

Engine - TDV6 3.0L Diesel -

Engine Data

Engine Description	Engine Capacity	Maximum Engine Torque (EEC) (SAE)	Maximum Engine Power (EEC) (SAE)	Compression Ratio	Bore	Stroke
60° "Vee" • 6 Cylinder • 24 Valves	2993 ccm	600 Nm at 2000 RPM	180 kW at 4000 RPM	16.1:1 ± 0.5	84	90

Engine Firing Order

Firing Order
1:4:2:5:3:6

Glow Plug

Specification
9X2Q-6M090-AC

Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Engine oil (EUR)	5W/30 - WSS-M2C934-B
Engine oil (ROW)	5W/30 - WSS-M2C913-B or C
Sealant	WSE-M4G323-A5
Core plug and stub pipe retainer	WSK-M2G349-A7
Jaguar premium cooling system fluid	WSS-M97B44-D

Capacities

Description	Liters
Engine oil initial fill	6.75
Engine oil service fill with oil filter change	5.9

Cylinder Head and Valve Train

Item	Specification
Valve guide inner diameter (mm)	5.980 ± 0.010
Intake valve effective length (mm) (tip to gauge line)	94.99mm +/- 0.15
Exhaust valve effective length (mm) (tip to gauge line)	94.45mm +/-0.15
Valve stem to guide clearance intake diametrical (mm)	0.027 - 0.063
Valve stem to guide clearance exhaust diametrical (mm)	0.037 - 0.073
Valve head diameter intake (mm)	27.8mm +/-0.1
Valve head diameter exhaust (mm)	25.2mm +/-0.1
Intake valve face angle (degrees)	44 deg 52 min +/-7min30sec
Exhaust valve face angle (degrees)	44 deg 52 min +/-7min30sec
Valve stem diameter intake (mm)	5.935±0.008
Valve stem diameter exhaust (mm)	5.925±0.008
Valve spring free length (mm) - inlet	38.9mm
Valve spring free length (mm) - exhaust	38.9mm
Valve spring installed height (mm) - inlet	31.22mm
Valve spring installed height (mm) - exhaust	31.22mm
Camshaft lobe max lift intake (mm)	3.75187mm
Camshaft lobe max lift exhaust (mm)	3.80999mm
Camshaft journal to cylinder head bearing surface clearance diametrical (mm)	0.040-0.090
Camshaft journal diameter - all positions	26.015±0.015
Bearing diameter - all positions	25.950±0.010
Camshaft journal maximum run out limit (mm)	0.030mm
Camshaft journal maximum out of round (mm) - all journals	0.010mm

Cylinder Head Gasket

Identification	Gasket Thickness (mm)	Piston Protrusion (mm)
2	1.17	0.552 - 0.603
3	1.22	0.604 - 0.655
4	1.27	0.656 - 0.707
5	1.32	0.708 - 0.760

Torque Specification

- NOTE: A = refer to procedure for correct torque sequence

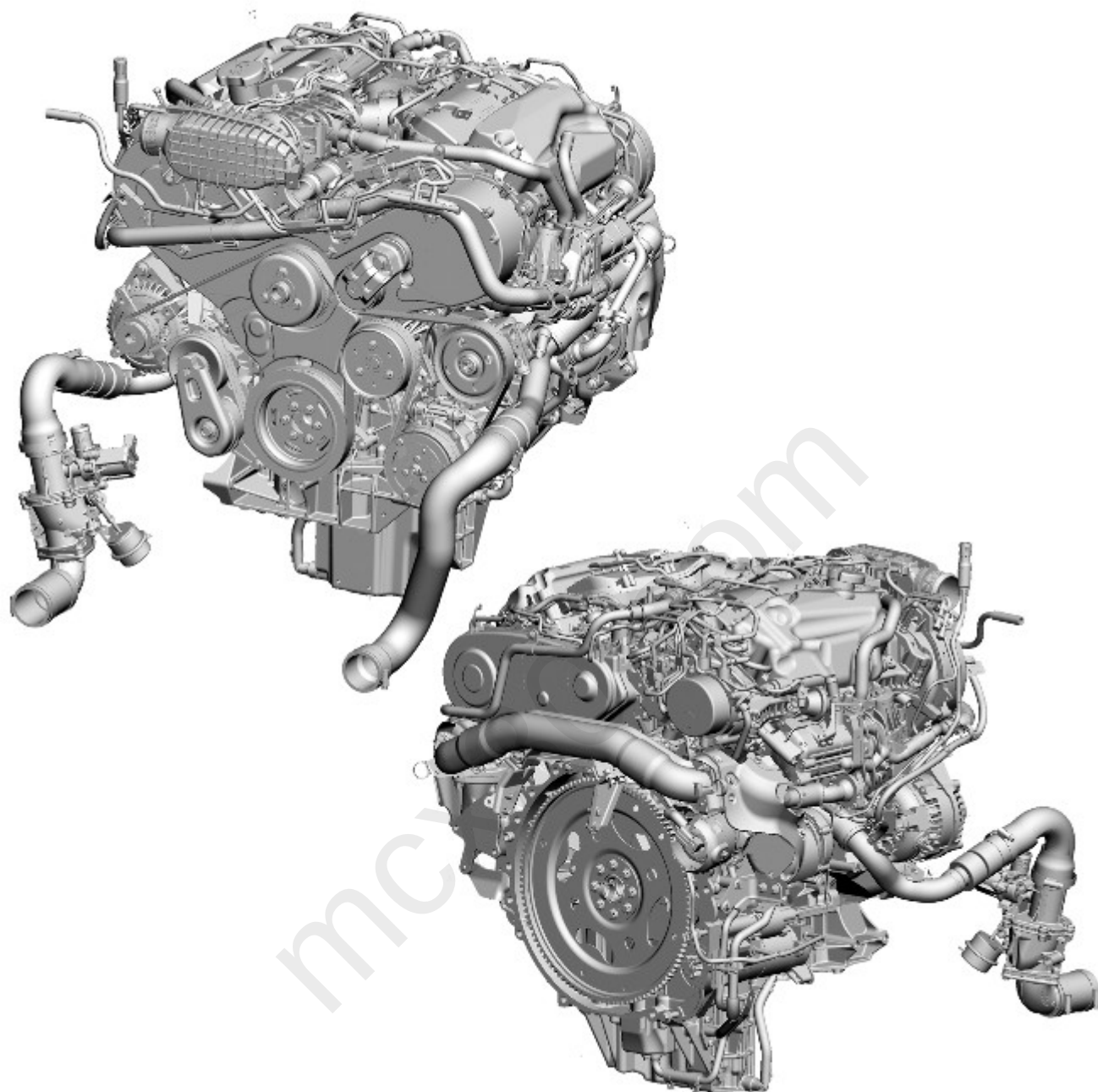
Description	Nm	lb-ft	lb-in
Piston cooling nozzle	10	7	-
Engine coolant drain plug	18	13	-
Cylinder head retaining bolts	A	-	-
Oil filter housing retaining bolts	10	7	-
Fuel injection pump cradle retaining bolts	23	17	-
Fuel injection pump to cradle retaining bolts	23	17	-
Fuel injection pump bracket to cradle retaining bolts	10	7	-
Fuel injection pump to bracket retaining bolts	10	7	-
Oil pump retaining bolts	10	7	-
Crankshaft rear oil seal housing retaining bolts	10	7	-
Oil pan retaining bolts M6	10	7	-
Oil pan retaining bolts M8	23	17	-
Oil pump pick up pipe retaining bolts	10	7	-

Description	Nm	lb-ft	lb-in
Engine oil level sensor retaining nuts	10	7	-
Crankshaft timing belt pulley retaining bolt	A	-	-
Crankshaft position sensor (CKP) retaining bolt	5	-	44
Timing chain tensioner retaining bolts	10	7	-
Camshaft bearing cap retaining bolts	A	-	-
Timing belt idler pulley retaining bolt	45	33	-
Fuel injection pump belt rear cover retaining bolts	10	7	-
Fuel injection pump sprocket retaining nut	50	37	-
Coolant outlet pipe retaining bolts	10	7	-
Coolant pump retaining bolts	10	7	-
Timing belt tensioner retaining bolt	26	19	-
Engine lifting eye bolts	23	17	-
Camshaft rear end accessory drive (READ) pulley hub retaining bolt	Stage 1 - 80 Stage 2 - 80 degrees	Stage 1 - 59 Stage 2 - 80 degrees	-
Camshaft front timing pulley hub retaining bolt	80 + 80°	59 + 80 °	-
Camshaft READ pulley retaining bolt	23	17	-
Camshaft front timing pulley retaining bolt	23	17	-
Fuel injection pump timing belt tensioner bolt	23	17	-
Camshaft position sensor (CMP) retaining bolt	10	7	-
Intake manifold / camshaft cover retaining bolts	10	7	-
Brake vacuum pump retaining bolts	23	17	-
Engine oil pressure (EOP) switch	14	10	-
Glow plug	11	8	-
Fuel rail retaining bolts	23	17	-
Fuel rail bracket retaining bolts	23	17	-
Fuel injector retaining bolts	A	-	-
High pressure fuel line union nuts	A	-	-
High pressure fuel line bracket retaining bolts	9	-	80
Turbocharger assembly to exhaust manifold retaining nuts	24	18	-
Exhaust manifold to cylinder head retaining nuts	A	-	-
Exhaust manifold heatshield retaining bolts	11	8	-
Turbocharger heatshield retaining bolts	11	8	-
Exhaust gas recirculation (EGR) valve retaining bolts M6	10	7	-
Accessory drive belt idler pulley bracket retaining bolts	83	61	-
Timing belt covers retaining bolts	10	7	-
Engine mount bracket to engine retaining bolts	115	85	-
Exhaust cross over pipe retaining nuts	24	18	-
Engine coolant inlet pipe retaining bolts	10	7	-
Coolant pump pulley retaining bolts	25	18	-
Crankshaft pulley/vibration damper retaining bolts	25	18	-
Throttle body retaining threaded stud	10	7	-
Wiring harness retaining nuts	10	7	-
Vacuum hose assembly retaining bolts	10	7	-
Flexplate retaining bolts	A	-	-
Accessory drive component bracket retaining bolts	23	17	-
Power steering pump retaining bolts	23	17	-
Generator retaining bolts	47	35	-
Accessory drive belt tensioner retaining bolt	47	35	-
Accessory drive belt idler pulley retaining bolt	47	35	-
Air conditioning compressor bracket retaining bolts	23	17	-
Air conditioning compressor retaining bolts	23	17	-

Engine - TDV6 3.0L Diesel - Engine - Component Location

Description and Operation

External Views



E120969

Engine - TDV6 3.0L Diesel - Engine - Overview

Description and Operation

OVERVIEW

The 3.0 liter diesel engine is a V6 configuration unit with 2 banks of 3 cylinders arranged at 60 degrees to each other. There are 4 valves per cylinder, which are operated by 2 overhead camshafts per cylinder bank.

The cylinder block is cast in compacted graphite iron, which uses less material to produce compared to a conventional cast iron block. This provides reduced weight and length with superior structural capabilities.

The cylinder heads are cast aluminum with a moulded plastic camshaft cover with an integral air intake. The single-piece structural oil pan is high pressure die cast from aluminum. The exhaust manifolds are cast from an iron alloy. A moulded plastic acoustic cover is fitted over the upper engine to absorb engine-generated noise.

A low compression ratio of 16:1 contributes to improved emissions quality, quieter combustion and compatibility with the engine's unique forced induction system. For additional information refer to Intake Air distribution and Filtering.

The low compression ratio also means less heat build-up in the piston bowl and more efficient fuel burn, resulting in the production of lower levels of pollutants. It also assists with cold starting allowing a faster cranking speed.

The engine is available in two power output forms. The power difference is achieved by changes to the engine calibration within the [ECM \(engine control module\)](#) and other vehicle control modules.

- NOTE: It is not possible to re-configure a lower power output engine to the higher output specification.

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Engine - TDV6 3.0L Diesel - Engine - System Operation and Component Description

Description and Operation

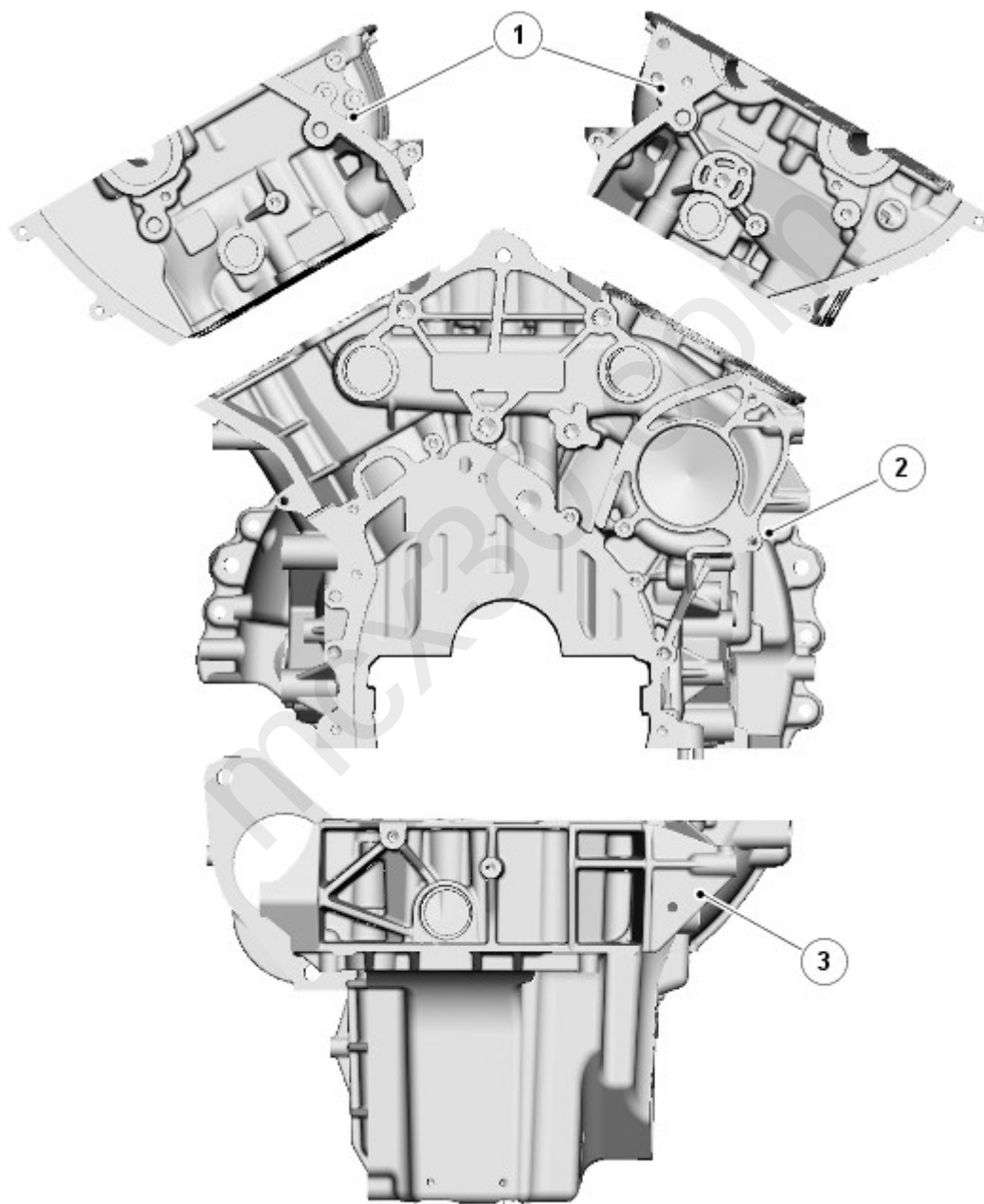
System Operation

OPERATION

Operation of the engine is controlled by the [ECM \(engine control module\)](#). For additional information refer to 303-14A Electronic Engine Controls.

Component Description

ENGINE STRUCTURE



E120983

ItemDescription

1	Cylinder heads
2	Cylinder block
3	Oil pan

CYLINDER BLOCK COMPONENTS

The cylinder block is a single cast construction with a hollow beam structure, cast from compact graphite iron. This type of construction provides outstanding strength and durability and uses less material than a conventional cast iron block, therefore reducing engine weight and length.

The use of compact graphite iron allows the cross sectional areas of the casting to be reduced, compared with a conventional gray cast iron block. This ensures reduced engine weight and length, with higher structural capabilities.

To maintain the stiffness of the bottom end of the cylinder block and crankshaft system, the cylinder block has a deep skirt and bearing cap design. Each of the main bearing caps is double bolted at each side of the crankshaft bearing and cross bolted back to the cylinder block.

Lubrication oil is distributed through the cylinder block, via a main oil gallery and channels bored in the block, to all critical moving parts. These channels divert oil to the main and connecting rod bearings via holes machined into the crankshaft.

A tapping at the rear of the cylinder block connects a pipe to the turbochargers by means of banjo connections. Oil is supplied, under pressure via this tapping, from the oil pump to provide lubrication for the bearings of the turbochargers.

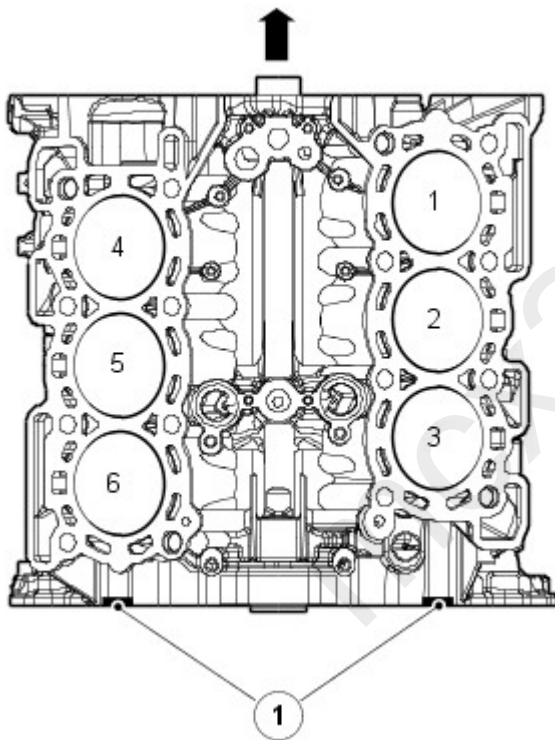
Cylinder cooling is achieved by coolant circulating through chambers in the cylinder block casting.

Two hollow metal dowels are used to locate the cylinder heads to the cylinder block, 1 on each side at the rear of the unit.

A port is included at the **RH (right-hand)** and **LH (left-hand)** side of the cylinder block, below each of the turbochargers, to connect the turbochargers oil return pipe to the oil pan.

Two coolant drain plugs are installed in the cylinder block; one is fitted in the rear **RH** side, and the other is fitted in the middle of the cylinder block on the **LH** side.

Engine Data



E44217

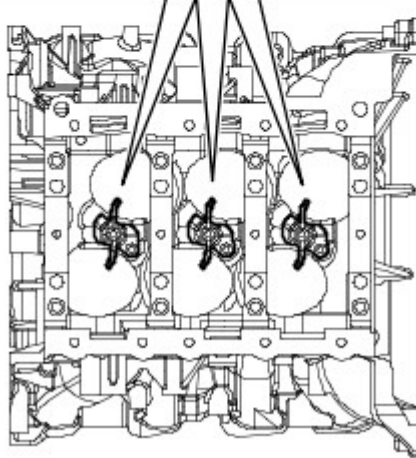
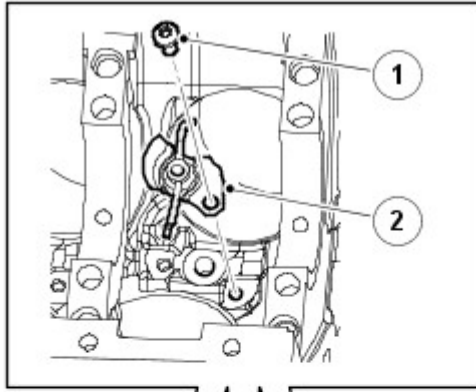
NOTE: Arrow indicates front of engine

Item Description

1 Engine data locations

Engine data is marked at 2 locations at the back of the cylinder block. Component diameters are represented by alphabetical and numerical codes; keys to the codes are in the removal and installation section of this manual.

Piston Cooling Jets



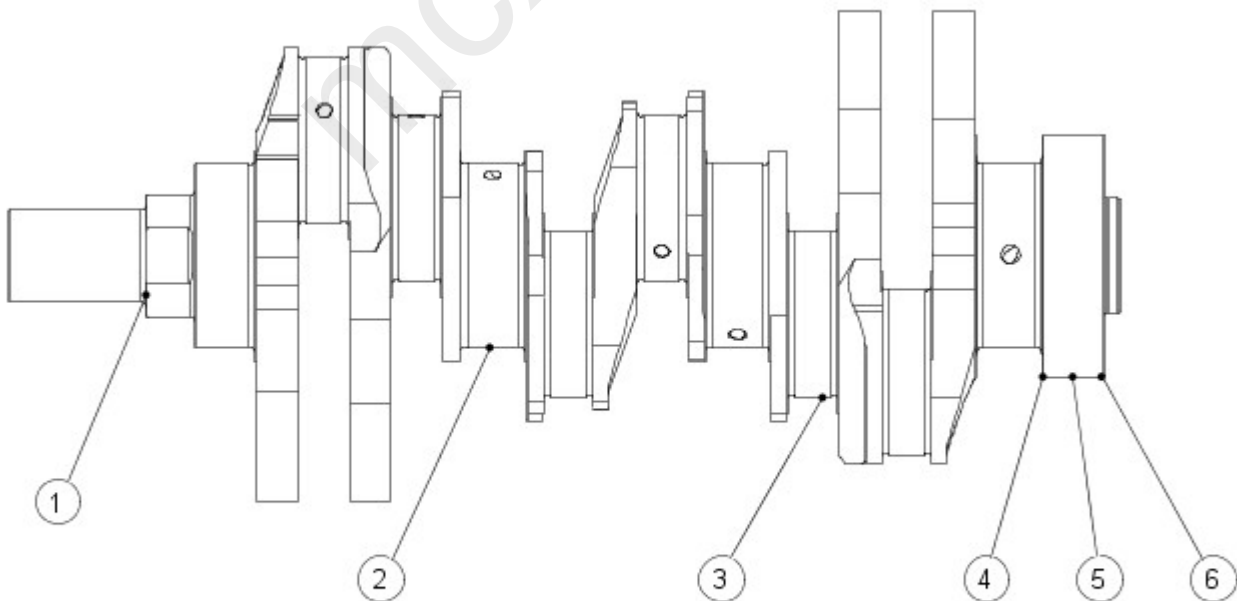
E44219

ItemDescription

- | | |
|---|-------------|
| 1 | Bolt |
| 2 | Cooling jet |

Jets located in the cylinder block provide piston and piston pin lubrication and cooling. These jets spray oil on to the inside of the piston, the oil then flows through 2 internal wave shaped channels to help cool each piston crown.

CRANKSHAFT



E52135

ItemDescription

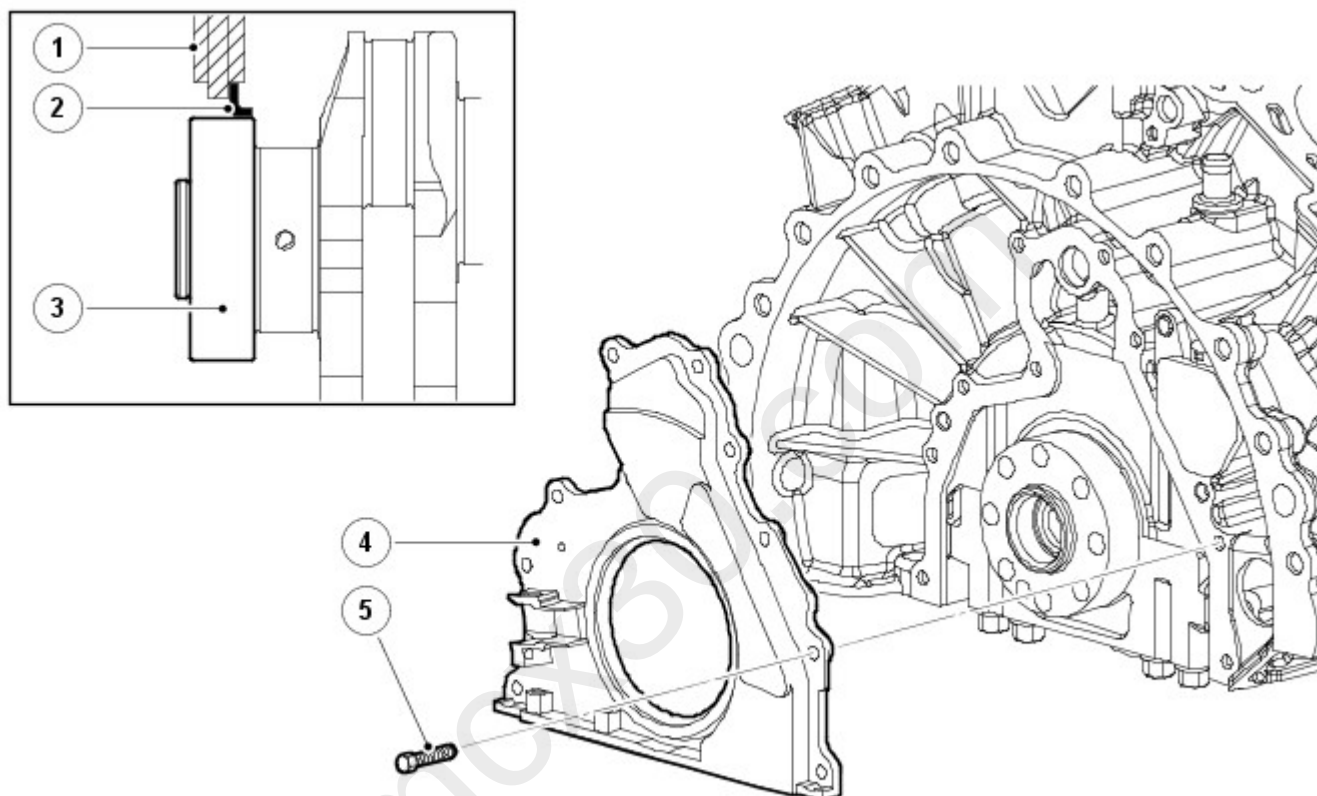
- | | |
|---|--|
| 1 | |
|---|--|

Oil pump drive
2 Main bearing Journal
3 Connecting rod bearing journal
4 Rear drive flange
5 Rear oil seal location
6 Trigger wheel location

The crankshaft is forged steel and fillet rolled with induction hardened journals, which run in 4 bearings with clamped 2 layer bearing shells. The upper and lower shells of bearing number 4 are flanged, which limits the end float of the crankshaft. The main bearing caps are double bolted and cross bolted to increase the strength and rigidity of the engine block.

The main bearings are aluminum/tin split plain selective bearings. An oil groove in the top half of each bearing transfers oil into the crankshaft for lubrication of the connecting rod bearings. The upper and lower shells of bearing number 4 contain integral thrust washers, which limits the end float of the crankshaft.

Rear Crankshaft Oil Seal



E44227

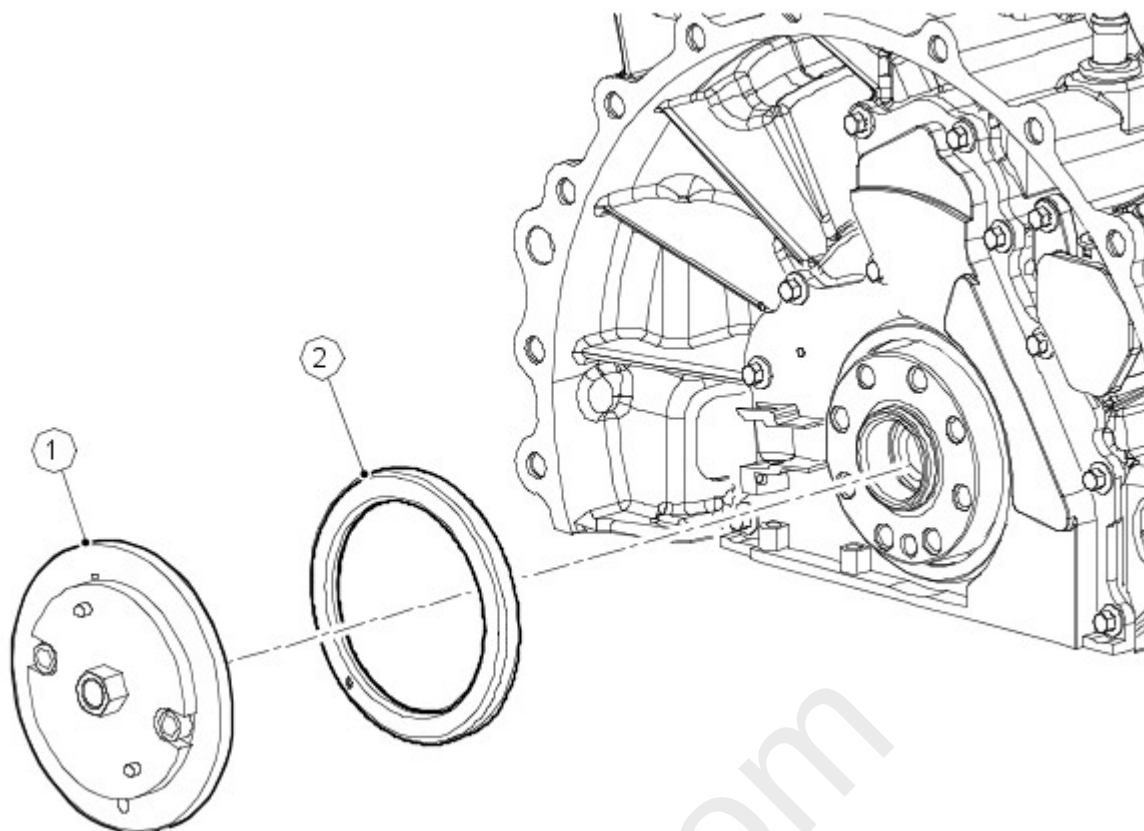
ItemDescription

1	Housing
2	Seal
3	Crankshaft
4	Rear oil seal retainer
5	Bolt (10 off)

The rear main oil seal and retainer assembly is a one-piece unit and is supplied with its own plastic fitting sleeve. The seal and retainer have 2 locating dowels, 10 fixing bolts and a rubber seal. In addition, the retainer has a location for the crankshaft position sensor. For additional information refer to 303-14A Electronic Engine Controls.

A torsional vibration crankshaft damper pulley is bolted to the front of the crankshaft.

Crankshaft Trigger Wheel



E52137

ItemDescription

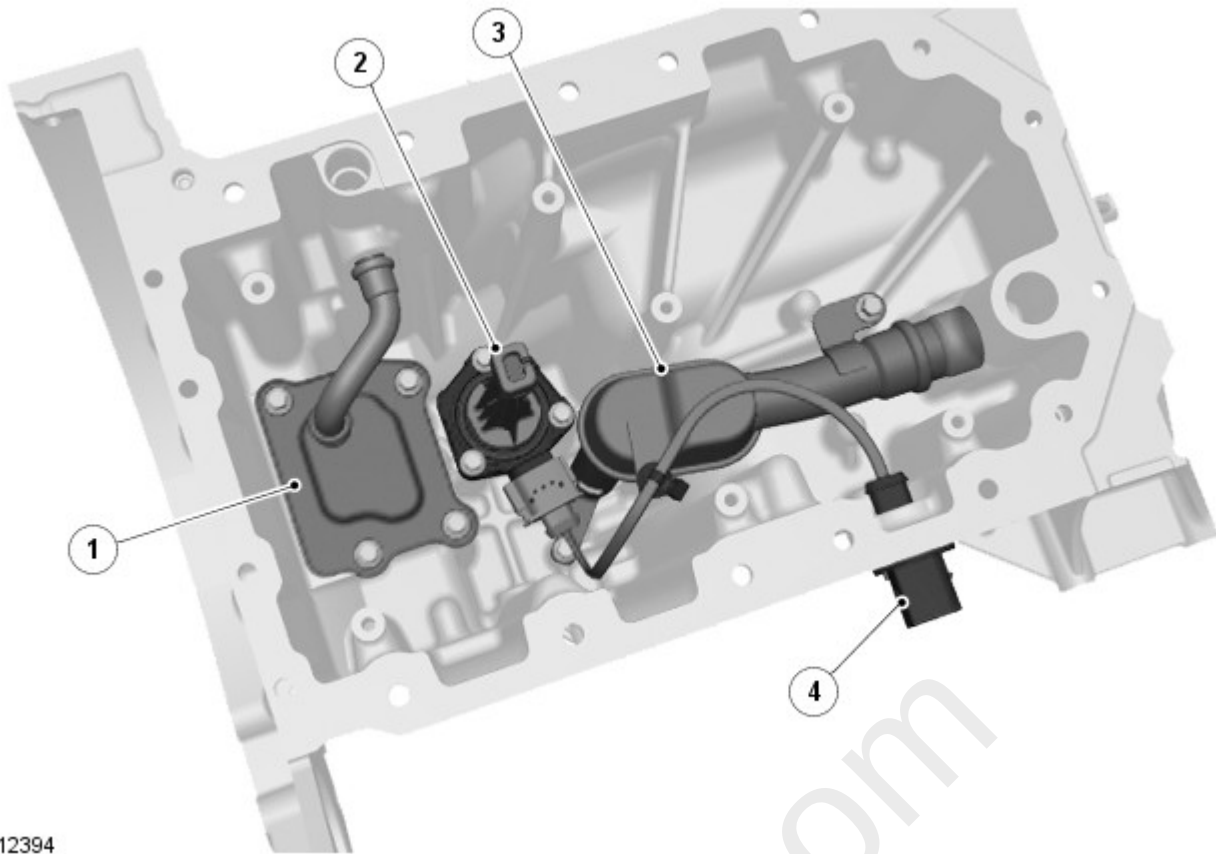
- | | |
|---|---------------|
| 1 | Special Tool |
| 2 | Trigger wheel |

The crankshaft trigger wheel is located on the rear of the crankshaft. It is pressed onto the crank using a special tool, which also precisely aligns the trigger wheel for crankshaft position and timing.

The trigger wheel consists of 60 magnets minus 2 for [ECM](#) crankshaft position reference and synchronization. The magnets cannot be seen on the trigger wheel, which therefore can only be positioned using a special tool. For additional information refer to 303-14A Electronic Engine Controls.

If the trigger is removed for any reason, then a new trigger wheel must be fitted.

OIL PAN COMPONENTS



E112394

ItemDescription

1	Oil scavenge reservoir
2	Oil level and temperature sensor
3	Oil pick-up pipe
4	Oil level and temperature sensor connector

The structural oil pan is of a single piece die cast aluminum construction and is fitted to the lower cylinder block to stiffen the base structure of the engine, helping to reduce noise, vibration and harshness. The oil pan also incorporates an oil baffle plate to reduce oil foaming and splash.

The oil pan is secured to the cylinder block with 2 dowels, 2 locator pins for the gasket and 18 retaining bolts; 3 different lengths of bolts are used:

- M6 x 20 (6 off)
- M8 x 75 (4 off)
- M6 x 105 (8 off).

Iron inserts, cast into the main bearing supports of the stiffening frame, minimize main bearing clearance changes due to heat expansion.

A gasket seals the joint between the oil pan and the cylinder block.

An oil pick-up pipe with integral strainer locates in the oil pan to provide oil to the crankshaft driven oil pump.

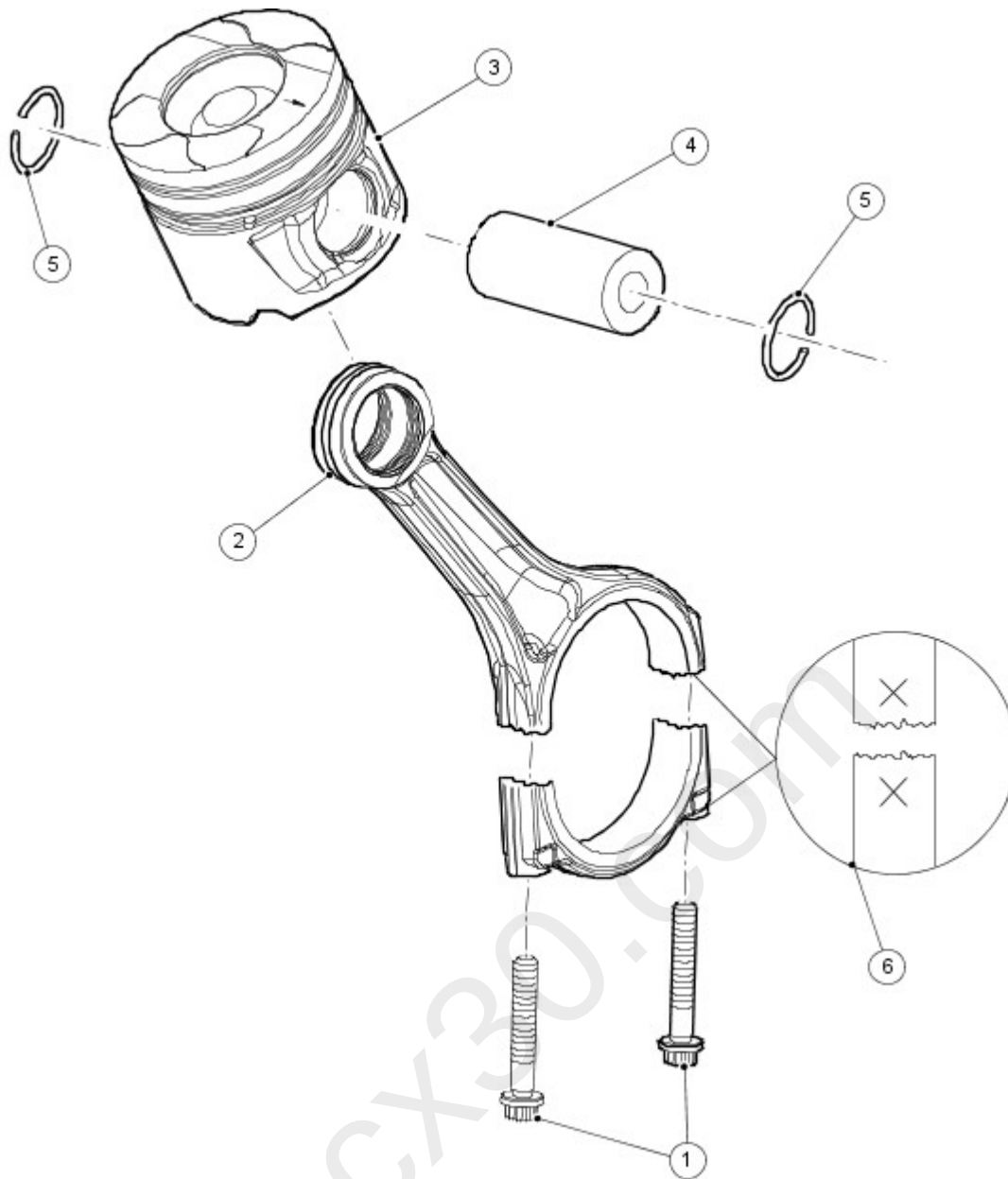
An ultrasonic sensor provides an electronic indication when the oil in the oil pan is low or high. This removes the requirement for the mechanical dipstick. An advantage in comparison with the static 'dipstick' method is that all marginal influences, for example vehicle being on a slope, lateral and longitudinal acceleration, are compensated for by averaging.

The values determined can be used to signal that the minimum oil level has been reached or to display the current oil level if required.

The sensor is mounted inside the oil pan where it sends an ultrasonic pulse vertically upward, it then measures the time for the pulse to be reflected back from the top surface of the oil.

Warnings will be displayed in the message center if the oil level is not maintained within the safe operating levels (minimum and maximum). A warning will also be displayed if there is a fault with the oil level monitoring system.

PISTON AND CONNECTING ROD ASSEMBLY



E52134

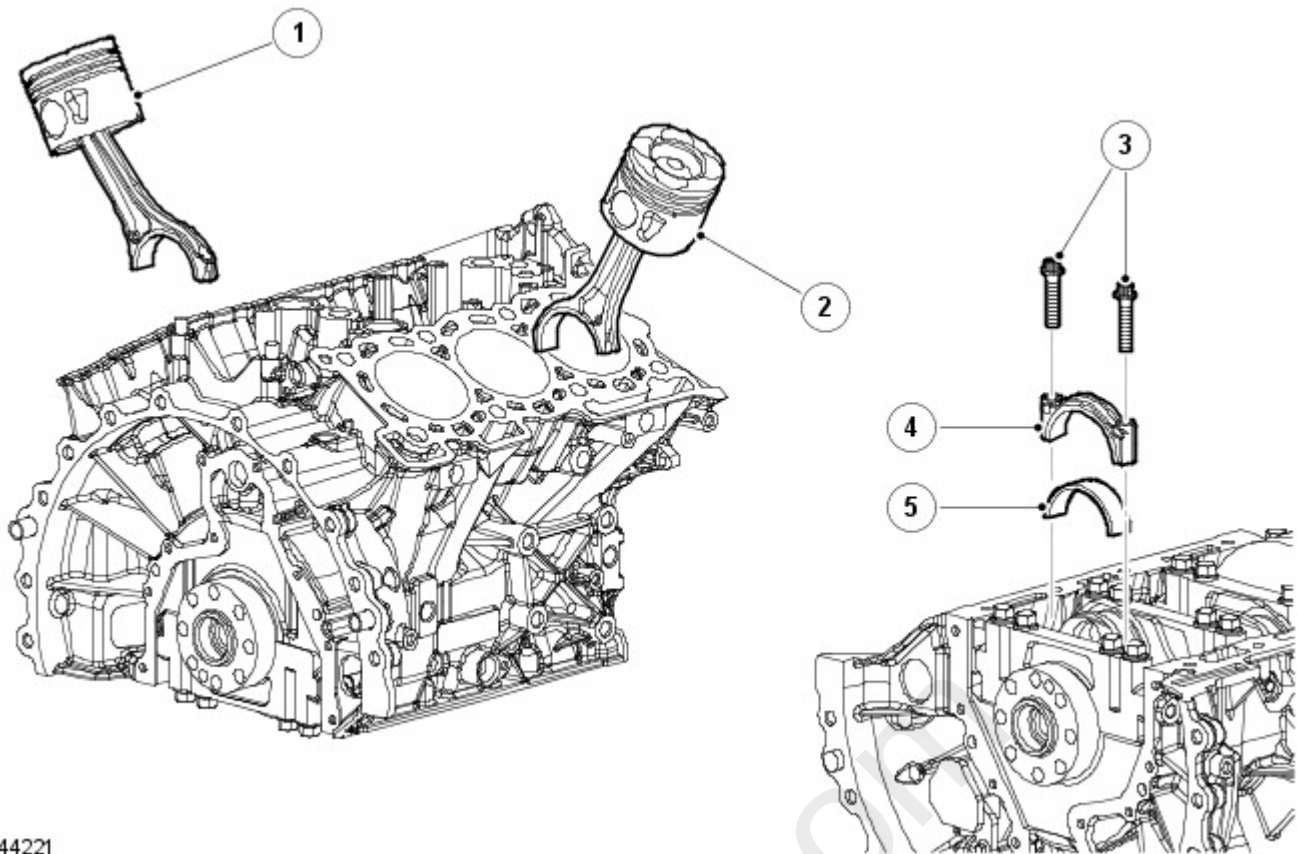
ItemDescription

1	Connecting rod bolts (2 off)
2	Connecting rod
3	Piston
4	Piston pin
5	Circlips
6	Connecting rod identification

The connecting rods are manufactured from sinter-forged steel and have fracture-split bearing caps. The bearing caps are produced by fracturing the opposing sides of the connecting rod at the bearing horizontal centre-line. As well as being easier to manufacture, when reassembled the fractured surfaces interlock to form a strong seamless joint. The cylinder position is etched on adjoining sides of the joint to identify matching connecting rods and bearing caps. The selective connecting rod bearings are aluminum/tin split plain bearings. The connecting rod bearing is 'sputter coated', which is a manufacturing process that layers the bearing material to produce a higher load capacity for improved durability.

• **NOTE:** The connecting rods are not selective.

Piston and Connecting Rod Orientation



E44221

ItemDescription

1	Piston and connecting rod assembly, cylinders 4-6
2	Piston and connecting rod assembly, cylinders 1-3
3	Bolts (12 off)
4	Connecting rod bearing cap (6 off)
5	Connecting rod lower bearing (6 off)

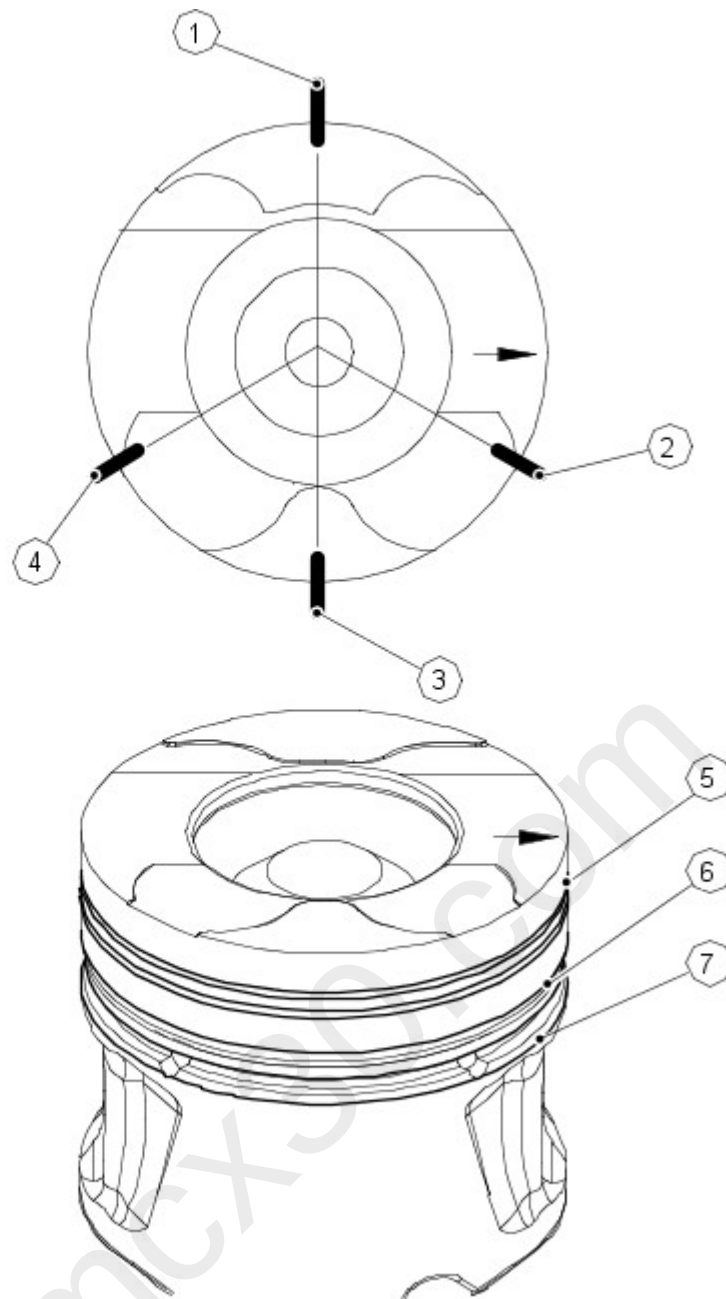
When installing a connecting rod, ensure the back of the connecting rod faces the center of the 'vee'.

The pistons are made from aluminum alloy and are fitted with 3 rings. The piston crown incorporates a pronounced bowl; this forms the combustion chamber, which promotes swirl and turbulence necessary for good combustion and improved emissions. In addition, the piston skirt has a molybdenum-coated surface, which counteracts scoring of the cylinder bore and piston.

The piston also incorporates a double wave gallery within the piston crown to enhance piston cooling. The pistons are supplied oil by means of spray jets located in the cylinder block oil gallery. These jets ensure optimum piston cooling to counteract the high temperatures generated by the combustion process.

Each piston is installed on a piston pin located in a aluminum/tin bushing in the connecting rod.

Piston Ring Orientation



552133

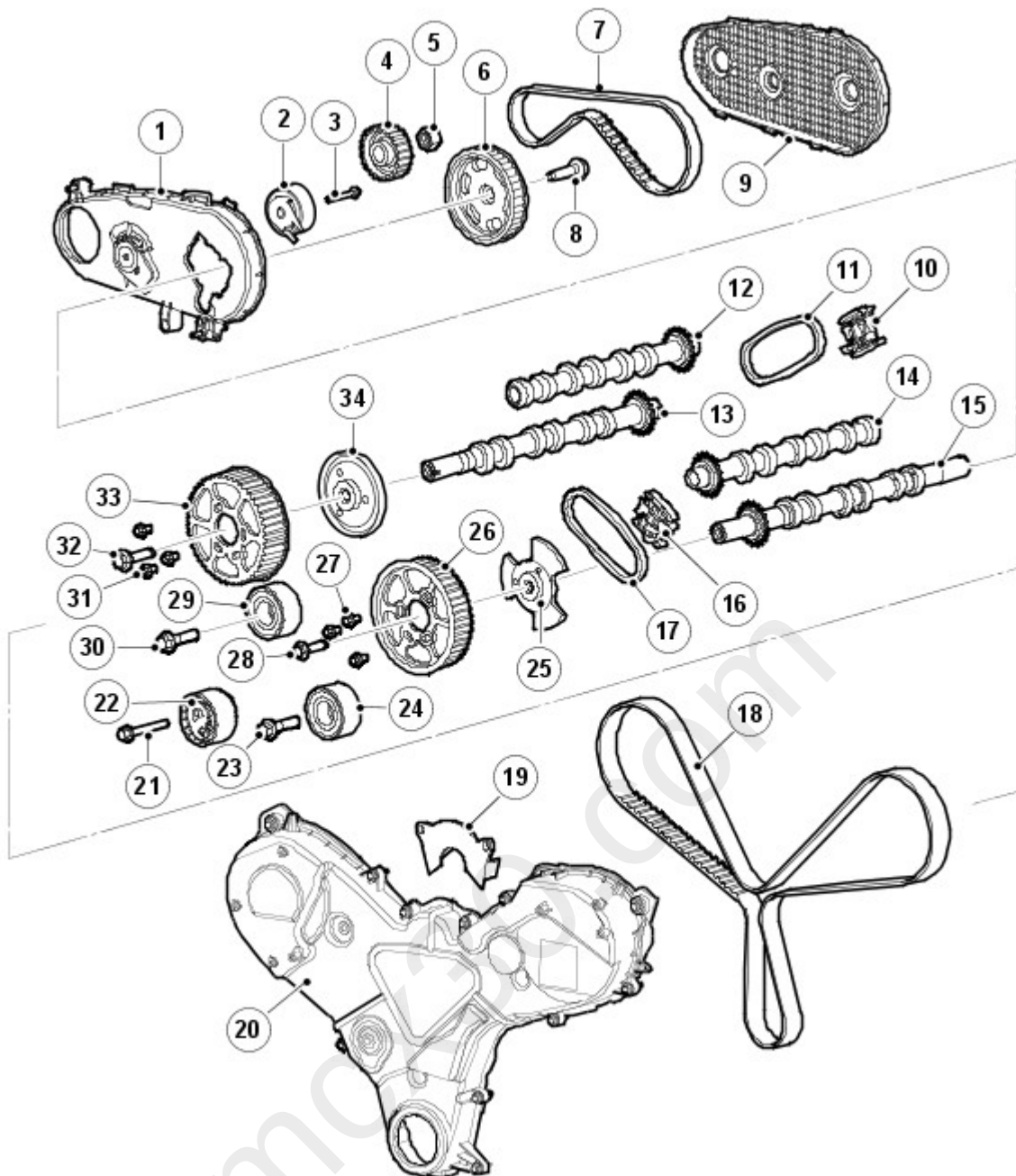
ItemDescription

1	Ring gap oil control
2	Ring gap upper compression
3	Spiral joint oil control
4	Ring gap lower compression
5	Upper compression ring
6	Lower compression ring
7	Oil control ring

When installing pistons ensure the arrows on the piston crowns all point to the front of the engine. All pistons are common single grade/single part number for all engines.

The piston top ring is a taper type and is fitted with the taper to the top of the piston. All rings marked 'top' are assembled with 'top' uppermost. All rings must be spaced evenly around the piston before installing. The circumference gap of the double bevelled oil control ring must be opposite the spiral control joint.

CAMSHAFT TIMING COMPONENTS



E94884

ItemDescription

1	Rear engine accessory drive rear cover
2	Rear engine accessory drive tensioner
3	Bolt
4	Fuel pump pulley
5	Nut
6	Rear engine accessory drive camshaft pulley
7	Rear engine accessory drive belt
8	Bolt
9	Rear engine accessory drive front cover
10	RH chain tensioner
11	RH timing chain
12	RH intake camshaft
13	RH exhaust camshaft
14	LH intake camshaft
15	LH exhaust camshaft
16	LH chain tensioner
17	LH timing chain
18	Timing belt

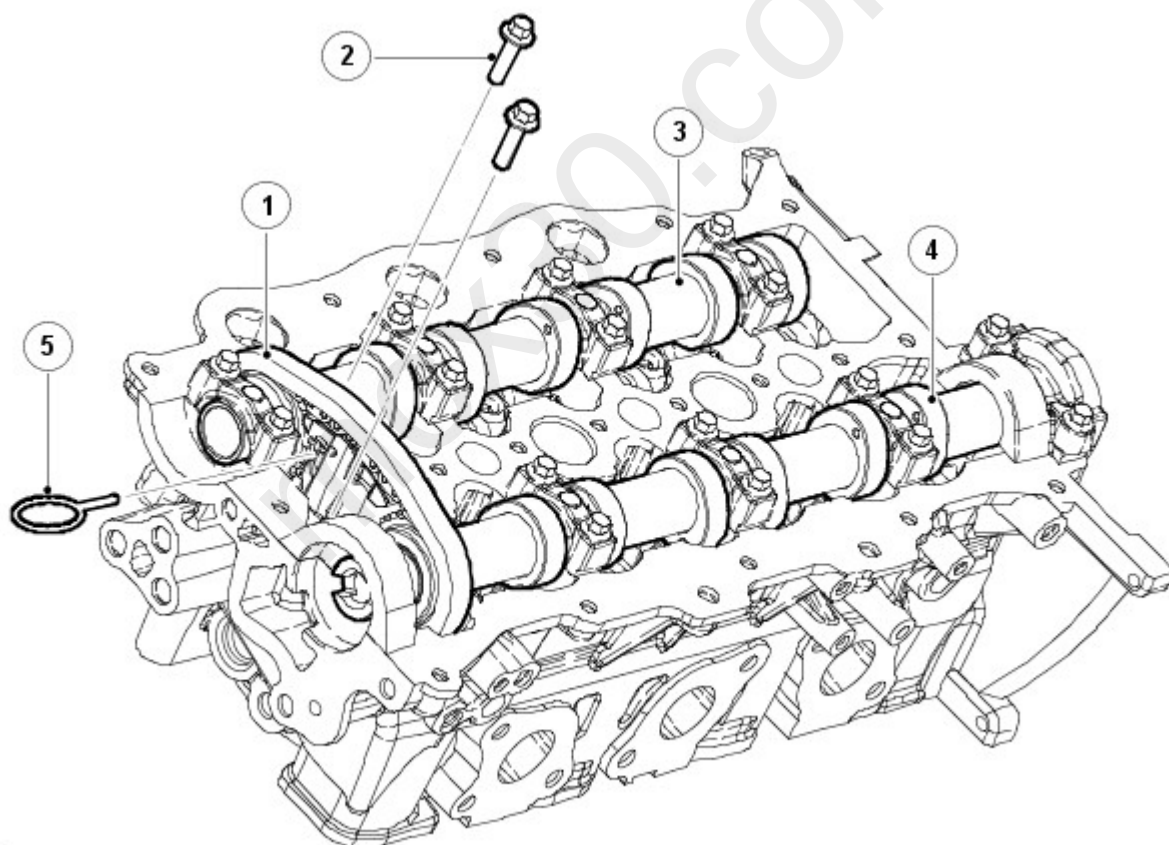
Front cover bridge
20 Primary drive cover
21 Bolt
22 Tensioner
23 Bolt
24 Idler
25 Camshaft hub
26 LH camshaft timing pulley
27 Bolt (3 off)
28 Bolt
29 Idler
30 Bolt
31 Bolt (3 off)
32 Bolt
33 RH camshaft timing pulley
34 Camshaft hub

Primary drive is provided by a single toothed belt from the crankshaft to the exhaust camshaft gears of each cylinder bank via 2 idler pulleys and a tensioner.

Timing belt adjustment is carried out by an eccentric type tensioner mounted on the [RH](#) front face of the cylinder block.

A primary drive cover is made up from 3 separate plastic mouldings. The covers are secured to the front of the cylinder block and cylinder heads with 15 bolts and 1 stud and nut. The 2 upper covers are partially sealed with a rubber seal.

Secondary Drive



E44233

ItemDescription

1	Timing chain
2	Bolts
3	Intake camshaft
4	Exhaust camshaft
5	Tensioner firing pin

Secondary drive is provided by 2 short crossover chains, which transfer drive from the exhaust camshaft gears to the intake camshaft gears. The crossover drives are located at the rear of the [RH](#) cylinder bank and the front of the [LH](#) cylinder bank. This allows for a much shorter and simpler run for the main camshaft drive belt at the front of the engine.

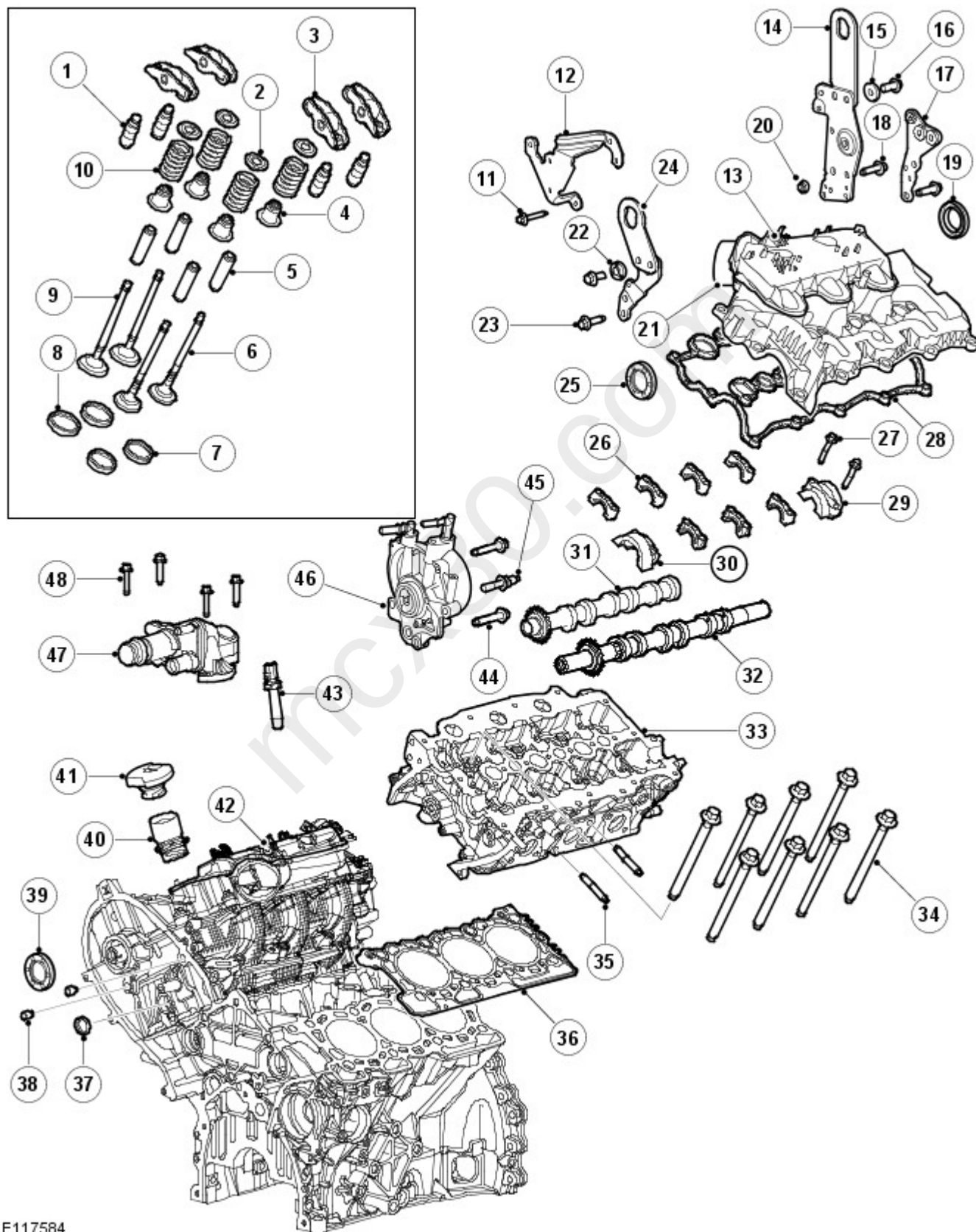
Each crossover chain is tensioned via an automatic chain tensioner, which acts directly on the chains via a guide rail. The

tensioners are located between the exhaust and intake camshafts at the front or rear of the cylinder head, depending on the cylinder bank.

The tensioner firing pin holds the automatic chain tensioner in a compressed state to aid installation.

CYLINDER HEAD COMPONENTS

- NOTE: [LH](#) cylinder head shown; [RH](#) cylinder head similar.

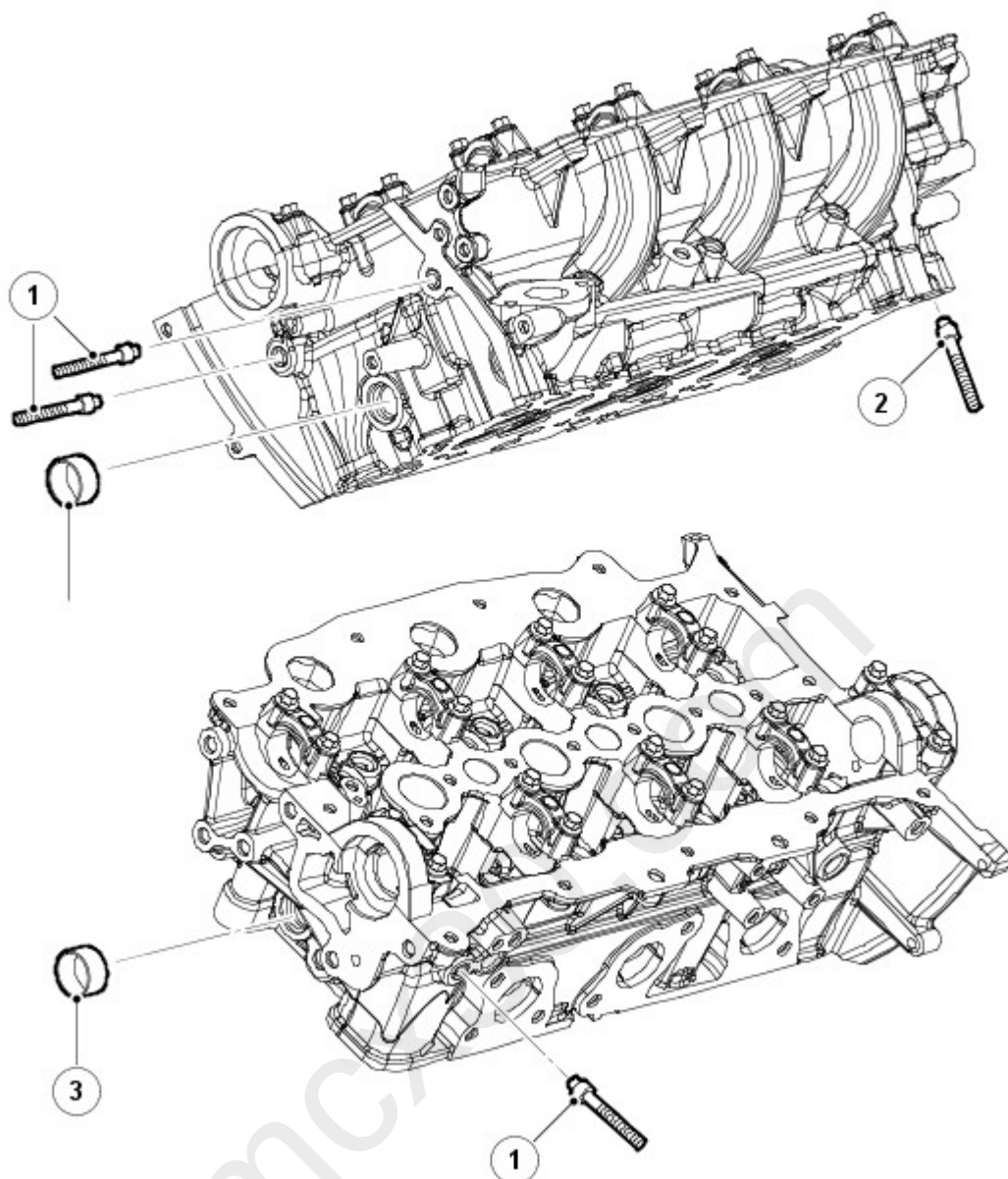


E117584

ItemDescription

Hydraulic lash adjusters (12 off)
2 Valve spring retainers (12 off)
3 Roller rockers (12 off)
4 Valve stem seals (12 off)
5 Valve guides (12 off)
6 Exhaust valves (6 off)
7 Intake valve seats (6 off)
8 Exhaust valve seats (6 off)
9 Intake valves (6 off)
10 Valve springs (12 off)
11 Bolt
12 Bracket
13 Intake manifold
14 Lifting eye
15 Washer
16 Bolt
17 Bolt
18 Bolt
19 Seal
20 Cap
21 Intake manifold cover assembly
22 Washer
23 Bolt
24 Lifting eye
25 Seal
26 Camshaft bearing caps (7 off)
27 Bolts (18 off)
28 Gasket
29 Camshaft bearing cap and seal housing
30 Camshaft bearing cap and seal housing
31 Intake camshaft
32 Exhaust camshaft
33 Cylinder head
34 Cylinder head bolts (8 off)
35 Exhaust manifold studs (6 off)
36 Cylinder head gasket
37 Core plug
38 Plug
39 Seal
40 Oil filler tube
41 Oil filler cap
42 Intake manifold
43 Injectors (3 off)
44 Bolt (2 off)
45 Bolt
46 Tandem pump
47 Water outlet assembly
48 Bolt (4 off)

Cylinder Heads



E44236

ItemDescription

1	Studs
2	Bolts
3	Blanking plug

The aluminum gravity die cast cylinder heads are unique to each cylinder bank. Eight deep-seated bolts help reduce distortion and secure each cylinder head to the cylinder block. The cylinder head bolts are located beneath the camshafts, 4 under the intake camshaft and 4 under the exhaust camshaft. Two hollow dowels align each cylinder head with the cylinder block.

• **NOTE:** The cylinder heads cannot be reworked.

The cylinder head gasket is a 3-layer, laminated steel type and is available in 5 different thicknesses. The choice of gasket thickness is dependent on the maximum piston protrusion. Gasket thickness is identified by serrations cut into the front end of the gasket.

The cylinder head has 4 ports machined at each cylinder location, 2 exhaust ports and 2 intake ports. One of the intake ports is helical and functions as a swirl port, the other is arranged laterally as a tangential port and functions as a charge port.

The camshafts are of a hollow steel tube construction, with pressed on sintered lobes. Each camshaft is retained by aluminum alloy caps, 5 for the exhaust camshafts and 4 for the intake camshafts. Location letters, A to I for the intake camshaft and R to Z for the exhaust camshaft, are marked on the outer faces of the caps for each cylinder head.

The [LH](#) cylinder bank exhaust camshaft is machined to accept a rear camshaft gear. The rear camshaft gear provides drive for the high-pressure fuel pump. For additional information refer to 303-04A Fuel Charging and Controls.

The exhaust camshaft gear of the [LH](#) cylinder head also incorporates a trigger wheel, which is used in conjunction with the camshaft sensor to measure engine position. For additional information refer to 303-14A Electronic Engine Controls.

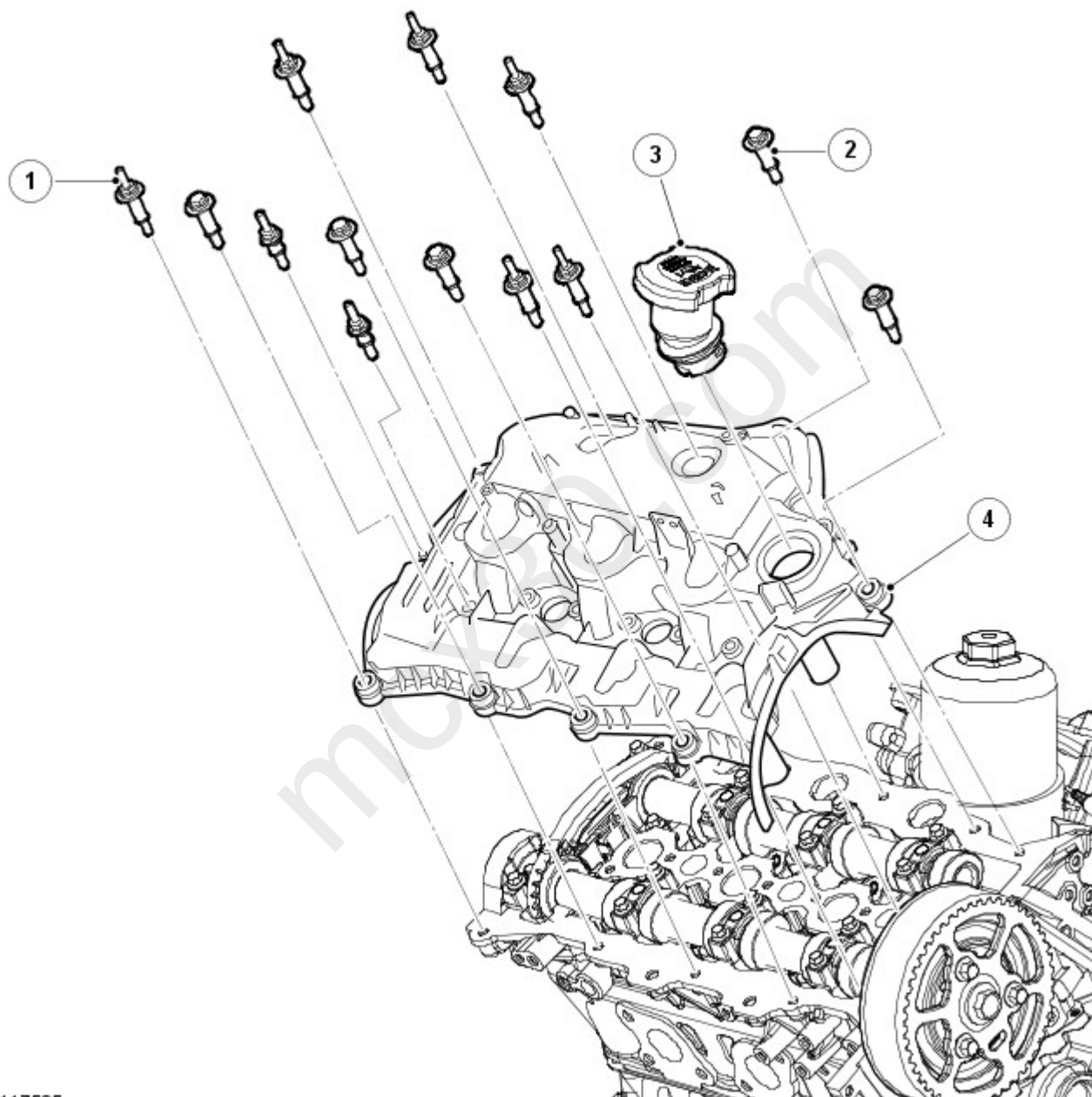
The [RH](#) cylinder head exhaust camshaft is machined at the rear end to provide a drive connection for the tandem pump.

The fuel injection nozzles are centrally mounted above each cylinder. For additional information refer to 303-04A Fuel Charging and Controls.

The glow plugs are arranged centrally on the intake side of the cylinder heads, between the 2 intake ports of each cylinder. For additional information refer to 303-07D Glow Plug System.

The engine lifting eyes are bolted to the cylinder head, 1 at the front and 2 at the rear, 1 per cylinder head.

Camshaft Covers



E117585

ItemDescription

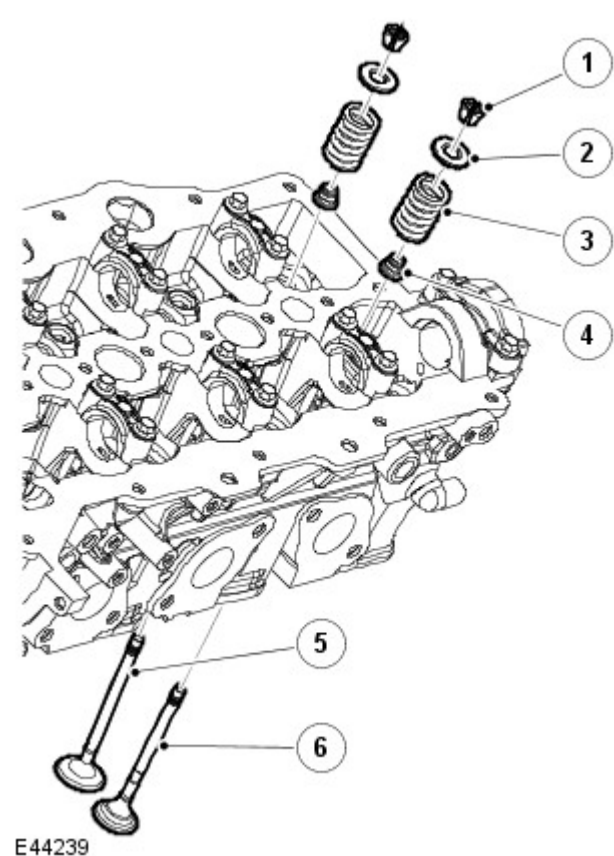
1	Stud bolt M6 x 40 (6 off)
2	Bolt M6 x 40 (7 off)
3	Oil filler cap
4	RH camshaft cover assembly

The camshaft covers are manufactured from vinyl ester composite. The [RH](#) bank camshaft cover incorporates an outlet for the full load engine breather and the engine oil filler cap. The [LH](#) bank camshaft cover incorporates an outlet for the part load engine breather. For additional information refer to 303-08A engine Emission Control.

Silicon rubber in-groove gaskets seal the joints between the camshaft covers and the cylinder heads. Together with spacers and seals on the camshaft cover fasteners, they also isolate the covers from direct contact with the cylinder

heads, to reduce noise.

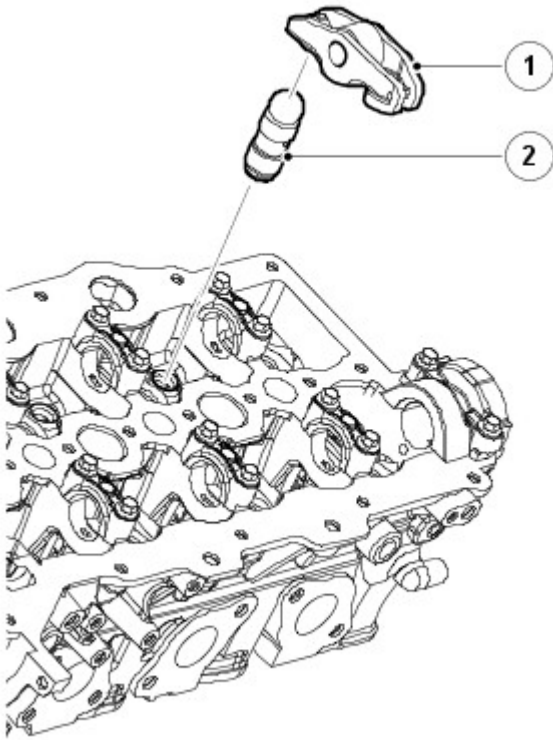
Intake and Exhaust Valves



Item	Description
1	Valve spring collet (24 off, 12 per cylinder head)
2	Valve spring retainer (24 off, 12 per cylinder head)
3	Valve spring (24 off, 12 per cylinder head)
4	Valve stem seal (24 off, 12 per cylinder head)
5	Intake valve (12 off, 6 per cylinder head)
6	Exhaust valve (12 off, 6 per cylinder head)

Each cylinder head incorporates 2 overhead camshafts operating 4 valves per cylinder via steel roller rockers with hydraulic lash adjusters.

Roller Rockers with Hydraulic Lash Adjusters

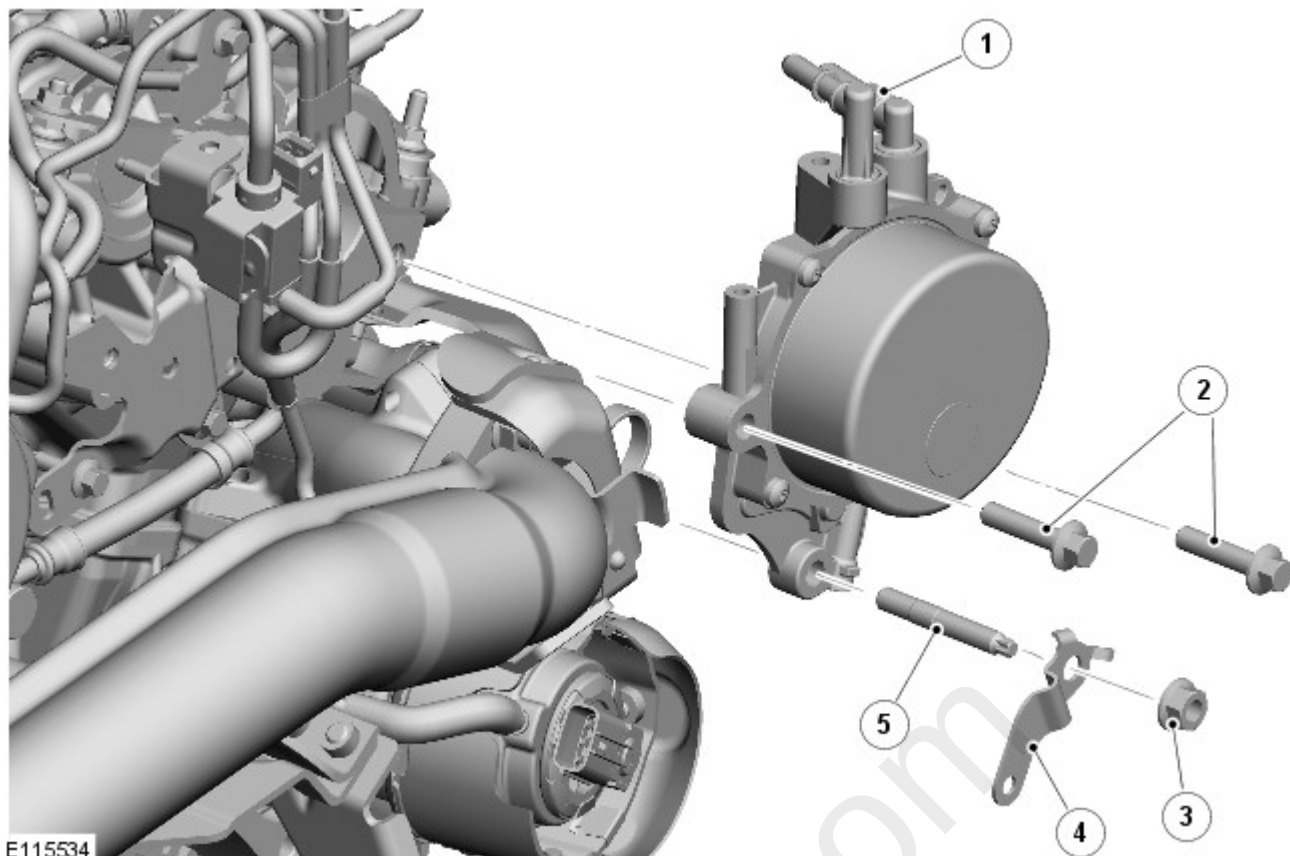


E44238

ItemDescription	
1	Roller rocker (24 off, 12 per cylinder head)
2	Hydraulic lash adjuster (24 off, 12 per cylinder head)

The lightweight valve gear provides good economy and noise levels. Valve head diameters are 31 mm (1.220 in) for the exhaust and 35 mm (1.378 in) for the intake. All valves have 5 mm (0.197 in) diameter stems supported in sintered metal seats and guide inserts. Collets, valve collars and spring seats locate single valve springs on both intake and exhaust valves. Valve stem seals are integrated into the spring seats.

Tandem Pump



E115534

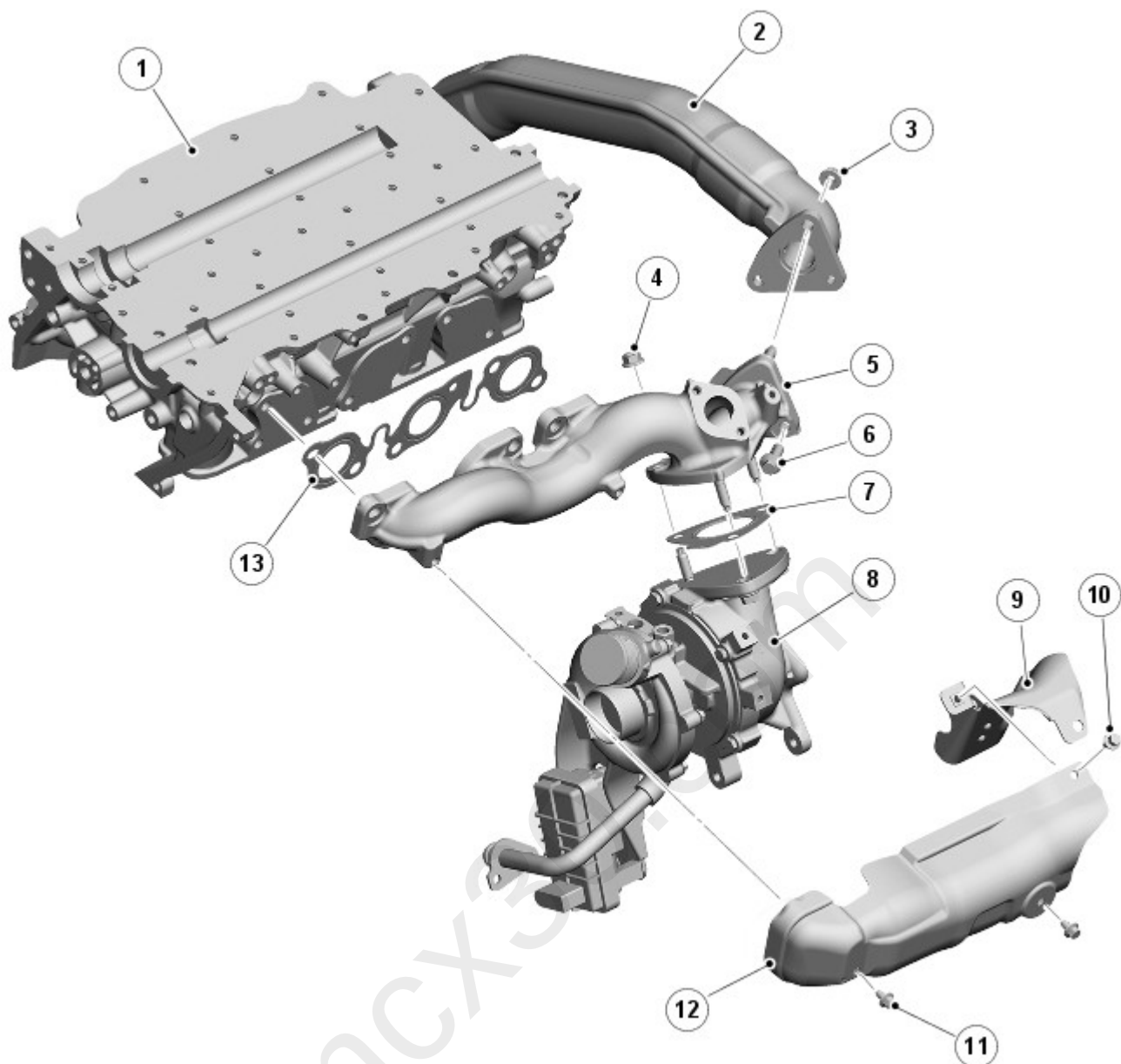
ItemDescription

1	Tandem pump connections
2	Bolt (2 off)
3	Nut
4	Bracket (emission hose)
5	Stud

The tandem pump is a combined vacuum and oil scavenge pump. The scavenge pump is g-rotor type pump that drains oil from the secondary turbocharger to accommodate vehicle tilt. The pump is located at the rear of the [RH](#) side cylinder head and is driven from the exhaust camshaft.

Exhaust Manifolds

- NOTE: [LH](#) exhaust manifold shown; [RH](#) exhaust manifold similar.



E115531

ItemDescription

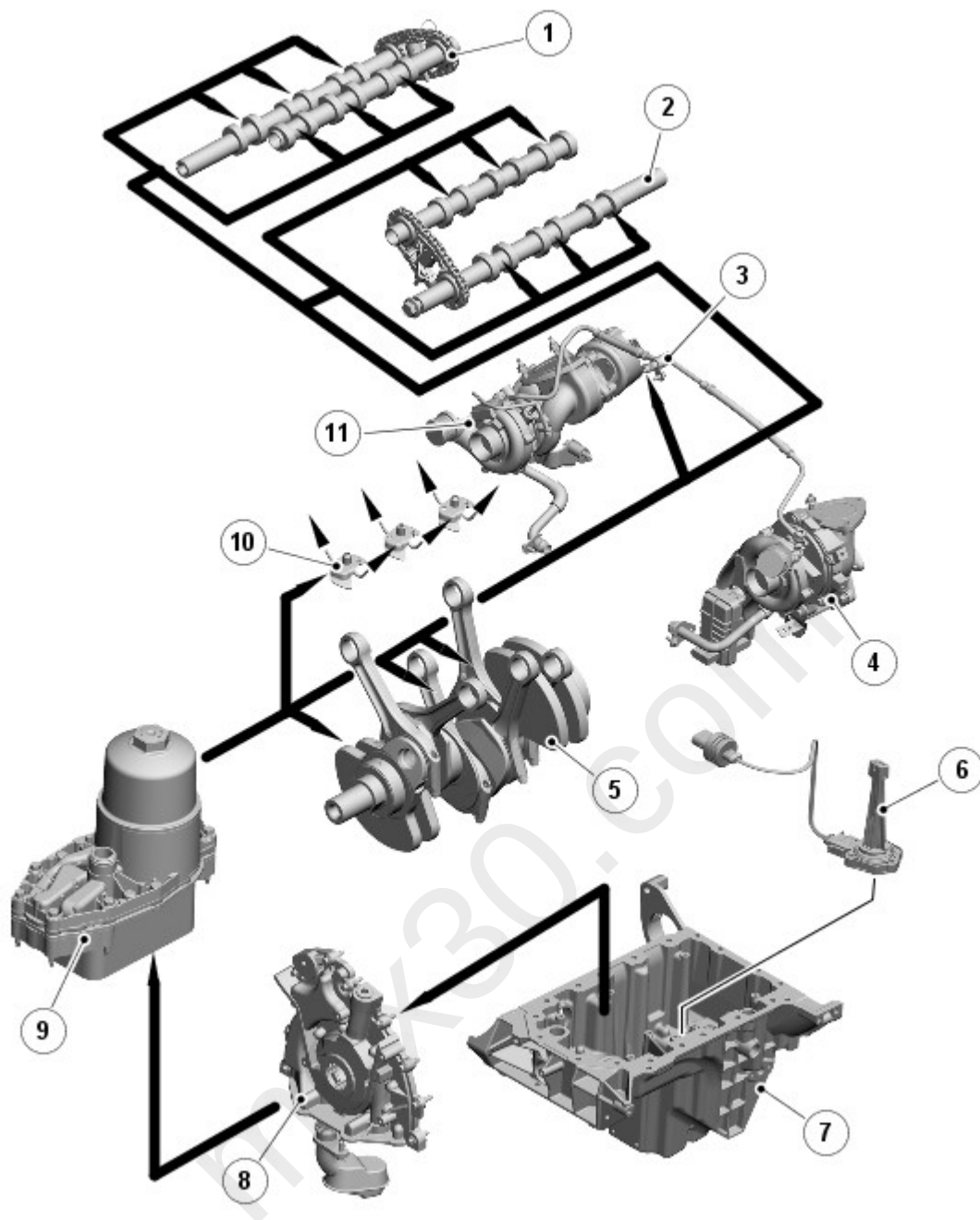
1	Cylinder head
2	Connecting pipe
3	Nut (2 off)
4	Nut (3 off)
5	Exhaust manifold
6	Bolt
7	Gasket
8	Turbocharger (primary turbocharger shown)
9	Manifold rear heat shield
10	Bolt
11	Bolt (2 off)
12	Manifold heat shield

The exhaust manifolds are cast from an iron alloy with a high nickel content giving excellent heat and corrosion resistance properties. They are sealed to the cylinder head by means of a steel gasket. Sacrificial plastic sleeves are used to align the manifolds. These sleeves must be changed when refitting the manifolds. Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads.

Each manifold has a connection for the [EGR \(exhaust gas recirculation\)](#) transfer pipe.

The engine is fitted with twin variable geometry turbochargers, which fix to the exhaust manifolds by a 3-hole flange with a steel gasket.

LUBRICATION SYSTEM



E117573

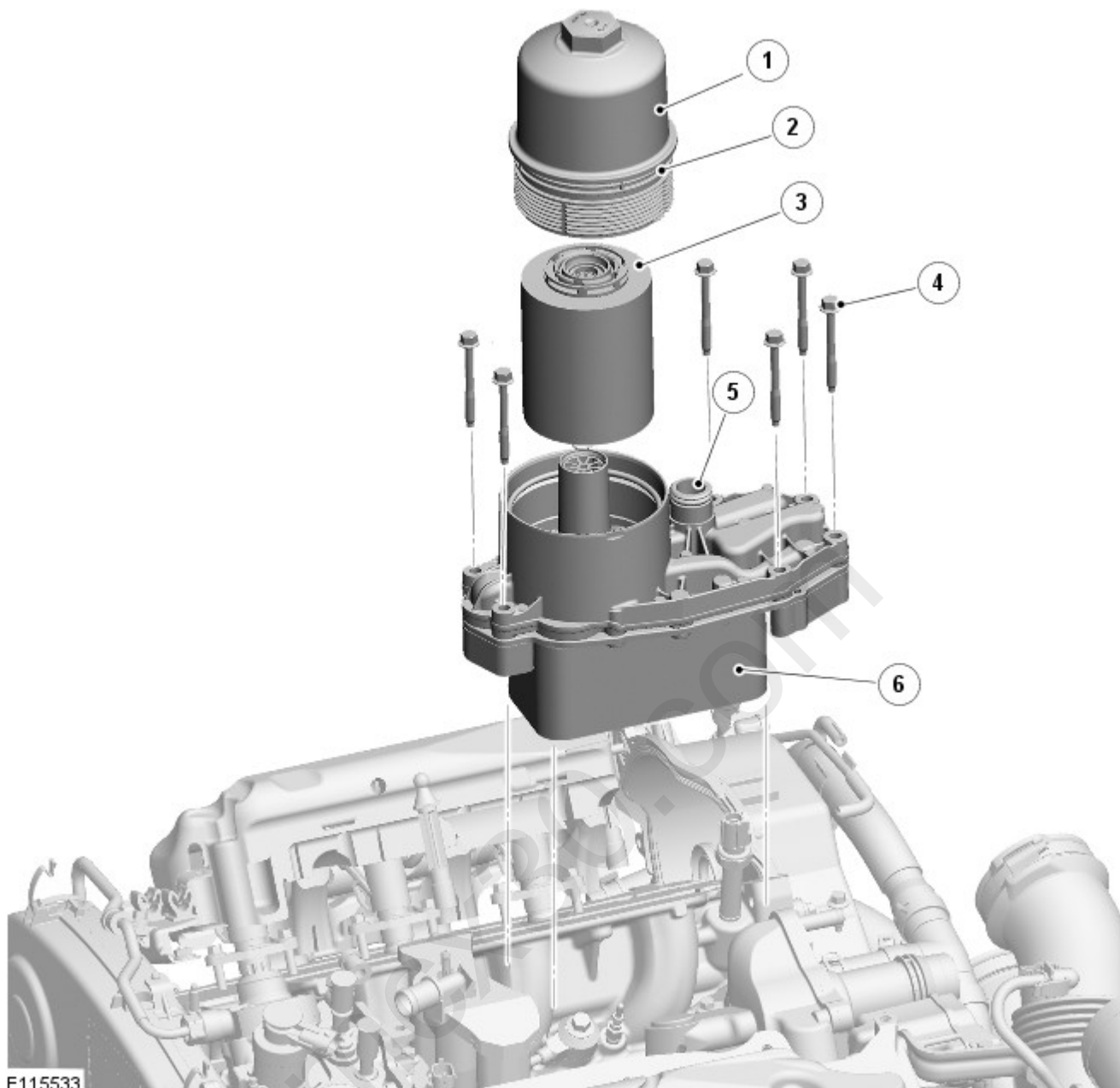
ItemDescription

1	Inlet camshaft
2	Exhaust camshaft
3	Turbocharger oil supply
4	Primary turbocharger
5	Crankshaft and connecting rods
6	Oil level and temperature sensor
7	Oil pan
8	Oil pump
9	Oil cooler and filter assembly
10	Piston cooling jets
11	Secondary turbocharger

Oil is drawn from the oil pan and pressurized by the oil pump. The output from the oil pump is then filtered and distributed through internal oil passageways.

All moving parts are lubricated by pressure or splash oil. Pressurized oil is also provided for operation of the hydraulic adjusters and the timing gear chain tensioners.

Oil Cooler and Filter Assembly



Item Description

1	Filter housing
2	'O' ring seal
3	Paper element
4	Retaining bolt (6 off)
5	Coolant outlet connection
6	Cooler assembly

The engine is lubricated by a force-feed oil circulation system with a full flow oil filter. The oil cooler forms a unit with the oil filter, which is mounted centrally in the middle of the cylinder block between the 2 banks of cylinders. The engine oil is cooled using the engine cooling system. This eliminates the need for an additional engine oil cooler remotely mounted.

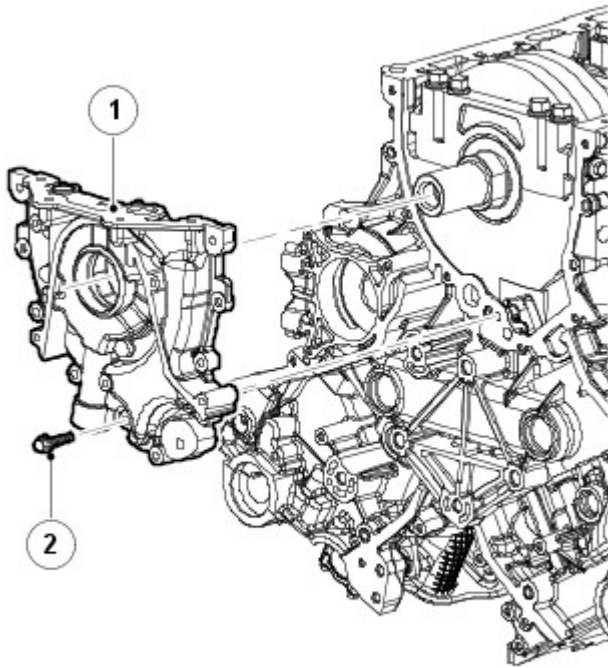
Oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the quick return of the oil, reducing the volume of oil required and enabling an accurate check of the contents soon after the engine stops.

System replenishment is through the oil filler cap on the [RH](#) camshaft cover.

The moulded composite oil pick-up is immersed in the oil reservoir to provide a supply to the oil pump during all normal vehicle attitudes. A mesh screen in the inlet prevents debris from entering the oil system.

• **NOTE:** Fuel cooling is facilitated by a blast air fuel cooler in the return line to the fuel tank.

Oil Pump



E44230

ItemDescription

1	Oil pump
2	Bolt (10 off)

The oil pump is a gear type pump and is bolted and dowelled to the front of the cylinder block. It is sealed by means of a rubber gasket, which is recessed into the oil pump housing. The pump inlet and outlet ports align with oil passages in the stiffening frame.

The pumping element is an eccentric rotor, which is directly driven by flats on the crankshaft. An integral pressure relief valve regulates pump outlet pressure at 4.5 bar (65.25 lb/in²).

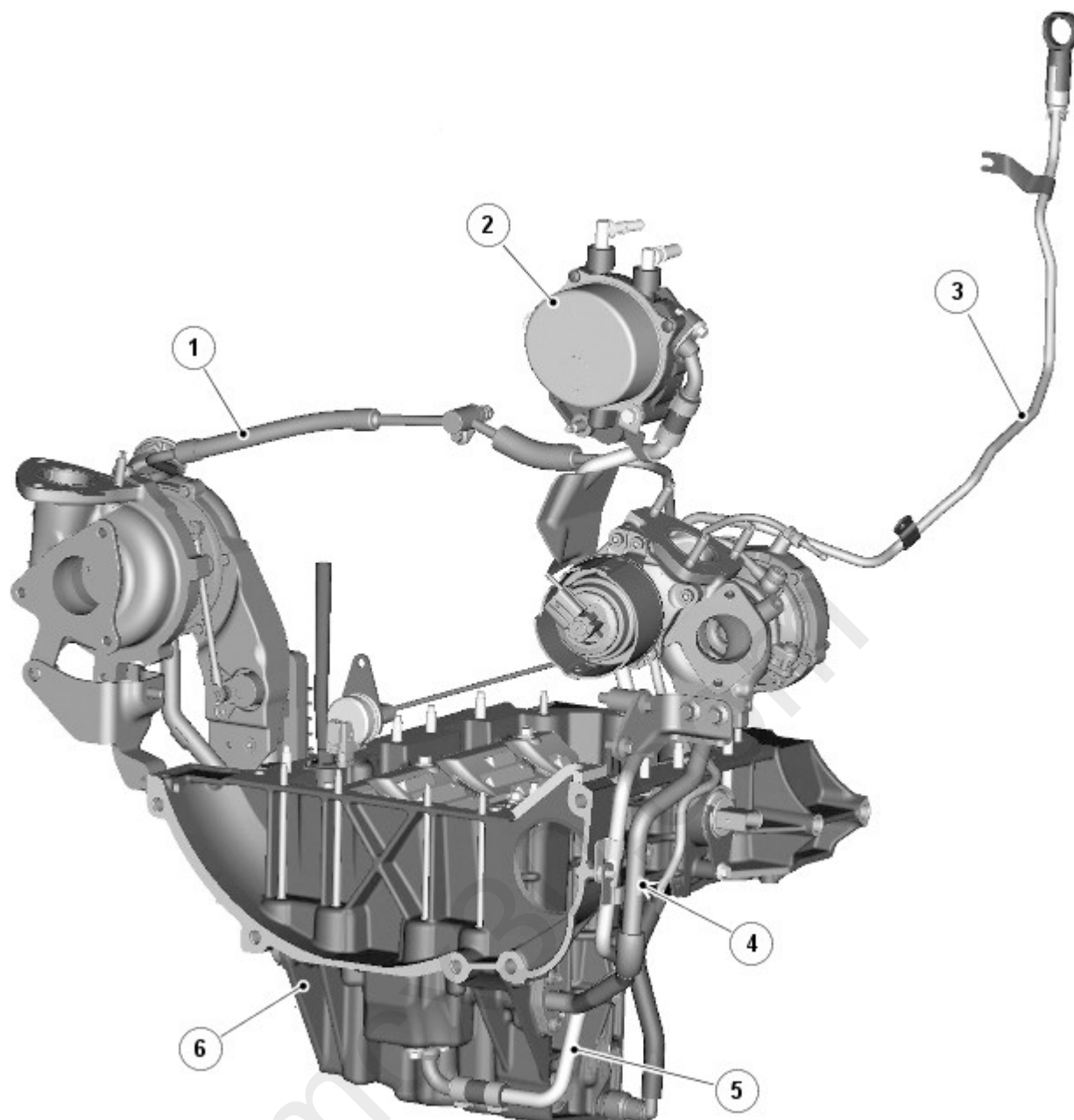
The front crankshaft oil seal is housed in the oil pump casing and is fitted such that its front face is 1 mm (0.04 in) under flush with the machined front face of the oil pump.

• **NOTE:** The seal is not to be pushed all the way into the bore as this will block the seal drains.

Due to the wide range of inclines Land Rover vehicles operate across, the geometry of the oil pan has been configured to guarantee oil pick-up across all operating angles. An oil-scavenge system has been developed to guarantee excellent oil flow through the turbochargers on severe side-slopes. Whilst the 60-degree cylinder bank angle of a V6 engine allows the turbochargers to be packaged relatively higher in the vehicle, to obtain the best configuration for the V6 engine, the turbochargers must be sited much lower. At extreme angles, there is a risk they may be below the oil level on the oil pan, restricting oil return flow.

To overcome this, the engine uses:

- the oil pump to supply oil to the turbocharger bearings from the main oil reservoir (oil pan)
- a secondary reservoir to receive oil from the turbocharger bearings
- a tandem pump to urge oil to flow from the turbocharger bearings into the secondary reservoir and to pump the oil back from the secondary reservoir to the primary reservoir (oil pan)



E107569

ItemDescription

1	Turbocharger oil feed pipe
2	Tandem pump
3	Oil evacuation tube
4	Turbocharger oil return pipe
5	Oil scavenge pipe
6	Oil pan

An additional feature of this system is that the tandem pump used to pump oil back from the secondary reservoir can also be used as a source of vacuum for a vacuum operated system.

A semi-synthetic, low SAPS (sulphated ash, phosphorus and sulphur) oil is specified, which reduces the ash loading in the [DPF \(diesel particulate filter\)](#). Ash cannot be burnt off like soot so it remains in the [DPF](#) for life. Without the use of low SAPS oil, the [DPF](#) will not be a 'fit for life' component.

This low SAPS oil is also more resistant to temperature-related degradation than conventional mineral oil. It has lower viscosity at low temperatures and improved lubrication performance at higher temperatures.

Engine - TDV6 3.0L Diesel - Engine

Diagnosis and Testing

For additional information, refer to Diagnosis and Testing, Engine - 3.0L Diesel.

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Engine - TDV6 3.0L Diesel - Engine Oil Draining and Filling

General Procedures

Draining



WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.



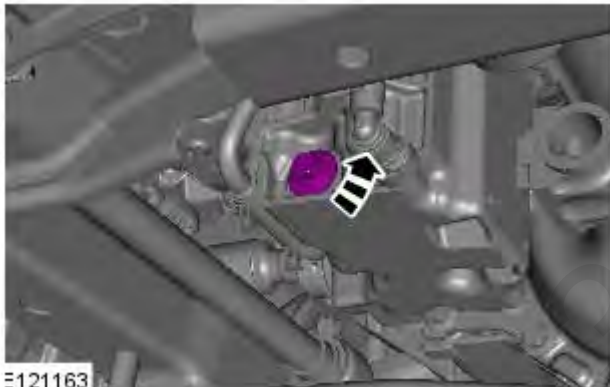
CAUTION: Make sure the engine is warm.

1. Refer to: [Oil Filter Element](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

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

Raise and support the vehicle.

3. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).



4. **WARNING:** Observe due care when draining engine oil as the oil can be very hot.

• **CAUTIONS:**



Be prepared to collect escaping oil.



Discard the bolt.



Allow at least 10 minutes for the engine oil to drain.

Drain the engine oil.

Filling

1. **5. CAUTIONS:**



Make sure that the component is clean, free of foreign material and lubricant.



Make sure that a new bolt is installed.

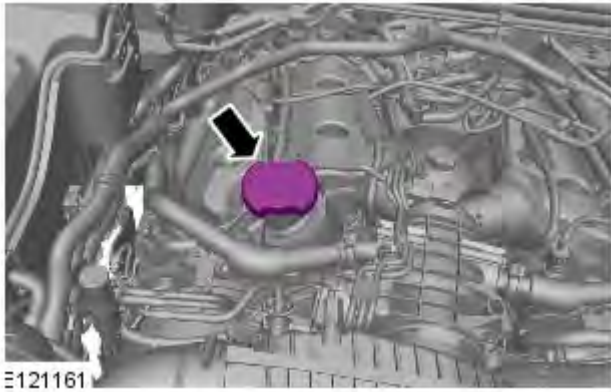
Torque: 23 Nm



2. Refer to: [Engine Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

3. Lower the vehicle.

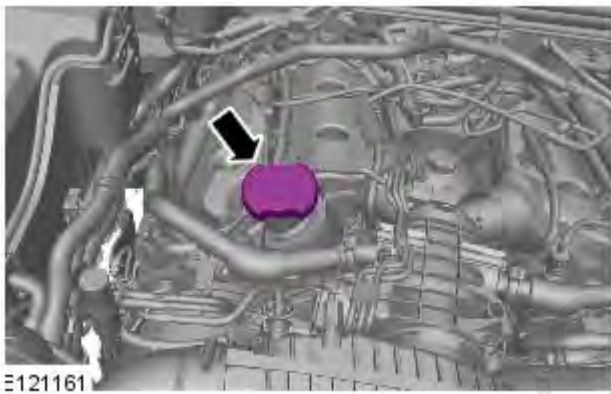
4. Refer to: [Oil Filter Element](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).



5. Fill the engine with oil.

6. **10.**  **CAUTION:** Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum, before starting the engine. To check engine oil level follow steps 9-12.

Clean any residual engine oil from the oil filler cap area.



7.

- 8.
- Start the engine and allow to run for 10 minutes, stop the engine.
 - Check for leaks.
9. **13. CAUTIONS:**
-  Make sure that the vehicle is parked on level ground.
 -  Make sure that the selector lever and the gearshift mechanism are in the park (P) position.
 -  Make sure that the hood is open.
- **NOTE:** Allow 10 minutes from the engine switch off for the engine oil level to stabilize.
 - Turn the ignition on.

10.

- Press the right-hand directional button to access the instrument cluster menu.



E123926

11.

- Press the right-hand OK button.



E123925

12.

- Press the right-hand directional button to access the Oil Level Display.



E123927

13.

- Press the right-hand OK button and follow the instructions.



E123928



E121008

14.

- Press the cruise control cancel button twice within 2 seconds.



E123929

15.

- The message center display will revert to the normal display in the trip computer.
- Press the right-hand OK button and follow the instructions.
- Check that the oil level display shows an oil level reading.
- Take a reading from the level display and, if necessary, top up with oil as instructed.

16. Turn the ignition off.

17. **21.** NOTE: Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

- Turn the ignition on.

18.

- Press the right-hand directional button to access the instrument cluster menu.



E123926

19.

- Press the right-hand OK button.



E123925

20.

- Press the right-hand directional button to access the Oil Level Display.



E123927

21.

- Scroll through the trip menu to access the engine oil level display.



E123929



E121008

22.

- Press the cruise control cancel button twice within 2 seconds.



E123929

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

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.



E121008

24.

- Press and hold the cruise control cancel button for more than 2 seconds.

25.

- The message center display will revert to the normal display in the trip computer.

26. Turn the ignition off.

27. Turn the ignition on.

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

- Scroll through the trip menu to access the engine oil level display.
- Make sure that the average oil level value has now been updated.



E123929

29. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornammentation, Removal and Installation).

Engine - TDV6 3.0L Diesel - Engine Oil Vacuum Draining and Filling

General Procedures

Special Tool(s)

 E129630	303-1484 Vacuum Pump, Oil Drain
 E129631	303-1484-01 Adapter for 303-1484

Draining

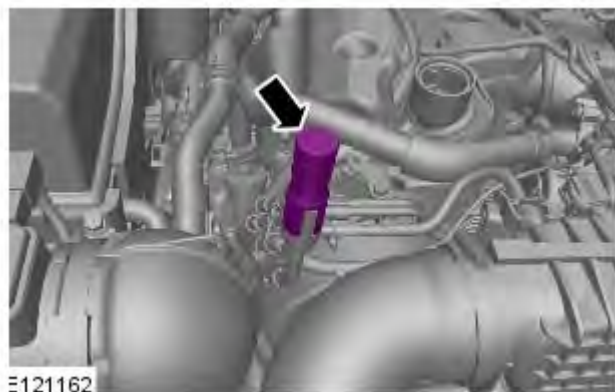
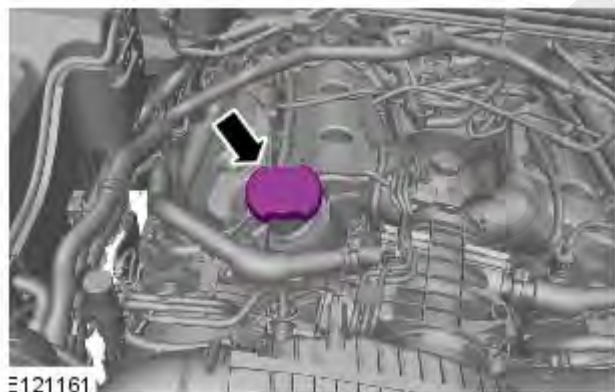


WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

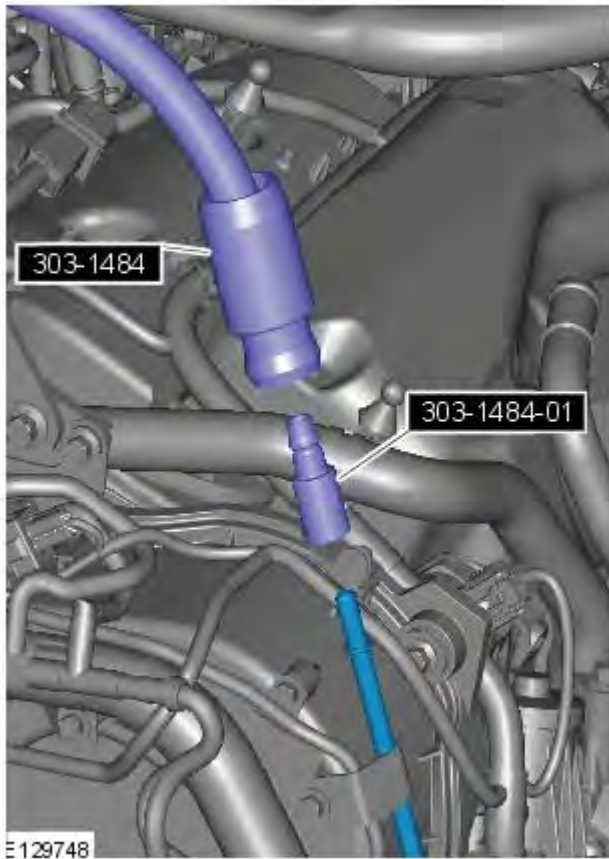
- NOTE: Make sure that the vehicle is parked on level ground.
- NOTE: Clean the components general area prior to dismantling.

1. Refer to: [Oil Filter Element](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

2.



3.  **CAUTION:** Allow 10 minutes from turning the engine off before starting oil extraction.



4.

- Using the oil vacuum pump drain the oil out through the oil extraction tube.

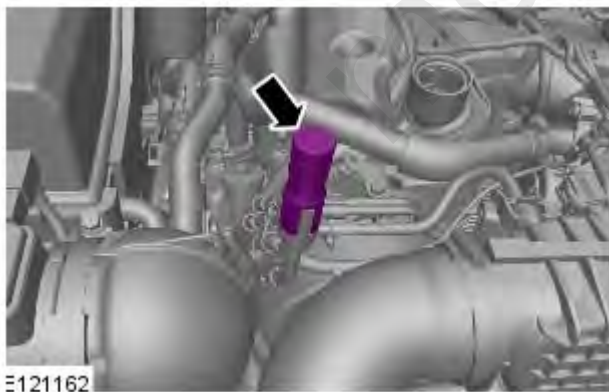
Special Tool(s): [303-1484](#), [303-1484-01](#)

5.

- Remove the oil vacuum pump.

Filling

1. Refer to: [Oil Filter Element](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

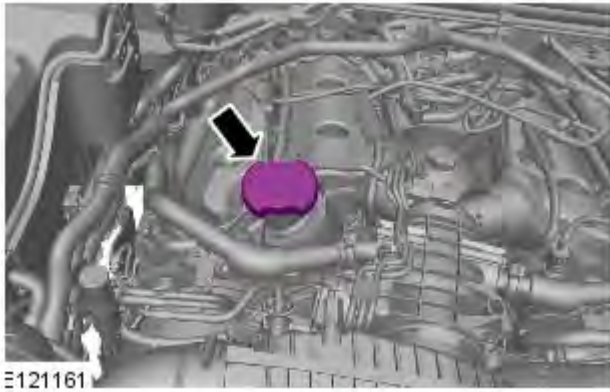


2.

3. Fill the engine with oil.

4. **9. ⚠ CAUTION:** Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum, before starting the engine. To check engine oil level follow steps 8-10.

Clean any residual engine oil from the oil filler cap area.



5. **10.**  **CAUTION:** Correct installation of the oil filler cap can be obtained by tightening the cap until an audible click is heard.

- 6.
- Start the engine and allow to run for 10 minutes, stop the engine.
 - Check for leaks.

7. **12. CAUTIONS:**



Make sure that the vehicle is parked on level ground.



Make sure that the selector lever and the gearshift mechanism are in the park (P) position.



Make sure that the hood is open.

• **NOTE:** Allow 10 minutes from the engine switch off for the engine oil level to stabilize.

- Turn the ignition on.

- 8.

- Press the right-hand directional button to access the instrument cluster menu.





E123925

9.

- Press the right-hand OK button.



10.

- Press the right-hand directional button to access the Oil Level Display.



E123927

11.

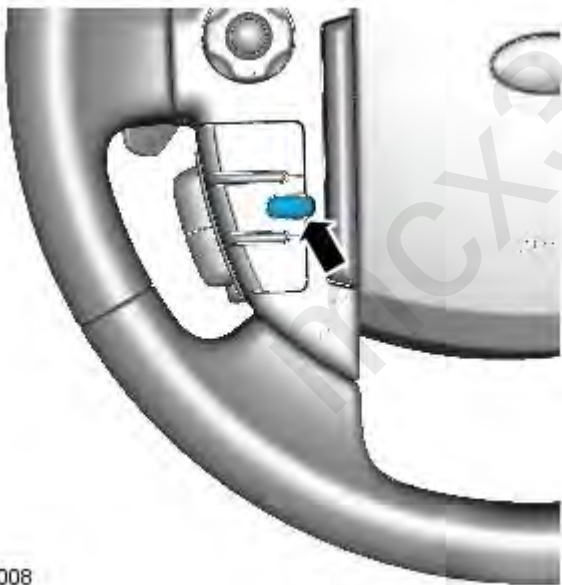
- Press the right-hand OK button and follow the instructions.



E123928

12.

- Press the cruise control cancel button twice within 2 seconds.



E121008



E123929

13.

- The message center display will revert to the normal display in the trip computer.
- Press the right-hand OK button and follow the instructions.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes, switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

14. Turn the ignition off.

15. **20. NOTE:** Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

Turn the ignition on.

16.

- Press the right-hand directional button to access the instrument cluster menu.



E123926

17.

- Press the right-hand OK button.



E123925

18.

- Press the right-hand directional button to access the Oil Level Display.



E123927

19.

- Press the right-hand OK button and follow the instructions.



E123928



E121008

20.

- Press and hold the cruise control cancel button for more than 2 seconds.



E123929

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

- The message center display will revert to the normal display in the trip computer.
- Press the right-hand OK button and follow the instructions.
- This display is now the live reading of the engine oil level.
- Take a reading from the level display and, if necessary, top up with oil as instructed.



E121008

22.

- Press and hold the cruise control cancel button for more than 2 seconds.

23. The message center display will revert to the normal display in the trip computer.

24. Turn the ignition off.

25. Turn the ignition on.

26.

- Press the right-hand directional button to access the instrument cluster menu.



E123926



E123925

27.

- Press the right-hand OK button.



28.

- Press the right-hand directional button to access the Oil Level Display.



E123927



E123929

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

- Press the right-hand OK button and follow the instructions.
- Make sure that the average oil level value has now been updated.

30. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamantation, Removal and Installation).

Engine - TDV6 3.0L Diesel - Camshaft LH

Removal and Installation

Special Tool(s)

 E60429	303-1145/2 Remover, Camshaft Rear Pulley Bolt
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Removal

1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2. Refer to: [Rear End Accessory Drive \(READ\)](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

4. Install the special tool.



5. Install the special tool.



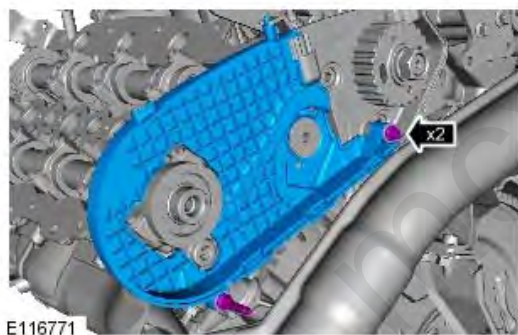
6. Using the special tool, remove the rear camshaft pulley retaining bolt.



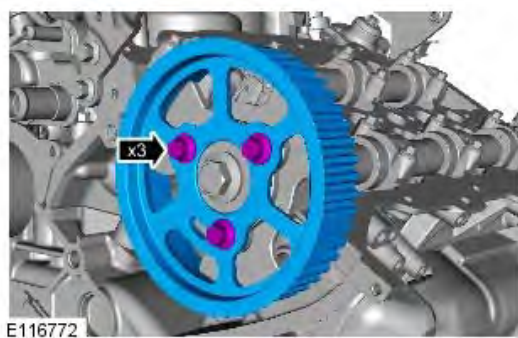
7. Remove the special tools.



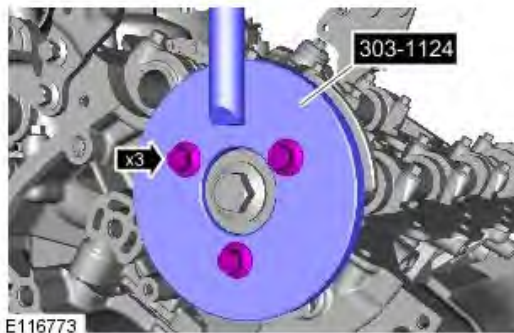
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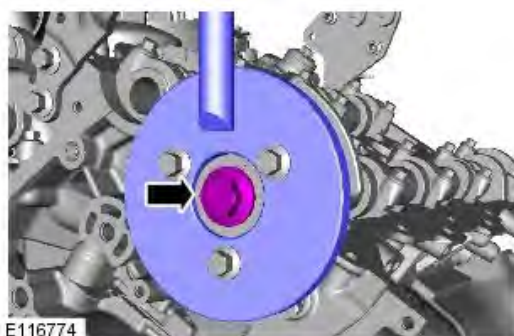
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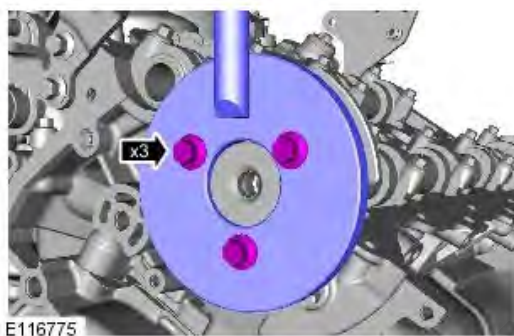
10.



11. Install the special tool.



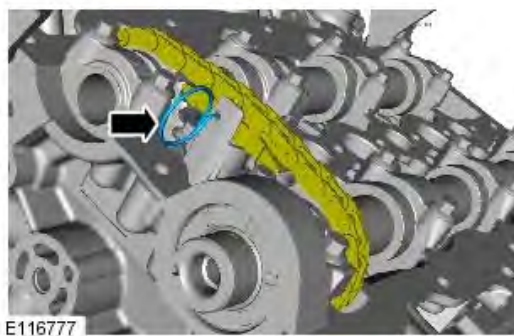
12.



13. Remove the special tool.

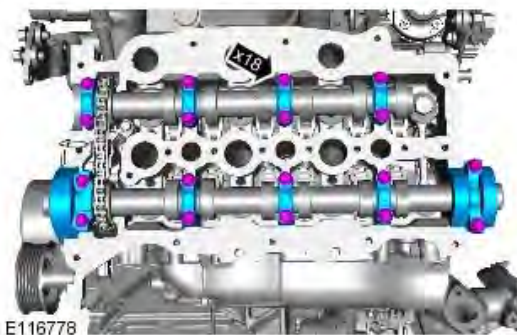


14.

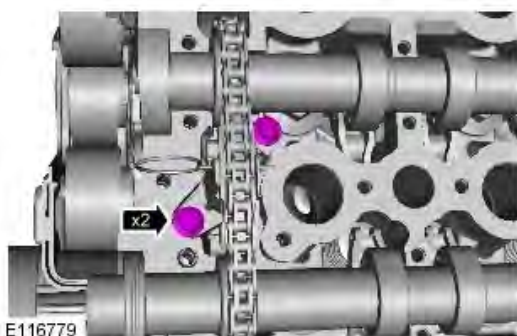


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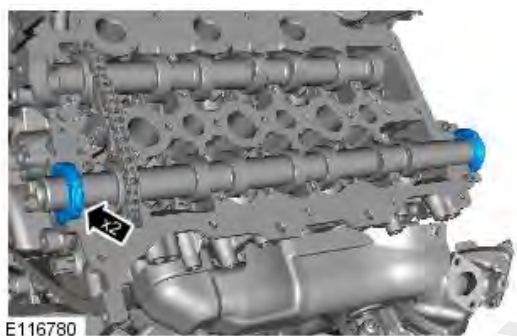
- Reposition the secondary timing chain tensioner.
- Retain the secondary timing chain tensioner plunger.



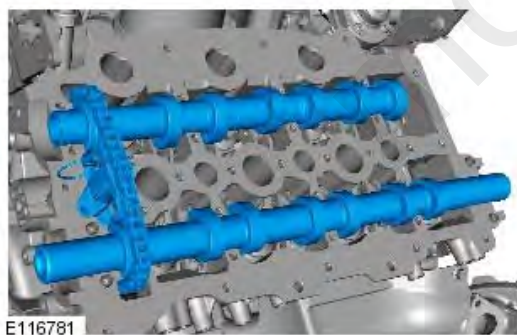
16. Remove the camshaft bearing caps evenly.



17.



18. **18.**  **CAUTION:** Discard the seals.

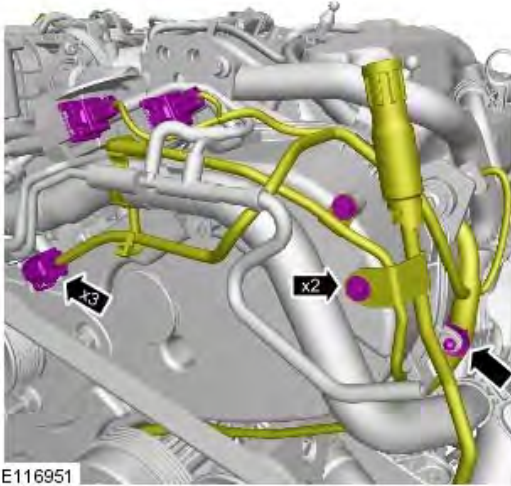


19.

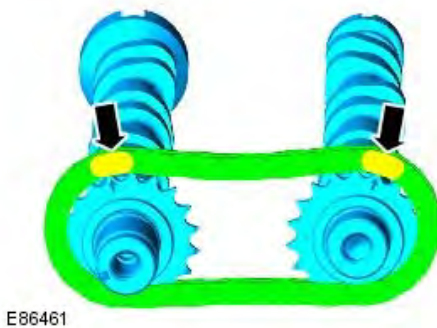


20.

21.



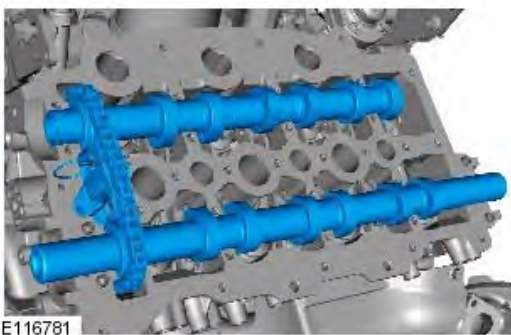
Installation



1. Install the secondary timing chain onto the camshafts.



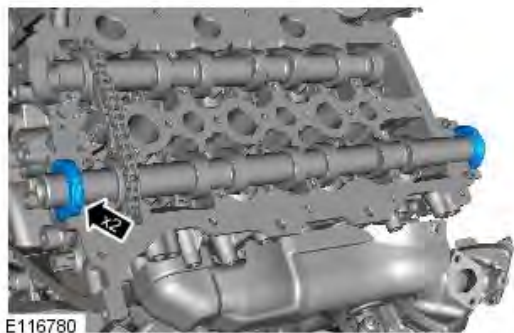
2. Install the secondary timing chain tensioner assembly.



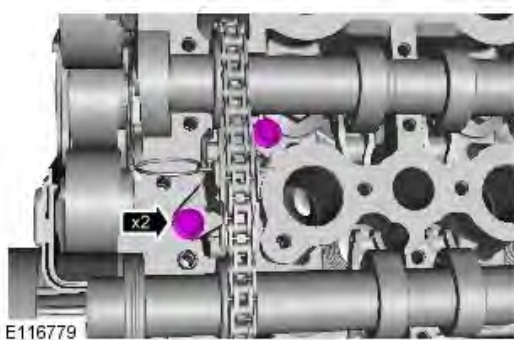
3.  **CAUTION:** Make sure that the dots on the camshafts are aligned at the 12 o'clock position. Failure to follow this instruction may result in damage to the engine.

- NOTE: Lubricate the camshafts and the camshaft bearing caps with oil meeting Jaguar specification prior to installation.
- NOTE: Use hypoid oil to lubricate the camshafts.

Install the camshafts.

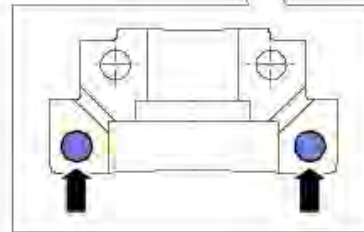
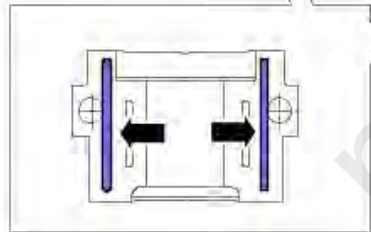
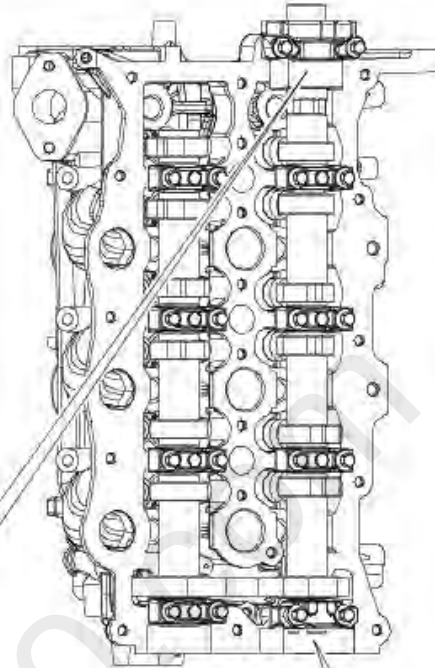
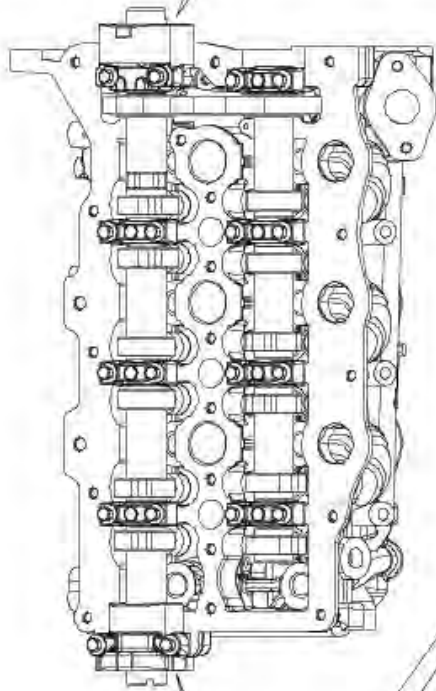
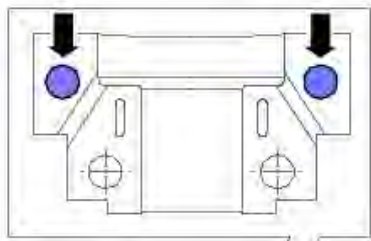


4. **4.** NOTE: Install new seals.



5. Torque: 10 Nm

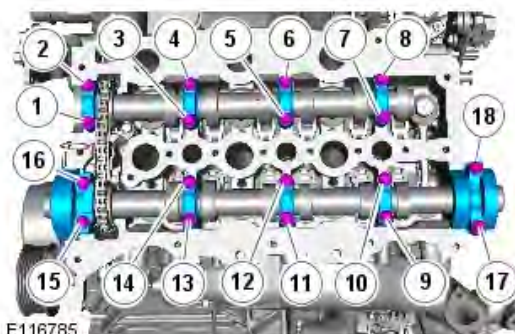
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E116784

6.

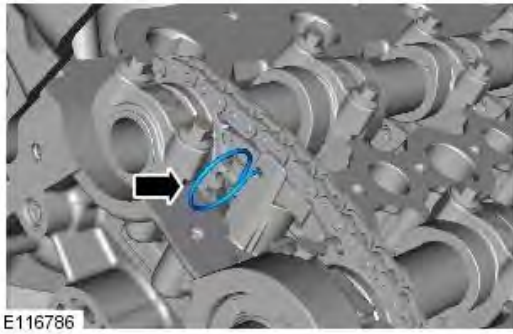
- Apply Loctite 518 sealant to the exhaust camshaft seal bearing caps.
- Apply Loctite 518 sealant, 2 mm wide, to the LH rear and RH front camshaft bearing caps.
- Apply Loctite 518 sealant, 7 mm diameter, to the LH front and RH rear camshaft bearing caps.



E116785

7. **7. NOTE:** Tighten the bolts in the indicated sequence.

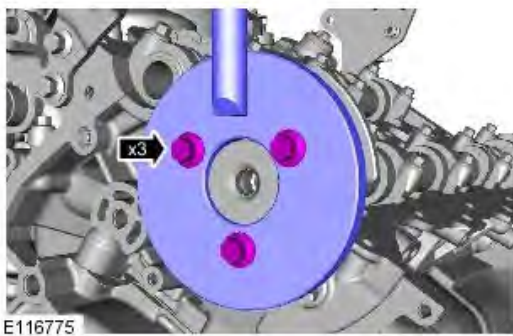
- Install the camshaft bearing caps in their original positions.
- Stage 1: Bolts 1 to 14, 1 Nm.
- Stage 2: Bolts 1 to 14, 5 Nm.
- Stage 3: Bolts 1 to 14, 10 Nm.
- Stage 4: Bolts 15 to 18, 1 Nm.
- Stage 5: Bolts 15 to 18, 5 Nm.
- Stage 6: Bolts 15 to 18, 10 Nm.



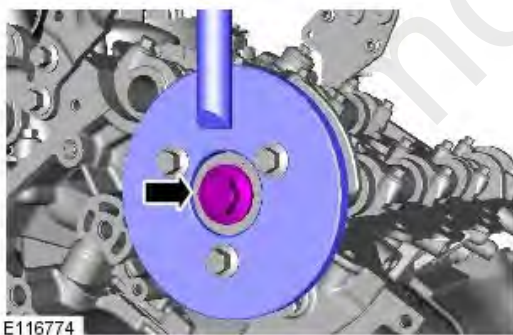
8. Remove the secondary timing chain tensioner retaining pin.



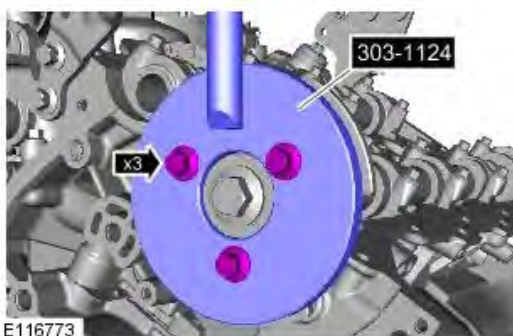
9.



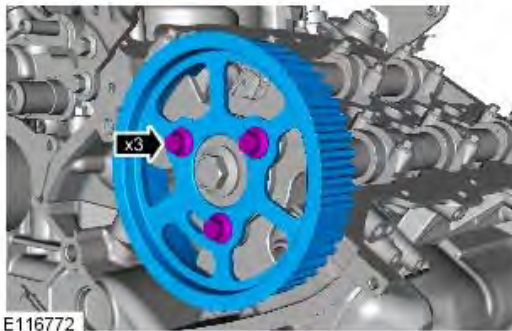
10. Install the special tool.



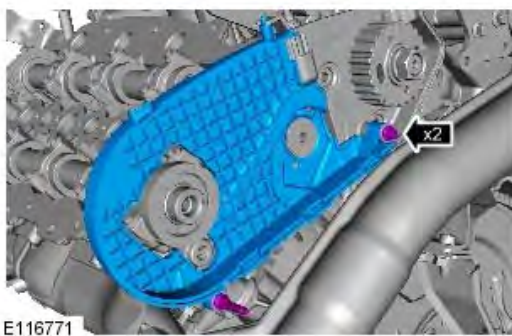
11. Torque:
Stage 1: 80 Nm
Stage 2: 80°



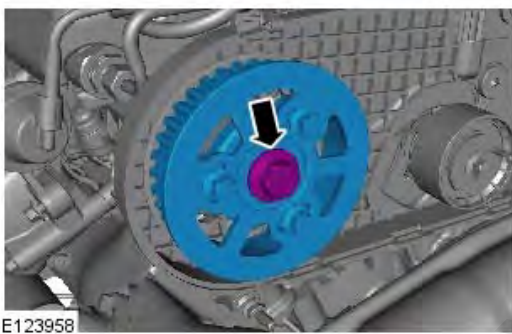
12. Remove the special tool.



13. **13.** ⚠ CAUTION: Only tighten the bolt finger-tight at this stage.



14. Torque: 10 Nm



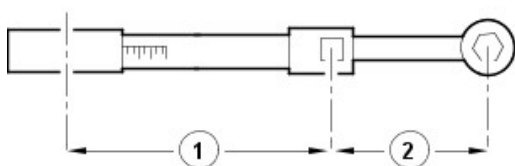
15. **15.** ⚠ CAUTION: Only tighten the bolt finger-tight at this stage.



16. Install the special tool.



17. Install the special tool.



18. **18.**  **CAUTION:** Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.
Calculate the setting for the torque wrench.

E37107



19. **19.**  **CAUTION:** Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.
- Using the special tool, install the camshaft rear pulley retaining bolt.
 - *Special Tool(s):* [303-1145/2](#)
 - *Torque:*
 - Stage 1: 80 Nm
 - Stage 2: 80°

20. Remove the special tools.

21. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

22. Refer to: [Rear End Accessory Drive \(READ\)](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

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

Engine - TDV6 3.0L Diesel - Camshaft RH

Removal and Installation

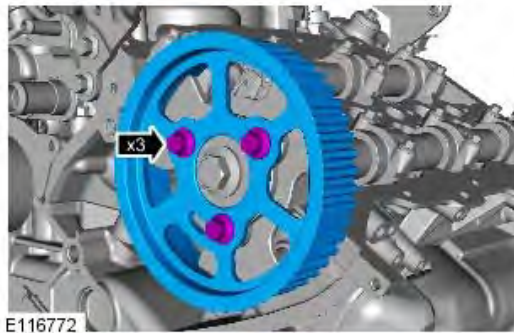
Special Tool(s)

 303-1124 E54549	303-1124 Holding Tool, Camshaft Front Pulley
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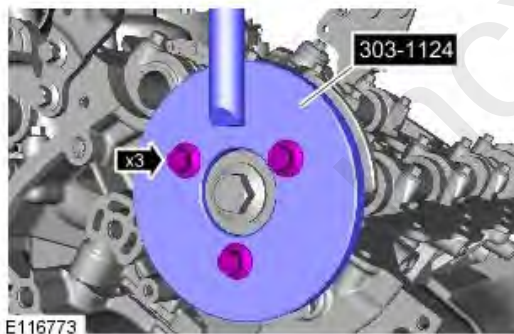
Removal

1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2. Refer to: [Brake Vacuum Pump - TDV6 3.0L Diesel](#) (206-07 Power Brake Actuation, Removal and Installation).
3. Refer to: [Valve Cover RH](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
4. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

5. **5. NOTE:** LH illustration shown, RH is similar.

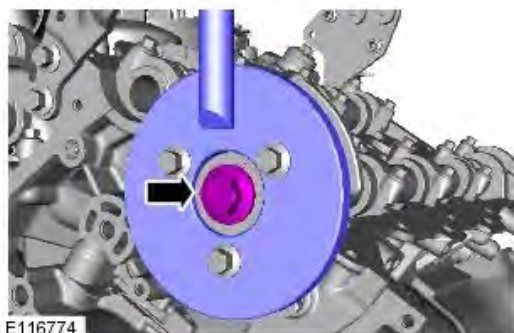


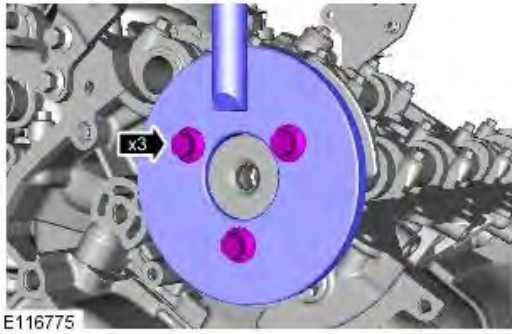
6. **6. NOTE:** LH illustration shown, RH is similar.



Special Tool(s): [303-1124](#)

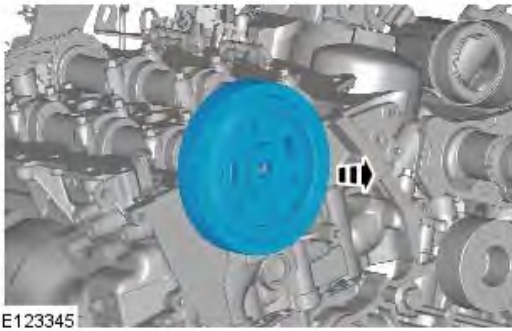
7. **7. NOTE:** LH illustration shown, RH is similar.



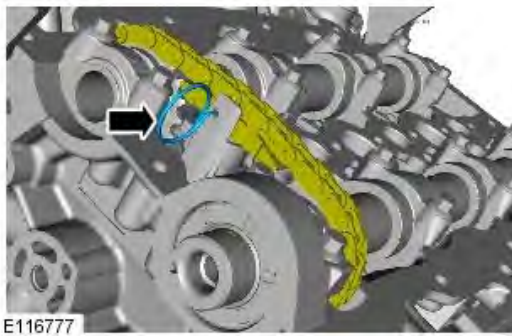


8. **8.** NOTE: LH illustration shown, RH is similar.

Special Tool(s): [303-1124](#)

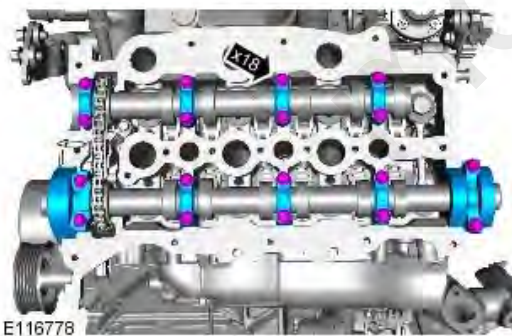


9.



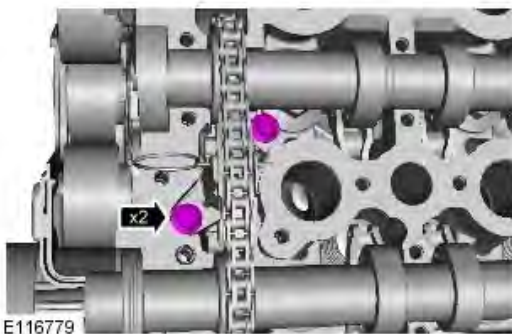
10. **10.** NOTE: LH illustration shown, RH is similar.

- Reposition the secondary timing chain tensioner.
- Retain the secondary timing chain tensioner plunger.

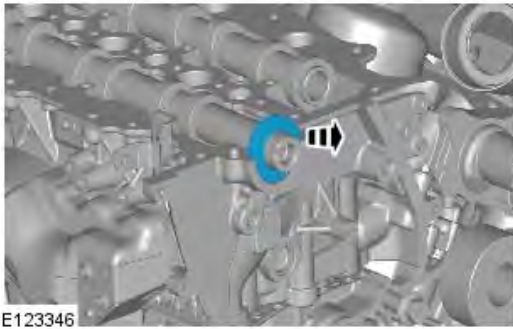


11. **11.**  CAUTION: Evenly and progressively, release the camshaft bearing caps.

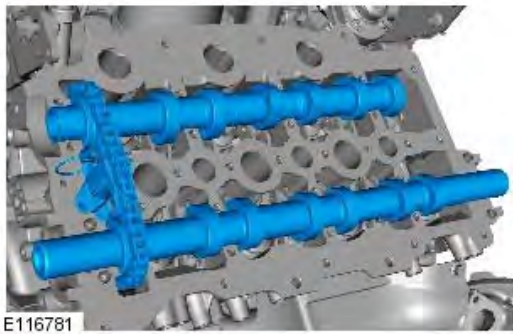
- NOTE: LH illustration shown, RH is similar.



12. **12.** NOTE: LH illustration shown, RH is similar.



13. **13.**  **CAUTION:** Discard the seals.



14. **14.** NOTE: LH illustration shown, RH is similar.

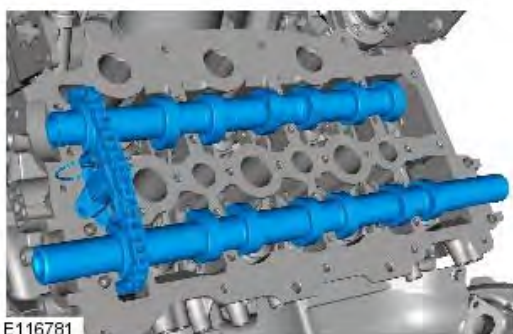


- 15.

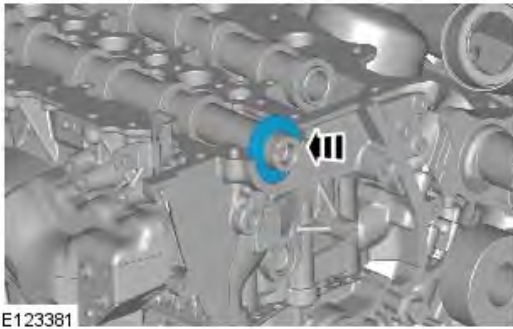


- 16.

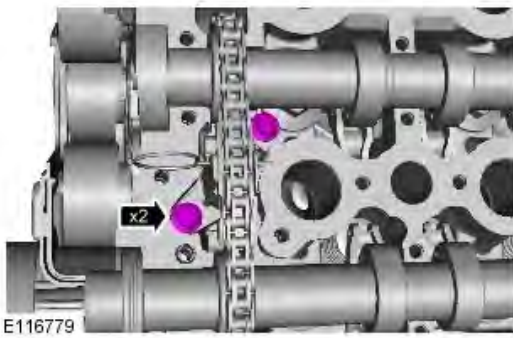
Installation



1. **1.**
3. **3.**  **CAUTION:** Make sure that the dots on the camshafts are aligned at the 12 o'clock position. Failure to follow this instruction may result in damage to the engine.
- NOTE: Use hypoid oil to lubricate the camshafts.

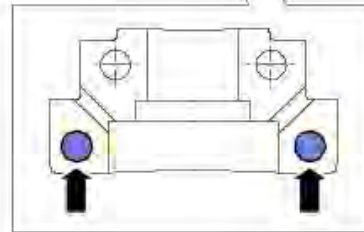
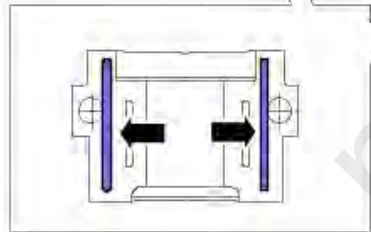
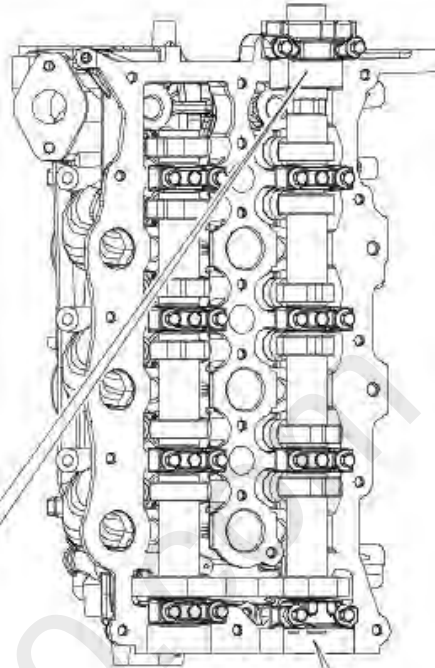
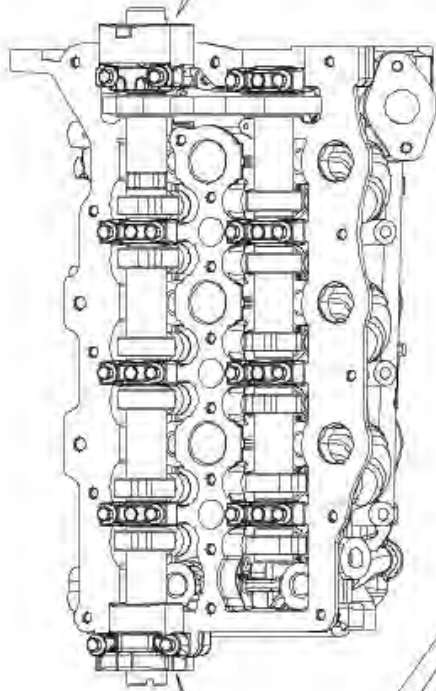
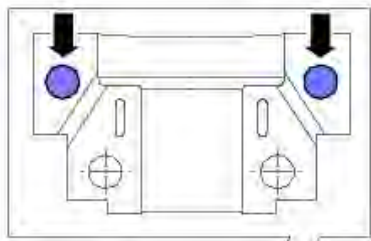


4. **4.** NOTE: Install new seals.



5. Torque: 10 Nm

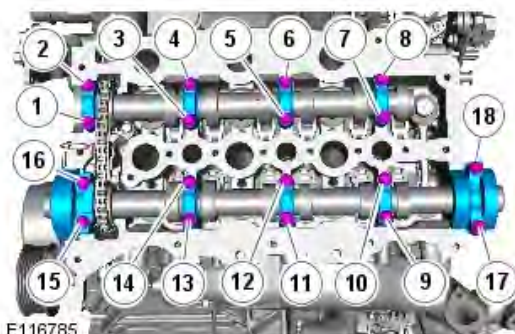
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E116784

6.

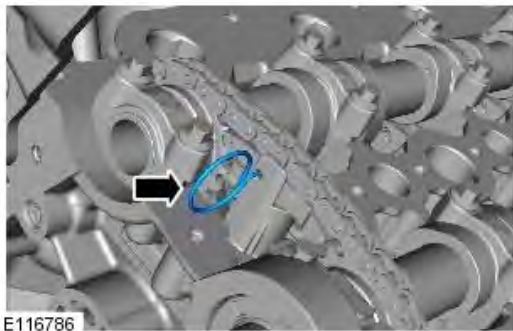
- Apply Loctite 518 sealant to the exhaust camshaft seal bearing caps.
- Apply Loctite 518 sealant, 2 mm wide, to the LH rear and RH front camshaft bearing caps.
- Apply Loctite 518 sealant, 7 mm diameter, to the LH front and RH rear camshaft bearing caps.



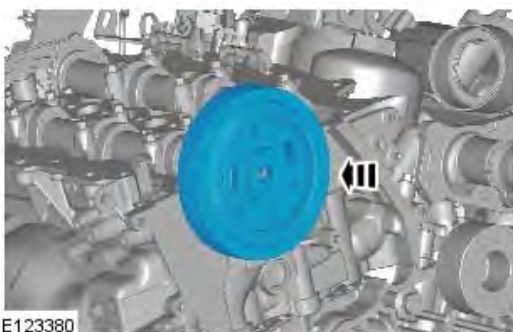
E116785

7. **7. NOTE:** Tighten the bolts in the indicated sequence.

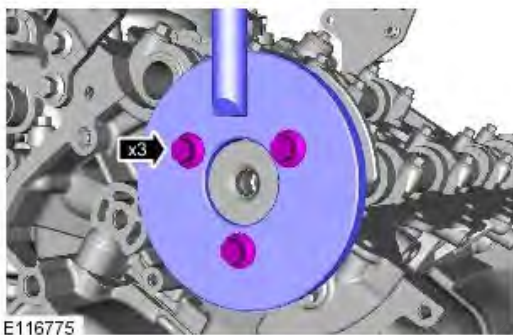
- Install the camshaft bearing caps in their original positions.
- Stage 1: Bolts 1 to 14, 1 Nm.
- Stage 2: Bolts 1 to 14, 5 Nm.
- Stage 3: Bolts 1 to 14, 10 Nm.
- Stage 4: Bolts 15 to 18, 1 Nm.
- Stage 5: Bolts 15 to 18, 5 Nm.
- Stage 6: Bolts 15 to 18, 10 Nm.



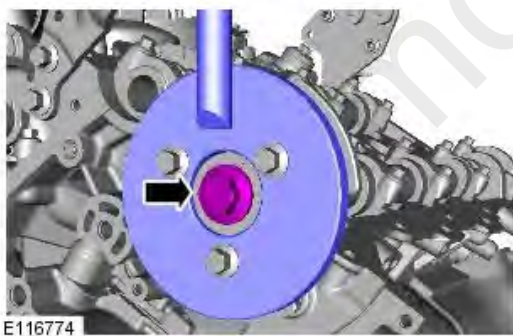
8.



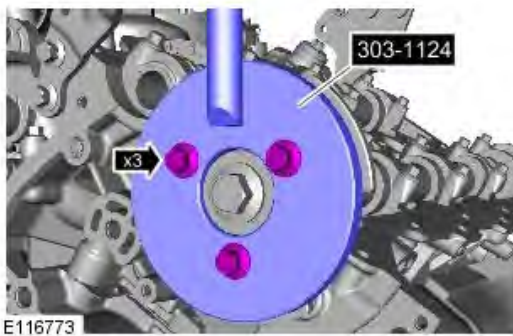
9.



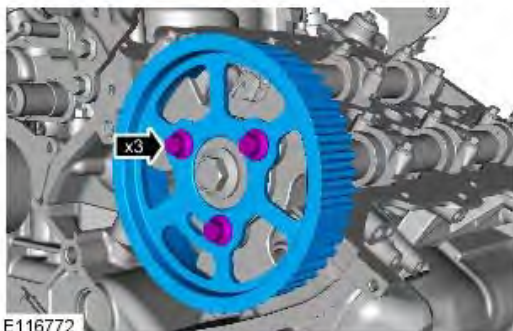
10. Special Tool(s): [303-1124](#)



11. Torque:
 Stage 1: 80 Nm
 Stage 2: 80°



12. Special Tool(s): [303-1124](#)



E116772

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

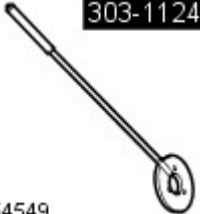
14. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
15. Refer to: [Valve Cover RH](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
16. Refer to: [Brake Vacuum Pump - TDV6 3.0L Diesel](#) (206-07 Power Brake Actuation, Removal and Installation).
17. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 3.0L Diesel - Camshaft Front Seal

Removal and Installation

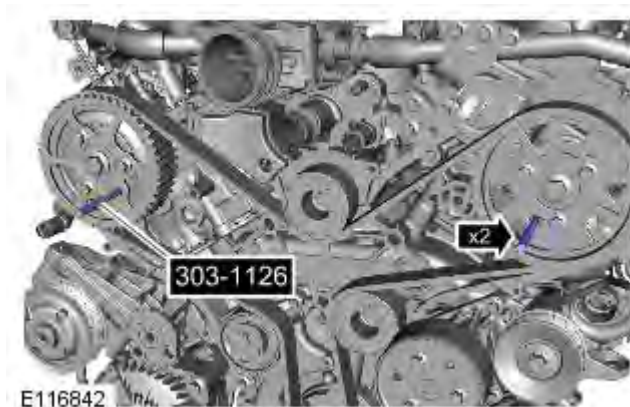
Special Tool(s)

 303-1118 Remover, Camshaft Seal E54541	
 303-1119 Installer, Camshaft Seal E54542	
 303-1124 Holding Tool, Camshaft Front Pulley E54549	
 303-1126 Timing Peg, Camshaft Pulley E54551	

Removal

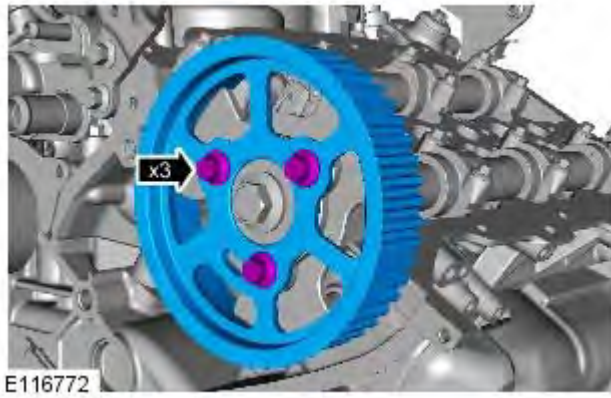
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

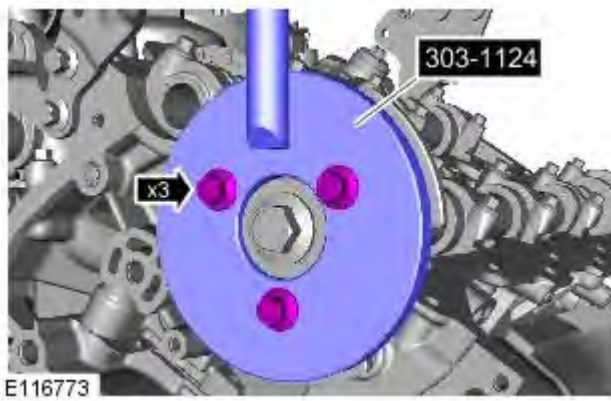


3. **CAUTION:** Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

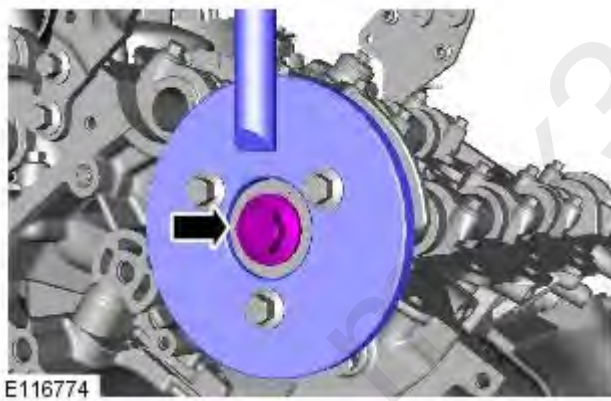
Special Tool(s): [303-1126](#)



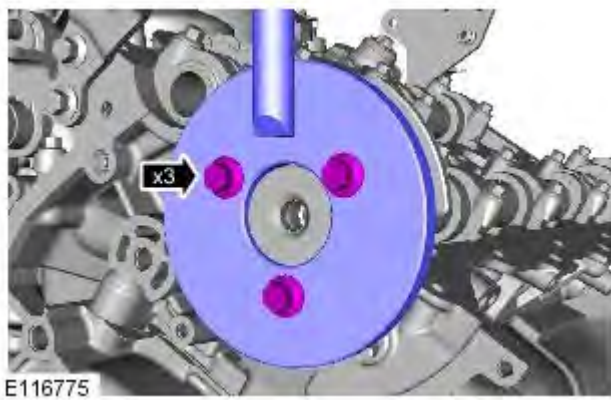
4.



5. *Special Tool(s):* [303-1124](#)



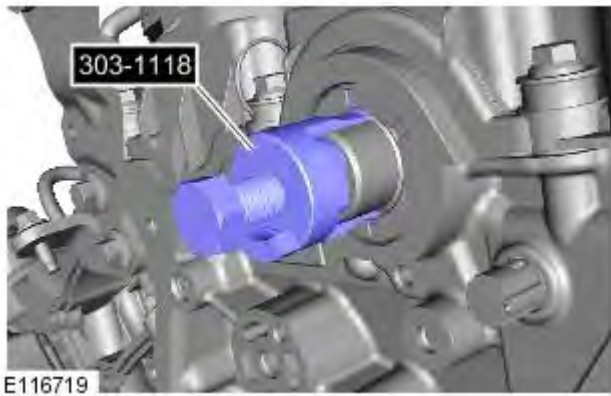
6.



7. *Special Tool(s):* [303-1124](#)

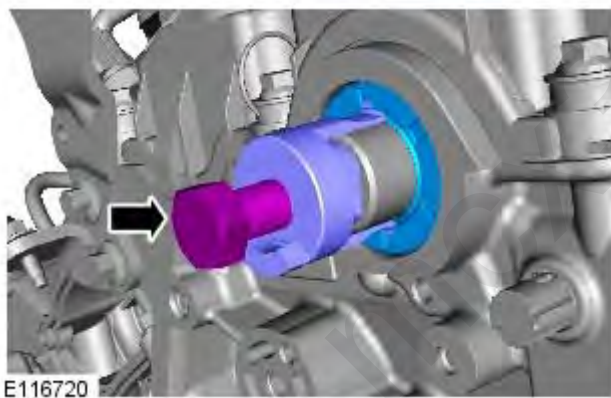


8.



9.  **CAUTION:** Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

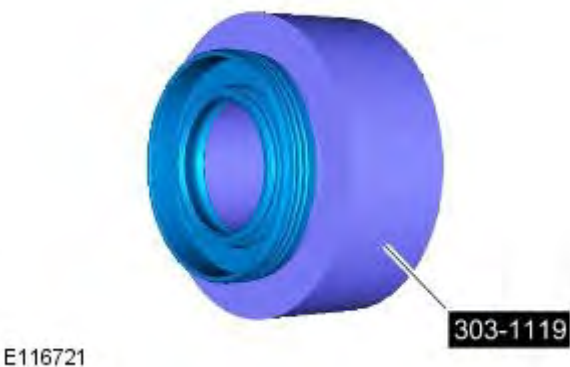
Special Tool(s): [303-1118](#)

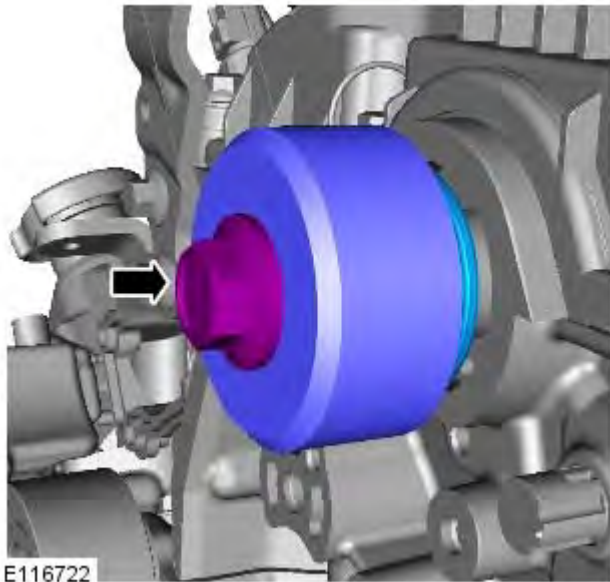


10.

Installation

1. *Special Tool(s):* [303-1119](#)





2. **2. CAUTIONS:**



Make sure the seal is installed correctly.

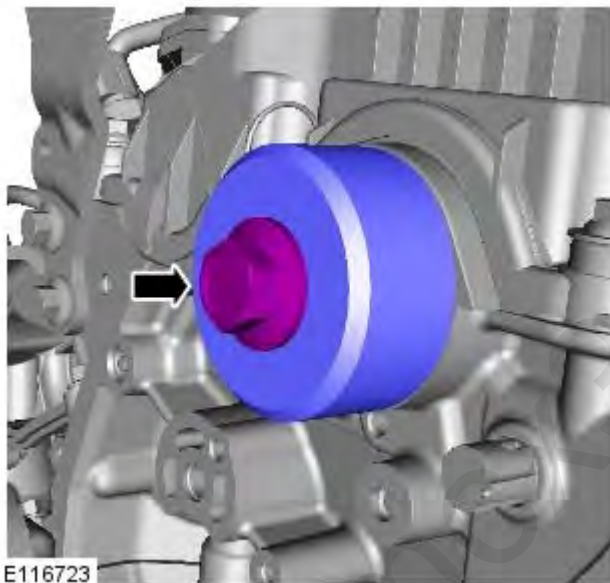


Make sure that the mating faces are clean and free of corrosion and foreign material.



Do not use any lubricant on the camshaft front seal or the camshaft. Failure to follow this instruction may result in damage to the vehicle.

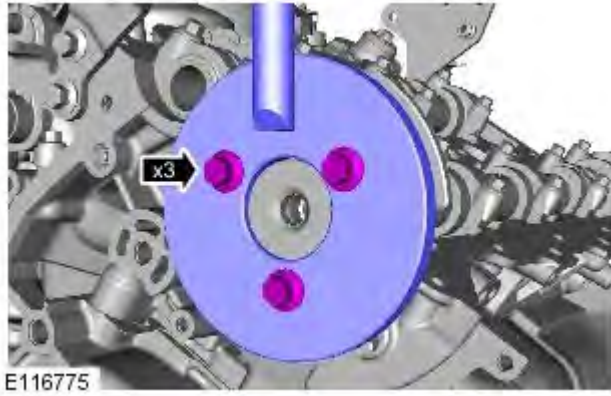
• **NOTE:** Make sure that the seal is 1mm below the face of the cylinder head.



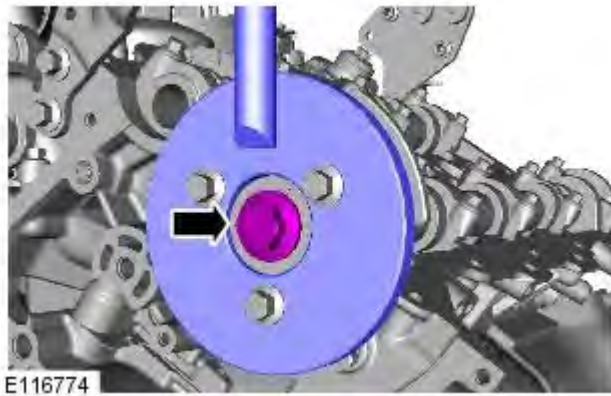
3. *Special Tool(s):* [303-1119](#)



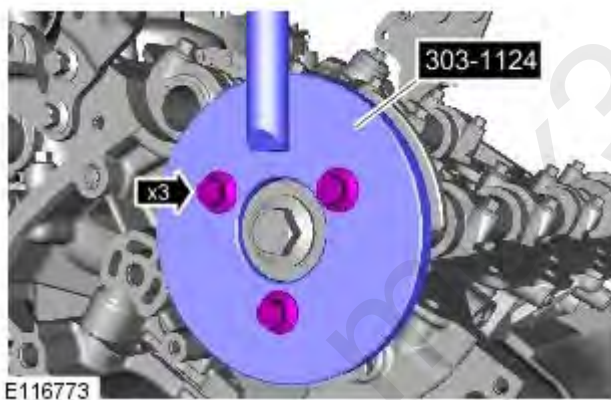
4.



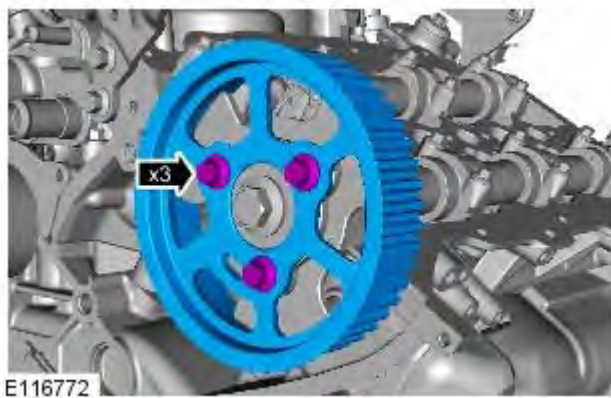
5. Special Tool(s): [303-1124](#)



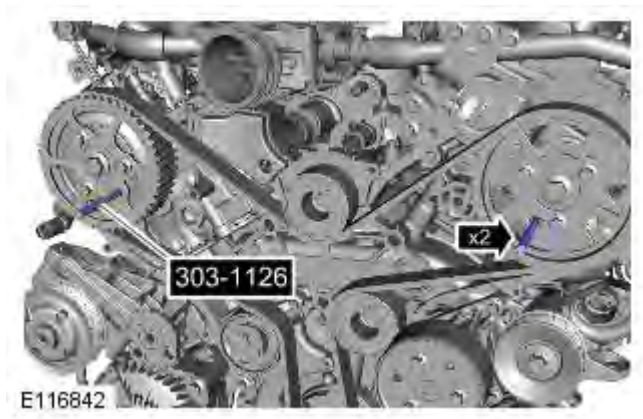
6. Torque:
 Stage 1: 80 Nm
 Stage 2: 80°



7. Special Tool(s): [303-1124](#)



8.  **CAUTION:** Only tighten the bolt finger-tight at this stage.



9.  **CAUTION:** Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

Special Tool(s): [303-1126](#)

10. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
11. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 3.0L Diesel - Camshaft Rear Seal

Removal and Installation

Removal

1. Refer to: [Rear End Accessory Drive \(READ\)](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

2. Install the special tool.



3. Install the special tool.



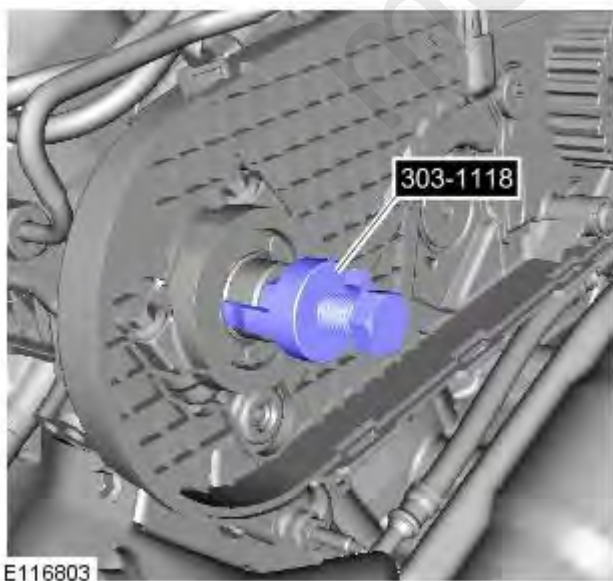


4. Using the special tool, remove the rear camshaft pulley retaining bolt.

5. Remove the special tools.



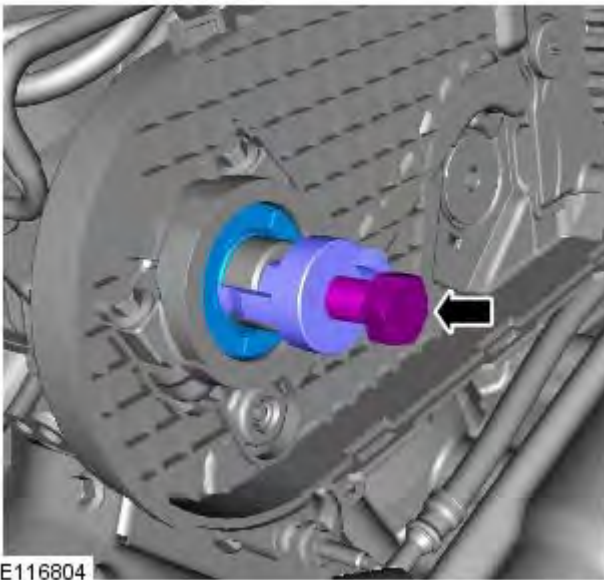
- 6.



7. **7. ⚠ CAUTION:** Make sure the special tool is correctly seated behind the camshaft seal. Failure to follow this instruction may result in damage to the special tool.

Install the special tool.

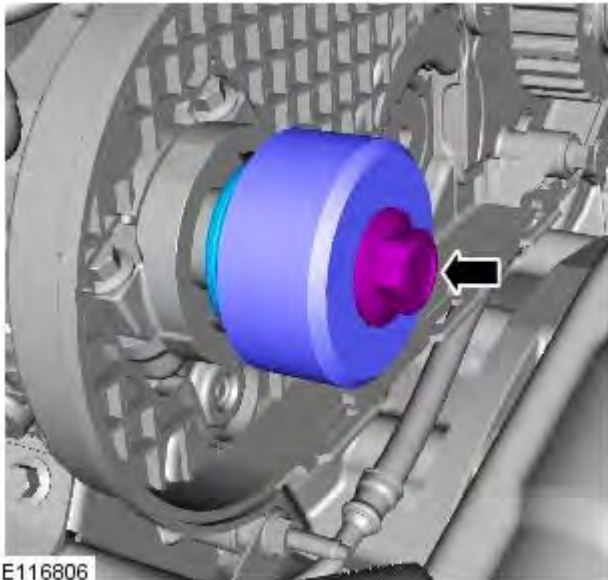
8.



Installation

1. Install with the special tool.





2. **2. CAUTIONS:**



Make sure the seal is installed correctly.

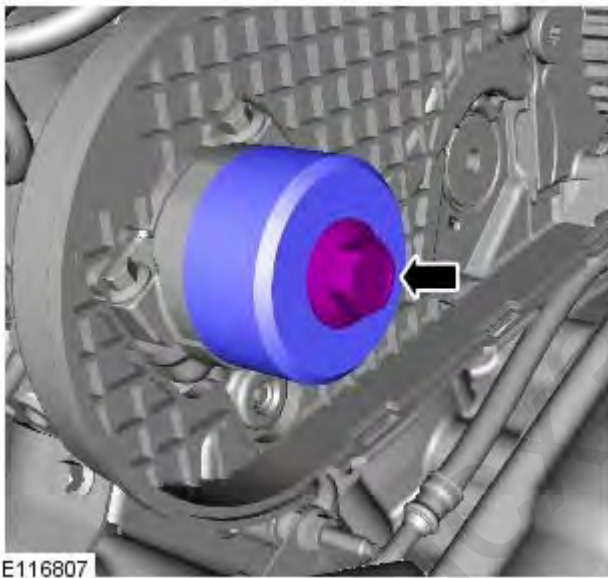


Make sure that the mating faces are clean and free of corrosion and foreign material.



Do not use any lubricant on the camshaft rear seal or the camshaft. Failure to follow this instruction may result in damage to the vehicle.

• **NOTE:** Make sure that the seal is 1mm below the face of the cylinder head.



3. Remove the special tool.



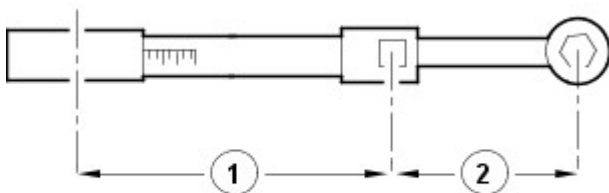
4. **4. CAUTION:** Only tighten the bolt finger-tight at this stage.



5. Install the special tool.



6. Install the special tool.



7.  **CAUTION:** Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.

Calculate the setting for the torque wrench.

E37107



8.  **CAUTION:** Make sure the torque wrench setting procedure is followed correctly. Failure to follow this instruction may result in damage to the vehicle.
- Using the special tool, install the camshaft rear pulley retaining bolt.
 - Stage one: Tighten to 80 Nm (59 lb.ft).
 - Stage two: Tighten a further 80 degrees.

9. Refer to: [Rear End Accessory Drive \(READ\)](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).

10. Remove the special tools.

Engine - TDV6 3.0L Diesel - Crankshaft Front Seal

Removal and Installation

Special Tool(s)

 E54543	303-1120 Remover, Crankshaft Front Seal
 E52717	303-1121 Crankshaft Seal Installer
 E54545	303-1122 Installer, Crankshaft Front Seal

Removal

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

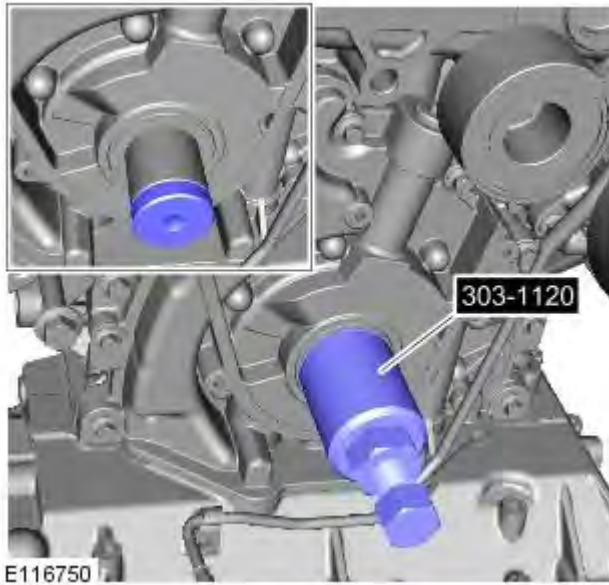
1. Disconnect the battery ground cable.

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

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

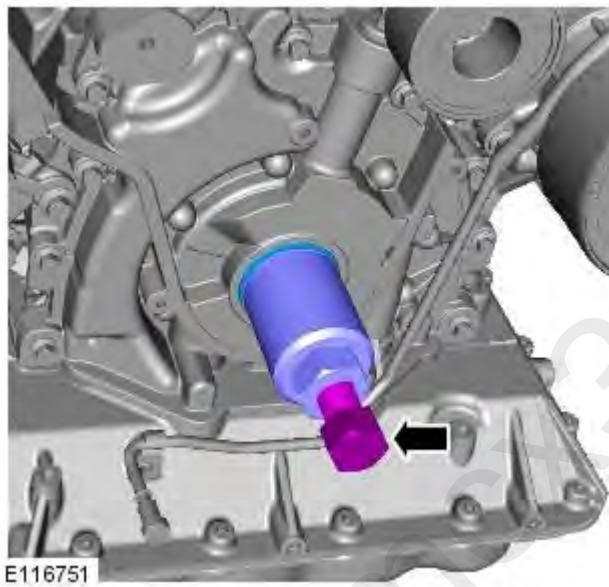
Raise and support the vehicle.

3. Refer to: [Crankshaft Pulley](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).



4. Install the special tool.

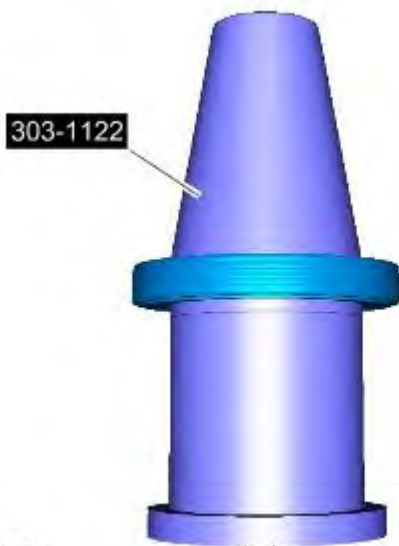
Special Tool(s): [303-1120](#)



5.  **CAUTION:** Discard the seal.

Using the special tool, remove the crankshaft front seal.

Installation

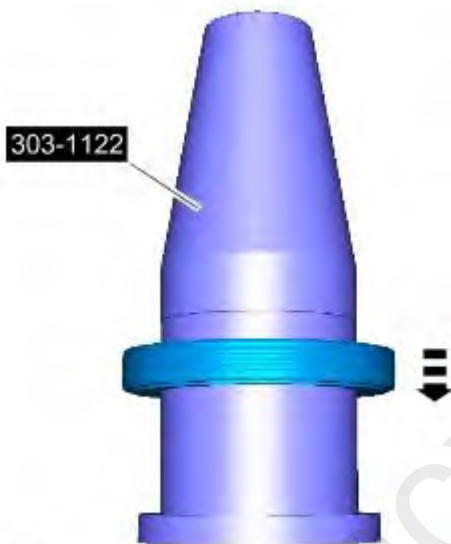


E116752

1.  **CAUTION:** Do not use any lubricant on the crankshaft front seal, special tools or the crankshaft. Failure to follow this instruction may result in damage to the vehicle.
- **NOTE:** Make sure that all the component mating faces are clean.

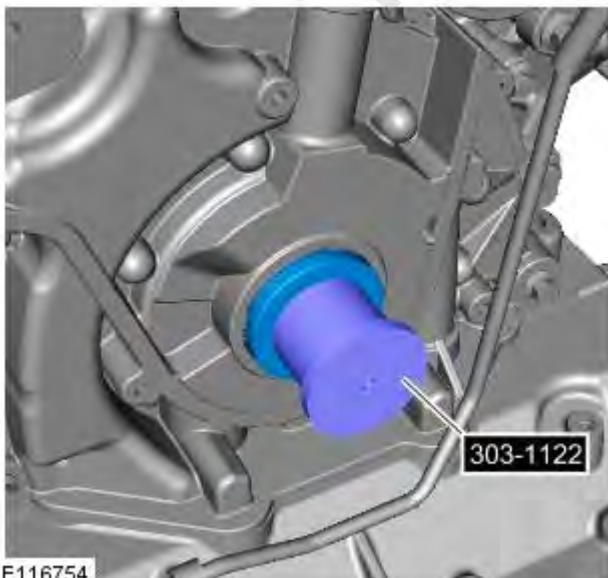
Install a new crankshaft front seal to the special tool.

Special Tool(s): [303-1122](#)



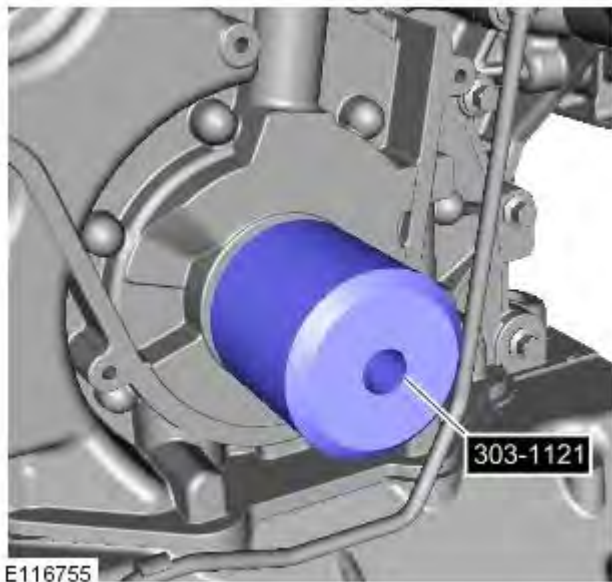
E116753

2. Reposition the crankshaft front seal along the special tool.



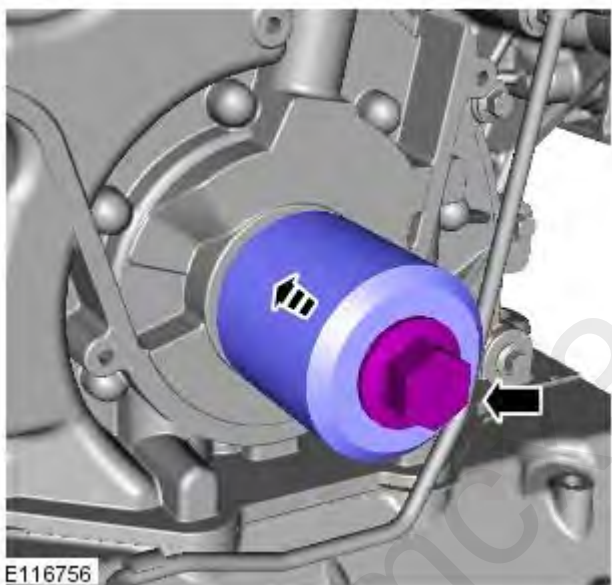
E116754

3. Install the special tool to the crankshaft.



4. Install the special tool to the crankshaft.

Special Tool(s): [303-1121](#)



5. **CAUTIONS:**



Make sure the seal is installed correctly.

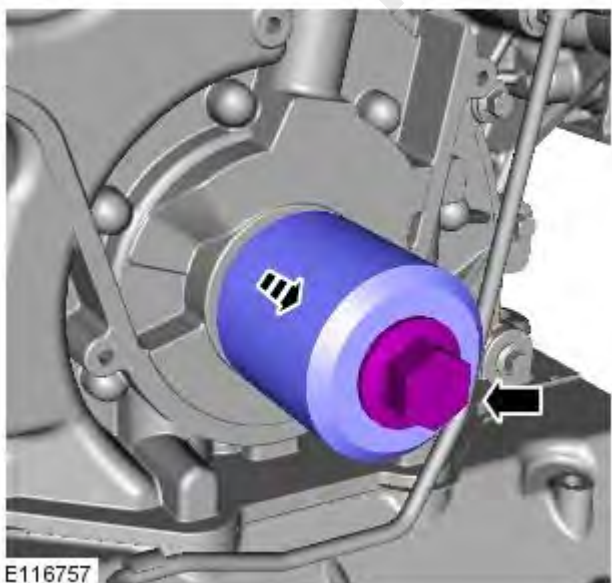


Make sure that the seal is seated 1mm under flush.



Discard the bolt.

Using the special tool, install the crankshaft front seal.



6. Remove the special tool.

Special Tool(s): [303-1121](#)

7. Refer to: [Crankshaft Pulley](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
8. Connect the battery ground cable.

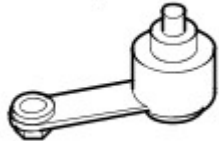
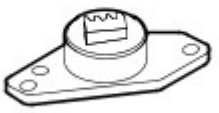
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 3.0L Diesel - Crankshaft Pulley

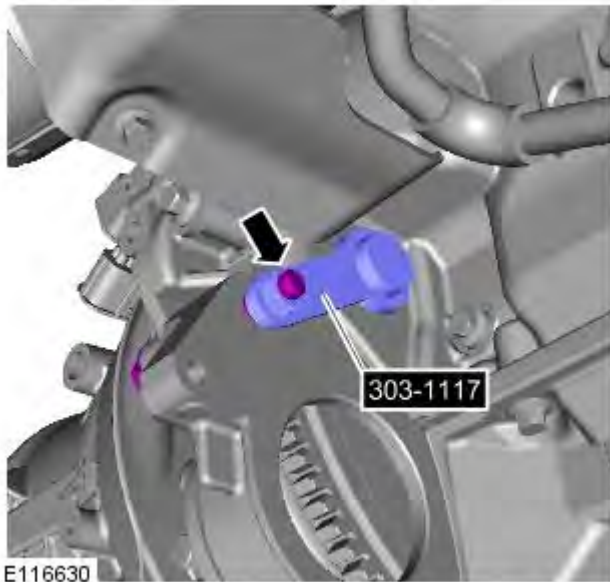
Removal and Installation

Special Tool(s)

 E54540	303-1117 Timing Peg, Automatic Transmission
 E 54546	303-1123 Locking Tool, Flywheel
 E64849	303-D121 Puller, General Purpose

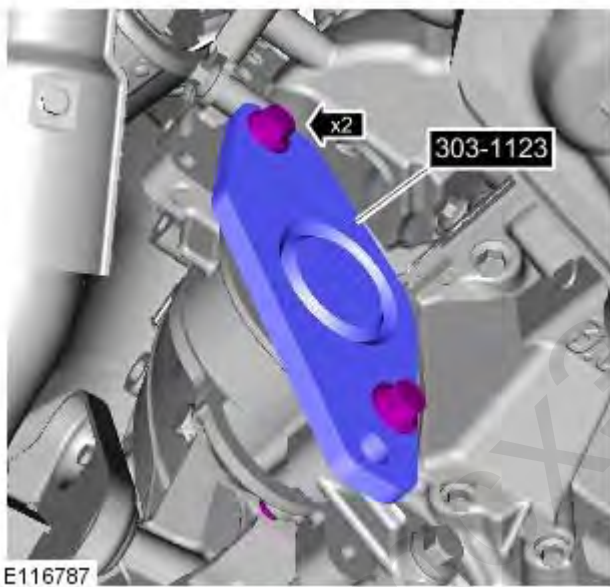
Removal

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Cooling Fan](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).



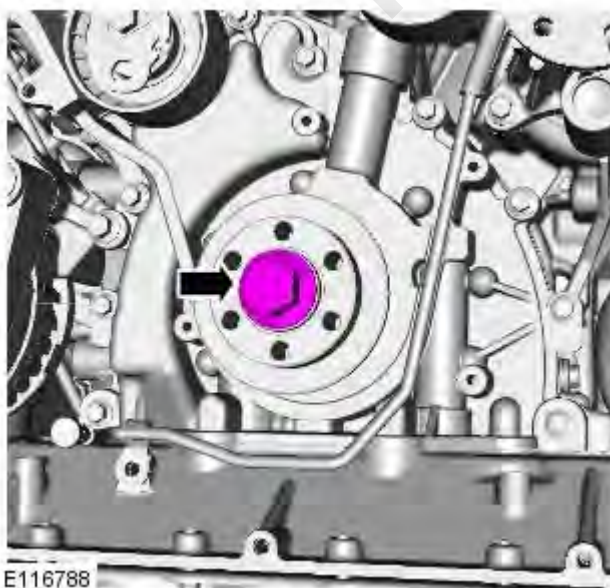
4.

- Remove the special tool.
- *Special Tool(s):* [303-1117](#)

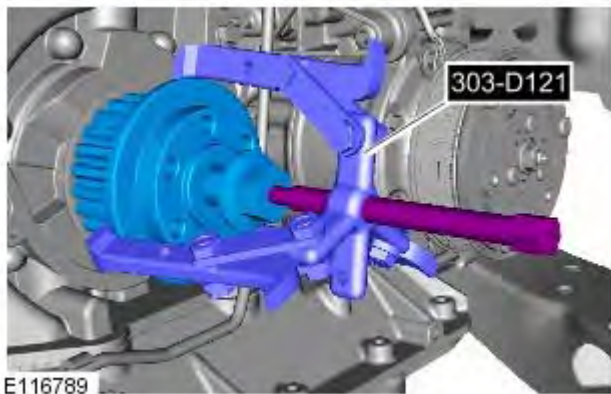


5.

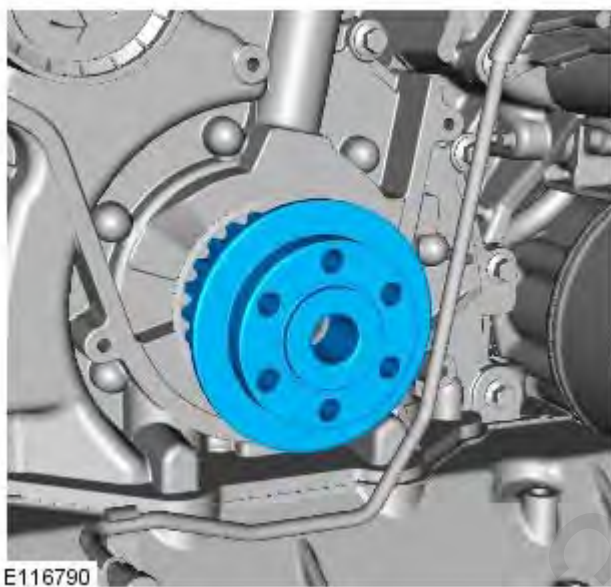
- Install the special tool.
- *Special Tool(s):* [303-1123](#)



6.

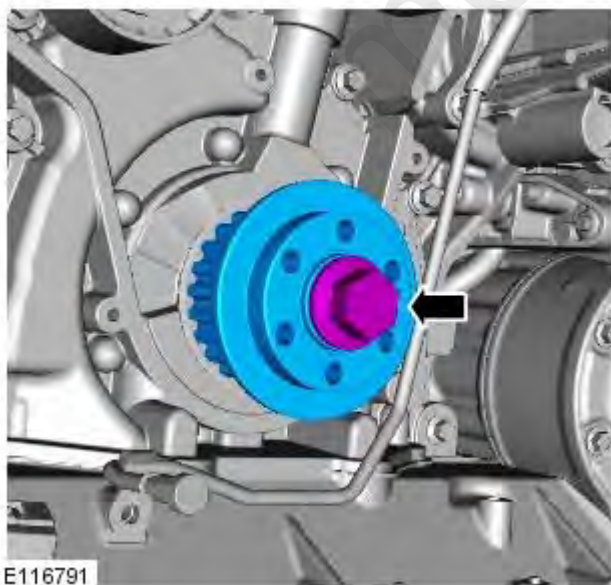


7.
 - Install the special tool.
 - *Special Tool(s)*: [303-D121](#)



8.  **CAUTION:** Discard the bolt.

Installation



1. **CAUTIONS:**

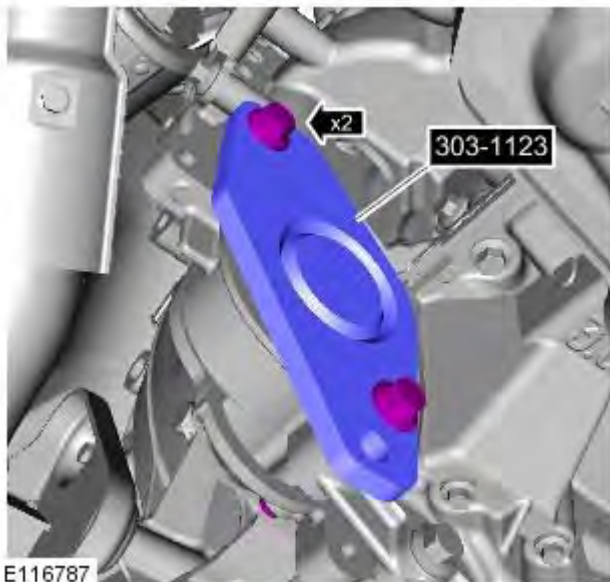
 Make sure that the pulley washer is correctly seated before installing the pulley.

 Do not lubricate the components.

 Make sure that a new bolt is installed.

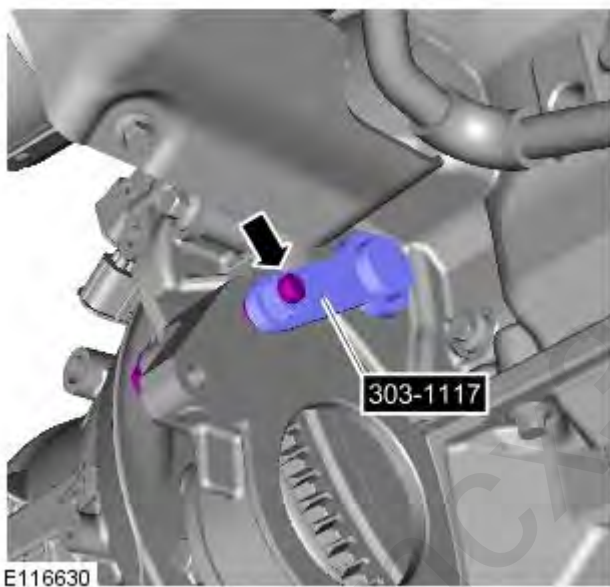
Torque:

Stage 1: 150 Nm
 Stage 2: 300 Nm
 Stage 3: 90°



2.

- Remove the special tool.
- *Special Tool(s):* [303-1123](#)



3.

- Install the special tool.
- *Special Tool(s):* [303-1117](#)

4. Refer to: [Cooling Fan](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).
5. Refer to: [Timing Belt](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

Engine - TDV6 3.0L Diesel - Crankshaft Rear Seal

Removal and Installation

Removal

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

1. Disconnect the battery ground cable.

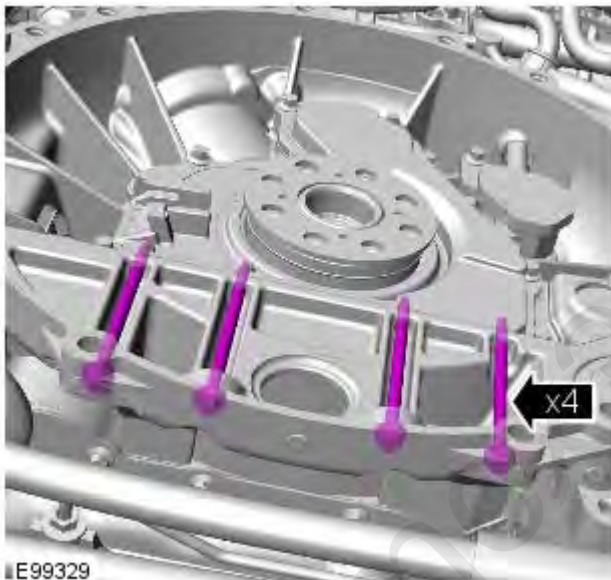
Refer to: [Specifications](#) (414-01 Battery, Mounting and Cables, Specifications).

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

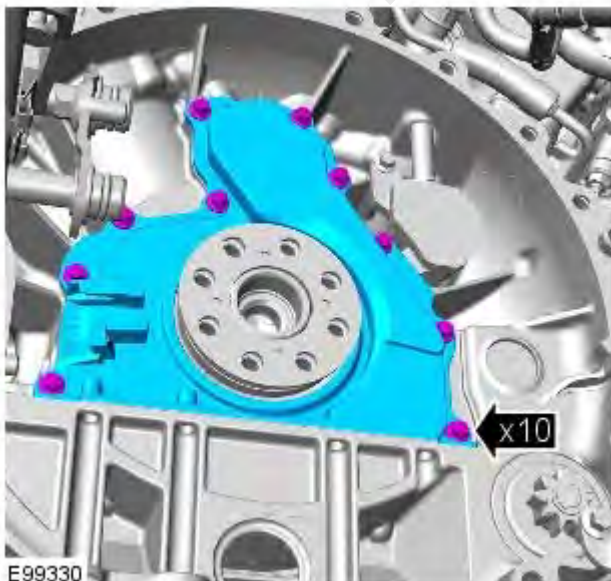
Raise and support the vehicle.

3. Refer to: [Crankshaft Position \(CKP\) Sensor Ring](#) (303-14B Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation).

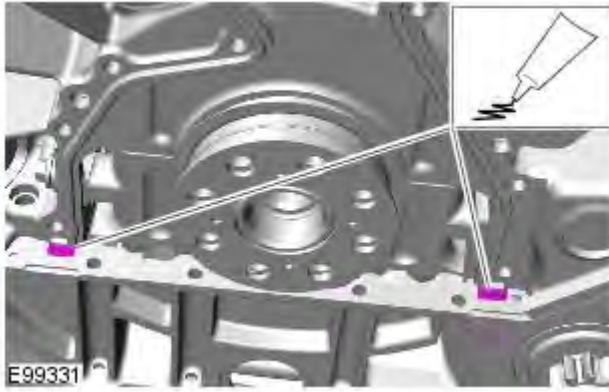
- 4.



5.  CAUTION: Discard the seal.



Installation



1. CAUTIONS:

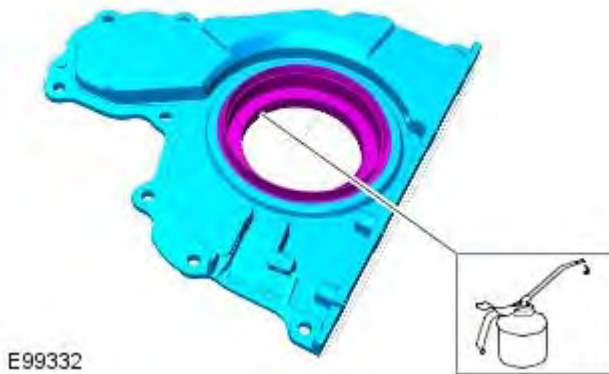


Make sure that the crankshaft rear oil seal is correctly located.



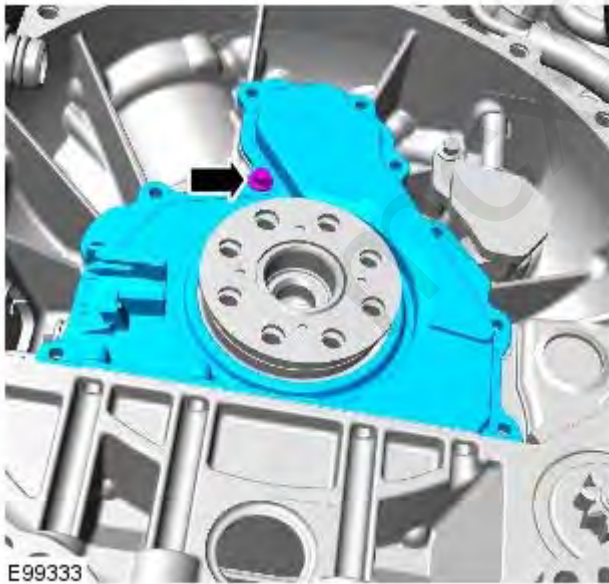
Make sure the crankshaft seal mating faces are clean and dry.

Apply an 8 mm bead of sealant to the cylinder block in the areas shown.

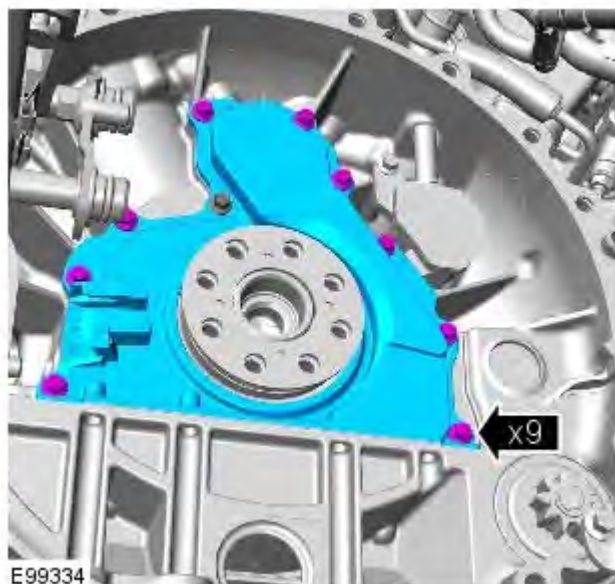


2.

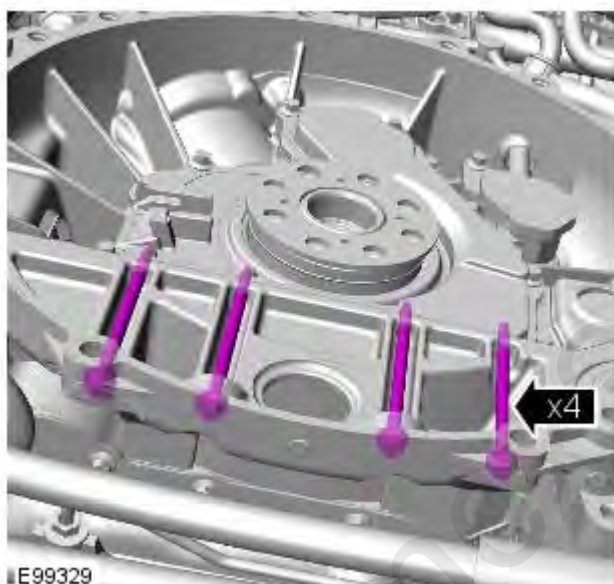
- Lubricate the oil seal.



3. Torque: 10 Nm



4. Torque: 10 Nm



5. Torque: 10 Nm

6. Refer to: [Crankshaft Position \(CKP\) Sensor Ring](#) (303-14B Electronic Engine Controls - TDV6 3.0L Diesel, Removal and Installation).

7. Connect the battery ground cable.

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

Engine - TDV6 3.0L Diesel - Cylinder Head

Removal and Installation

Removal

1. Disconnect the battery ground cable.

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

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

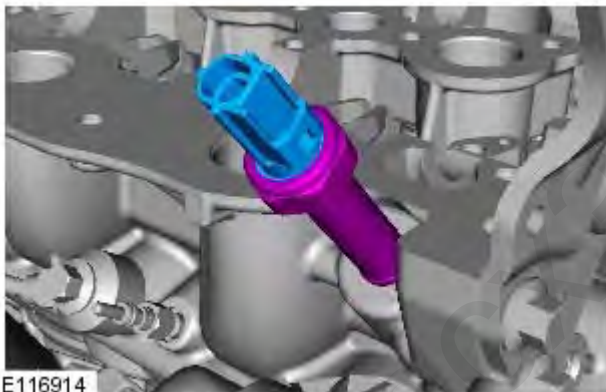
Raise and support the vehicle.

3. Refer to: [Camshaft LH](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

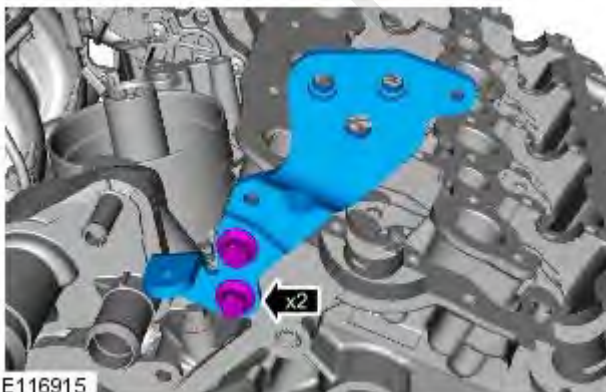
4. Refer to: [Glow Plugs](#) (303-07D Glow Plug System - TDV6 3.0L Diesel, Removal and Installation).

5. Refer to: [Exhaust Manifold](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

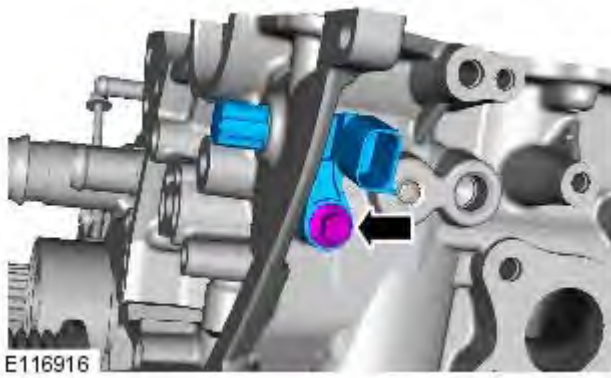
6.



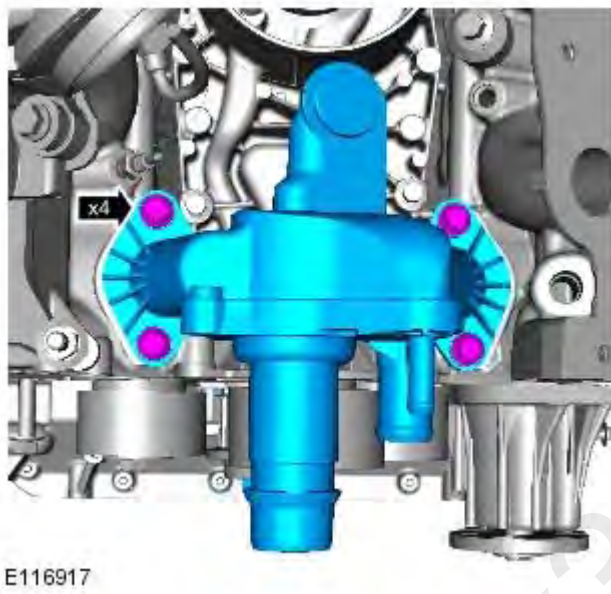
7.



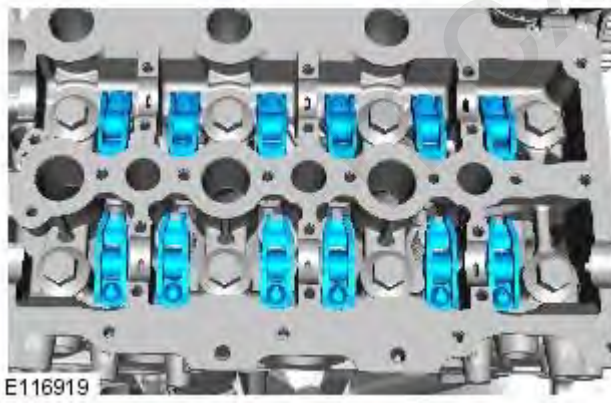
8.

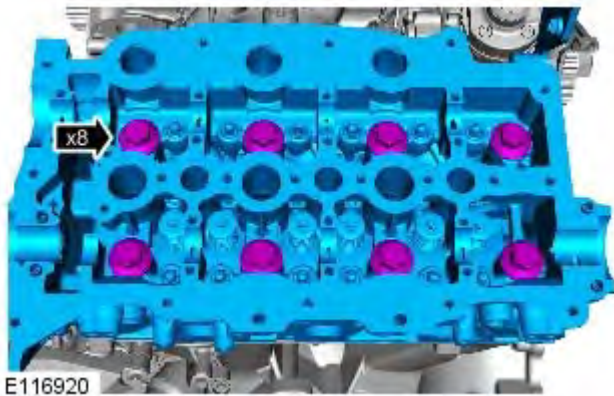


9.



10.



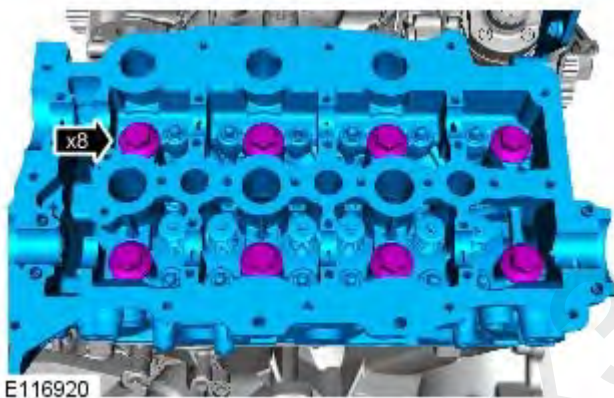


11. **11.** **CAUTION:** Discard the bolts.
- **NOTE:** Discard the gasket.

Installation

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

Clean and inspect the cylinder head and cylinder block.



2. **2.** **CAUTIONS:**

Only tighten the bolts finger-tight at this stage.

Make sure that new bolts are installed.

Use care when installing the cylinder head. Damage to the cylinder block, cylinder head or cylinder head gasket may result.

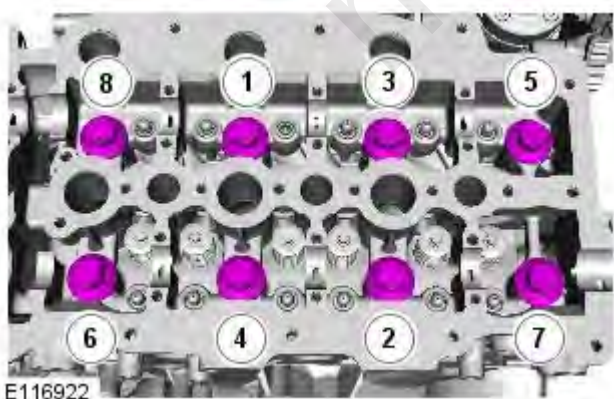
The head gasket must be installed over the cylinder block dowels.

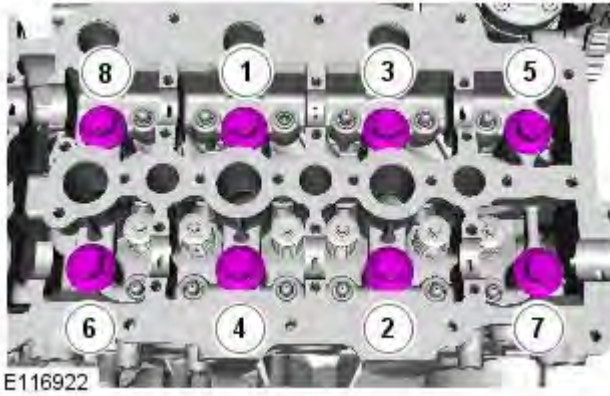
• **NOTE:** Install a new gasket.

• **NOTE:** No additional lubrication to the cylinder head bolts is required.

3. **3.** **NOTE:** Tighten the bolts in the indicated sequence.

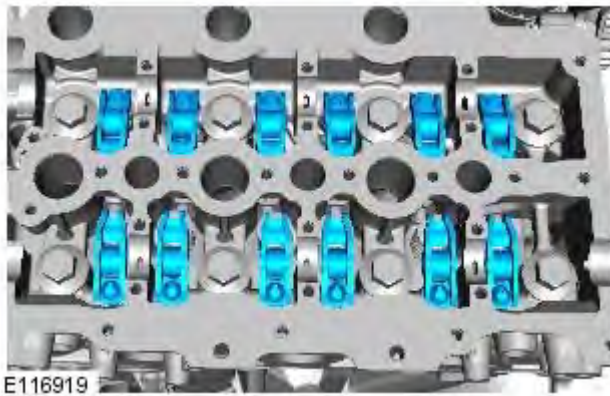
• **Torque:** 80 Nm



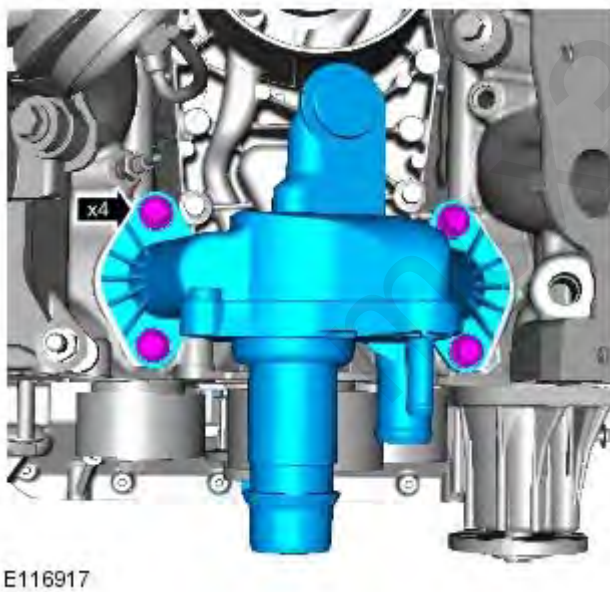


4. **4.** NOTE: Tighten the bolts in the indicated sequence.

- Torque: 180°



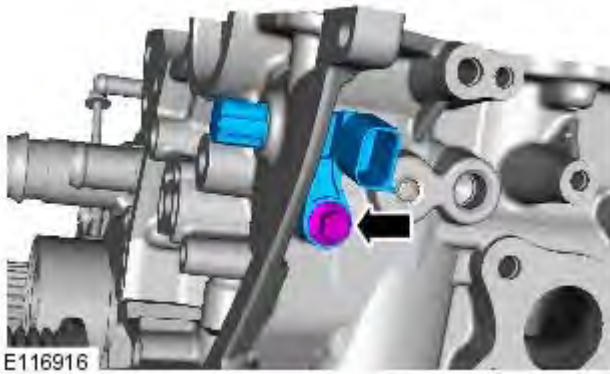
5. .



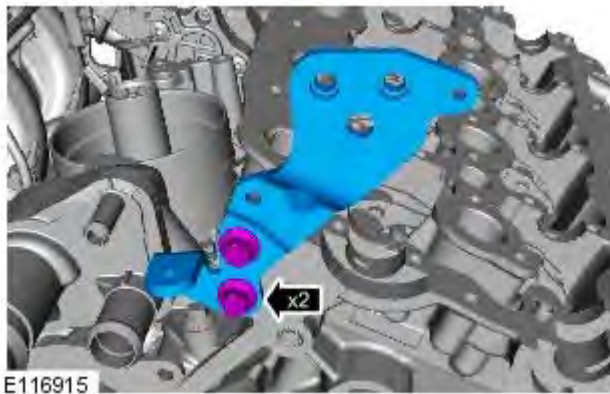
6. **6.**  CAUTION: Install the new seals.

Torque: 10 Nm

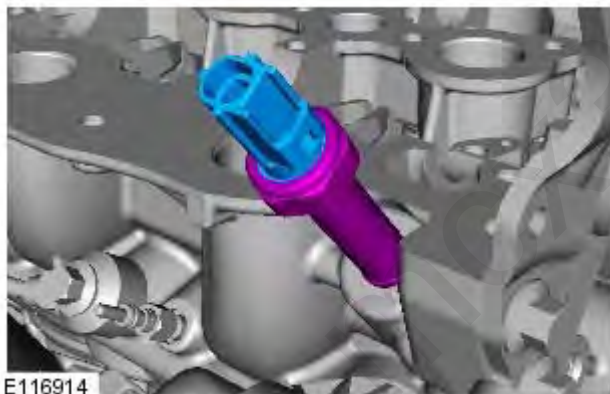
7. Torque: 10 Nm



8. Torque: 24 Nm



9. Torque: 14 Nm



10. Refer to: [Exhaust Manifold](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
11. Refer to: [Glow Plugs](#) (303-07D Glow Plug System - TDV6 3.0L Diesel, Removal and Installation).
12. Refer to: [Camshaft LH](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
13. Connect the battery ground cable.

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

Engine - TDV6 3.0L Diesel - Engine Mount LH

Removal and Installation

Removal

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

1. Refer to: [Cooling Fan Shroud](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).

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

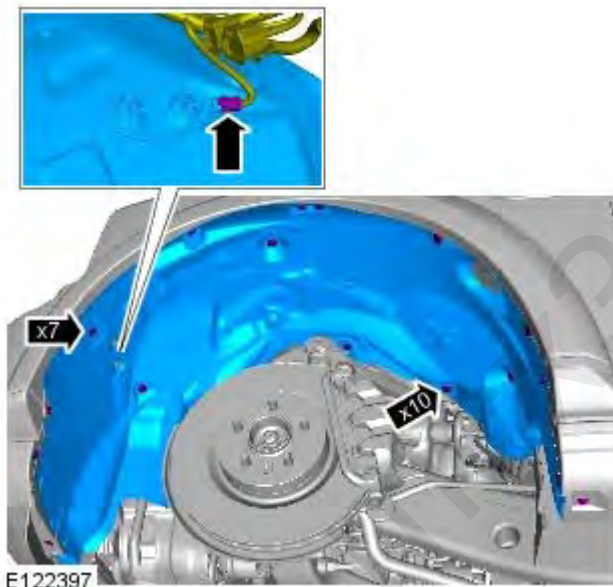
Raise and support the vehicle.

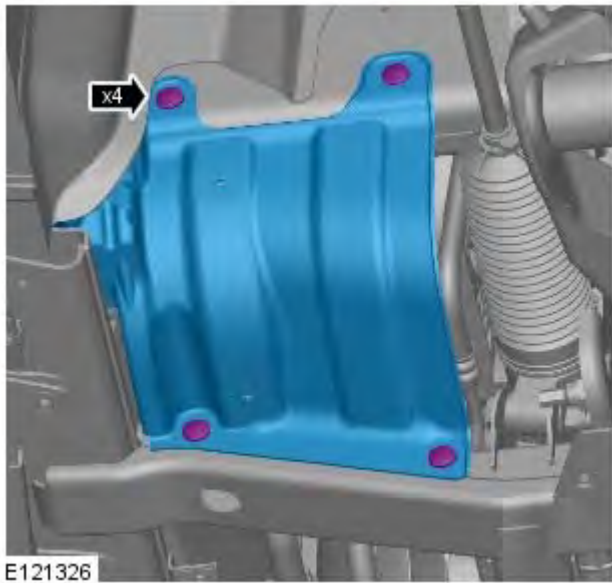
3. Refer to: [Catalytic Converter](#) (309-00B Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

4. Remove the LH front wheel and tire.

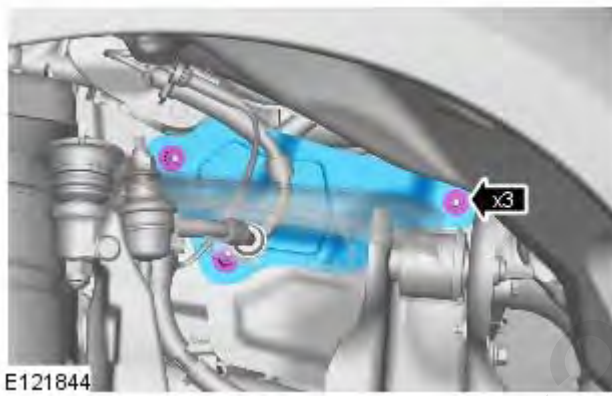
Torque: 140 Nm

5.

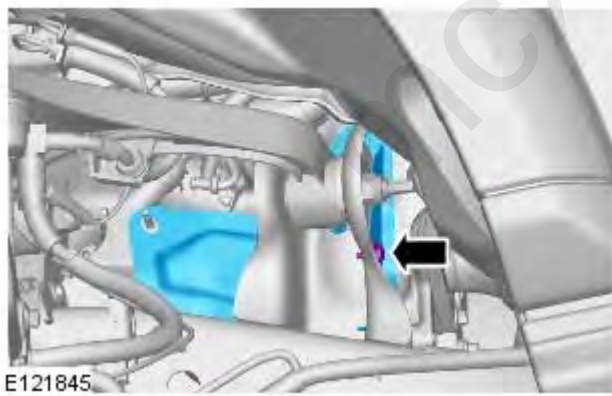




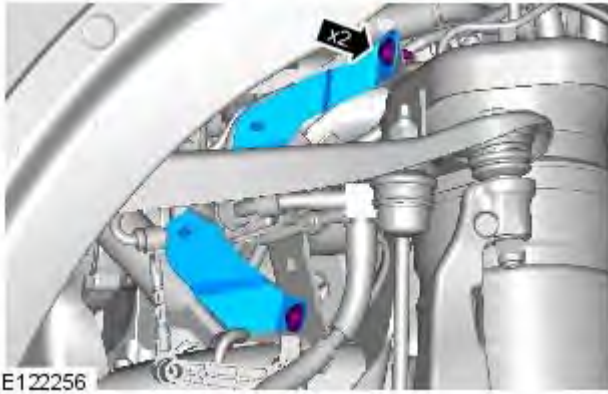
6.



7. Torque: 9 Nm

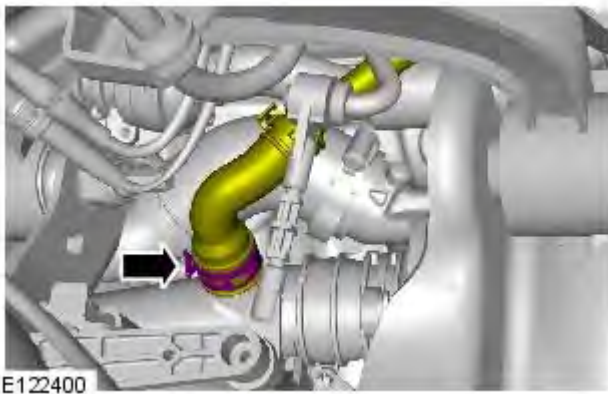


8. Torque: 9 Nm

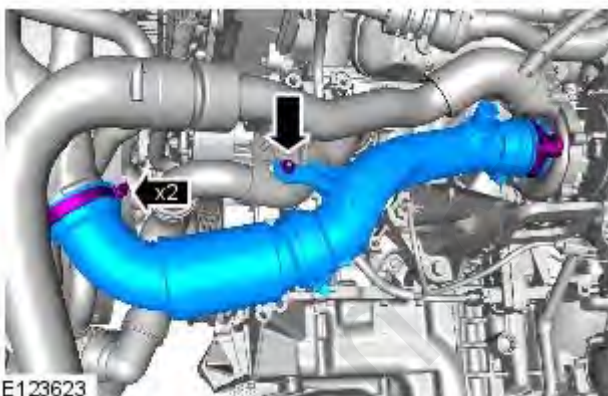


9. **9.** NOTE: RH illustration shown, LH is similar.

Torque: 9 Nm



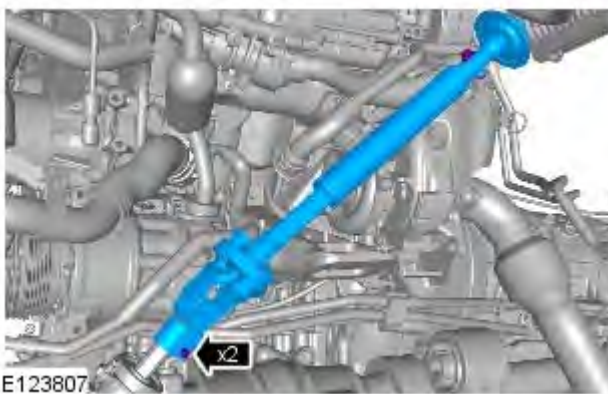
10. **10.**  CAUTION: Make sure that all openings are sealed. Use new blanking caps.



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

- NOTE: Engine shown removed for clarity.

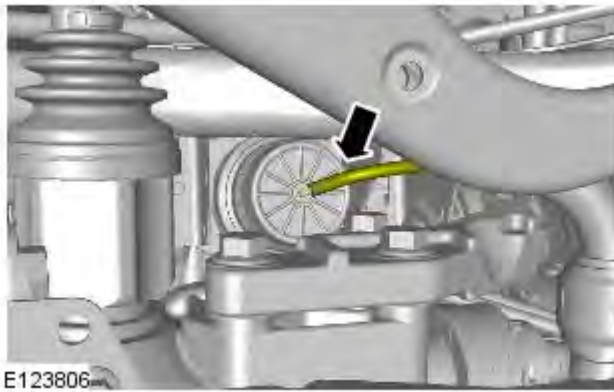
Torque: 10 Nm



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

- NOTE: Engine shown removed for clarity.

Torque: 30 Nm



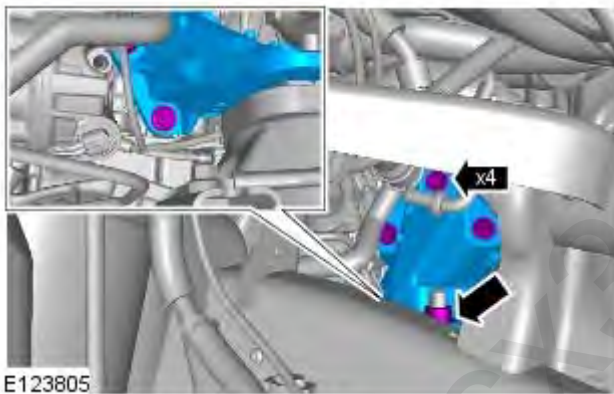
13. **13.**  **CAUTION:** Make sure that all openings are sealed.

14. **14.** **CAUTIONS:**

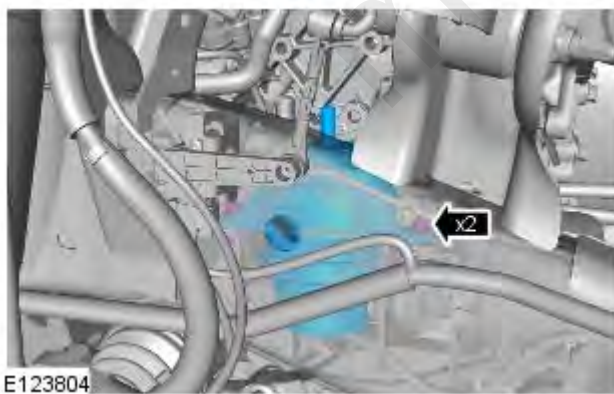
 Use a wooden block to protect the oil pan when supporting the engine.

 Protect the radiator during this operation.

Using a suitable hydraulic jack, raise and support the engine.



15. **Torque:**
Bolts 115 Nm
nut 90 Nm



16. **Torque:**
Stage 1: 45 Nm
Stage 2: 60°

Installation

1. To install, reverse the removal procedure.

Engine - TDV6 3.0L Diesel - Engine Mount RH

Removal and Installation

Removal

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

1. Disconnect both battery cables.

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

2. Refer to: [Exhaust System](#) (309-00B Exhaust System - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).
4. Refer to: [Generator](#) (414-02B Generator and Regulator - TDV6 3.0L Diesel, Removal and Installation).

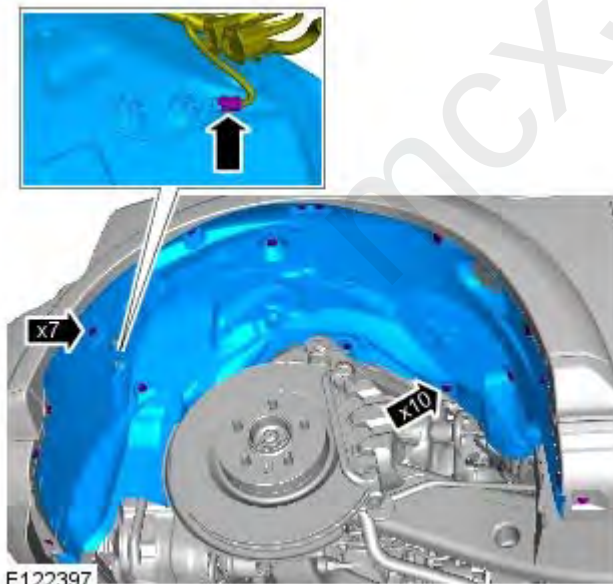
5.  **WARNING:** Make sure to support the vehicle with axle stands.

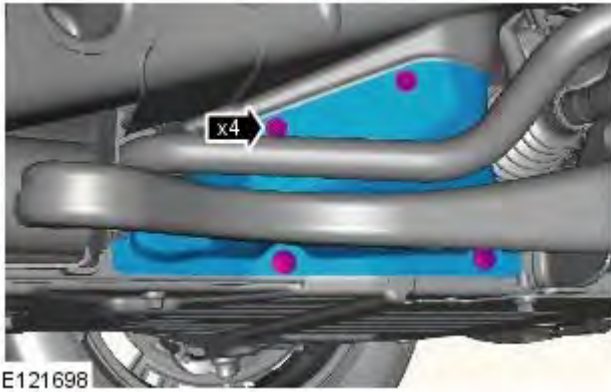
Raise and support the vehicle.

6. Remove the RH front wheel and tire.

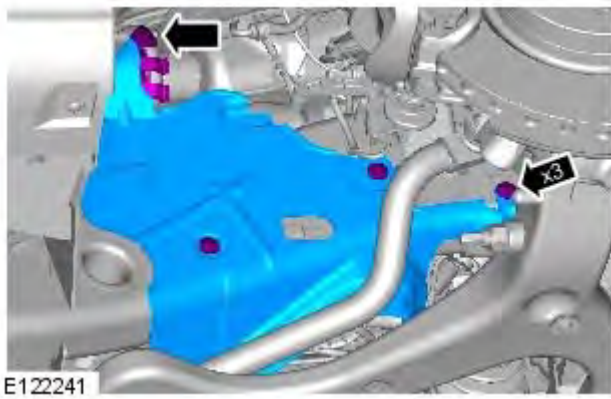
Torque: **140 Nm**

- 7.

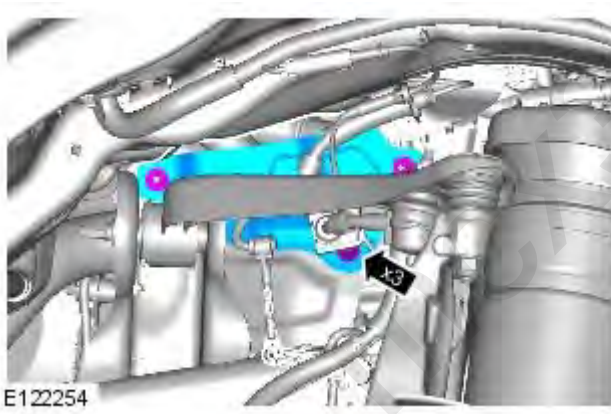




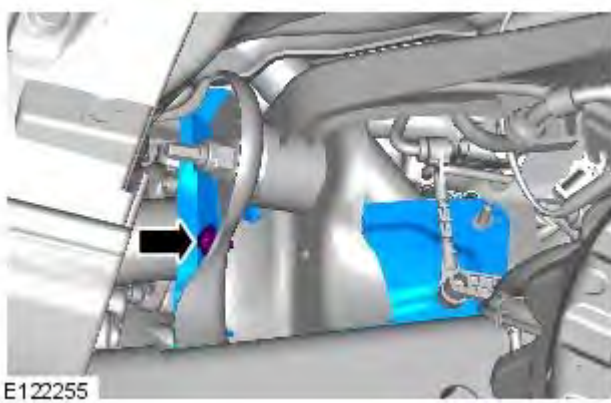
8.



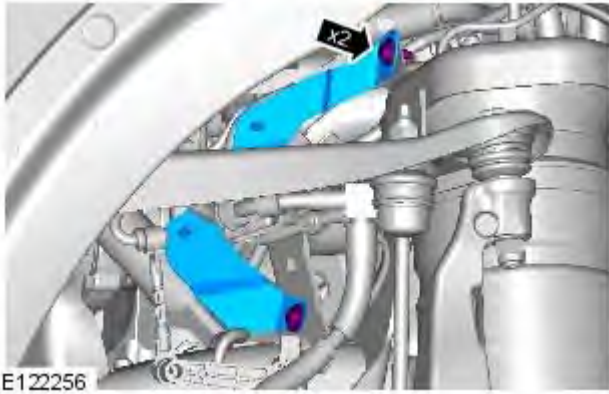
9.



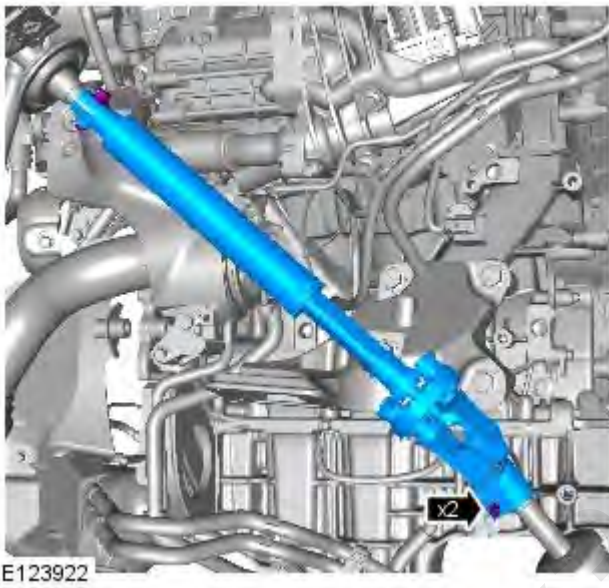
10. Torque: 9 Nm



11. Torque: 9 Nm



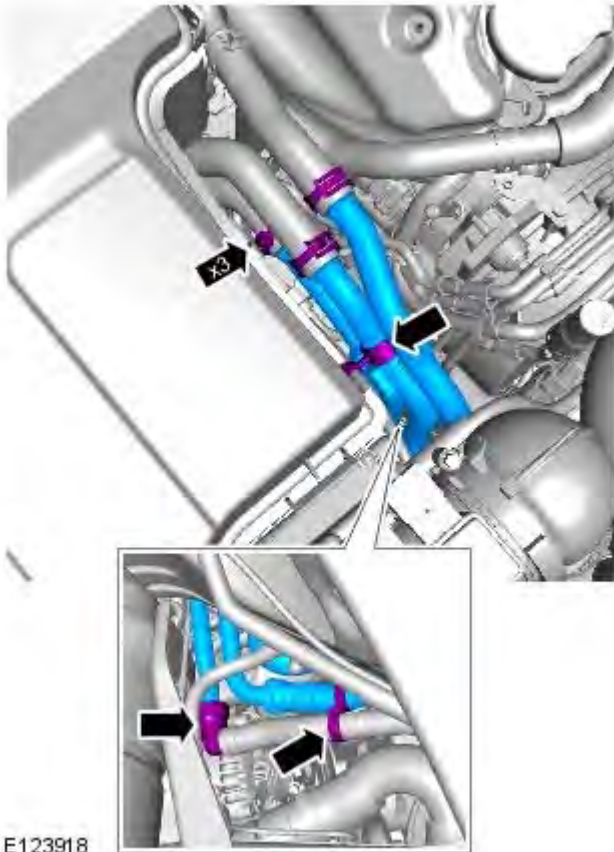
12. Torque: 9 Nm



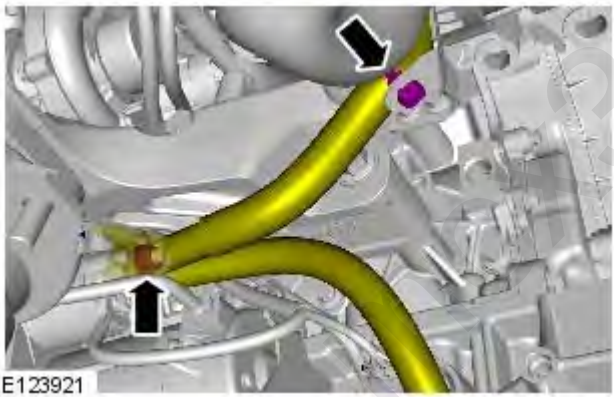
13. **13.** NOTE: Engine shown removed for clarity.

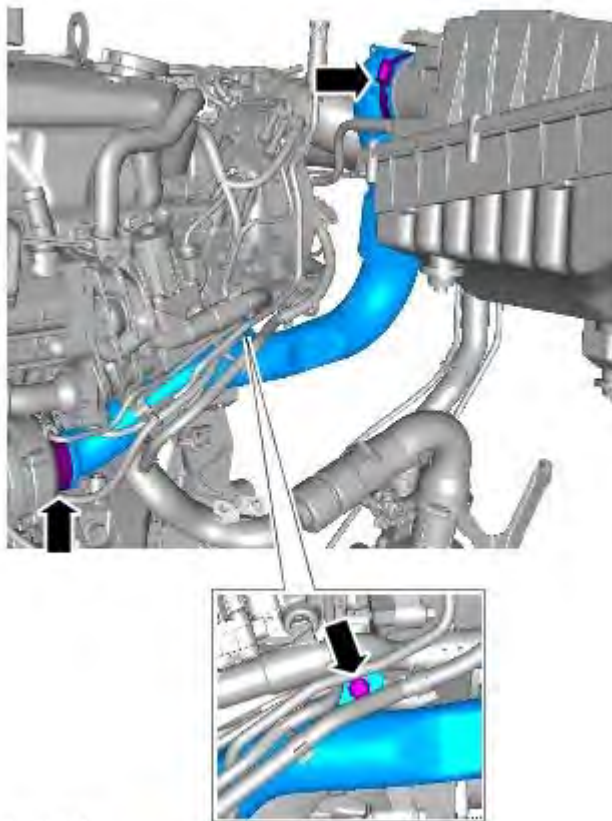
Torque: 30 Nm

14.



15. Torque: 10 Nm

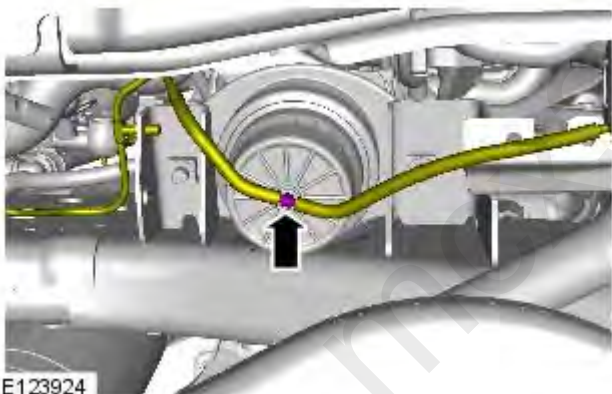




E123923

16. **16.** NOTE: Engine shown removed for clarity.

Torque: 10 Nm



E123924

17.

18. **18.** CAUTIONS:

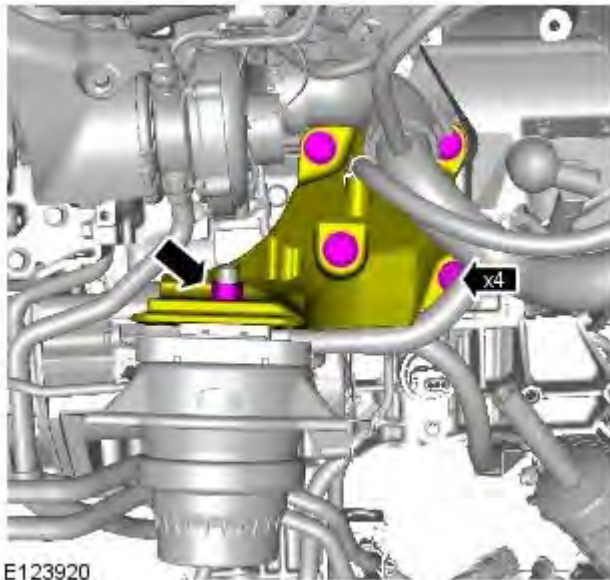


Use a wooden block to protect the oil pan when supporting the engine.



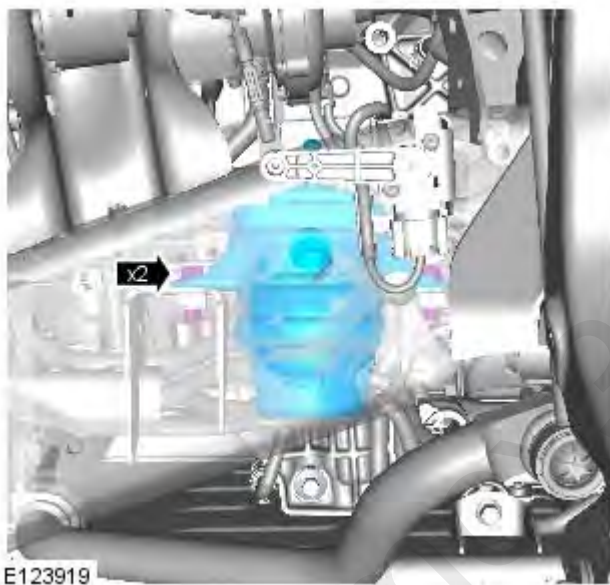
Protect the radiator during this operation.

Using a suitable hydraulic jack, raise and support the engine.

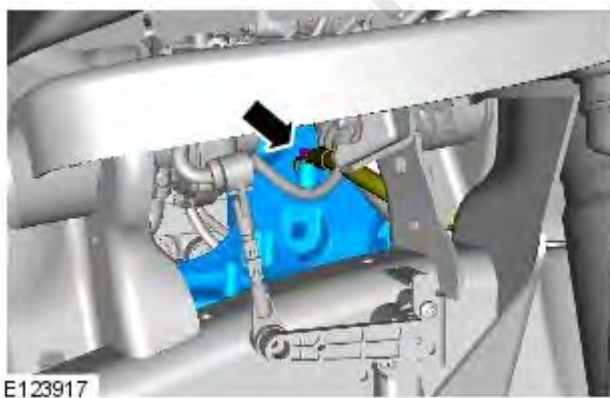


19. **19.** NOTE: Engine shown removed for clarity.

Torque:
Bolts 115 Nm
nut 90 Nm



20. *Torque:* 45 Nm



21. *Torque:* 10 Nm

Installation

1. To install, reverse the removal procedure.

Engine - TDV6 3.0L Diesel - Exhaust Manifold

Removal and Installation

Removal

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

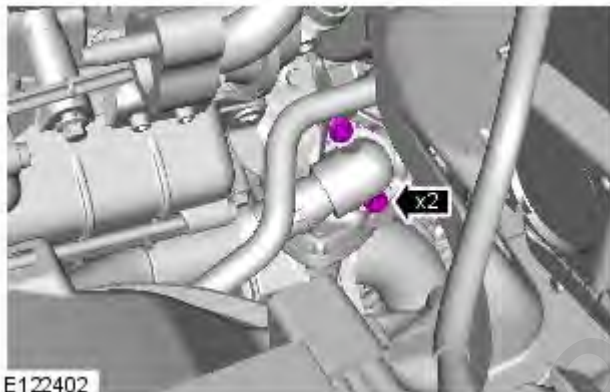
1. Disconnect the battery ground cable.

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

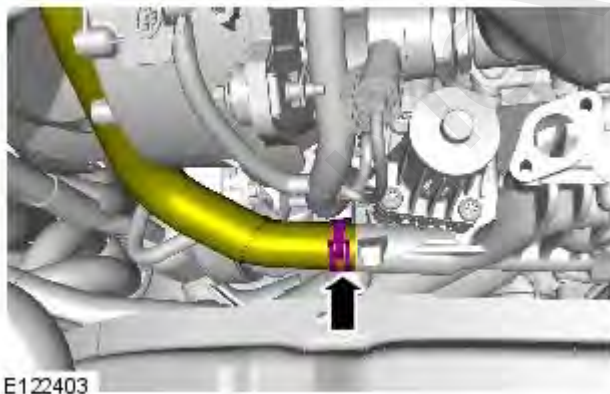
2. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).

3. Refer to: [Turbocharger LH](#) (303-04D Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).

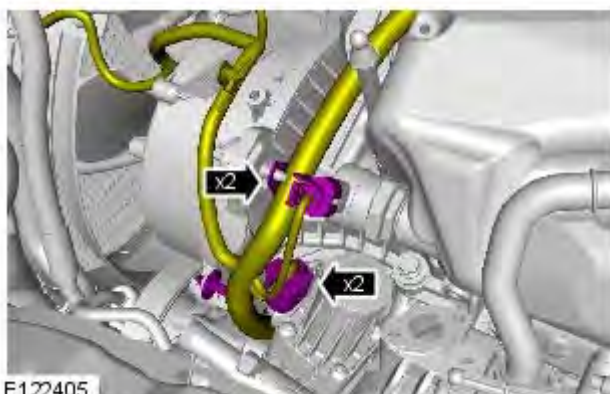
- 4.

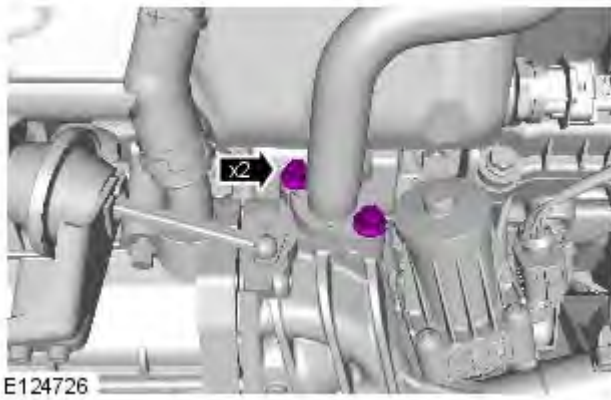


- 5.

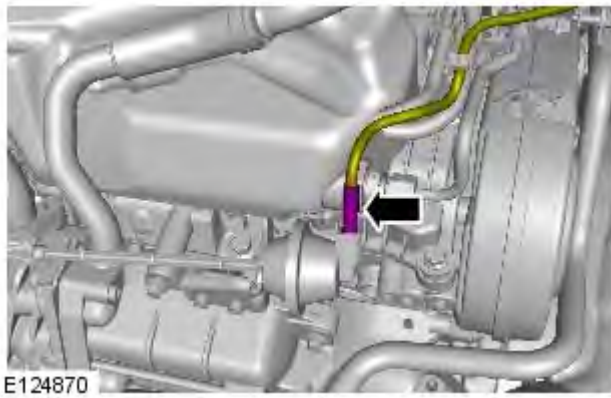


- 6.

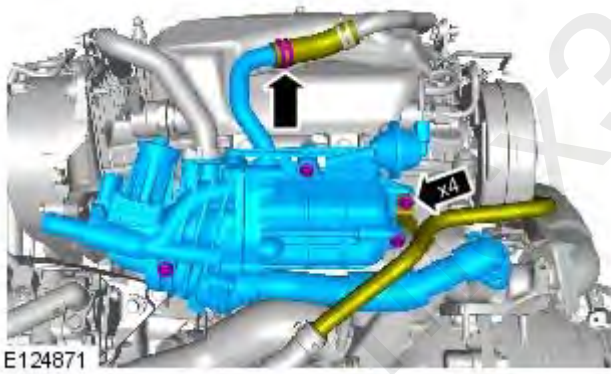




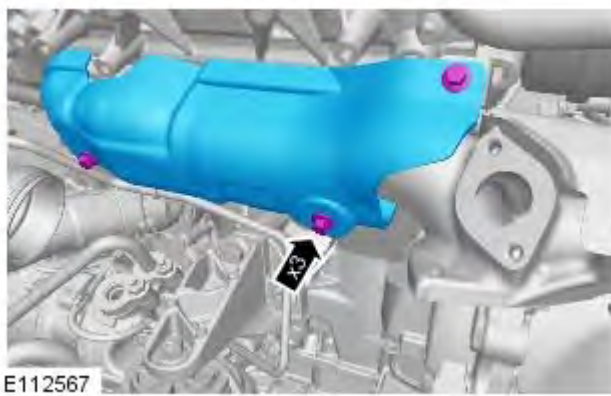
7. **7.** NOTE: RH illustration shown, LH is similar.



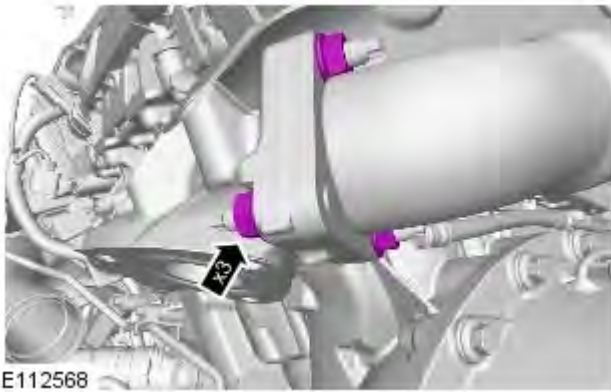
8.



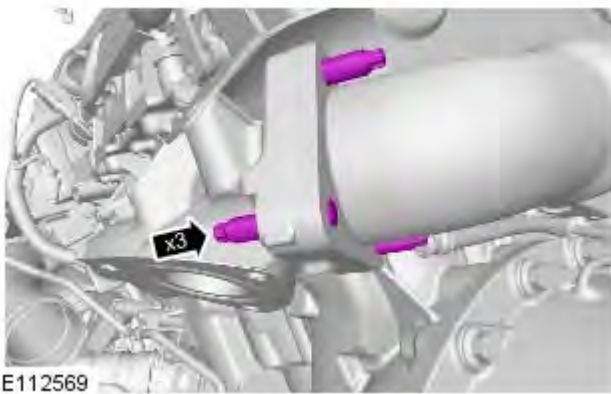
9. **9.** NOTE: Remove and discard the gasket.



10.



11. **11.**  CAUTION: Discard the nuts.

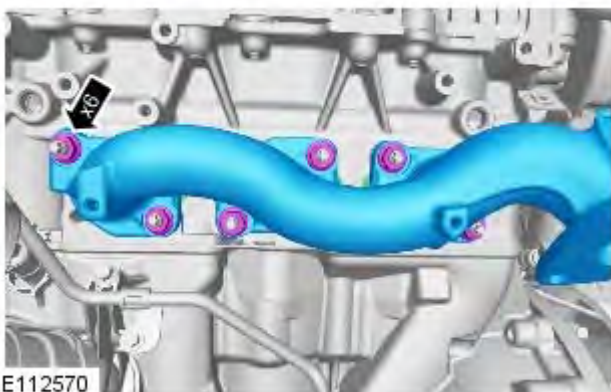


12. **12.**  CAUTION: Discard the studs.

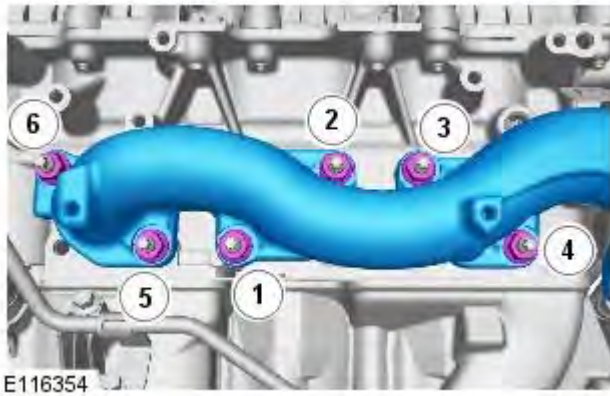


13. **13.**  CAUTION: Discard the nuts.
 • NOTE: Discard the gasket.

Installation

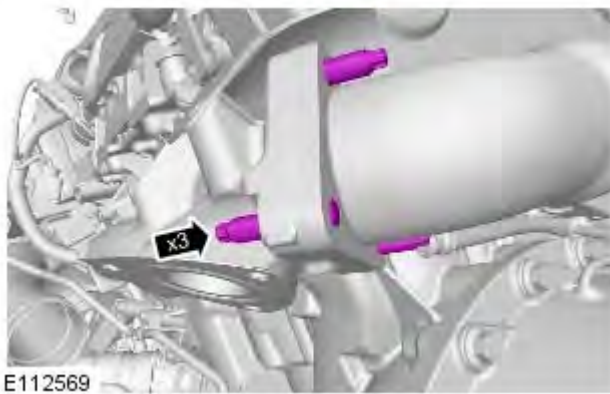


1. **1.**  WARNING: Make sure that new nuts are installed.
 CAUTION: Install the nuts finger tight before final tightening.
 • NOTE: Install a new gasket.



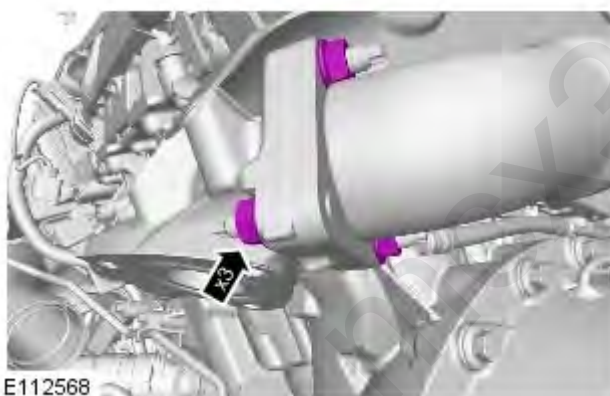
2. **2.** NOTE: Tighten the bolts in the indicated sequence.

Torque: 28 Nm



3. **3.**  CAUTION: Install new studs.

Torque: 24 Nm



4. **4.**  WARNING: Make sure that new nuts are installed.

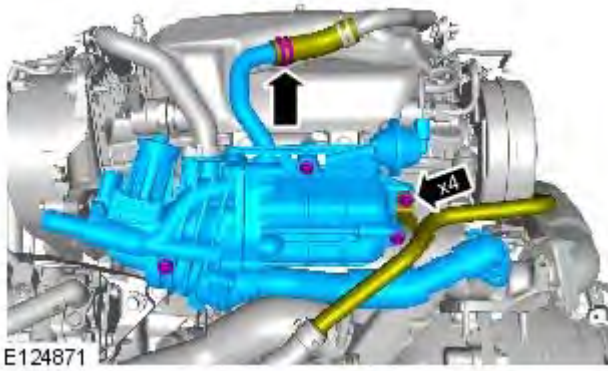
Torque: 24 Nm



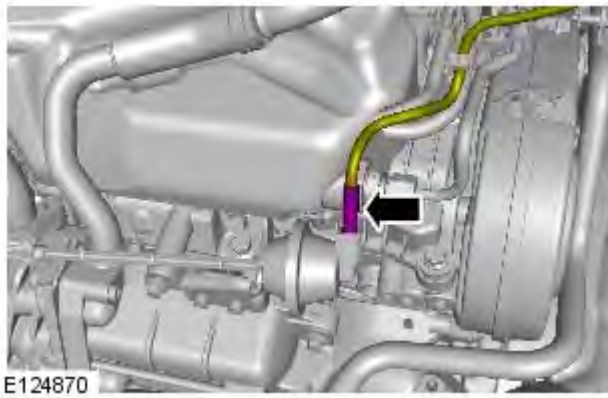
5. Torque: 10 Nm

6. **6.** NOTE: Install new gaskets.

Torque: 10 Nm

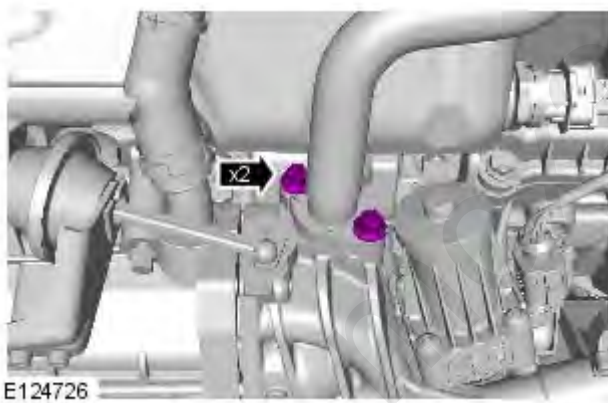


- 7.

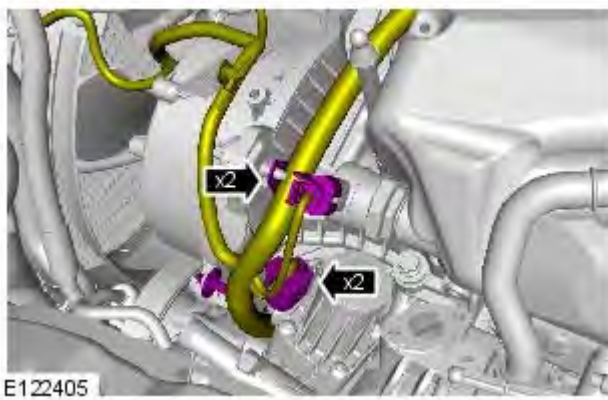


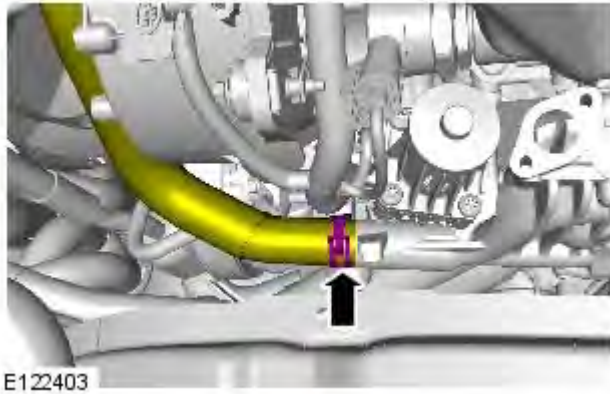
8. **8.** NOTE: RH illustration shown, LH is similar.

Torque: 10 Nm

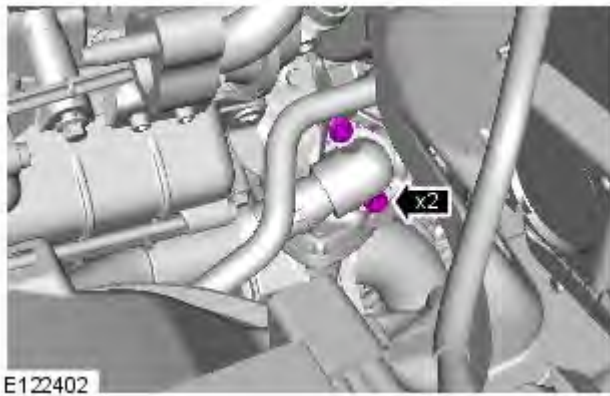


- 9.





10.



11. *Torque:* 10 Nm

12. Refer to: [Turbocharger LH](#) (303-04D Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).
13. Connect the battery ground cable.
- Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
14. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).

Engine - TDV6 3.0L Diesel - Exhaust Manifold Crossover Pipe

Removal and Installation

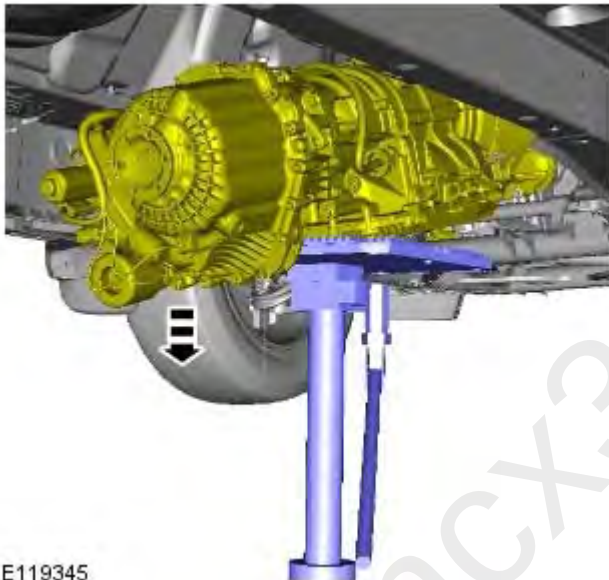
Removal



CAUTION: Take care when handling the cross-over pipe as damage to the insulating material may occur.

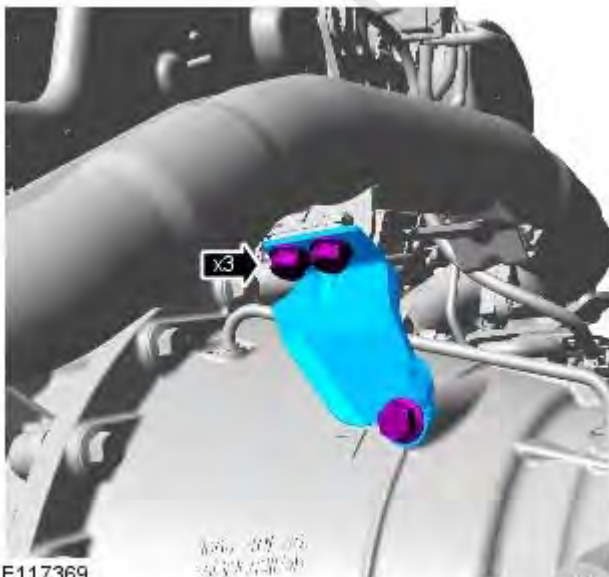
1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Transmission Support Crossmember - TDV6 3.0L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
3. Refer to: [Exhaust System](#) (309-00B Exhaust System - TDV6 3.0L Diesel, Removal and Installation).

4. **NOTE:** The transmission is lowered for access.



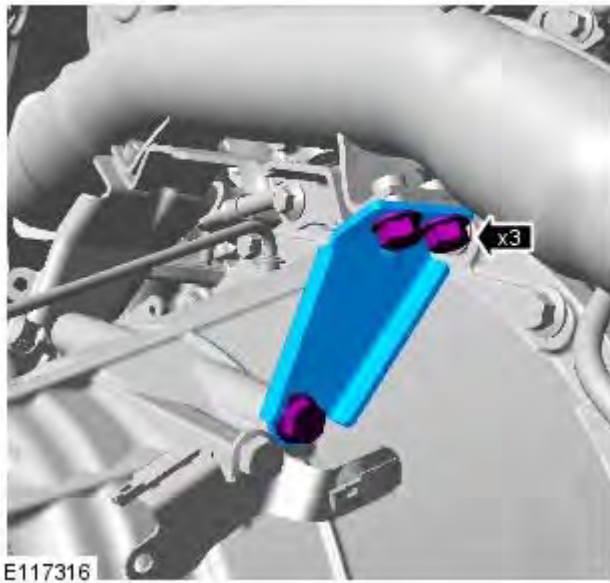
E119345

- 5.

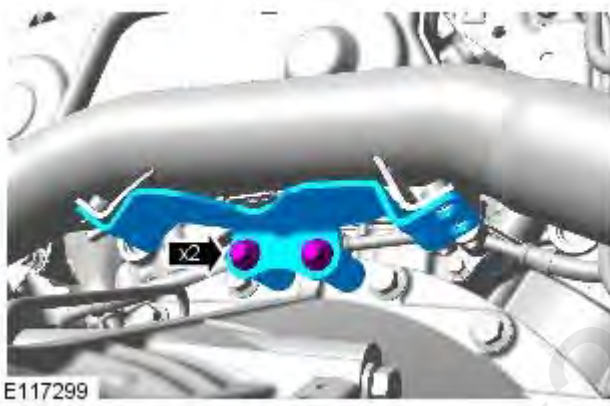


E117369

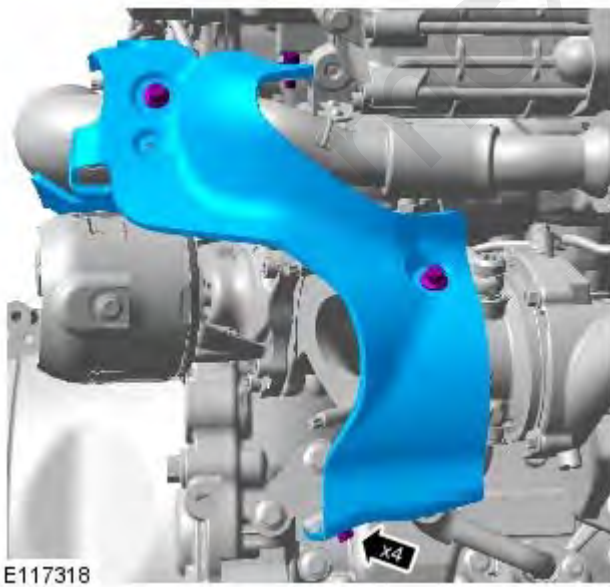
6.

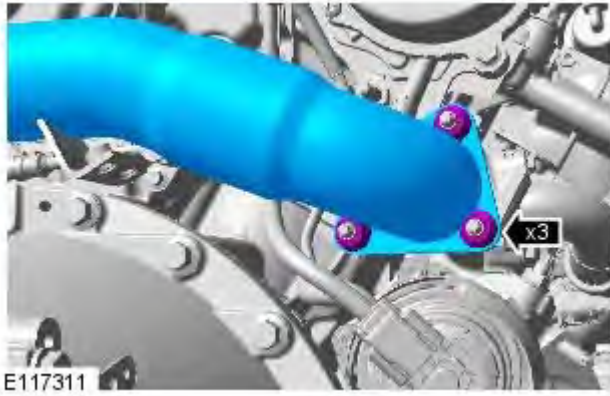


7.

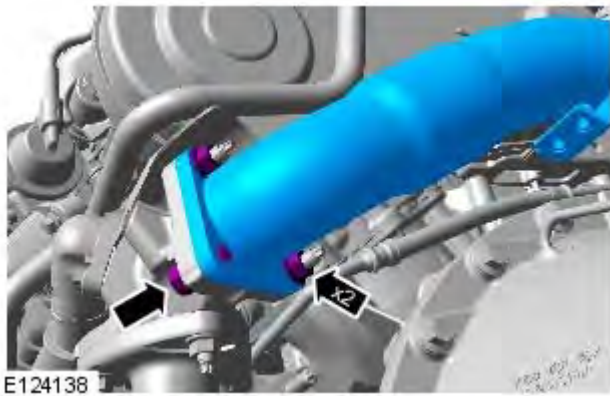


8.

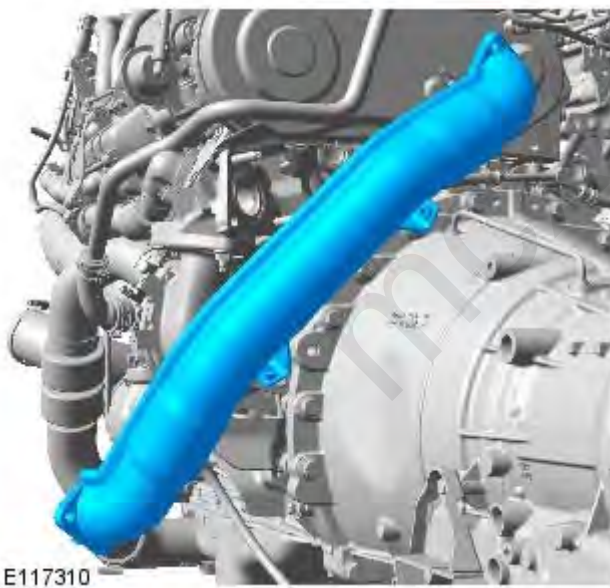




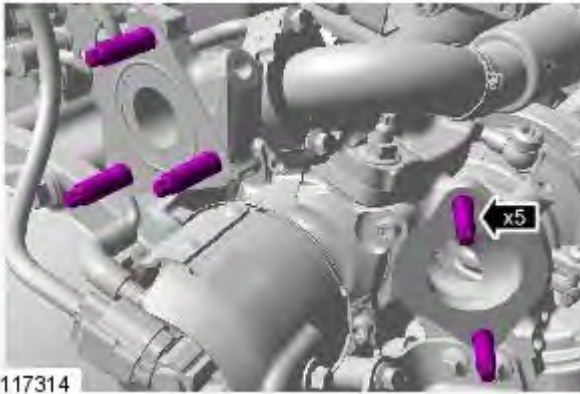
9. **9.**  CAUTION: Discard the nuts.



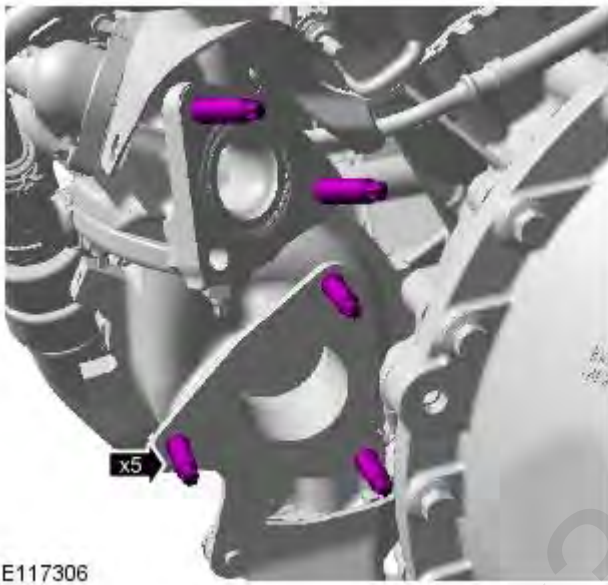
10. **10.**  CAUTION: Discard the nuts and bolt.



11.



12. **12.** ⚠ CAUTION: Discard the studs.



13. **13.** ⚠ CAUTION: Discard the studs.

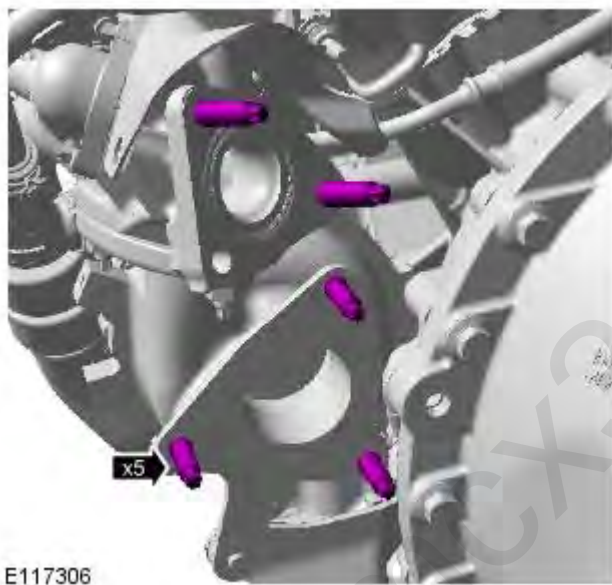


14. **14.** NOTE: Discard the gasket.

Installation

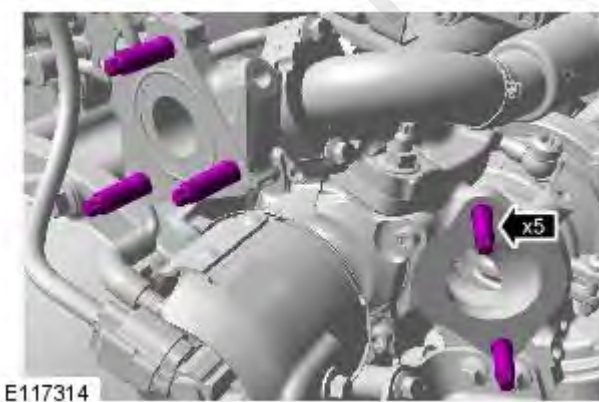


1. **1.** NOTE: Install new gaskets.



2. **2.** NOTE: New exhaust manifold retaining studs must be fitted if the old studs are removed.

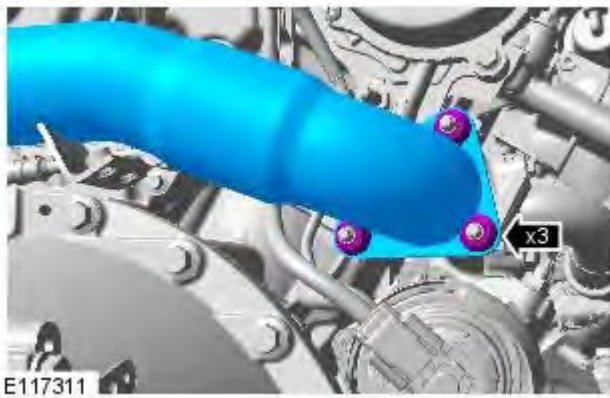
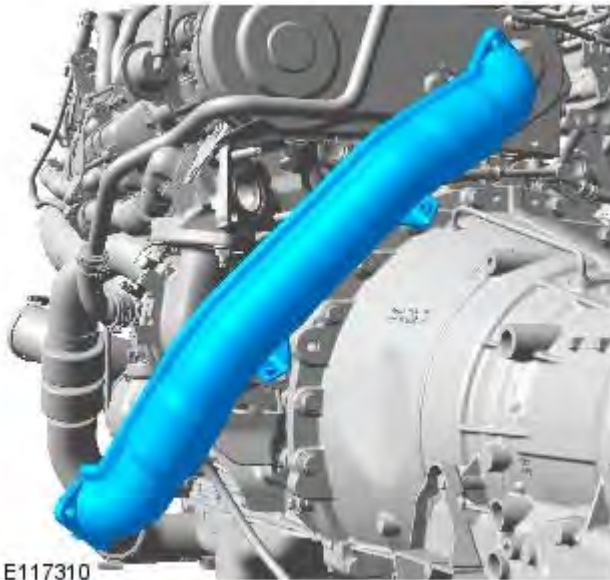
Torque: 13 Nm



3. **3.** NOTE: New exhaust manifold retaining studs must be fitted if the old studs are removed.

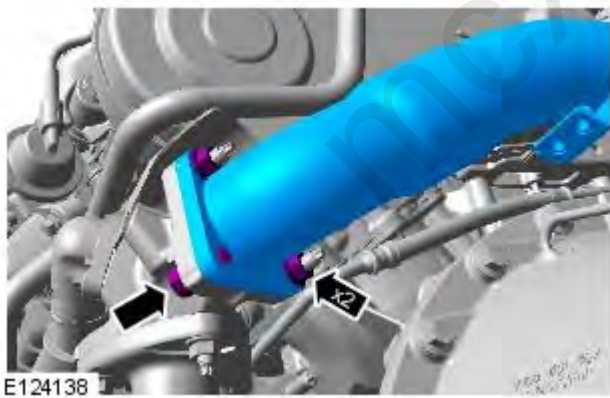
Torque: 13 Nm

4.



5.  **WARNING:** Make sure that new nuts are installed.

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



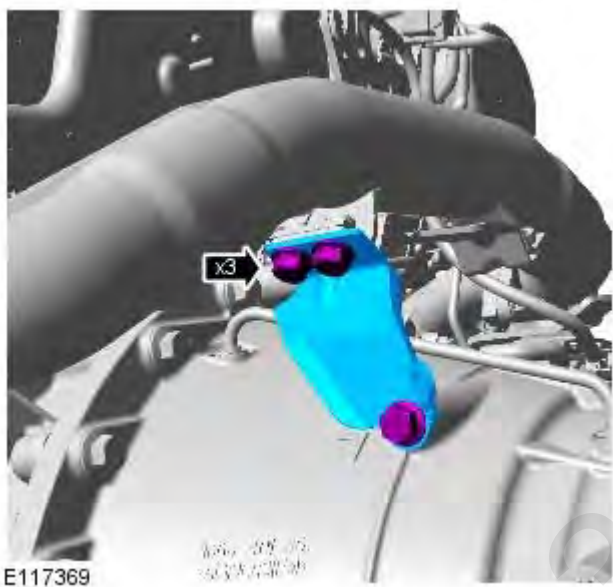
6. **CAUTIONS:**

 Only tighten the nuts and bolt finger-tight at this stage.

 Make sure that new nuts and bolt are installed.

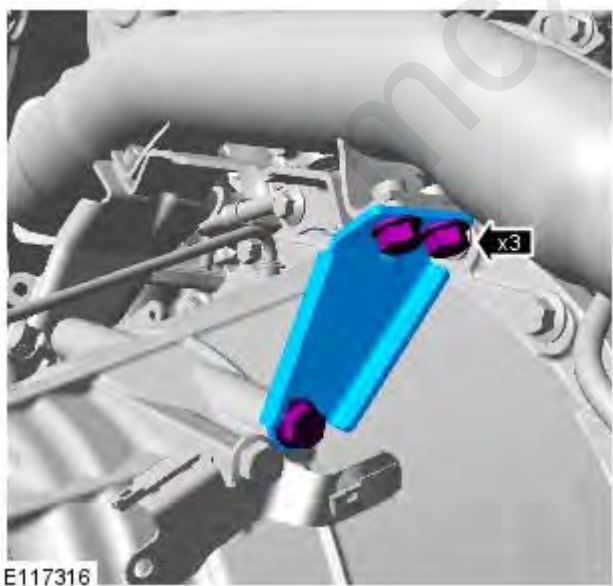


7.  **CAUTION:** Only tighten the bolts finger-tight at this stage.



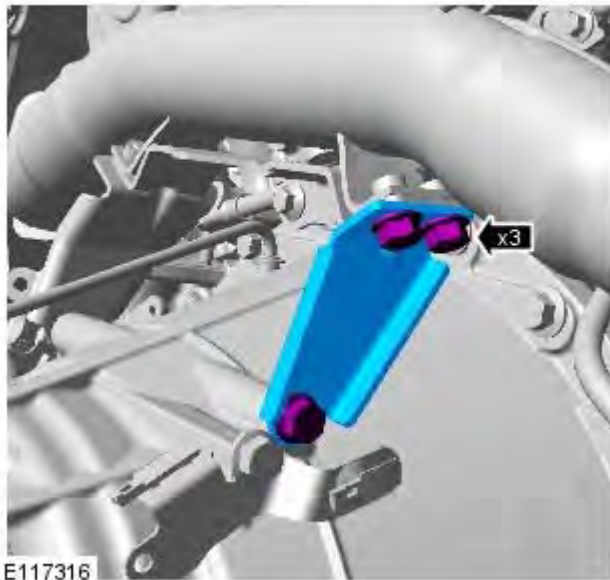
8.  **CAUTION:** Only tighten the bolts finger-tight at this stage.

Check for correct alignment.

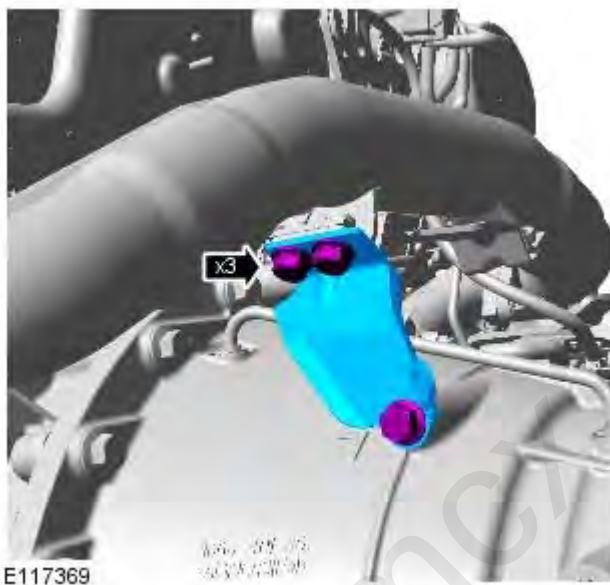


9.  **CAUTION:** Only tighten the bolts finger-tight at this stage.

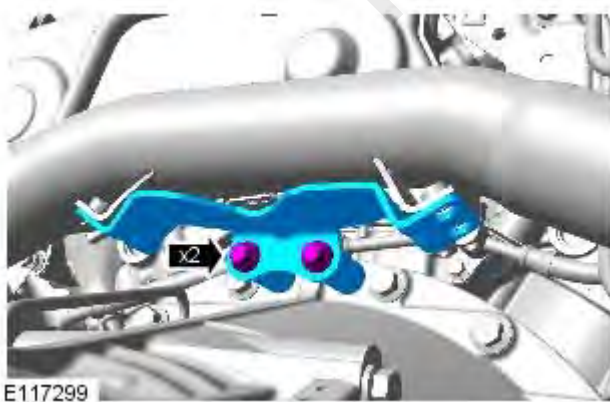
Check for correct alignment.



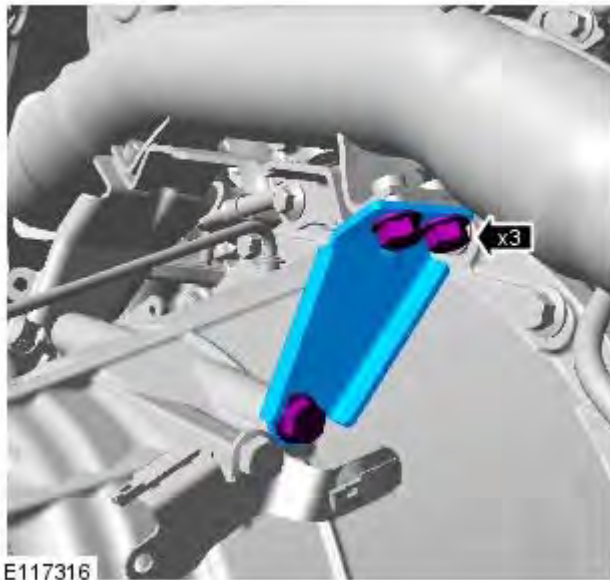
10. Remove the exhaust cross-over pipe RH support bracket.



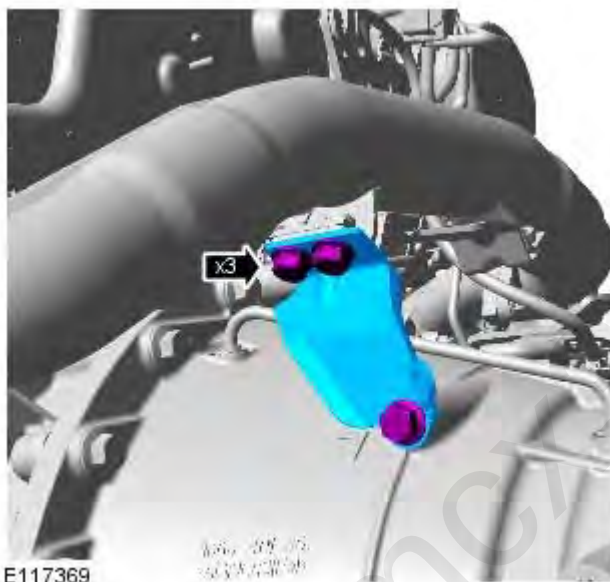
11. Remove the exhaust cross-over pipe LH support bracket.



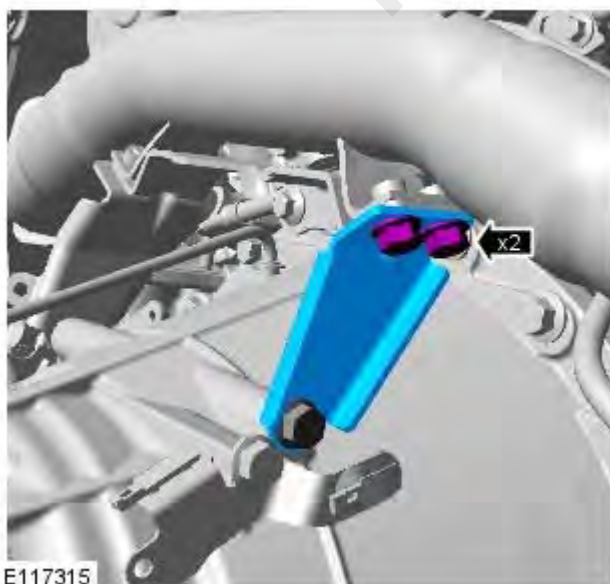
12. Torque: 23 Nm



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

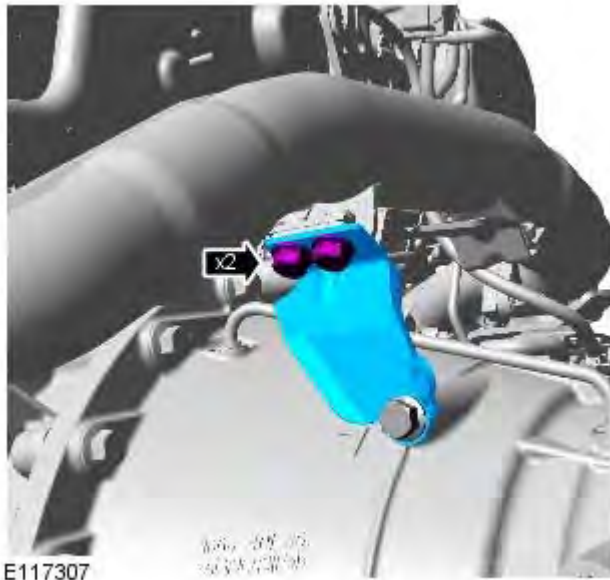


14. **14.**  **CAUTION:** Only tighten the bolts finger-tight at this stage.

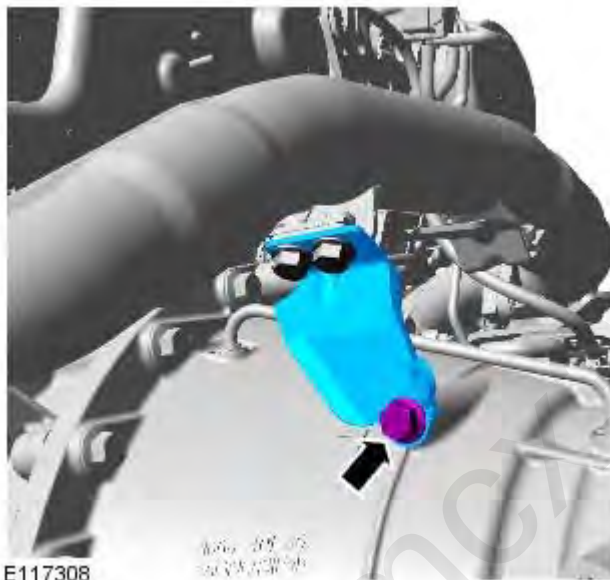


15. **Torque:** 23 Nm

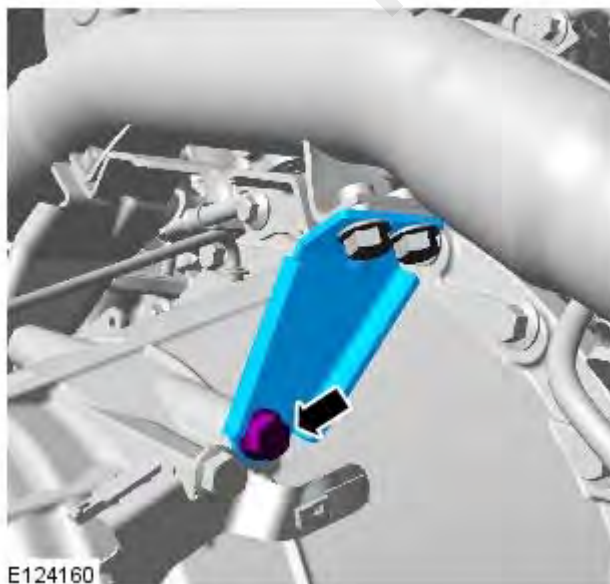
16. Torque: 23 Nm

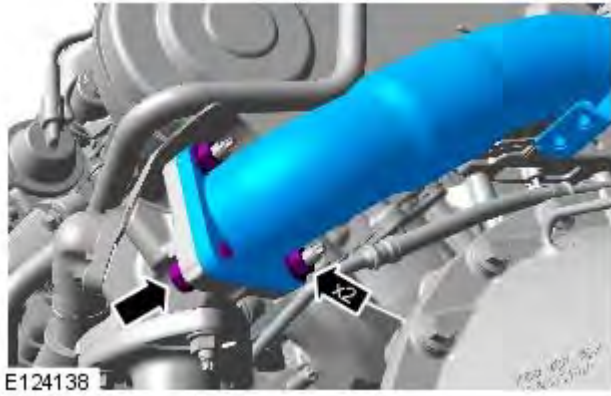


17. Torque: 23 Nm

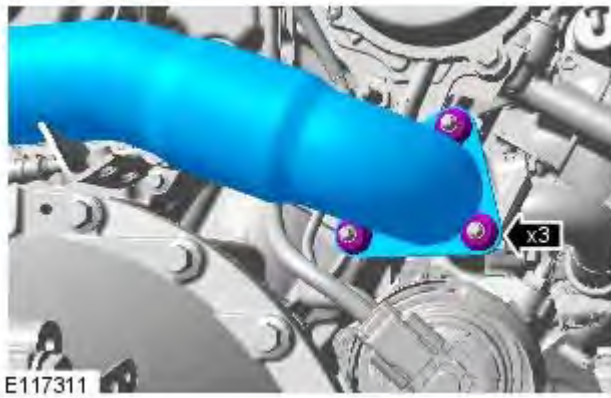


18. Torque: 23 Nm

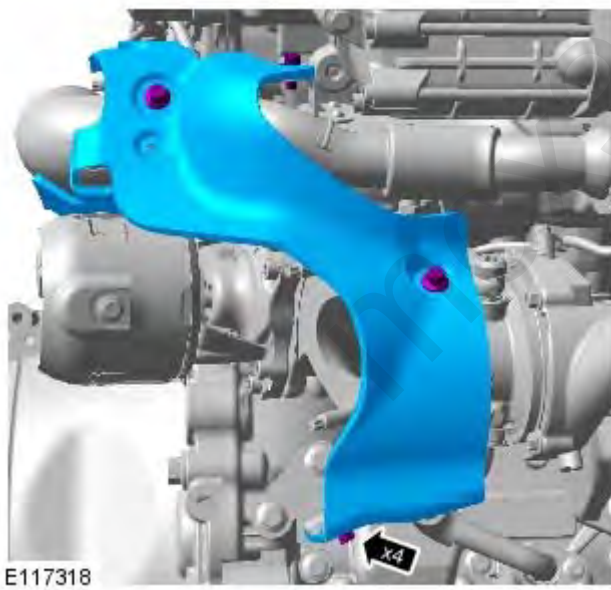




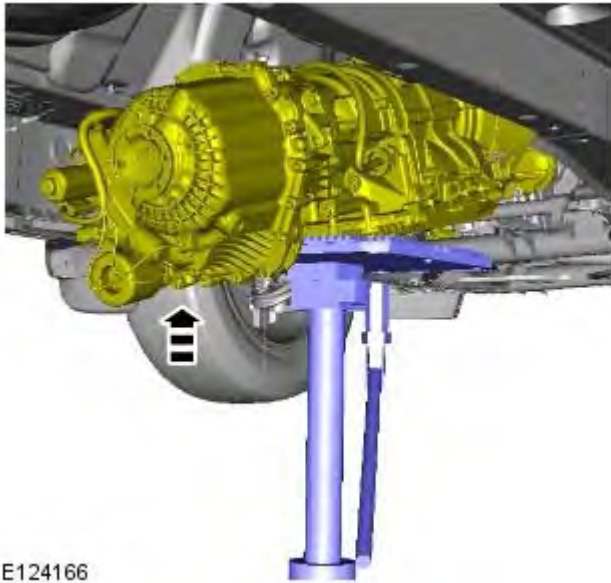
19. Torque: 23 Nm



20. Torque: 23 Nm



21. Torque: 11 Nm



E124166

22.

23. Refer to: [Exhaust System](#) (309-00B Exhaust System - TDV6 3.0L Diesel, Removal and Installation).
24. Refer to: [Transmission Support Crossmember - TDV6 3.0L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).

Engine - TDV6 3.0L Diesel - Flexplate

Removal and Installation

Special Tool(s)

 E 54546	303-1123 Locking Tool, Flywheel
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Removal

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

1. Disconnect the battery ground cable.

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

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

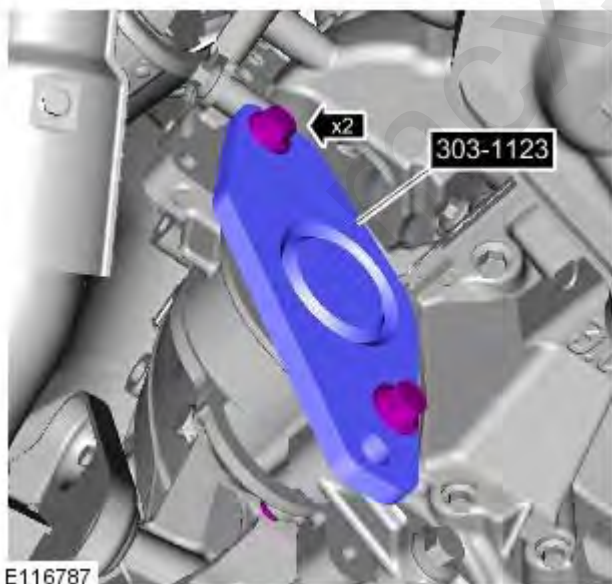
Raise and support the vehicle.

3. Refer to: [Starter Motor](#) (303-06B Starting System - TDV6 3.0L Diesel, Removal and Installation).

4. Refer to: [Transmission - TDV6 3.0L Diesel](#) (307-01D Automatic Transmission/Transaxle - V8 5.0L Petrol/TDV6 3.0L Diesel, Removal).

- 5.

- Install the special tool.
- *Special Tool(s):* [303-1123](#)

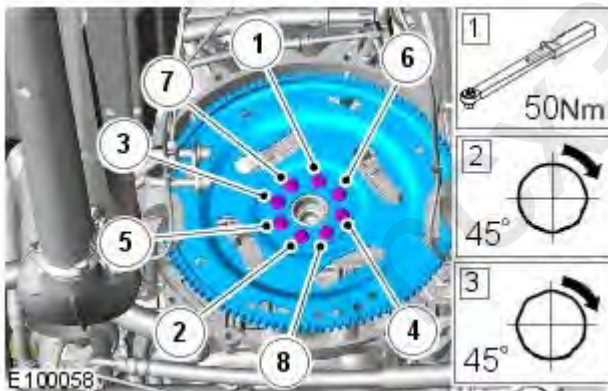




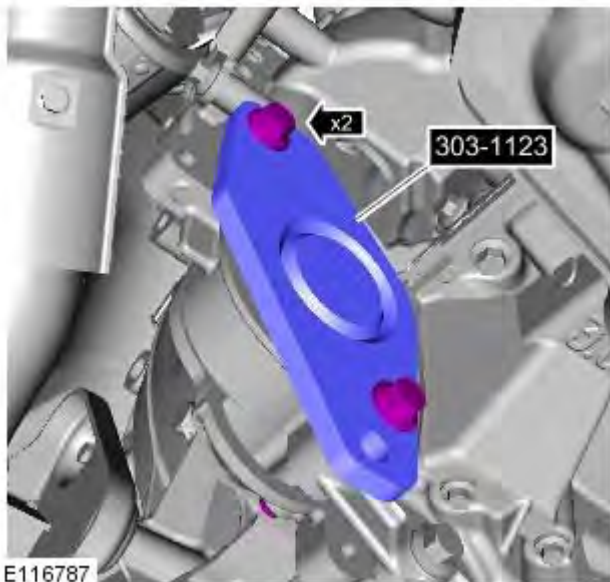
6. **⚠ CAUTION:** Discard the bolts.
 - **NOTE:** Prevent the flexplate from rotating.

Installation

1. **⚠ CAUTION:** Make sure that new bolts are installed.
 - **NOTE:** Make sure that all the component mating faces are clean.
 - **NOTE:** Loosely install all retaining bolts.
 - Prevent the flexplate from rotating.



2. **⚠ CAUTION:** Tighten the bolts evenly in the stages shown.
 - Stage 1: Tighten to 50 Nm.
 - Stage 2: Tighten to 45 degrees.
 - Stage 3: Tighten to 45 degrees.



3.

- Remove the special tool.
- *Special Tool(s):* [303-1123](#)

4. Refer to: [Transmission - TDV6 3.0L Diesel](#) (307-01D Automatic Transmission/Transaxle - V8 5.0L Petrol/TDV6 3.0L Diesel, Installation).
5. Refer to: [Starter Motor](#) (303-06B Starting System - TDV6 3.0L Diesel, Removal and Installation).
6. Connect the battery ground cable.

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

Engine - TDV6 3.0L Diesel - Oil Filter Element

Removal and Installation

Removal



CAUTION: Make sure that the correct tools are used to remove and install the oil filter element cap.

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

1. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornammentation, Removal and Installation).



2.

- Rotate the oil filter element housing six complete turns counter-clockwise.
- Allow the engine oil to drain from the oil filter element housing for two minutes.
- Remove the oil filter element housing.

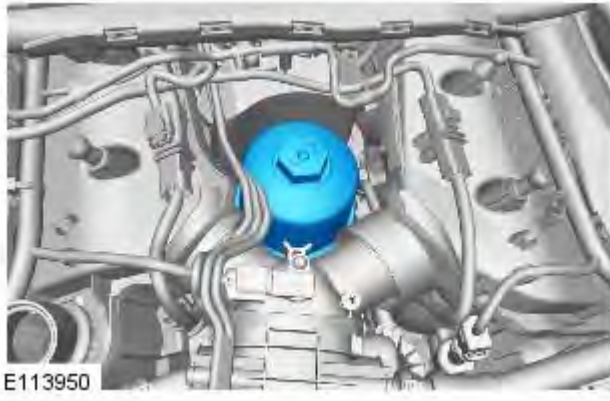
3. **3. NOTE:** Remove and discard the O-ring seal.



Installation



1. **1. CAUTION:** A new O-ring seal is to be installed.
 - **NOTE:** Lubricate the O-ring seal with clean engine oil.



2. Torque: 28 Nm

3. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornammentation, Removal and Installation).
4. Start and run the engine.
5. Check and top-up the engine oil.

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Engine - TDV6 3.0L Diesel - Oil Pan

Removal and Installation

Removal

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

1. Disconnect the battery ground cable.

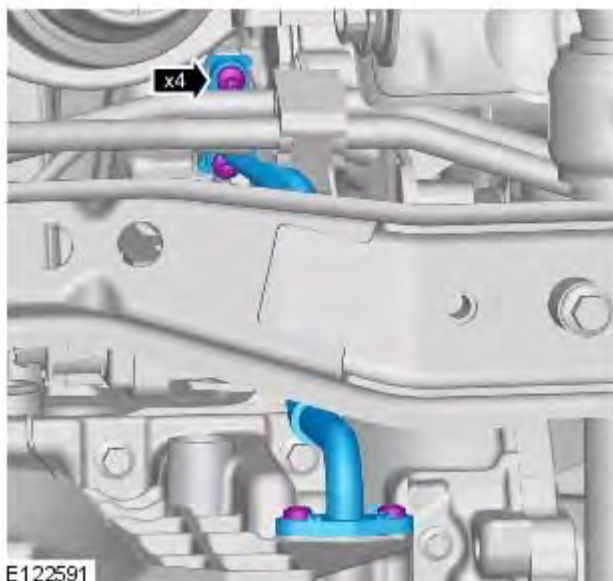
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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

Raise and support the vehicle.

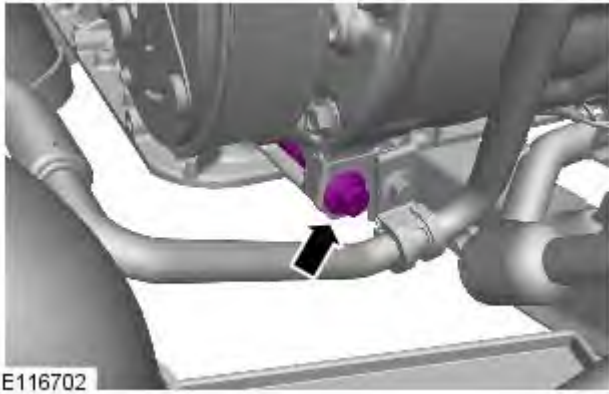
3. Refer to: [Engine Oil Draining and Filling](#) (303-01B Engine - TDV6 3.0L Diesel, General Procedures).
4. Refer to: [Axle Assembly](#) (205-03 Front Drive Axle/Differential, Removal and Installation).
5. Refer to: [Starter Motor](#) (303-06B Starting System - TDV6 3.0L Diesel, Removal and Installation).

6. Torque:
M10 40 Nm
M8 24 Nm

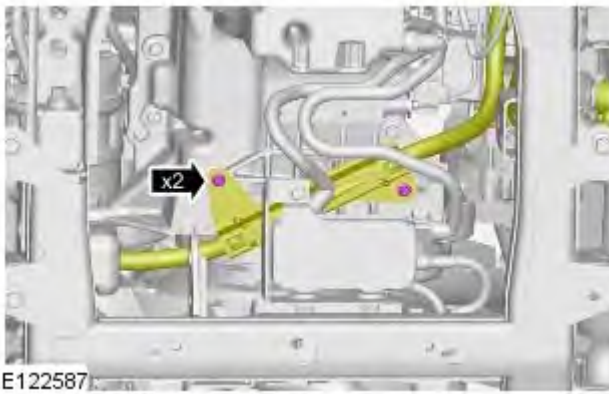


7.  **CAUTION:** Make sure that the gaskets are correctly located.

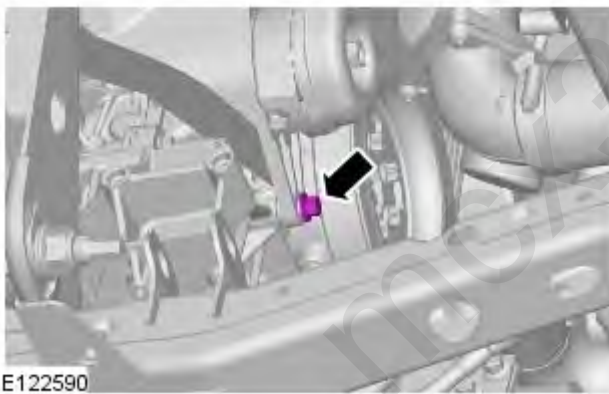
Torque: 10 Nm



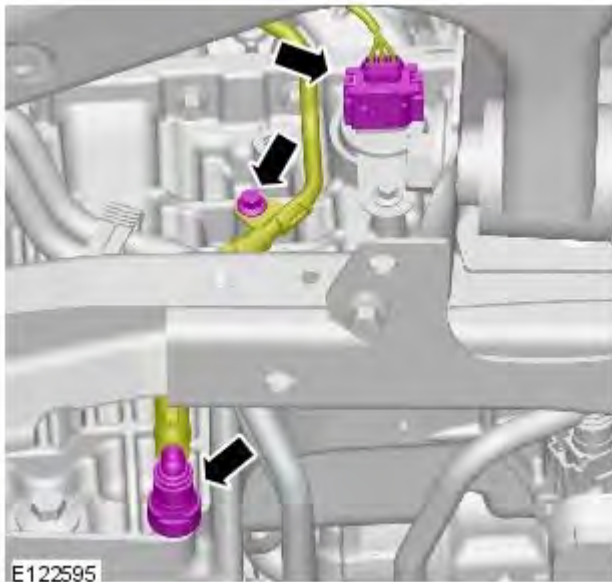
8. Torque: 25 Nm



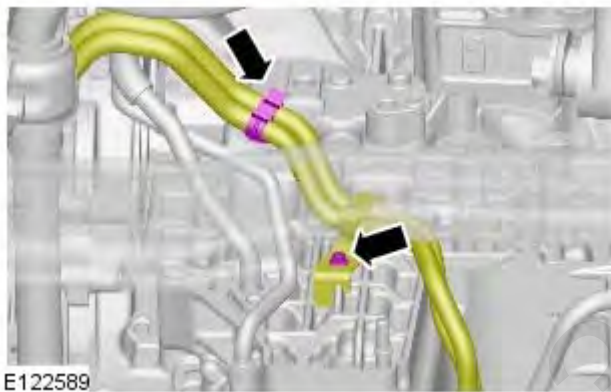
9. Torque: 10 Nm



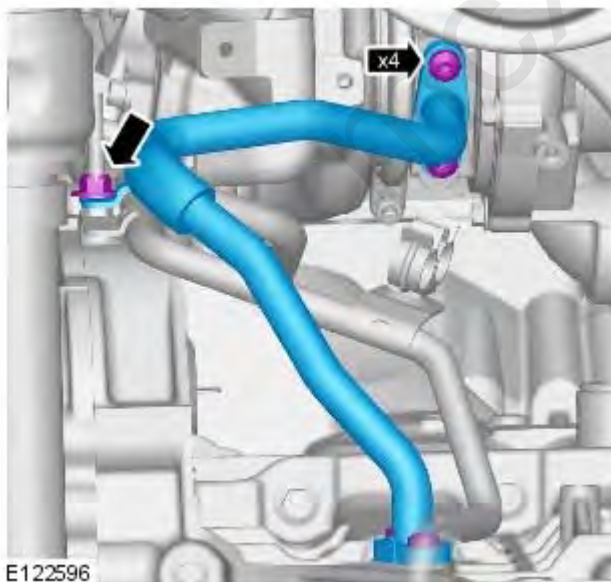
10. Torque: 24 Nm



11. Torque: 10 Nm

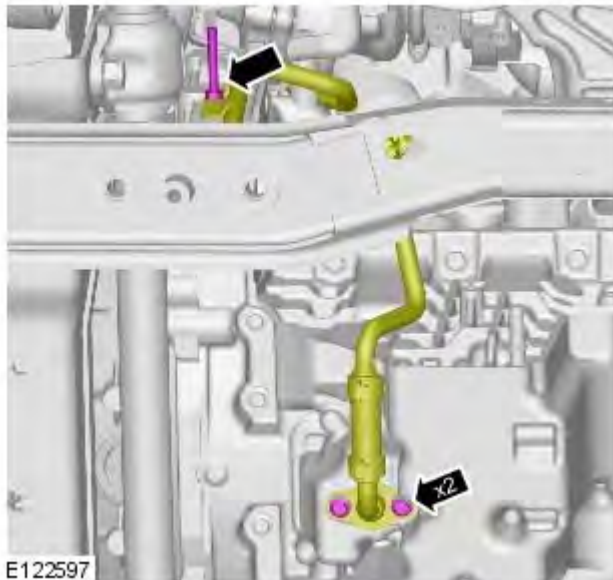


12. Torque: 10 Nm



13. **13.**  **CAUTION:** Make sure that the gaskets are correctly located.

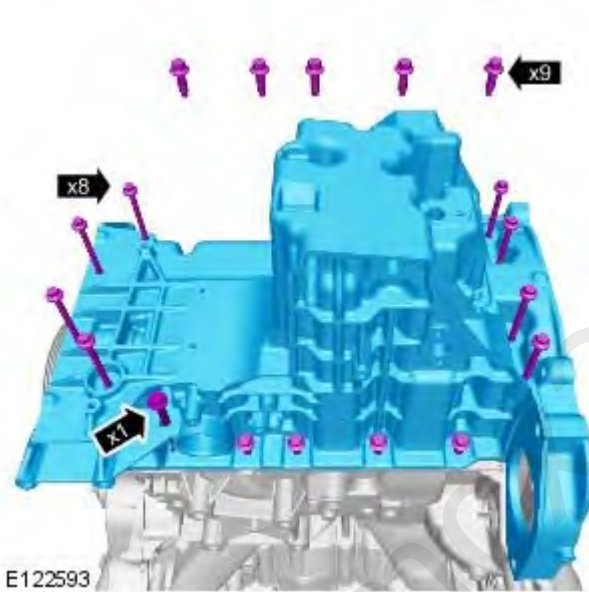
Torque: 10 Nm



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14. **14.** NOTE: Remove and discard the gasket.

Torque: 10 Nm



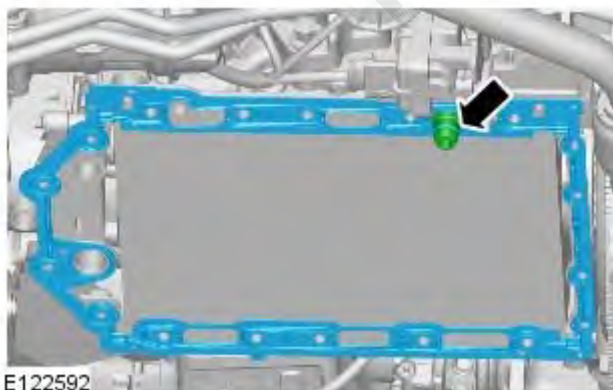
E122593

15. **15.**  CAUTION: Note the position of the bolts, prior to removal.

Torque:

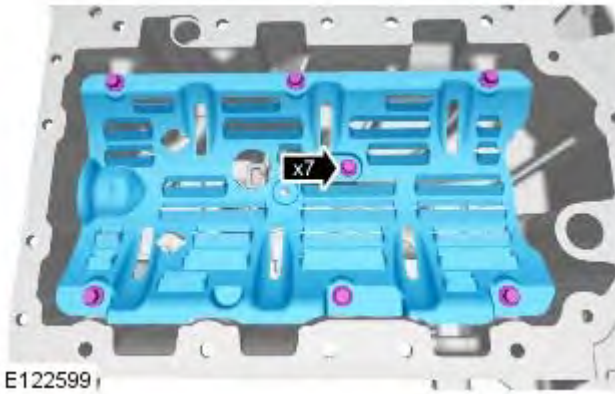
M8 23 Nm

M6 10 Nm



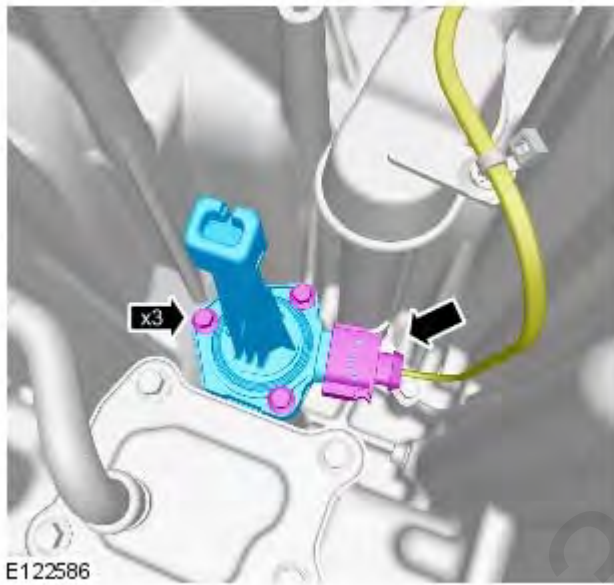
E122592

16. **16.** NOTE: Remove and discard the O-ring seal.

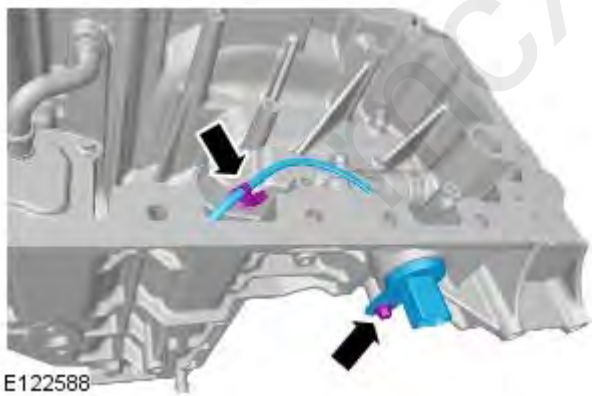


17. **17.** NOTE: Do not disassemble further if the component is removed for access only.

Torque: 10 Nm

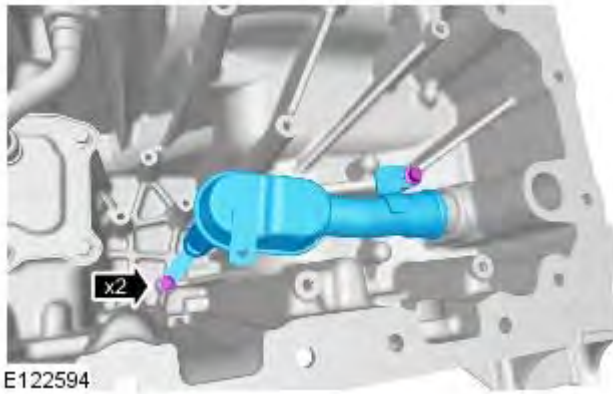


18. Torque: 10 Nm



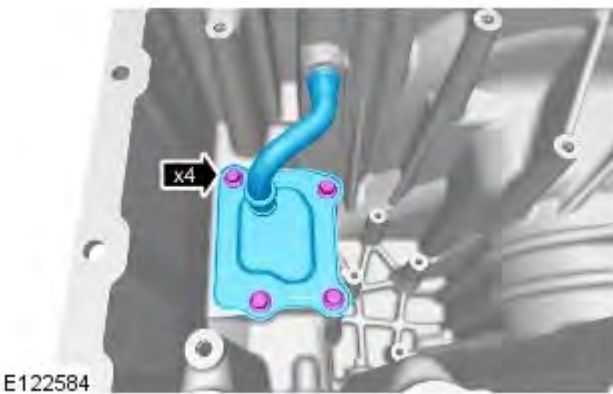
19. **19.** NOTE: Remove and discard the O-ring seal.

Torque: 10 Nm



20. **20.** NOTE: Remove and discard the O-ring seal.

Torque: 10 Nm

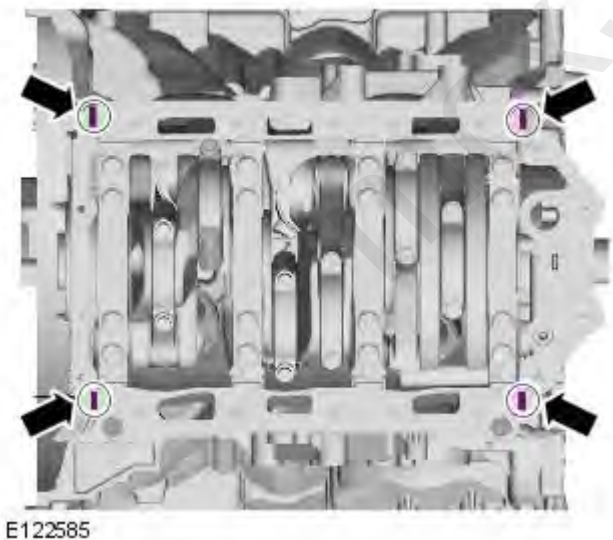


21. **21.** NOTE: Remove and discard the O-ring seals.

• NOTE: Discard the gasket.

Torque: 10 Nm

Installation



1. **1.** CAUTIONS:



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



Installation of the oil pan and tightening must be carried out within 7 minutes of applying the sealant.

Apply an 8 mm bead of sealant to the cylinder block in the areas shown.

2. To install, reverse the removal procedure.

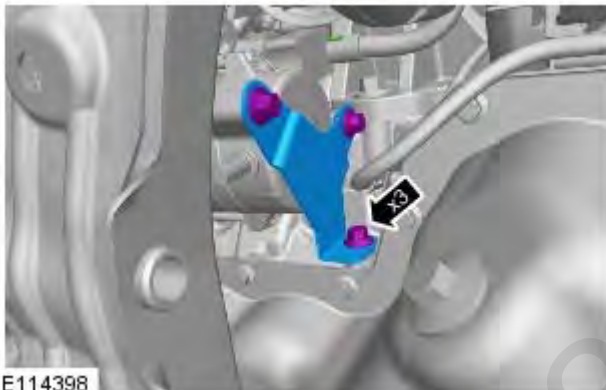
Engine - TDV6 3.0L Diesel - Oil Pan Extension

Removal and Installation

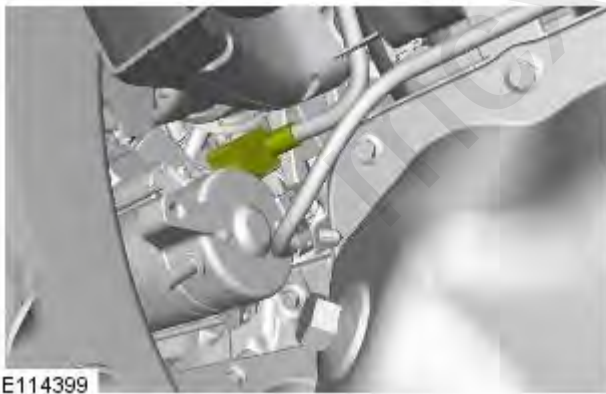
Removal

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).
2.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
3. Refer to: Transmission - 3.0L (307-01, Removal).
4. Refer to: [Oil Pan](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

5.



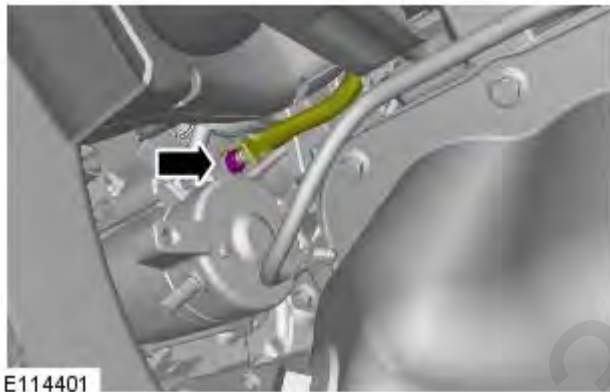
6.





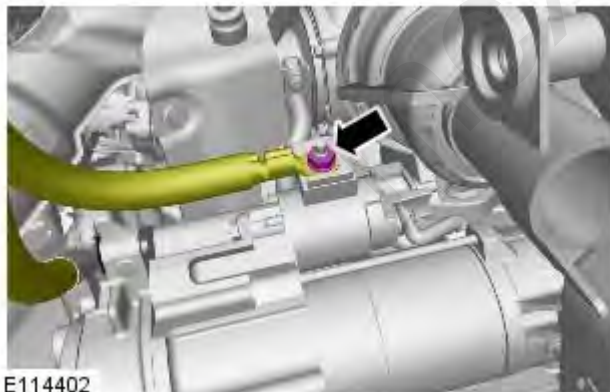
E114400

7.



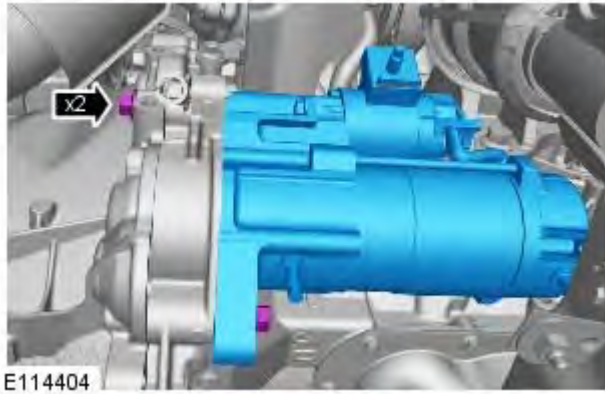
E114401

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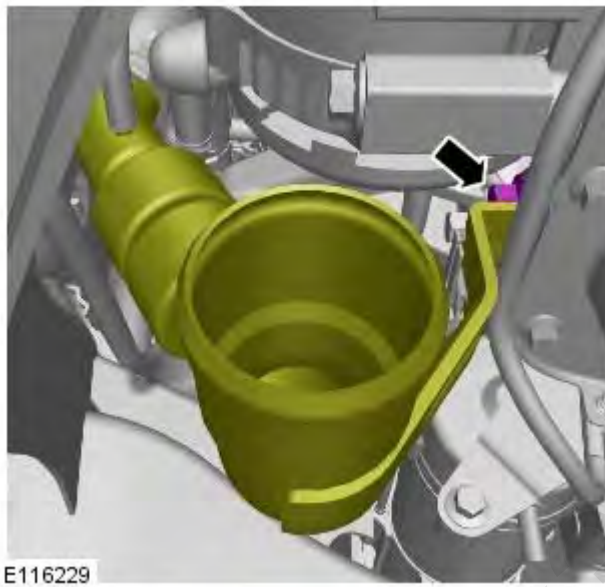


E114402

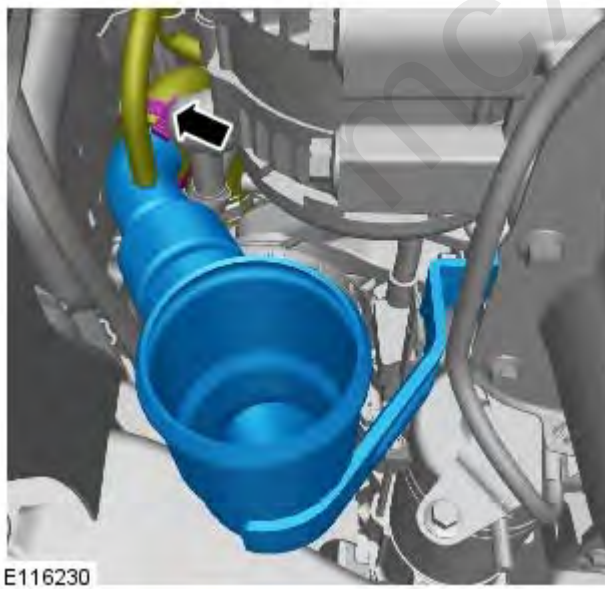
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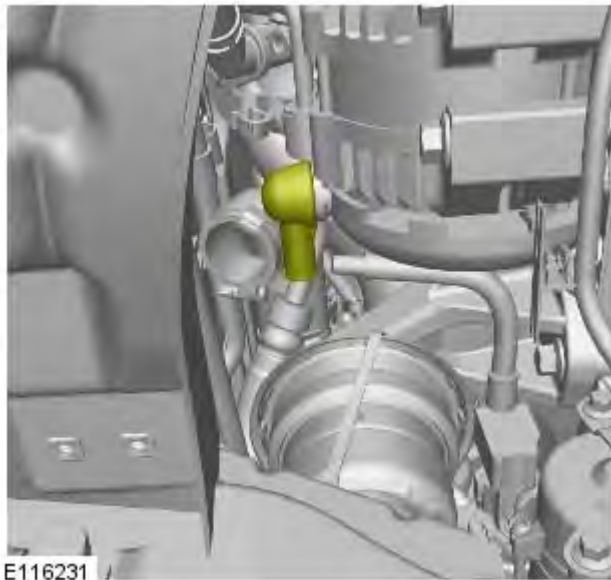
10. **10.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



- 11.

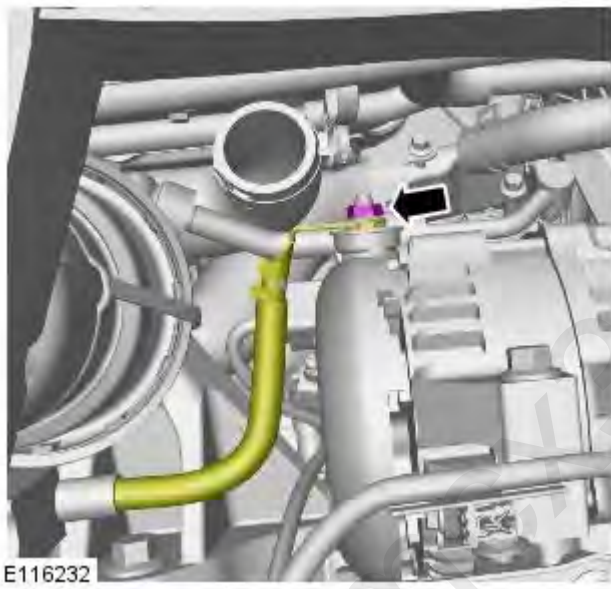


12. **12.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



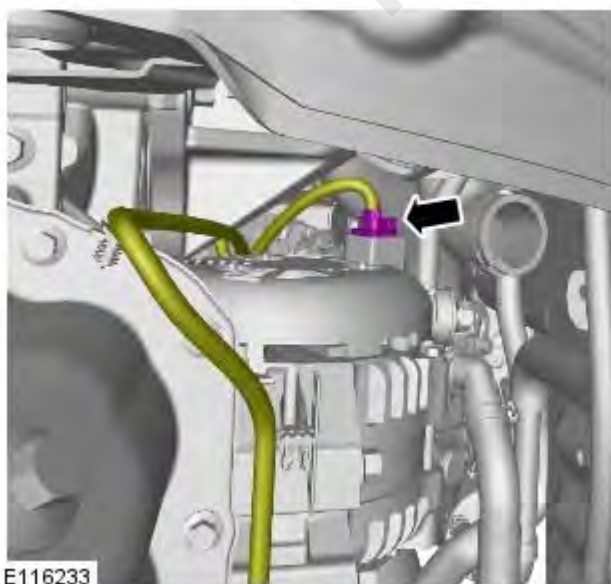
E116231

13.



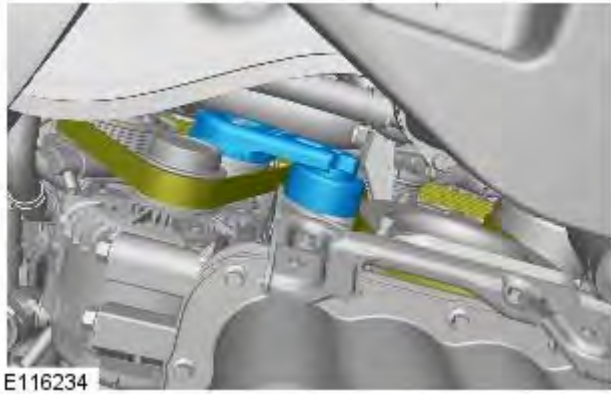
E116232

14.

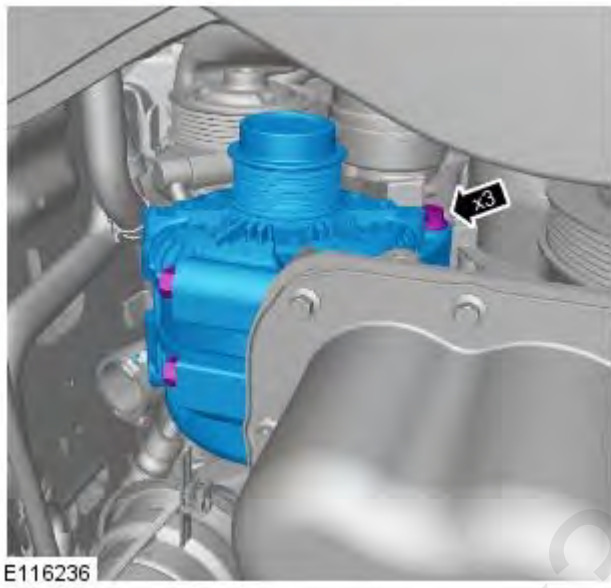


E116233

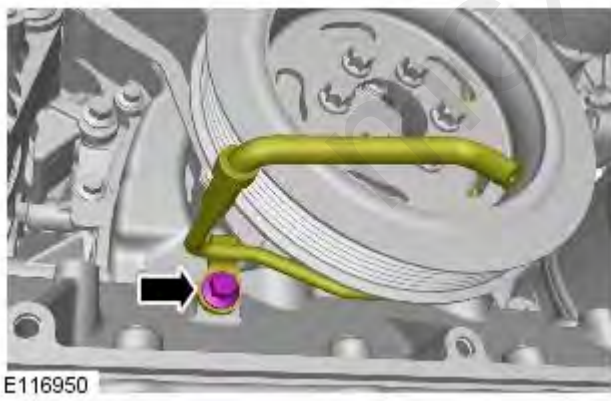
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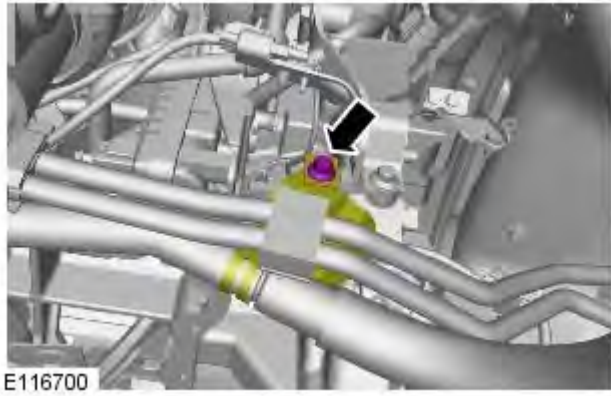
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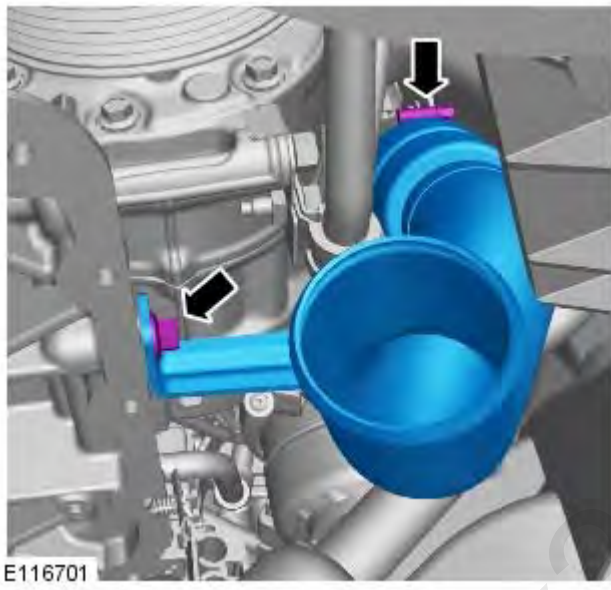
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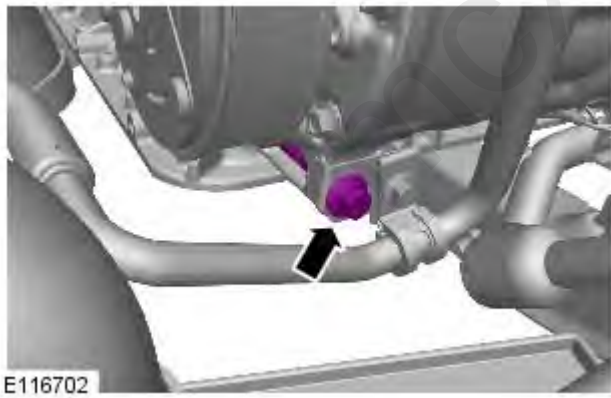
18.



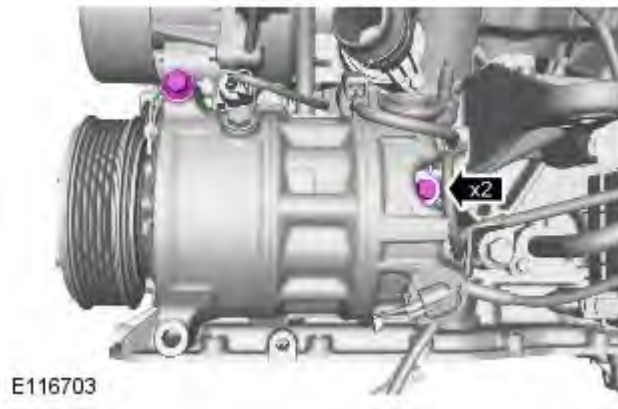
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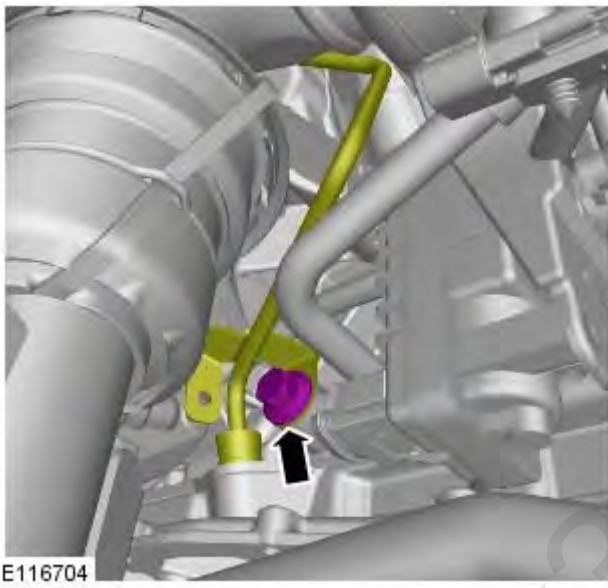
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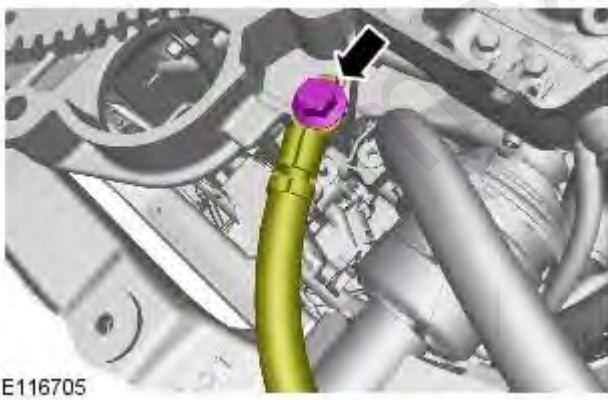
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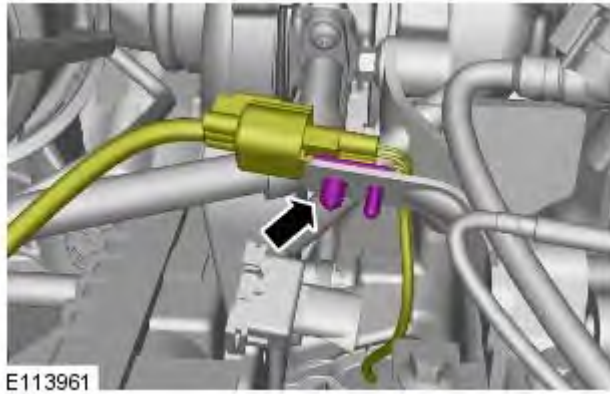
22. **22.** NOTE: Loosen the bolt, but do not fully remove.



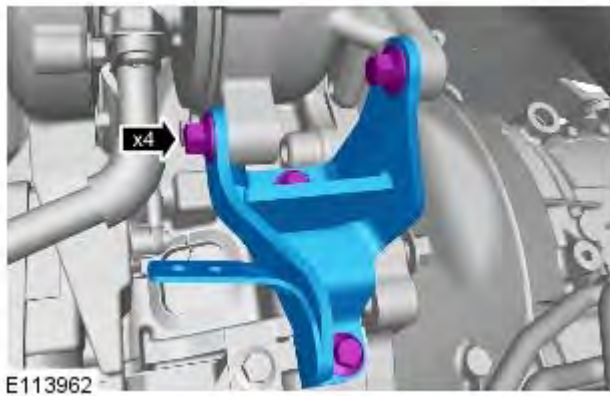
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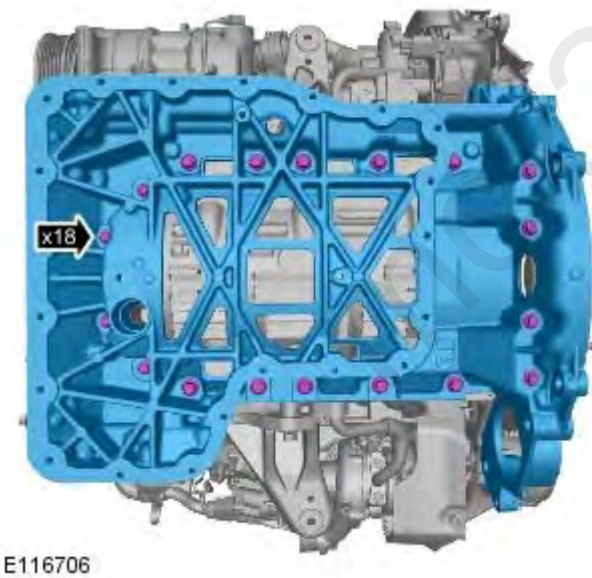
24.



25.



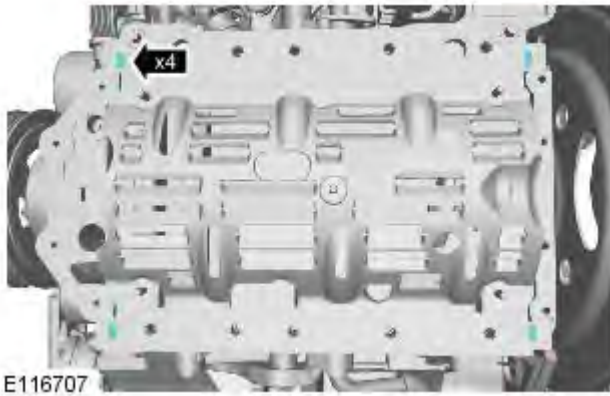
26.



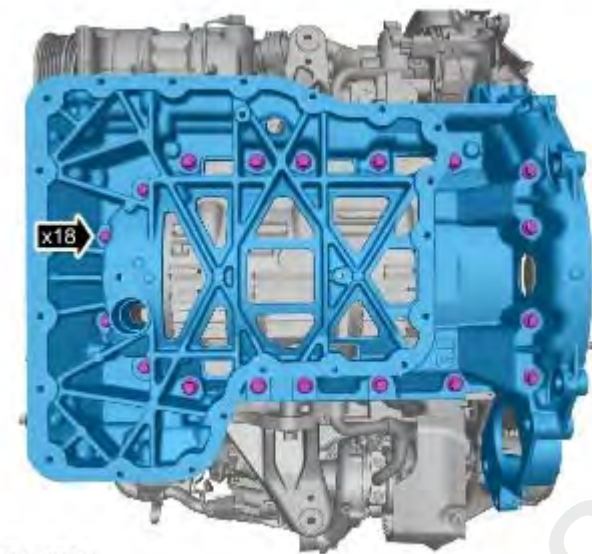
27. **27.** NOTE: Discard the gasket.

Installation

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

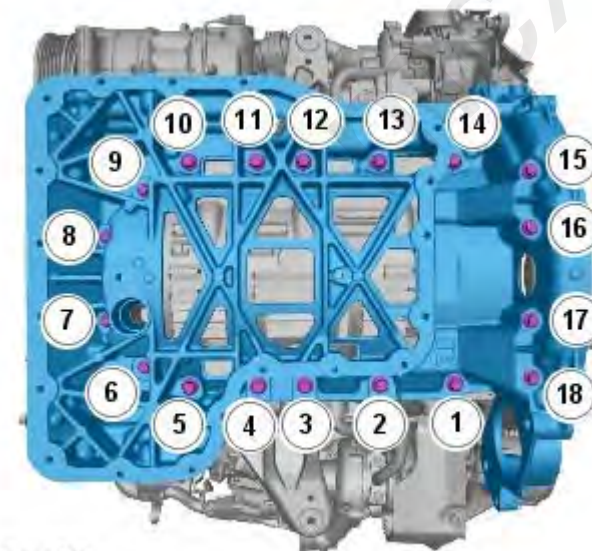


2. Apply the sealant as shown.



3.  CAUTION: Only tighten the bolt finger-tight at this stage.

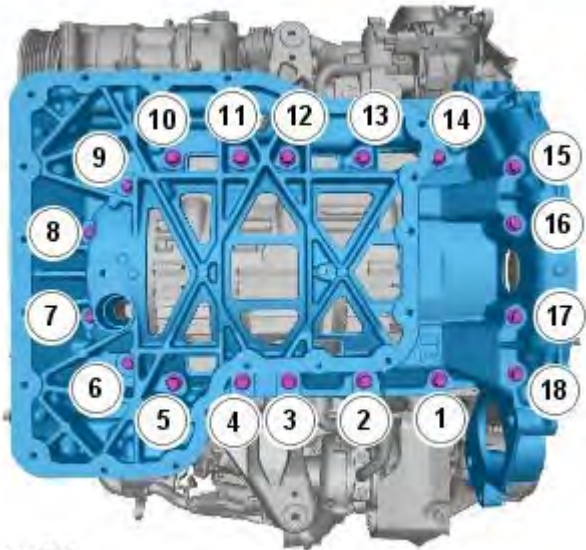
- NOTE: Install a new gasket.



4. **4.** NOTE: Tighten the bolts in the indicated sequence.

Torque:

M8 10 Nm
M6 4 Nm



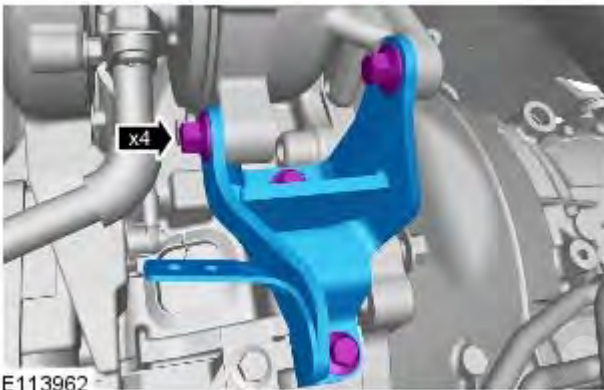
E116708

5. **5. NOTE:** Tighten the bolts in the indicated sequence.

Torque:

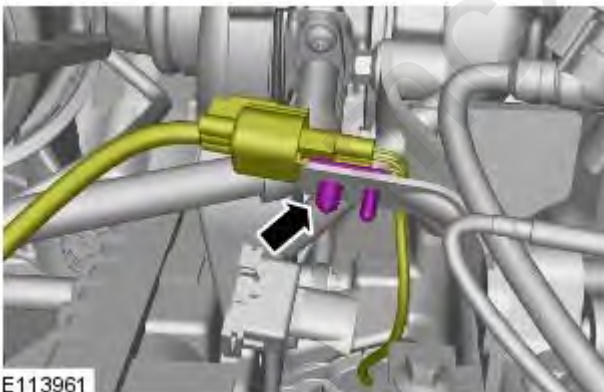
M8 24 Nm

M6 10 Nm



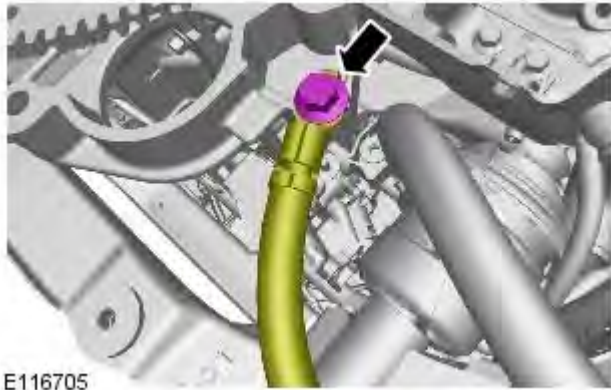
E113962

6. *Torque:* 24 Nm

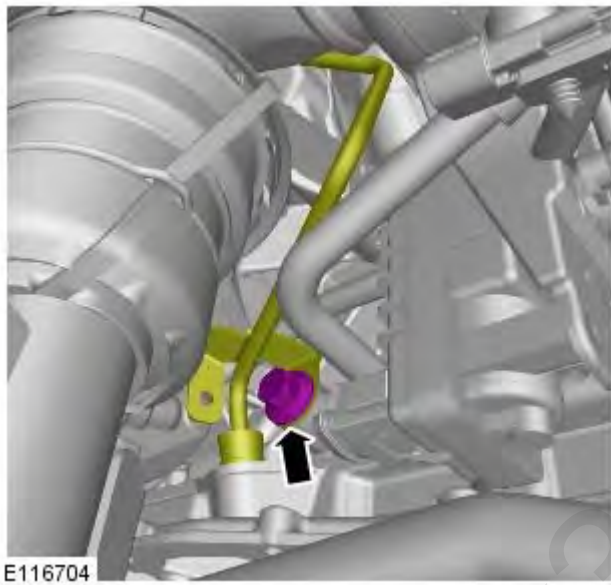


E113961

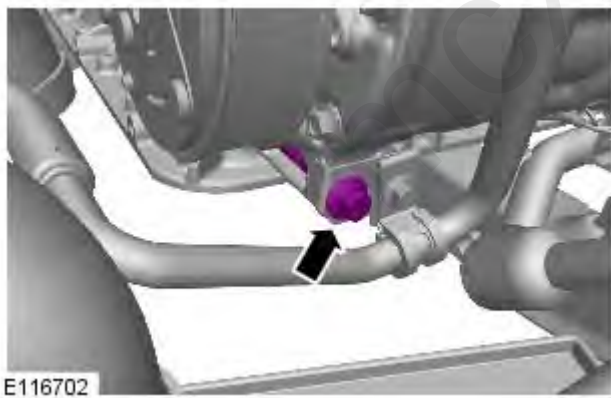
- 7.



8. Torque: 25 Nm



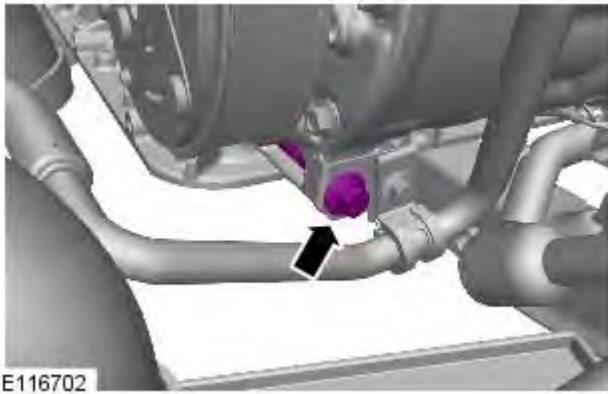
9. Torque: 24 Nm



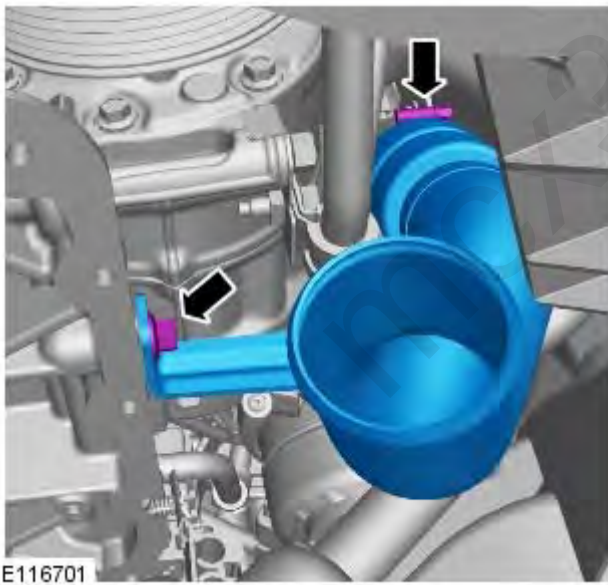
10. **10.**  **CAUTION:** Only tighten the bolts finger-tight at this stage.



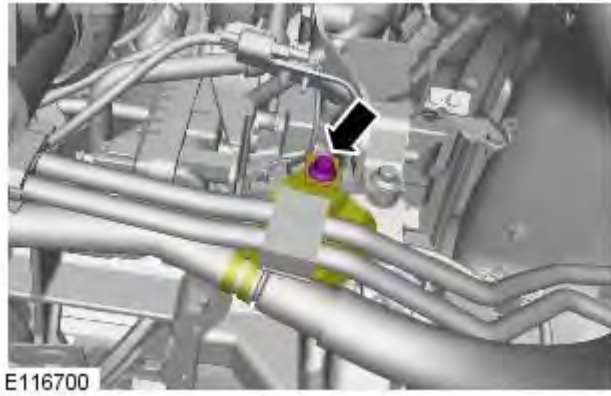
11. Torque: 24 Nm



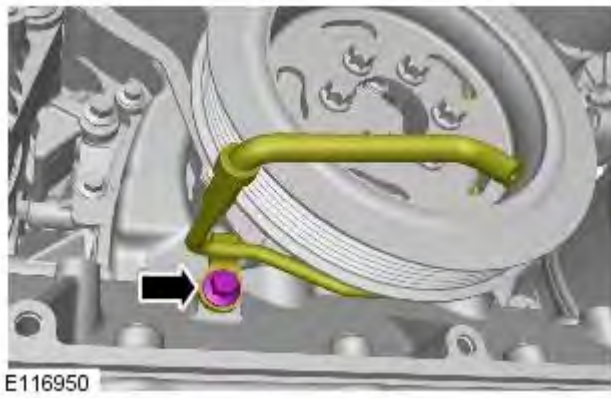
12. Torque: 24 Nm



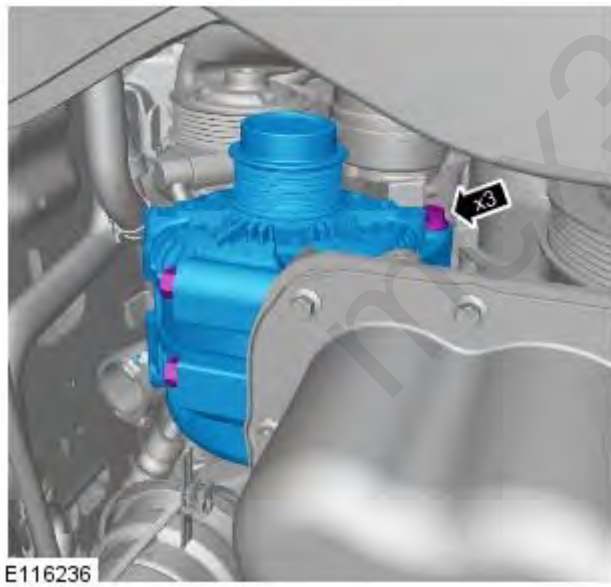
13. Torque:
M6 10 Nm
Clip 7 Nm



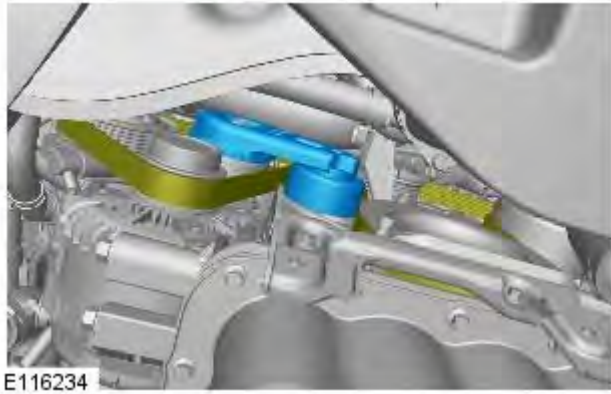
14. Torque: 10 Nm



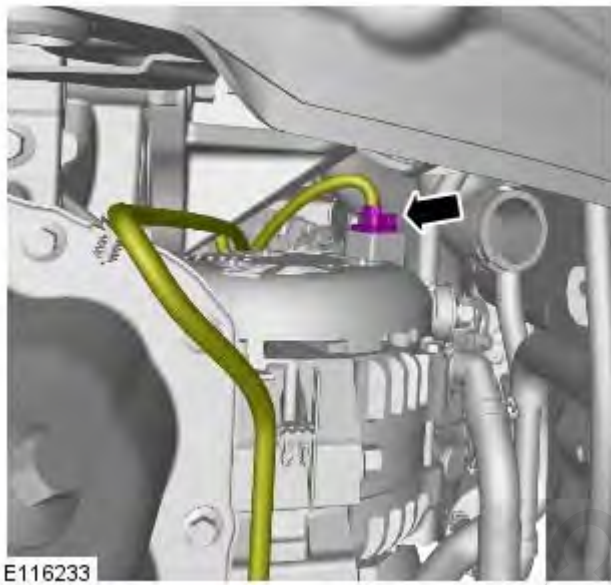
15. Torque: 10 Nm



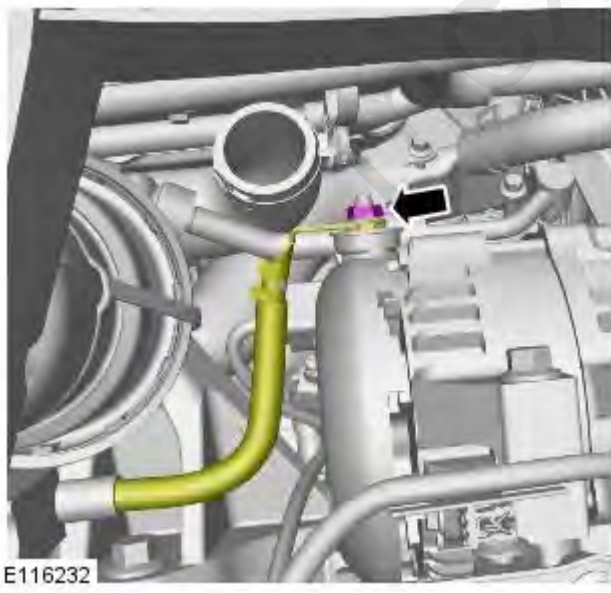
16. Torque: 47 Nm



17.

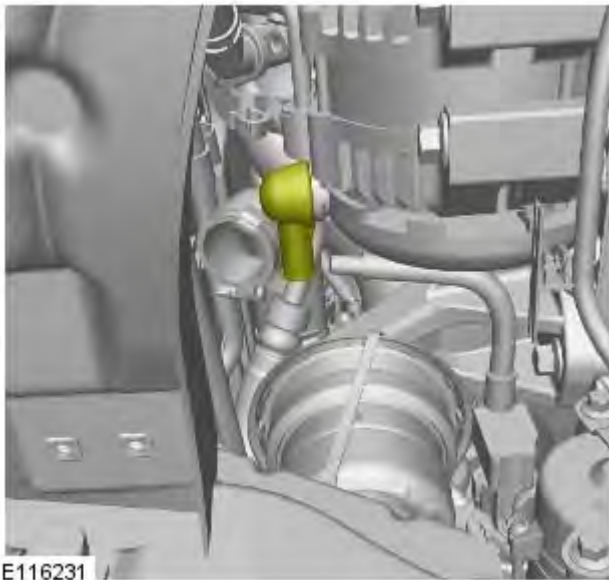


18.



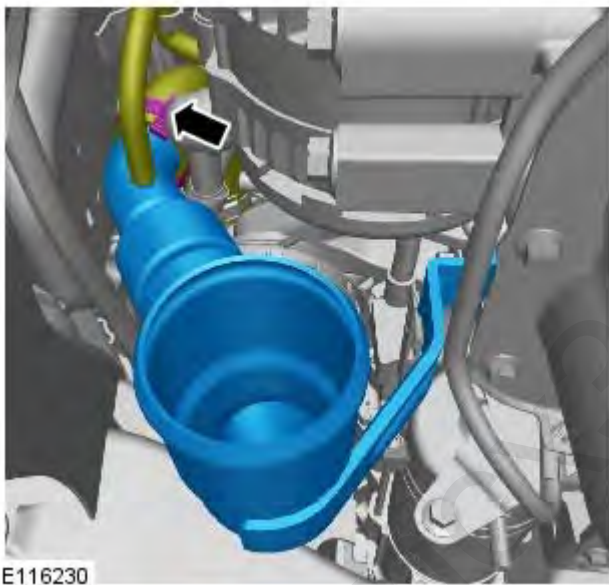
19. Torque: 15 Nm

20.

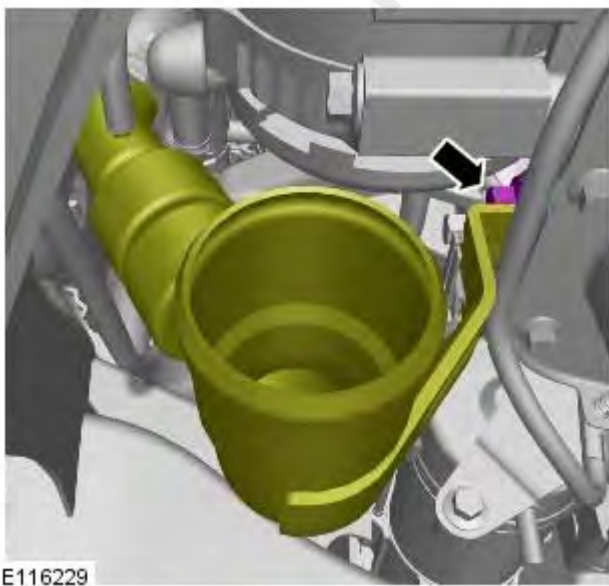


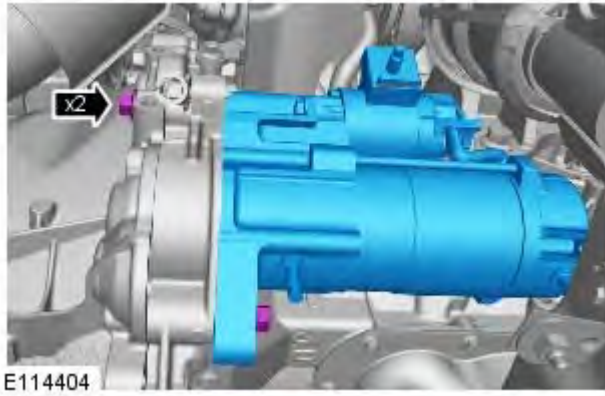
21. **21.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 7 Nm



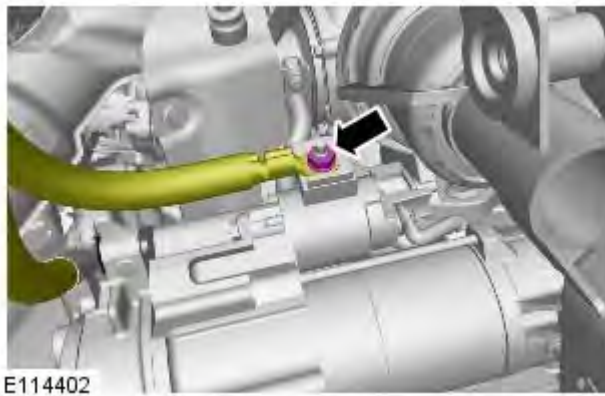
22. Torque: 10 Nm



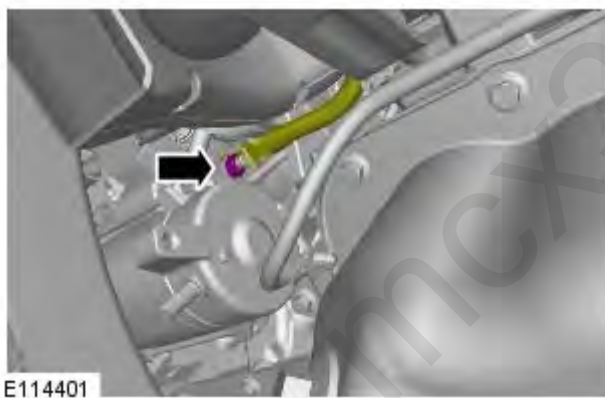


23. **23.** NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

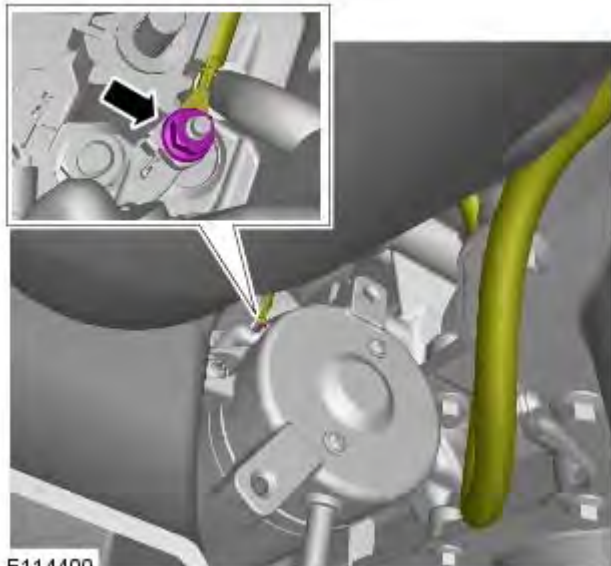
Torque: 48 Nm



24. *Torque:* 10 Nm

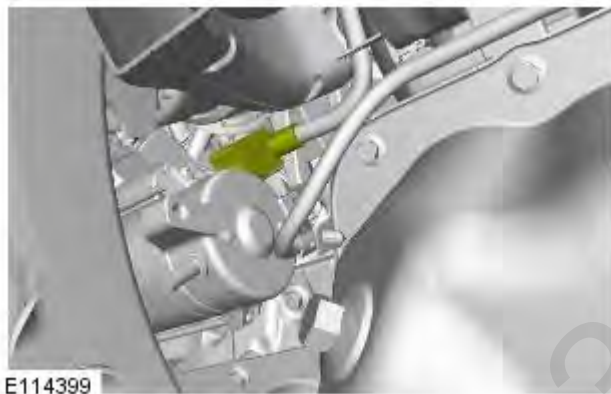


25. *Torque:* 10 Nm



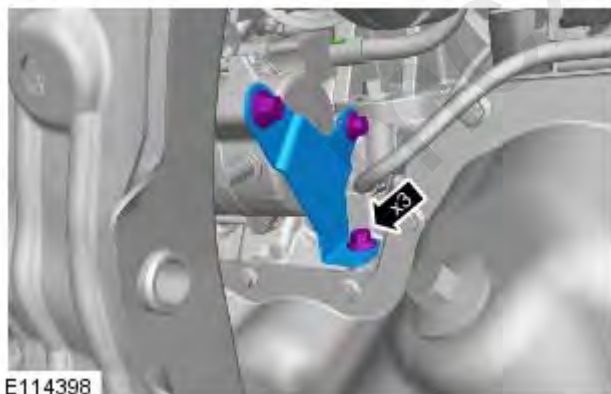
E114400

26. Torque: 7 Nm



E114399

27.



E114398

28. Torque: 23 Nm

29. Refer to: Transmission - 3.0L (307-01, Removal).

30. Refer to: [Oil Pan](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

31. Refer to: Battery Disconnect and Connect (414-01, General Procedures).

Engine - TDV6 3.0L Diesel - Oil Pump

Removal and Installation

Removal

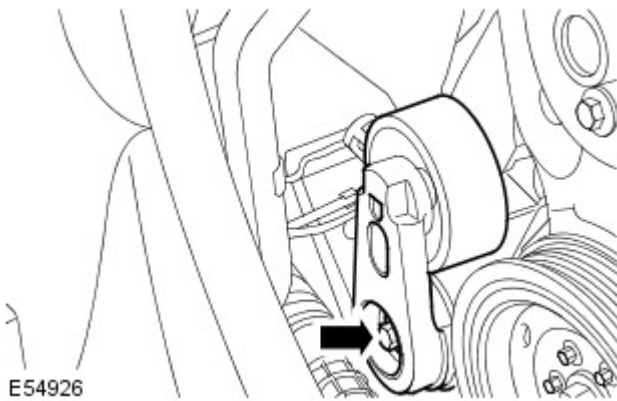
1. Disconnect the battery ground cable.

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

2. Remove the generator.

Refer to: [Generator](#) (414-02B Generator and Regulator - TDV6 3.0L Diesel, Removal and Installation).

3. Remove the accessory drive belt tensioner.

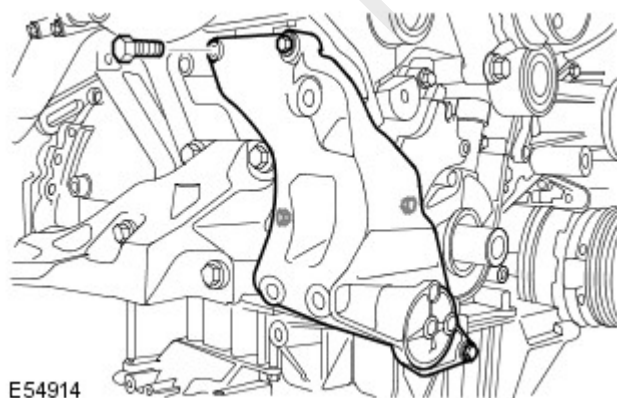


4. Remove the oil pan extension.

Refer to: [Oil Pan Extension](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

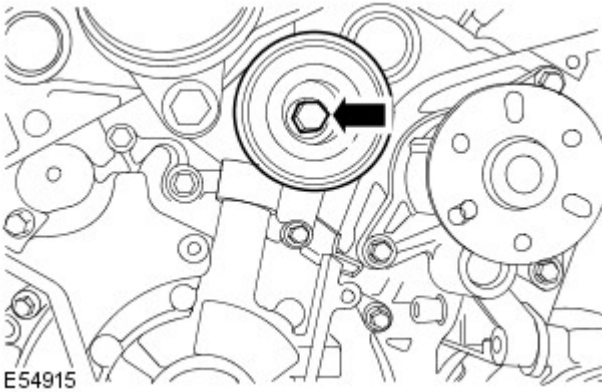
5. Remove the crankshaft front oil seal.

Refer to: [Crankshaft Front Seal](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).



6. Remove the generator mounting bracket.

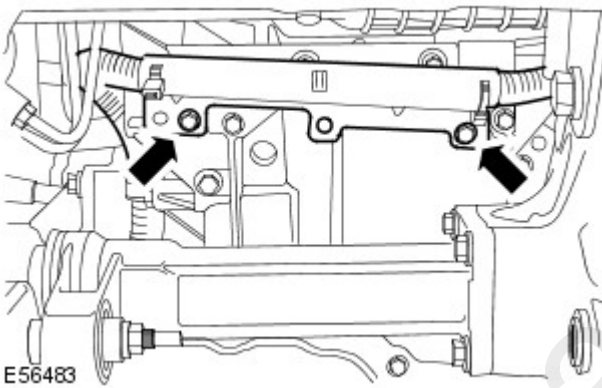
7. Remove the timing belt idler pulley.



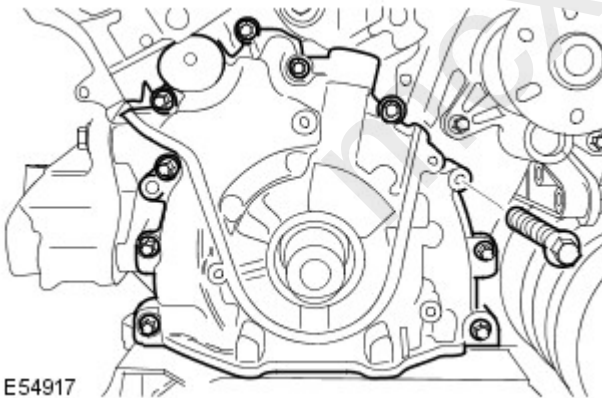
8.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

9. Release the battery positive cable.



10. Remove the oil pump.



Installation

1. Prime the oil pump.



E123911

2. **2. CAUTIONS:**

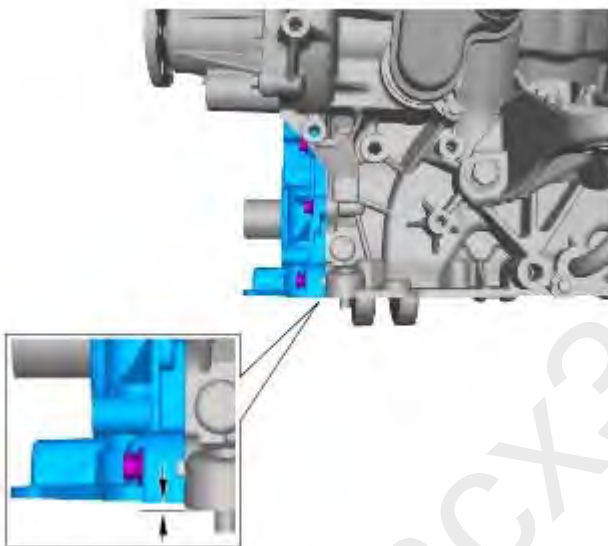


Make sure that the mating faces are clean and free of foreign material.



Make sure the gasket is installed correctly.

Install the oil pump.

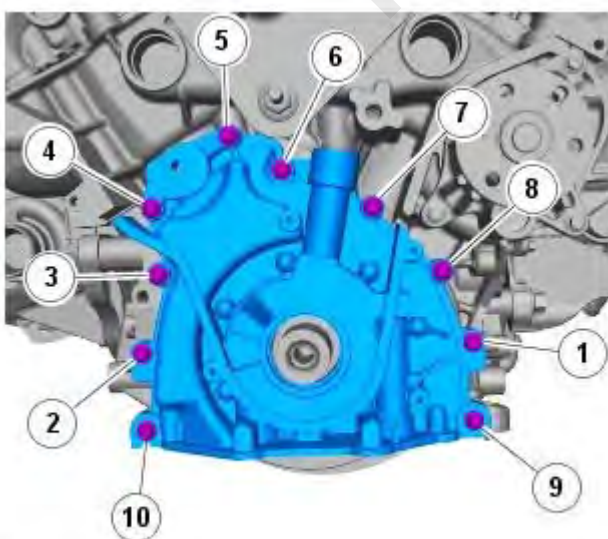


E123913

3.  **CAUTION:** Make sure the base of the oil pump is aligned within 0.2 mm of the base of the engine block. Failure to follow this instruction may result in damage to the vehicle.

- **NOTE:** Vehicles fitted with oil pumps without dowels.

Check the oil pump to engine block alignment.



E123912

4. Tighten the bolts in the sequence shown to 10 Nm .

5. Install the battery positive cable.

6. Install the timing belt idler pulley.

7. Install the crankshaft front oil seal.

Refer to: [Crankshaft Front Seal](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

8. Install the oil pan extension.

Refer to: [Oil Pan Extension](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

9. Install the generator mounting bracket.

10. Install the accessory drive belt tensioner.

11. Install the generator.

Refer to: [Generator](#) (414-02B Generator and Regulator - TDV6 3.0L Diesel, Removal and Installation).

12. Connect the battery ground cable.

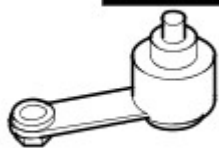
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

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Engine - TDV6 3.0L Diesel - Timing Belt

Removal and Installation

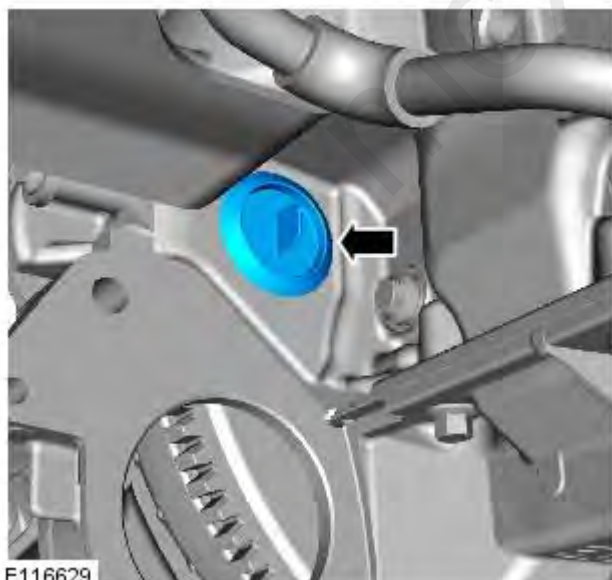
Special Tool(s)

 303-1117 E54540	303-1117 Timing Peg, Automatic Transmission
 303-1126 E54551	303-1126 Timing Peg, Camshaft Pulley

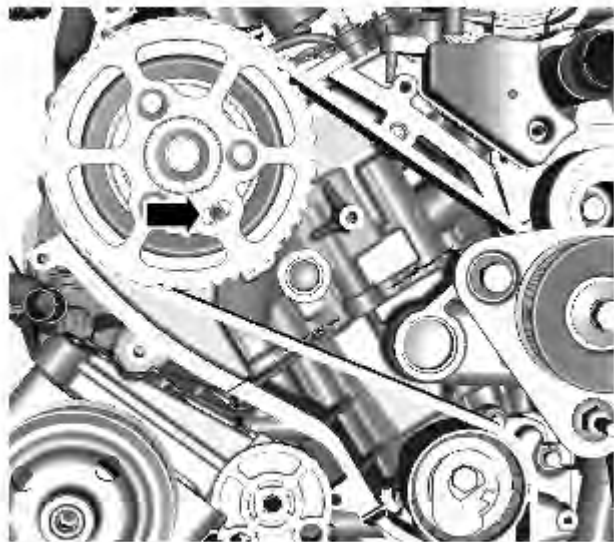
Removal

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Starter Motor](#) (303-06D Starting System - V8 5.0L Petrol, Removal and Installation).

4.

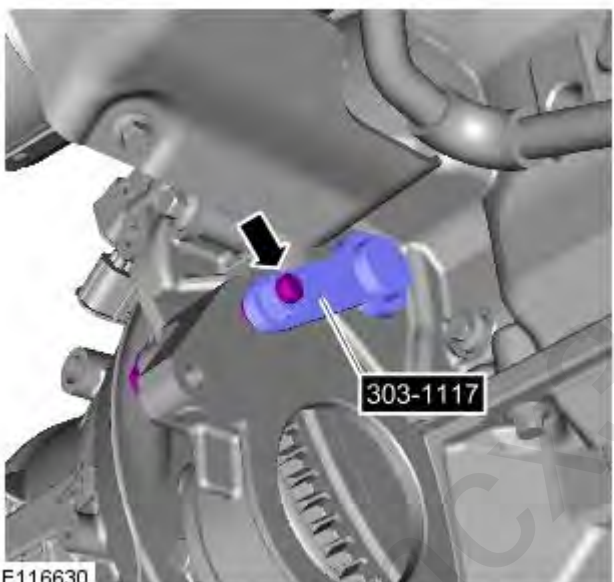


5. Rotate the crankshaft clockwise to align the crankshaft alignment hole in the flywheel or flexplate with the block aperture.



E116840

6. Check the camshaft pulley alignment holes are correctly aligned. If the alignment holes are not aligned, rotate the crankshaft one full turn clockwise.



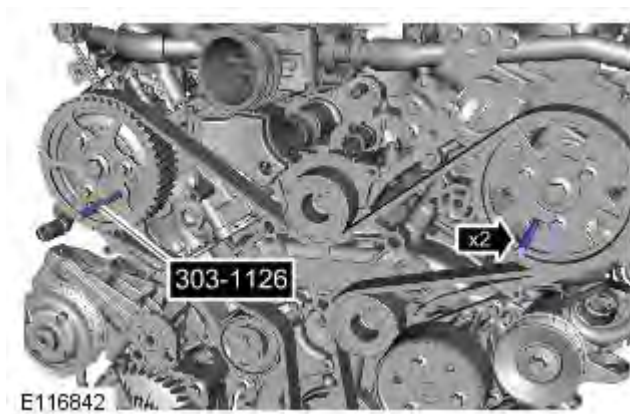
E116630

7. *Special Tool(s):* [303-1117](#)

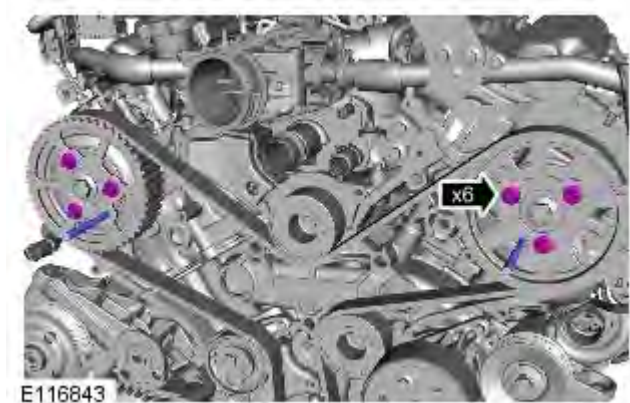


E116841

- 8.

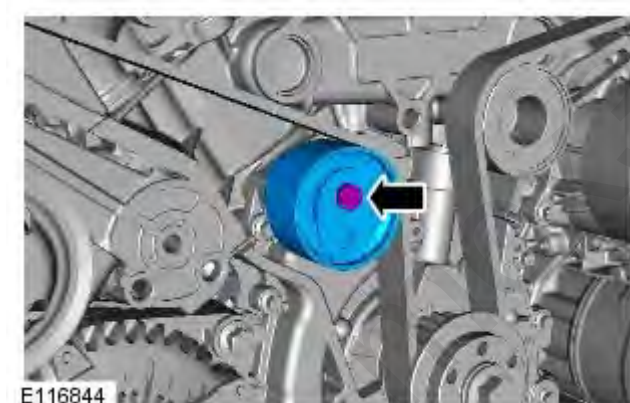


9. Special Tool(s): [303-1126](#)



10. **CAUTION:** Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.

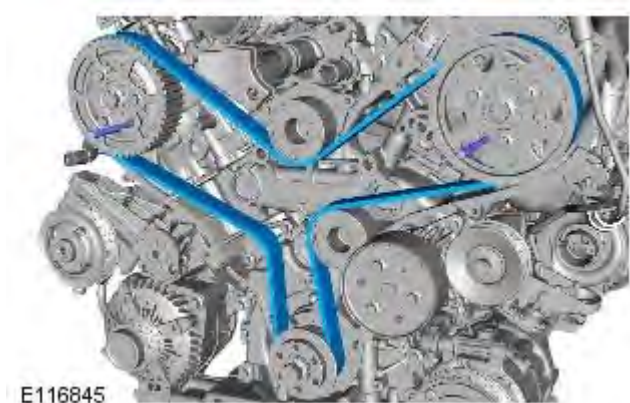
- NOTE: Do not loosen the bolts more than 2 turns.



11. **CAUTIONS:**

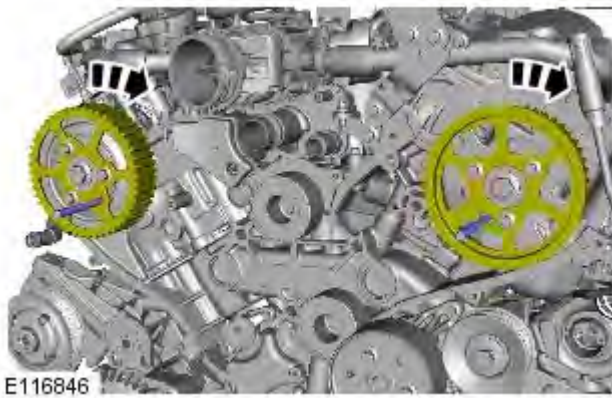
CAUTION: Discard the component.

CAUTION: Discard the bolt.

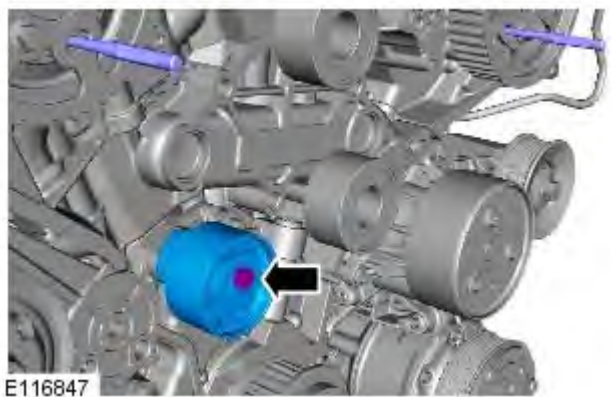


12. **CAUTION:** Discard the component.

Installation



1.



2. **CAUTIONS:**



Make sure that a new bolt is installed.

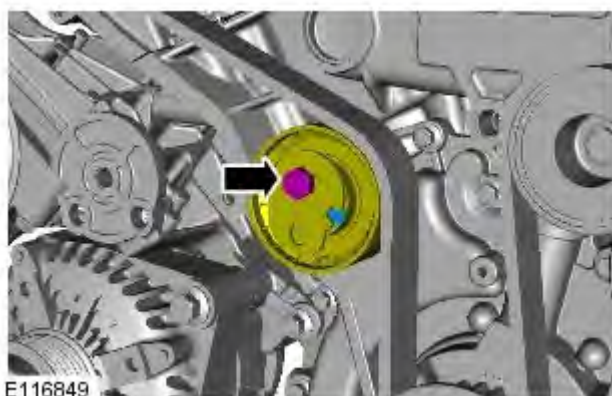


Only tighten the bolts finger-tight at this stage.



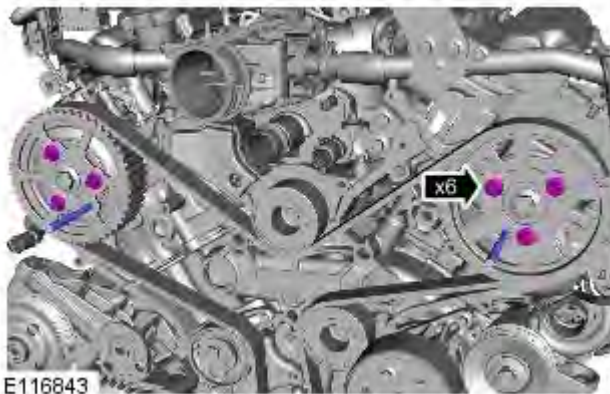
3. **CAUTION:** Make sure the camshaft pulleys remain in the clockwise position.

- Install the new timing belt.
- Starting at the crankshaft pulley, install the timing belt in a counter-clockwise direction, in the sequence shown.
- Stage one: Attach the timing belt to the crankshaft pulley.
- Stage two: Attach the timing belt to the idler pulley.
- Stage three: Attach the timing belt to the left-hand camshaft pulley.
- Stage four: Attach the timing belt to the idler pulley.
- Stage five: Attach the timing belt to the RH camshaft pulley.
- Stage six: Attach the timing belt to the timing belt tensioner.

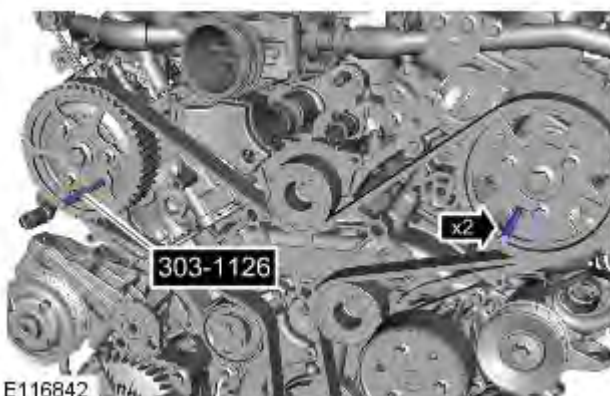


4. **CAUTION:** Make sure the timing belt tensioner window is aligned with the groove as illustrated.

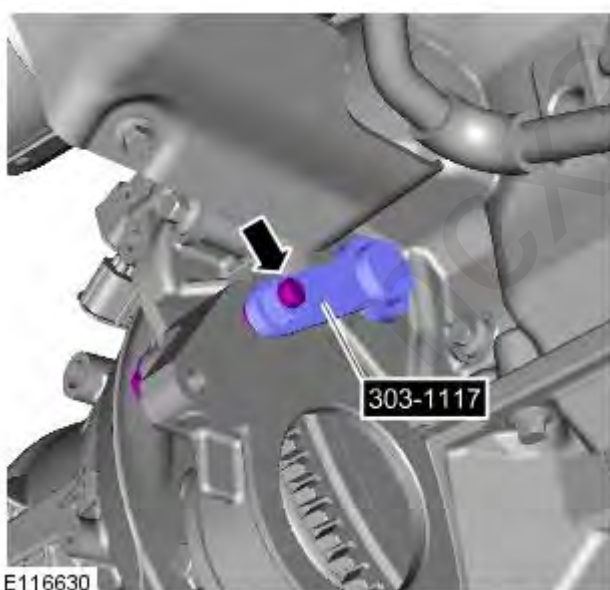
- Tension the timing belt.
- Rotate the tensioner assembly counter-clockwise.
- Torque: 26 Nm



5.  **CAUTION:** Do not use the special tools to lock the camshafts. Failure to follow this instruction may result in damage to the engine or the special tools.
 - Using a suitable tool, counterhold the camshaft pulley center retaining bolts.
 - *Torque:* 23 Nm

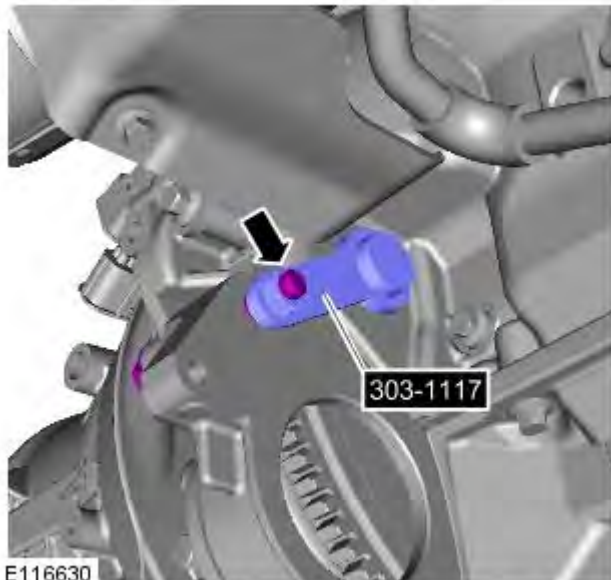


6. *Special Tool(s):* [303-1126](#)

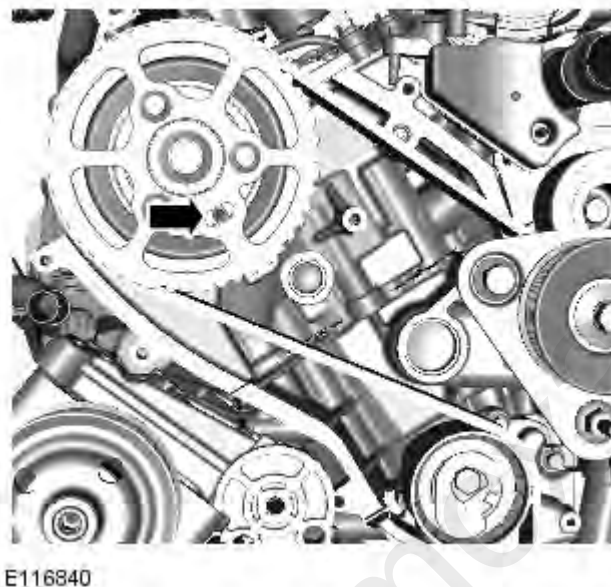


7. *Special Tool(s):* [303-1117](#)

8.  **CAUTION:** Only rotate the crankshaft clockwise.
Rotate the engine two complete turns clockwise.

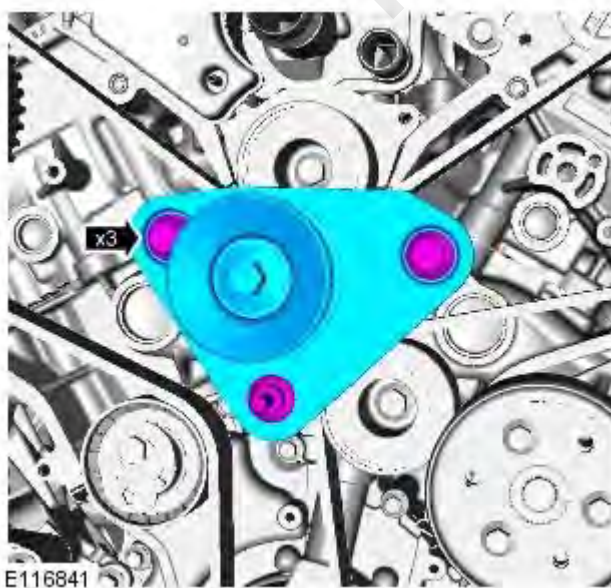


9. *Special Tool(s):* [303-1117](#)



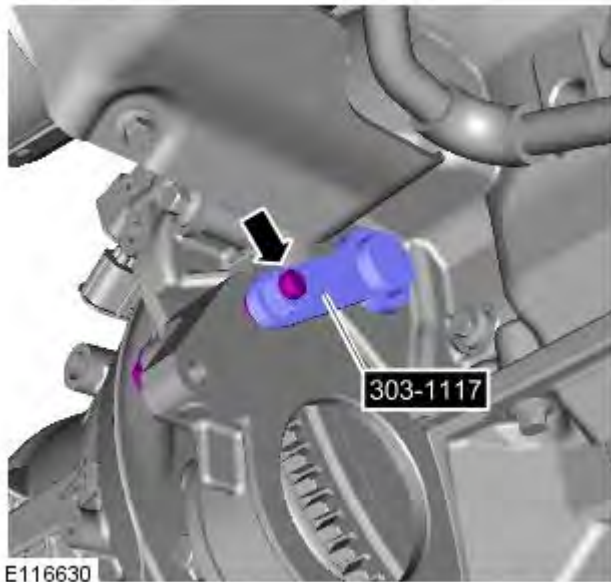
10.

- Install the special tools to the exhaust camshaft pulleys.
- If the special tool does not fit correctly, repeat the timing belt installation procedure.
- Remove the special tools from the camshaft pulleys.

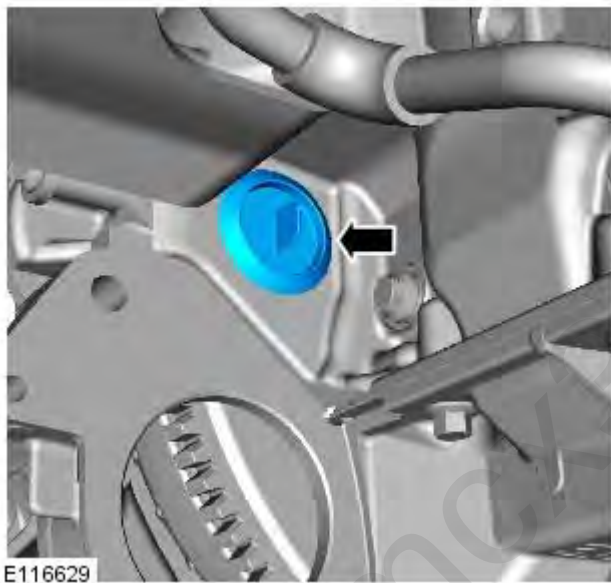


11. *Torque:* 80 Nm

12. Special Tool(s): [303-1117](#)



13.



14. Refer to: [Starter Motor](#) (303-06D Starting System - V8 5.0L Petrol, Removal and Installation).

15. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

Engine - TDV6 3.0L Diesel - Timing Cover

Removal and Installation

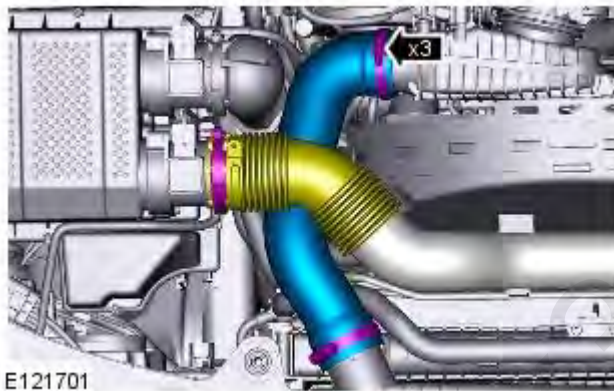
Removal

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

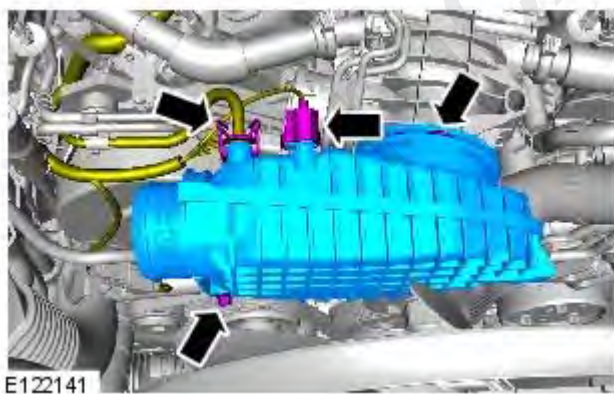
1. Disconnect the battery ground cable.

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

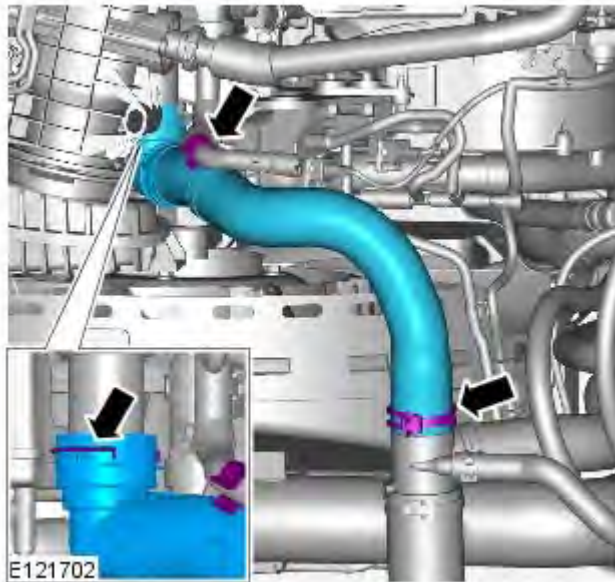
2. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).
3. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Refer to: [Cooling Fan](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).



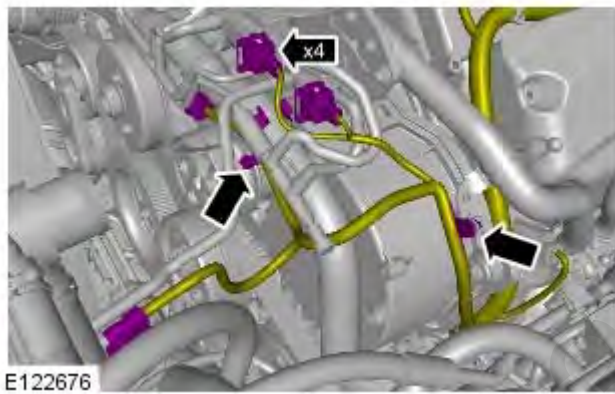
5.



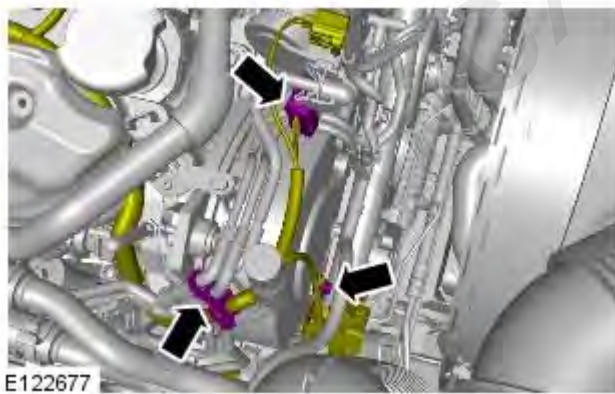
6. Torque: 10 Nm



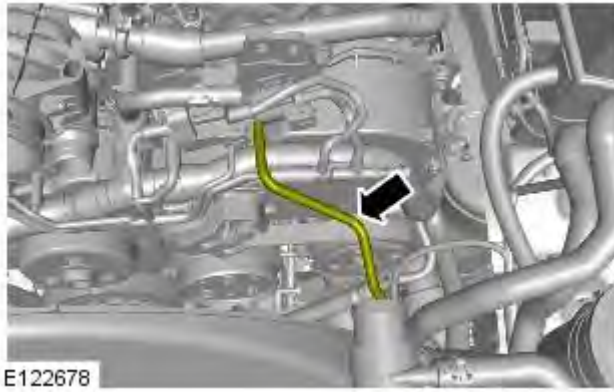
7.



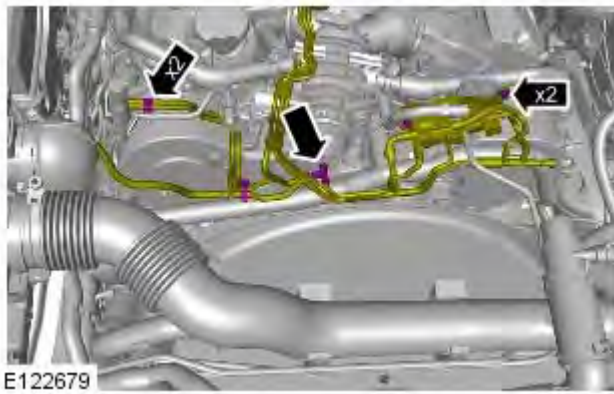
8.



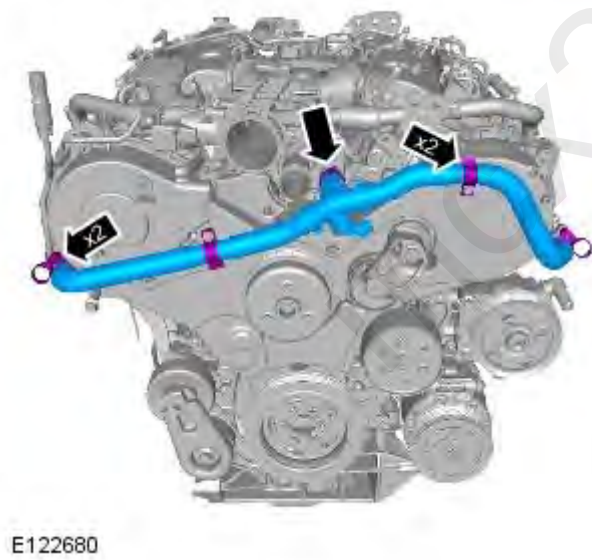
9. Torque: 3 Nm



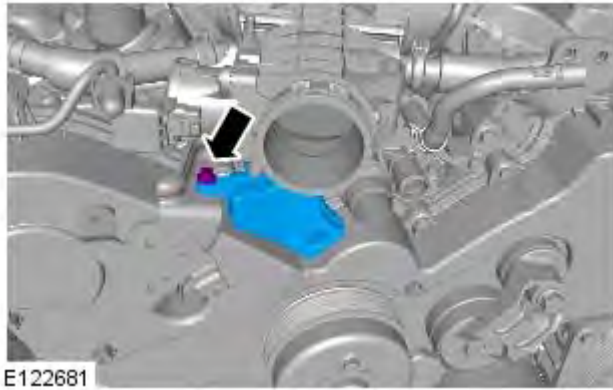
10.



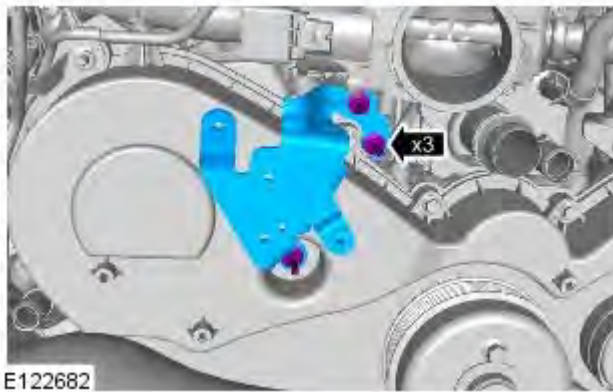
11. Torque: 8 Nm



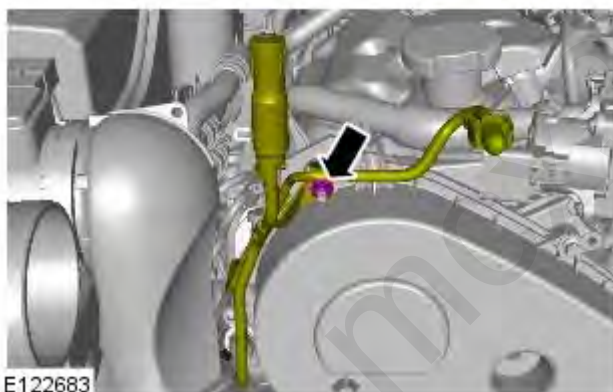
12. **12.** NOTE: Engine shown removed for clarity.



13. Torque: 8 Nm



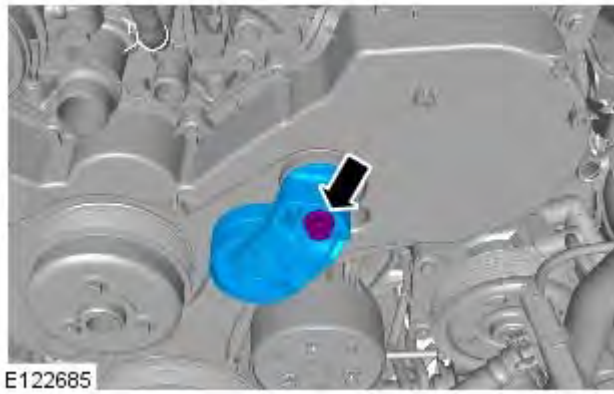
14. Torque: 8 Nm



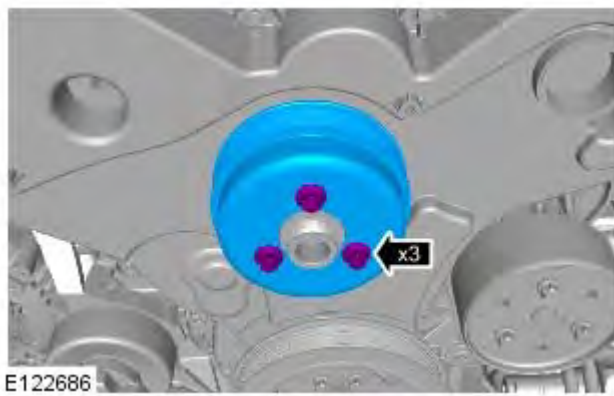
15. Torque: 8 Nm



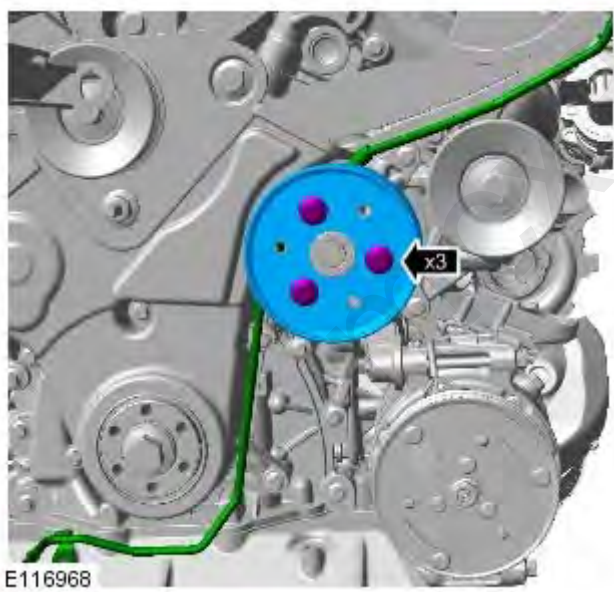
16. Torque: 5 Nm



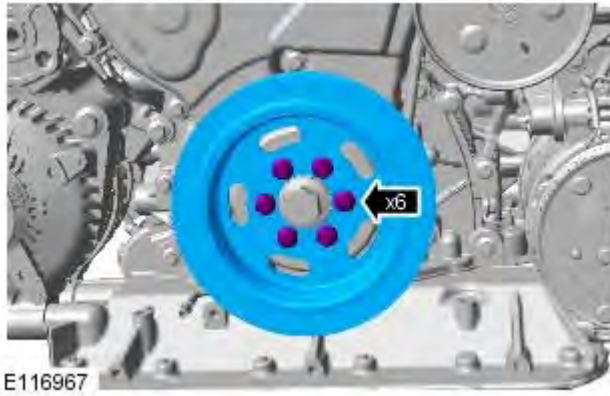
17. Torque: 47 Nm



18. Torque: 24 Nm



19. Torque: 24 Nm



20. Torque: 25 Nm



21. **21.** NOTE: Engine shown removed for clarity.

Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

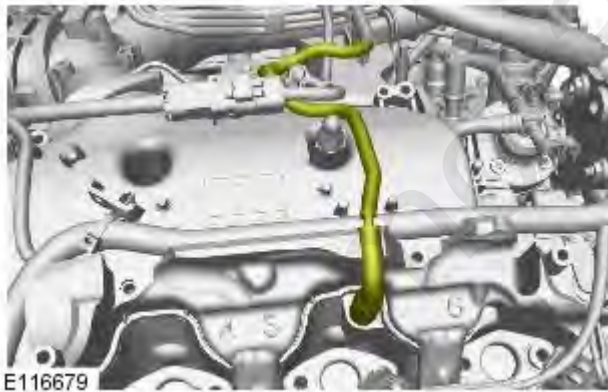
Engine - TDV6 3.0L Diesel - Valve Cover LH

Removal and Installation

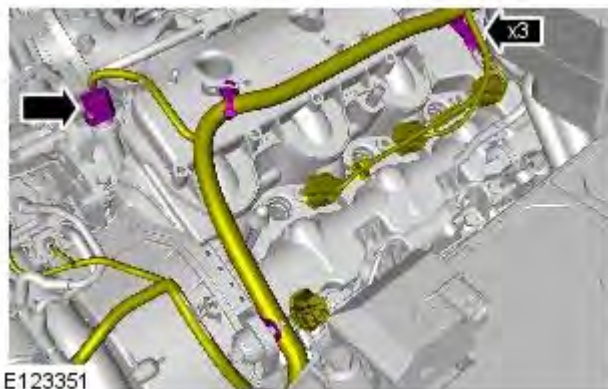
Removal

1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).
4. Refer to: [Accessory Drive Belt](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
5. Refer to: [Fuel Rail LH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
6. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
7. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
8. Refer to: [Fuel Injectors LH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

9.

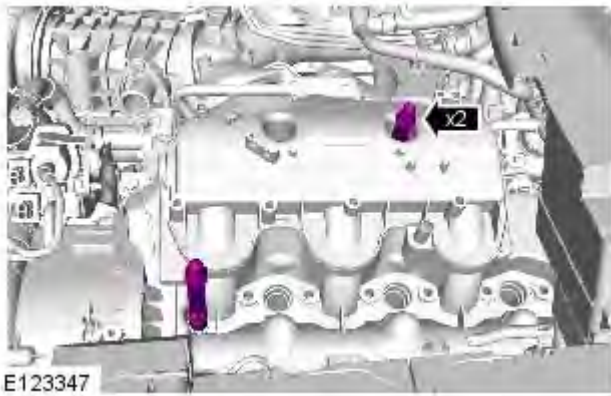


10.

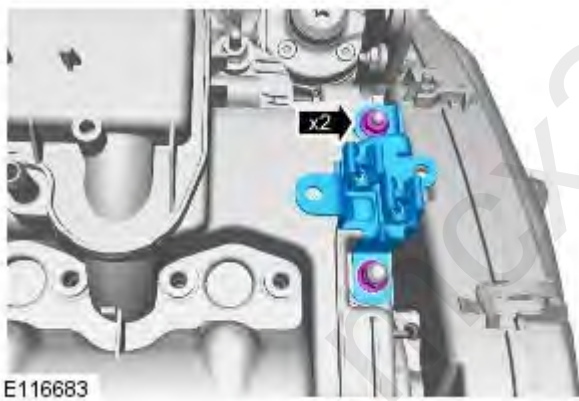




11.



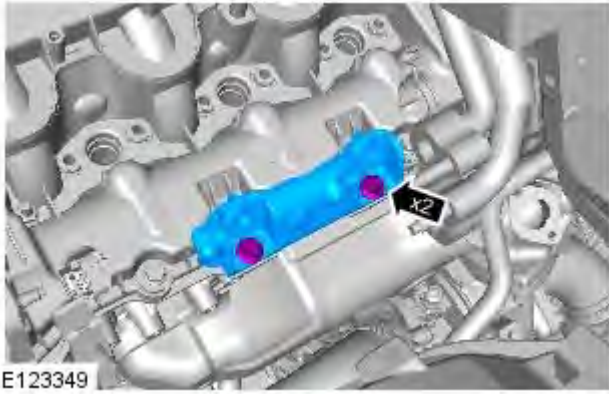
12.



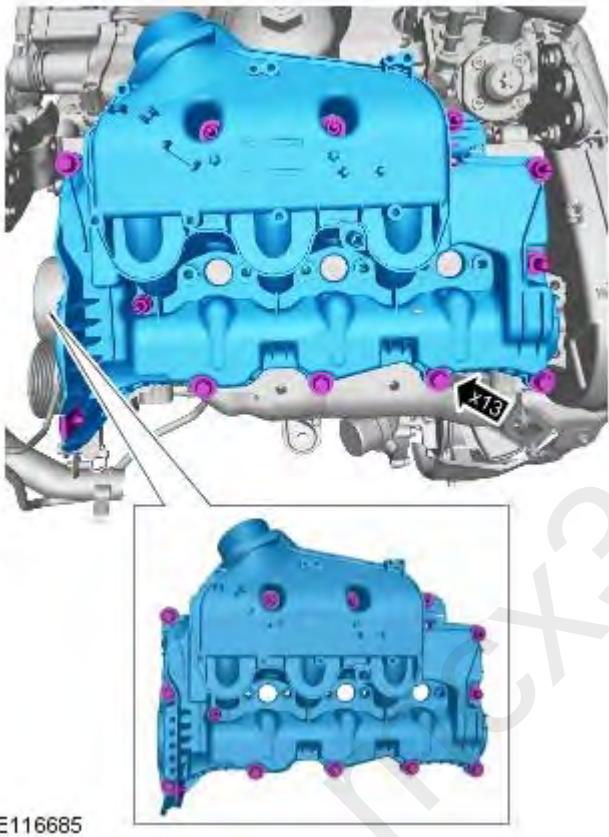
13.



14.

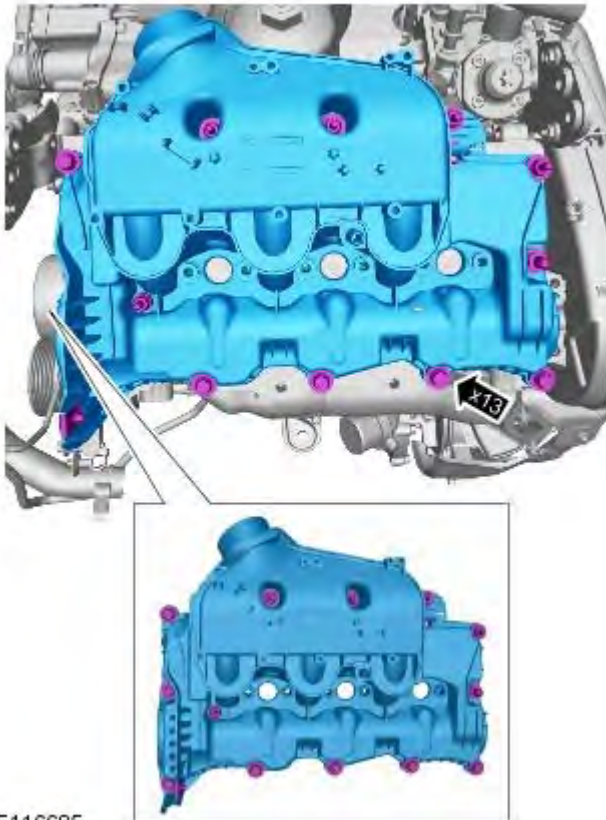


15.



16. **16.**  **CAUTION:** Make sure that the mating faces are clean and free of corrosion and foreign material.
- NOTE: Discard the gasket.
 - NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation



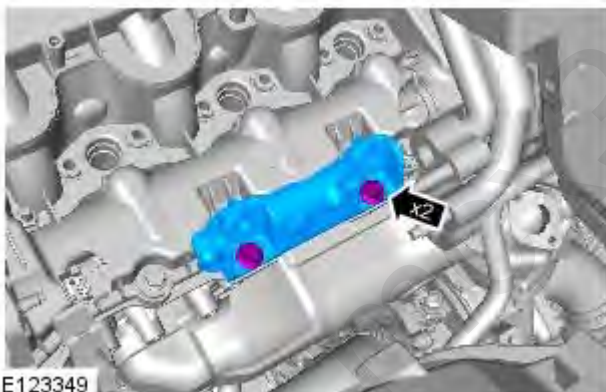
1. **1. CAUTIONS:**

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

 Install all the bolts finger tight before final tightening.

• NOTE: Install a new gasket.

Torque: 10 Nm

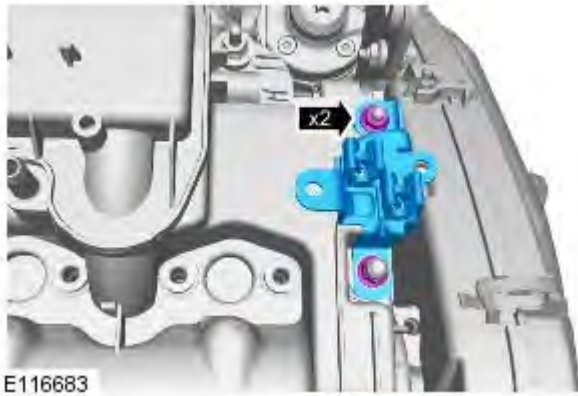


2. Torque: 23 Nm

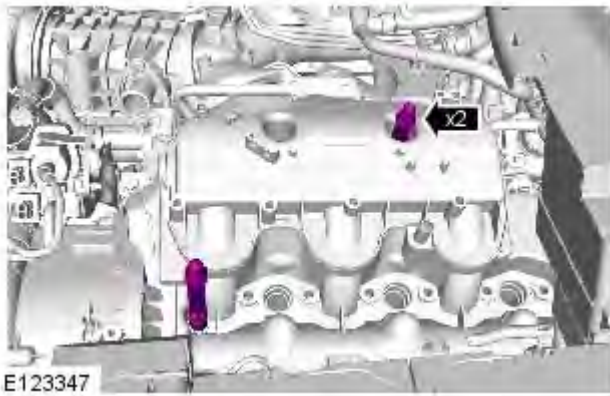
3.



4. Torque: 10 Nm



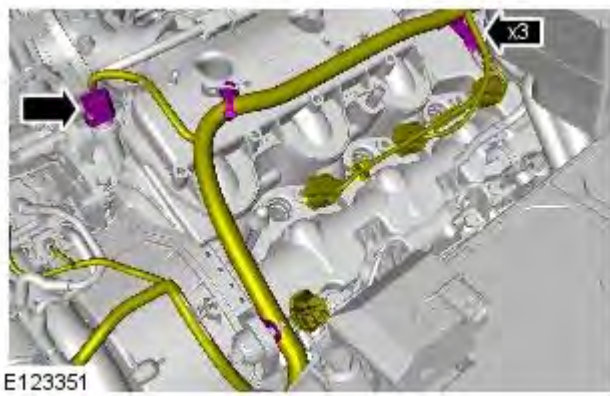
5. Torque: 5 Nm

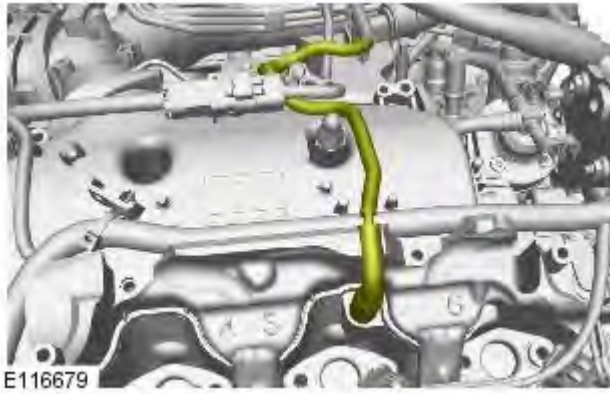


6.



7.





8.

9. Refer to: [Fuel Injectors LH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
10. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
11. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
12. Refer to: [Fuel Rail LH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
13. Refer to: [Accessory Drive Belt](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
14. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, General Procedures).
15. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
16. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

Engine - TDV6 3.0L Diesel - Valve Cover RH

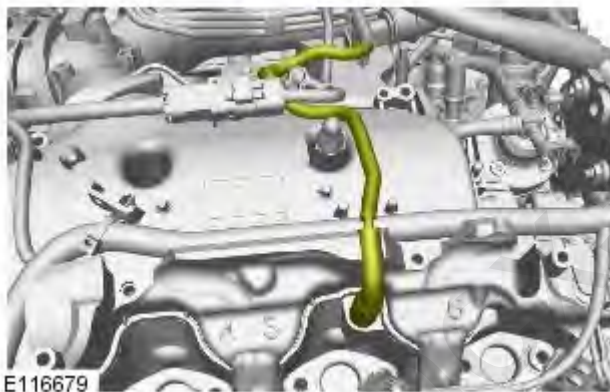
Removal and Installation

Removal

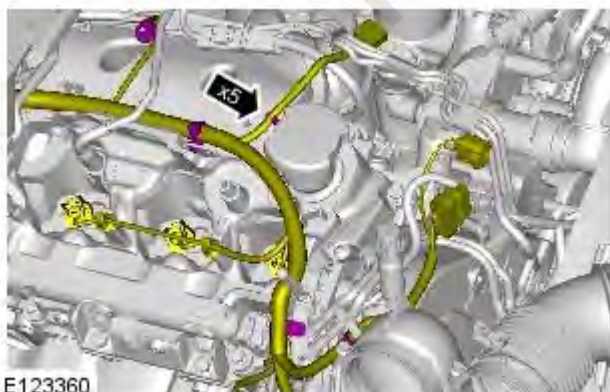
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).
2. Refer to: [Accessory Drive Belt](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Fuel Rail RH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
4. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
5. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
6. Refer to: [Fuel Injectors RH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).

7.



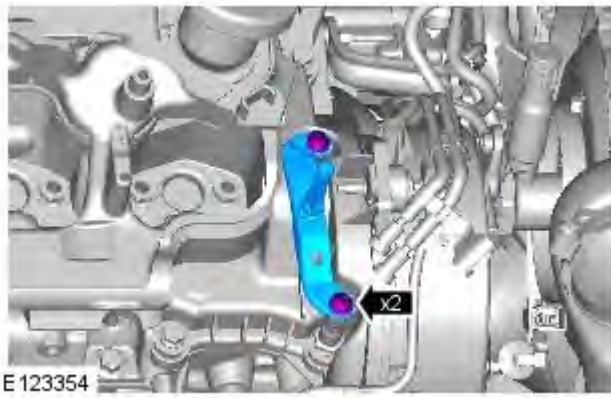
8.



9.



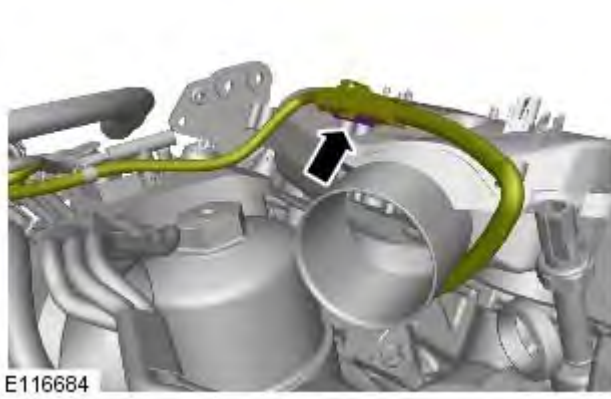
10.

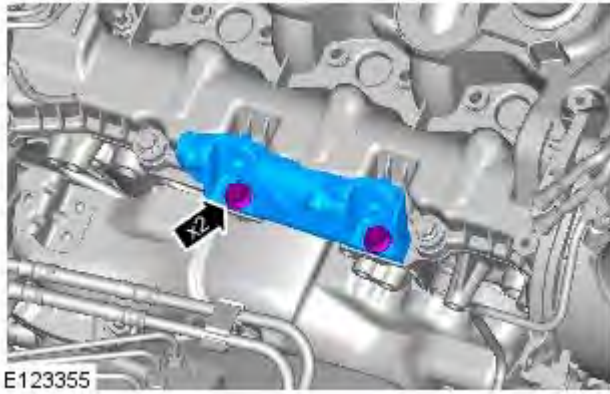


11.

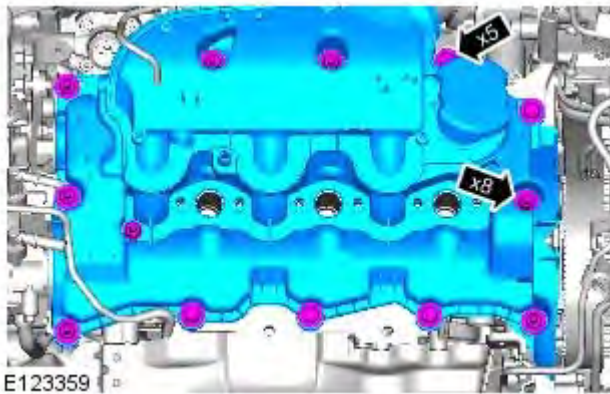


12.



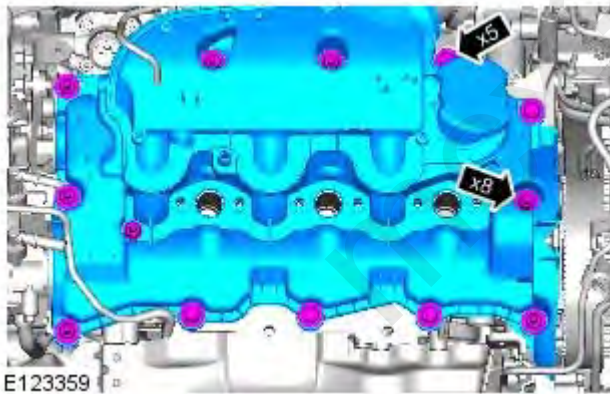


13.



14. **14.**  **CAUTION:** Make sure that the mating faces are clean and free of corrosion and foreign material.
- **NOTE:** Discard the gasket.

Installation



1. **1.** **CAUTIONS:**



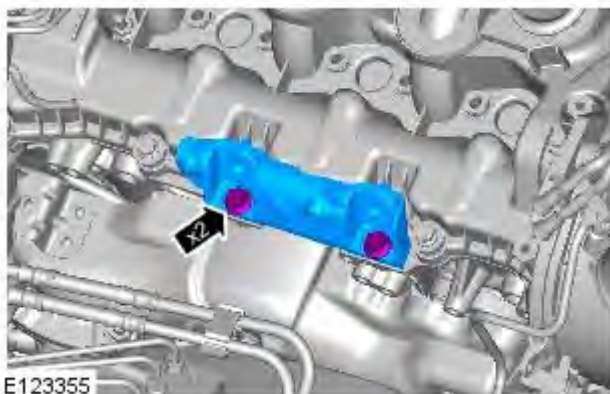
Make sure that the mating faces are clean and free of corrosion and foreign material.



Install all the bolts finger tight before final tightening.

- **NOTE:** Install a new gasket.

Torque: 10 Nm

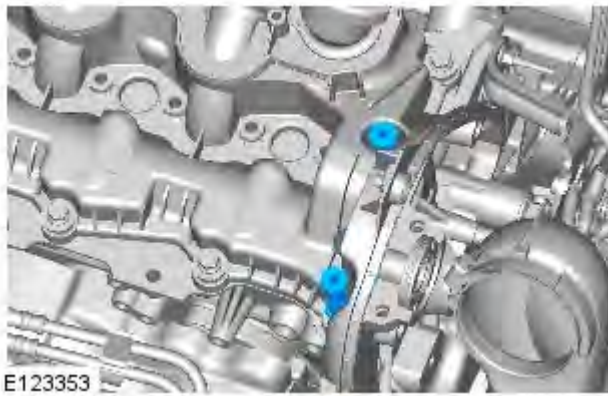


2. **Torque:** 23 Nm

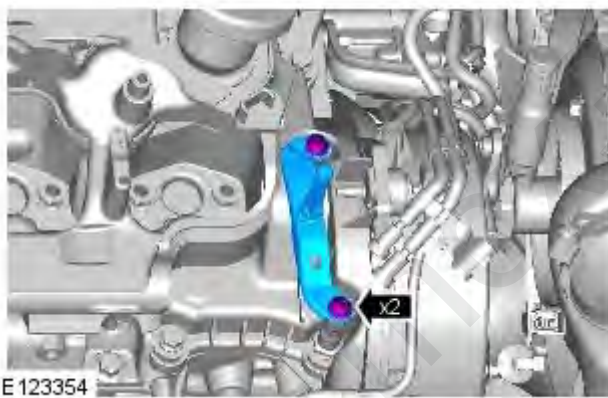
3.



4. Torque: 7 Nm

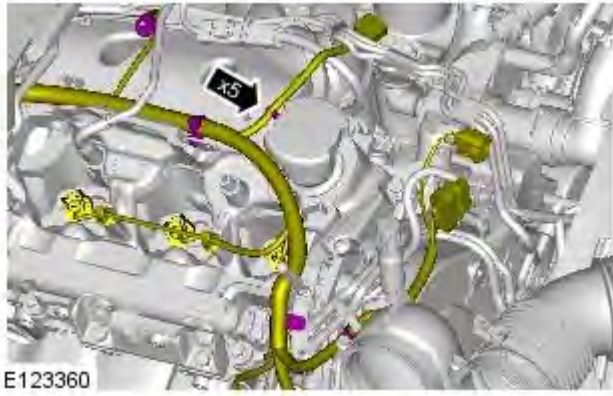


5. Torque: 7 Nm

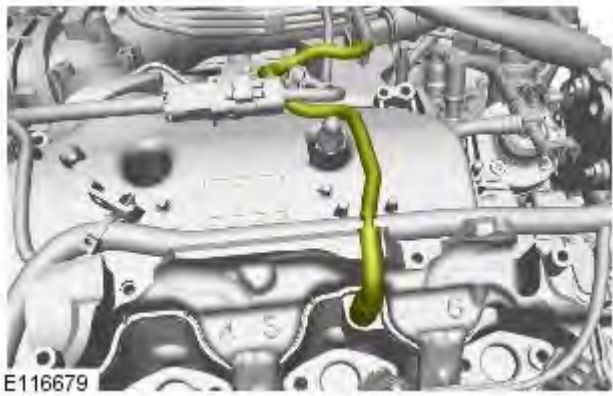


6.





7.



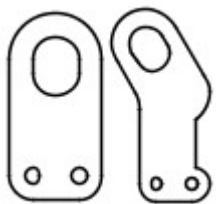
8.

9. Refer to: [Fuel Injectors RH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
10. Refer to: [Timing Cover](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).
11. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
12. Refer to: [Fuel Rail RH](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
13. Refer to: [Accessory Drive Belt](#) (303-05B Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
14. Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

Engine - TDV6 3.0L Diesel - Engine

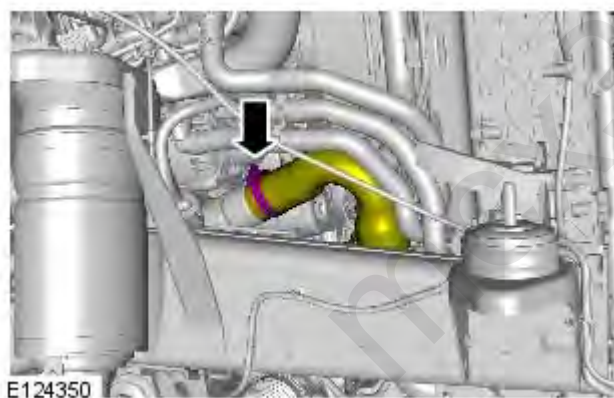
Removal

Special Tool(s)

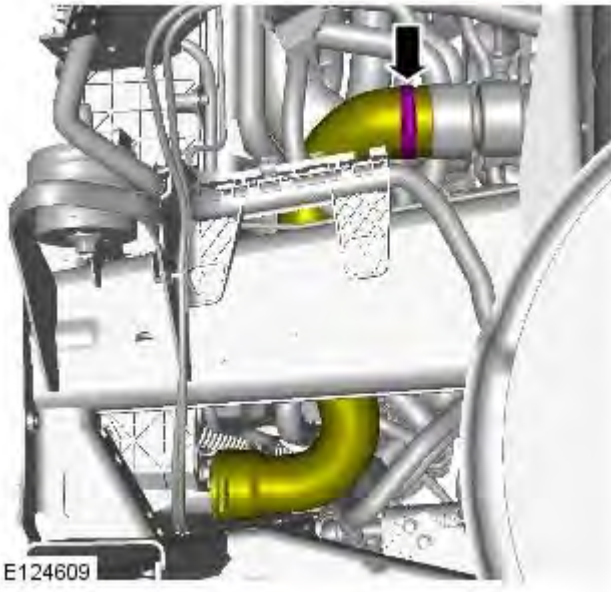
 E54554	303-1129 Engine Lifting Brackets
 E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

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

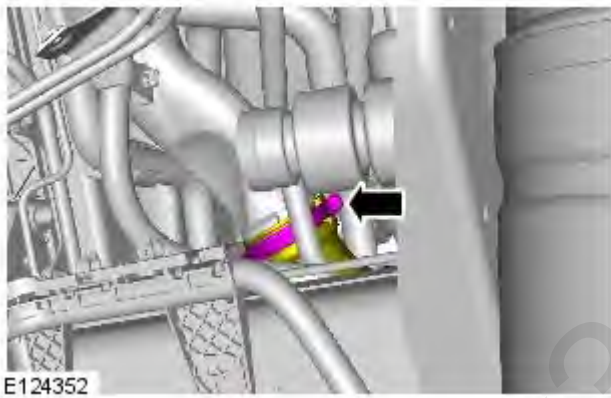
1. Refer to: [Body - TDV6 3.0L Diesel/TDV6 2.7L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
2. Refer to: [Cooling Fan](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).



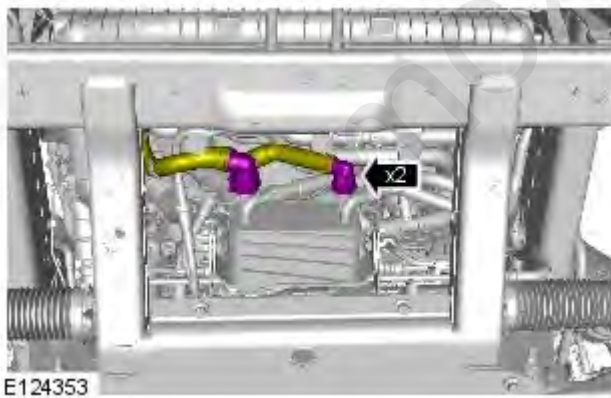
3.  CAUTION: Make sure that all openings are sealed. Use new blanking caps.



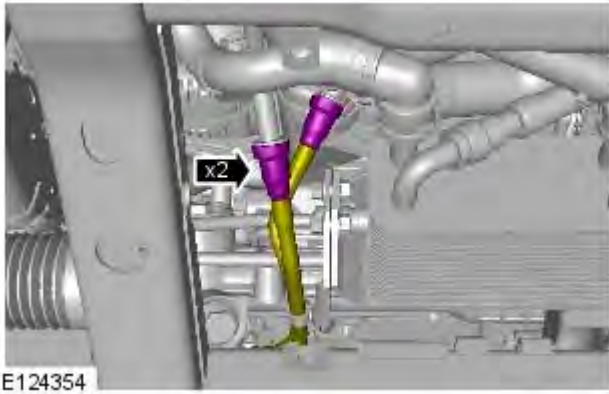
4.  CAUTION: Make sure that all openings are sealed. Use new blanking caps.



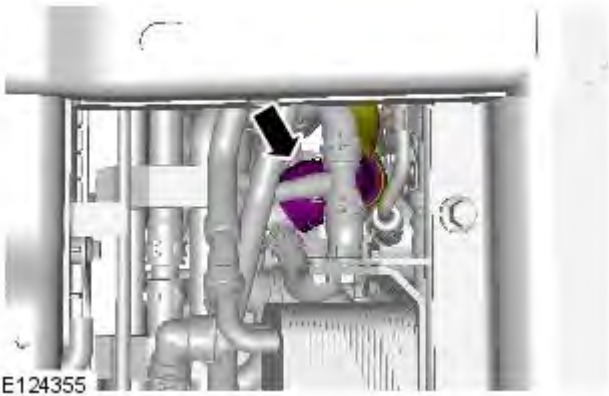
5.  CAUTION: Make sure that all openings are sealed. Use new blanking caps.



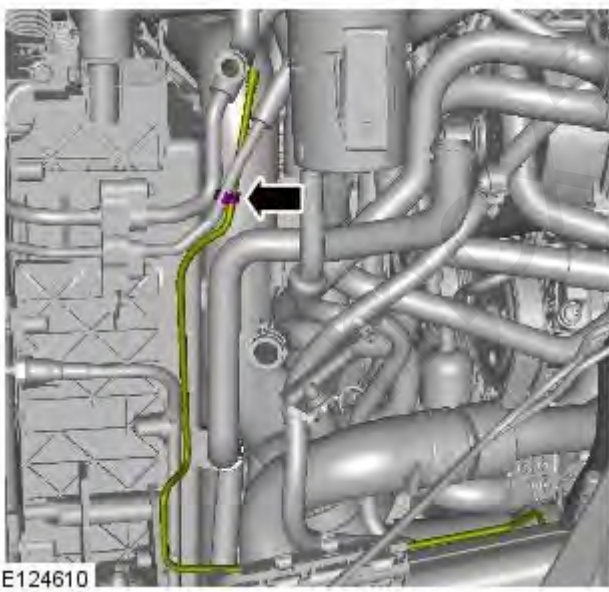
6.  CAUTION: Be prepared to collect escaping coolant.



7.  CAUTION: Be prepared to collect escaping coolant.

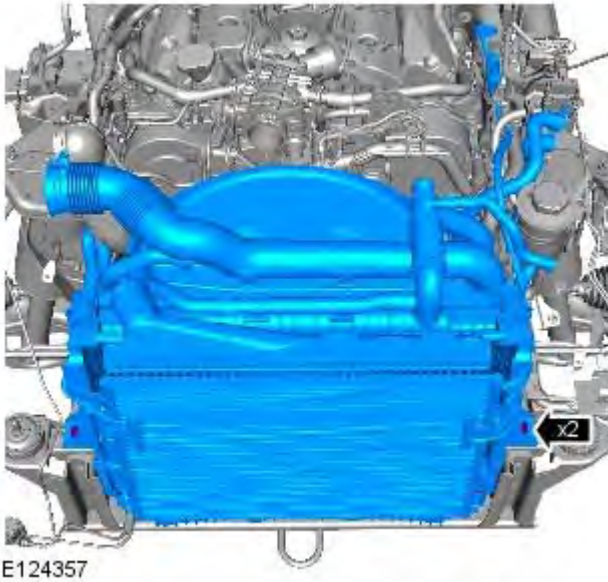


8.  CAUTION: Be prepared to collect escaping coolant.



- 9.

10.



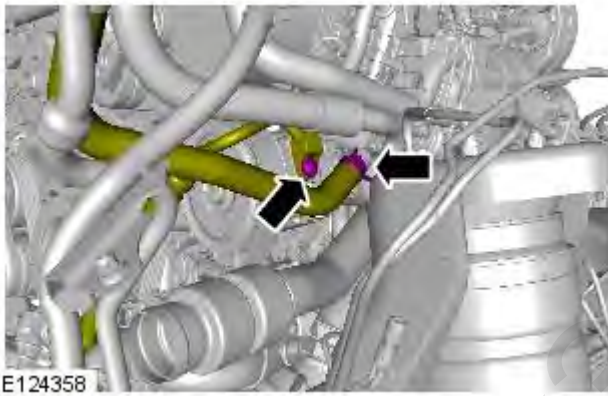
11. **11. CAUTIONS:**



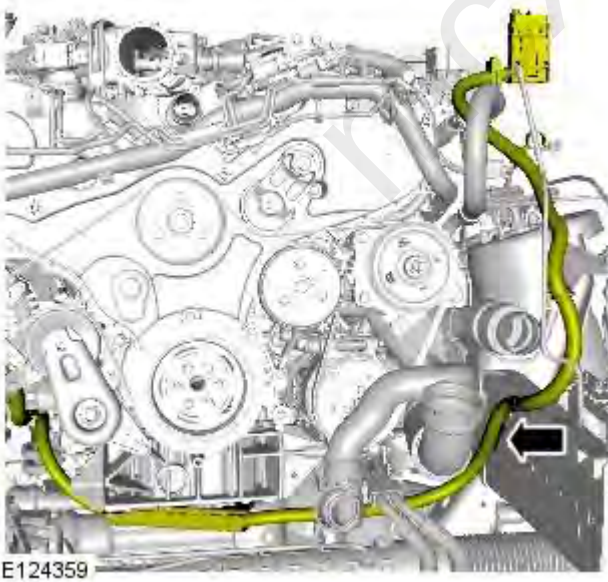
Be prepared to collect escaping fluids.



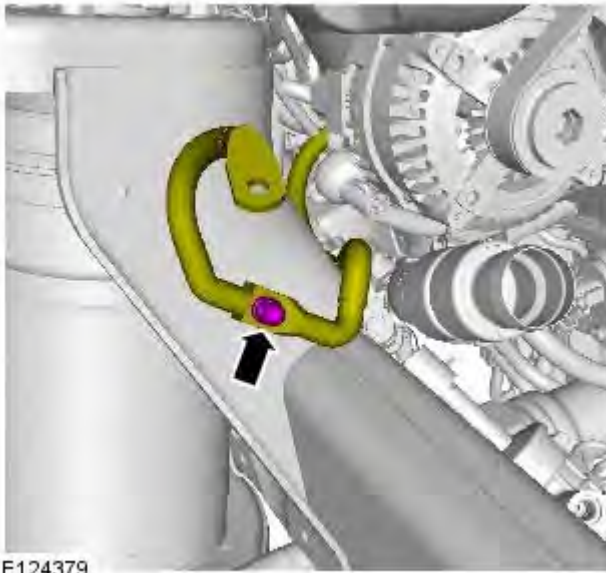
Make sure that all openings are sealed. Use new blanking caps.



12.



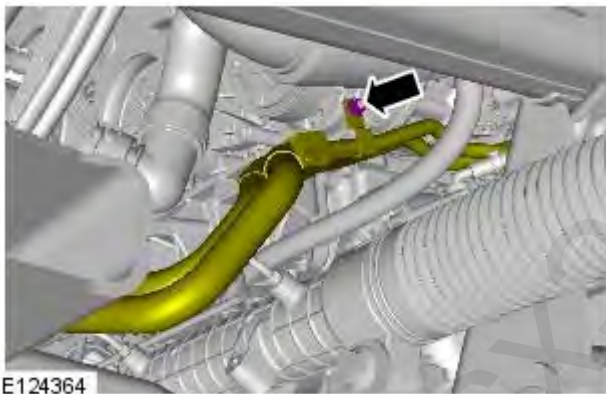
13.



E124379

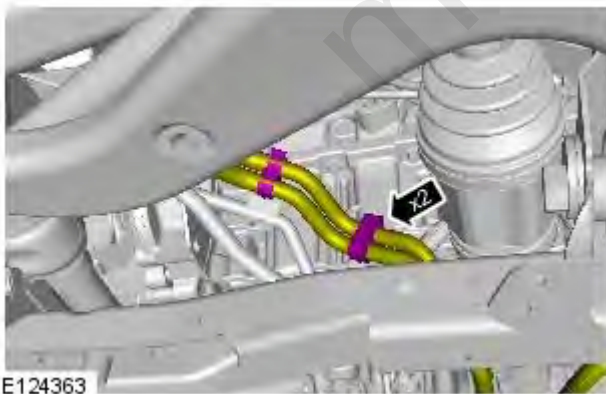
14. Refer to: [Starter Motor](#) (303-06B Starting System - TDV6 3.0L Diesel, Removal and Installation).

15.



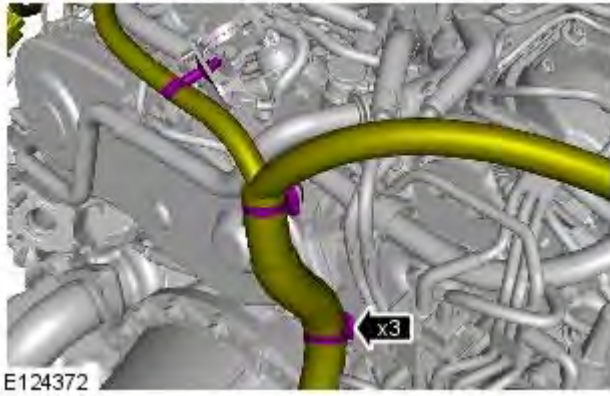
E124364

16.

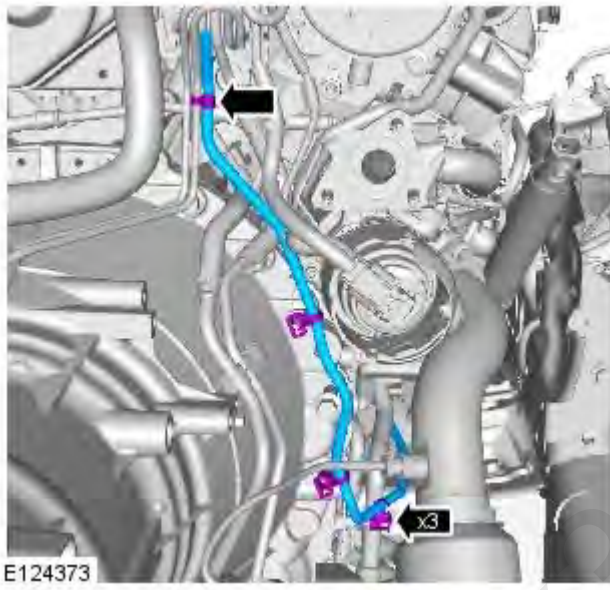


E124363

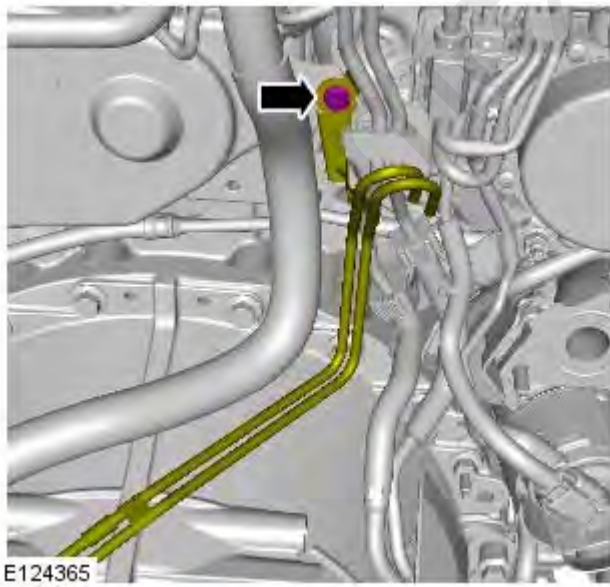
17. Refer to: [Exhaust Manifold Crossover Pipe](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).



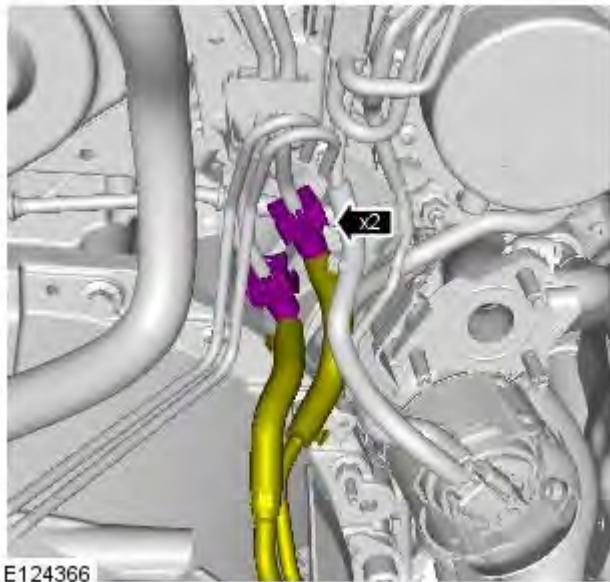
18.



19.



20.



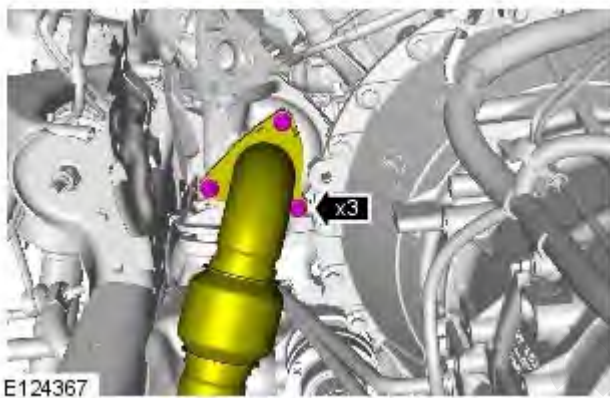
21. **21. CAUTIONS:**



Be prepared to collect escaping fuel.



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

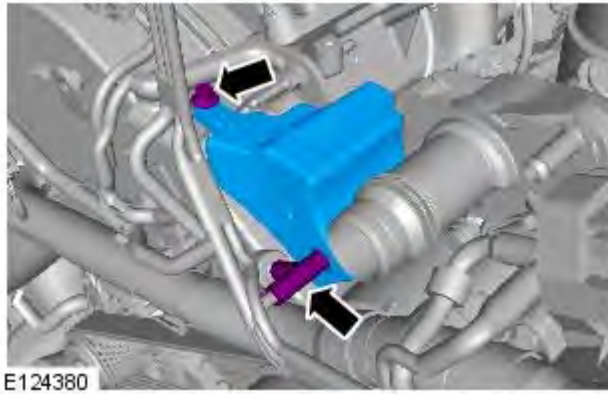


22. **22. NOTE:** Remove and discard the gasket.

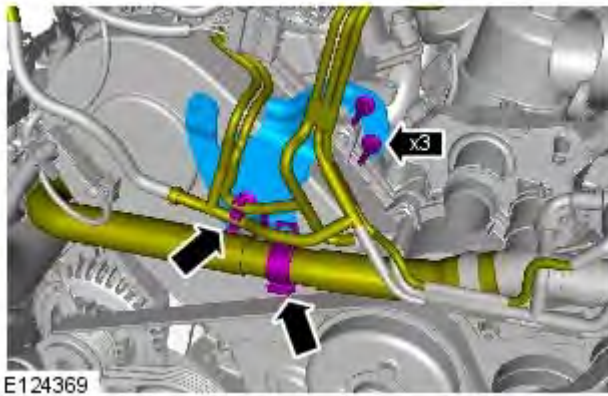


23. **23. NOTE:** Remove and discard the gasket.

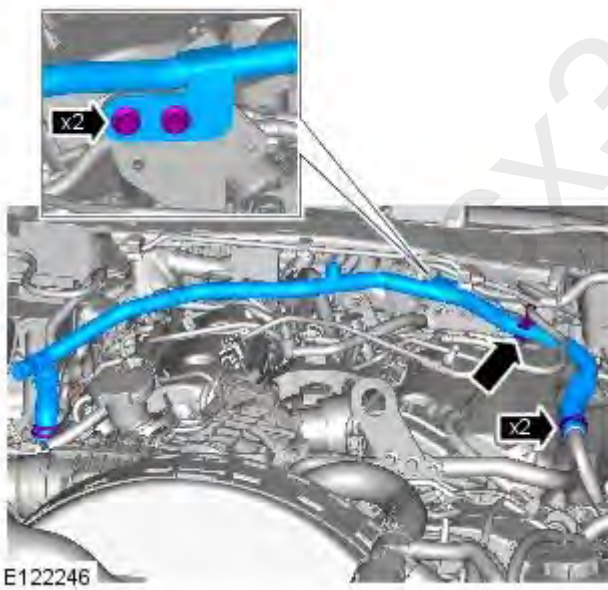
24. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).



25.

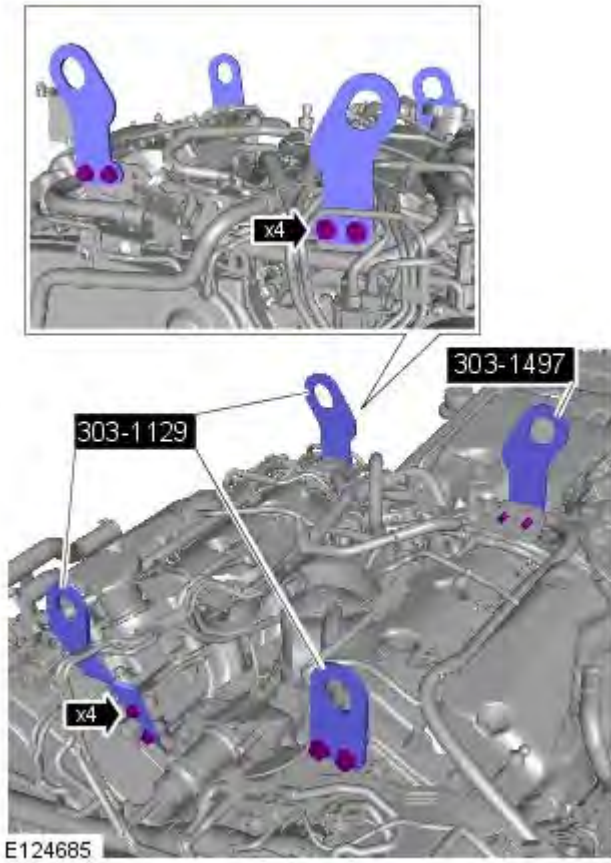


26.

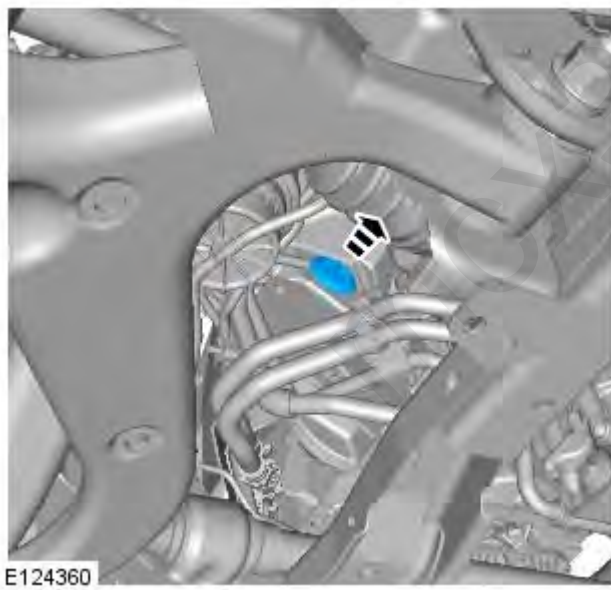


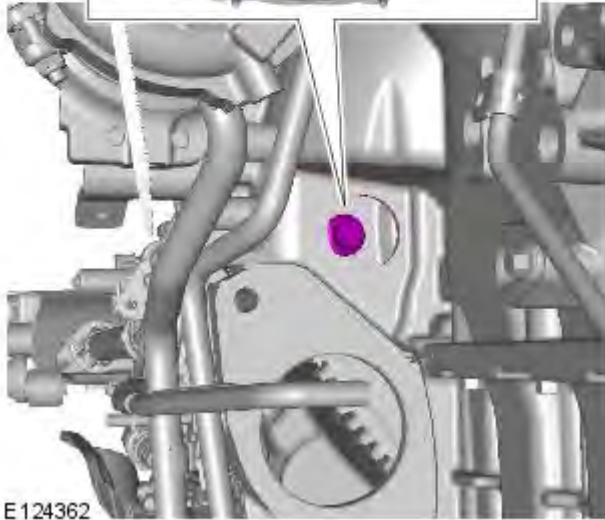
27. **27.**  CAUTION: Make sure that all openings are sealed.

28. Special Tool(s): [303-1129](#), [303-1497](#)



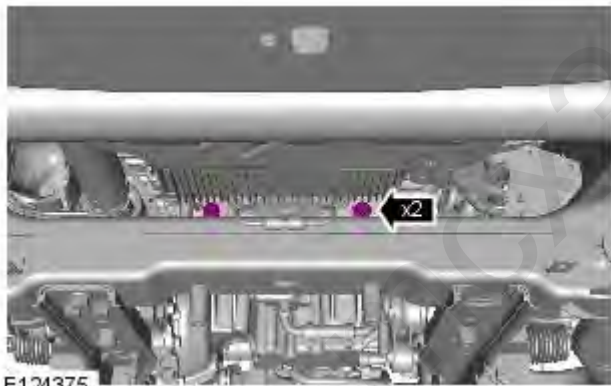
29.





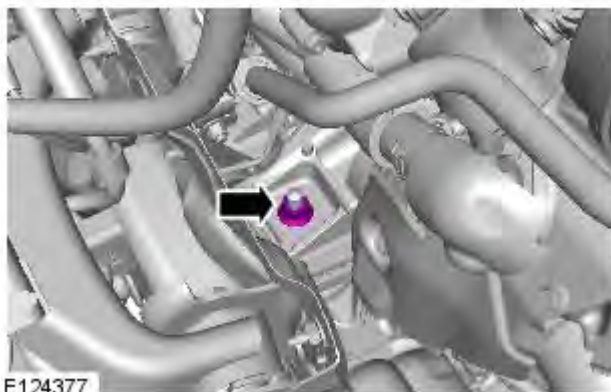
E124362

30. **30.**  CAUTION: Discard the bolts.



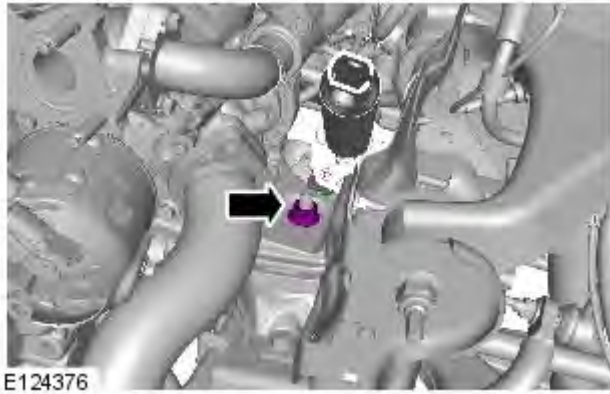
E124375

31.

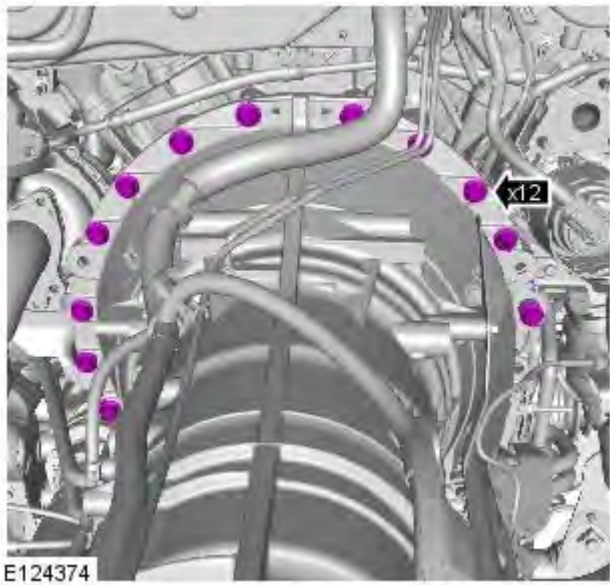


E124377

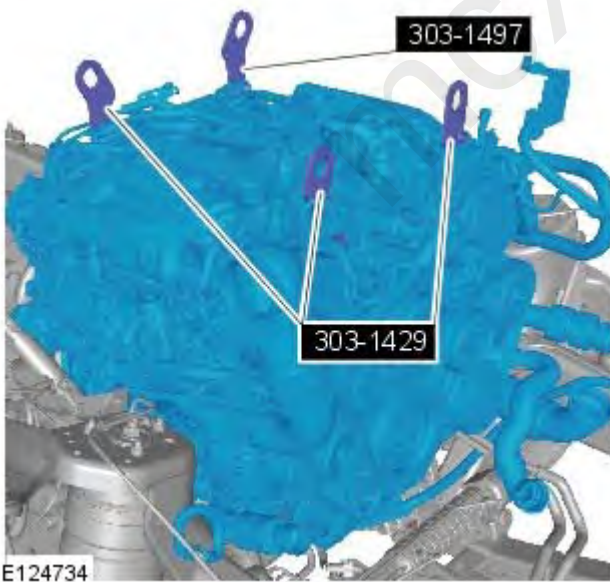
32.



33.

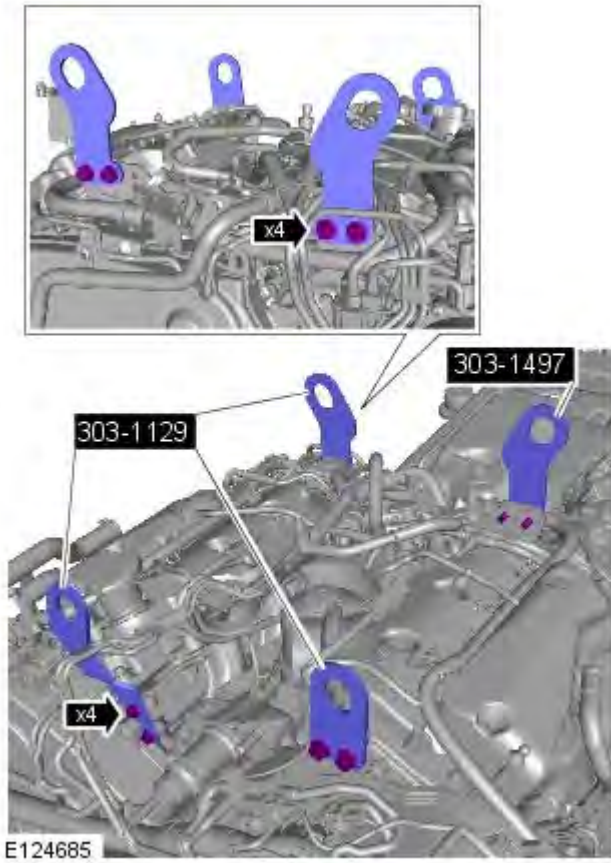


34. Using a suitable tool, support the transmission.



35. **35.** NOTE: Note the routing of the battery positive cable.
- NOTE: Note the routing of the transmission wiring harness.
 - NOTE: This step requires the aid of another technician.

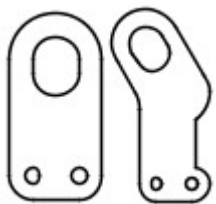
36. Special Tool(s): [303-1129](#), [303-1497](#)



Engine - TDV6 3.0L Diesel - Engine

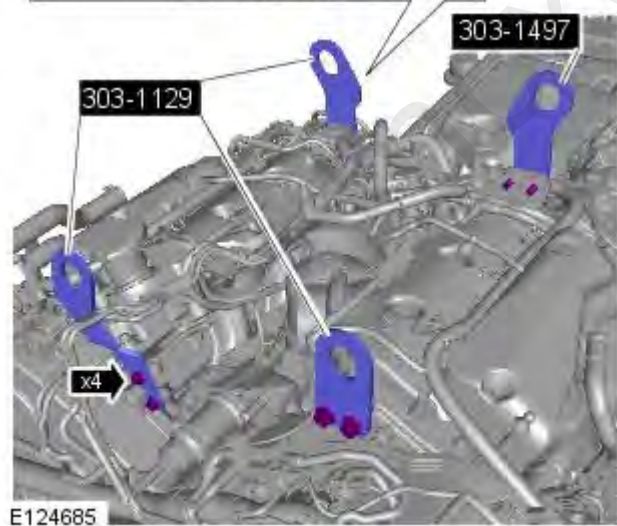
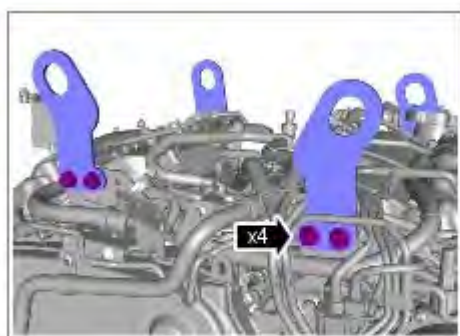
Installation

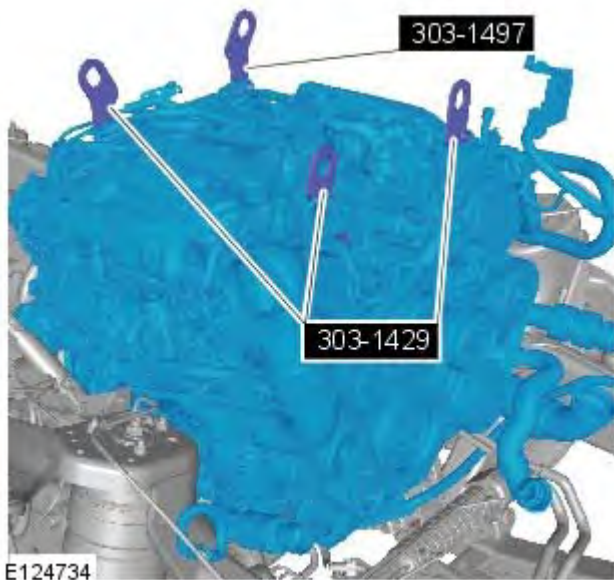
Special Tool(s)

 E54554	303-1129 Engine Lifting Brackets
 E116925	303-1497 Left-Hand Rear Engine Lifting Bracket

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

1. Special Tool(s): [303-1129](#), [303-1497](#)





2. CAUTIONS:



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

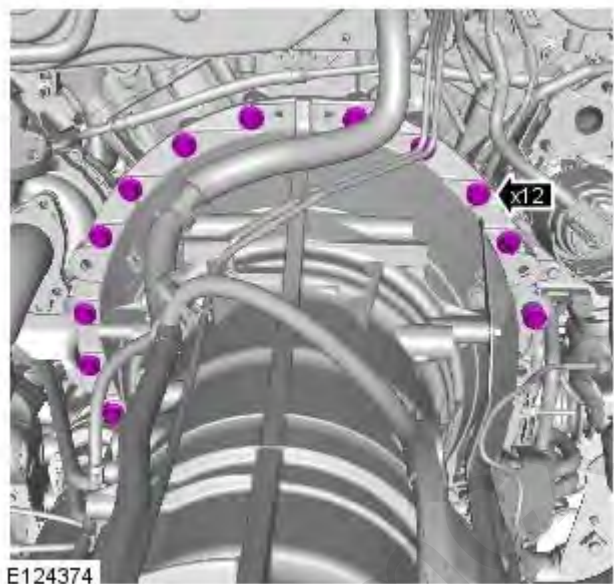


Make sure the torque converter is fully located into the oil pump drive.



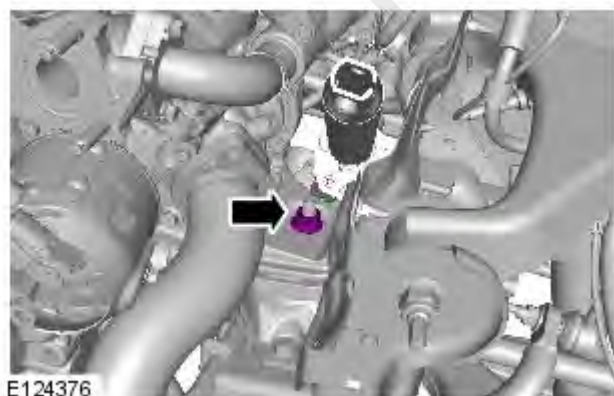
Make sure that the mating faces are clean and free of foreign material.

• NOTE: This step requires the aid of another technician.

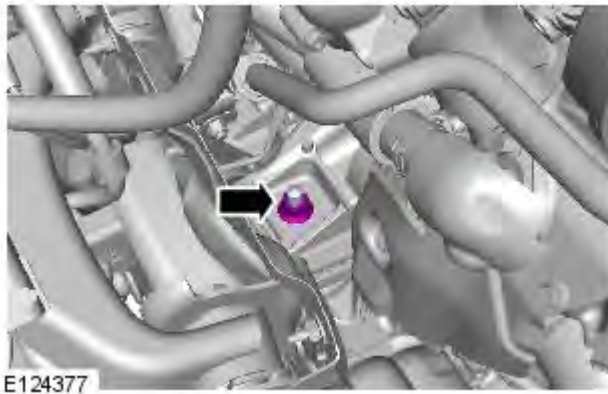


3.  CAUTION: Make sure the torque converter remains connected to the transmission.

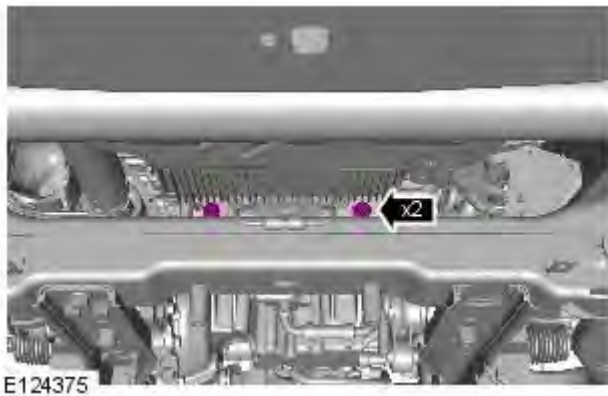
Torque: 40 Nm



4. Torque: 90 Nm



5. Torque: 90 Nm



6. Torque: 40 Nm



7. **7. CAUTIONS:**

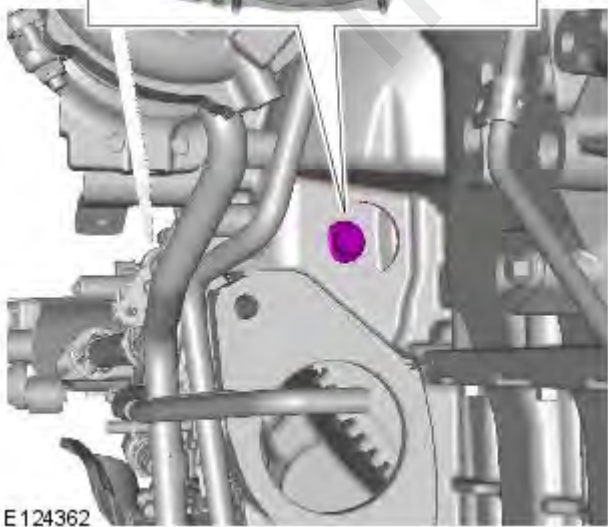


Only rotate the crankshaft clockwise.

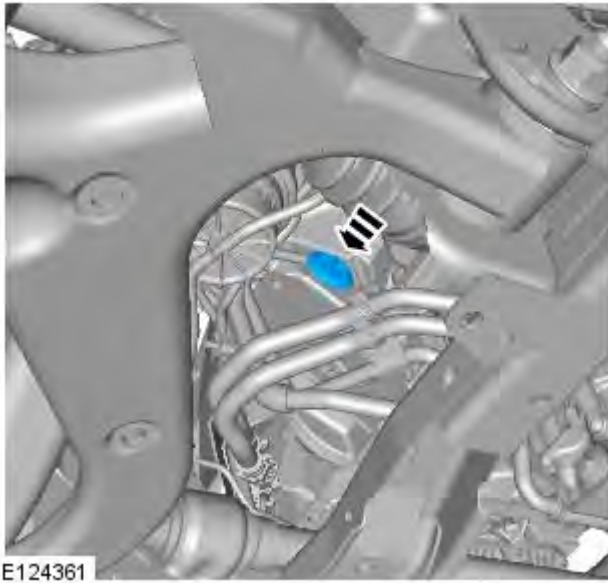


Make sure that new bolts are installed.

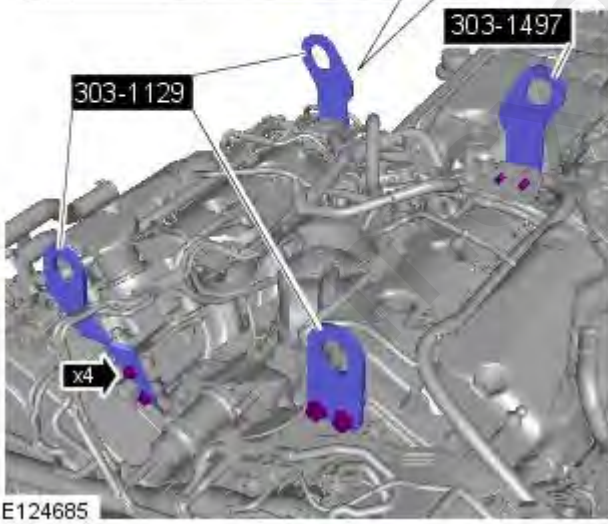
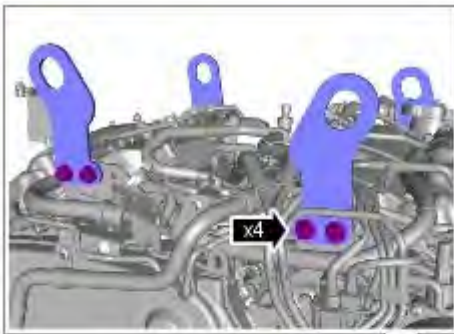
Torque: 63 Nm

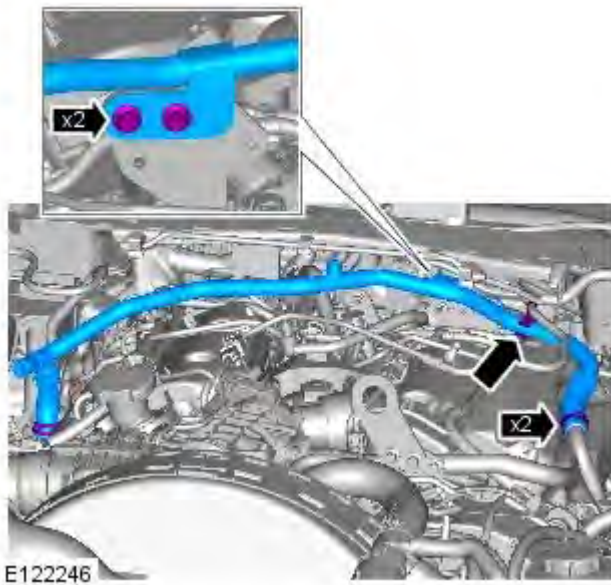


8.



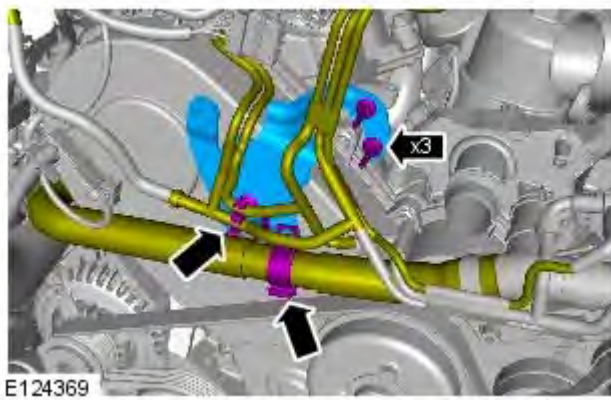
9. *Special Tool(s):* [303-1129](#), [303-1497](#)



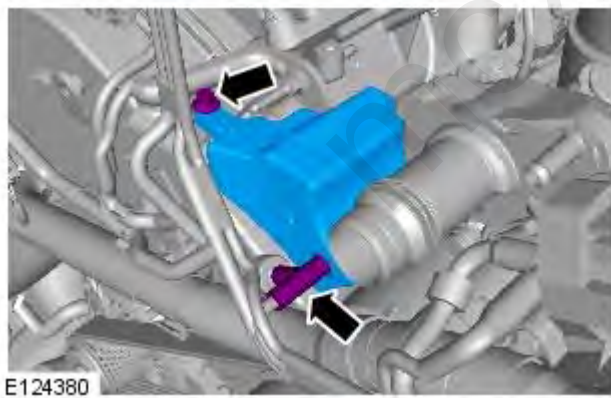


10. **10.** NOTE: Remove and discard the blanking caps.

Torque: 10 Nm

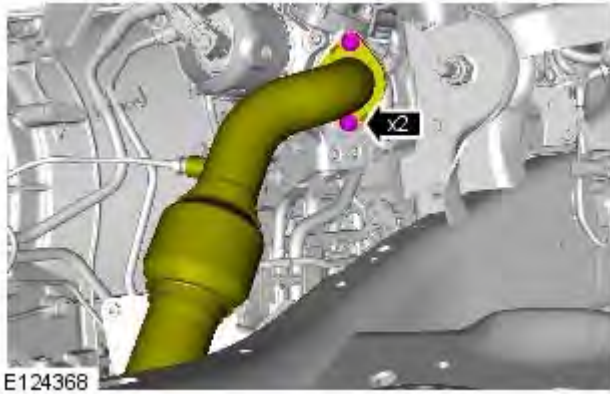


11. Torque: 8 Nm



12. Torque: 8 Nm

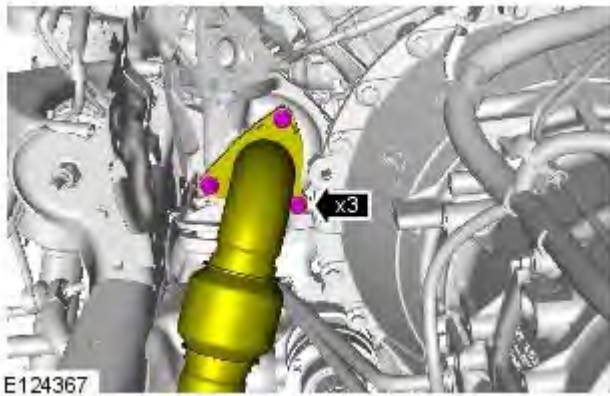
13. Refer to: [Intake Air Shutoff Throttle](#) (303-04C Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).



14. **14.** NOTE: Make sure that all the component mating faces are clean.

- NOTE: Install a new gasket.

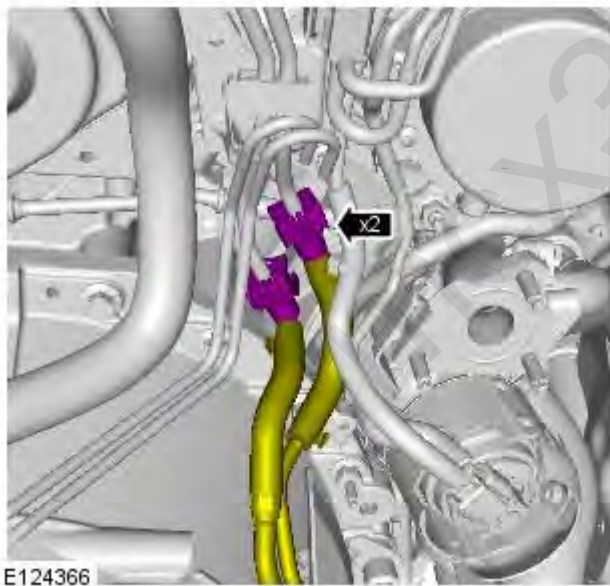
Torque: 28 Nm



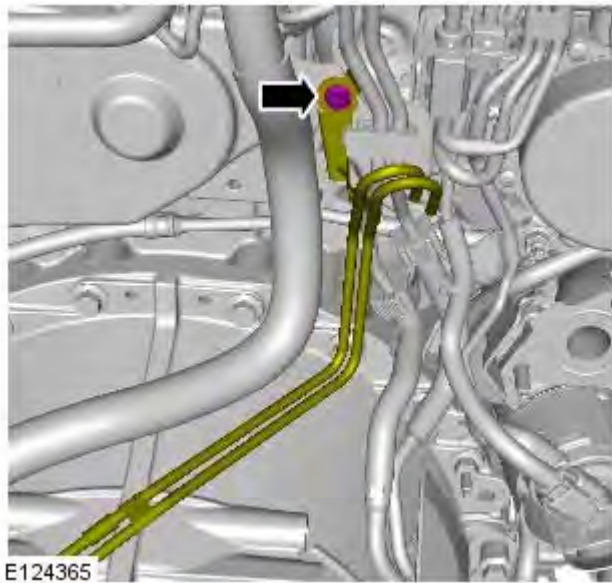
15. **15.** NOTE: Make sure that all the component mating faces are clean.

- NOTE: Install a new gasket.

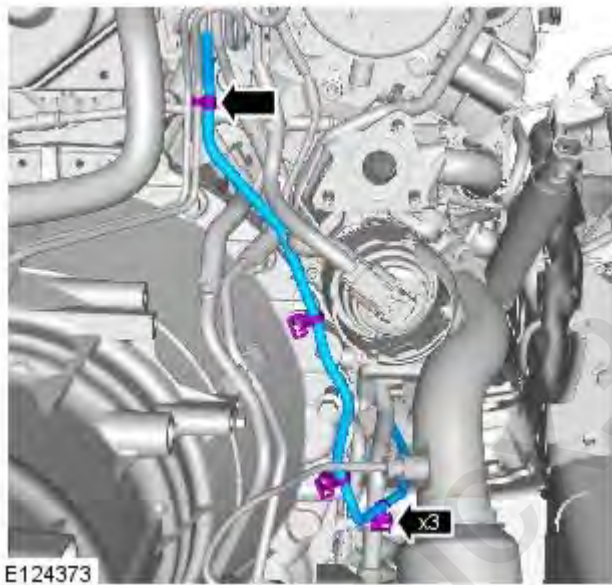
Torque: 28 Nm



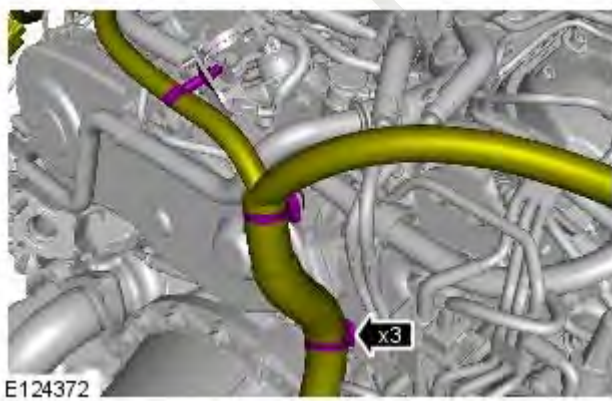
16. **16.** NOTE: Remove and discard the blanking caps.



17. Torque: 7 Nm

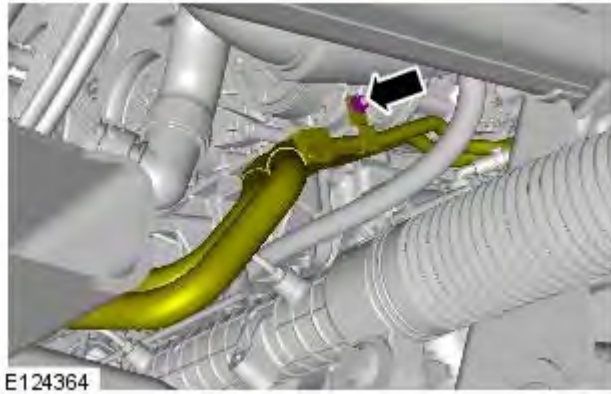


18.

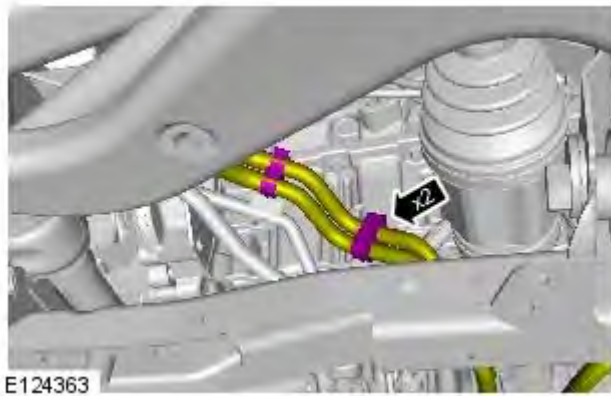


19.

20. Refer to: [Exhaust Manifold Crossover Pipe](#) (303-01B Engine - TDV6 3.0L Diesel, Removal and Installation).

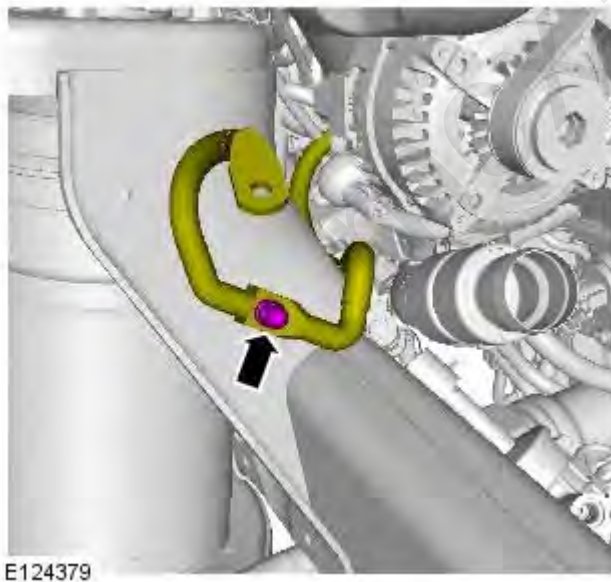


21. Torque: 10 Nm



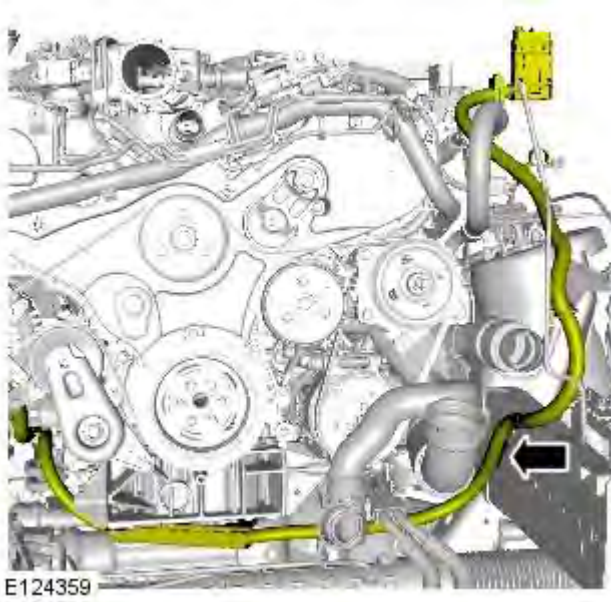
22.

23. Refer to: [Starter Motor](#) (303-06B Starting System - TDV6 3.0L Diesel, Removal and Installation).



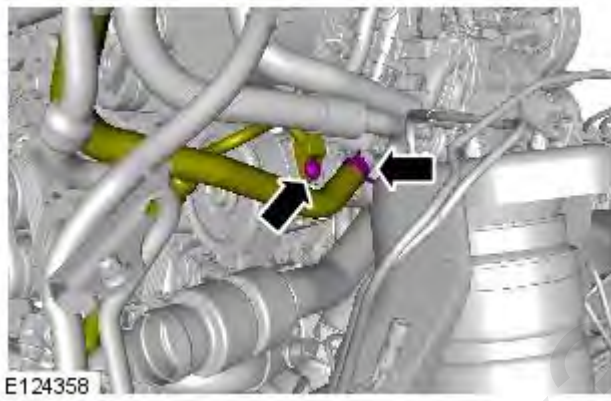
24. Torque: 22 Nm

25.

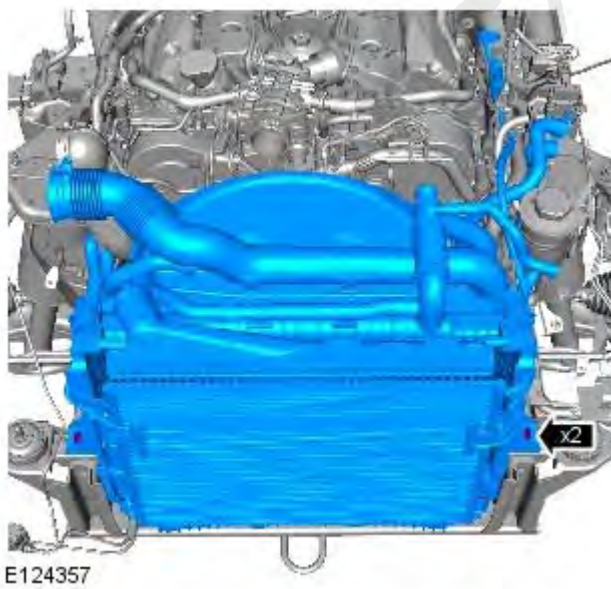


26. **26.** NOTE: Remove and discard the blanking caps.

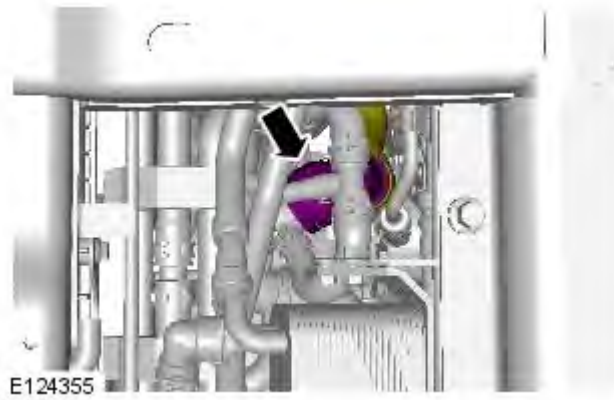
Torque: 25 Nm



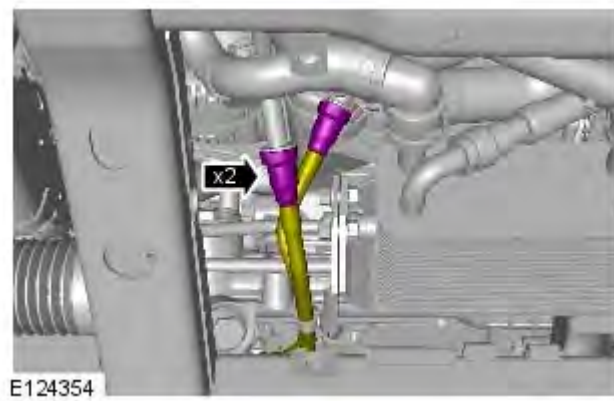
27. Torque: 15 Nm



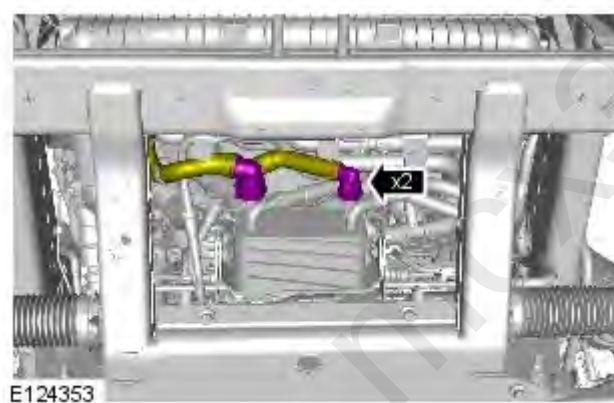
28.



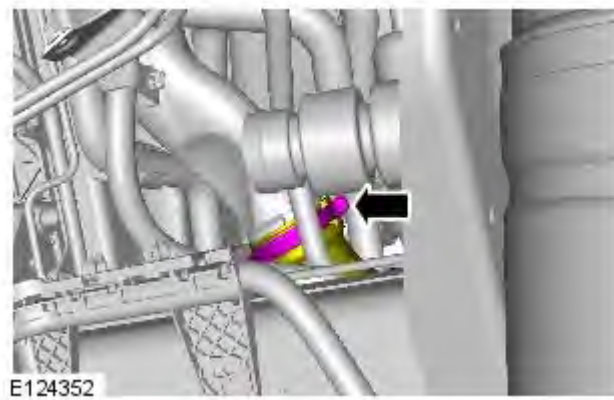
29.

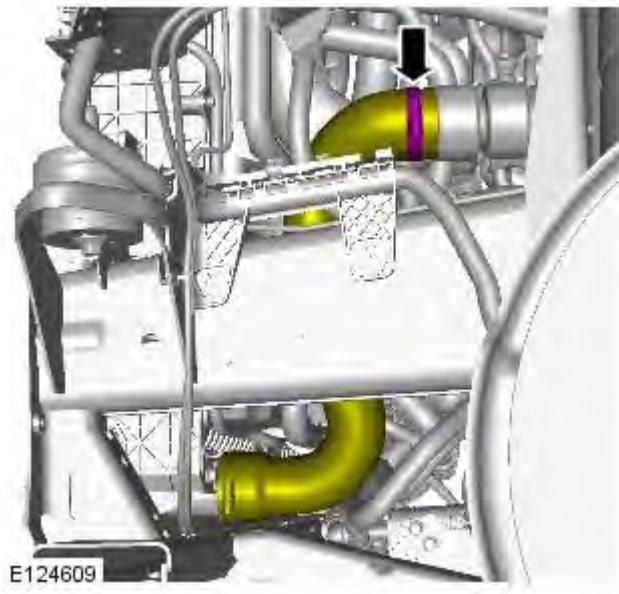


30.



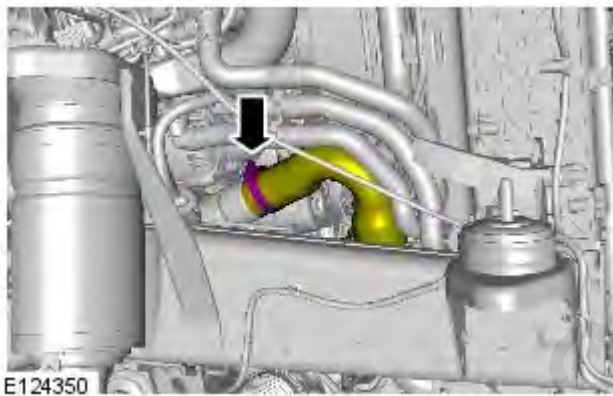
31. **31.** NOTE: Remove and discard the blanking caps.





32. **32.** NOTE: :Remove and discard the blanking caps.

Torque: 5 Nm



33. **33.** NOTE: Remove and discard the blanking caps.

Torque: 5 Nm

34. Refer to: [Cooling Fan](#) (303-03B Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).
35. Refer to: [Body - TDV6 3.0L Diesel/TDV6 2.7L Diesel](#) (502-02 Full Frame and Body Mounting, Removal and Installation).
36. Refer to: [Power Steering System Filling and Bleeding](#) (211-00 Steering System - General Information, General Procedures).