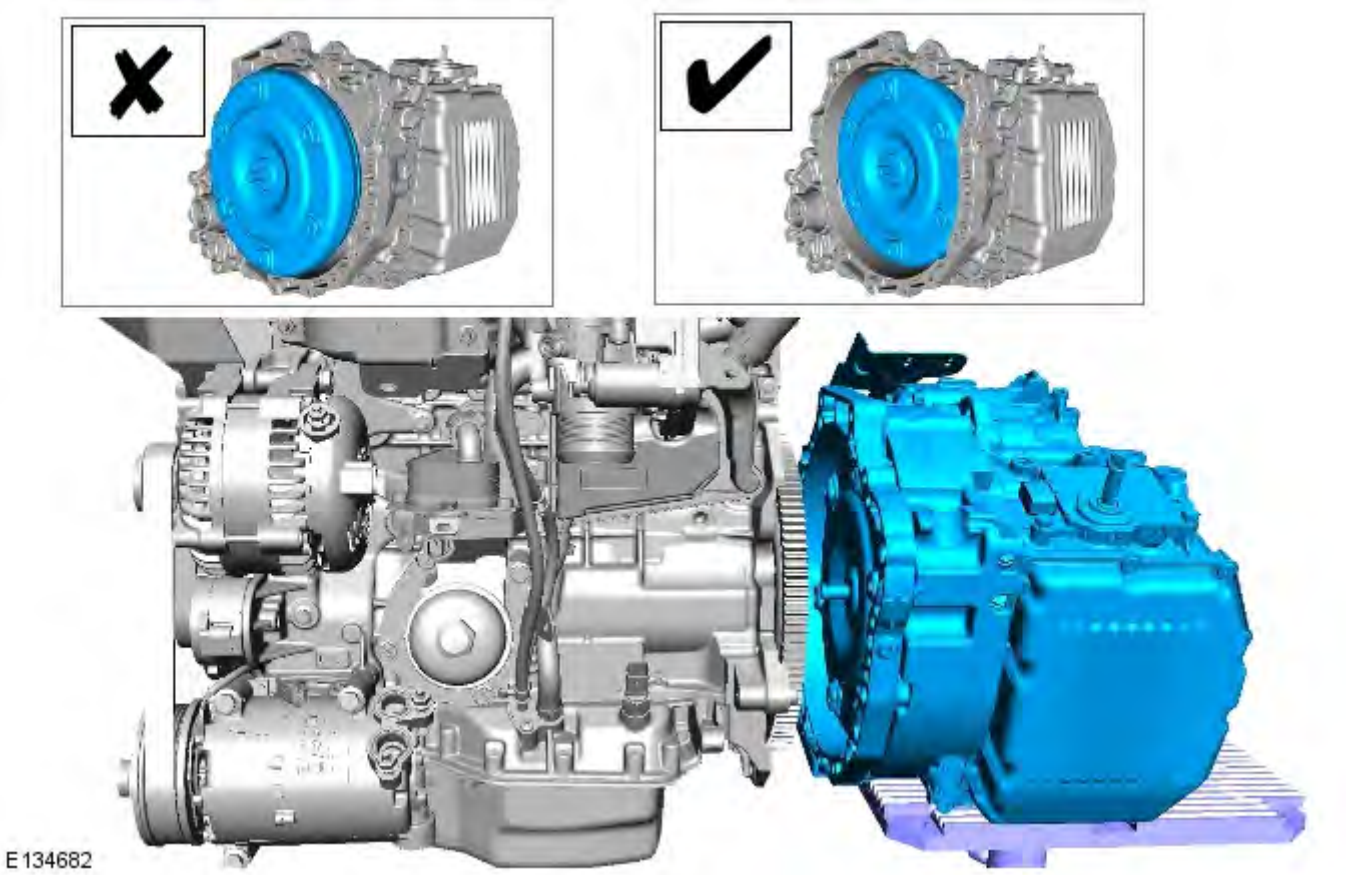
4. CAUTIONS:

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

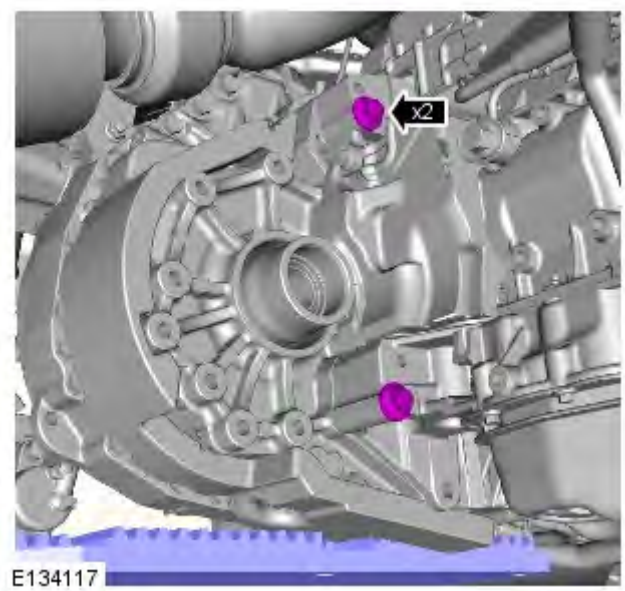
   Apply grease of the correct specification to the torque converter spigot.

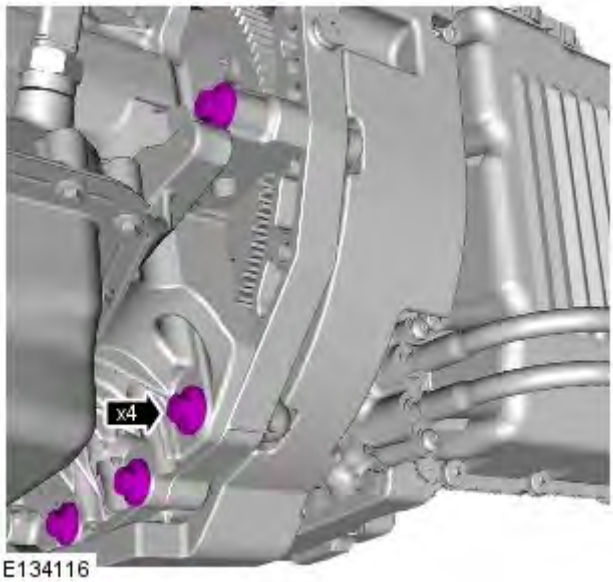
   Make sure the torque converter is fully located into the oil pump drive.

   Make sure that the component is fitted correctly on to the locating dowels.



5. *Torque:* 65 Nm



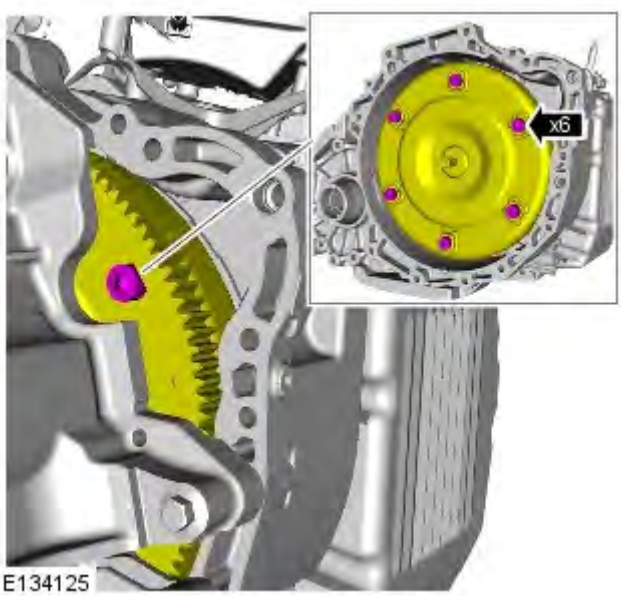


E134116

6. *Torque:* 65 Nm


E134121

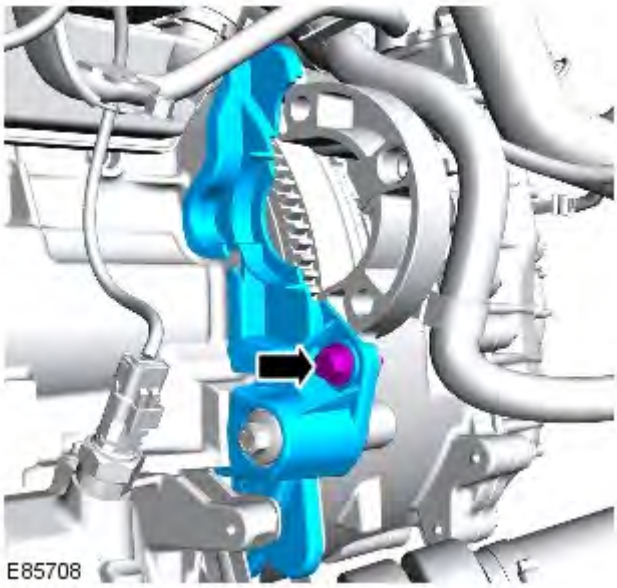
7. Remove the transmission jack.



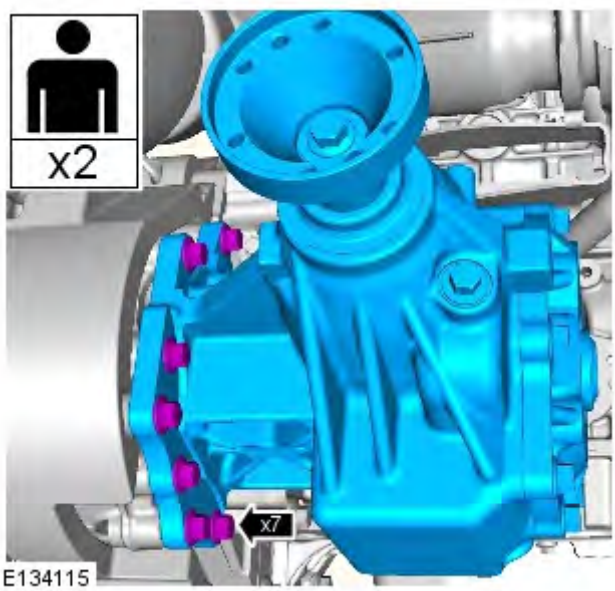
E134125

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

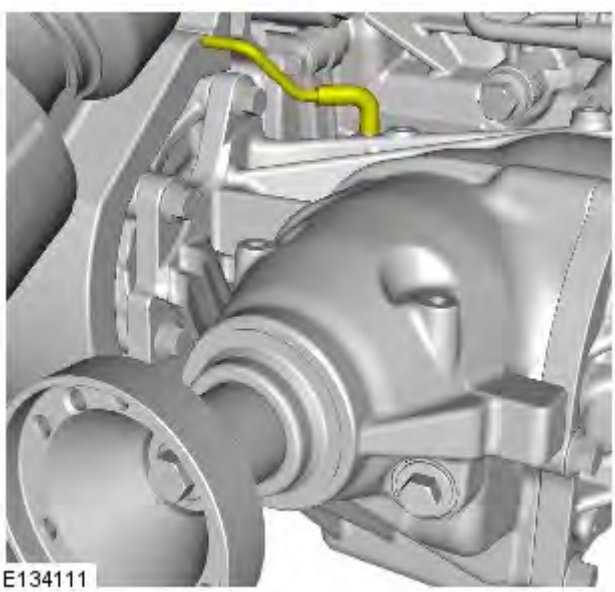
Torque: 60 Nm



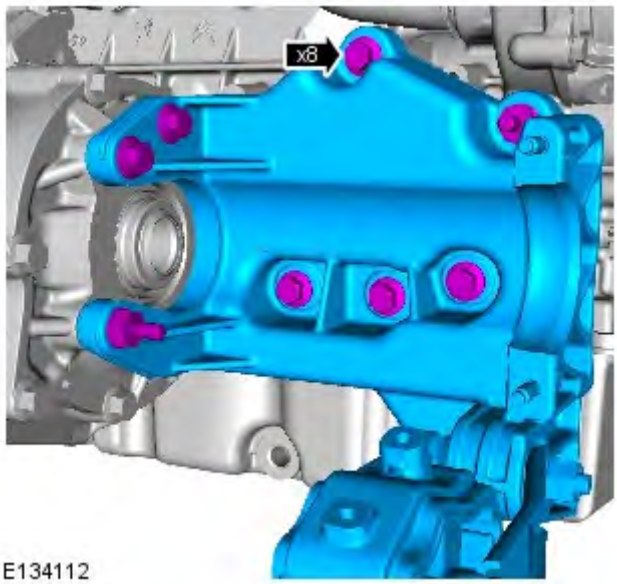
9. *Torque:* 24 Nm



10. *Torque:* 65 Nm

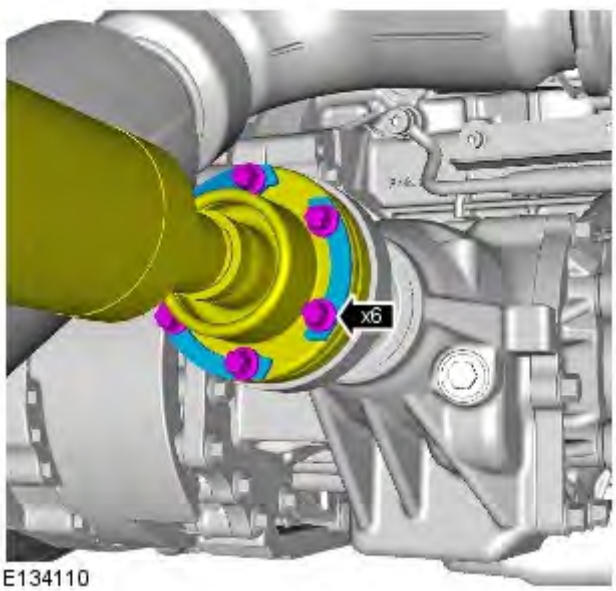


11.



E134112

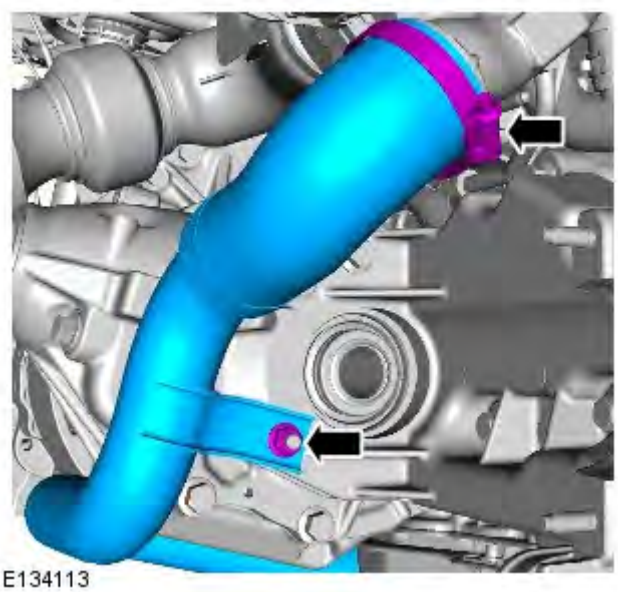
12. *Torque:* 65 Nm



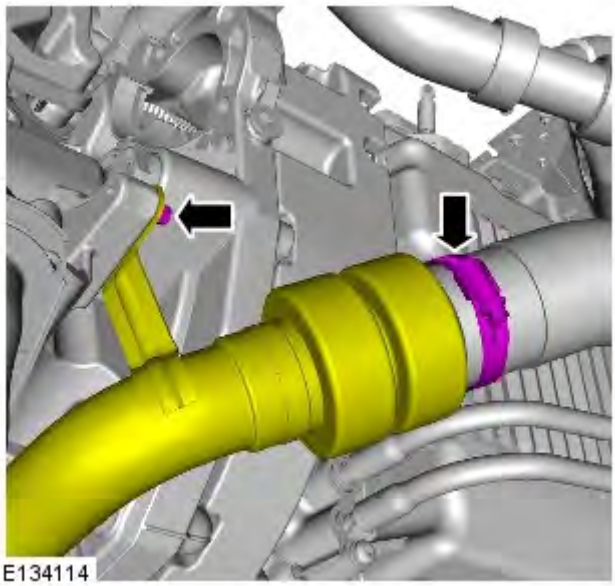
E134110

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

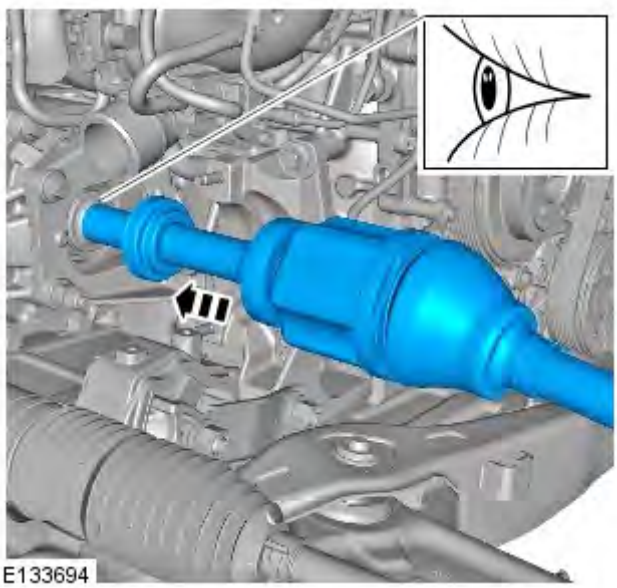
Torque: 40 Nm


E134113

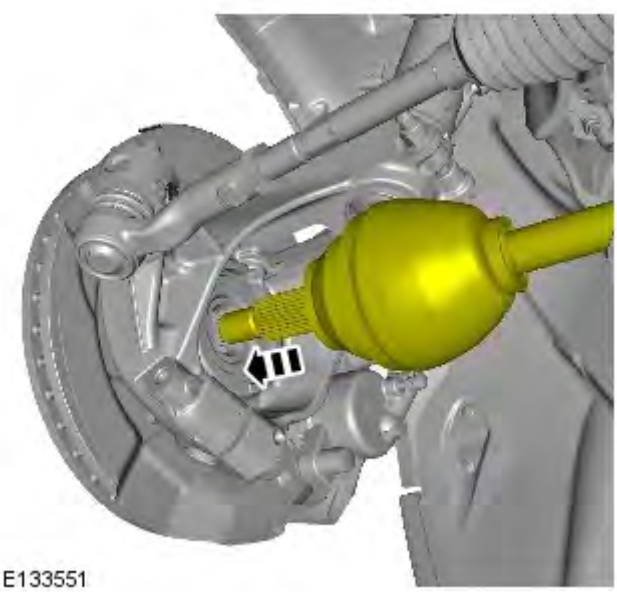
14. *Torque:*
M8 12 Nm
Clamp 3.5 Nm


E134114

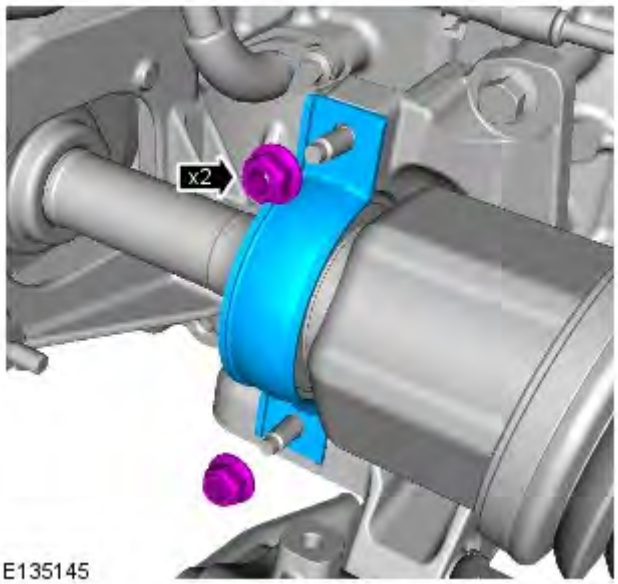
15. *Torque:*
    M6 12 Nm
    Clamp 3.5 Nm


E133694

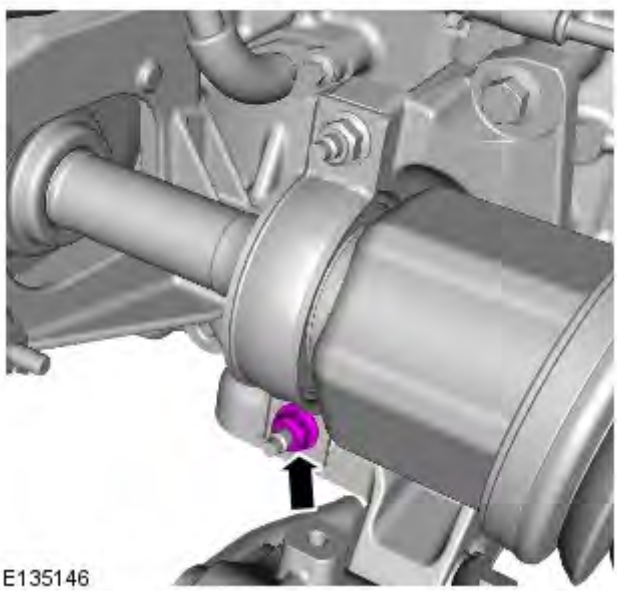
16. CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.


E133551

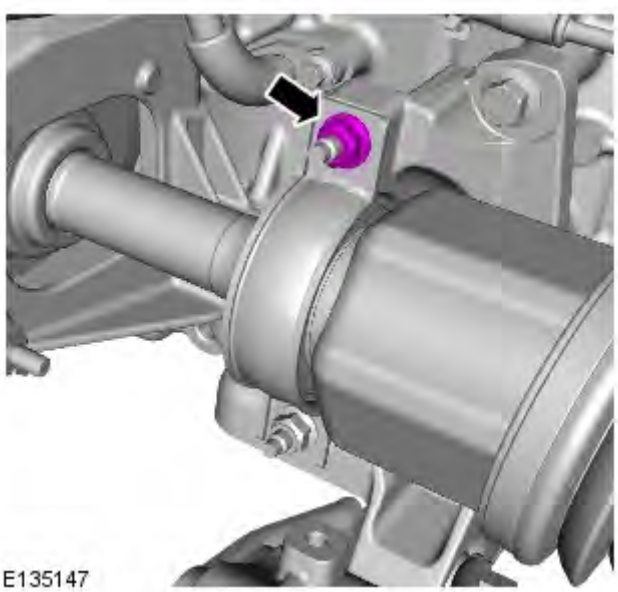
17. CAUTION: LH illustration shown, RH is similar.



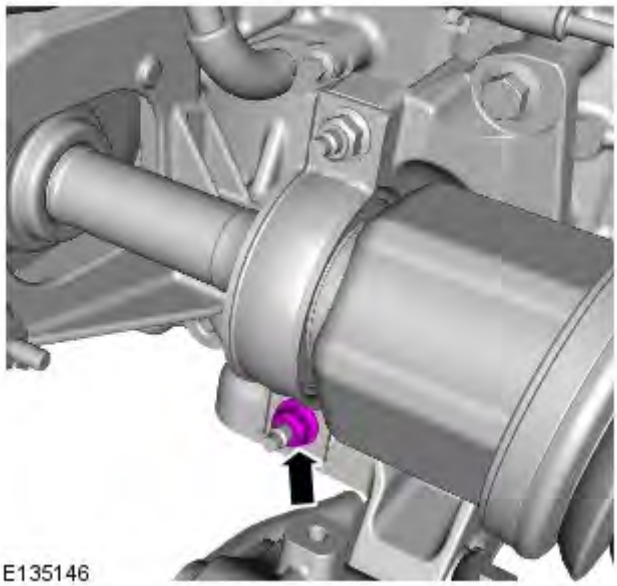
18. CAUTION: Only tighten the nuts finger-tight at this stage.



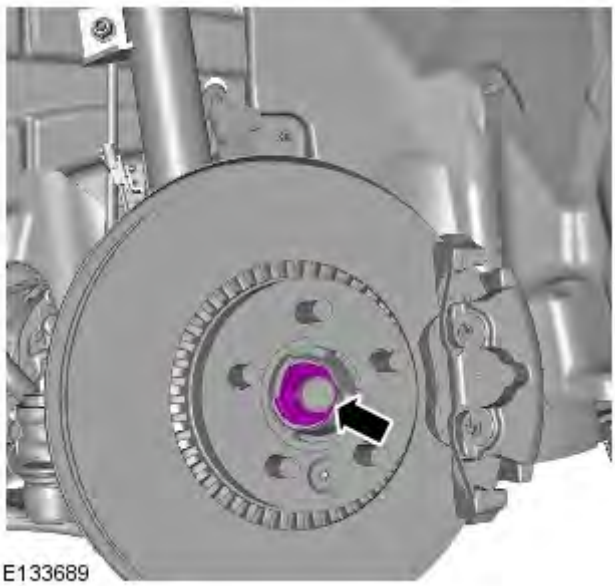
19. *Torque:* 2 Nm



20. *Torque:* 24 Nm


E135146

21. *Torque:* 24 Nm


E133689

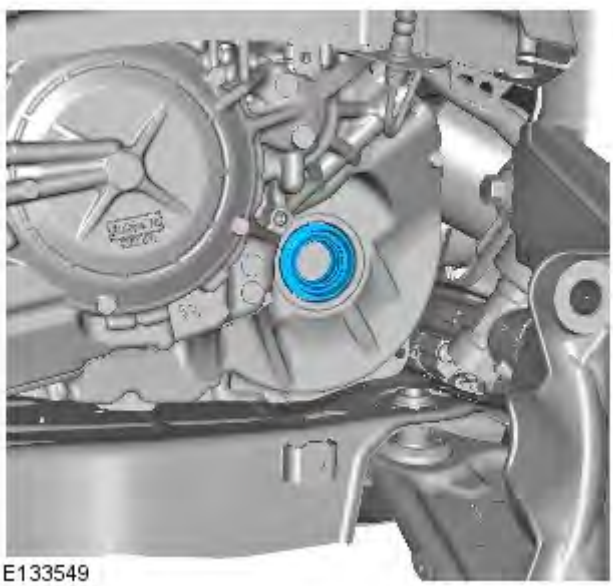
22. WARNING: Make sure that a new nut is installed.

CAUTIONS:

Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Install the halfshaft nut finger tight.

Torque: 120 Nm


E133549

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


E133550

24. CAUTION: Make sure that a new component is installed.


E133647

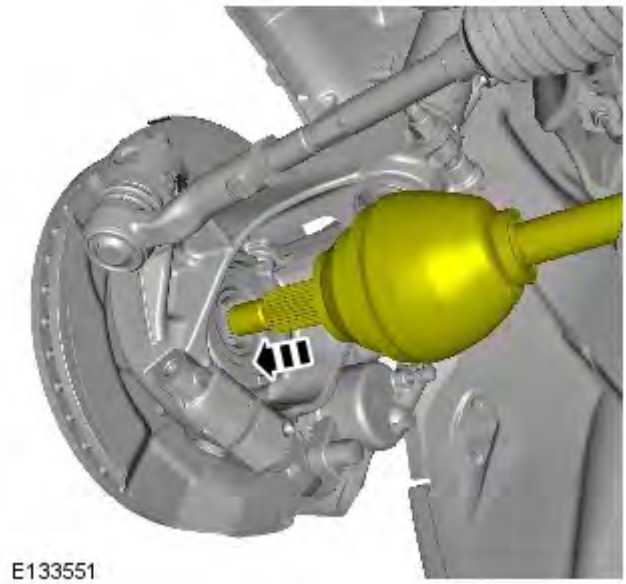
25. CAUTION:

To prevent oil seal damage use the protector when installing the shaft into the transmission. It is not a special tool but is available from the Parts Catalogue.

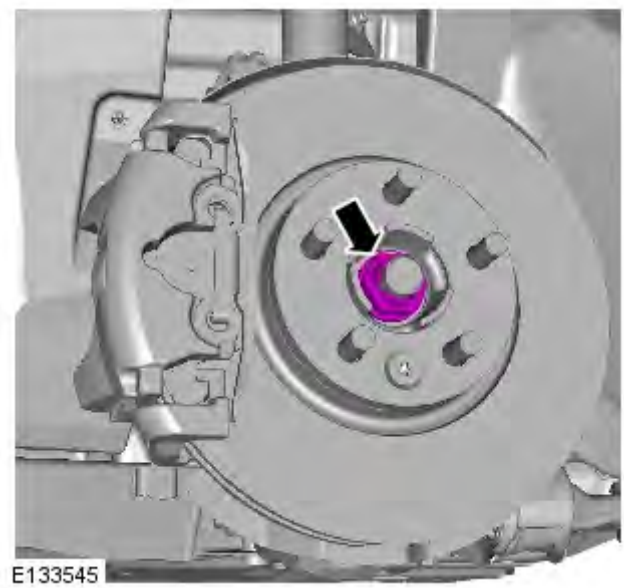
E133646

26. CAUTION: Keep the halfshaft horizontal to avoid damaging the oil seal.

NOTE: Do not fully engage the halfshaft until the oil seal protector has been removed.



27.



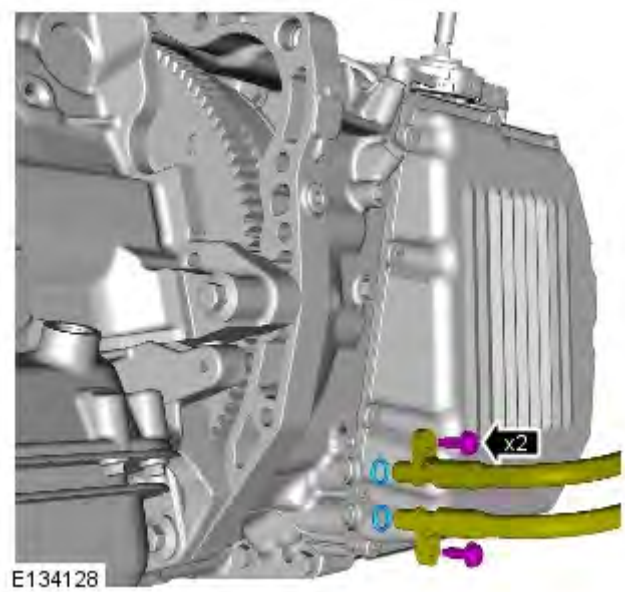
28. WARNING: Make sure that a new nut is installed.

CAUTIONS:

Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Install the halfshaft nut finger tight.

Torque: 120 Nm



29. CAUTIONS:

Install new o-ring seals

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

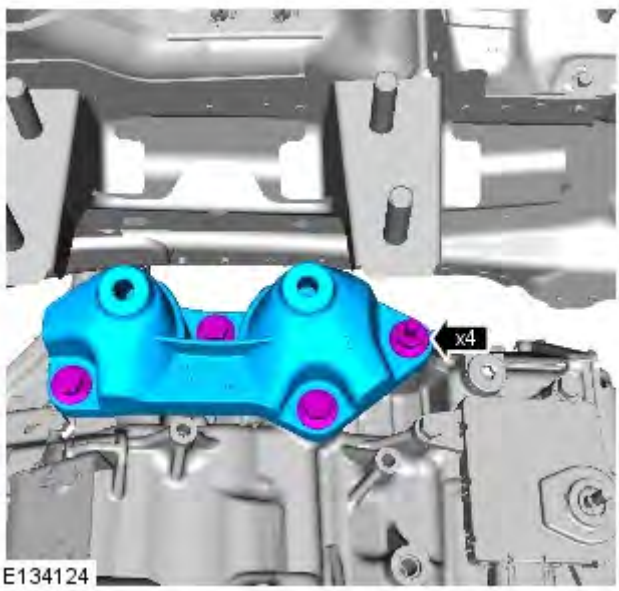
Torque: 10 Nm

30. Refer to: Front Subframe (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

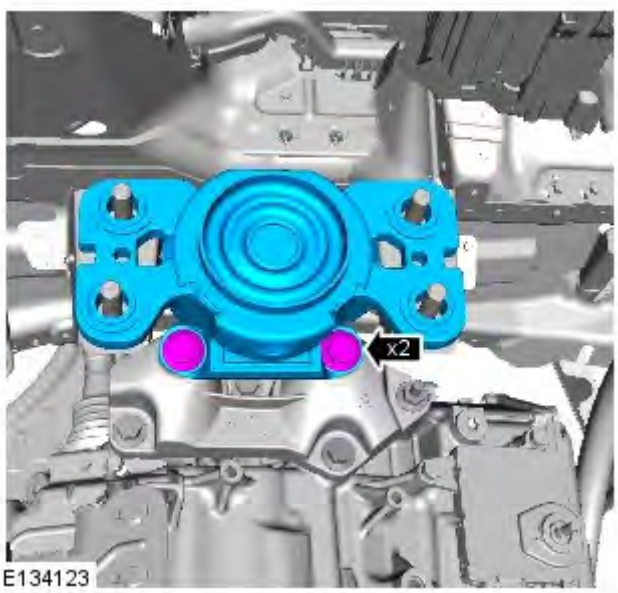
31. Install the front wheels and tires.

    Refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

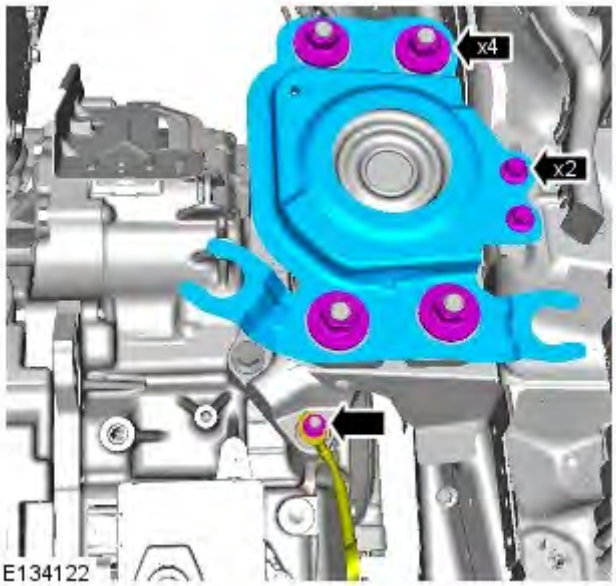
32. Lower the vehicle.



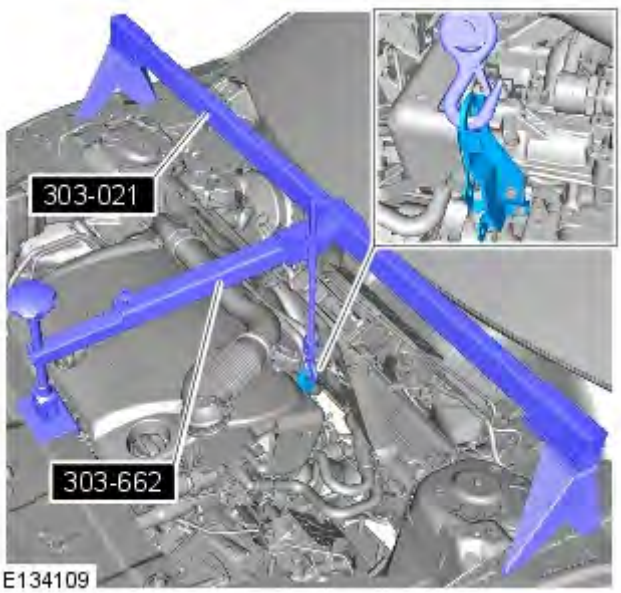
33. *Torque:* 80 Nm



34. *Torque:* 175 Nm



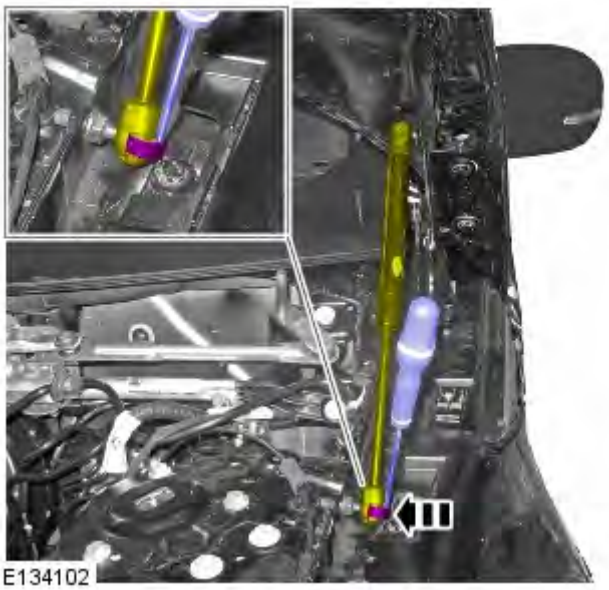
35. *Torque:*
    M8 24 Nm
    M12 80 Nm



36. Remove the special tools.

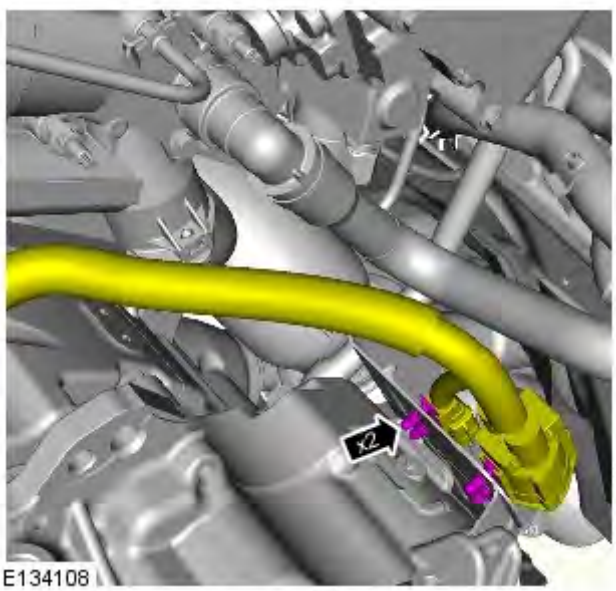
    Special Tool(s): 303-021, 303-662

37.
- *Torque:* 12 Nm
- Repeat the above step for the other side.


E134102

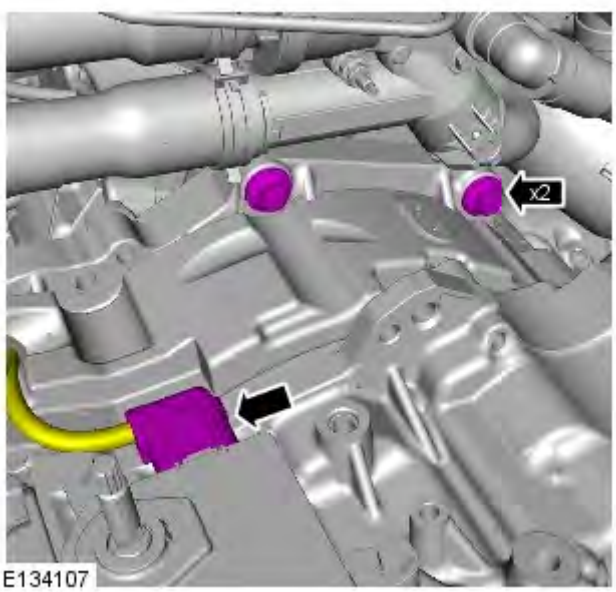
38.

- Repeat the above step for the other side.



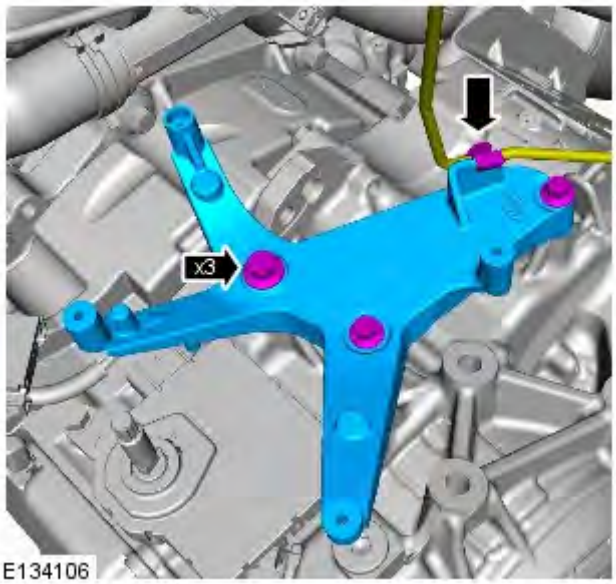
E134108

39.



E134107

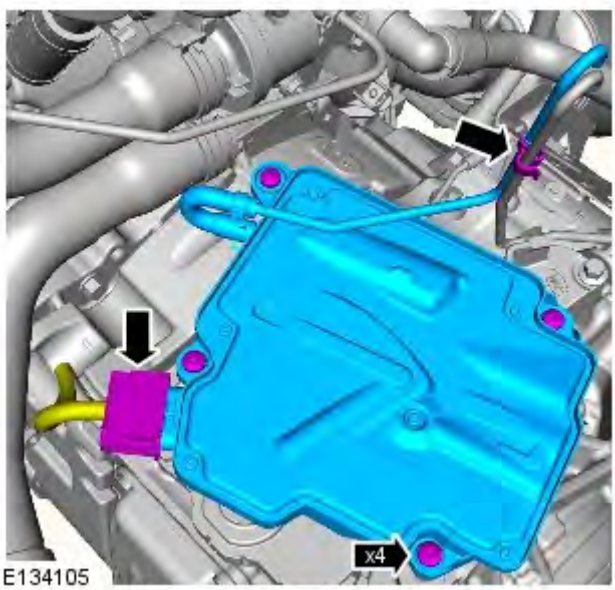
40. *Torque:* 65 Nm



41. *Torque:*
M10 47 Nm
M8 24 Nm

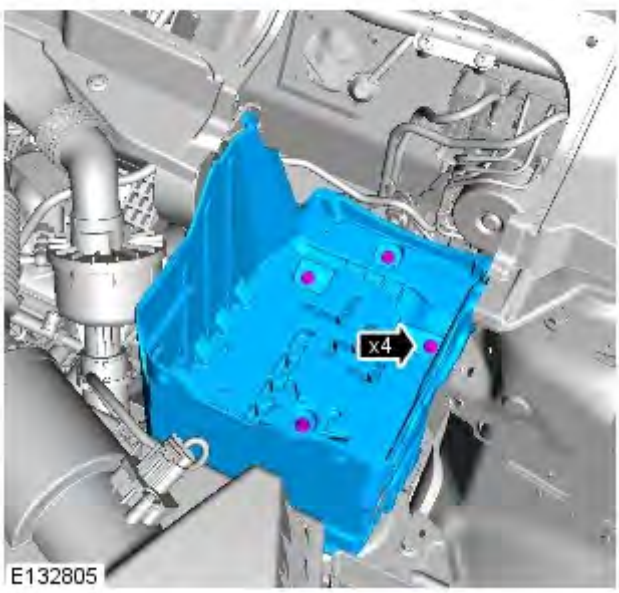
42. CAUTION: Make sure that new components are installed.

NOTE: Do not fully tighten the clamp at this stage.

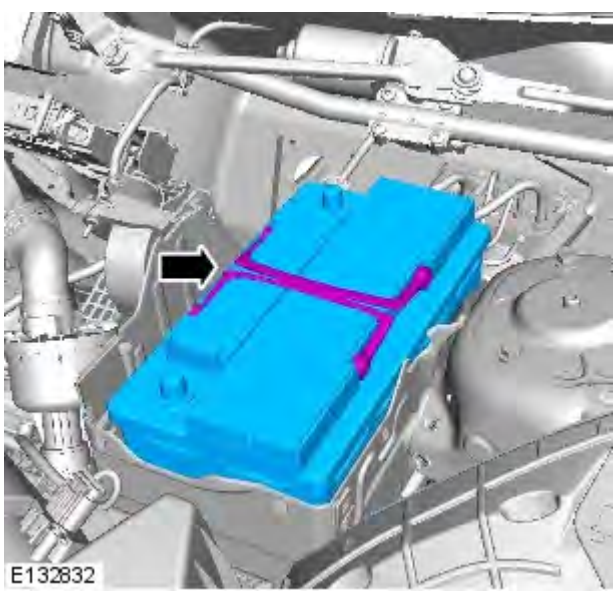


43. *Torque:* 10 Nm

44. *Torque:* 10 Nm

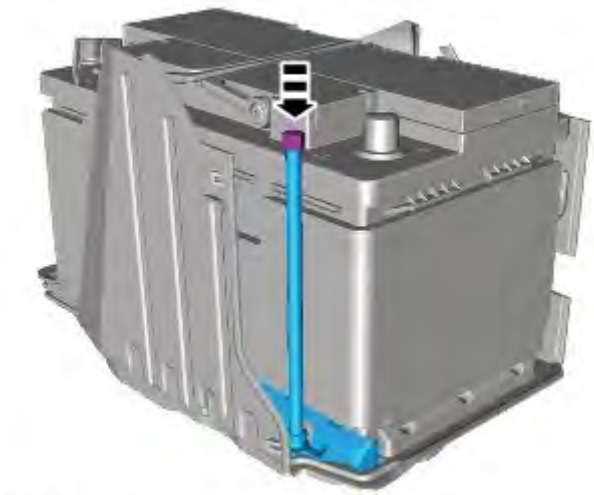


45. *Torque:* 10 Nm



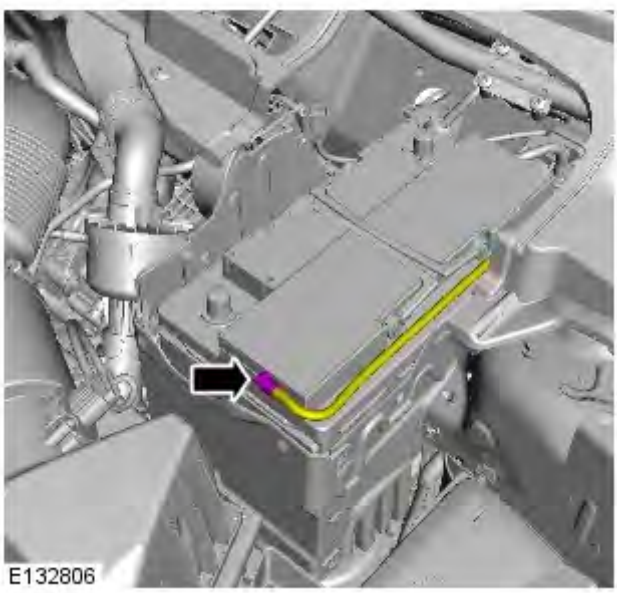
46.

47. *Torque:* 12 Nm



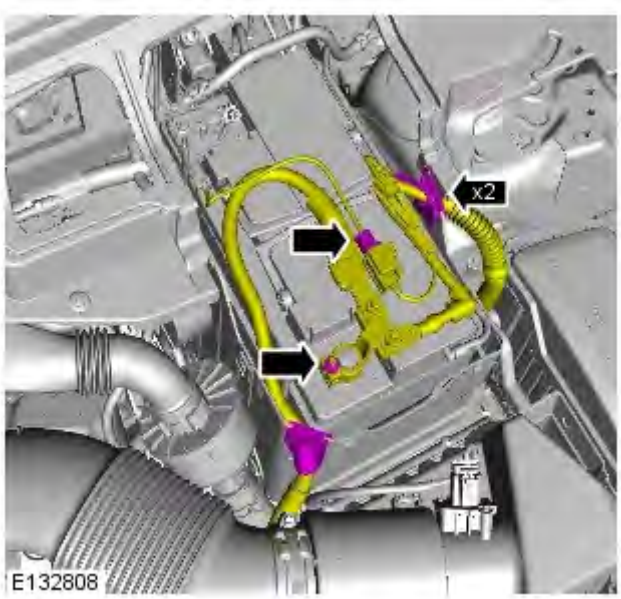
E134165

48.



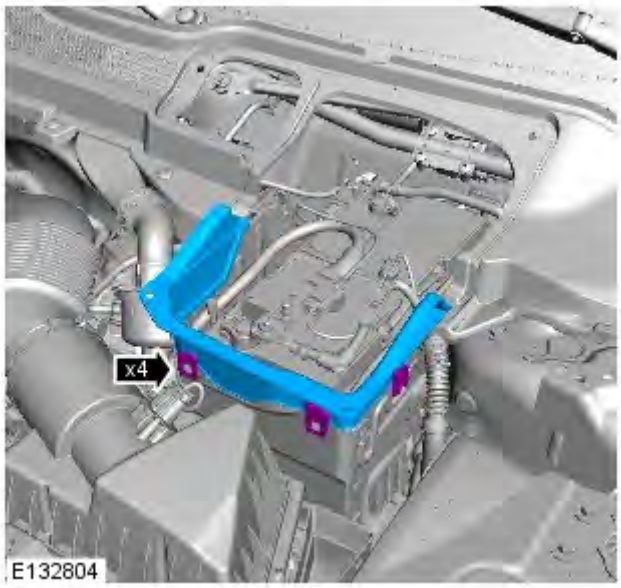
E132806

49.



E132808

50.



51. Refer to: Starter Motor (303-06A Starting System - TD4 2.2L Diesel, Removal and Installation).

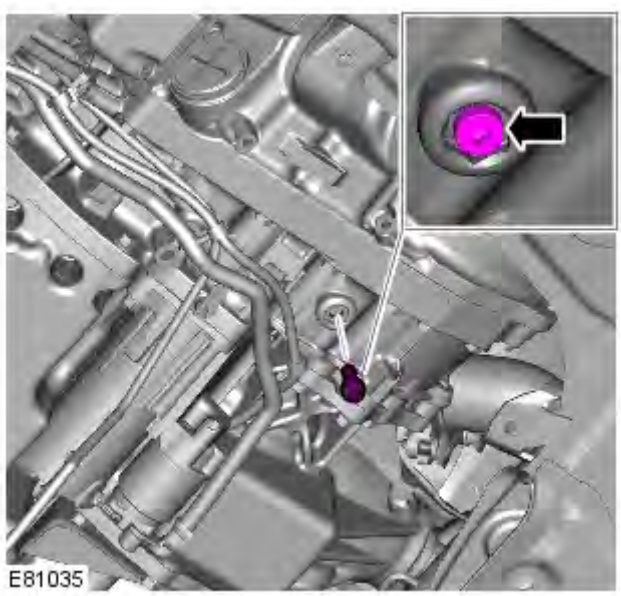
52. Refer to: Plenum Chamber (412-01 Climate Control, Removal and Installation).

53. Connect the battery ground cable.

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

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

    Raise and support the vehicle.



55. CAUTION: The fluid level plug and drain plug both use the same point on the transmission. The inner plug is for level indication and the outer plug is to drain the fluid.

    - Carry out a transmission fluid level check.
    - With the engine running a small amount of fluid should drip out of the level plug.
    - If the transmission fluid does not come out of the transmission fluid level 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.
    - *Torque:* 7 Nm

56. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

57. Lower the vehicle.

58.

- Using the diagnostic tool, calibrate the transmission control unit (TCM).
- Using the diagnostic tool, calibrate the gear shift module (GSM).

Published: 21-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Diagnostics

Diagnosis and Testing

Principles of Operation

For a detailed description of the Automatic transmission/transaxle, refer to the relevant section of the workshop manual. REFER to: Transmission Description (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Description and Operation) /
Transmission Description (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Description and Operation) /
Transmission Description (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, 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 be between 50°C (122°F) and 60°C (140°F) whilst checking level. Should the temperature rise above this figure, abort the check and allow the transmission fluid to cool.

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. For fluid level checks refer to the relevant section of the workshop manual.

Fluid Condition Check

Use the following procedure to check the fluid condition, which is a good indicator of the internal condition of the transmission:

1. Check the fluid level.
2. Observe the colour and the odour of the fluid. The colour under normal circumstances should be reddish, not brown or black.
   - If in doubt, compare the fluid with that from a new, sealed container.
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.

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/transmission 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/transmission.

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

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

Visual Inspection

Mechanical	Electrical	Hydraulic
• Damaged shift mechanism/linkages • Damaged automatic transmission casing • Check the transmission selector lever cable for correct adjustment	• Blown fuse(s) • Damaged, loose or corroded connectors • Wiring harness • Contact resistance or oxidation in the 22 way connector terminals	• 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. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes before moving onto the diagnostic trouble code index.
   - Make sure that all diagnostic trouble codes are cleared following rectification.

Transmission control module 22 way connector pin assignment

Pin assignment

Pin number	Pin name	Signal description
1	SLTG	Line pressure control solenoid ground
2	S2	Shift solenoid 2
3	SLT	Line pressure control solenoid
4	SLUG	L-UP linear solenoid ground
5	S1	Shift solenoid No.1
6	Not used	Not used
7	OTG	Oil temperature ground
8	OT	oil temperature
9	SLU	L-UP linear solenoid
10	SLC1G	C1 pressure control linear solenoid ground
11	SLC1	C1 pressure control linear solenoid
12	NIN+	Input revolution
13	NIN-	Input revolution ground
14	SLC3	C3 pressure control linear solenoid
15	Not used	Not used
16	SLB1G	B1 pressure control linear solenoid ground
17	SLC2	C2 pressure control linear solenoid
18	SLC2G	C2 pressure control linear solenoid ground
19	SP+	Vehicle speed
20	SP-	Vehicle speed ground
21	SLB1	B1 pressure control linear solenoid
22	SLC3G	C3 pressure control linear solenoid ground

Transmission control module set up routines

NOTE: Service routines will be carried out using the manufacturer approved diagnostic system, special applications programs

Service routine	Process description	Service routine description	When required
On-Demand Self-Test - (0x0202)	Test all outputs for electrical errors	• This routine is used to check that the transmission control module is installed without any electrical errors • When activated the transmission control module will test all outputs for electrical errors • Solenoids are activated high and low to check for electrical errors	• This routine shall be performed after transmission related repairs have been completed
Neutral Position Learning - (0x4000)	Gear selection sensor adjustment	• This routine is used to calibrate the gear selector position sensor in the transmission control module towards a specific cable adjustment or transmission • To adjust the new transmission control module to the transmission or the vehicle cable to the gear shift module	• This routine shall be performed when a transmission control module is installed on the transmission • This routine shall be performed when a transmission is installed
Clear Self-learning Data - (0x0402)	Clear pre-adaptions	• This routine is used to clear the solenoid adaptation in the transmission control module	• This routine shall be performed when a transmission is installed and transmission control module is reused
Reset Adaption Values - (0x4013)	Routine adaption clear	• This routine is used to clear the adaptation in the transmission, this needs to be done when software is exchanged or if some other reason the adaptation might be incorrect	• This routine shall be performed when a transmission is installed and transmission control module is reused
Oil Change Reset - (0x4024)	Clear oil degradation	• This routine is used to clear the counter that counts the oil degradation, the data needs to be erased if new oil is installed	• This routine shall be performed when a transmission is installed and transmission control module is reused
Set Adaptation Mode - (0x4041)	Enter exit adaption mode	• This routine is used to prevent harsh gear changes	• This routine shall be performed when a transmission control module is installed on the transmission • This routine shall be performed when a transmission is installed

For a complete list of all diagnostic trouble codes 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).

Published: 09-Jun-2011

Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Transmission Fluid Pan GTDi 2.0L Petrol

Removal and Installation

Removal

CAUTION: Extreme cleanliness must be exercised when handling this component.

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

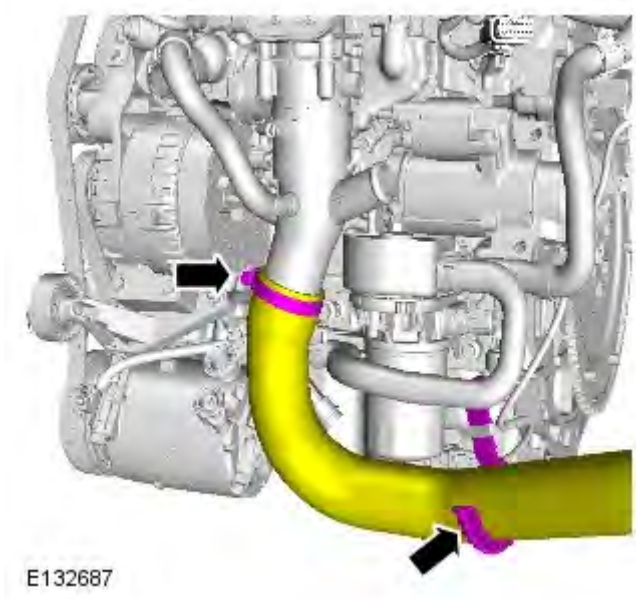
1. WARNING: Make sure to support the vehicle with axle stands.

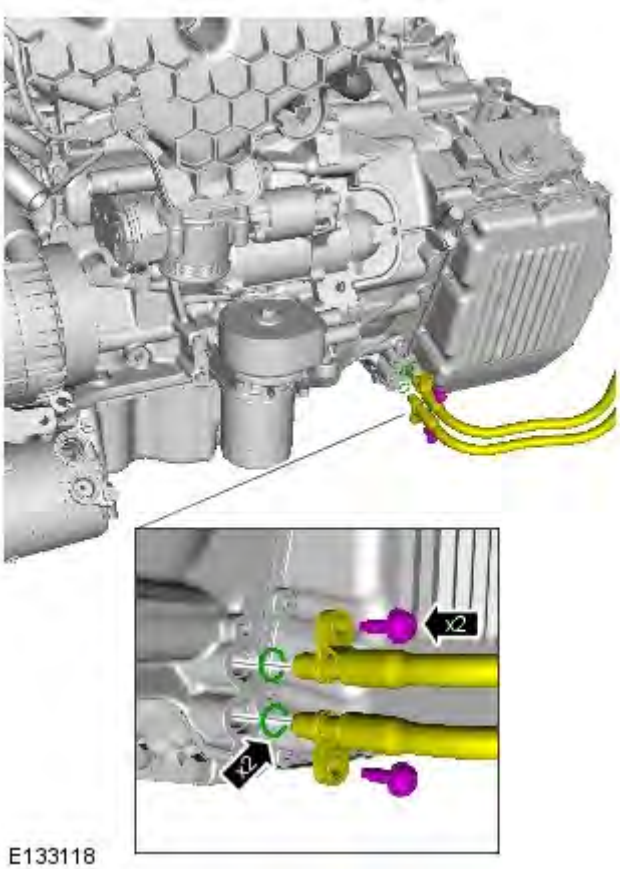
   Raise and support the vehicle.

2. Refer to: Engine Cover - GTDi 2.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, General Procedures).

4.





5. CAUTION: Be prepared to collect escaping oil.

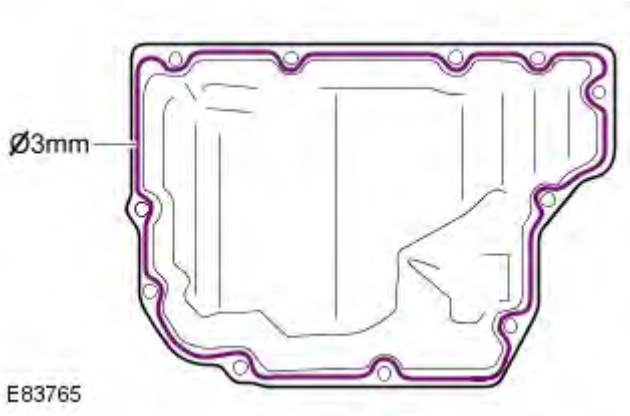
6. CAUTION: Be prepared to collect escaping oil.

7. Carefully remove the sealant.

Installation

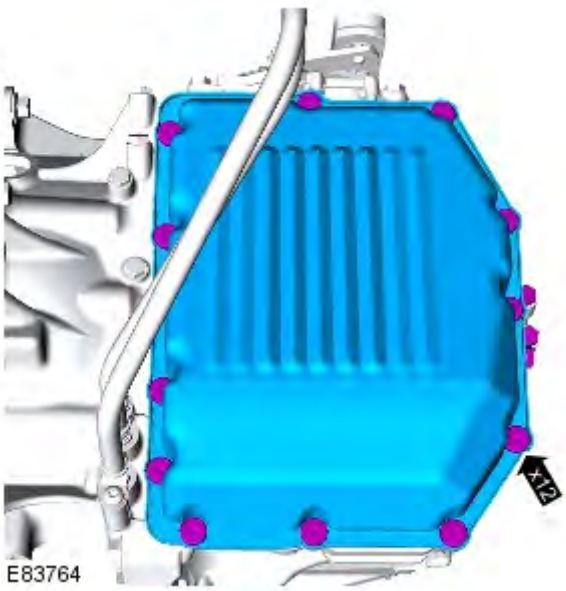
1. For sealant specification, refer to the specifications section.

   Refer to: Specifications (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Specifications).

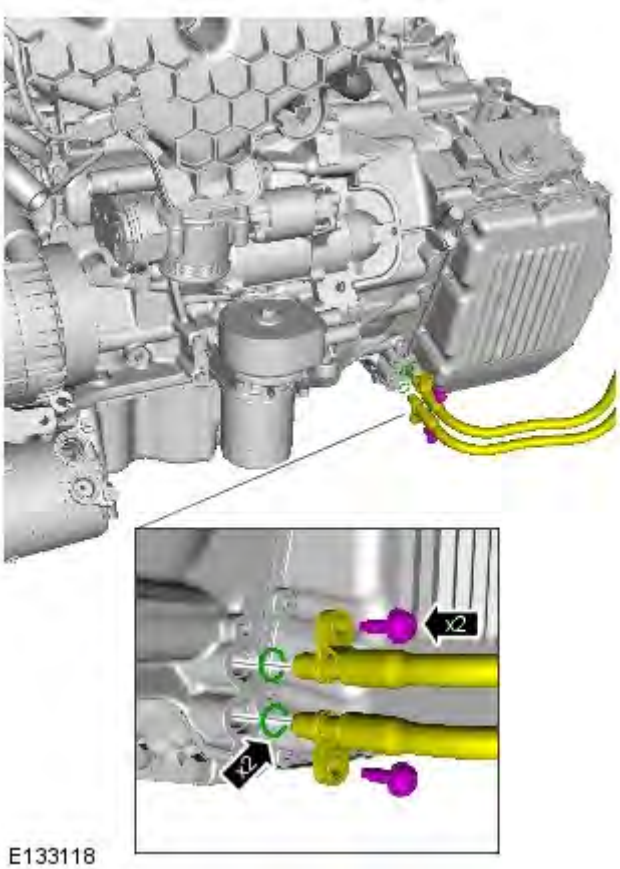


2. CAUTION: Make sure that the mating faces are clean and free of foreign material.

   Apply a bead of sealant, 3 mm diameter, to the area indicated.

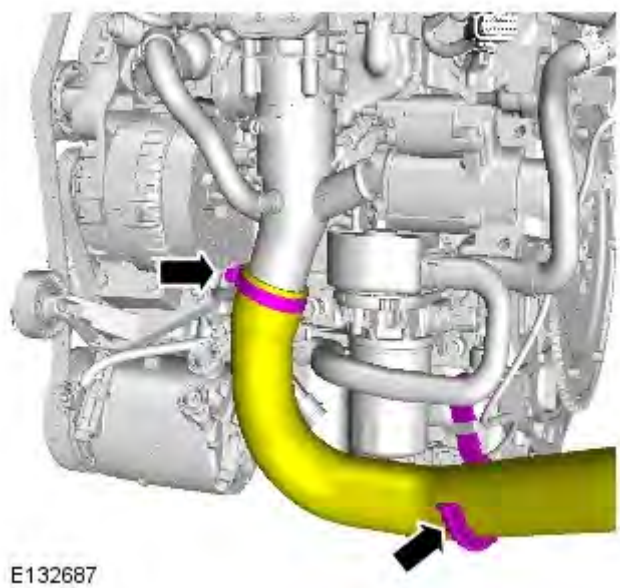


3. *Torque:* 14 Nm



E133118

4. *Torque:* 10 Nm


E132687

5.

6. Refer to: Engine Cover - GTDi 2.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

7. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, General Procedures).

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Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Main Control Valve Body TD4 2.2L Diesel

Removal and Installation

Removal

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. Disconnect the battery ground cable.

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

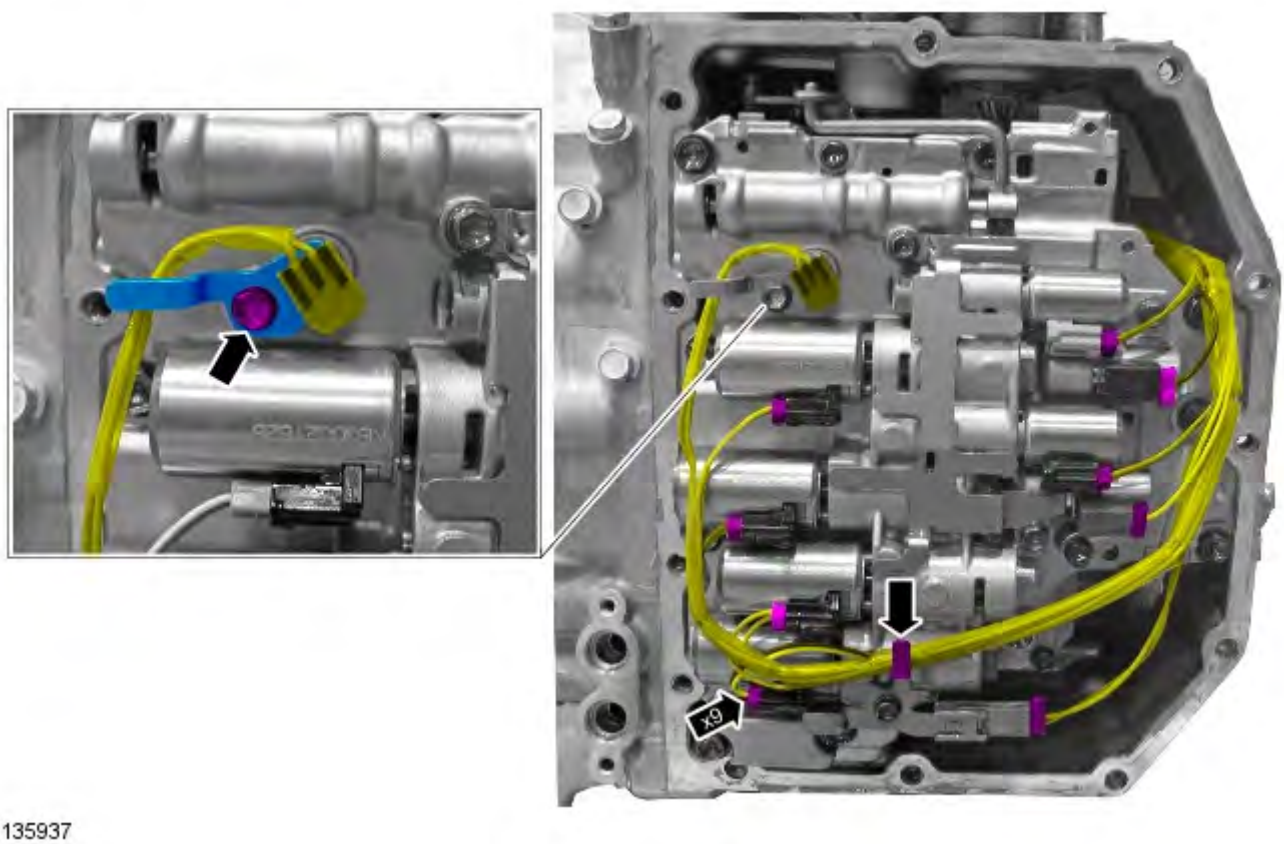
3. Refer to: Transmission Fluid Pan - TD4 2 2L Diesel (307-01 Automatic Transmission/Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission, Removal and Installation).

4. CAUTIONS:

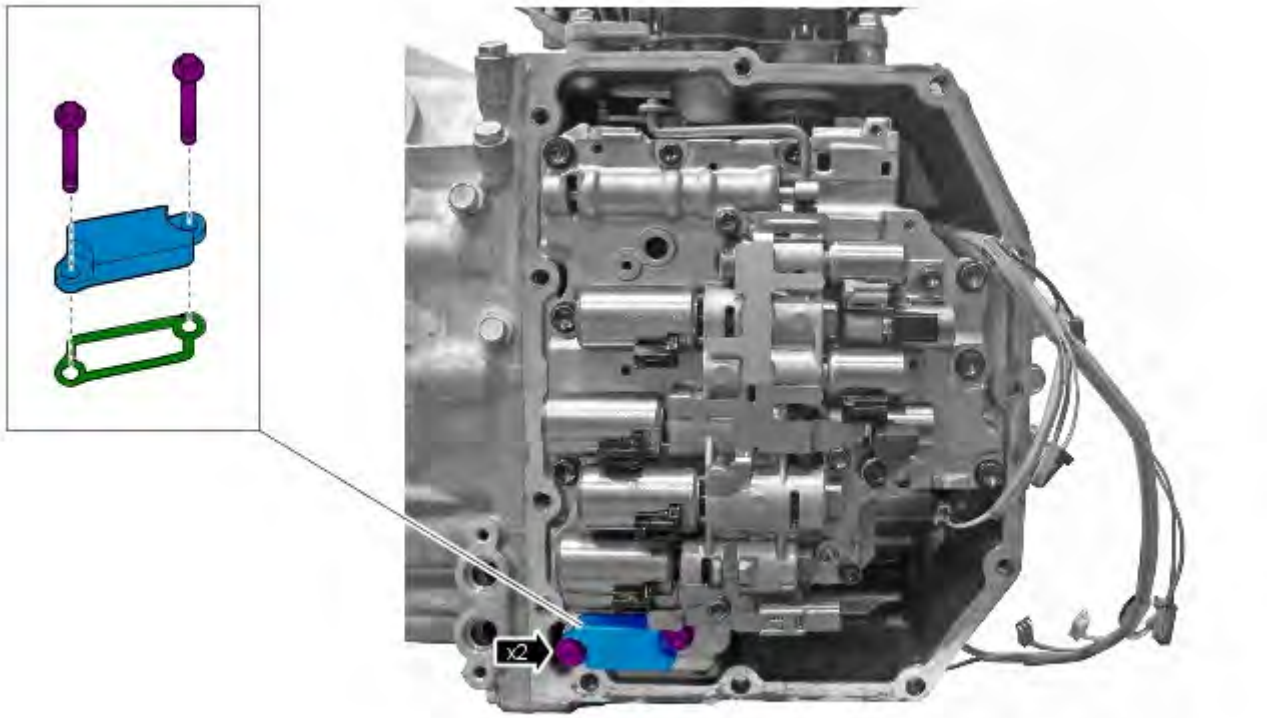
   Take extra care not to damage the wiring harnesses.

   Note the fitted position of the component prior to removal.

   Torque: 10 Nm

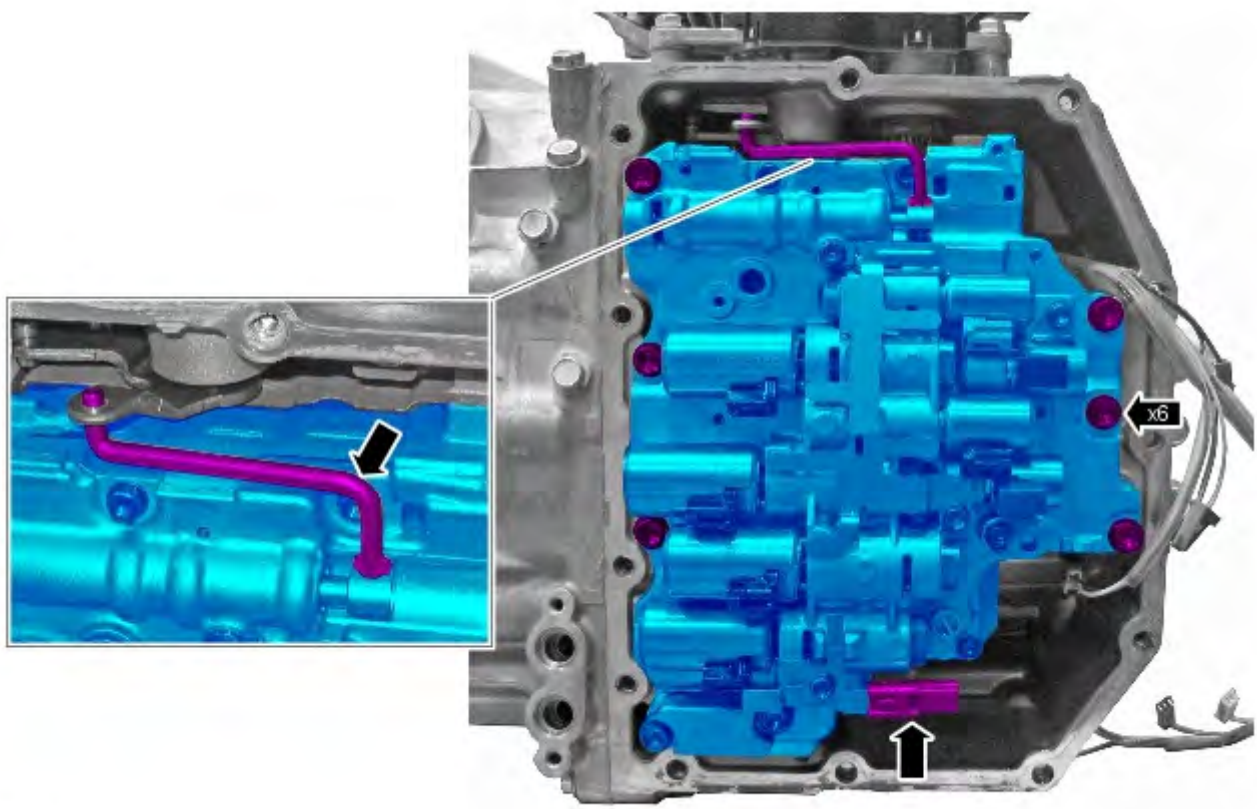


5.



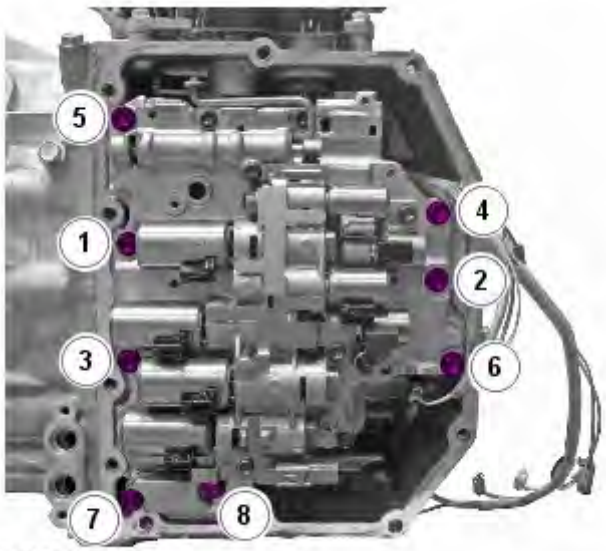
E135938

6.



E135939

Installation



E135940

1. CAUTION: Tighten the bolts in the sequence shown.

   Torque: 10 Nm

2. To install, reverse the removal procedure.

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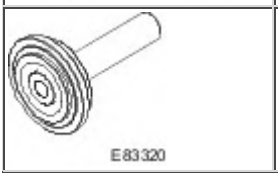
Automatic Transmission / Transaxle - Vehicles With: AWF21 6-Speed Automatic Transmission - Halfshaft Seal LH

Removal and Installation

Special Tool(s)

	303-1300 Remover, Crankshaft Seal
	307-596 Installer, Halfshaft Seal

Removal

NOTE: Manual transmission shown, automatic transmission is similar.

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

   Raise and support the vehicle.

2. Refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).

3. CAUTIONS:

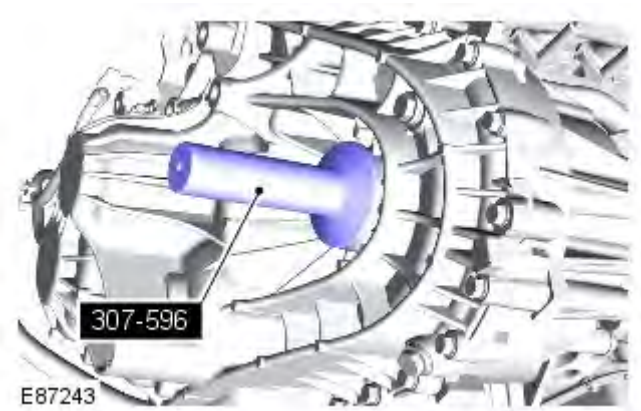
   Take extra care not to damage the mating faces.

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

   NOTE: Some oil spillage is inevitable during this operation.

   Special Tool(s): 303-1300

Installation



1. CAUTION: Take extra care not to damage the seal.

   Special Tool(s): 307-596

2. Refer to: Front Halfshaft LH (205-04 Front Drive Halfshafts, Removal and Installation).