

SECTION 303-01B Engine — 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L

Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma

VEHICLE APPLICATION: 2011.50 Ranger

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INSTALLATION

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SPECIFICATIONS

Engine Data — 120 PS

Description	
Code	GBVAJPF
Firing order	1-3-4-2
Bore diameter	86 mm
Stroke	94.6 mm
Displacement	2198 cc
Compression ratio	15.7:1
Power output at _3700 rpm	88 kW (120 PS)
Torque between 1500 to 2700 rpm	285 Nm
Idle speed	800 rpm

Engine Data — 125 PS

Description	
Code	GBVAJQW
Firing order	1-3-4-2
Bore diameter	86 mm
Stroke	94.6 mm
Displacement	2198 cc
Compression ratio	15.7:1
Power output at _3700 rpm	92 kW (125 PS)
Torque between 1700 to 2300 rpm	330 Nm
Idle speed	800 rpm

Engine Data — 150 PS

Description	
Code	GBVAJQJ
Firing order	1-3-4-2
Bore diameter	86 mm
Stroke	94.6 mm
Displacement	2198 cc
Compression ratio	15.7:1
Power output at _3700 rpm	110 kW (150 PS)
Torque between 1500 to 2500 rpm	375 Nm
Idle speed	800 rpm

Engine Oil Capacity

Description	Liters
Initial fill including oil filter	8.9
Service fill including oil filter	8.6

SPECIFICATIONS

Description	Liters
Service fill without oil filter	8.2

Cylinder Block Dimensions

Description	mm
Cylinder bore diameter	86.000-86.020
Main bearing shells 1 to 4 inner diameter — bearings installed	65.003-65.030
Main bearing shell 5 inner diameter — bearings installed	70.004-70.033
Main bearings 1 to 4 radial clearance	0.033-0.080
Main bearing 5 radial clearance	0.034-0.083
Main bearings 1 to 4 parent bore diameter — vertical measurement	69.504-64.520
Main bearing 5 parent bore diameter — vertical measurement	74.504-74.520
Main bearings 1 to 4 parent bore diameter — horizontal measurement	69.502-69.525
Main bearing 5 parent bore diameter — horizontal measurement	74.502-74.525

Piston Dimensions

Description	mm
Piston diameter	85.950-85.934
Piston clearance in cylinder	0.05-0.07
Piston ring end gaps	
— upper compression ring	0.25-0.4
— lower compression ring	0.85-1.1
— oil control ring	0.25-0.50

Piston ring gap position: The piston ring gaps must be distributed evenly around the circumference of the piston. This also applies to the oil control ring elements. Align the piston ring gaps at 120 degrees to each other.

Crankshaft Dimensions

Description	mm
Main bearing journal end float	0.090-0.305
Main bearing journals 1 to 4 diameter	64.950-64.970
Main bearing journal 5 diameter	69.950-69.970
Connecting rod bearing journal diameter	52.980-53.000

Connecting Rod Dimensions

Description	mm
Large end bore diameter	55.996-56.016
Small end bore diameter	30.010-30.018
Connecting rod bearing shell inner diameter — bearings installed	53.017-53.043
Connecting rod bearing radial clearance	0.034-0.100
Connecting rod bearing axial clearance	0.100-0.320

SPECIFICATIONS

Piston Pin Dimensions

Description	mm
Piston pin length	66.700
Piston pin diameter	30.000
Piston pin slide clearance	0.005-0.016

Camshaft Dimensions

Description	mm
Camshaft end float	0.014-0.20
Camshaft bearing journal diameter	26.450
Camshaft bearing clearance — radial measurement	0.065

Valve Dimensions

Description	mm
Valve stem to valve guide clearance — intake valve	0.045
Valve stem to valve guide clearance — exhaust valve	0.055

Cylinder Head Dimensions

Description	mm
Maximum distortion — measured longitudinally and diagonally over 25mm, over 150 mm, over distance in excess of 150mm	0.025, 0.050, 0.10
Peak to valley height of mating surface	0.02
Thickness of cylinder head gasket with piston protrusion of 0.430 - 0.520 mm	1.1
Thickness of cylinder head gasket with piston protrusion of 0.521 - 0.570 mm	1.15(two hole/teeth)
Thickness of cylinder head gasket with piston protrusion of 0.571 - 0.620 mm	1.2(three holes/teeth)

Oil Pressure Specifications

Description	bar
Minimum oil pressure at idle speed	1.25
Minimum oil pressure at 2000 rpm	2.0

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Ford Formula E SAE 5W-30 engine oil (for markets with low sulphur content less than 350 ppm)	WSS-M2C-913-C
Ford Formula E SAE 10W-30 engine oil (for markets with high sulphur content greater than 350 ppm)	WSS-M2C-921-A
Sealer — oil pan, camshaft carrier and engine front cover	WSE-M4G323-A4

DESCRIPTION AND OPERATION

Engine – Overview

General

- The 2.2L Duratorq-TDCi (Puma) Diesel is available in three different power output versions: 88 kW (120 PS), 92 kW (125 PS) and 110 kW (150 PS).
- The 88KW(120PS) and 92KW(125PS) version have the same fixed geometry turbocharger with wastegate.
- The 92 kW (125 PS) version is available with fixed type and adjustable guide vane type also.
- The 110 kW (150 PS) version has a turbocharger with electrically adjustable guide vane geometry as well as fuel injectors with an increased flow rate.

Features

- 4-cylinder turbodiesel in-line engine with two overhead camshafts and 16 valve technology
- Cast iron cylinder block with cast-in cylinder liners
- Ladder frame for extending the cylinder block
- Two-part cylinder head made from aluminium
- Intake and exhaust camshaft and fuel high pressure pump driven a timing chain
- Oil pump drive by chain
- camshaft driven vacuum pump
- Valves actuated by roller cam followers with hydraulic tappets
- Variable-geometry turbocharger for optimum cylinder charging

Fuel system

- Continental common rail system 1800bar
- Fuel injectors with piezo technology
-

Engine management

- Continental PCM
- Volume control valve, fuel inlet temperature sensor and fuel rail pressure sensor for efficient regulation of fuel pressure
- Actuator motor-controlled EGR (exhaust gas recirculation) valve

Engine-emission control

- Meets EURO 5
- Actuator motor-controlled EGR valve and cooled by water
- Electronic throttle body with position sensor
- Broadband Lambda probe for correcting the injection volume and for optimizing the EGR
- Coated DPF (diesel particulate filter) to minimize rust particle emissions

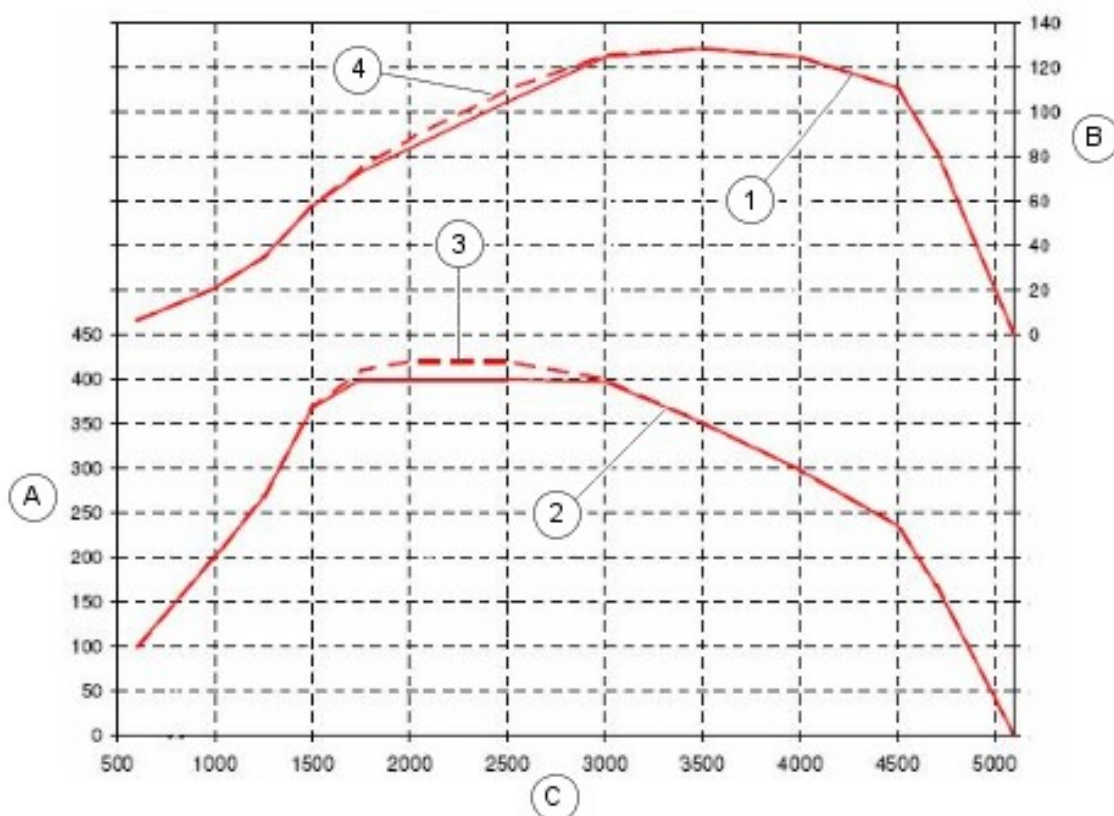
Diagnosis

- Via the DLC (data link connector)with IDS (Integrated Diagnostic System)

Specification

Torque and power output:

DESCRIPTION AND OPERATION



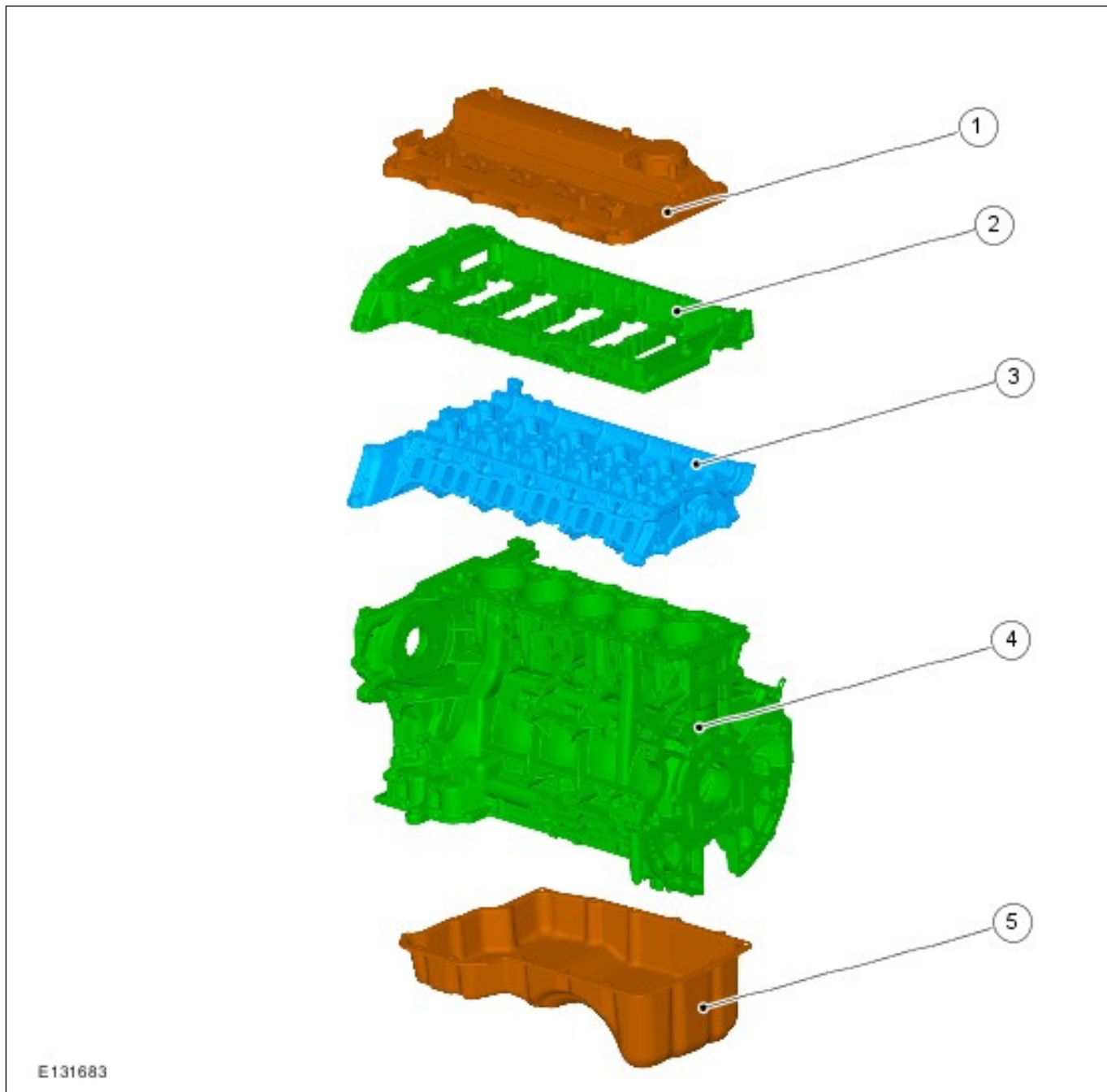
E99773

Item	Description
A	Torque (nm)
B	Power output(Kw)
c	Engine speed
1	Power output curve

Item	Description
2	Engine speed curve
3	Torque during the overtorque function
4	Power output during the overtorque function

DESCRIPTION AND OPERATION

Overview of the main engine components



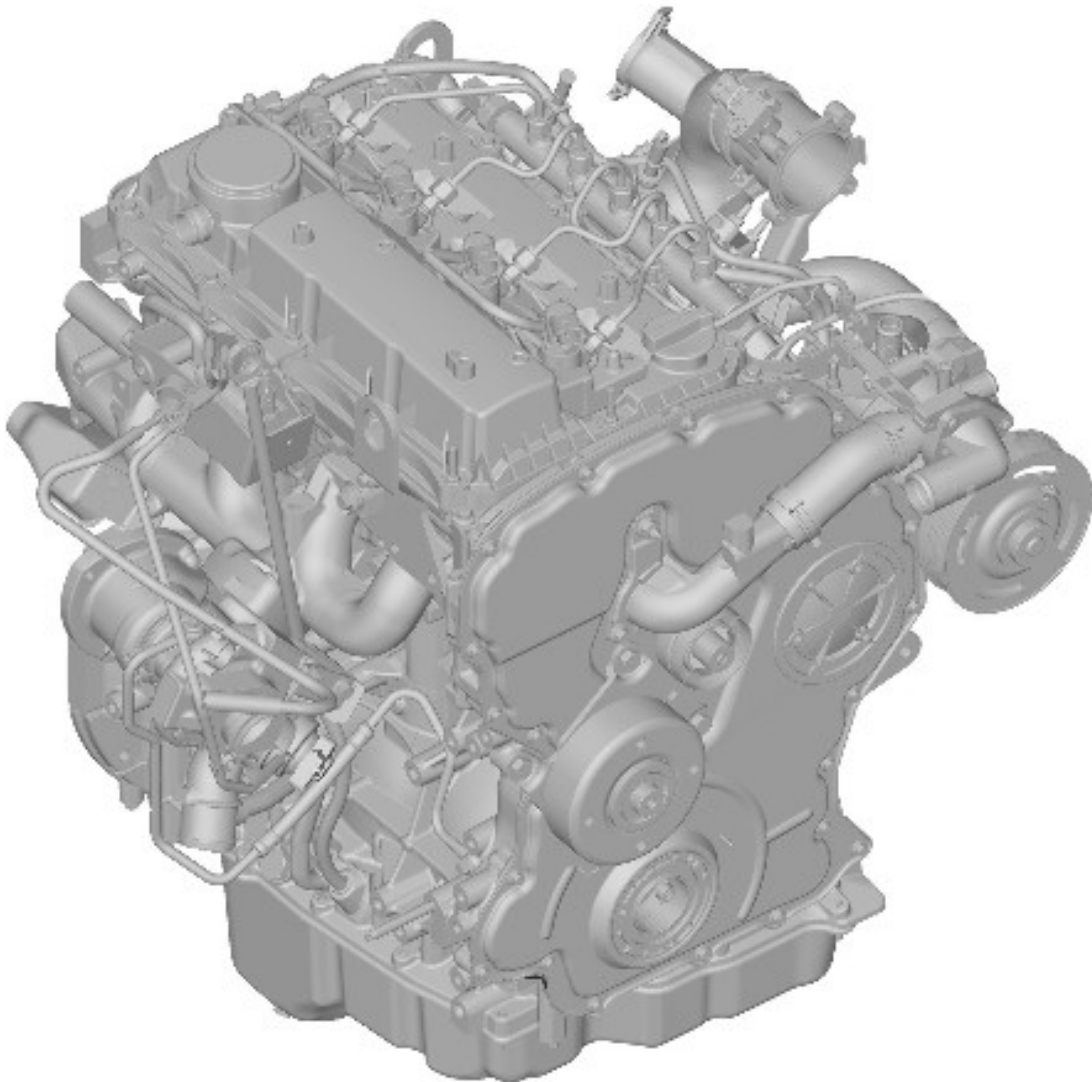
Item	Description
1	Valve cover
2	Housing valve rocker arm

Item	Description
3	Cylinder head
4	Cylinder block
5	Oil pan

DESCRIPTION AND OPERATION

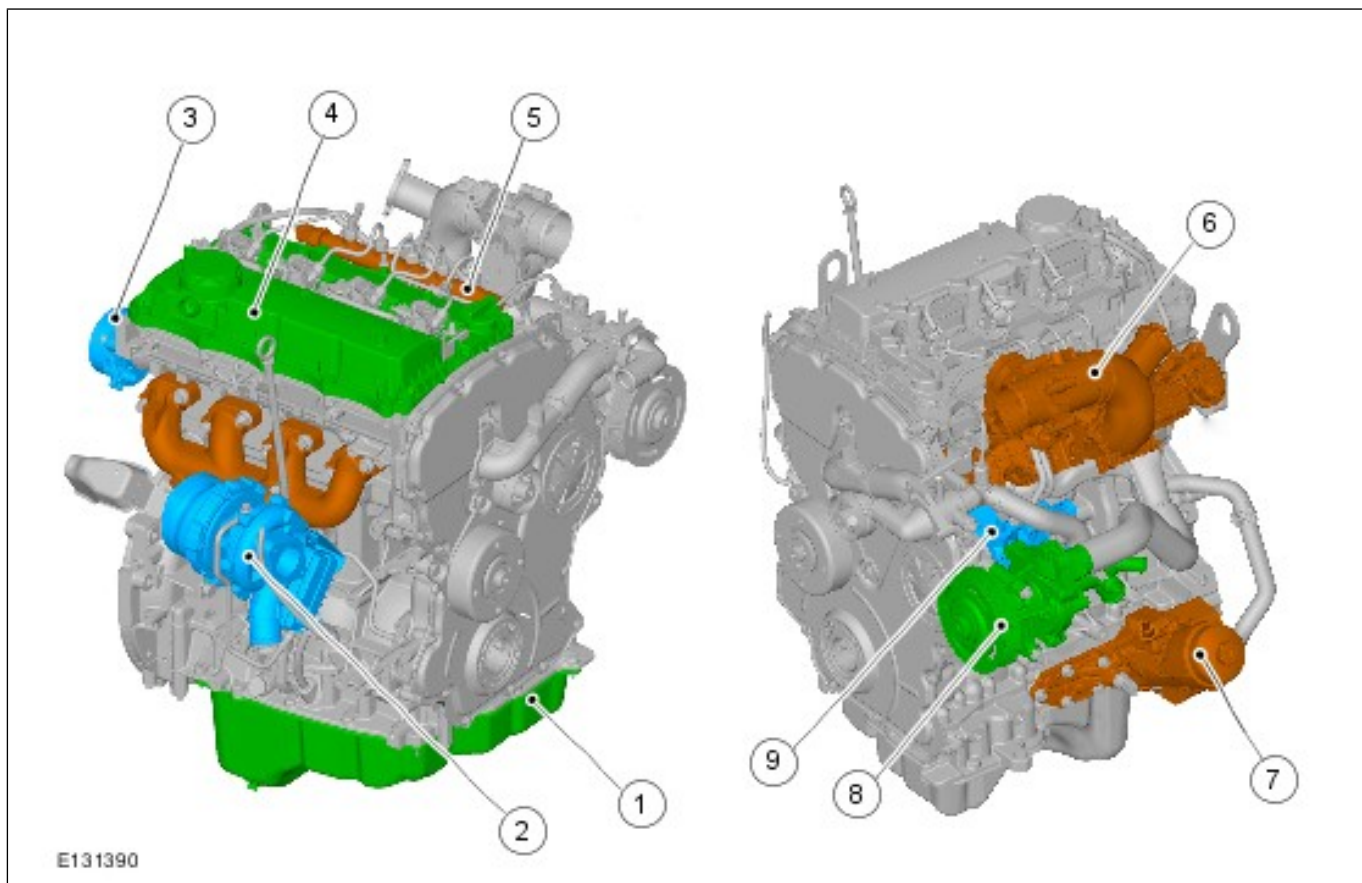
Engine

Engine -component location



E131389

DESCRIPTION AND OPERATION

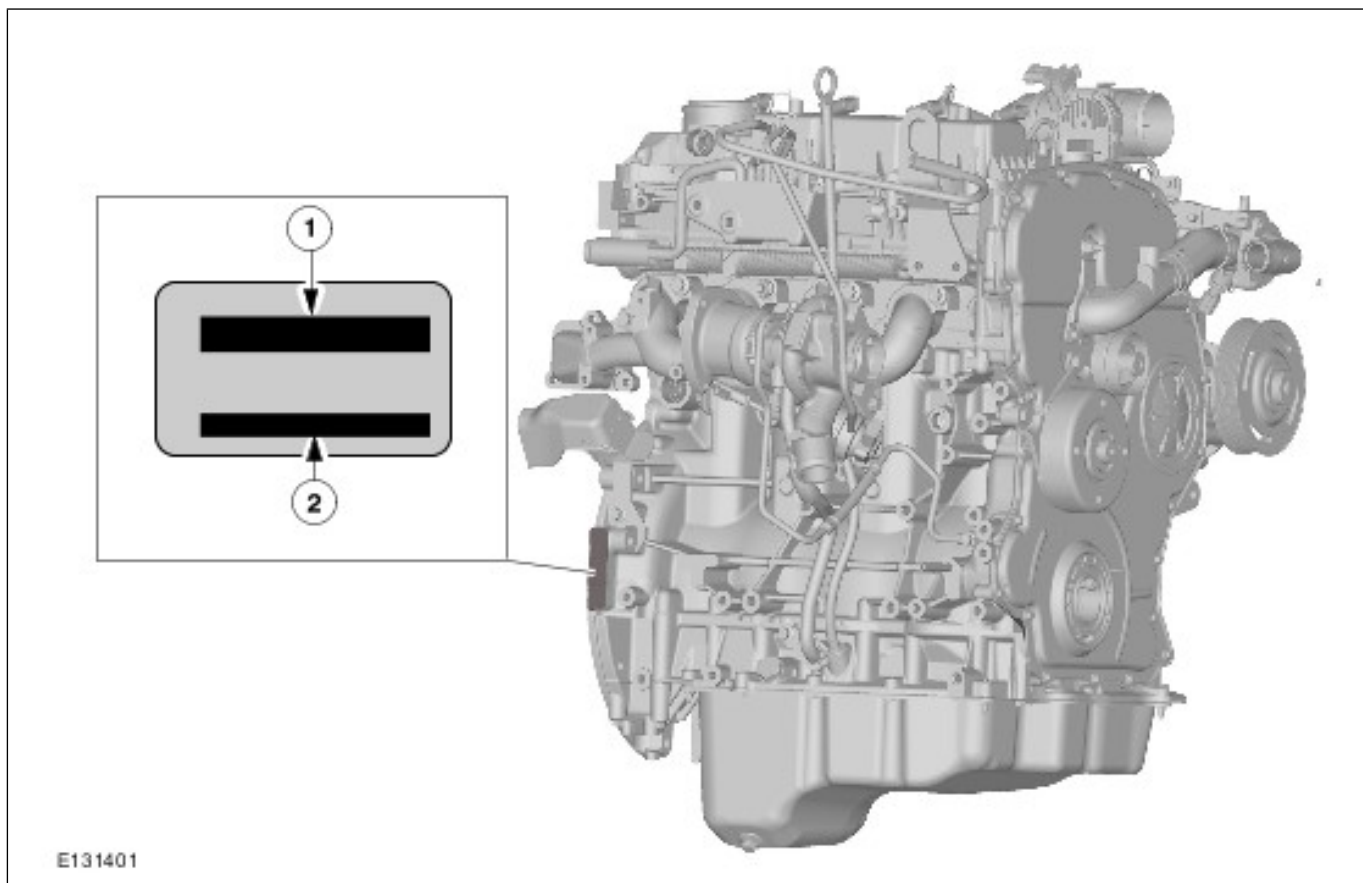


1.

Item	Description
1	Oil sump
2	Turbocharger
3	vacuum pump
4	Valve cover

Item	Description
5	Fuel injection rail
6	Intake manifold
7	Oil cooler
8	Coolant pump
9	Fuel pump

DESCRIPTION AND OPERATION





2.

Item	Description
1	Engine code
2	Engine serial number

REMOVAL AND INSTALLATION

Camshafts(21 284 0)

Special Tool(s) / General Equipment

	100-010 Remover, O-Ring Seal
	303-1562 Timing Tool
2 mm Punch	
6 mm Drill Bit	

Removal

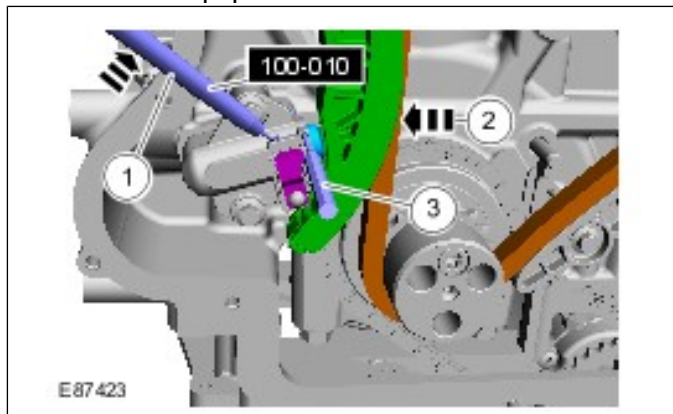
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

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

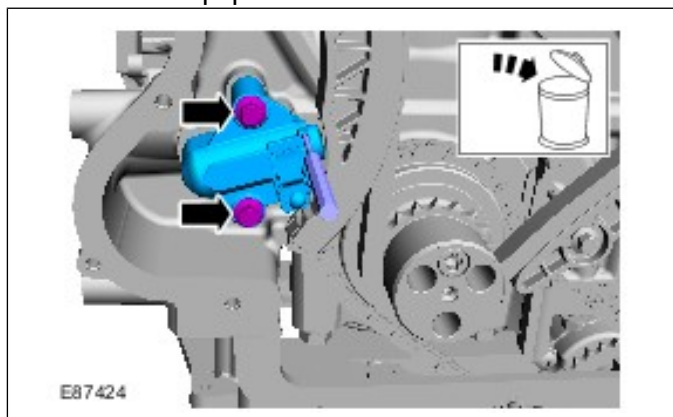
1. Refer to: [Fuel Rail](#) (303-04 Fuel Charging and Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
2. Refer to: [Valve Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
3. Refer to: [Timing Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
4. Refer to: [Brake Vacuum Pump - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (206-07 Power Brake Actuation, Removal and Installation).
5. Special Tool(s): 100-010

REMOVAL AND INSTALLATION

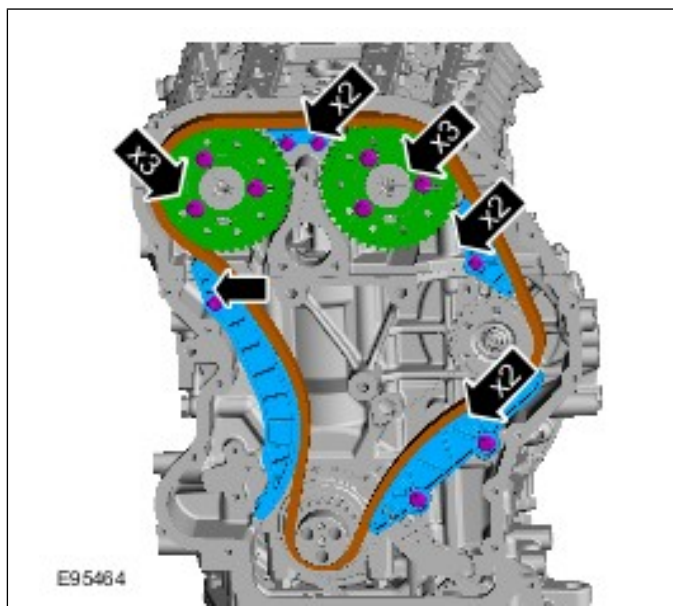
General Equipment: 2 mm Punch



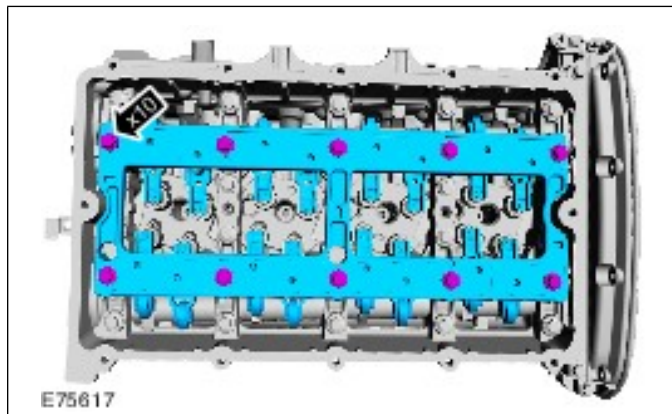
6. General Equipment: 2 mm Punch



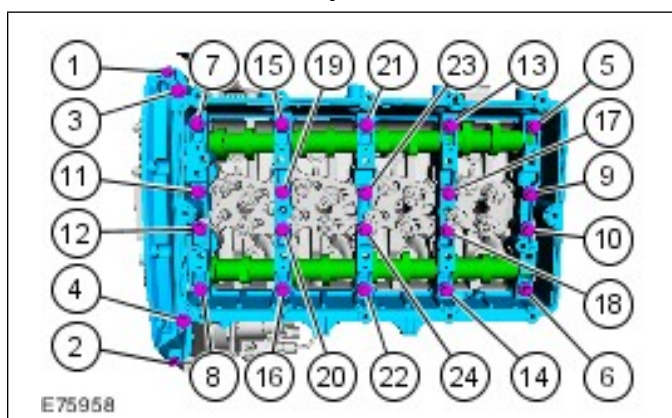
7.



8.



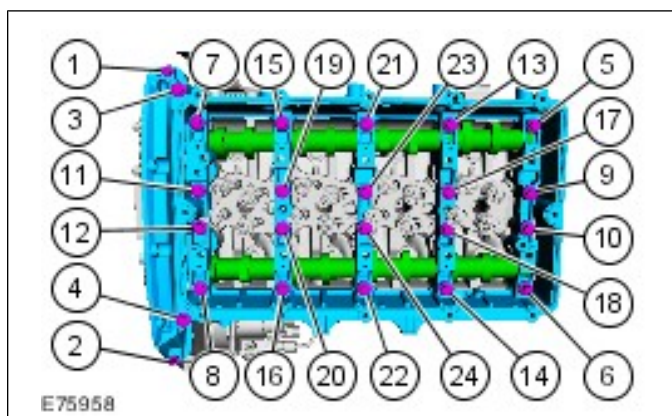
9. **CAUTION:** Remove the camshaft carrier bolts in the sequence shown.



Installation

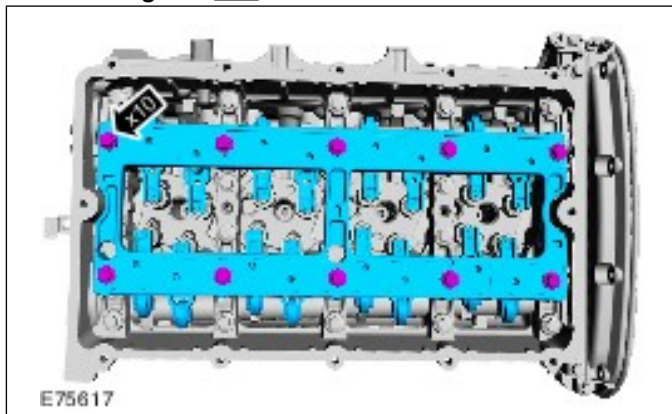
NOTE: Clean the mating faces of the camshaft carrier and the cylinder head.

1. • Bolts 1 to 22
Torque: 23 Nm
- Bolts 23 to 25
Torque: 10 Nm

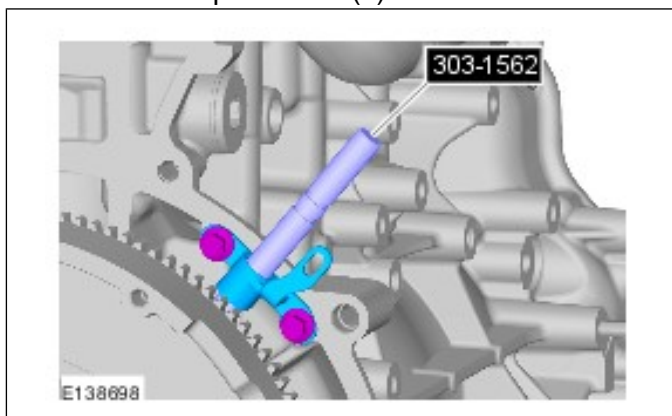


REMOVAL AND INSTALLATION

2. Torque:
 - Stage 1: 10 Nm
 - Stage 2: 30°

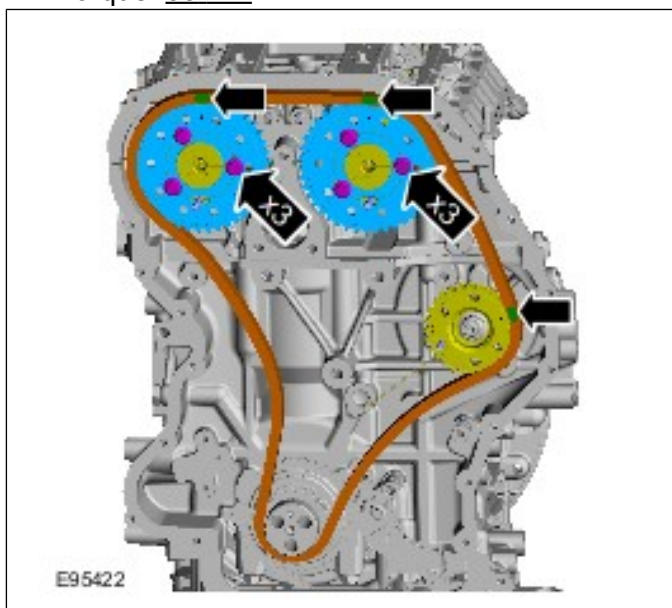


3. Install the Special Tool(s): 303-1562



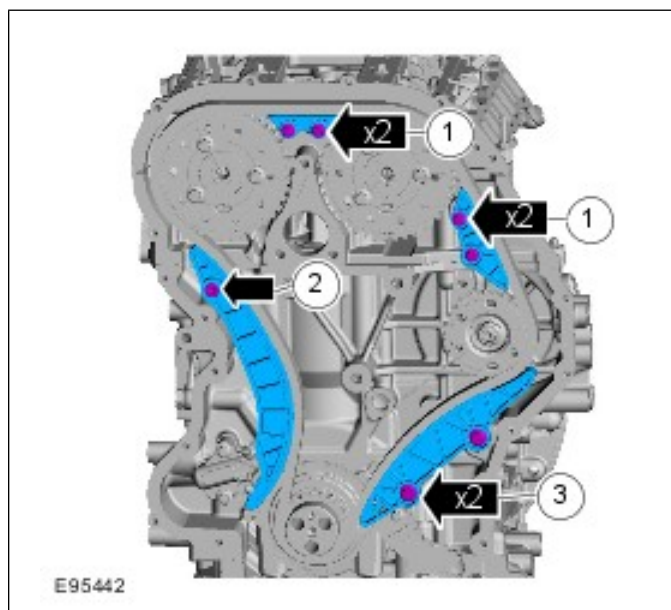
4. **NOTE:** Make sure that the installation marks are aligned.

General Equipment: 6 mm Drill Bit
Torque: 33 Nm

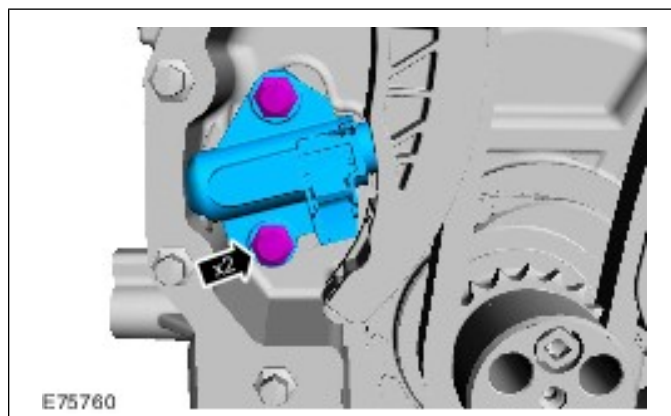


5. Remove the 6 mm drill bits.

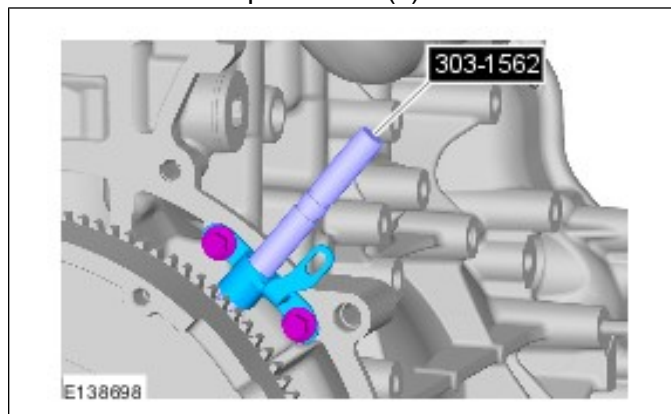
6. 1. Torque: 15 Nm
2. Torque: 40 Nm
3. Torque: 40 Nm



7. **NOTE:** Make sure that a new component is installed.



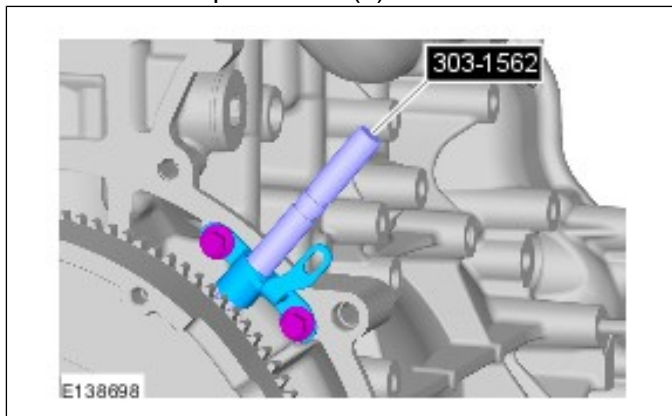
8. Remove the Special Tool(s): 303-1562



9. Rotate the engine two revolutions.

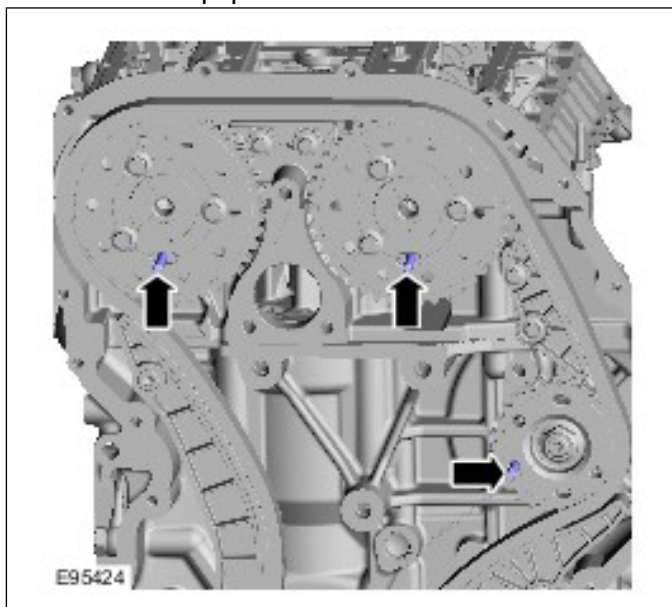
REMOVAL AND INSTALLATION

10. Install the Special Tool(s): 303-1562



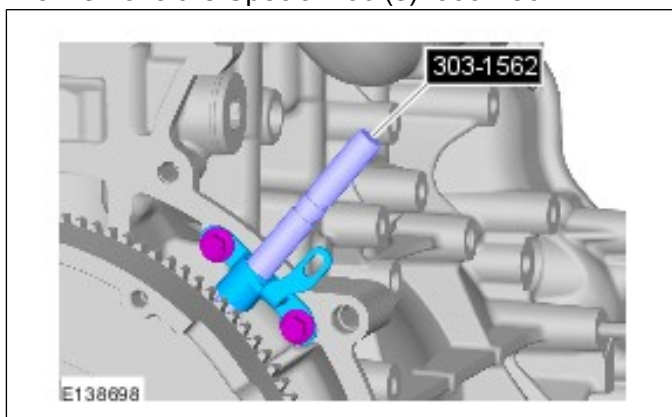
11. Check the valve timing by inserting the drill bits. If the drill bits cannot be inserted repeat the timing steps.

General Equipment: 6 mm Drill Bit



12. Remove the 6 mm drill bits.

13. Remove the Special Tool(s): 303-1562



14. Refer to: [Brake Vacuum Pump - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (206-07 Power Brake Actuation, Removal and Installation).

15. Refer to: [Timing Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).


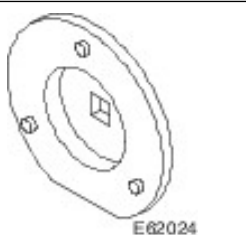
16. Refer to: [Valve Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

17. Refer to: [Fuel Rail](#) (303-04 Fuel Charging and Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

REMOVAL AND INSTALLATION

Crankshaft Front Seal(21 467 0)

Special Tool(s)

 <p>E87614</p>	<p>303-1310 Holding Wrench, Crankshaft</p>
 <p>E62024</p>	<p>303-679A Remover/Installer, Engine Front Cover Inspection Plate</p>

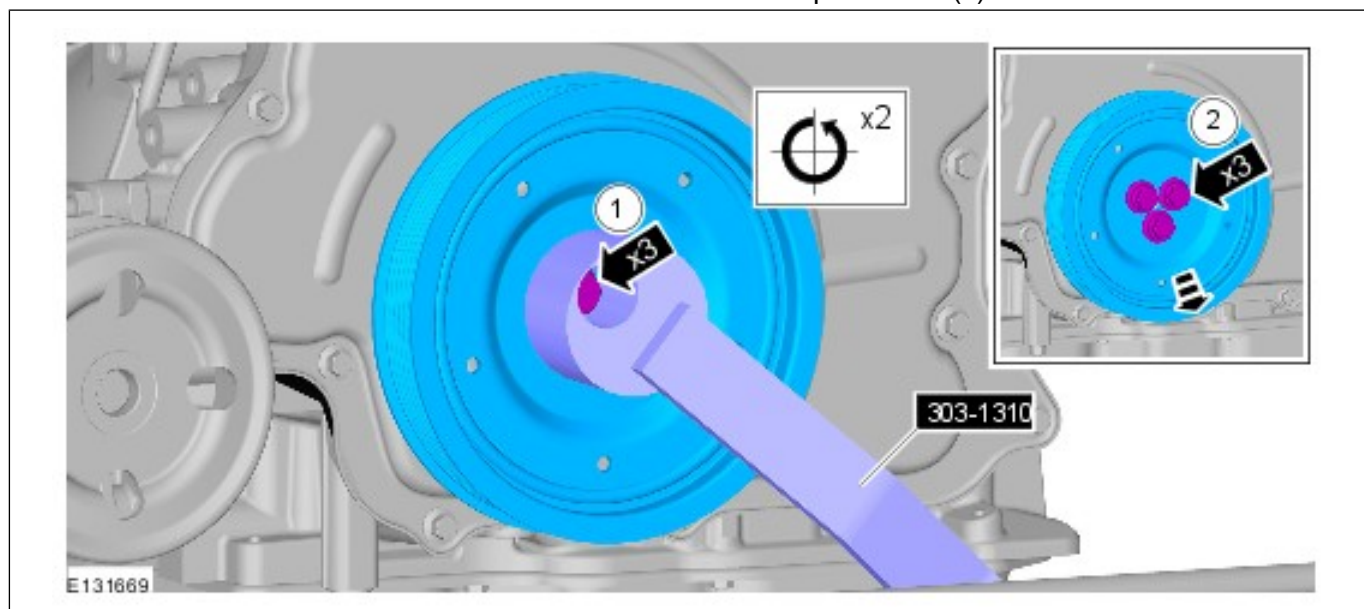
Removal

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

1. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

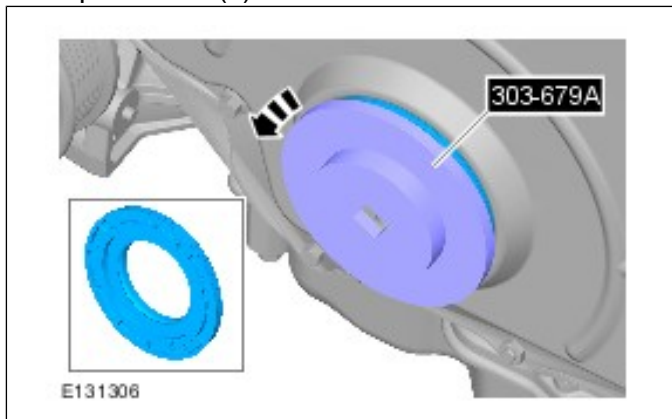
2. 1. Do not completely loosen the crankshaft pulley bolts.

Special Tool(s): 303-1310



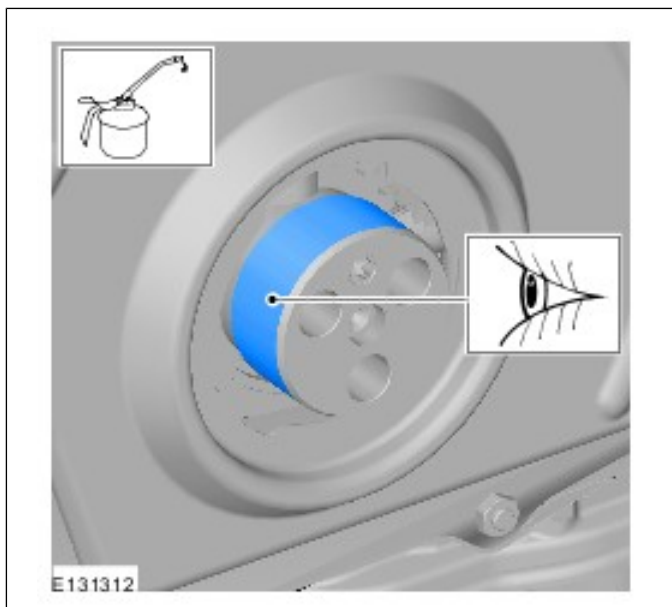
REMOVAL AND INSTALLATION

3. Special Tool(s): 303-679A

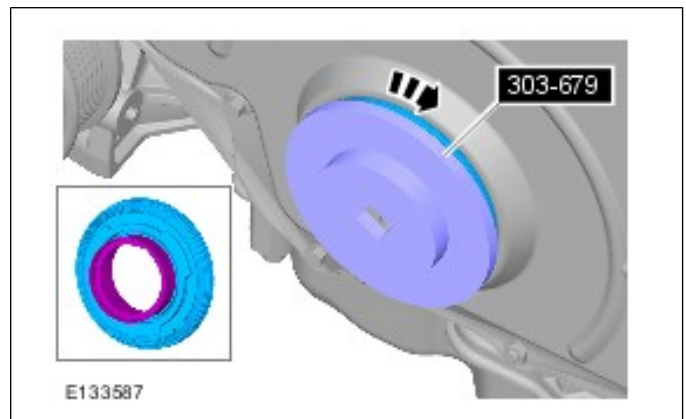


Installation

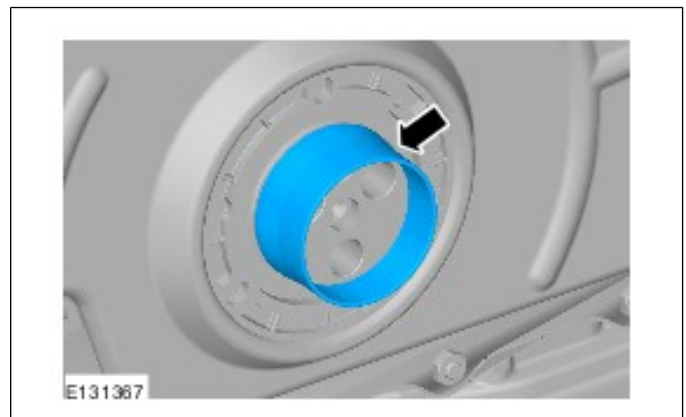
1. **NOTE:** Make sure that mounting face is clean and lubricated.



2. **CAUTION:** A new crankshaft seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft seal is fully installed. Failure to follow this instruction may result in damage to the crankshaft.



3.

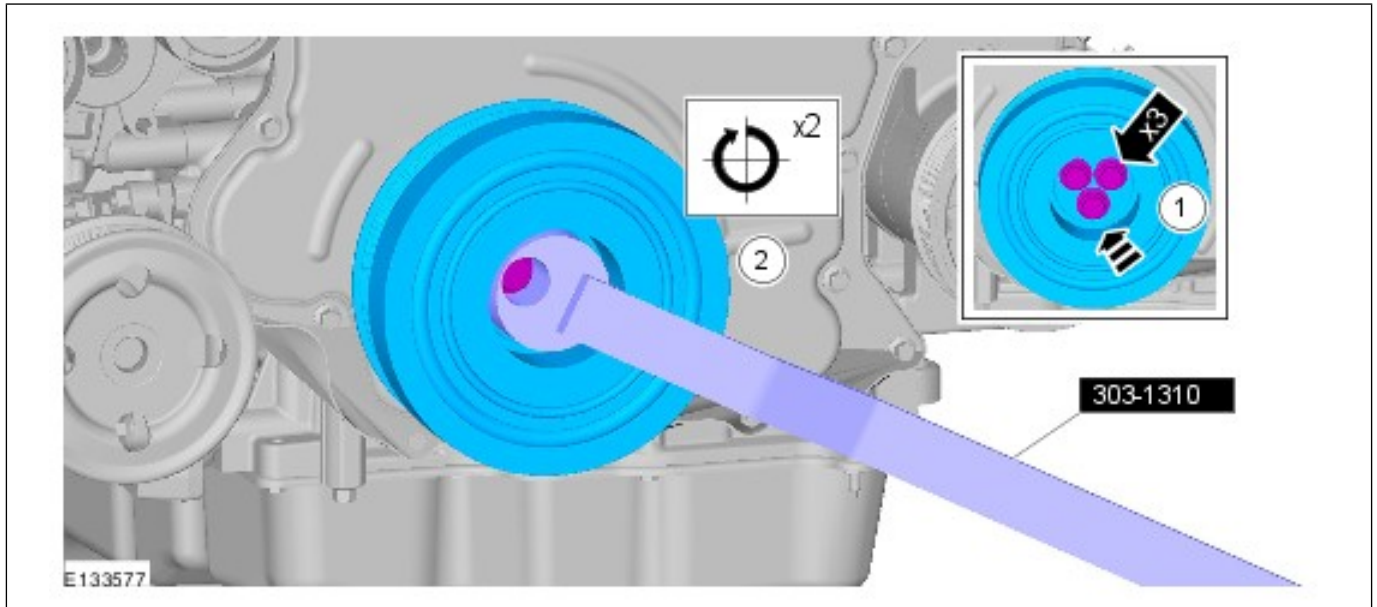


4. **NOTE:** Initially hand tighten the fasteners.

Torque:

- Stage 1: 45 Nm
- Stage 2: 120°

REMOVAL AND INSTALLATION

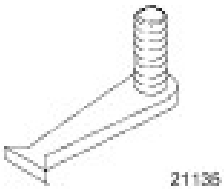


5. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

REMOVAL AND INSTALLATION

Crankshaft Rear Seal(21 468 4)

Special Tool(s)

	<p>303-254 Locking Tool, Flywheel</p>
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Materials

Name	Specification
Silicone Sealant LB 2U7J-M4G323-AA	WSE-M4G323-A4
Silicone Gasket and Sealant TA-30	

Removal

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

REMOVAL AND INSTALLATION

Vehicles with automatic transmission

1. Refer to: [Transmission - 2WD](#) (307-01 Automatic Transmission - Vehicles With: 6-Speed Automatic Transmission - 6R80, Removal).

Refer to: [Transmission - 4WD](#) (307-01 Automatic Transmission - Vehicles With: 6-Speed Automatic Transmission - 6R80, Removal).

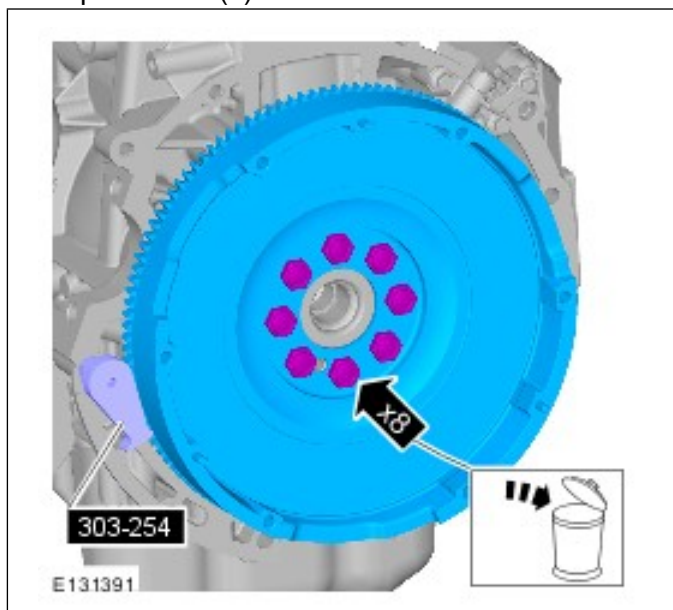
Vehicles with manual transmission

2. Refer to: [Clutch Disc and Pressure Plate](#) (308-01 Clutch - Vehicles With: 5-Speed Manual Transmission - MT75, Removal and Installation).

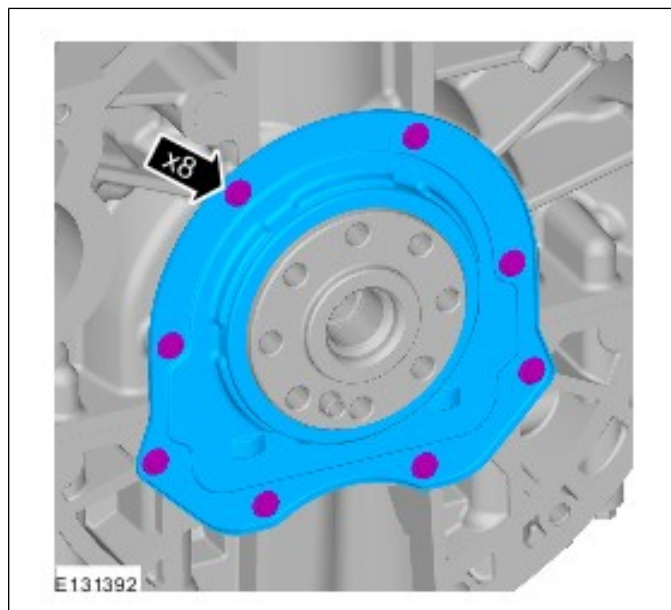
Refer to: [Clutch Disc and Pressure Plate](#) (308-01 Clutch - Vehicles With: 6-Speed Manual Transmission - MT82, Removal and Installation).

All vehicles

3. Special Tool(s): 303-254



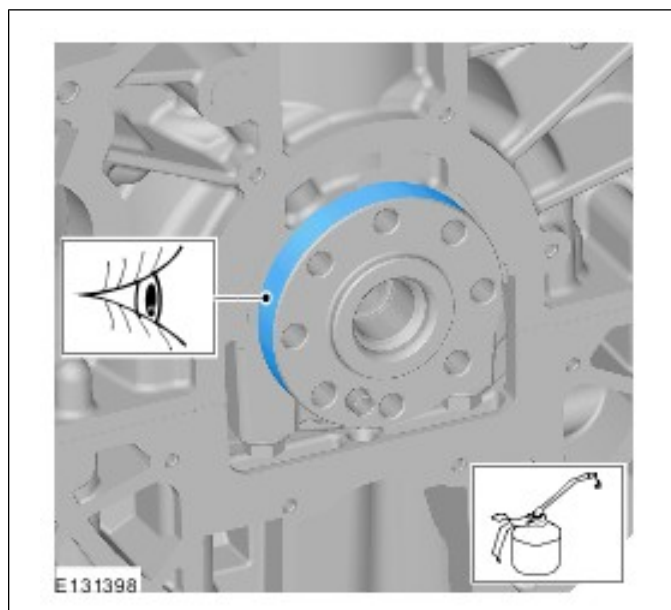
4.



Installation

All vehicles

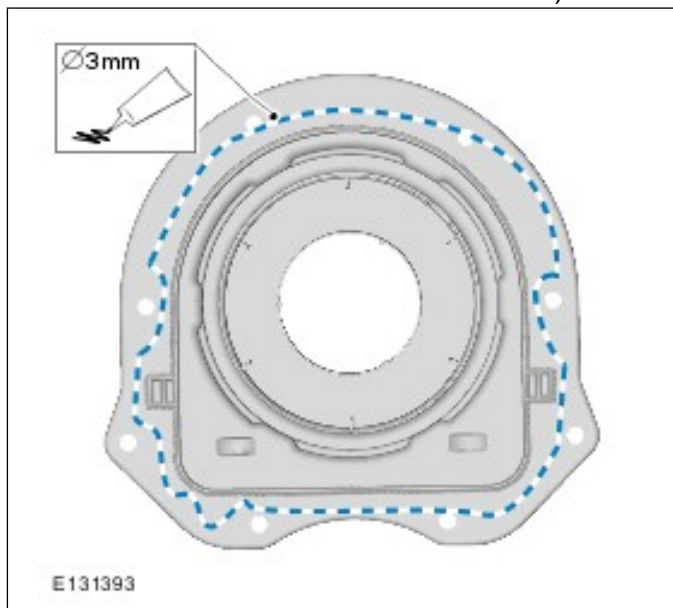
1.



2. **NOTE:** Install new crankshaft rear seal carrier with in five minutes after applying the recomendad sealent.

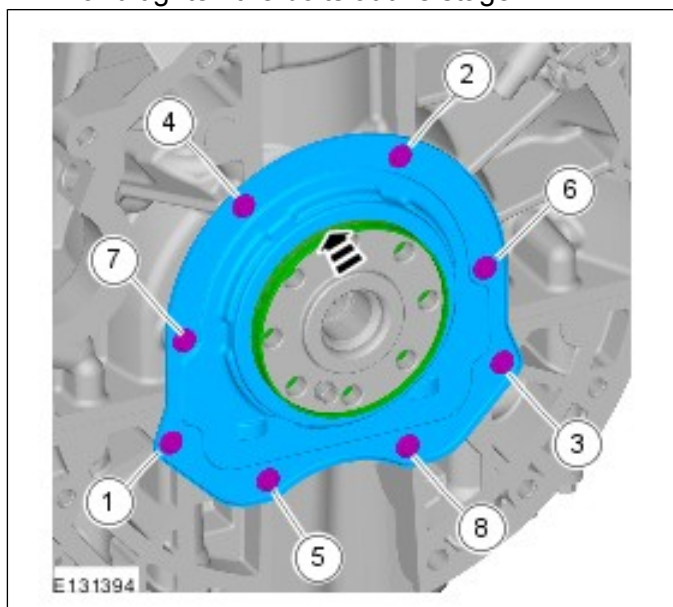
REMOVAL AND INSTALLATION

Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)



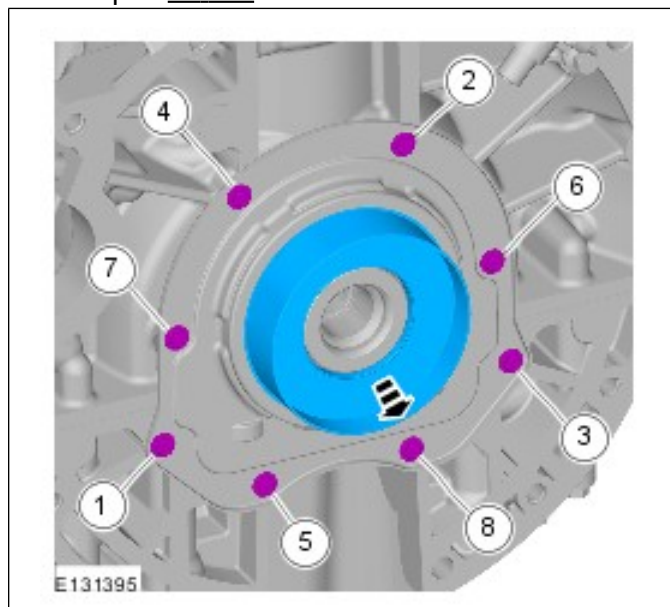
3. **CAUTION:** A new crankshaft rear seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft rear seal is fully installed. Failure to follow this instruction may result in damage to the vehicle.

Hand tighten the bolts at this stage.



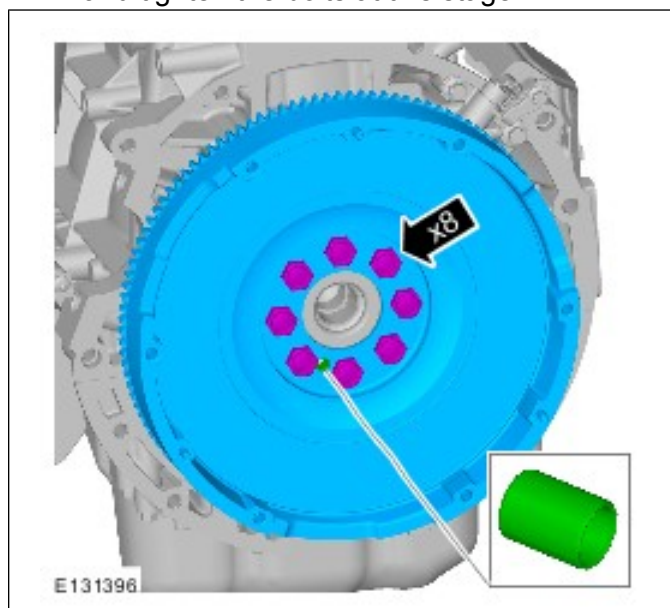
4. **NOTE:** New crankshaft seal carriers are supplied with an alignment sleeve which must be removed after installation.

Torque: 10 Nm



5. **NOTE:** Make sure that flywheel is in full contact with flywheel flange before installing the flywheel bolts.

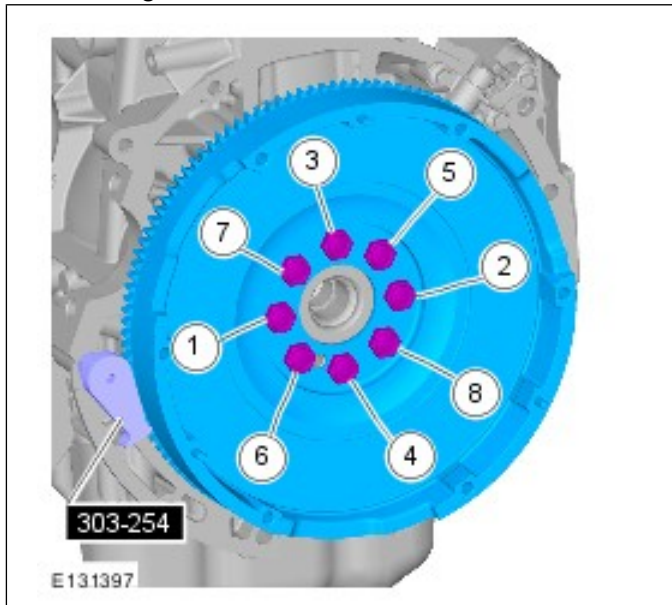
Hand tighten the bolts at this stage.



REMOVAL AND INSTALLATION

6. Torque:

- Stage 1: 15 Nm
- Stage 2: 30 Nm
- Stage 3: 75 Nm
- Stage 4: 45°



Vehicles with manual transmission

7. Refer to: [Clutch Disc and Pressure Plate](#) (308-01 Clutch - Vehicles With: 5-Speed Manual Transmission - MT75, Removal and Installation).

Refer to: [Clutch Disc and Pressure Plate](#) (308-01 Clutch - Vehicles With: 6-Speed Manual Transmission - MT82, Removal and Installation).

Vehicles with automatic transmission

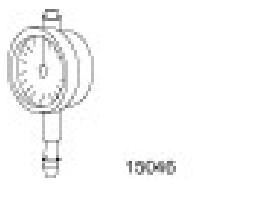
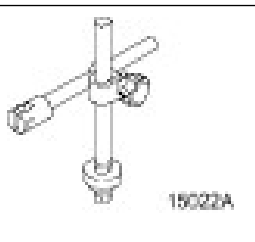
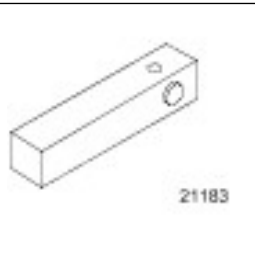
8. Refer to: [Transmission - 2WD](#) (307-01 Automatic Transmission - Vehicles With: 6-Speed Automatic Transmission - 6R80, Installation).

Refer to: [Transmission - 4WD](#) (307-01 Automatic Transmission - Vehicles With: 6-Speed Automatic Transmission - 6R80, Installation).

REMOVAL AND INSTALLATION

Cylinder Head(21 163 0)

Special Tool(s)

	205-069 Dial Indicator Gauge (Metric)
	205-070 Holding Fixture, Dial Indicator Gauge
	303-432 Holding Fixture, Dial Indicator Gauge (Cylinder Liner Protrusion)

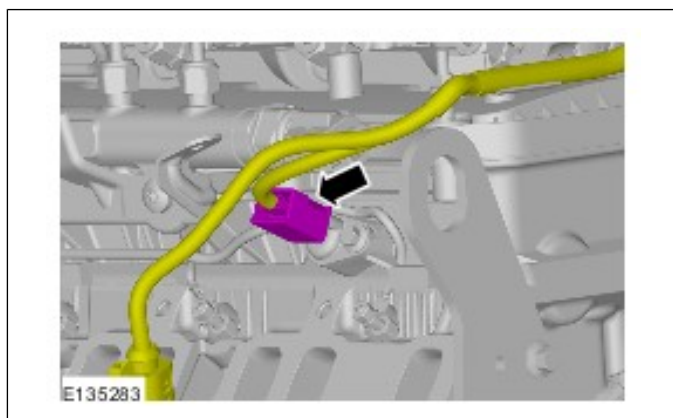
Removal

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

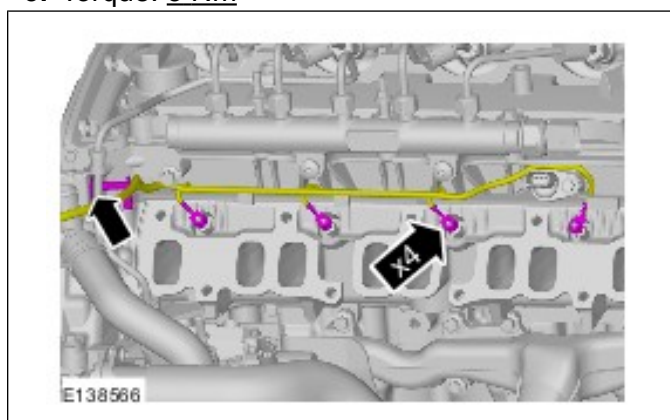
All vehicles

1. Refer to: [Intake Manifold](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

2.

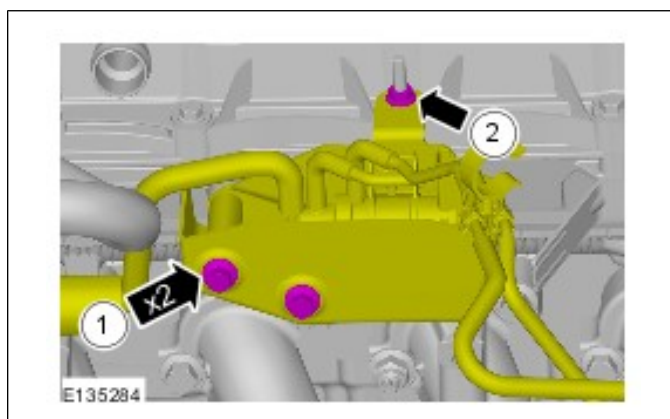


3. Torque: 3 Nm



Vehicles with fixed vane turbocharger

4. 1. Torque: 10 Nm
2. Torque: 12 Nm

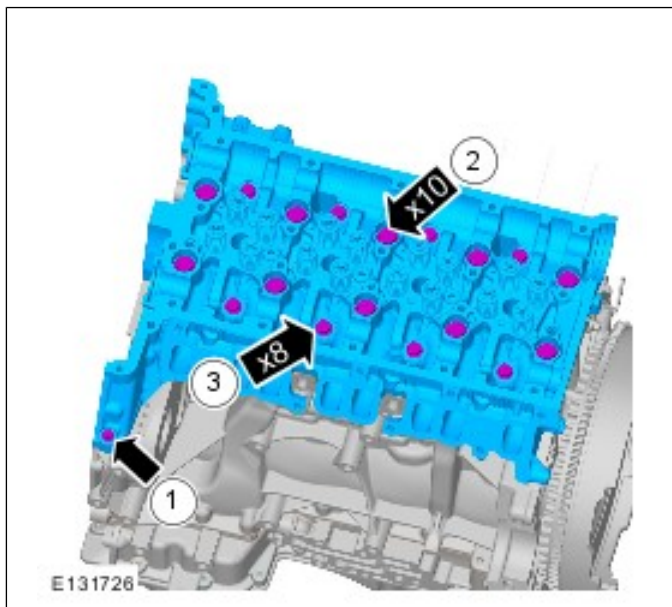


REMOVAL AND INSTALLATION

All vehicles

5. Refer to: [Exhaust Gas Recirculation \(EGR\) Valve](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-08 Engine Emission Control - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).
6. Refer to: [Exhaust Manifold](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
7. Refer to: [Camshafts](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

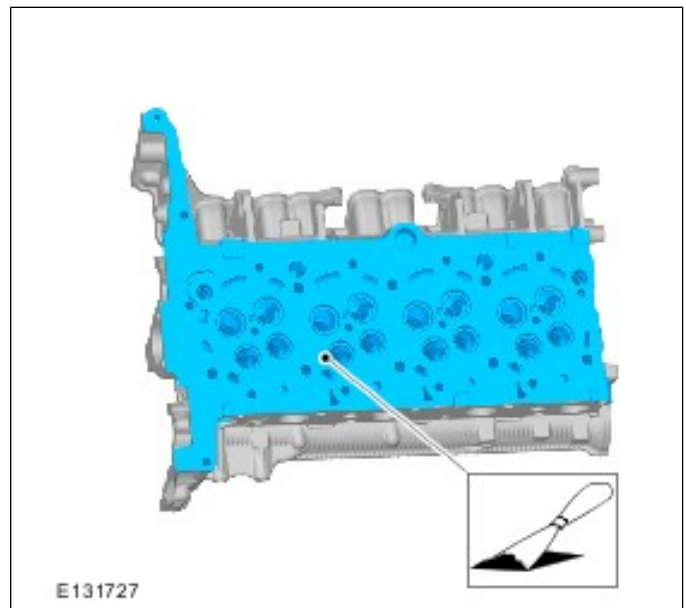
8.



Installation

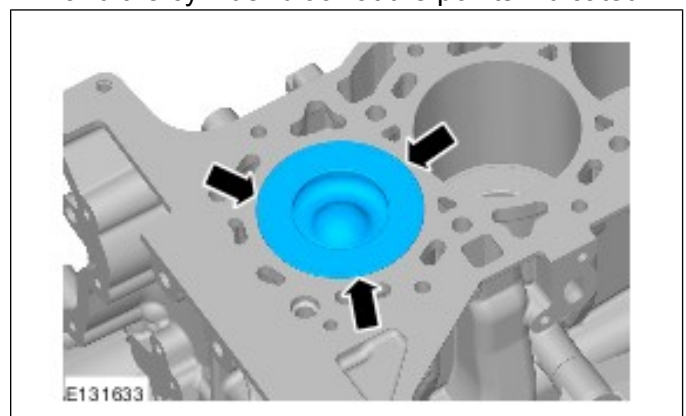
1. **WARNING:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak

paths. Use a plastic scraping tool to remove all traces of the head gasket.



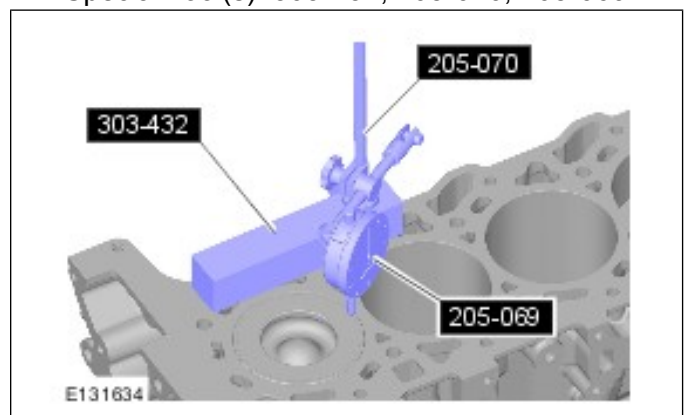
2. **NOTE:** Measure the piston protrusion of each cylinder at top dead center (TDC)

Measure the distance between the piston crown and the cylinder block at the points indicated.



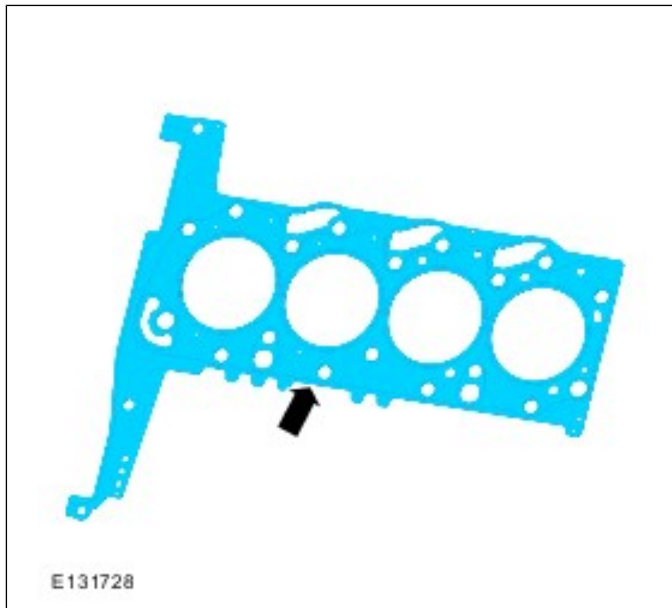
3. **NOTE:** The largest measurement determines the choice of the cylinder head gasket.

Special Tool(s): 303-432, 205-070, 205-069



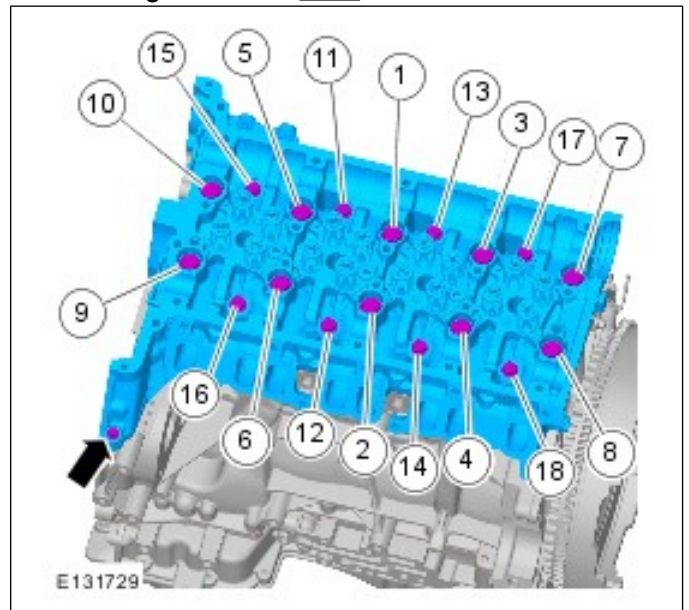
REMOVAL AND INSTALLATION

4. **NOTE:** Make sure that new component is installed.

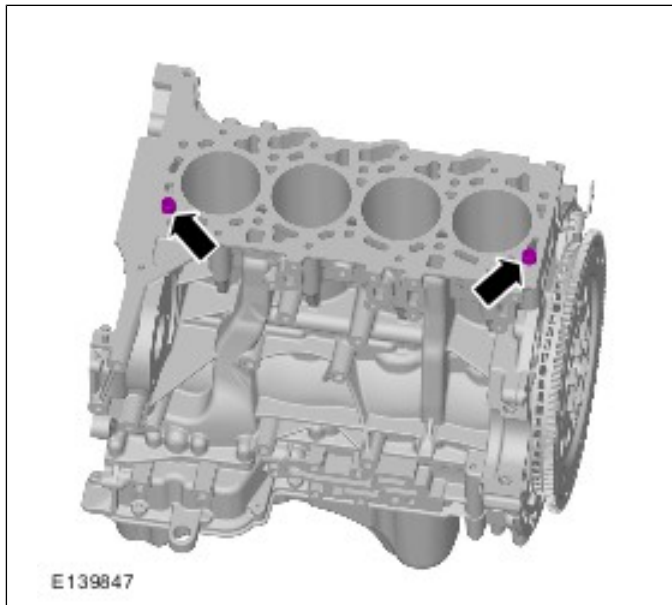


Torque:

- Stage 1: 1 -10 10 Nm
- Stage 2: 11-18 5 Nm
- Stage 3: 1-10 20 Nm
- Stage 4: 11-18 10 Nm
- Stage 5: 1-10 40 Nm
- Stage 6: 11-18 20 Nm
- Stage 7: 1-10 180°
- Stage 8: 11-18 180°



5.



7. To install, reverse the removal procedure.

6.  **CAUTION:** Make sure that new cylinder head bolts are installed.

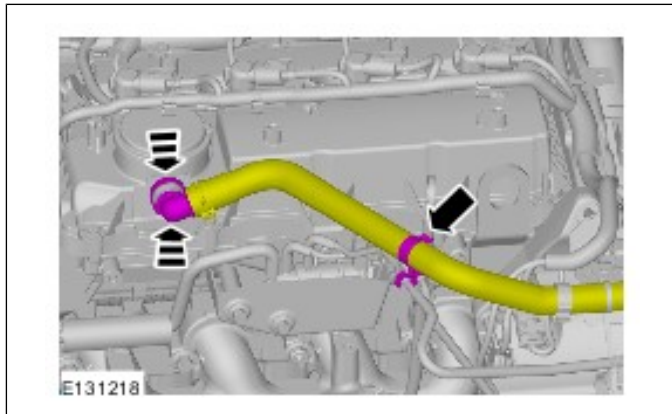
REMOVAL AND INSTALLATION

Exhaust Manifold(21 187 0)

Removal

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

1.

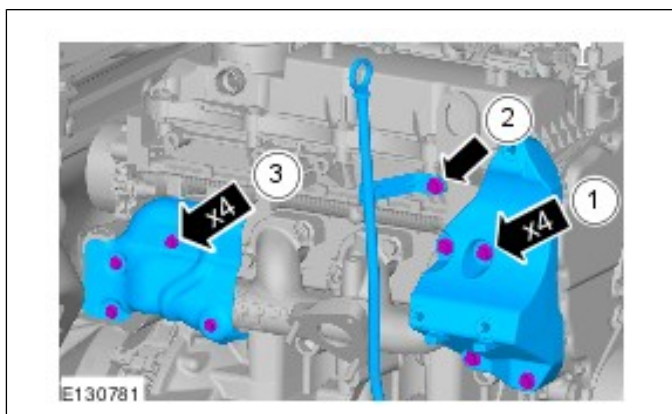


2. Refer to: [Turbocharger - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, LHD 4WD/LHD RWD \(303-04 Fuel Charging and Controls - Turbocharger, Removal and Installation\).](#)

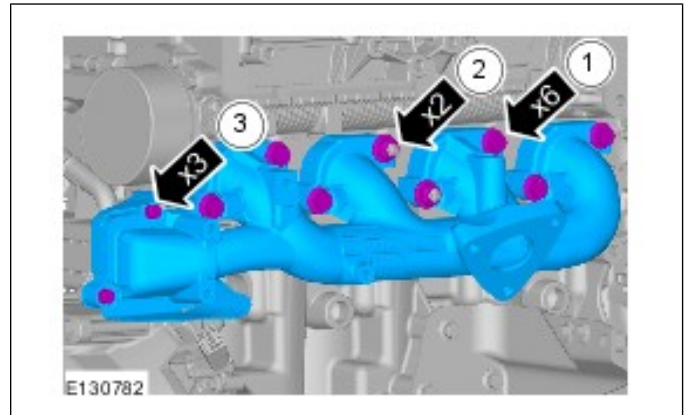
Refer to: [Generator - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma \(414-02 Generator and Regulator, Removal and Installation\).](#)

Refer to: [Turbocharger - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, RHD 4WD/RHD RWD \(303-04 Fuel Charging and Controls - Turbocharger, Removal and Installation\).](#)

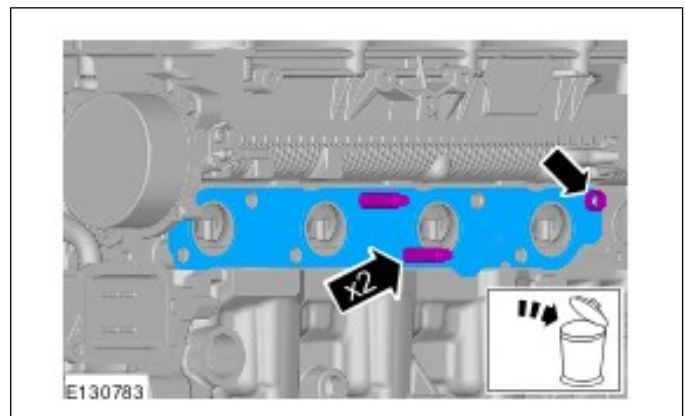
3. 1. Torque: 25 Nm
2. Torque: 23 Nm
3. Torque: 9 Nm



4. 1. Torque: 55 Nm
2. Torque: 40 Nm
3. Torque: 15 Nm



5.



Installation

NOTE: Install new exhaust manifold studs, bolts, nuts, gaskets and O-ring seals.




1. To install , reverse the removal procedure.

REMOVAL AND INSTALLATION

Intake Manifold(21 183 0)

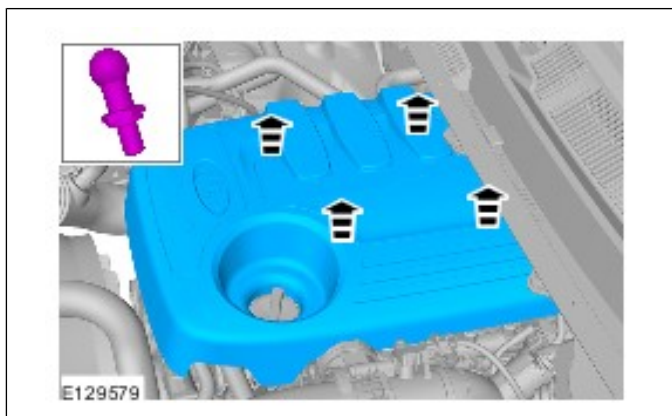
Removal

WARNINGS:

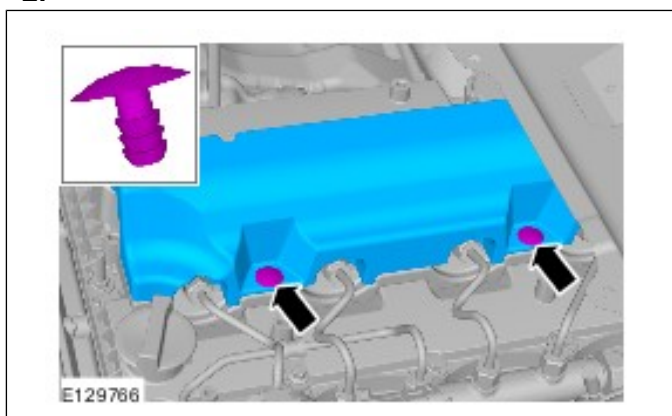
-  Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.
-  Do not carry out any repairs to the fuel injection system with the engine running. The fuel pressure within the system is approximately 1600 bars. Failure to follow this instruction may result in personal injury.
-  Wait at least one minute after the engine stops before commencing any repair to the fuel injection system. Failure to follow this instruction may result in personal injury.

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

1.

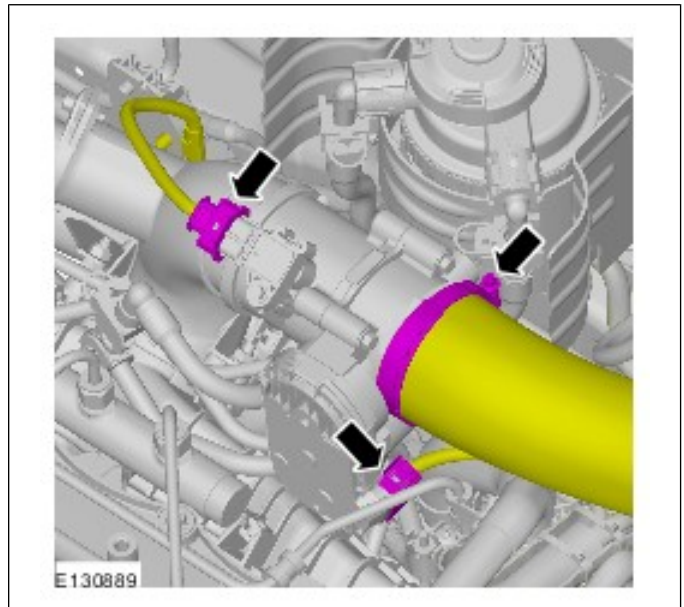


2.

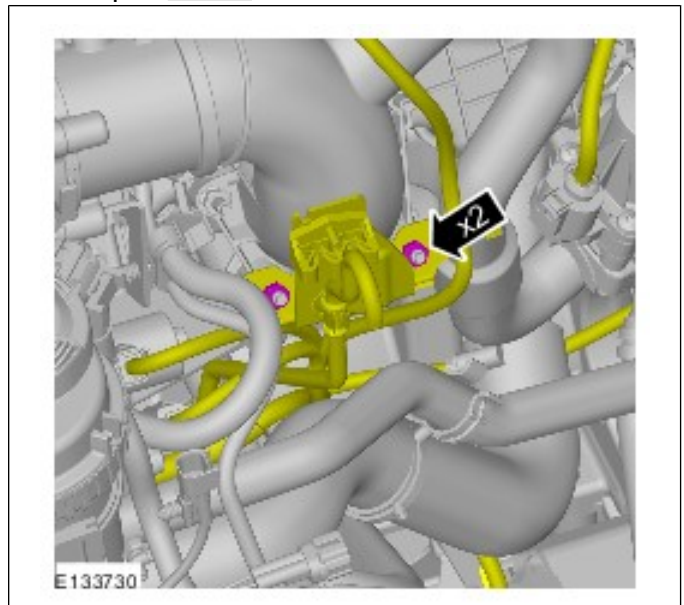


3. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

4.

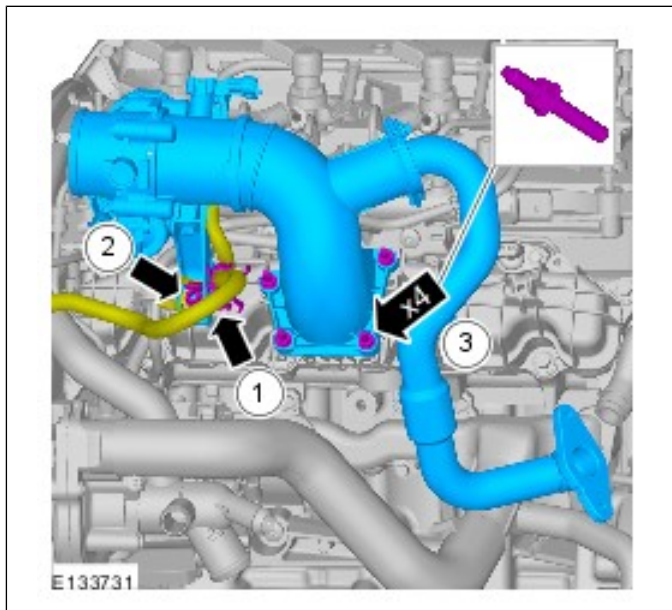


5. Torque: 11 Nm

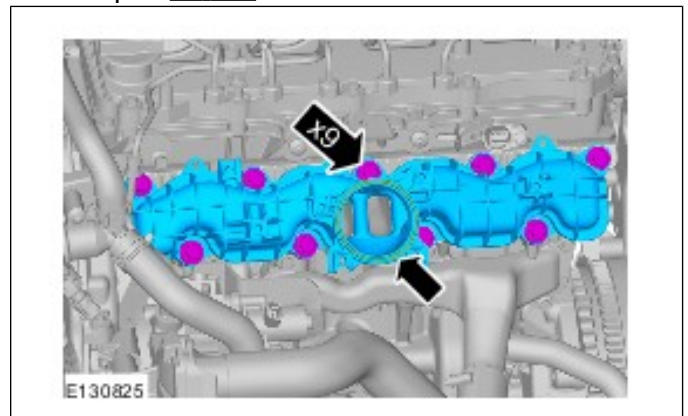


REMOVAL AND INSTALLATION

6. Refer to: Exhaust Gas Recirculation (EGR) Valve - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-08 Engine Emission Control - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).
7. 2. Torque: 10 Nm
3. Torque: 15 Nm



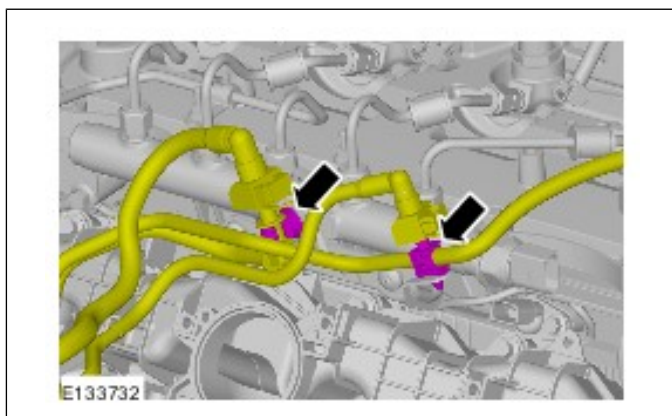
9. Torque: 25 Nm



Installation

1. **NOTE:** Inspect the intake manifold gaskets, Install new intake manifold gaskets if necessary.
To install, reverse the removal procedure.


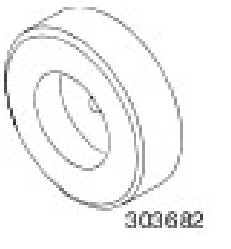
- 8.



REMOVAL AND INSTALLATION

Timing Cover(21 146 0)

Special Tool(s)

	303-428 Separator, Oil Pan
	303-682 Aligner, Engine Front Cover

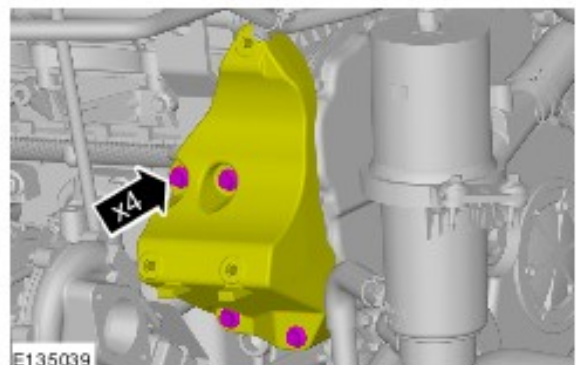
Materials

Name	Specification
Silicone Sealant LB 2U7J-M4G323-AA	WSE-M4G323-A4
Silicone Gasket and Sealant TA-30	

Removal

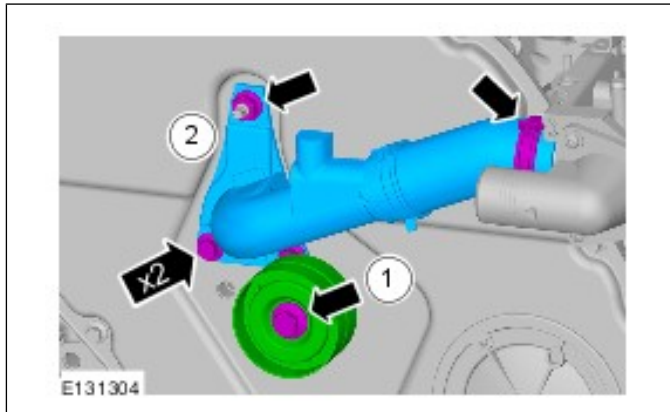
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
3. Refer to: [Generator - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (414-02 Generator and Regulator, Removal and Installation).
4. Torque: 25 Nm

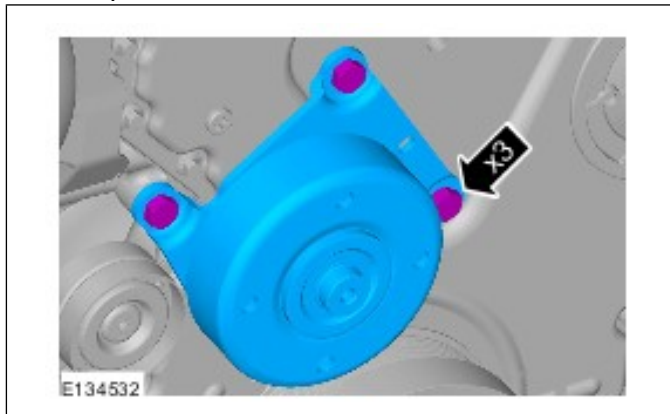


REMOVAL AND INSTALLATION

5. 1. Torque: 48 Nm
2. Torque: 23 Nm

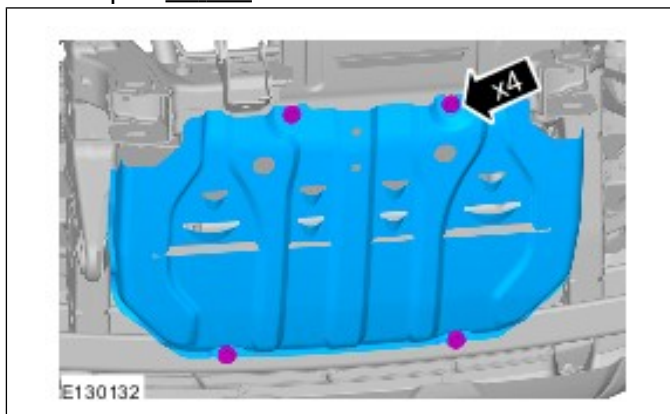


6. Torque: 48 Nm



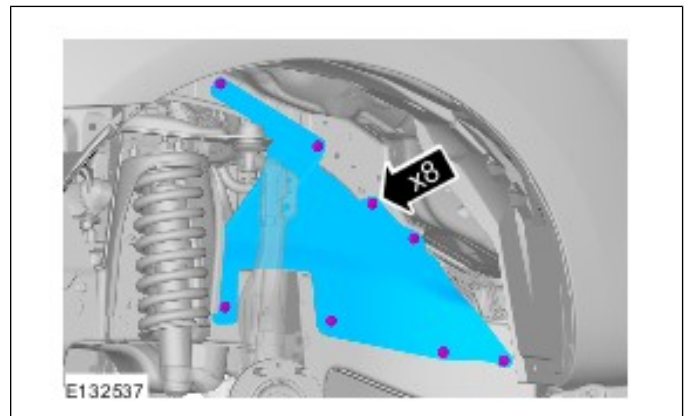
7. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

8. Torque: 30 Nm



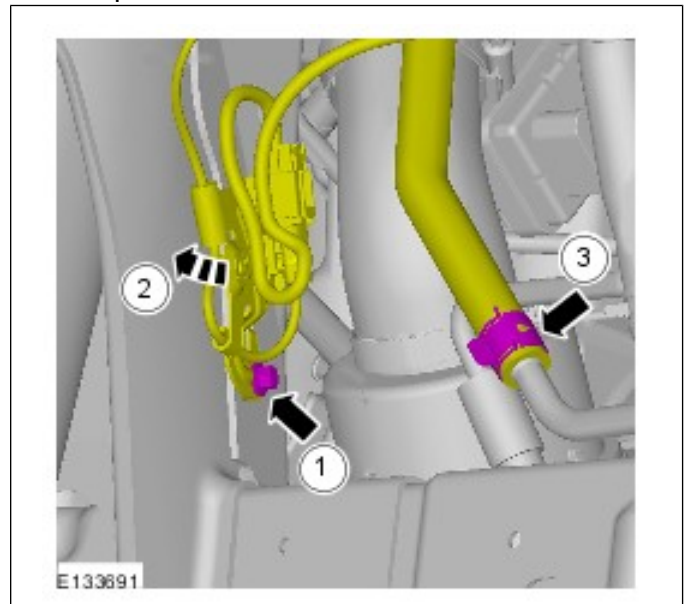
9. **NOTE:** Remove front RH wheel only.
Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

- 10.



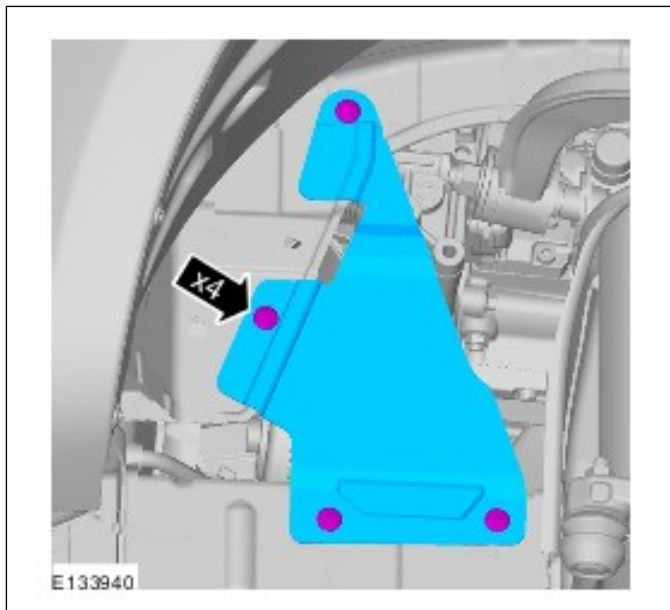
11. **CAUTION:** Cap the power steering line to prevent fluid loss or dirt ingress.

Torque: 7 Nm

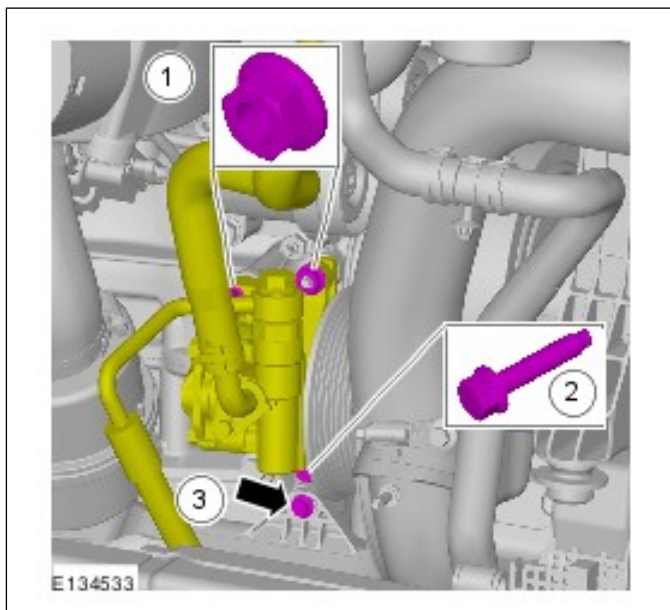


REMOVAL AND INSTALLATION

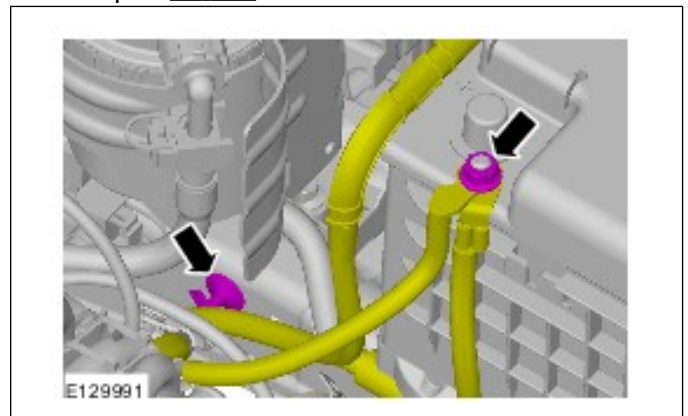
12.



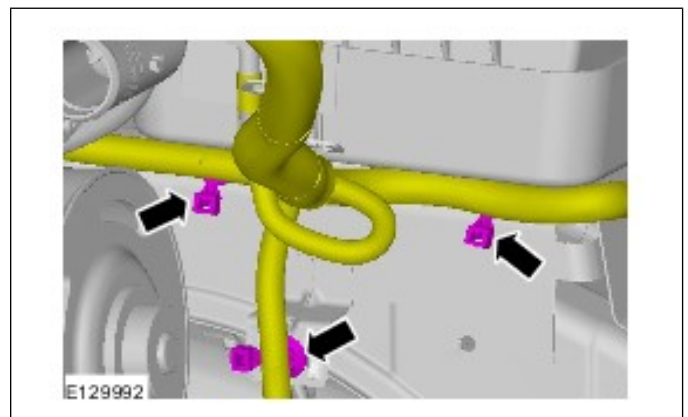
13. 1. Torque: 20 Nm
 2. Torque: 20 Nm
 3. Torque: 18 Nm



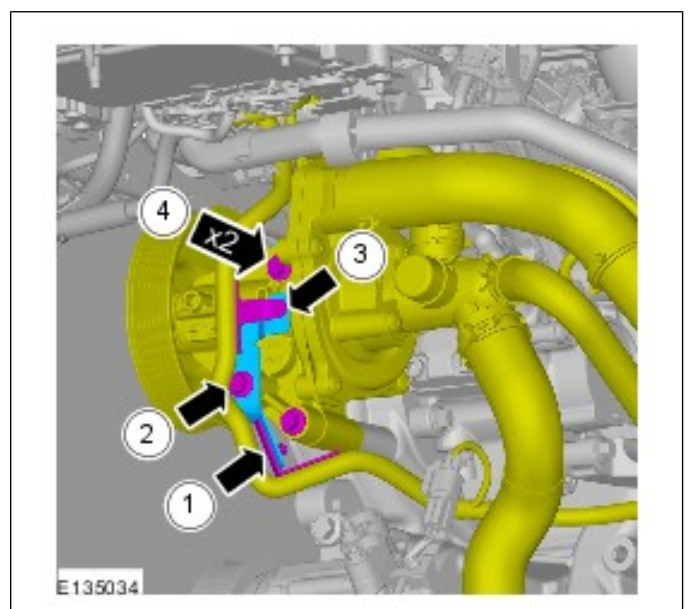
14. Torque: 22 Nm



15.

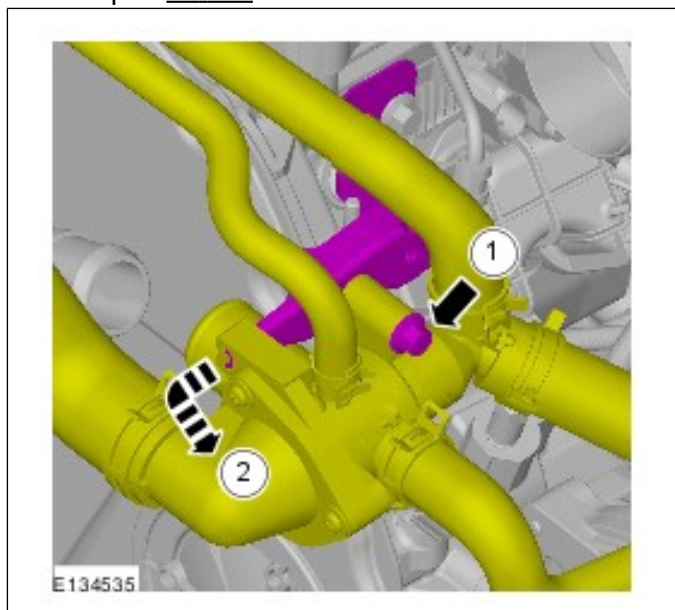


16. 2. Torque: 23 Nm
 4. Torque: 23 Nm

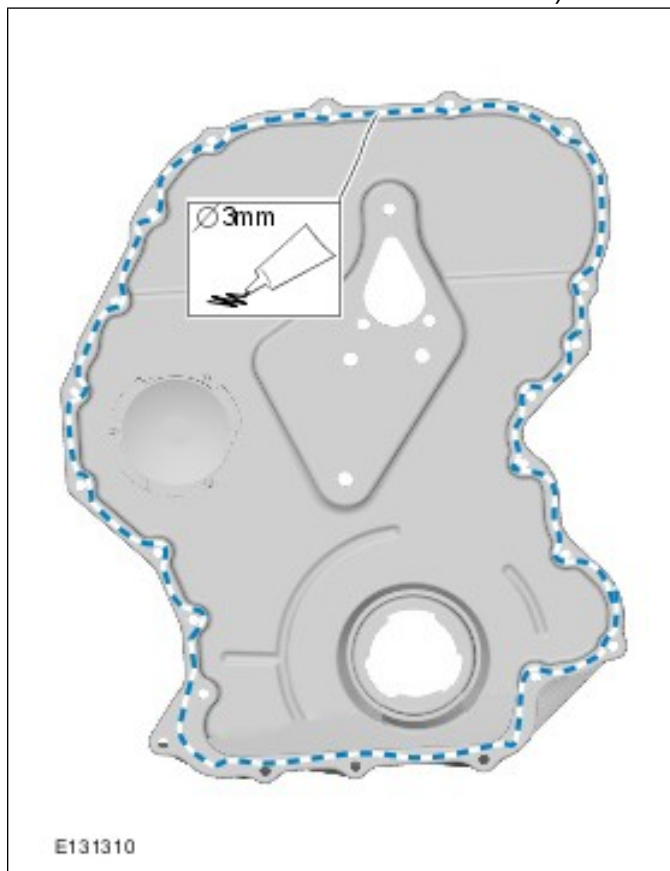


REMOVAL AND INSTALLATION

17. Torque: 23 Nm

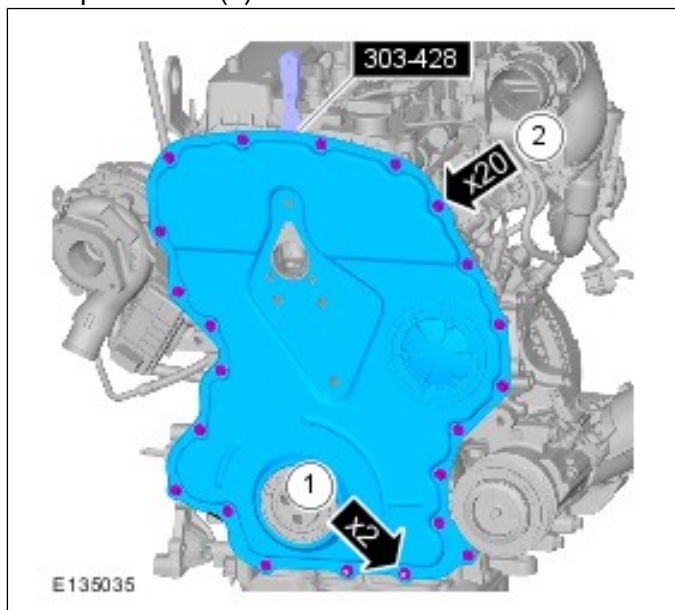


Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)



18. Refer to: [Crankshaft Front Seal](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

19. Special Tool(s): 303-428



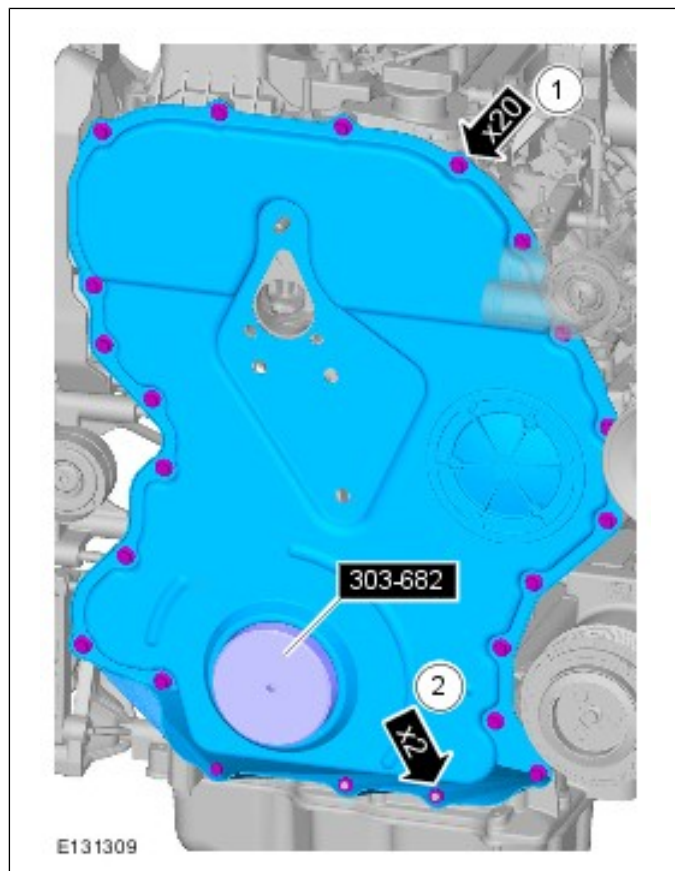
Installation

1. **CAUTION:** Install timing cover with in five minutes of applying the sealent.

NOTE: Do not damage the mating surfaces.

REMOVAL AND INSTALLATION

2. 1. Special Tool(s): 303-682
Torque: 14 Nm
2. Torque: 10 Nm



3. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Oil Pan(21 154 0)

Special Tool(s)

	303-428 Separator, Oil Pan
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Materials

Name	Specification
Silicone Sealant LB 2U7J-M4G323-AA	WSE-M4G323-A4
Silicone Gasket and Sealant TA-30	

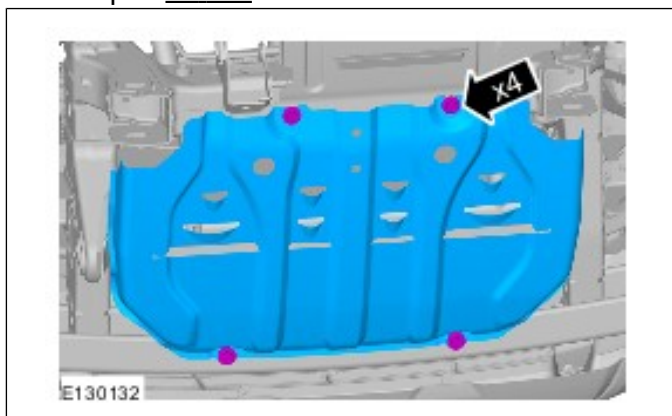
Removal

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

1. Refer to: [Engine Cooling System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

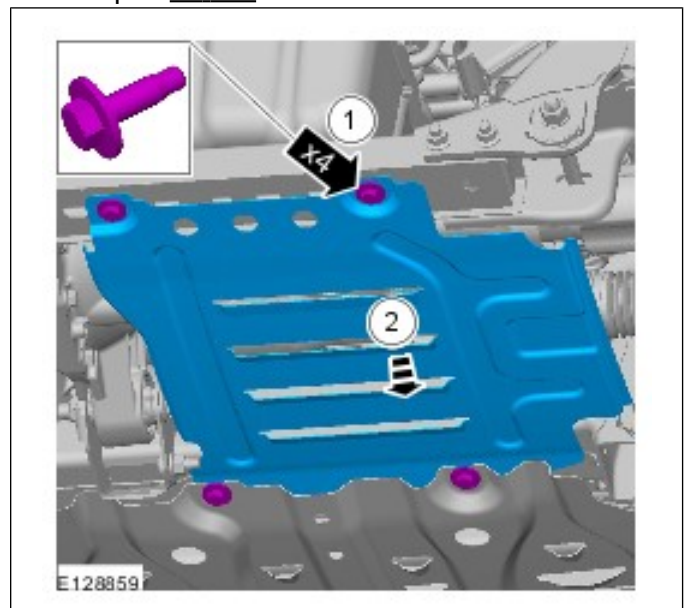
4x4

4. Torque: 30 Nm

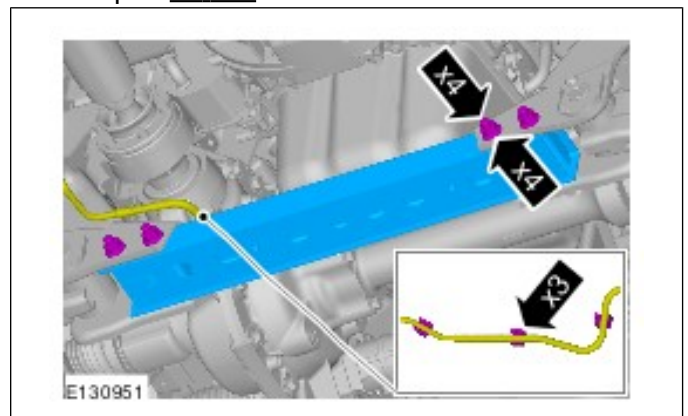


All vehicles

5. Torque: 30 Nm



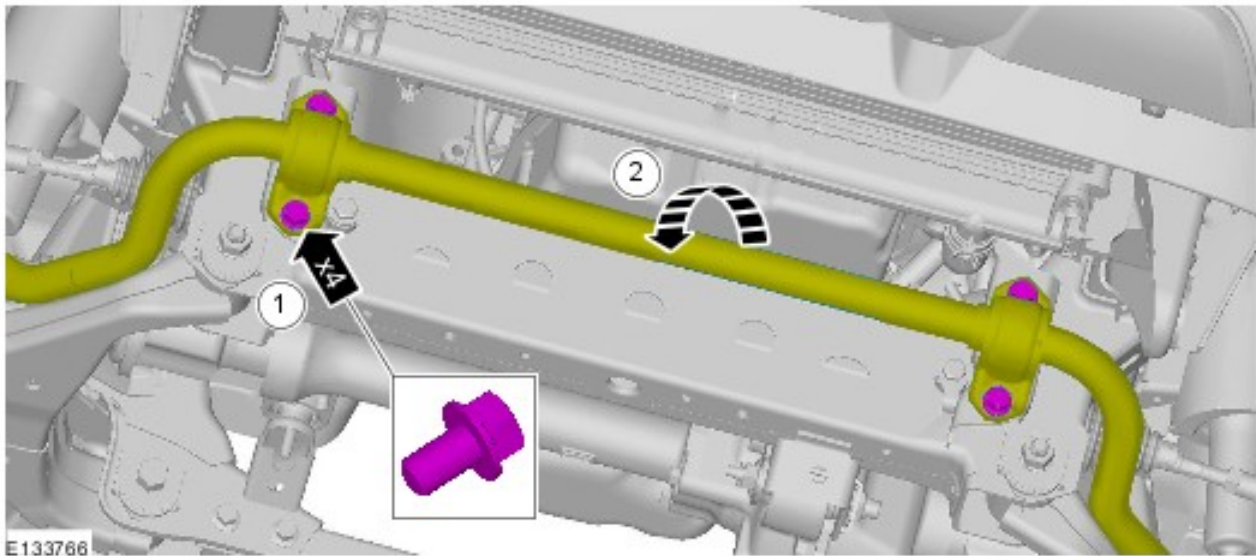
6. Torque: 90 Nm



REMOVAL AND INSTALLATION

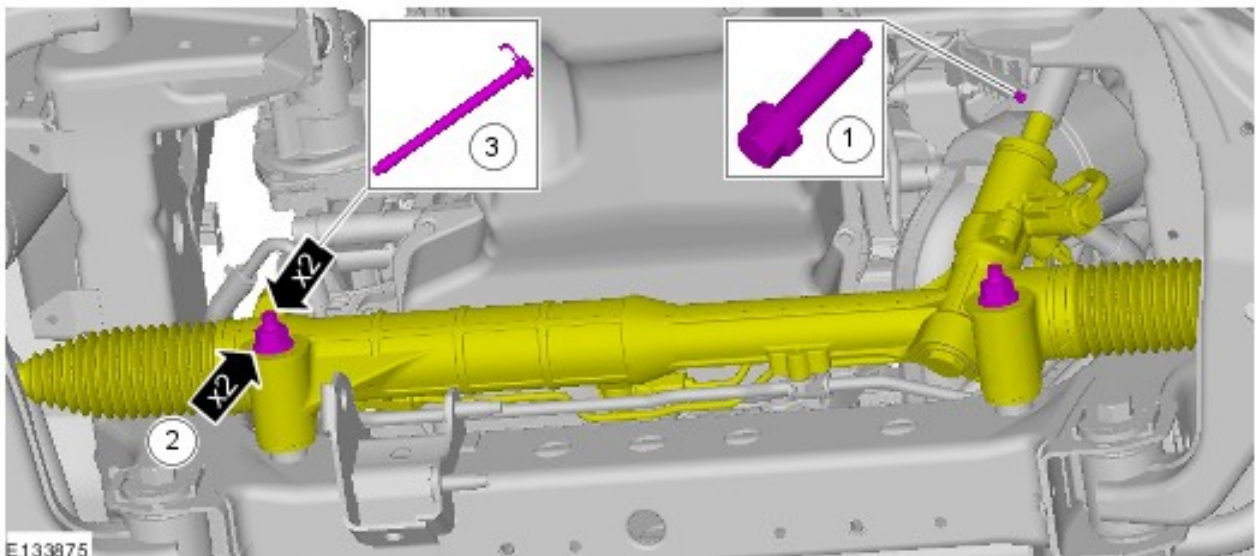
4x4

7. Torque: 30 Nm



All vehicles

8. 1. Torque: 23 Nm
2. Torque: 150 Nm



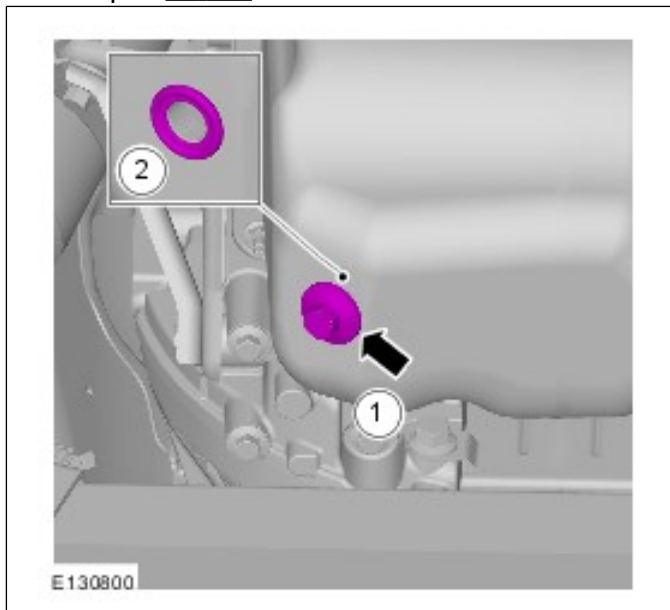
9. **NOTE:** Be prepared to collect escaping fluid.

NOTE: Inspect the oil pan drain plug seal for damage. Install a new drain plug and seal if required.

Drain the oil into a suitable container.

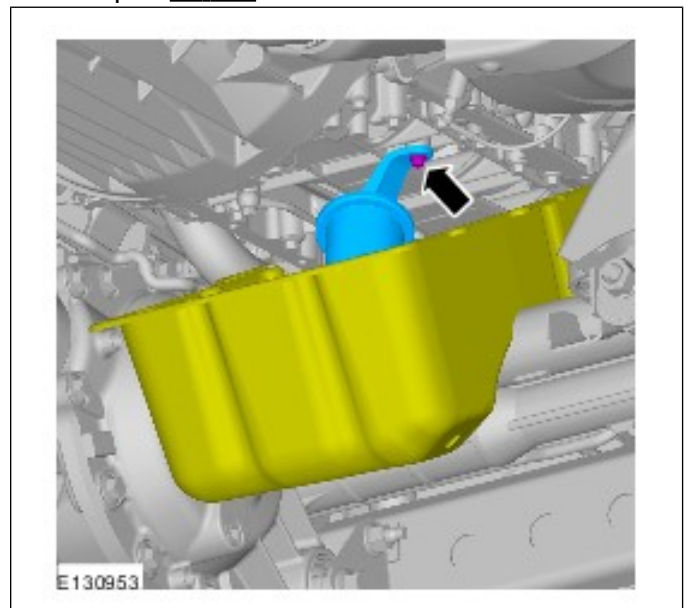
REMOVAL AND INSTALLATION

Torque: 39 Nm

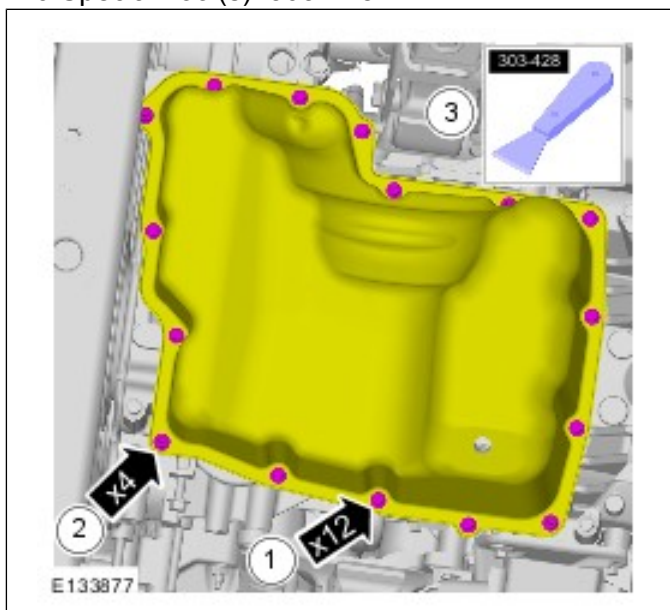


4x4

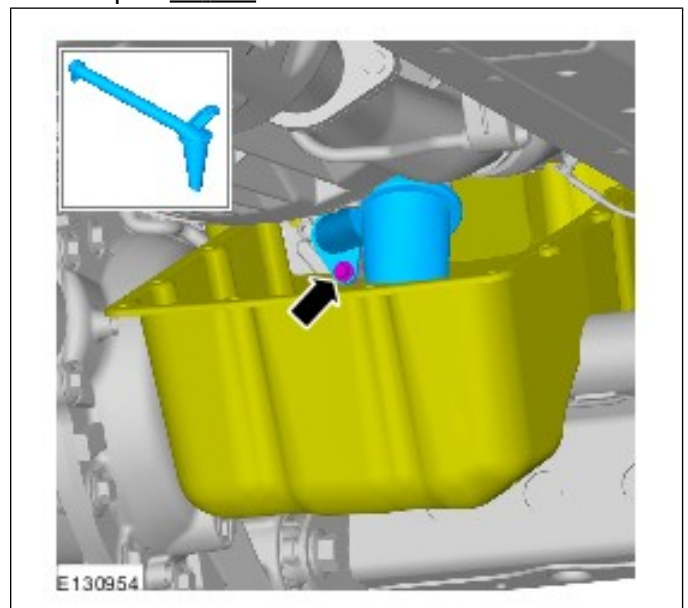
11. Torque: 10 Nm



10. Special Tool(s): 303-428

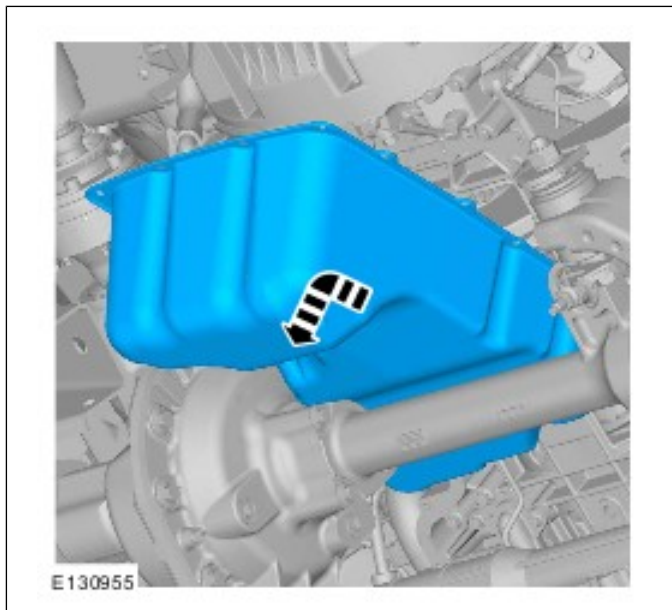


12 Torque: 10 Nm



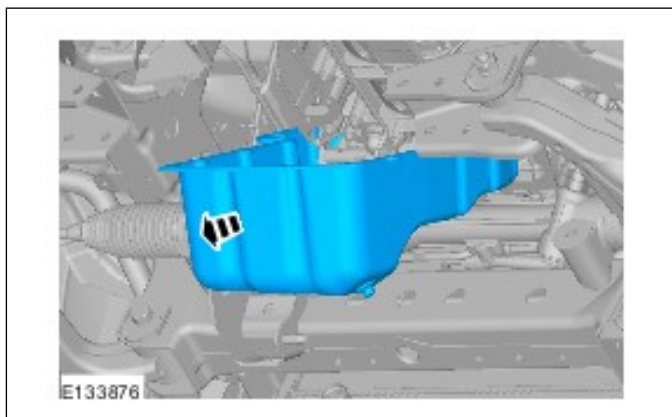
REMOVAL AND INSTALLATION

13.




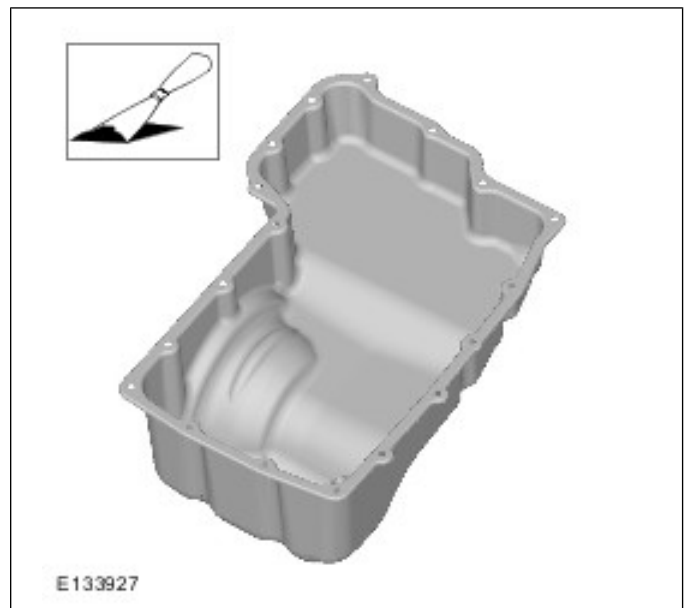
All vehicles

14.



Installation

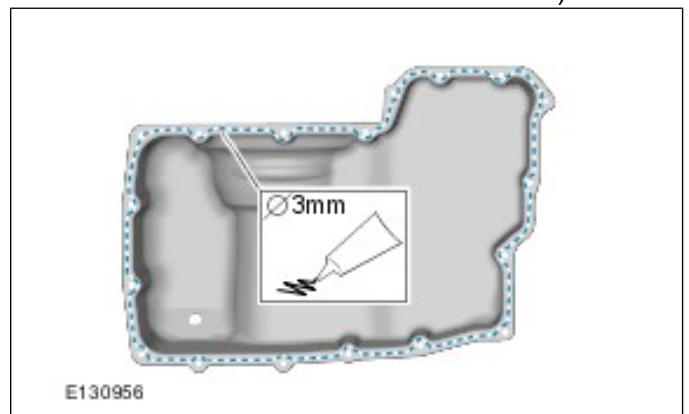
1.  **WARNING:** Take extra care not to damage the mating faces.



2.  **CAUTION:** Install the oil pan within five minutes of applying the sealer.

NOTE: Take extra care not to damage the mating faces.

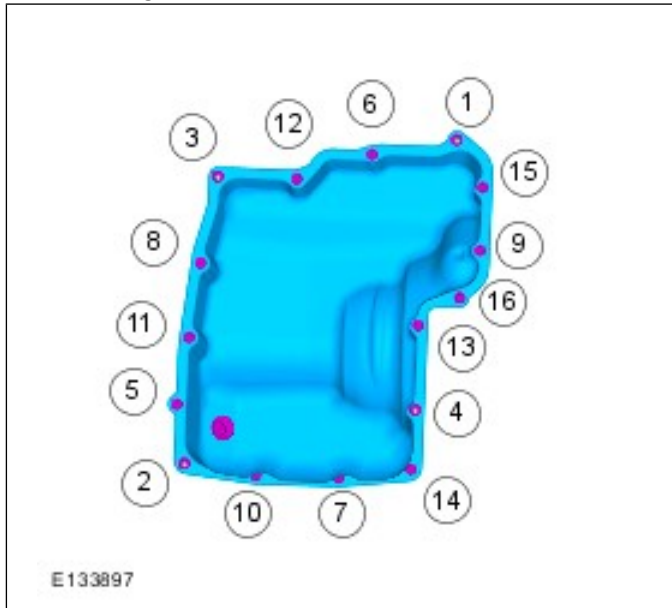
Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)



REMOVAL AND INSTALLATION

3. Torque:

- Stage 1: 7 Nm
- Stage 2: 14 Nm



4. To install, reverse the removal procedure.

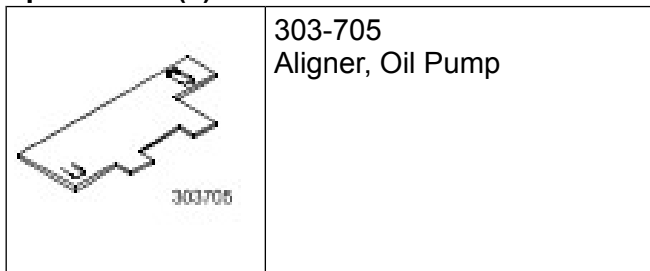
5. Fill the engine with clean engine oil.

Refer to: [Specifications](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Specifications).

REMOVAL AND INSTALLATION

Oil Pump(21 714 0)

Special Tool(s)



Removal

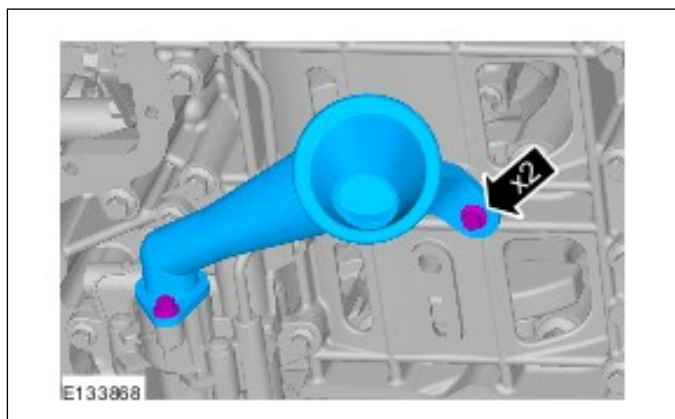
NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Oil Pan](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

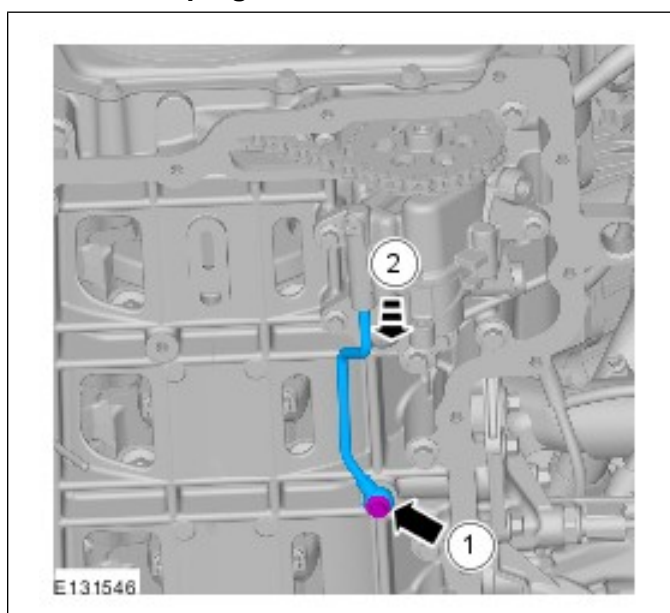
4x2

2.



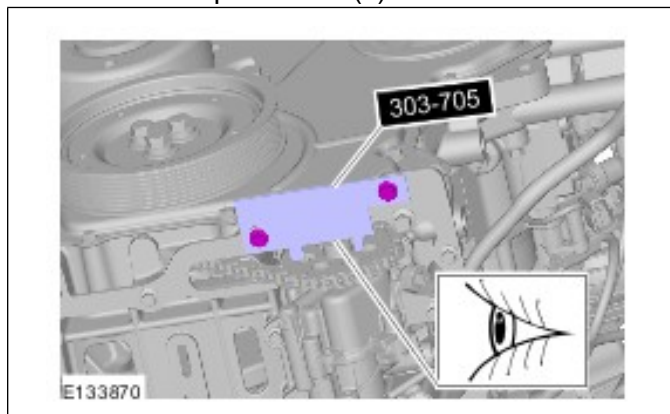
All vehicles

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



4. **NOTE:** The profile of the special tool must be in contact with the oil pump sprocket.

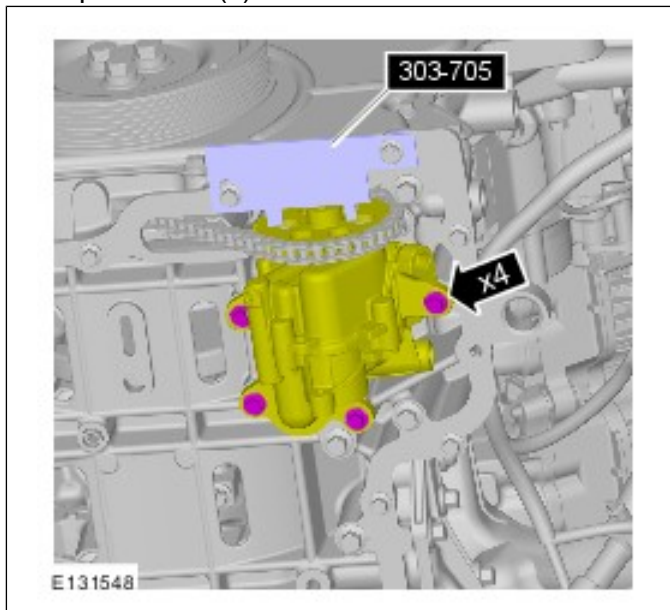
Install the Special Tool(s): 303-705



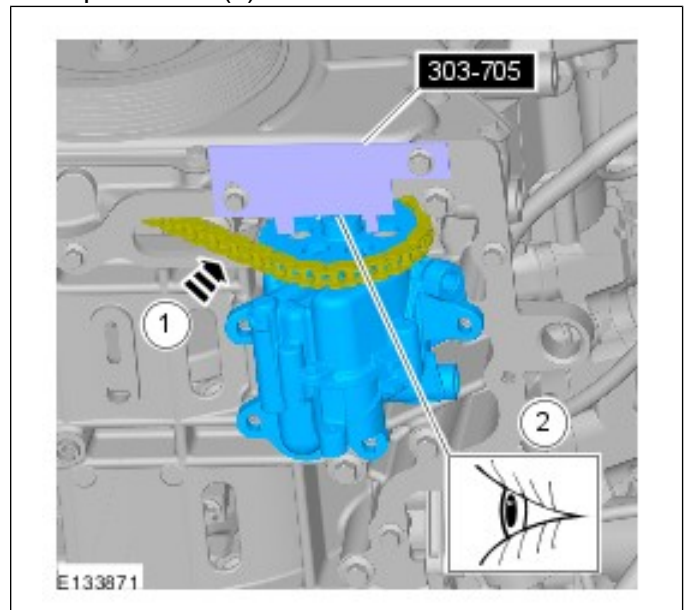
5. **NOTE:** Do not completely loosen the bolts at this stage.

REMOVAL AND INSTALLATION

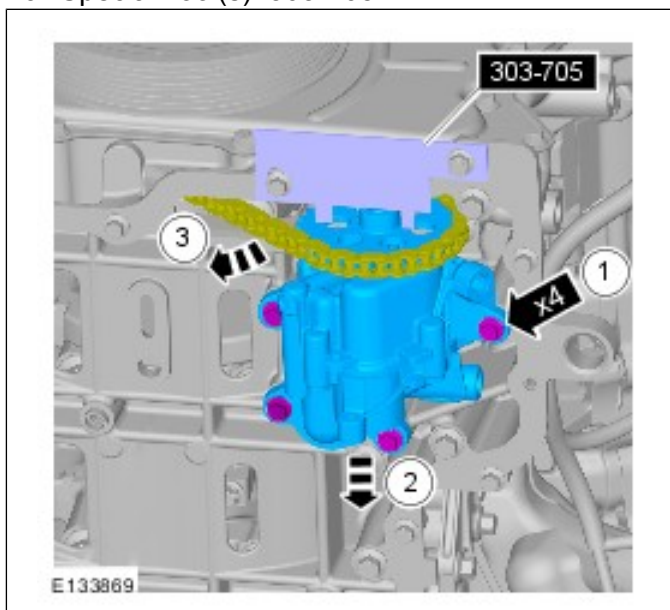
Special Tool(s): 303-705



Special Tool(s): 303-705

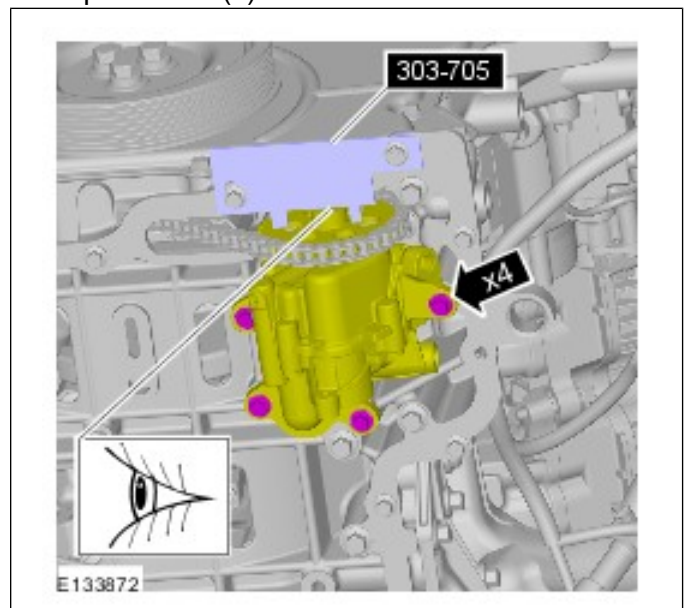


6. Special Tool(s): 303-705



2. **NOTE:** Hand tighten the bolts at this stage.

Special Tool(s): 303-705

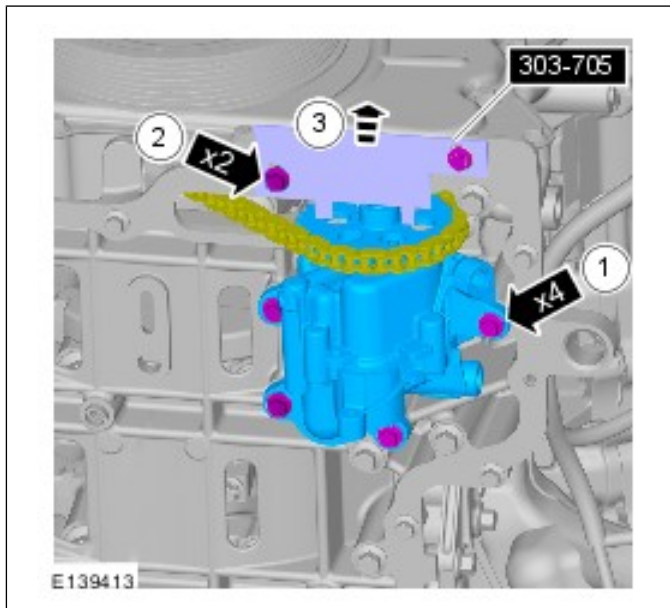


Installation

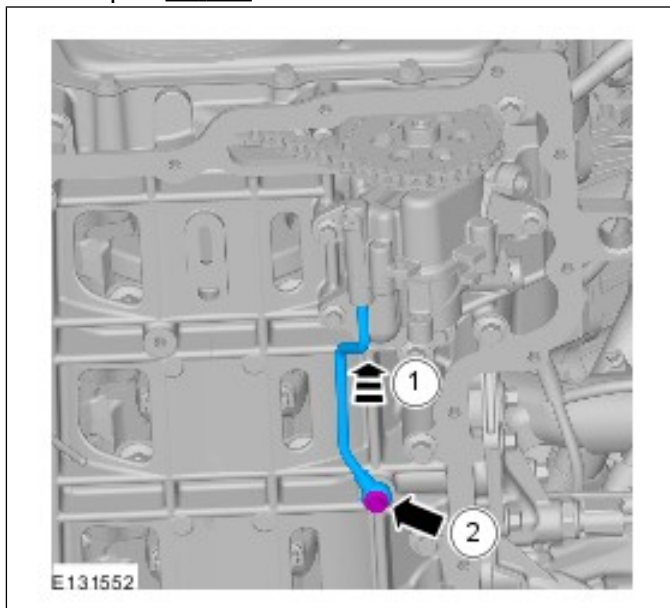
1. **NOTE:** The profile of the special tool must be in contact with the oil pump sprocket.

REMOVAL AND INSTALLATION

3. 1. Torque: 10 Nm
3. Remove the Special Tool(s): 303-705

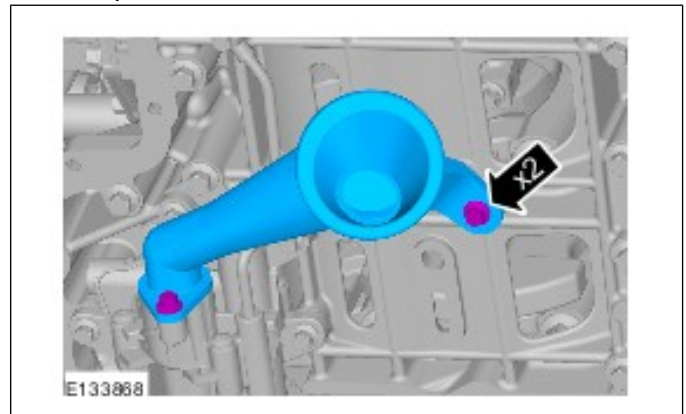


4. Torque: 13 Nm



4x2

5. Torque: 10 Nm



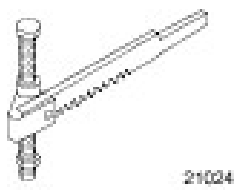

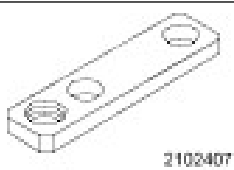
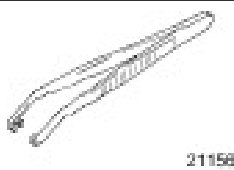
All vehicles

6. Refer to: [Oil Pan](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

REMOVAL AND INSTALLATION

Valves

Special Tool(s)

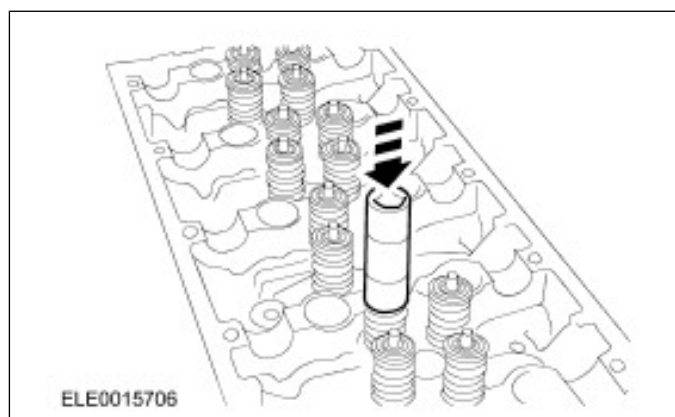
	303-060 Compressor, Valve Spring
	303-060-05 Adapter for 303-060
	303-060-07 Adapter for 303-060
	303-362 Installer, Valve Stem Collets

Removal

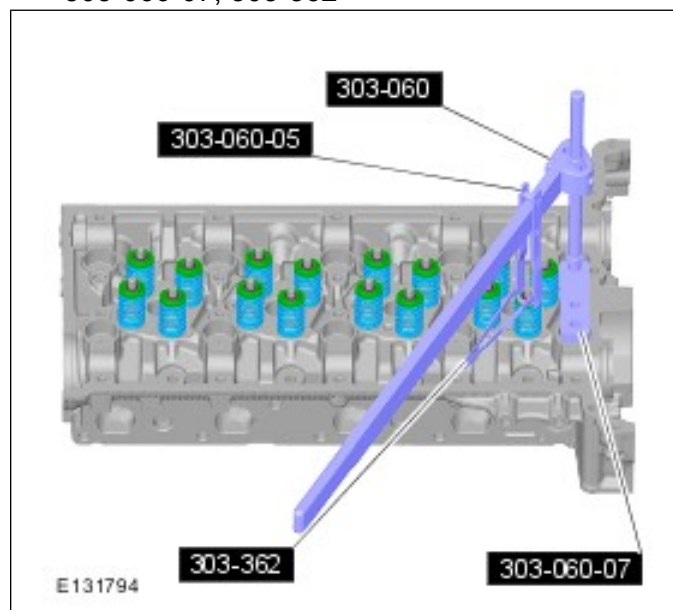
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Cylinder Head](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

2. **NOTE:** Position a socket on the valve spring seat and gently strike it with a hammer.

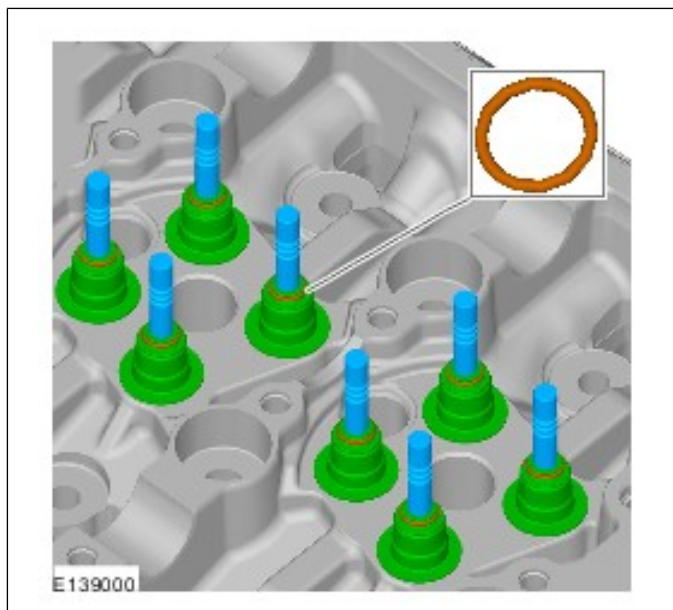


3. Special Tool(s): 303-060, 303-060-05, 303-060-07, 303-362



REMOVAL AND INSTALLATION

4.



Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

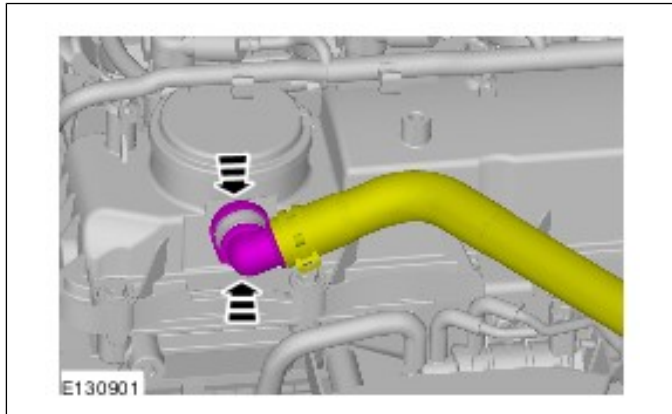
Valve Cover(21 141 0)

Removal

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

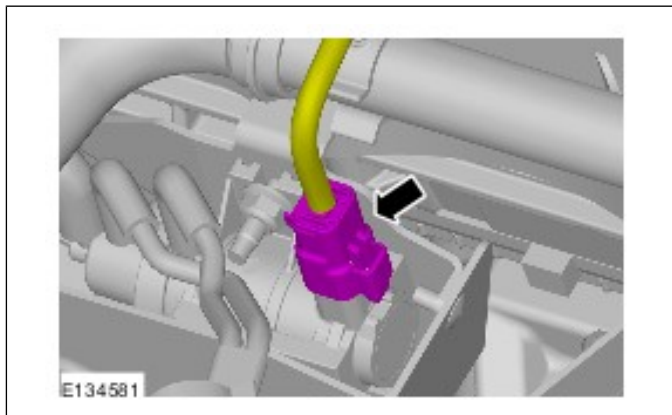
All vehicles

1.



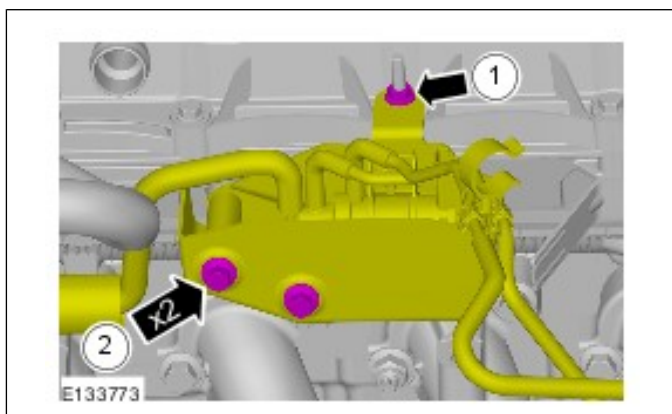
Vehicles with fixed vane turbocharger

2.



3. 1. Torque: 10 Nm

2. Torque: 23 Nm



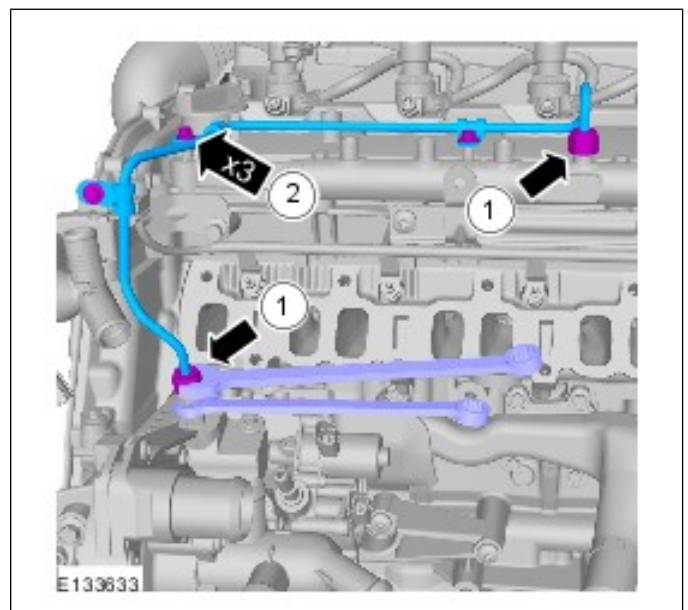
All vehicles

4. Refer to: [Fuel Injectors](#) (303-04 Fuel Charging and Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

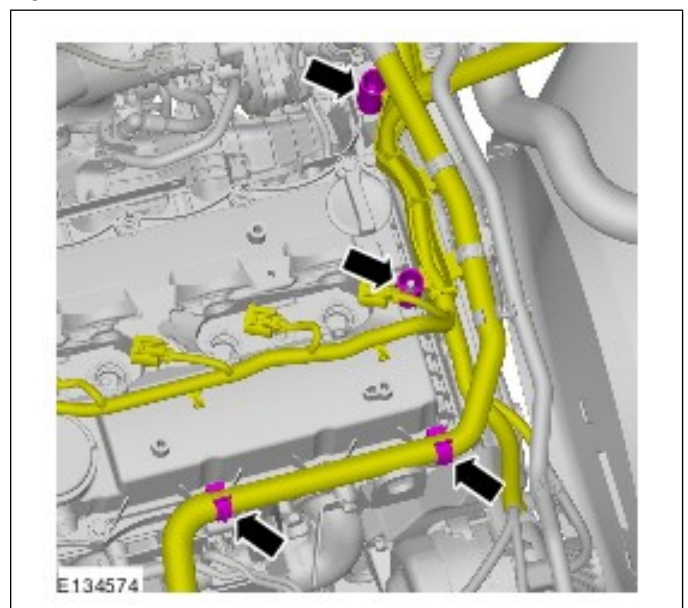
5. 1. Torque:

- Stage 1: 5 Nm
- Stage 2: 35 Nm

2. Torque: 10 Nm

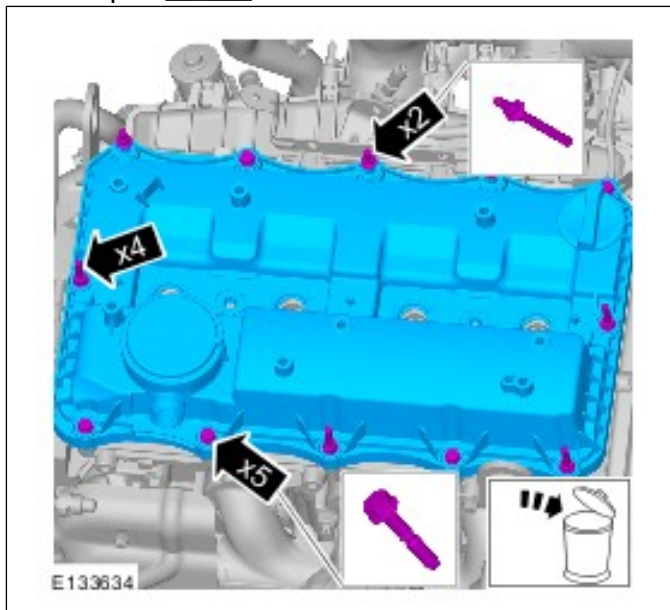


6.

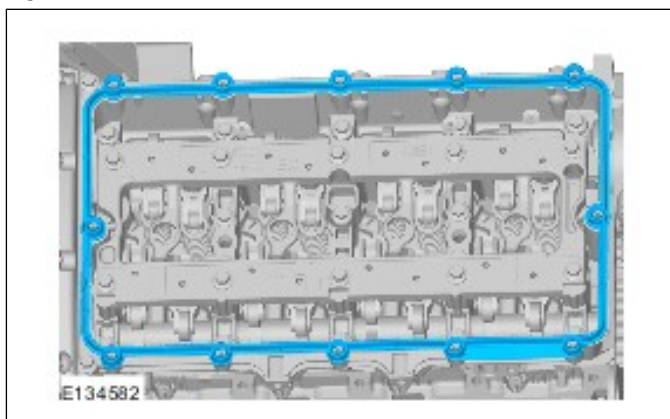


REMOVAL AND INSTALLATION

7. Torque: 10 Nm



8.



Installation

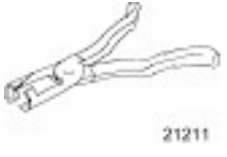
NOTE: Install a new valve cover gasket as necessary.

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Valve Stem Seals(21 238 0)

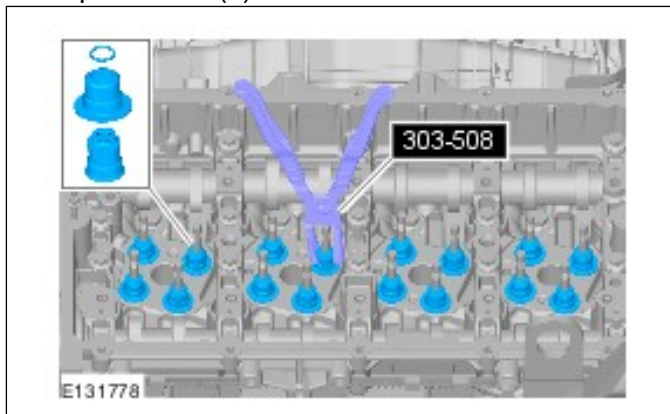
Special Tool(s)

	303-508 Pliers, Valve Stem Seal
---	------------------------------------

Removal

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

1. Refer to: [Valve Springs](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).
2. Special Tool(s): 303-508



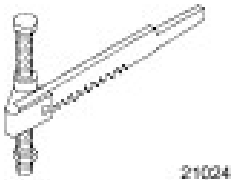
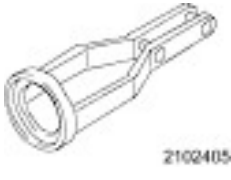
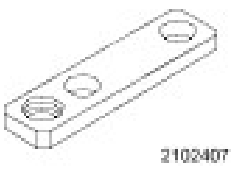

Installation

1. To install, reverse the removal procedure.

REMOVAL AND INSTALLATION

Valve Springs

Special Tool(s)

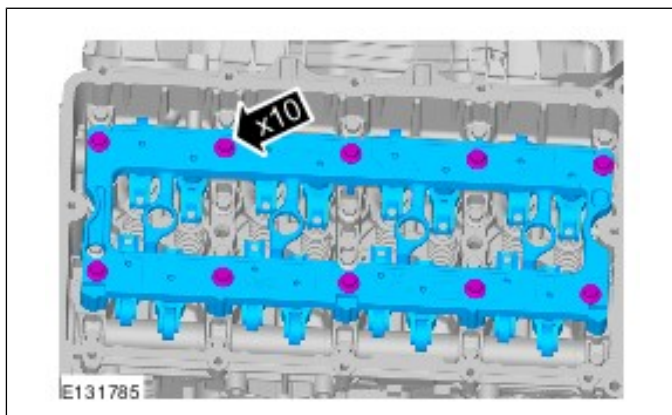
 21024	303-060 Compressor, Valve Spring
 2102405	303-060-05 Adapter for 303-060
 2102407	303-060-07 Adapter for 303-060
 21156	303-362 Installer, Valve Stem Collets

Removal

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

1. Refer to: [Valve Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

- 2.

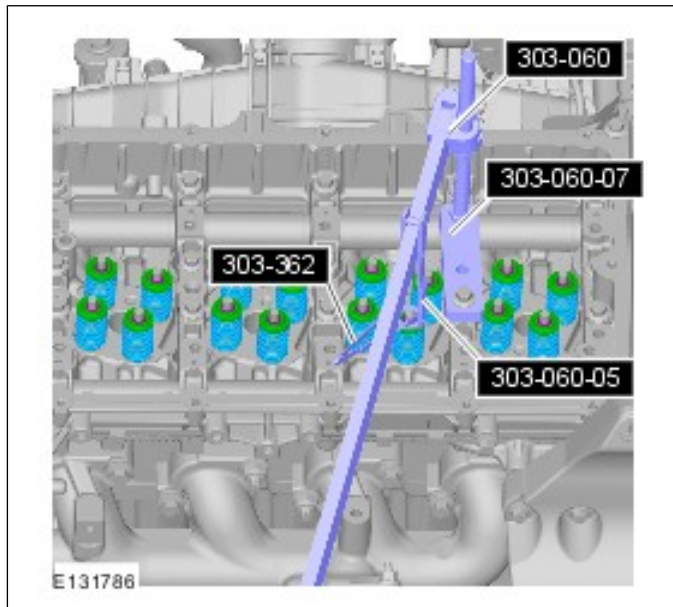


3. Position the appropriate piston at top dead center (TDC).

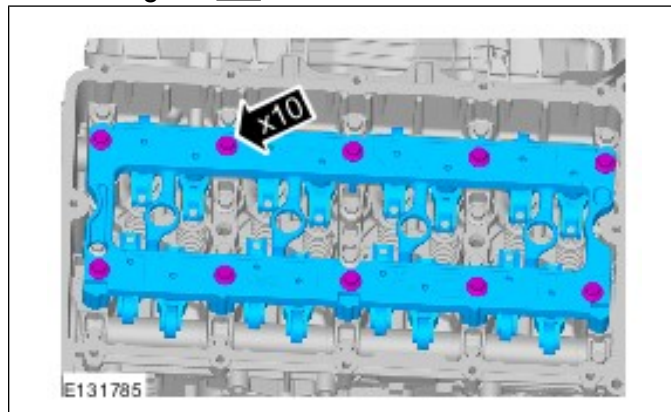
4. Using the special tools, remove the valve collets.

REMOVAL AND INSTALLATION

Special Tool(s): 303-060, 303-060-05, 303-060-07, 303-362



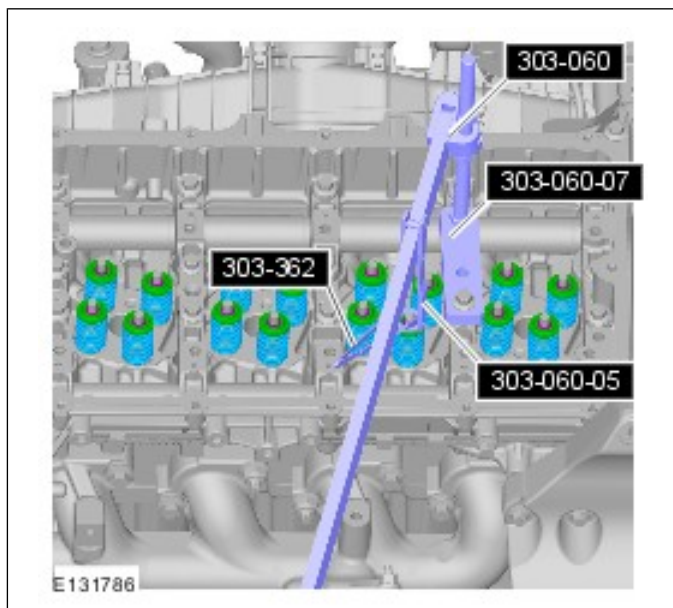
2. Torque:
 - Stage 1: 10 Nm
 - Stage 2: 30°



3. Refer to: [Valve Cover](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

Installation

1.

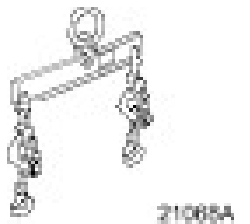


REMOVAL

Engine — Vehicles With: 5-Speed Manual Transmission -
MT75(21 132 0; 21 132 6; 21 132 7)

Removal

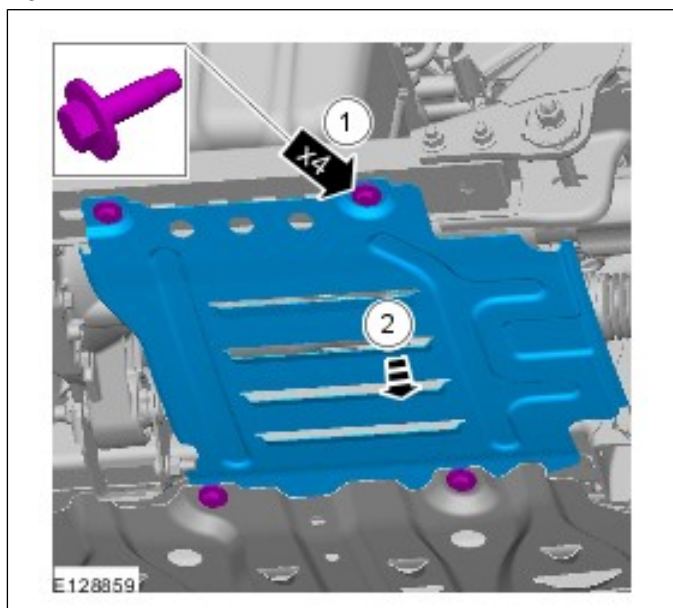
Special Tool(s) / General Equipment

 <p>21085A</p>	<p>303-122 Lifting Bracket, Engine</p>
<p>Transmission Jack</p>	

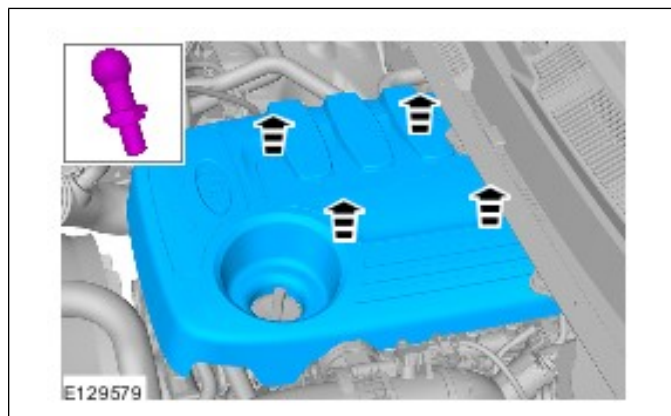
REMOVAL

1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).
4. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
5. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

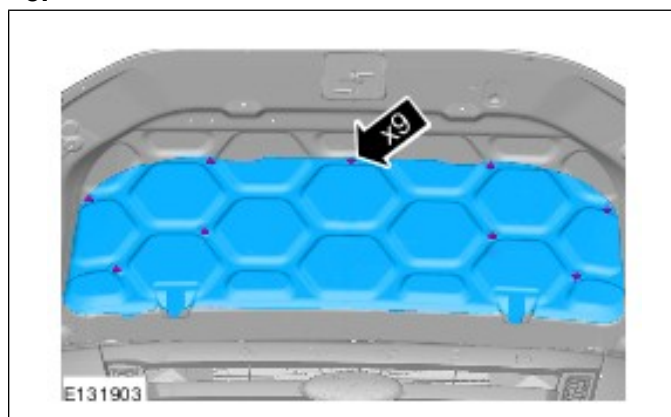
6.



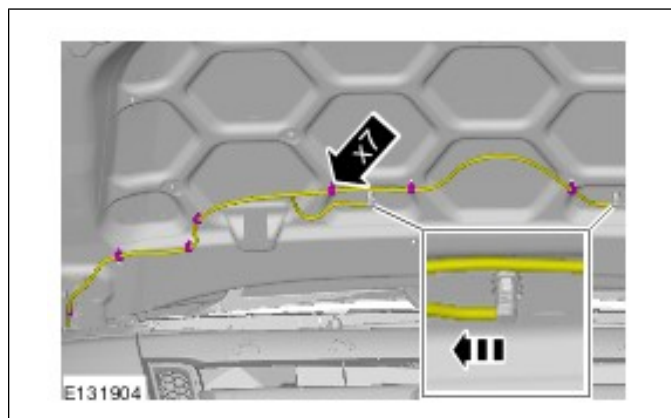
7.



8.

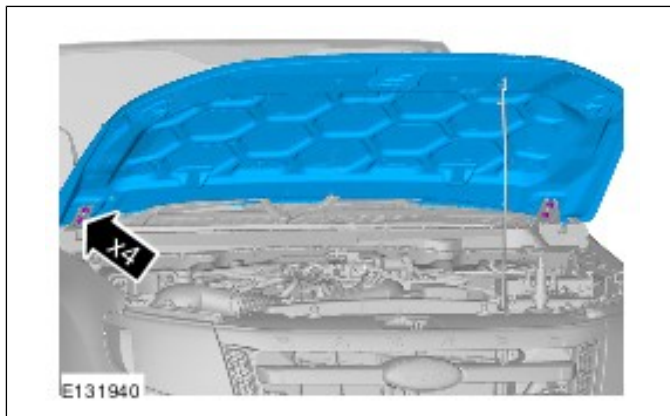


9.



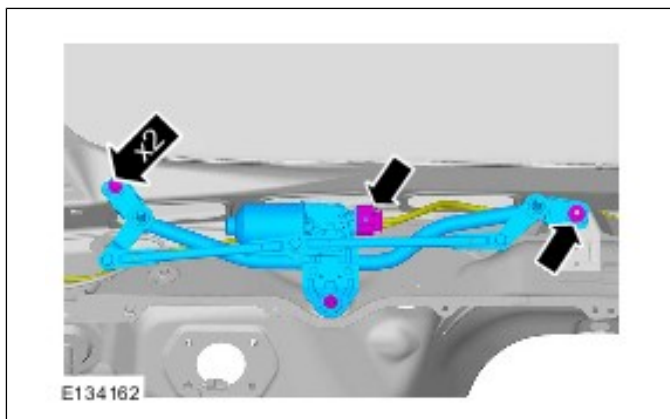
REMOVAL

10.

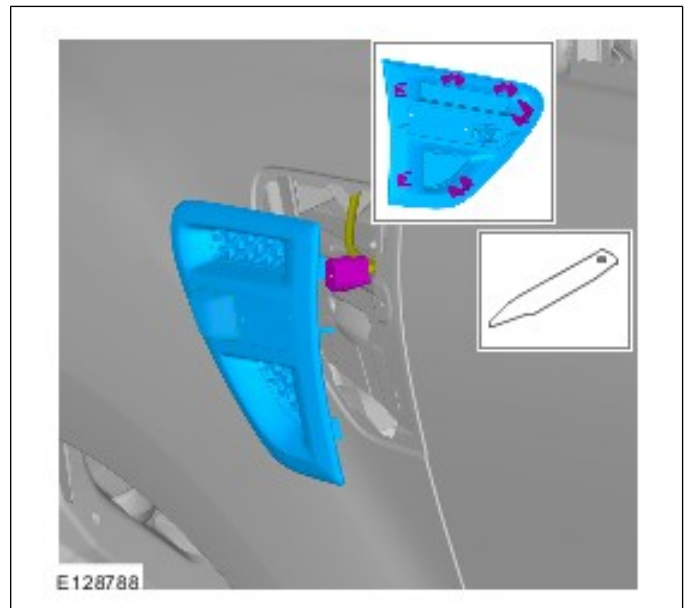


11. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

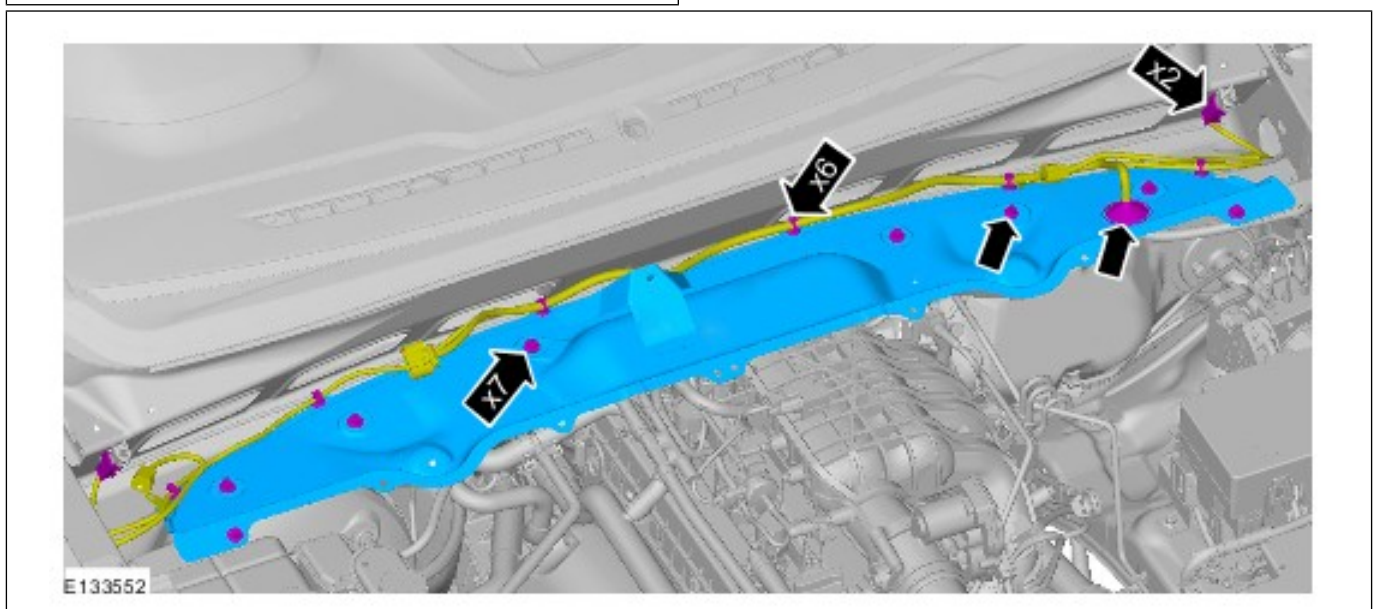
12.



13. On both sides.

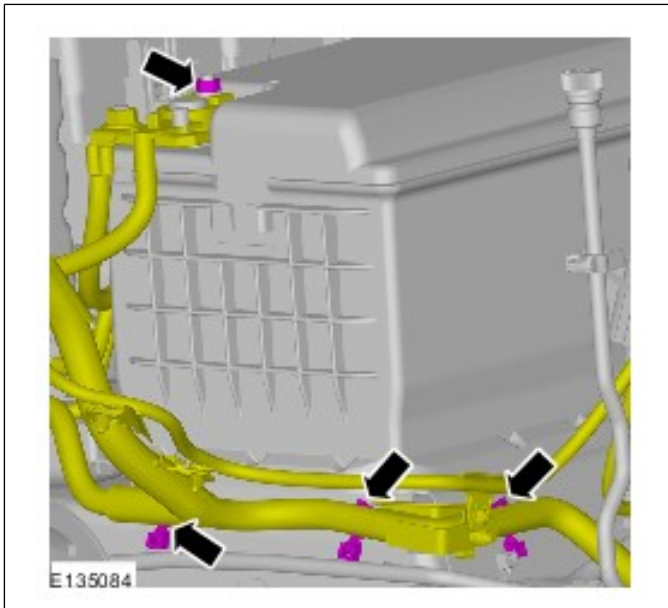


14.

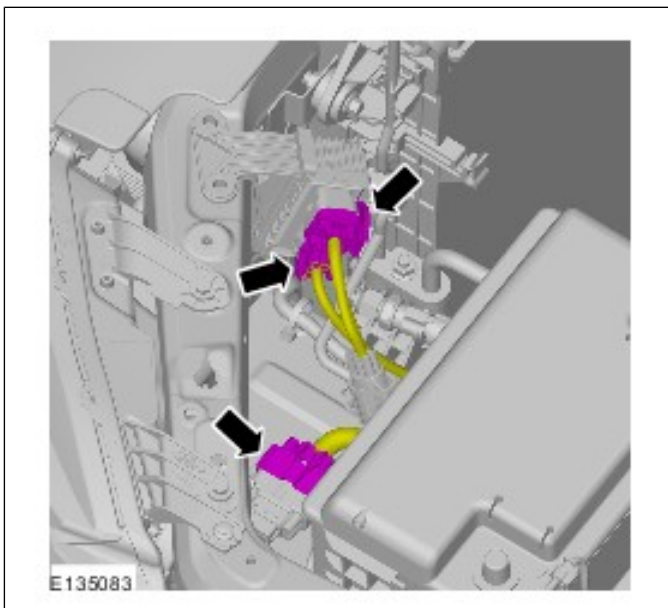


REMOVAL

15.



16.



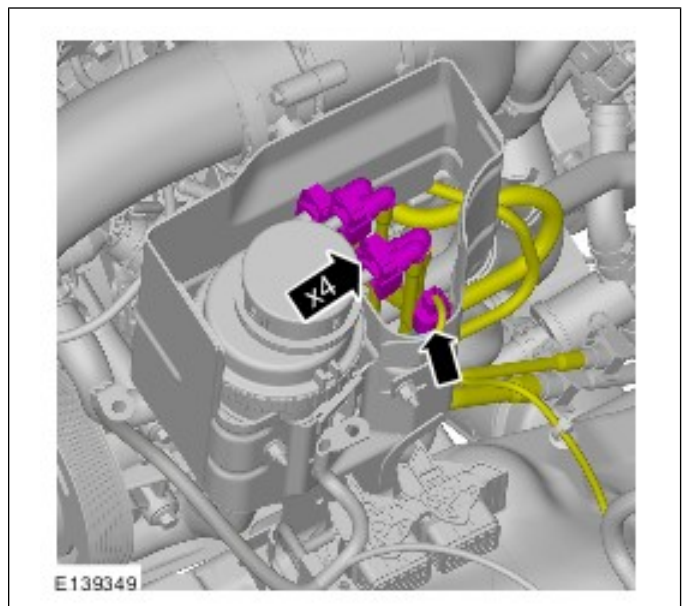
17. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

18. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

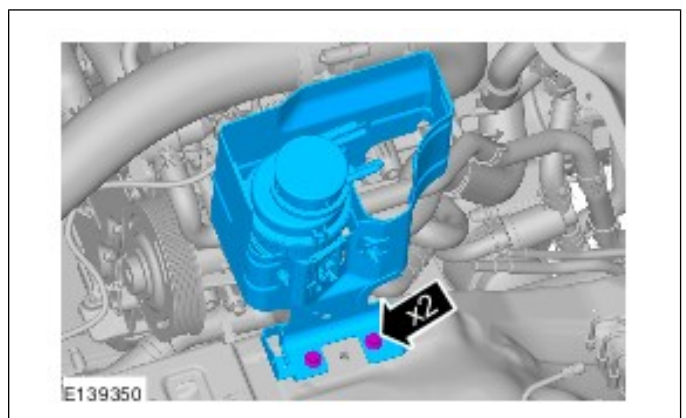
19. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.5L Duratec-HE (122kW/165PS) - M14, Removal and Installation).

Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

20.

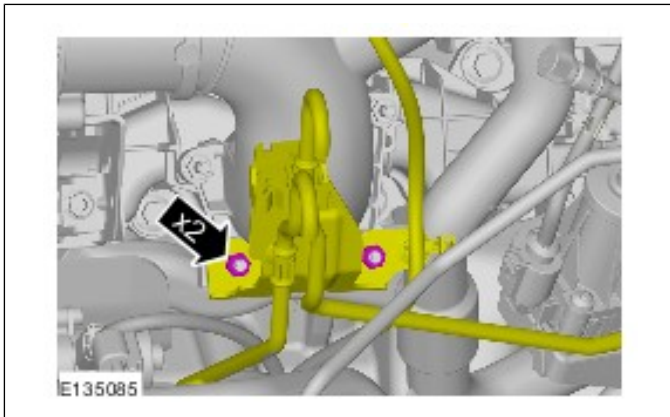


21.



REMOVAL

22.

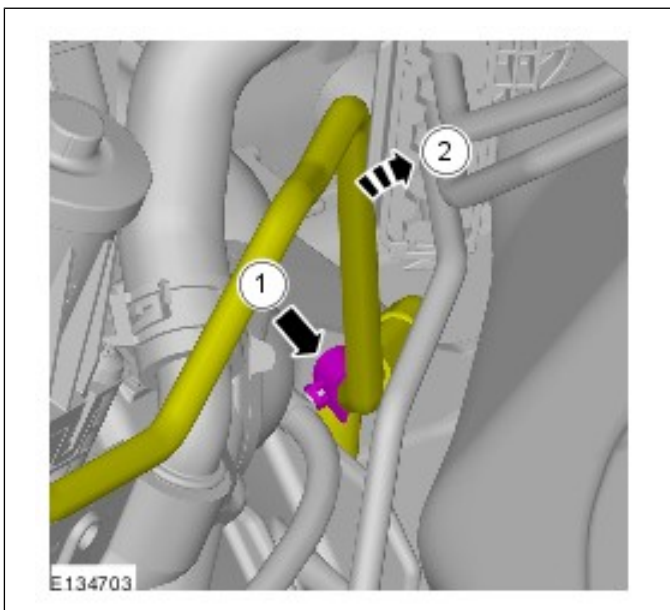


25. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

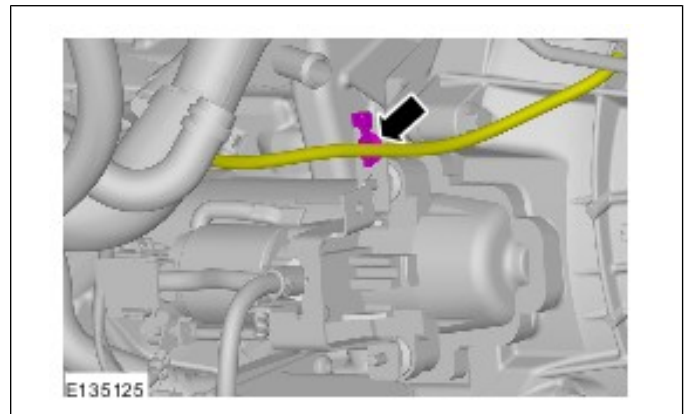
26. Refer to: [Radiator](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

27. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma](#) (412-01 Climate Control, Removal and Installation).

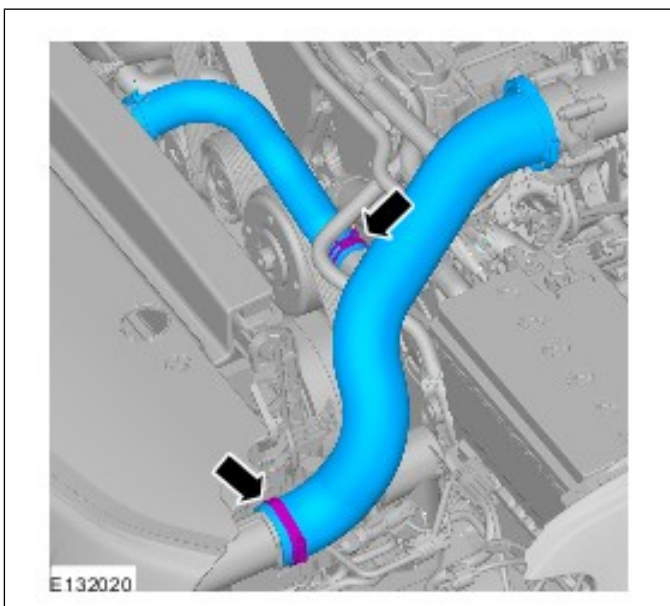
23.



28.



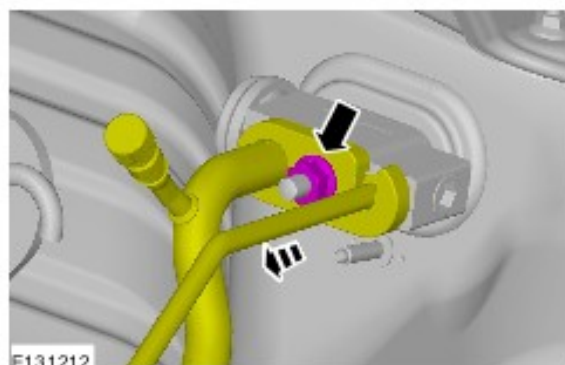
24.



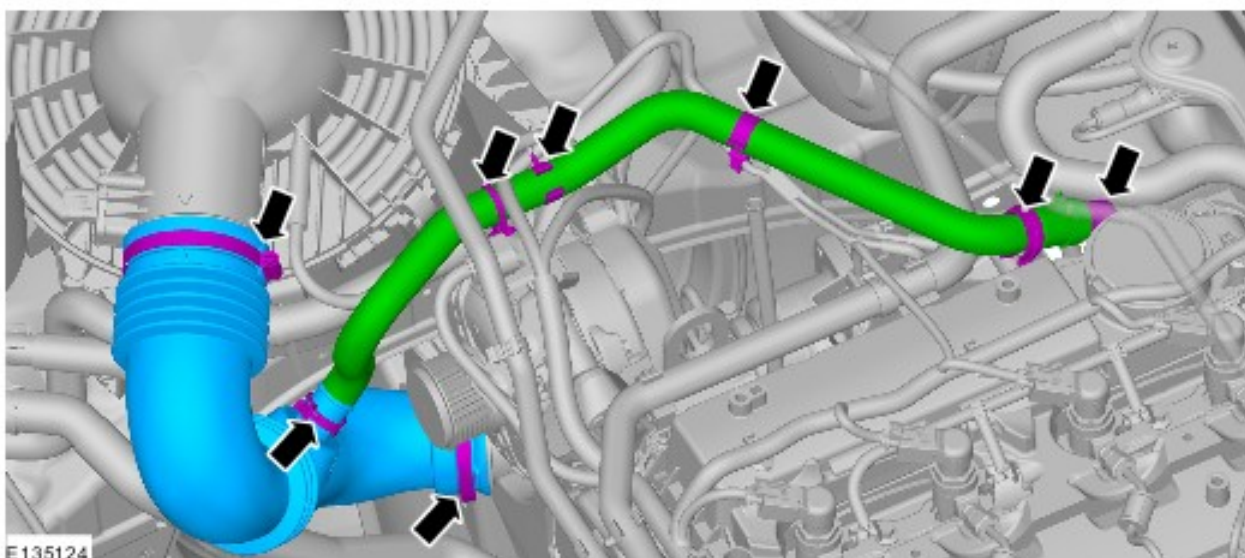
REMOVAL

29. Refer to: Starter Motor - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-06 Starting System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

30.



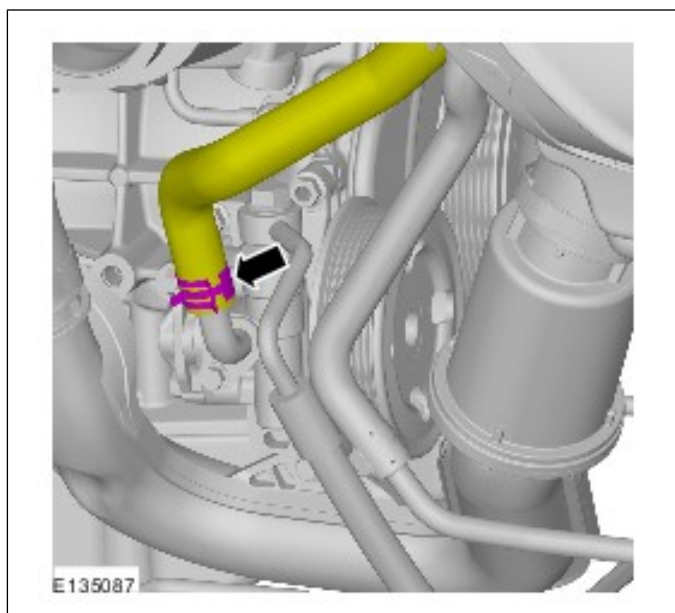
31.



REMOVAL

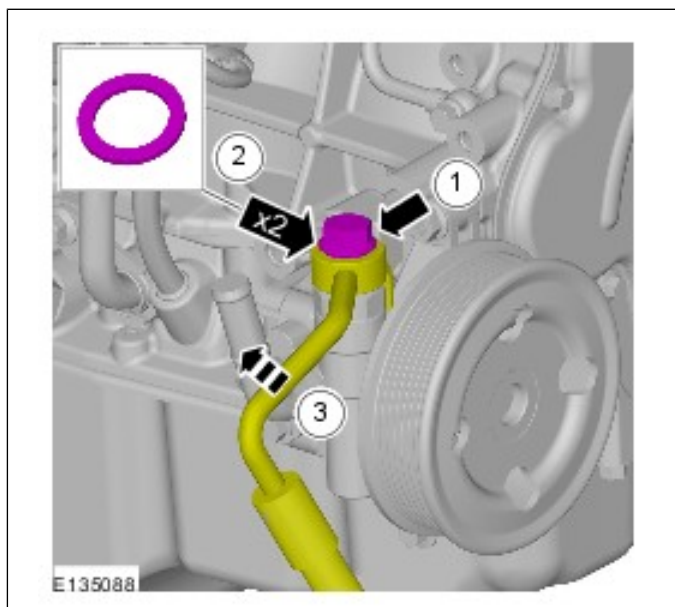
- 32 Refer to: Air Cleaner - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

33. **NOTE:** Make sure that all openings are sealed.

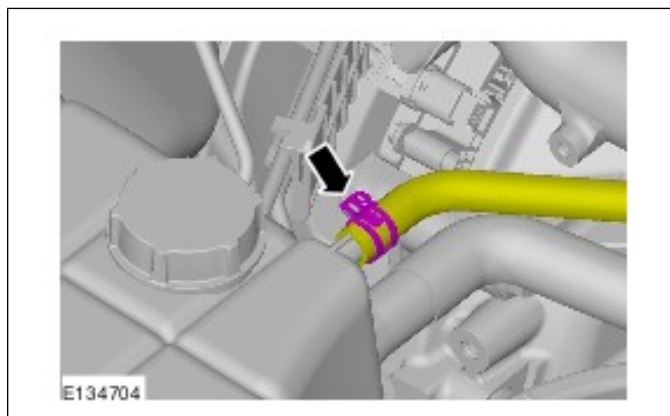


34. **CAUTION:** Cap the power steering line to prevent fluid loss or dirt ingress.

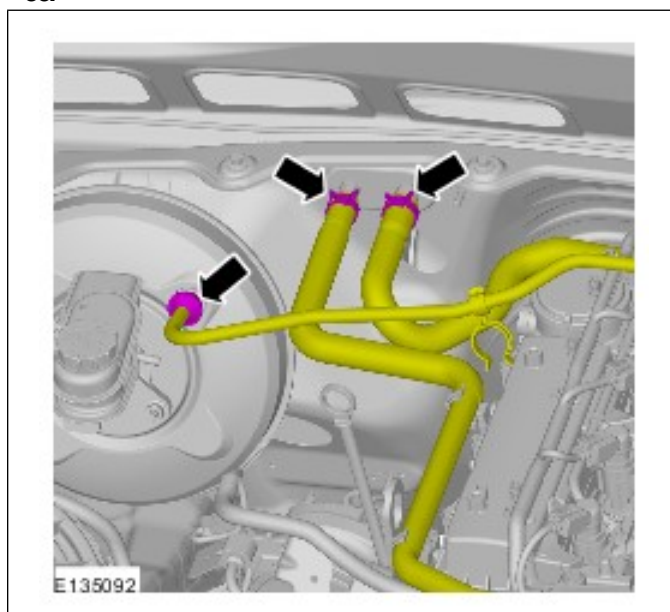
NOTE: The washers can be reused unless damaged.



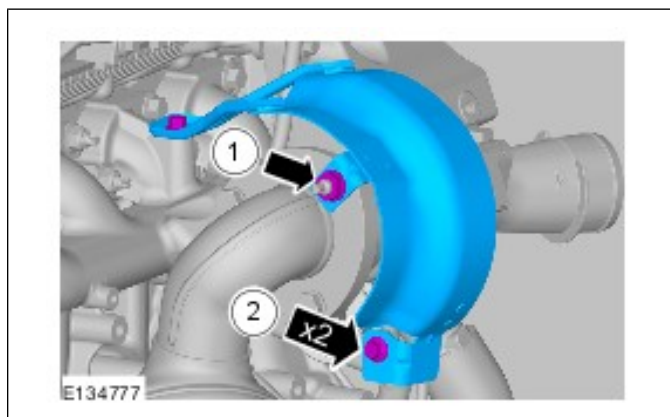
35.



36.



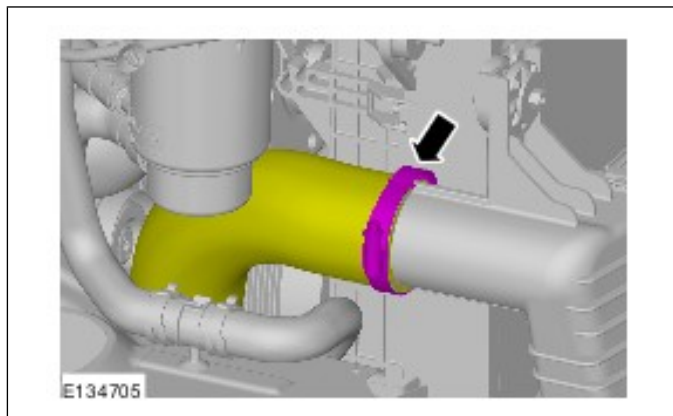
37.



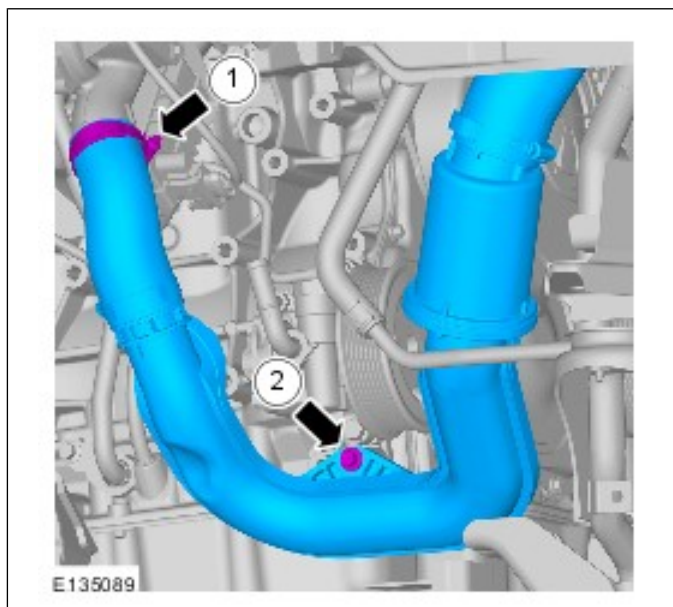
REMOVAL

38. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

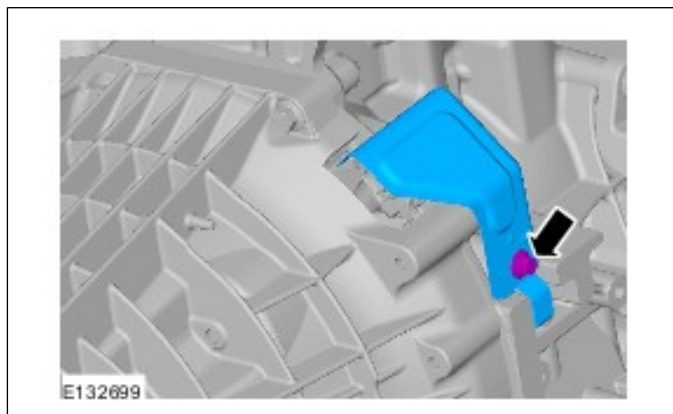
39.



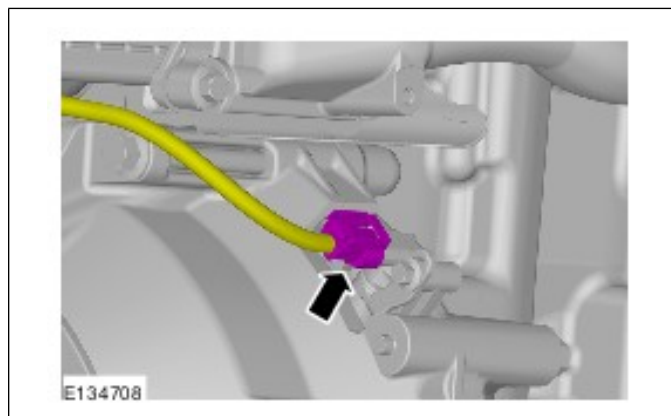
40.



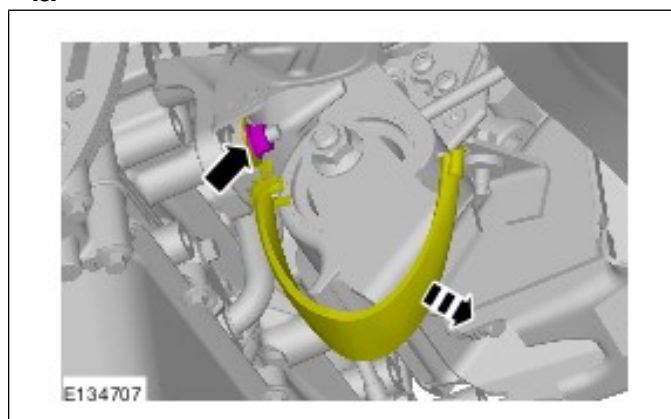
41.





42.



43.



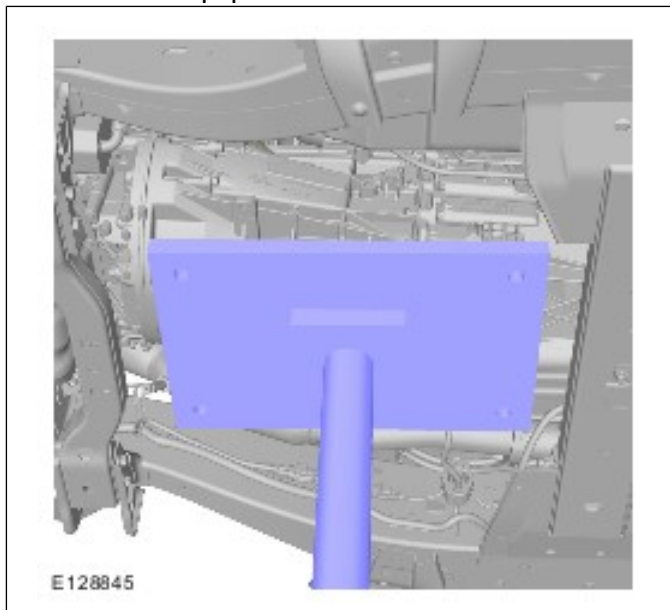
44.  **WARNING:** Make sure that transmission assembly is on wooden blocks and secured with suitable retaining straps.

-  **CAUTION:** Do not tilt the transmission. This may cause damage to the pilot bearing.

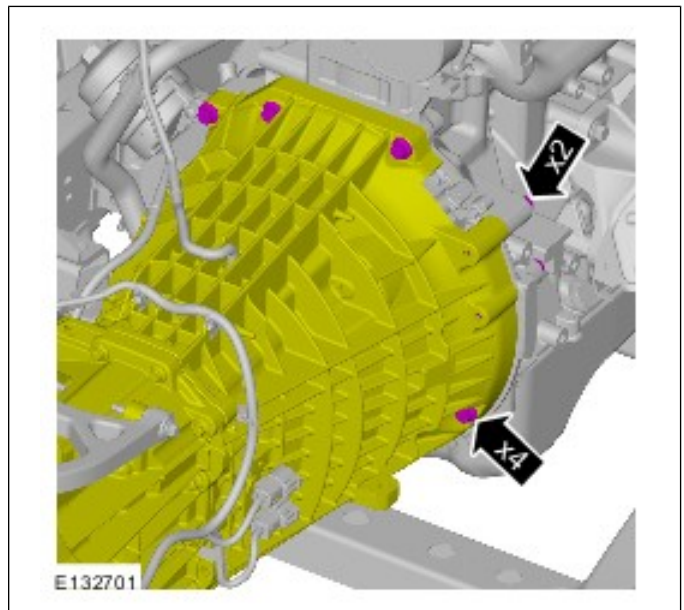
Tie and support the transmission to the chassis with a suitable strap.

REMOVAL

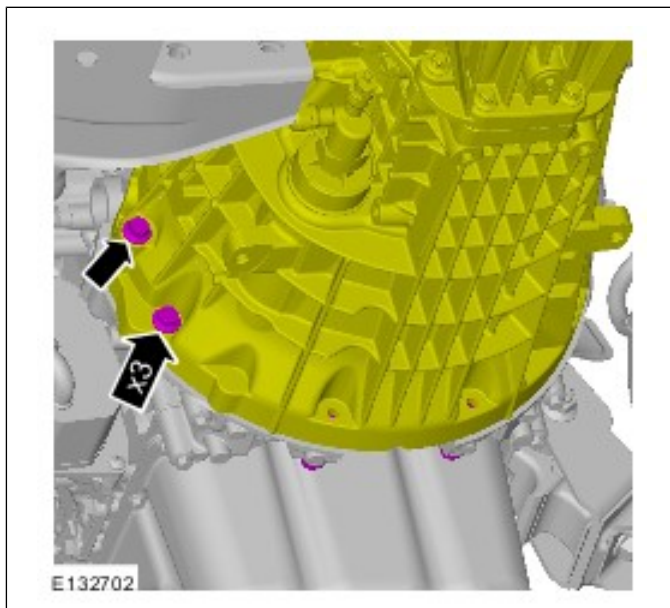
General Equipment: Transmission Jack



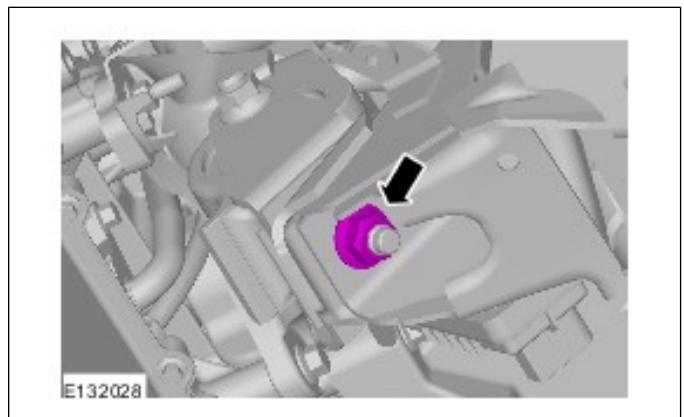
46.



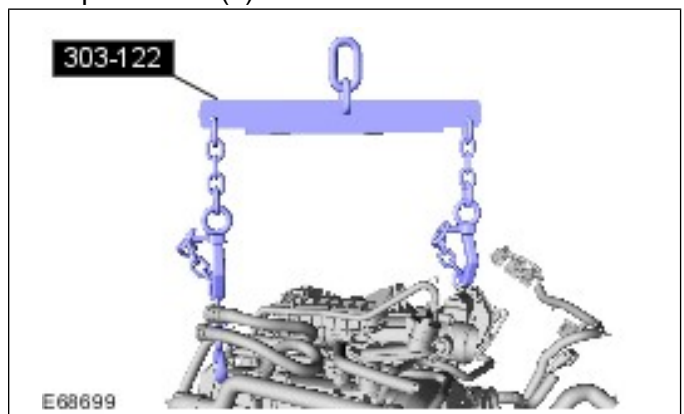
45.



47. On both sides.

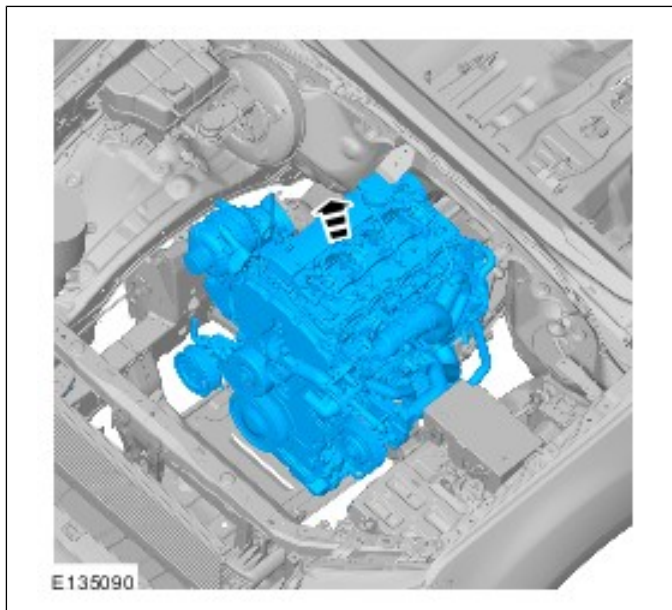


48. Special Tool(s): 303-122

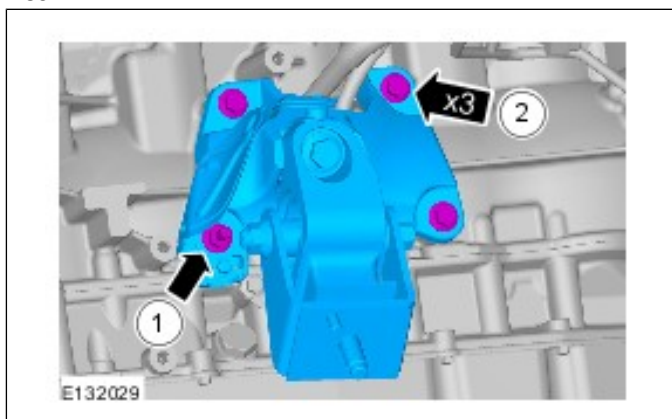


REMOVAL

49.



50.

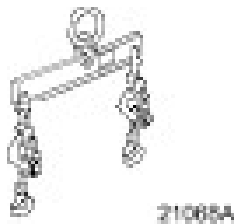


REMOVAL

Engine — Vehicles With: 6-Speed Manual Transmission -
MT82(21 132 0; 21 132 6; 21 132 7)

Removal

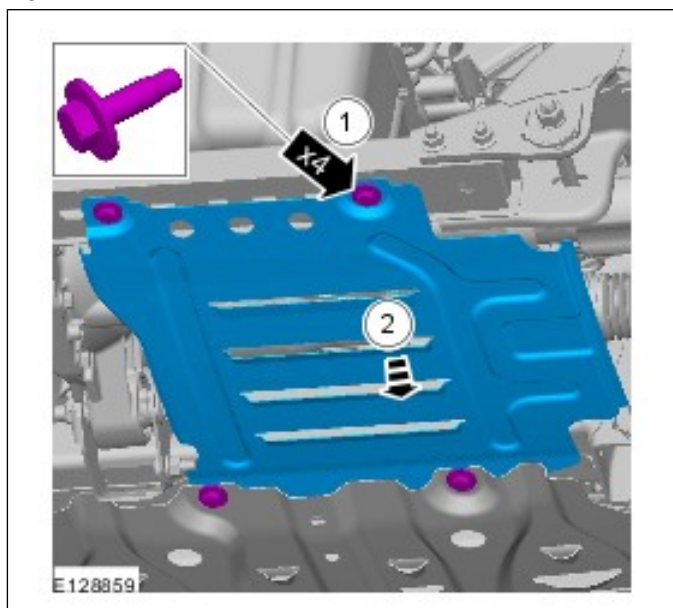
Special Tool(s) / General Equipment

 <p>21085A</p>	<p>303-122 Lifting Bracket, Engine</p>
<p>Transmission Jack</p>	

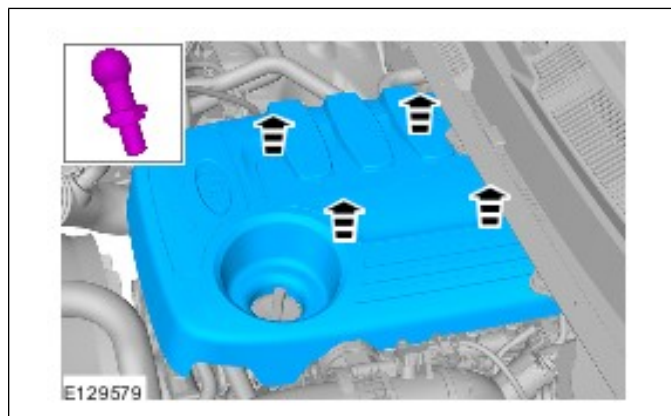
REMOVAL

1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).
4. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
5. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

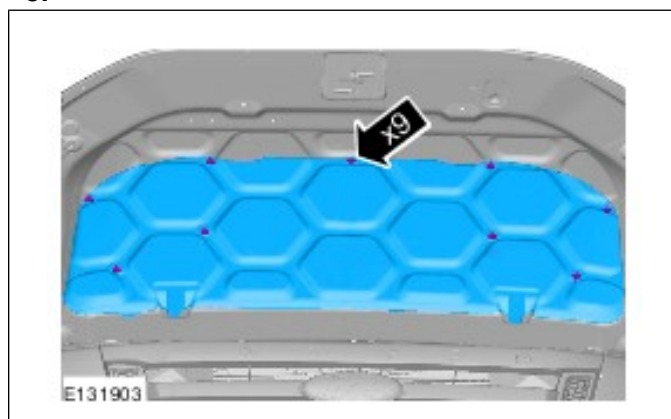
6.



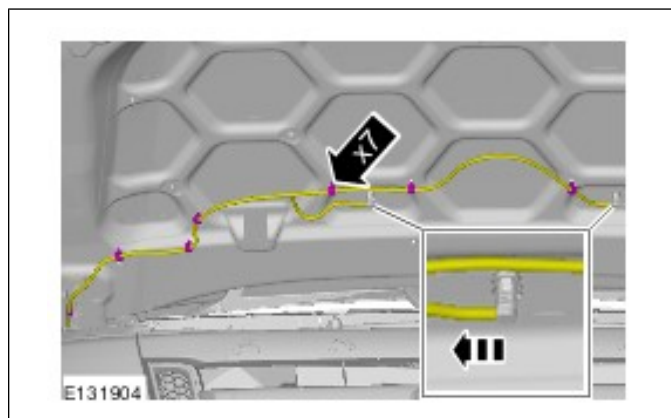
7.



8.

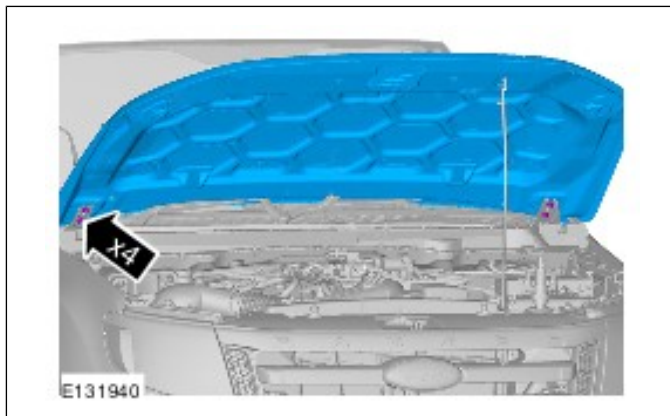


9.



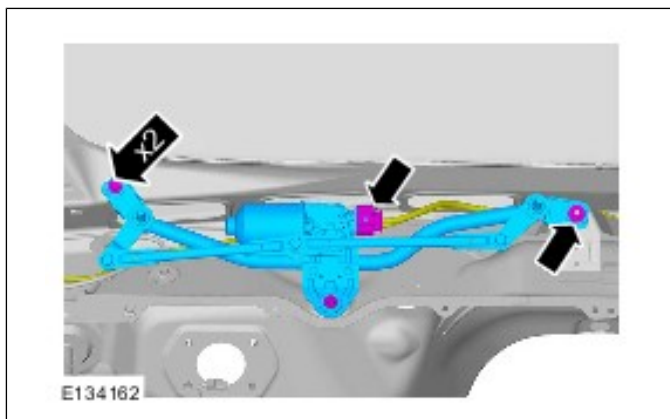
REMOVAL

10.

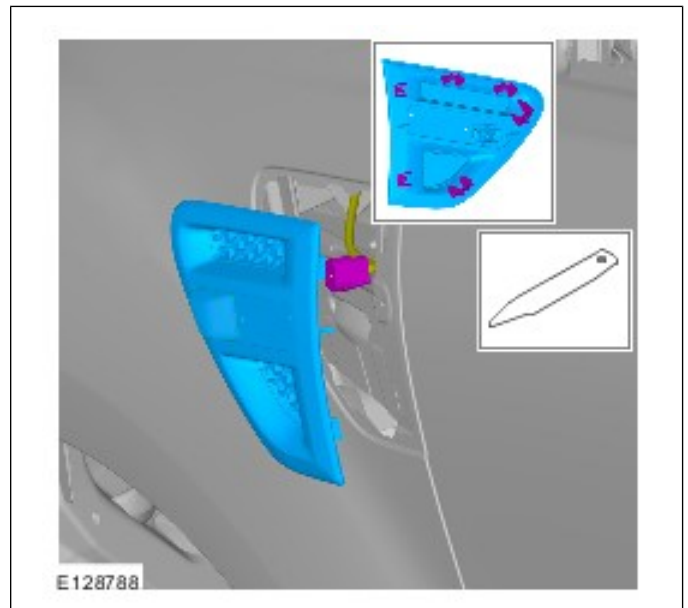


11. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

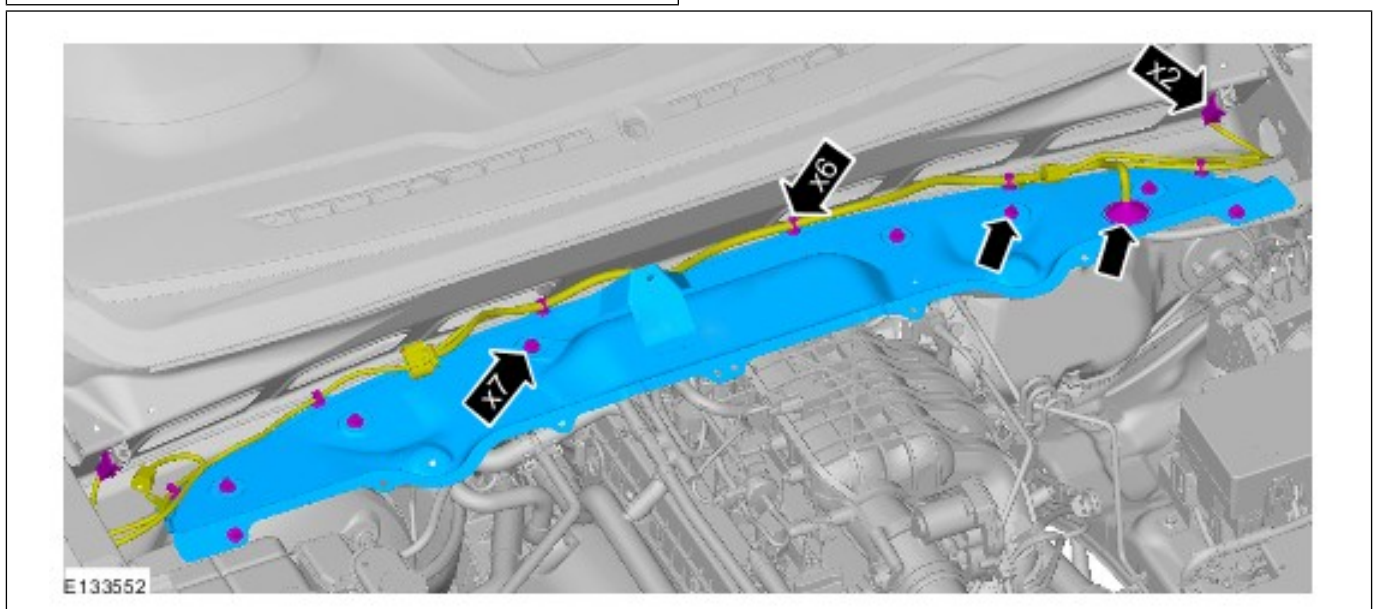
12.



13. On both sides.

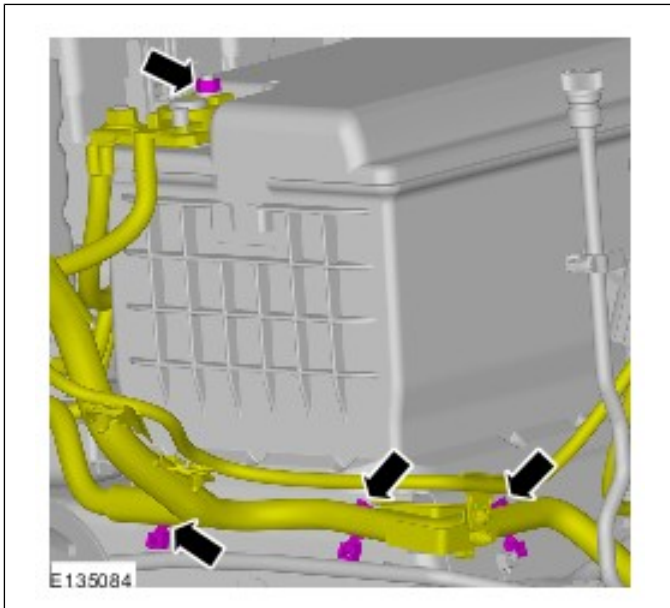


14.

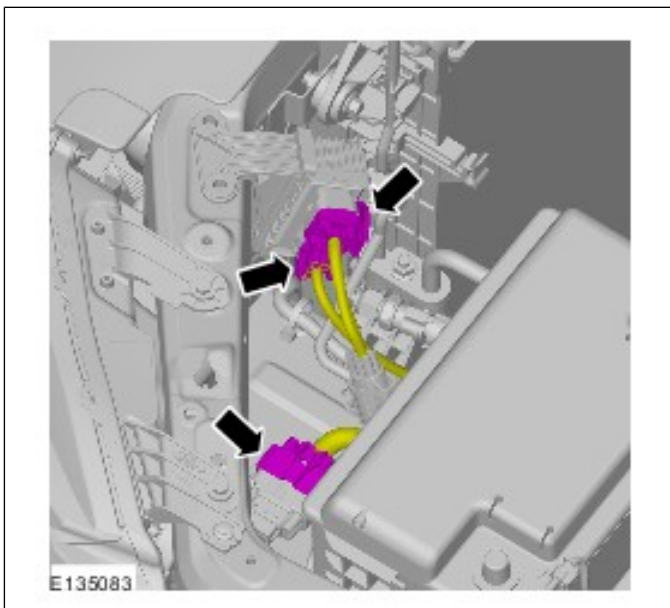


REMOVAL

15.



16.



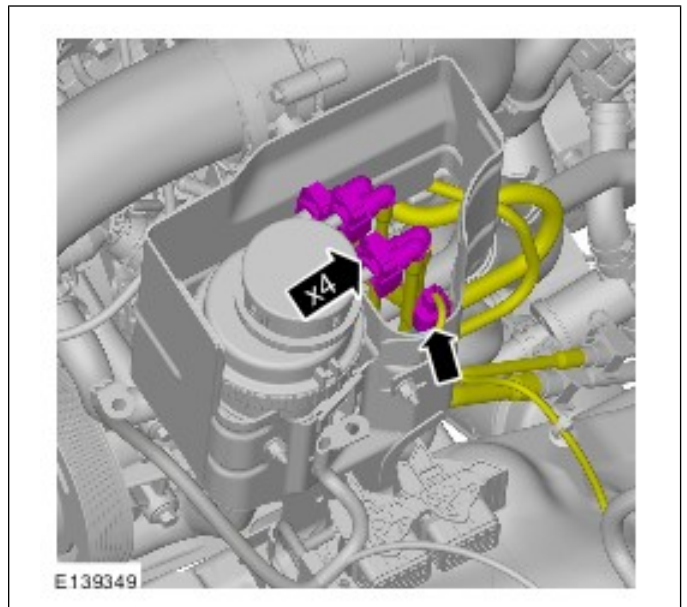
17. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

18. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

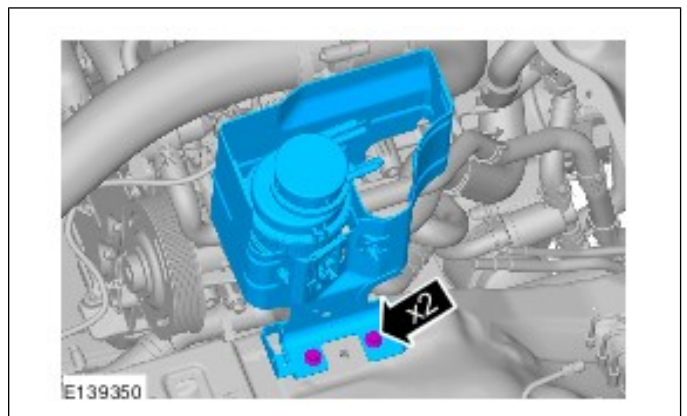
19. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.5L Duratec-HE (122kW/165PS) - M14, Removal and Installation).

Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

20.

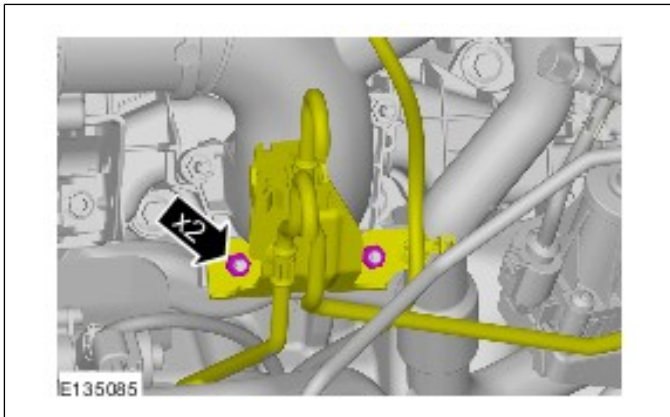


21.



REMOVAL

22.

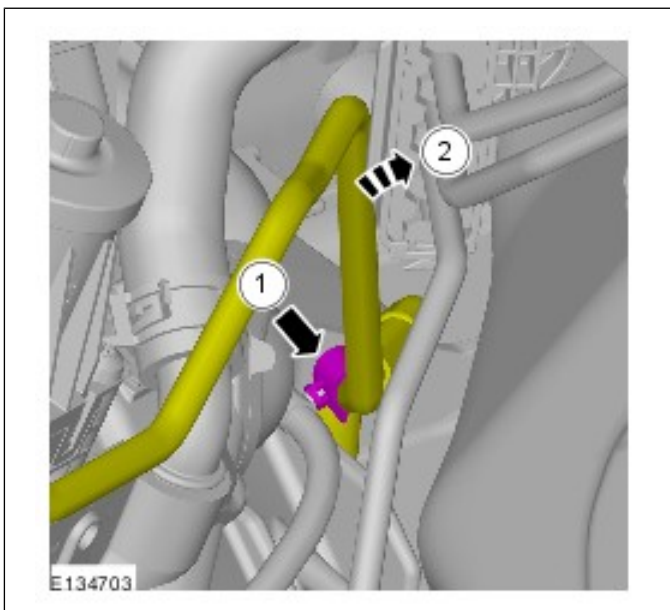


25. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

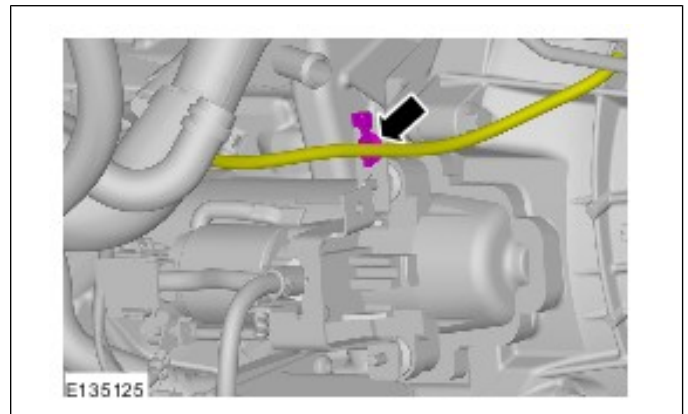
26. Refer to: [Radiator](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

27. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma](#) (412-01 Climate Control, Removal and Installation).

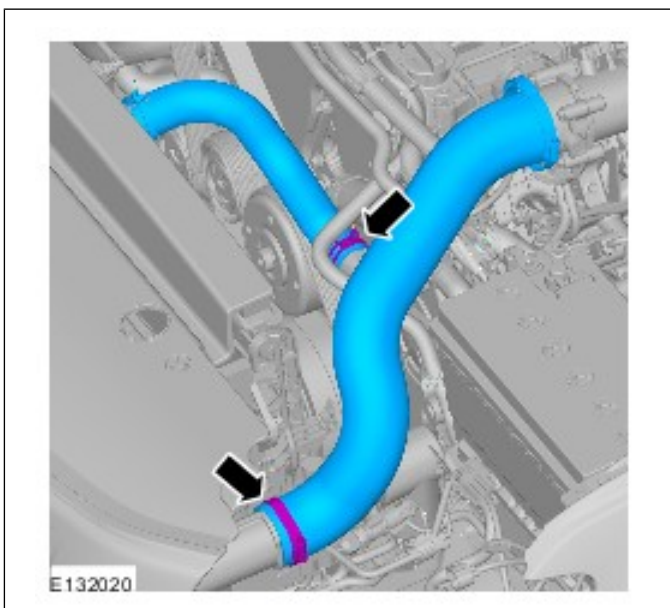
23.



28.



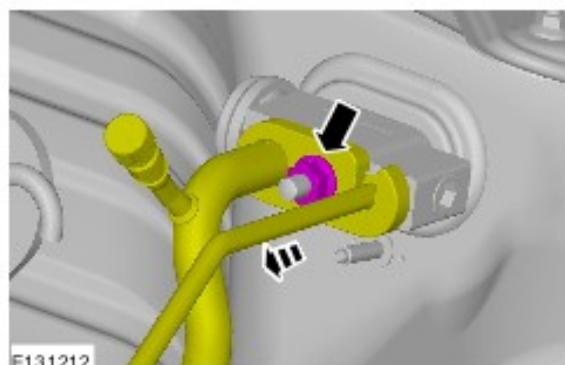
24.



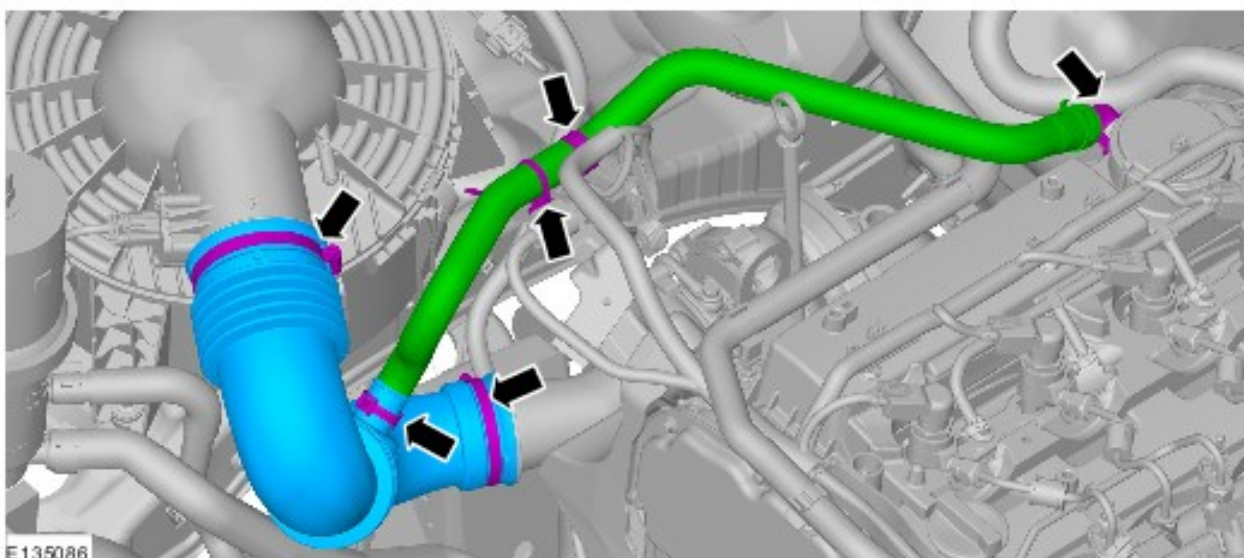
REMOVAL

29. Refer to: Starter Motor - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-06 Starting System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

30.



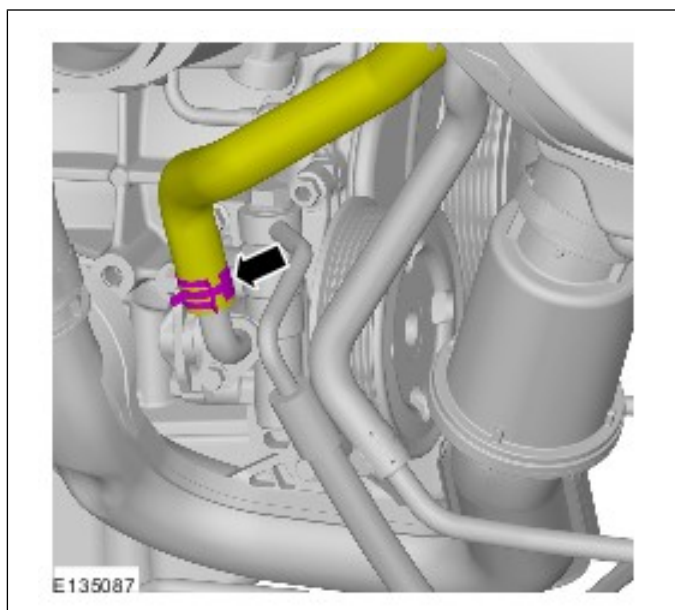
31.



REMOVAL

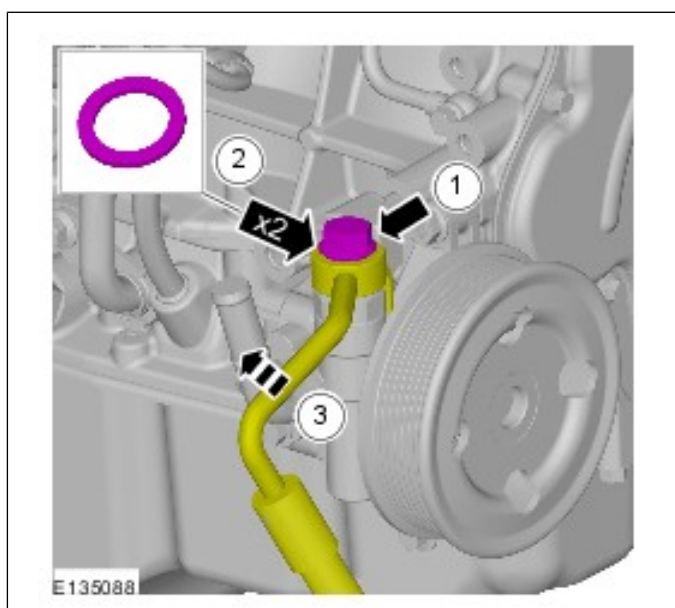
32 Refer to: Air Cleaner - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

33. NOTE: Make sure that all openings are sealed.

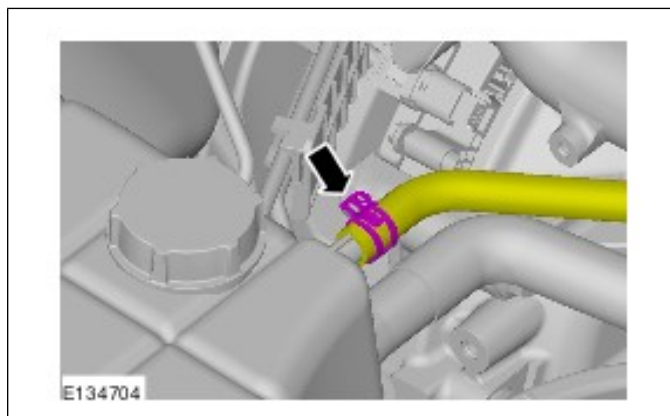


34. ⚠ CAUTION: Cap the power steering line to prevent fluid loss or dirt ingress.

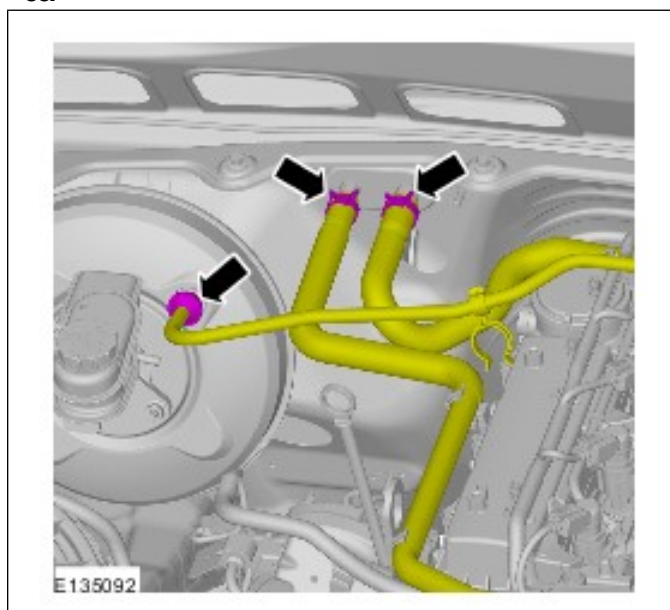
NOTE: The washers can be reused unless damaged.



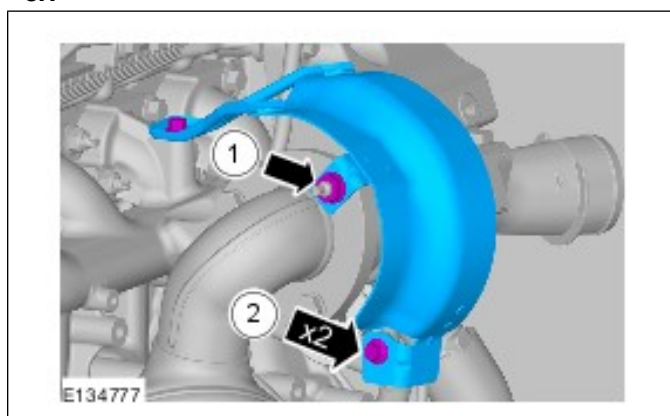
35.



36.



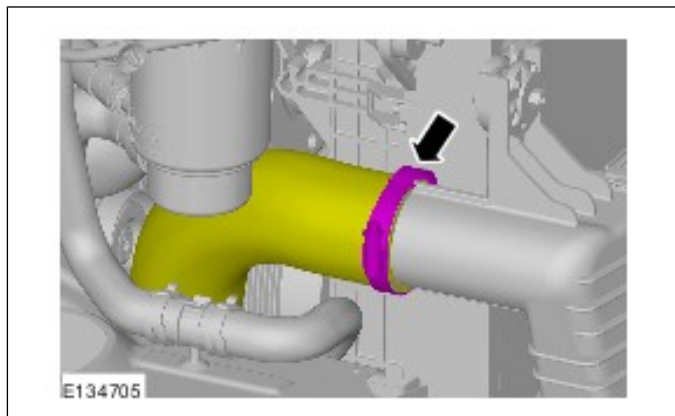
37.



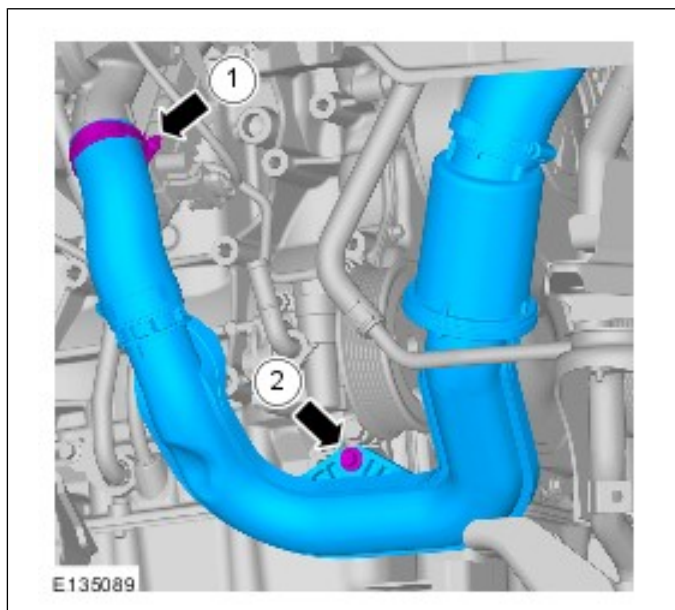
REMOVAL

38. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

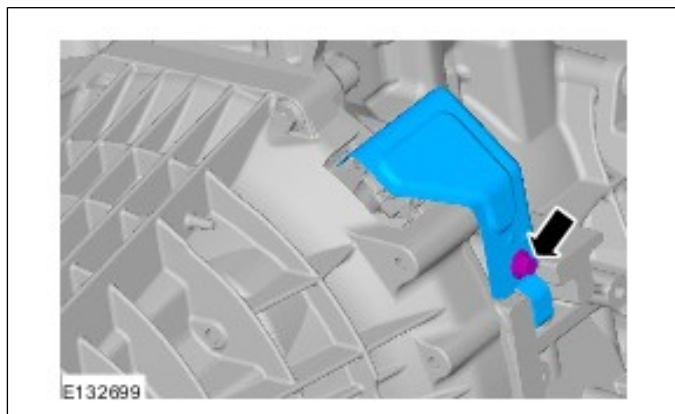
39.



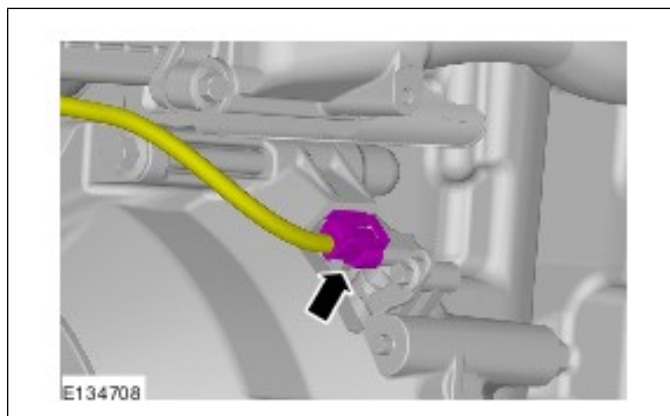
40.



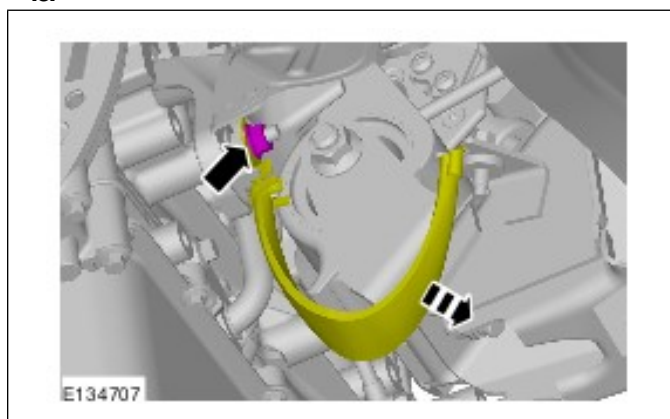
41.





42.



43.



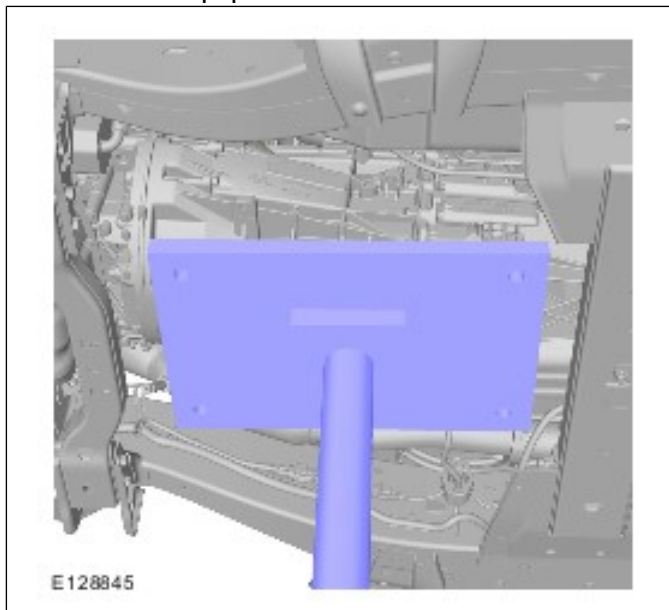
44.  **WARNING:** Make sure that transmission assembly is on wooden blocks and secured with suitable retaining straps.

-  **CAUTION:** Do not tilt the transmission. This may cause damage to the pilot bearing.

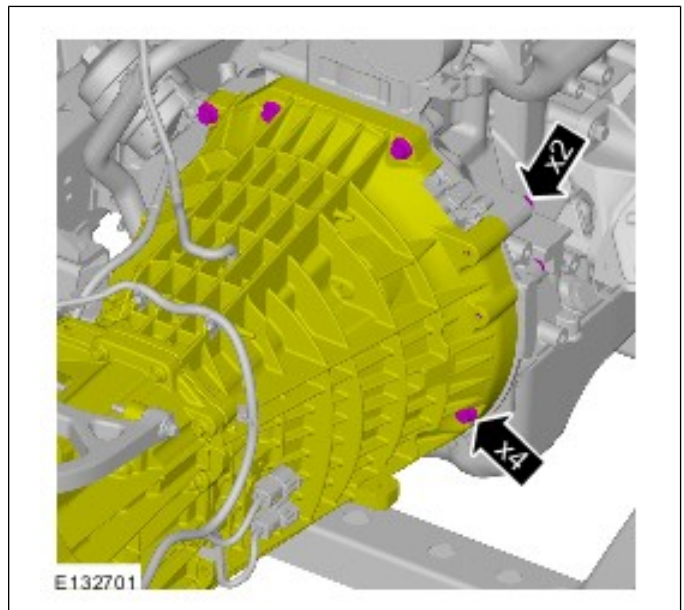
Tie and support the transmission to the chassis with a suitable strap.

REMOVAL

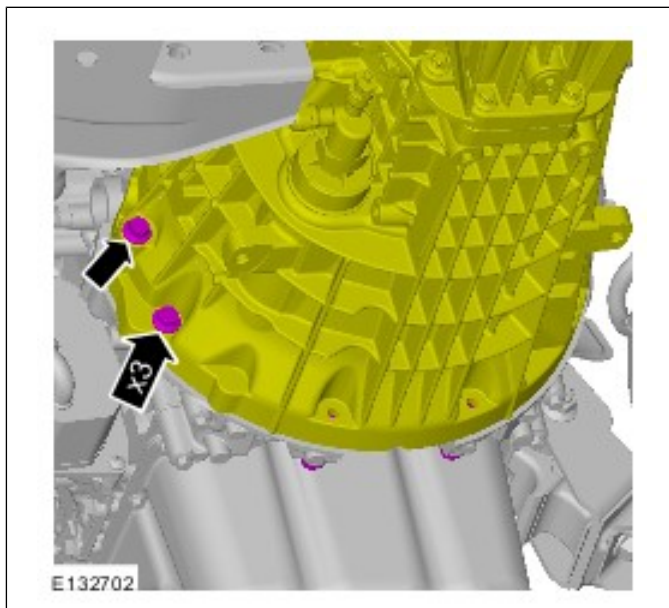
General Equipment: Transmission Jack



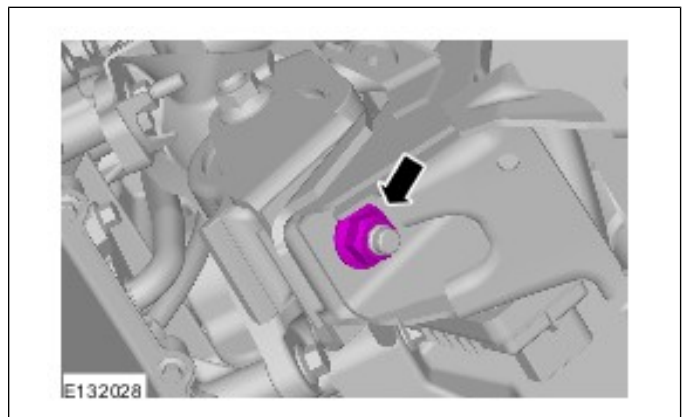
46.



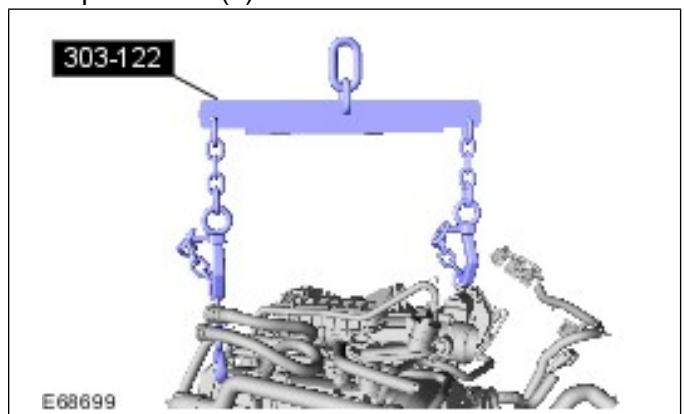
45.



47. On both sides.

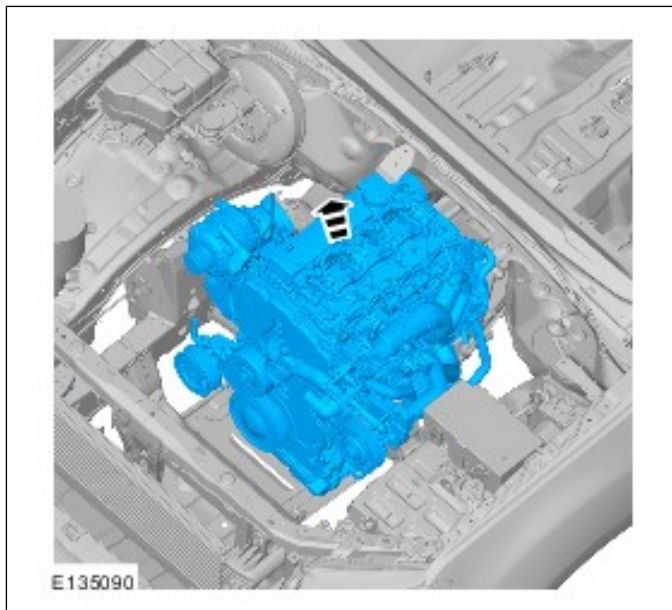


48. Special Tool(s): 303-122

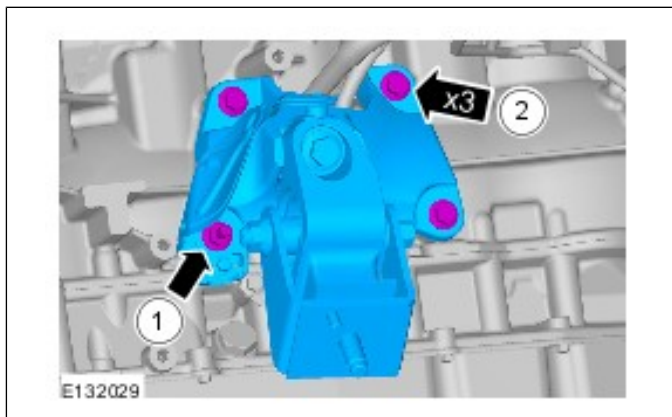


REMOVAL

49.



50.

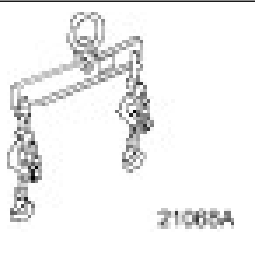


REMOVAL

Engine — Vehicles With: 6-Speed Automatic Transmission -
6R80(21 132 0; 21 132 6; 21 132 7)

Removal

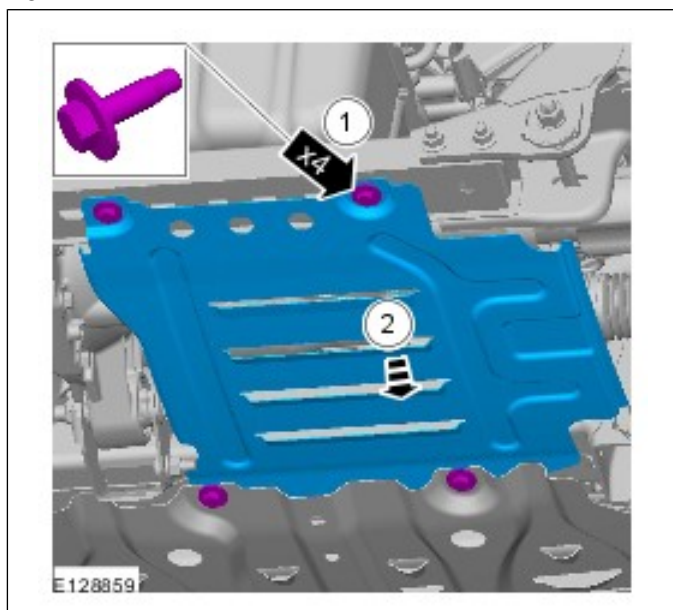
Special Tool(s) / General Equipment

	303-122 Lifting Bracket, Engine
Transmission Jack	

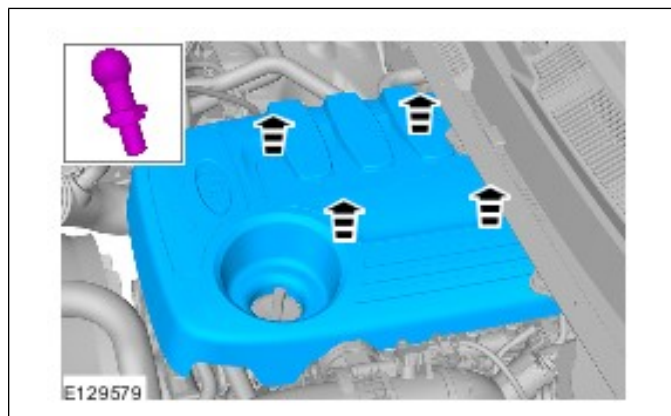
REMOVAL

1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).
4. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
5. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

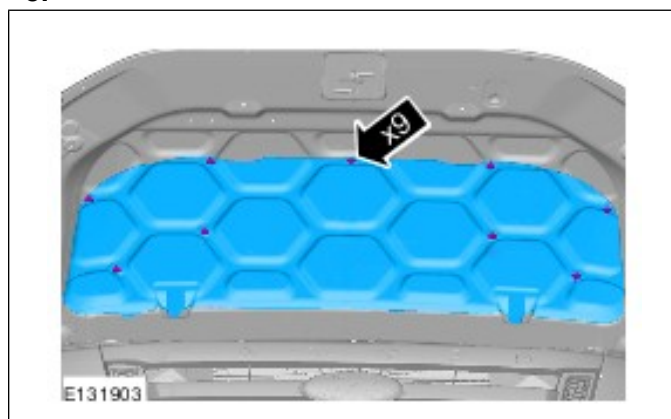
6.



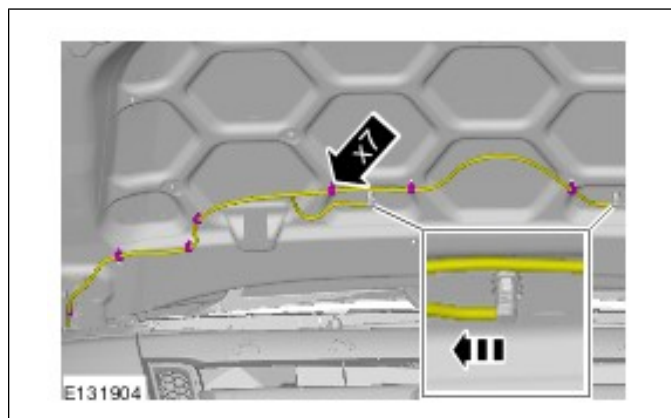
7.



8.

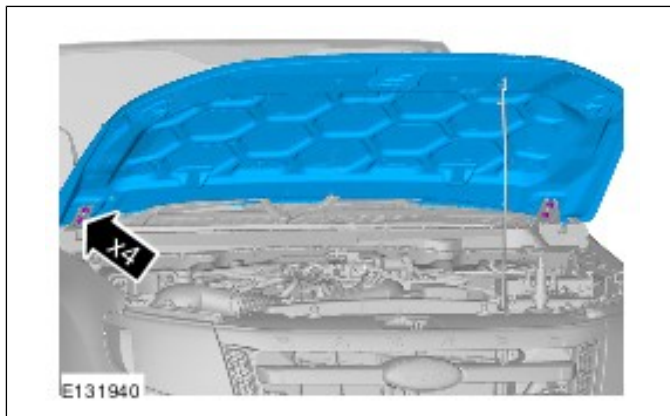


9.



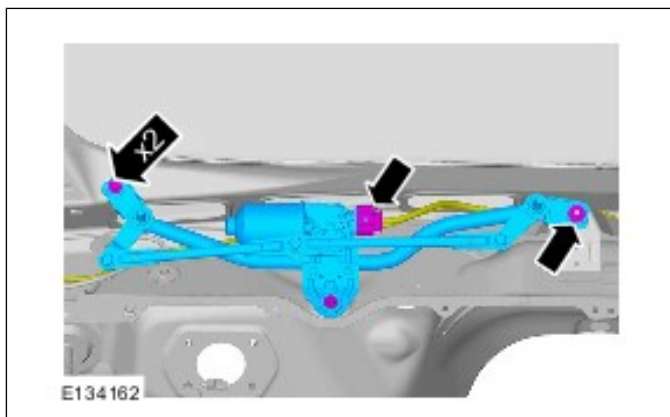
REMOVAL

10.

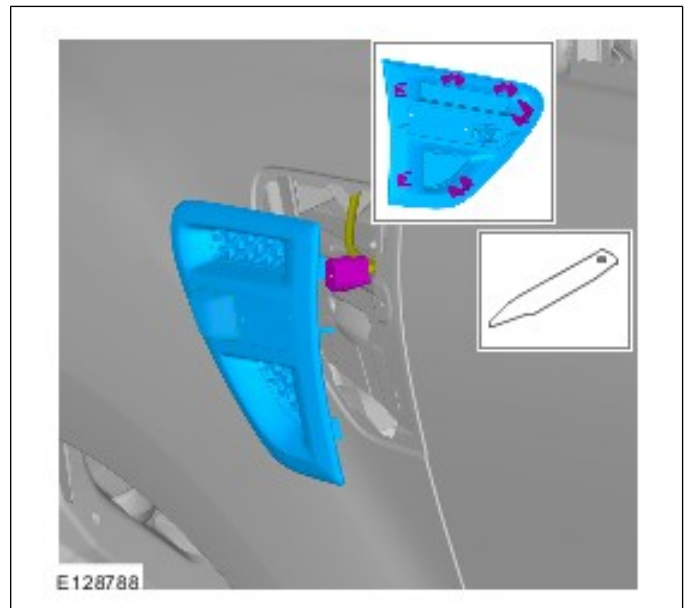


11. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

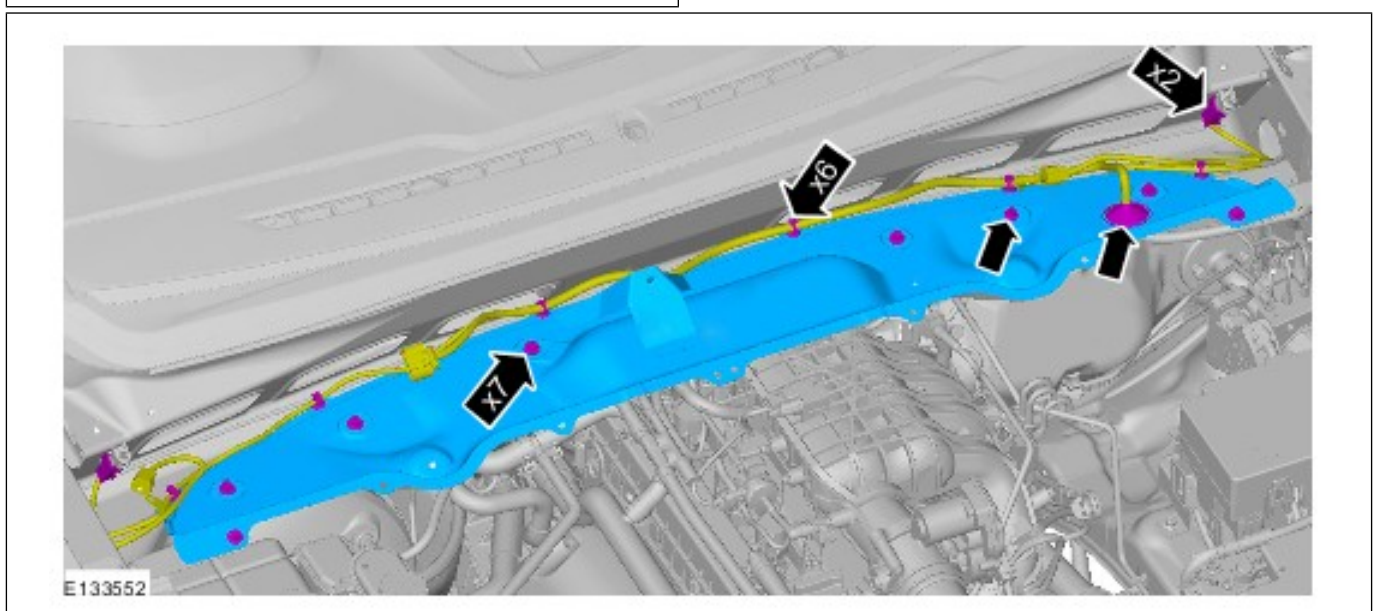
12.



13. On both sides.

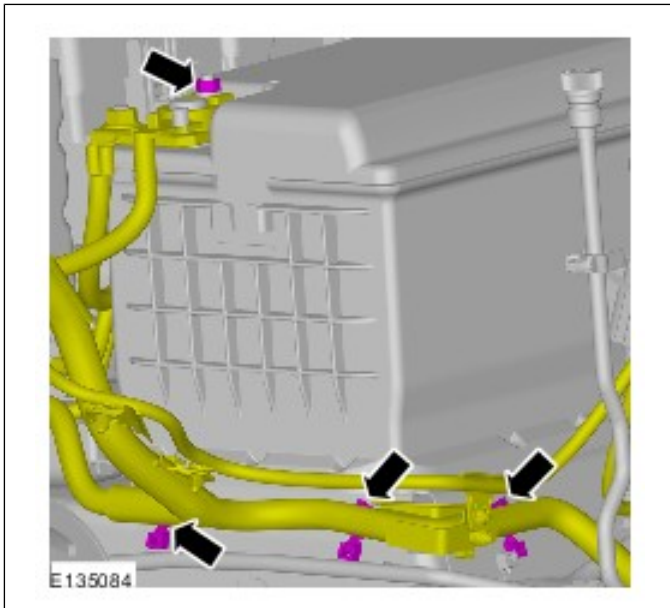


14.

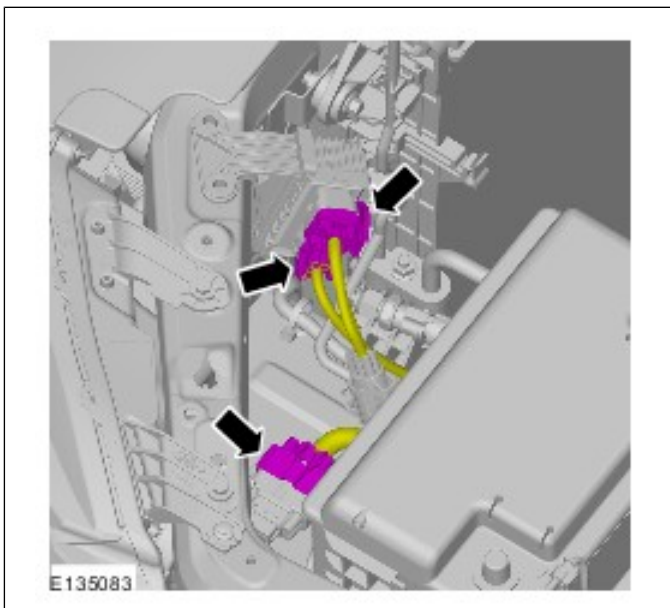


REMOVAL

15.



16.

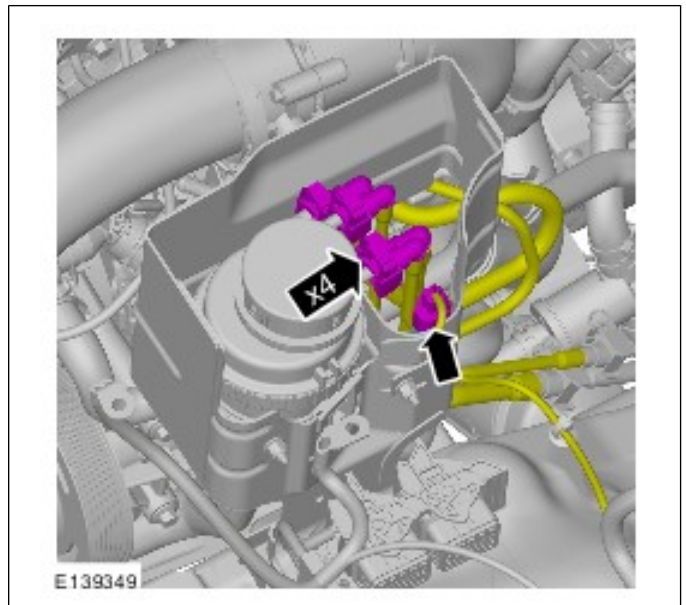


17. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

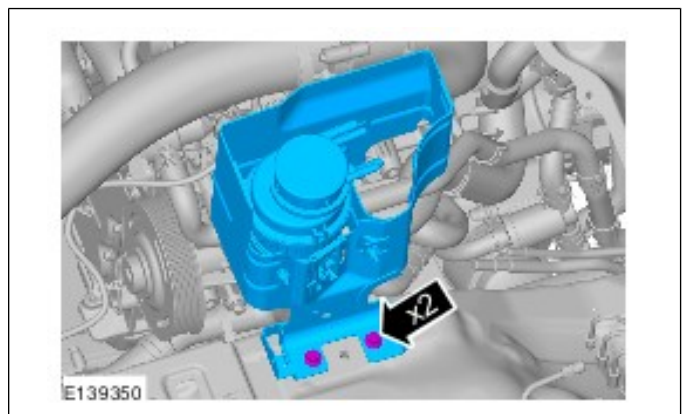
18. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

19. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

20.

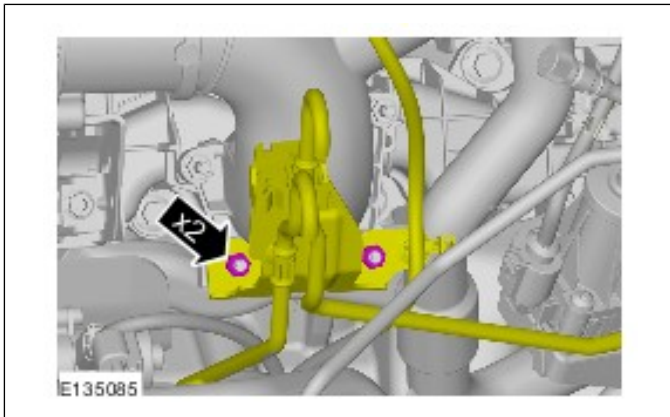


21.



REMOVAL

22.

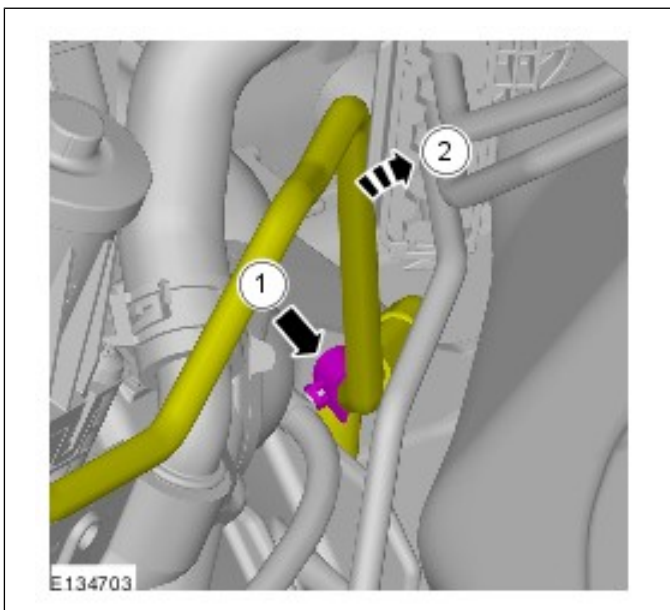


25. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

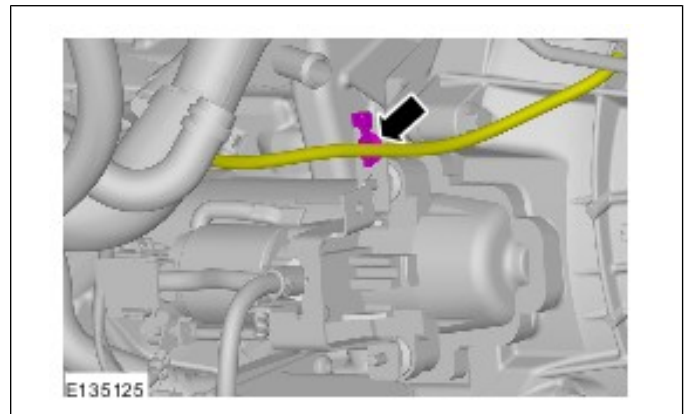
26. Refer to: [Radiator](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

27. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma](#) (412-01 Climate Control, Removal and Installation).

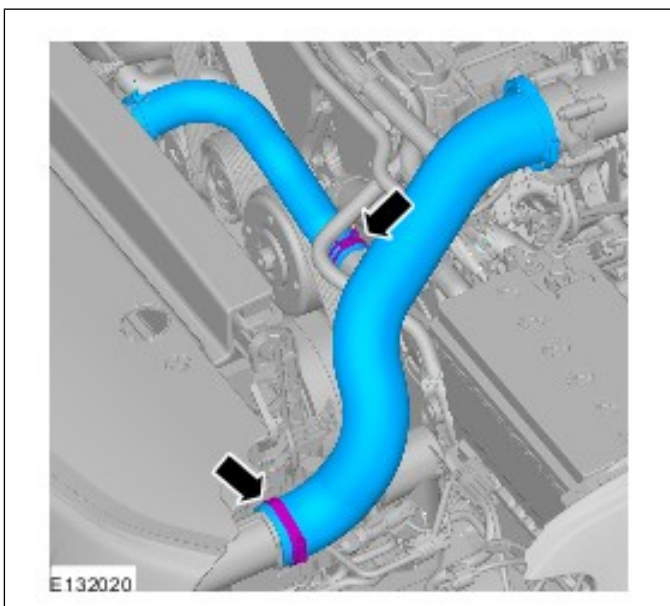
23.



28.

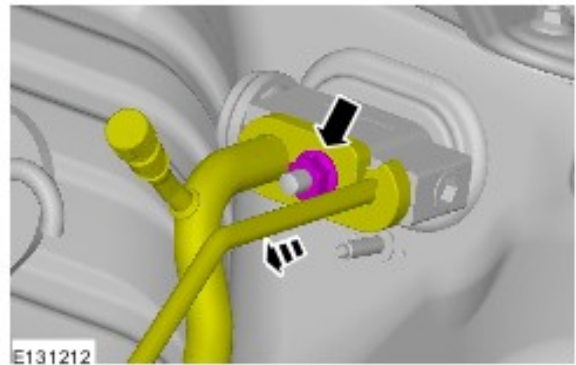


24.



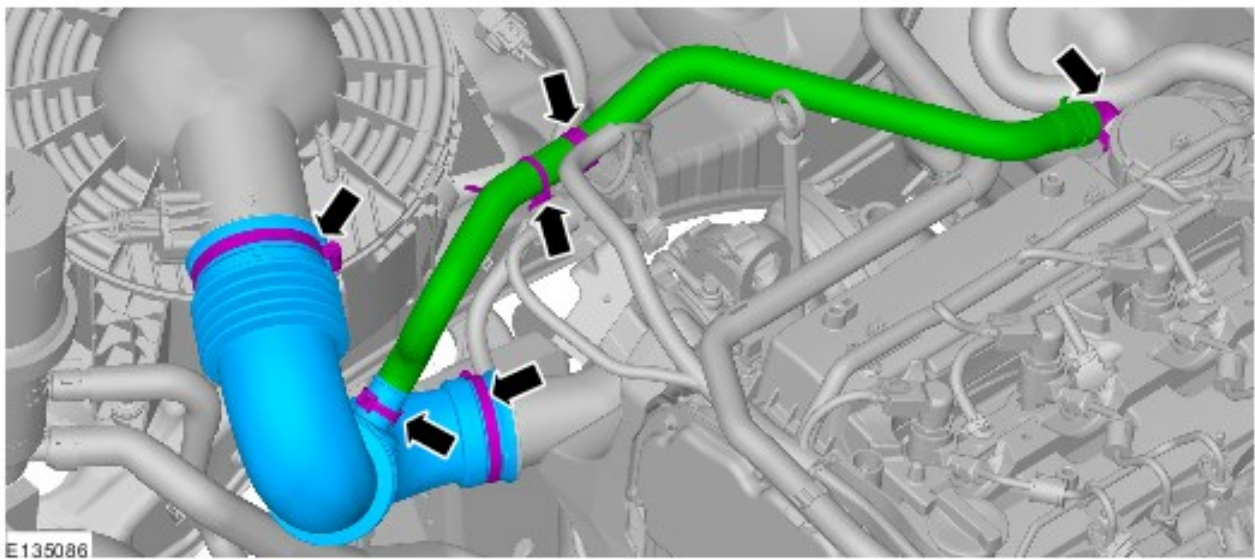
REMOVAL

29. Refer to: [Starter Motor - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (303-06 Starting System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).
30. Refer to: [Transmission Fluid Cooler](#) (307-02 Transmission Cooling, Removal and Installation).



31.

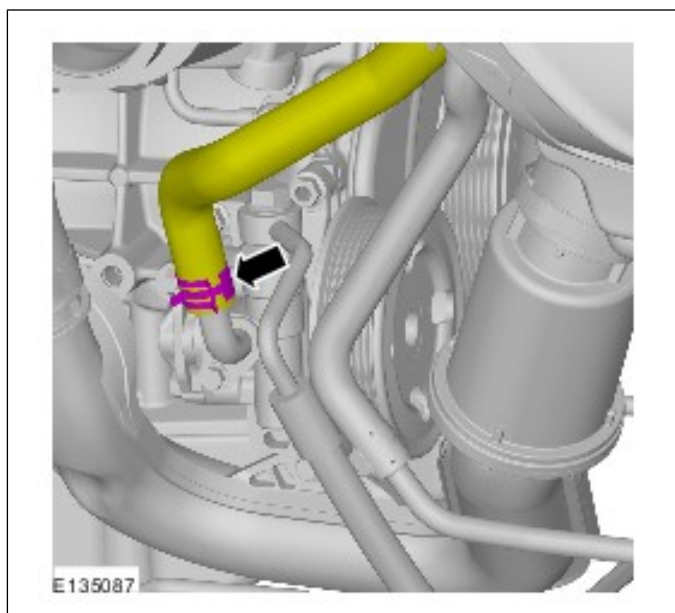
32.



REMOVAL

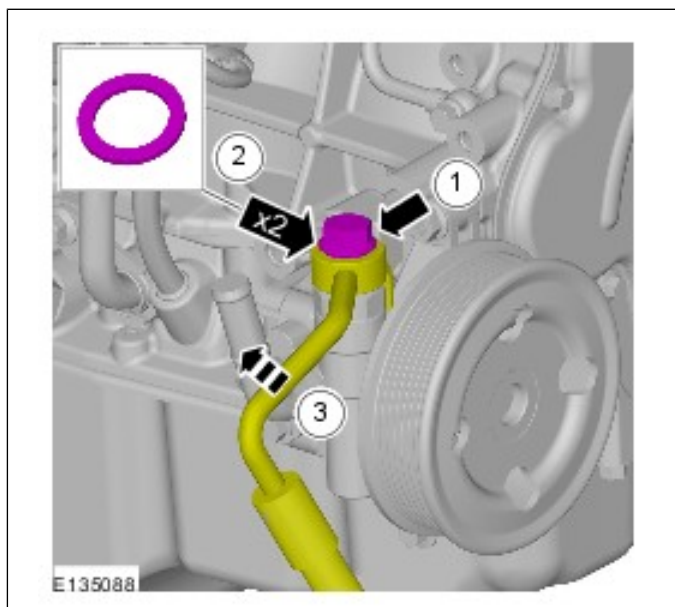
33. Refer to: Air Cleaner - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma (303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

34. **NOTE:** Make sure that all openings are sealed.

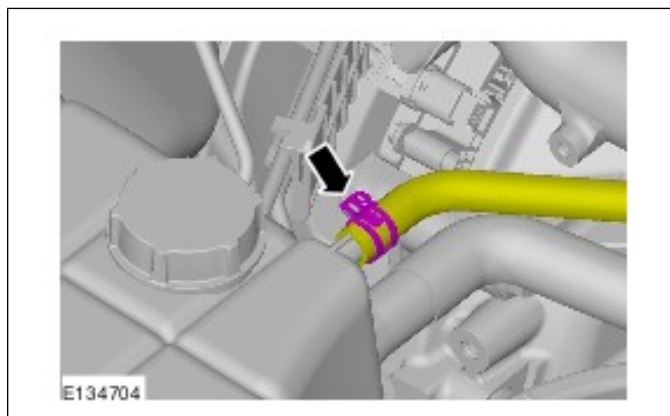


35. **CAUTION:** Cap the power steering line to prevent fluid loss or dirt ingress.

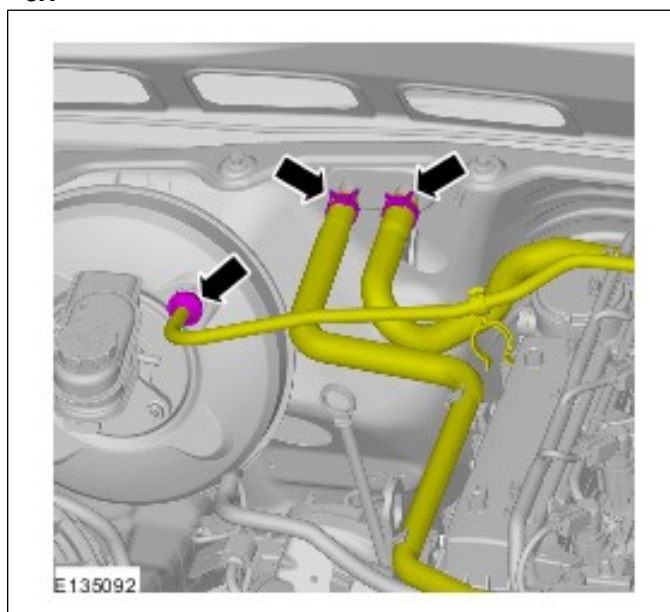
NOTE: The washers can be reused unless damaged.



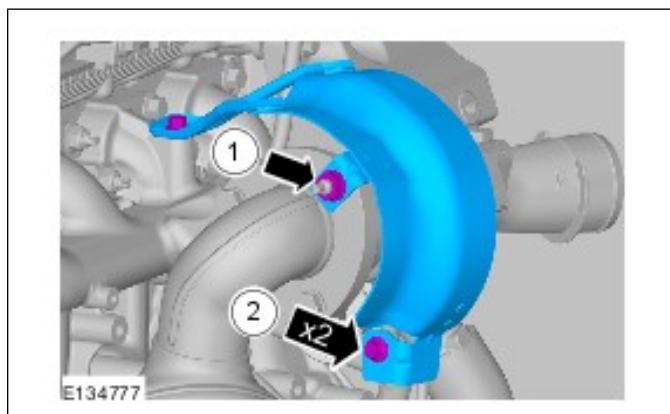
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37.



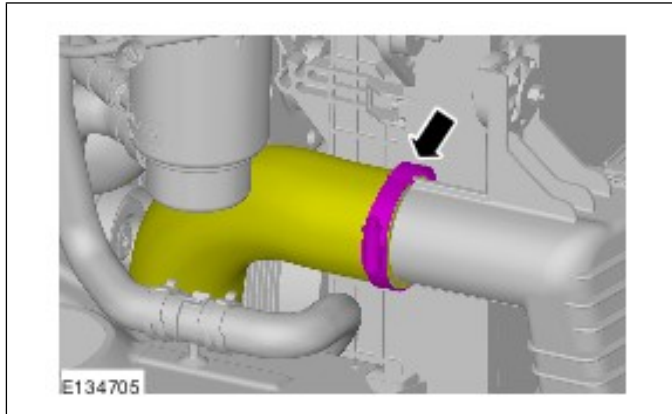
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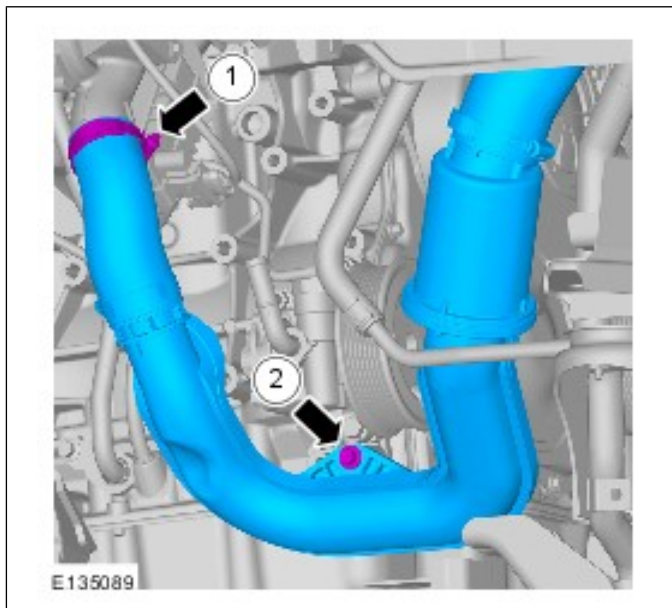
REMOVAL

39. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

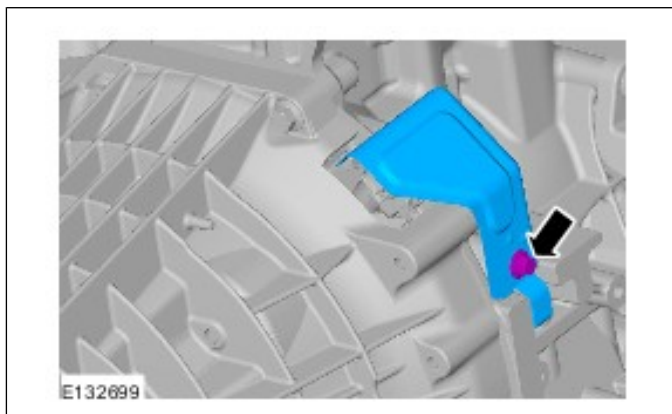
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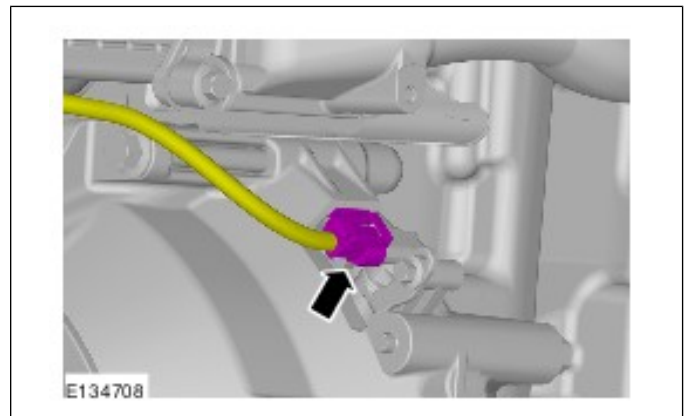
41.



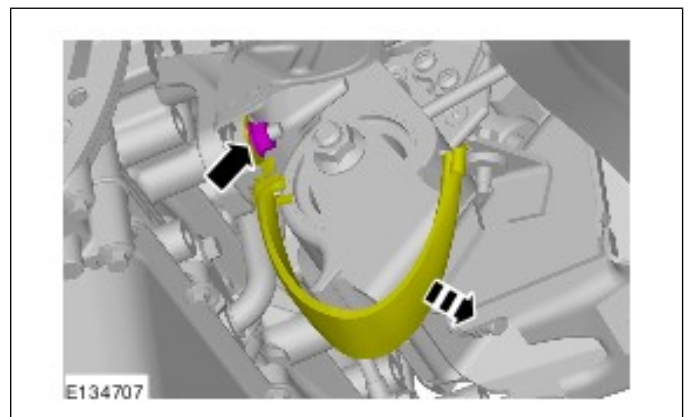
42.



43.



44.



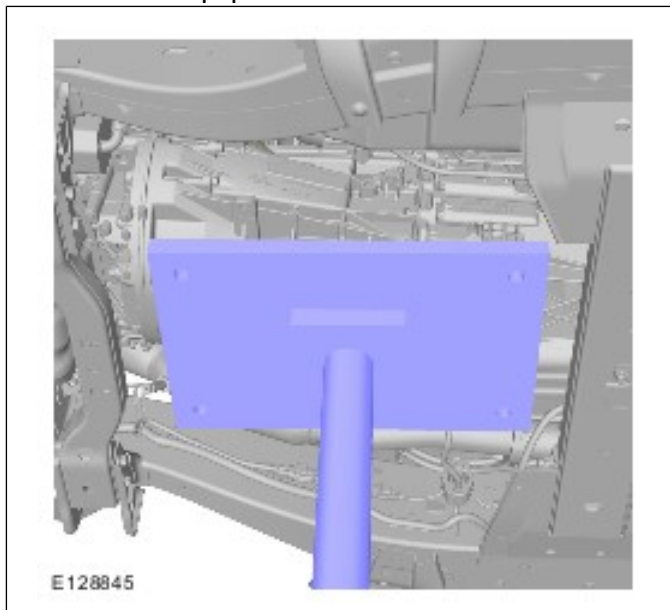
45.  **WARNING:** Make sure that transmission assembly is on wooden blocks and secured with suitable retaining straps.

-  **CAUTION:** Do not tilt the transmission. This may cause damage to the pilot bearing.

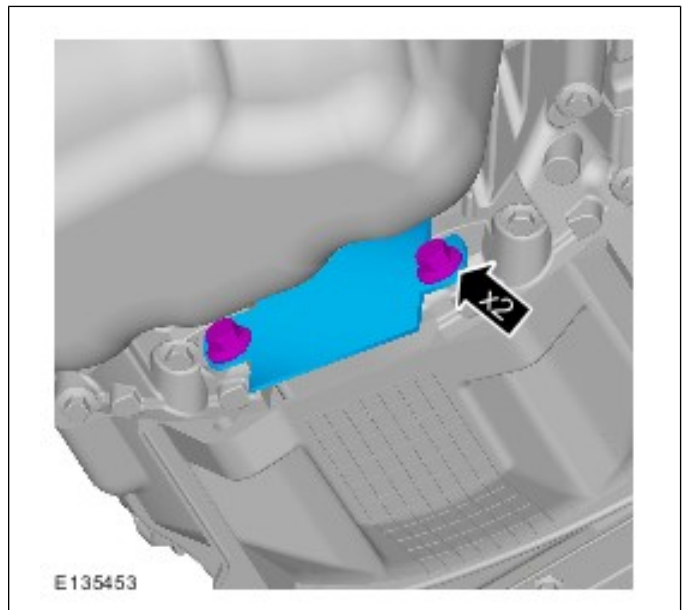
Tie and support the transmission to the chassis with a suitable strap.

REMOVAL

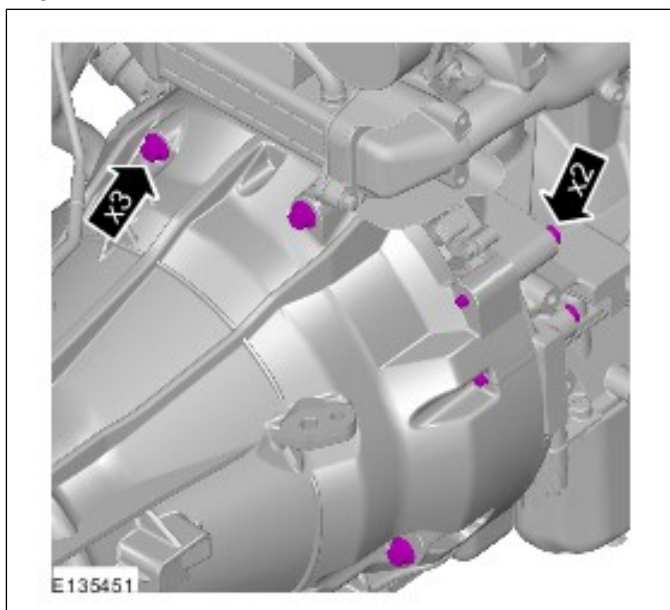
General Equipment: Transmission Jack



47.

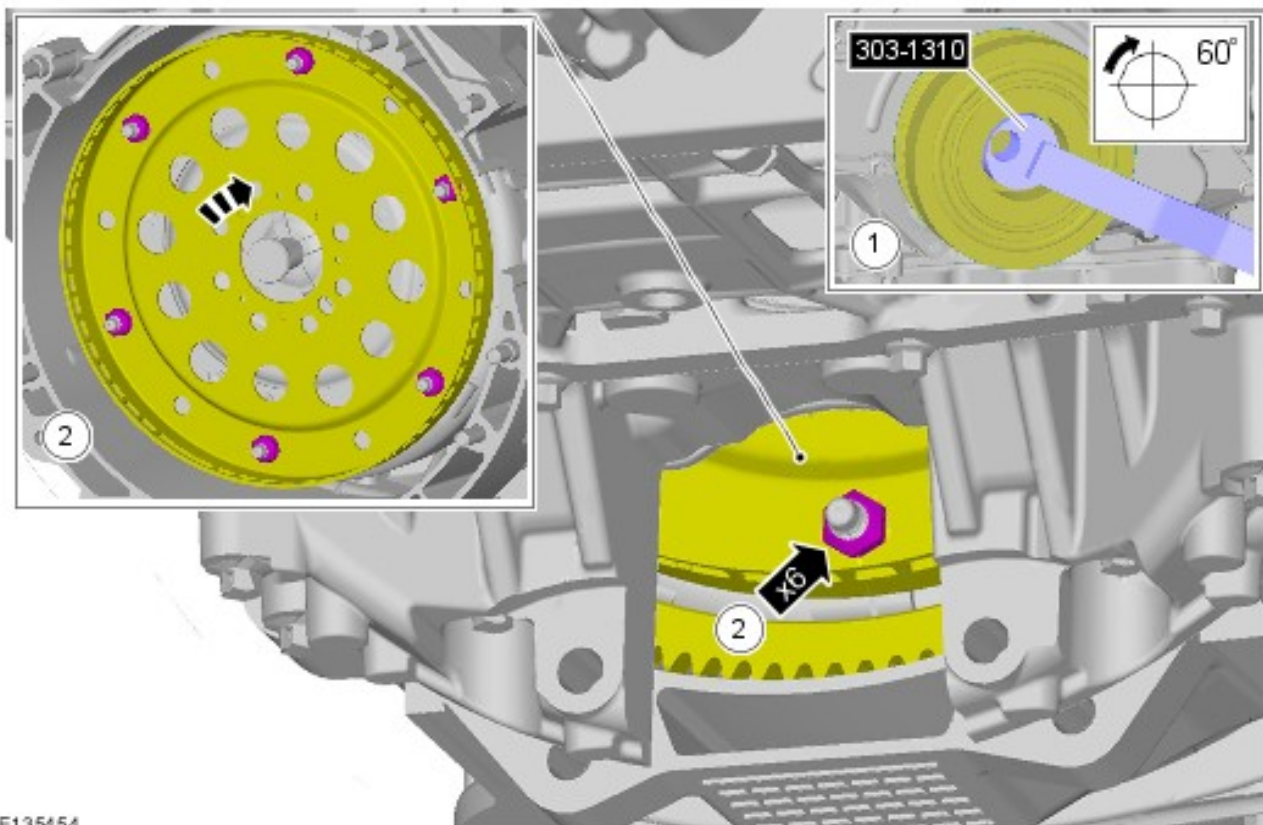


46.



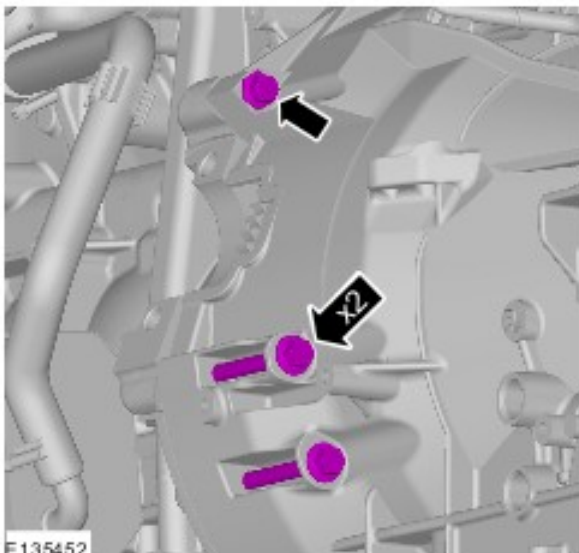
48.

REMOVAL



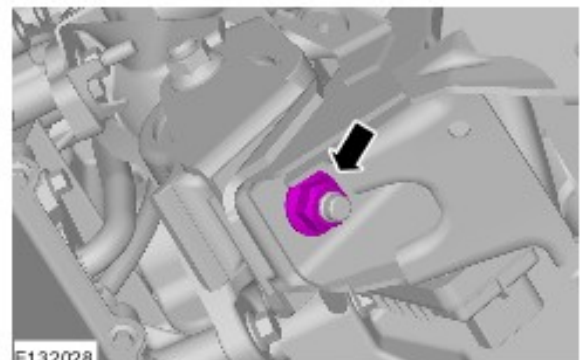
E135454

49.



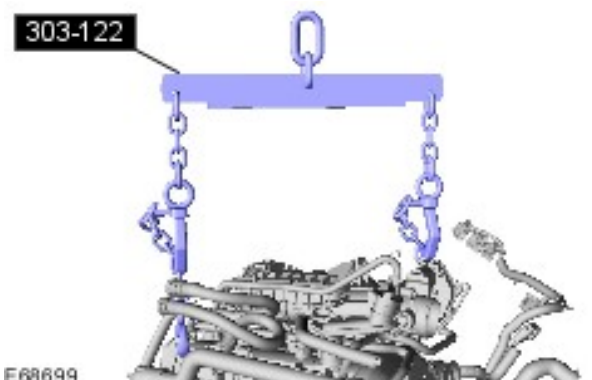
E135452

50. On both sides.



E132028

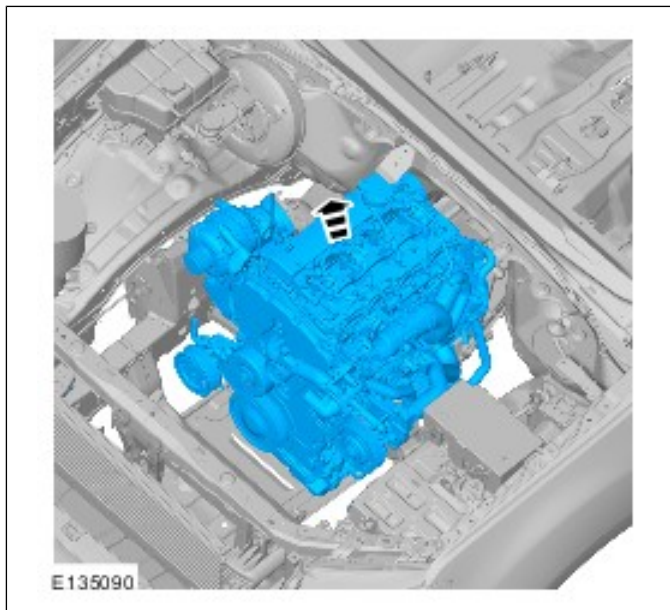
51. Special Tool(s): 303-122



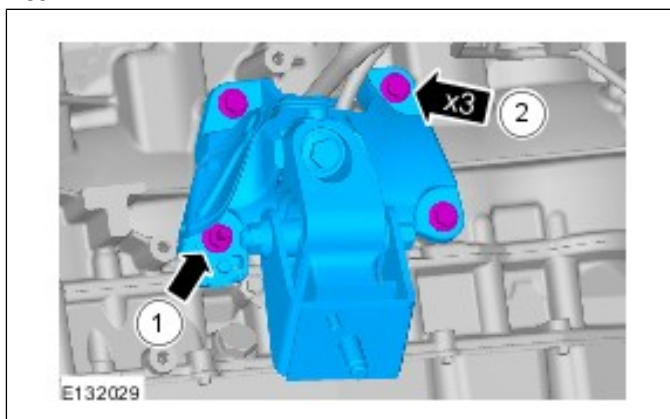
E68699

REMOVAL

52.



53.

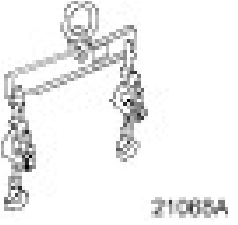


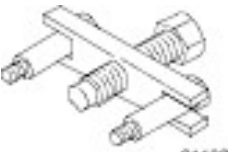
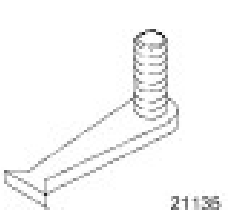
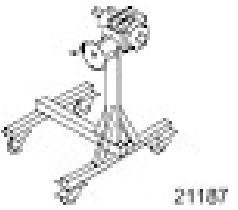


REMOVAL

Engine Accessories(21 139 4)

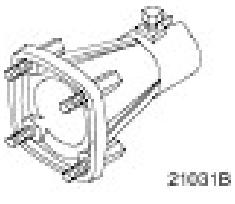
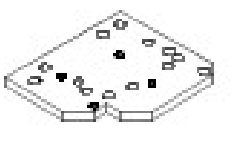
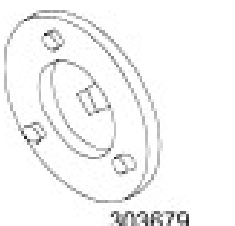
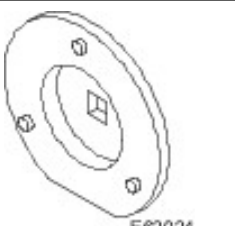
Removal

Special Tool(s) / General Equipment

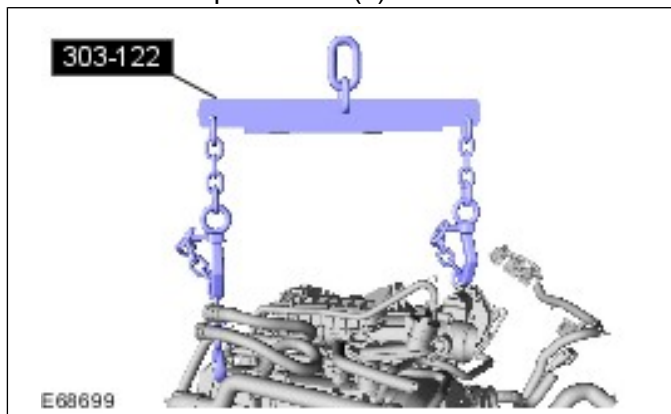
 <p>210854</p>	<p>303-122 Lifting Bracket, Engine</p>
 <p>E87 614</p>	<p>303-1310 Holding Wrench, Crankshaft</p>
 <p>E 753 78</p>	<p>303-1317 Locking Tool, Fuel Injection Pump Sprocket</p>
 <p>21132</p>	<p>303-249 Remover, Crankshaft Timing Pulley</p>
 <p>21126</p>	<p>303-254 Locking Tool, Flywheel</p>
 <p>21187</p>	<p>303-435 Mounting Stand</p>

REMOVAL

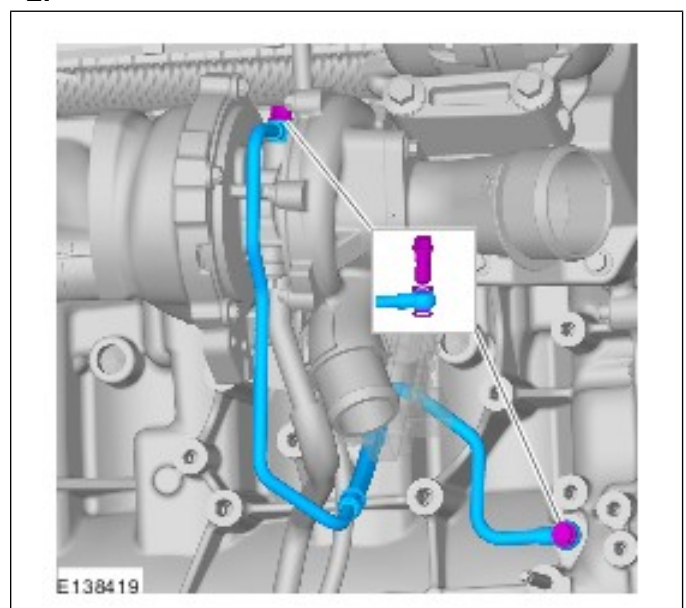
Special Tool(s) / General Equipment

 21031B	303-435-06 Mounting Bracket for 303-435
 E68388	303-435-11B Mounting Plate for 303-435-06
 303679	303-679 Remover/Installer, Engine Front Cover Inspection Plate
 E62024	303-679A Remover/Installer, Engine Front Cover Inspection Plate
1/2 Inch Square Drive Breaker Bar	
Dowel with a Diameter of 6 mm	

1. Install the Special Tool(s): 303-122

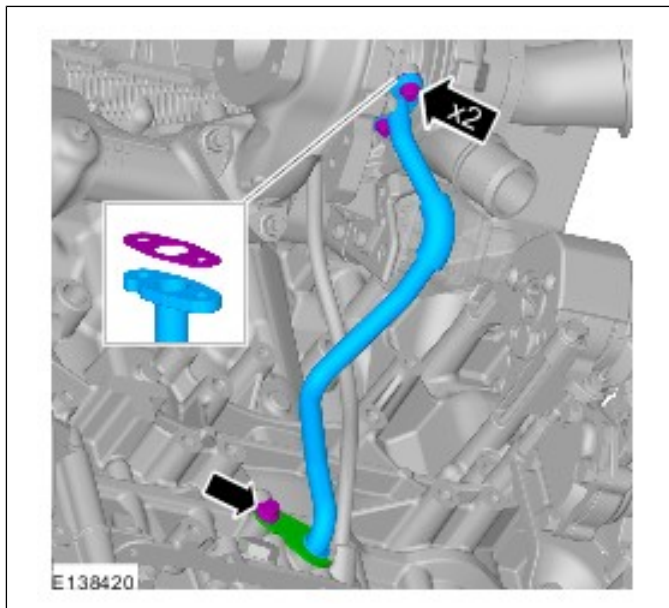


2.

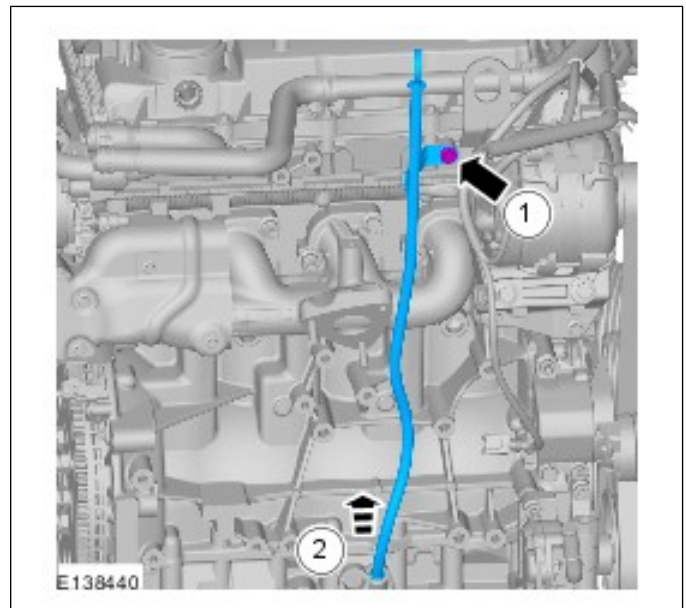


REMOVAL

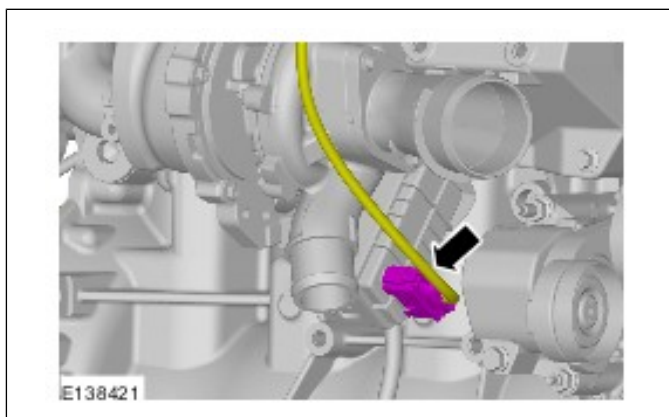
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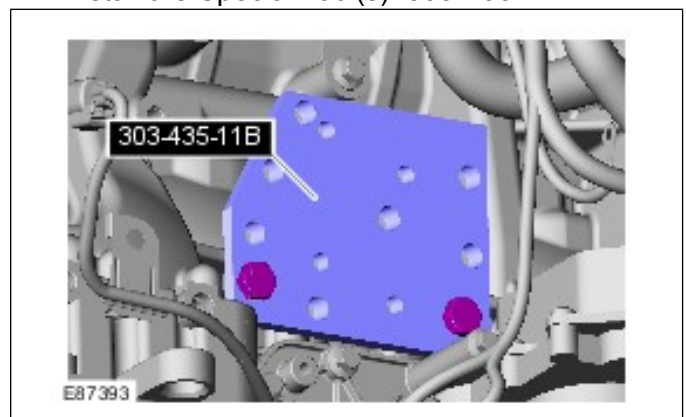
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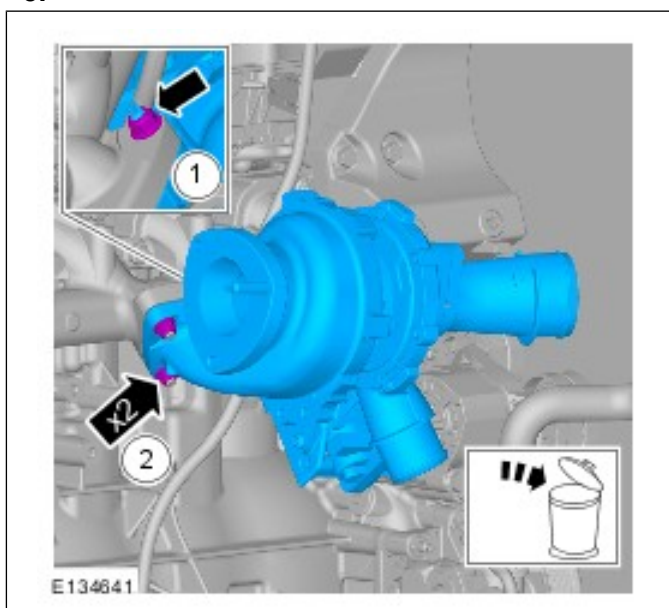
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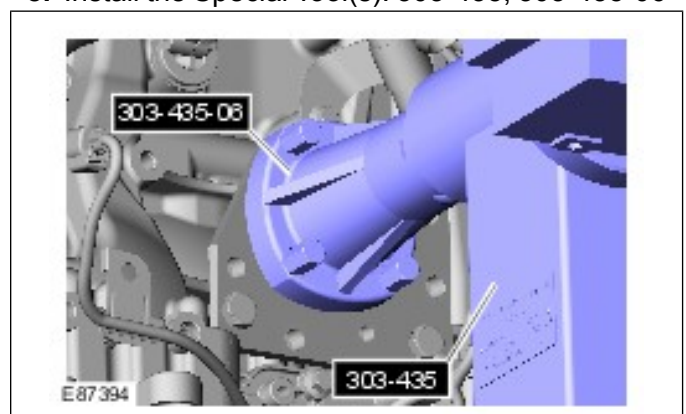
7. Install the Special Tool(s): 303-435-11B



5.

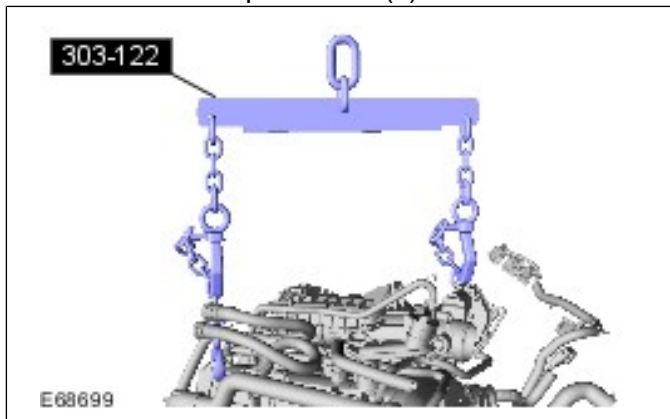


8. Install the Special Tool(s): 303-435, 303-435-06

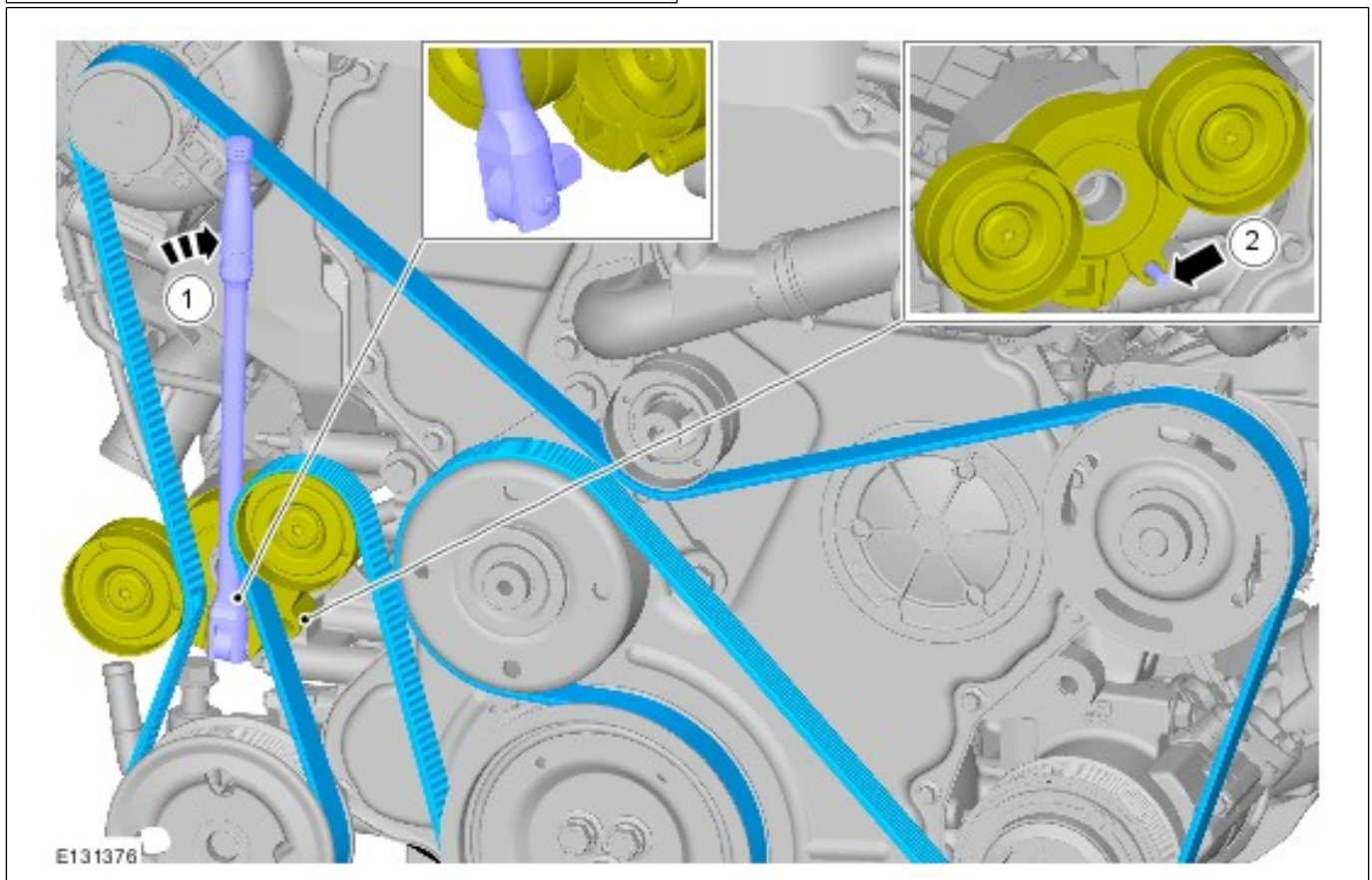


REMOVAL

9. Remove the Special Tool(s): 303-122

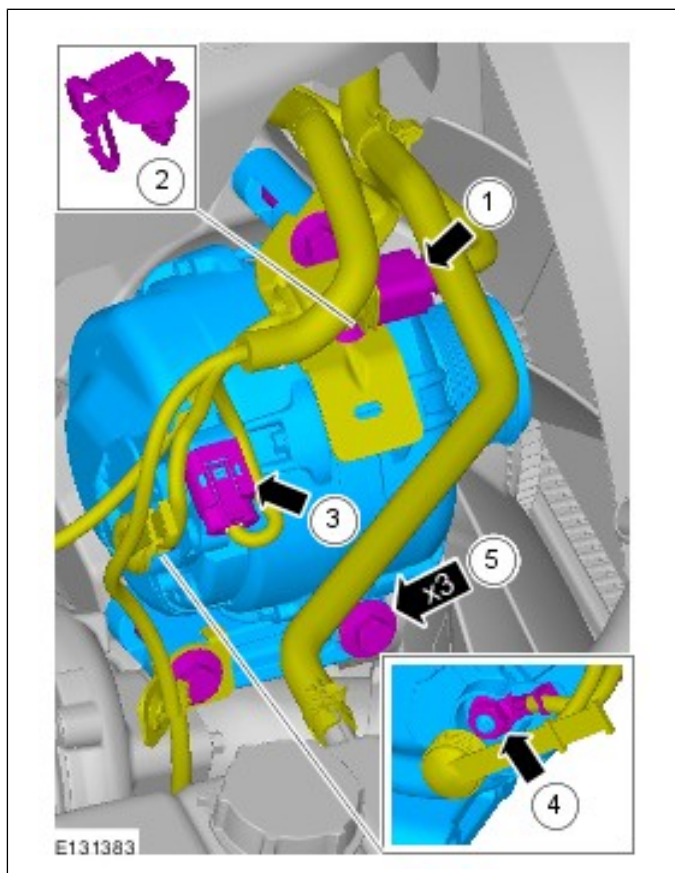


10. General Equipment: 1/2 Inch Square Drive
Breaker Bar
General Equipment: Dowel with a Diameter of
6 mm

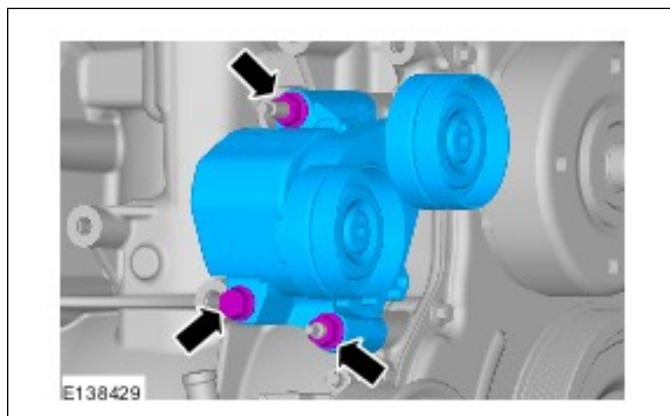


REMOVAL

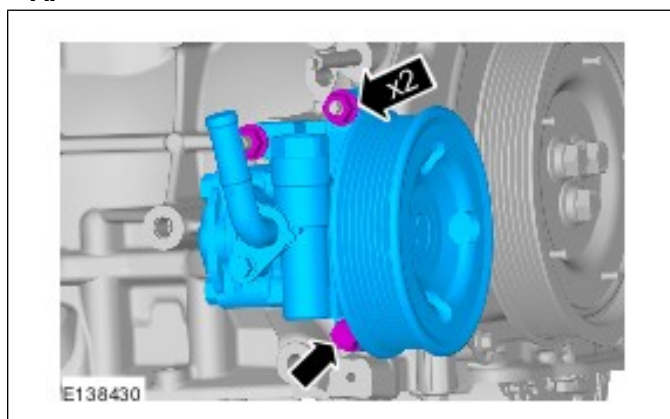
11.  **CAUTION:** Take extra care not to damage the wiring harnesses.



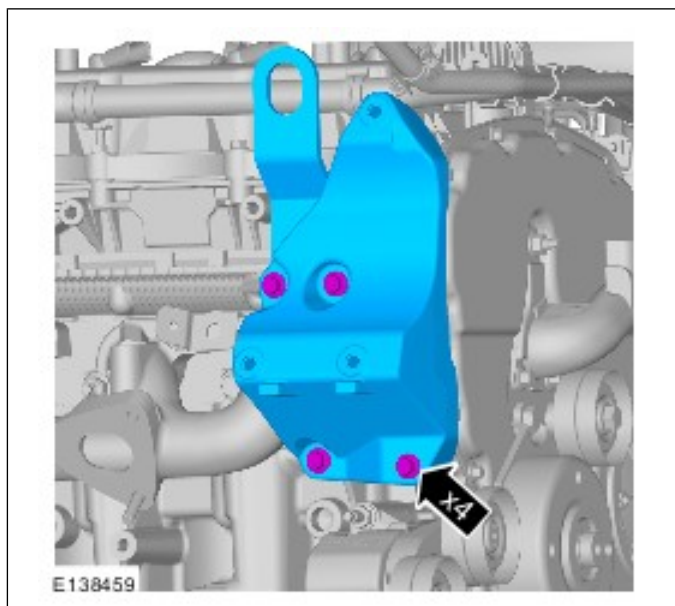
13.



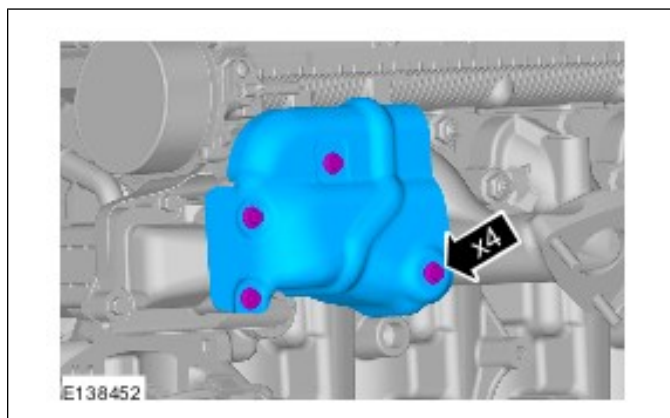
14.



12.

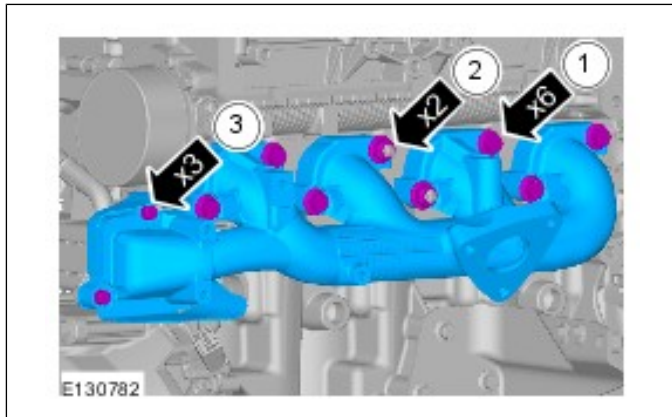


15.



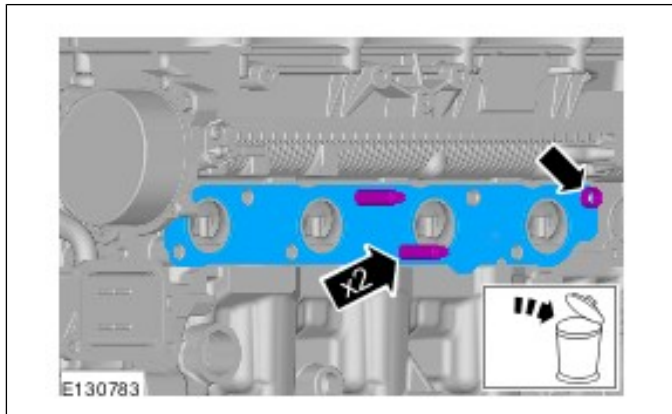
REMOVAL

16.

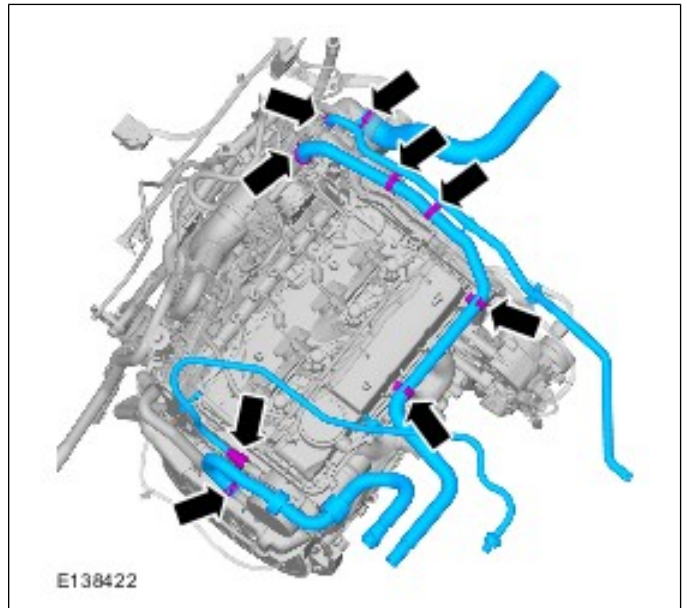


17. **NOTE:** The gasket is to be reused unless damaged.

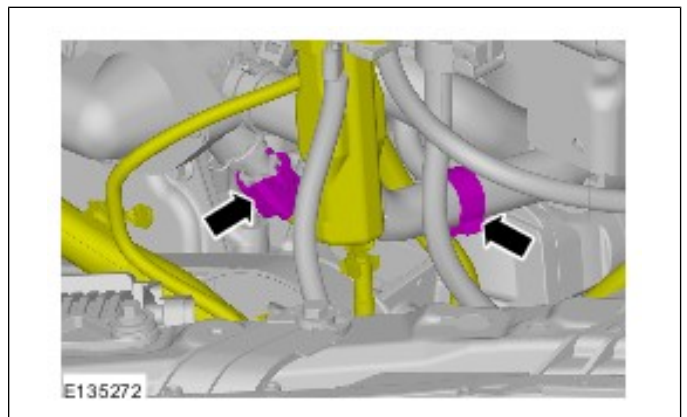
NOTE: The studs are to be reused unless damaged.



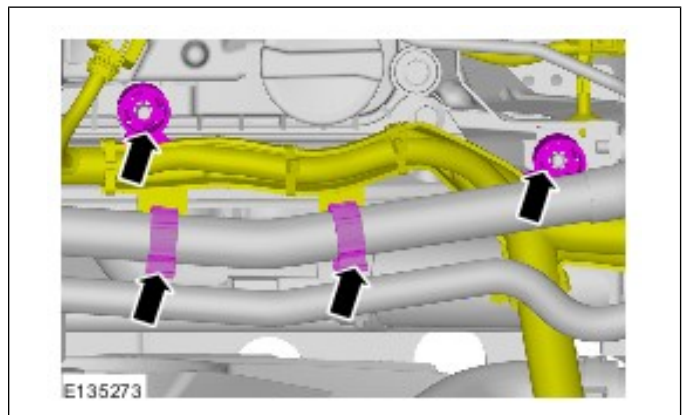
18.



19.

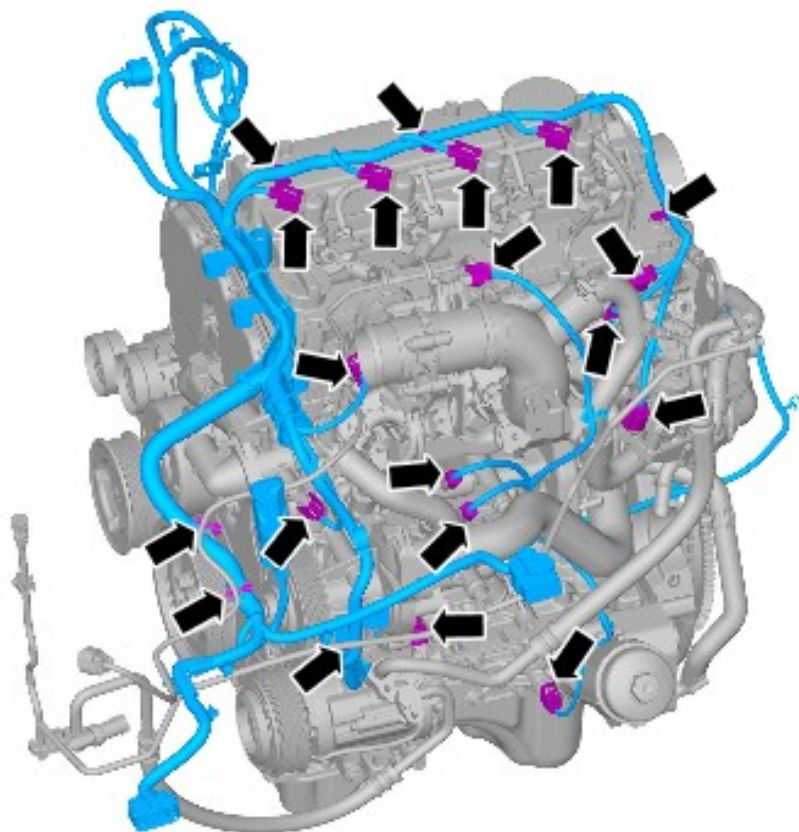


20.



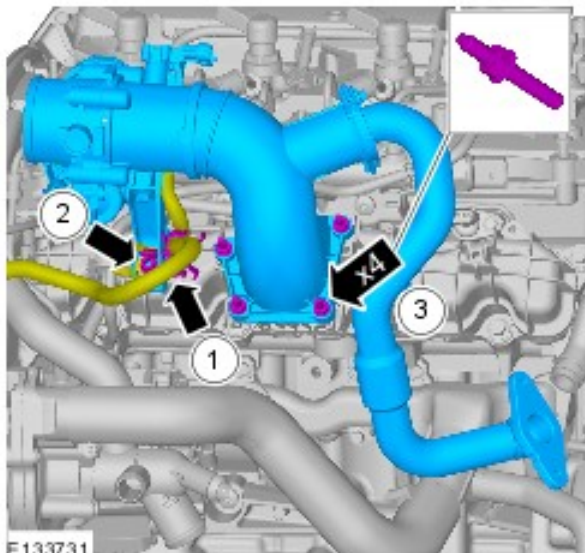
21.

REMOVAL



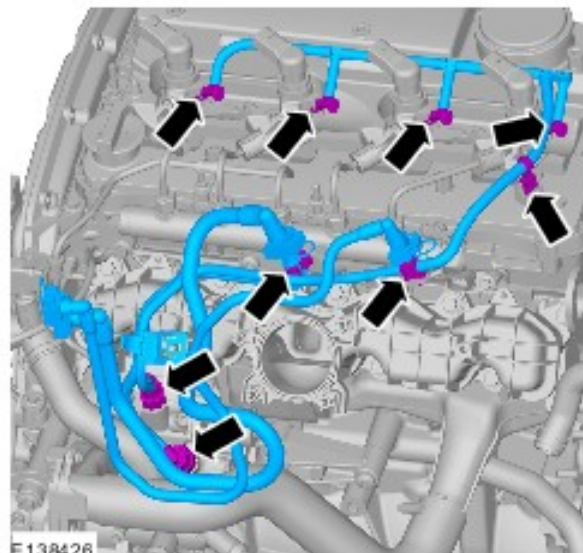
E138423

22



E133731

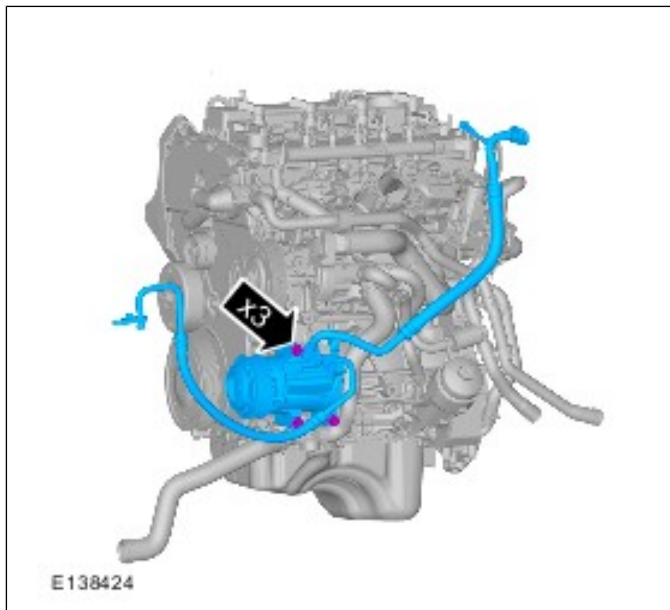
23.  **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.



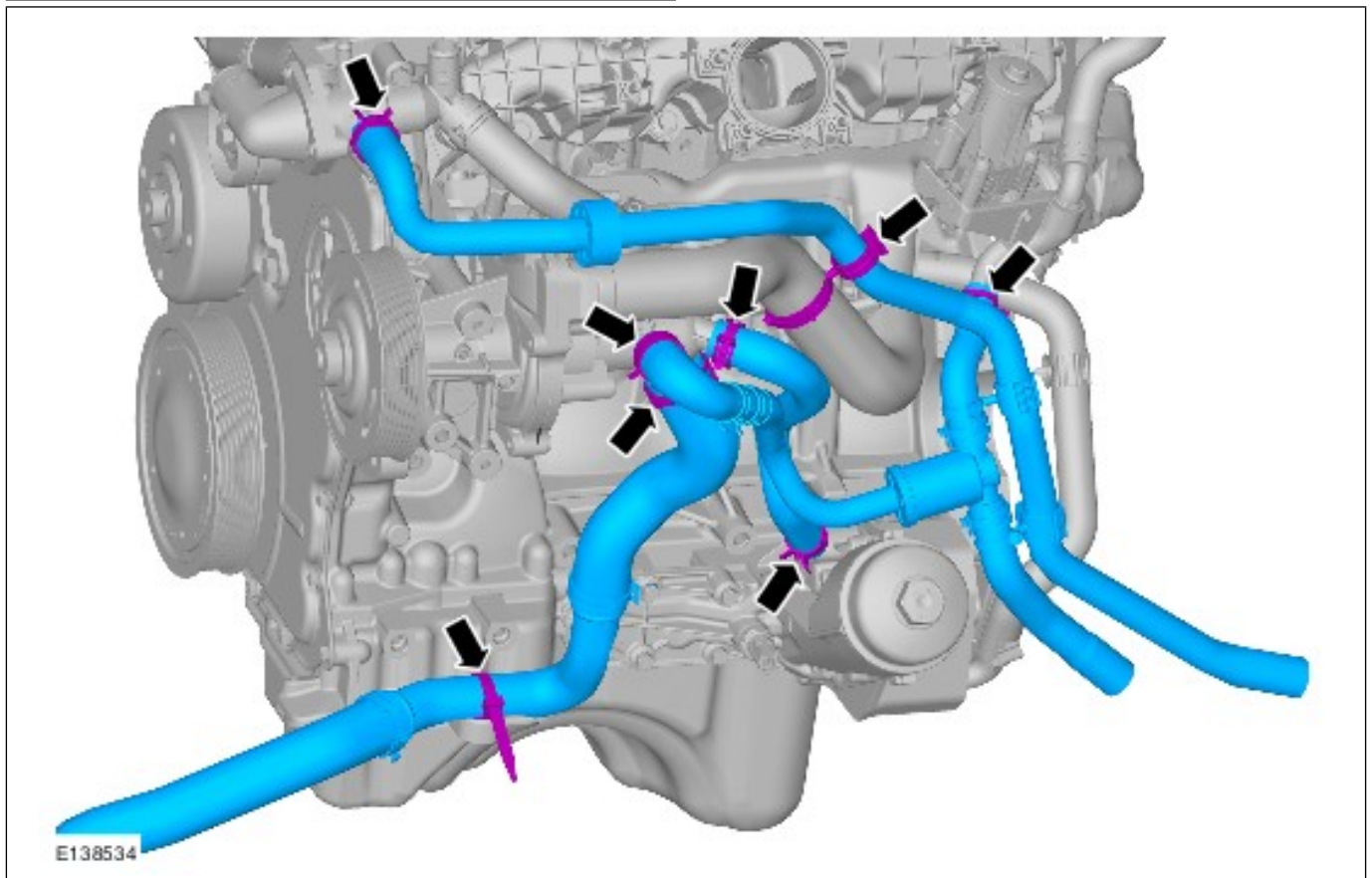
E138426

REMOVAL

24.

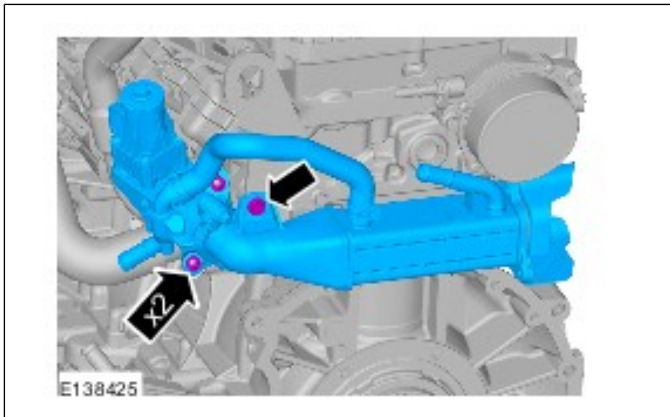


25.

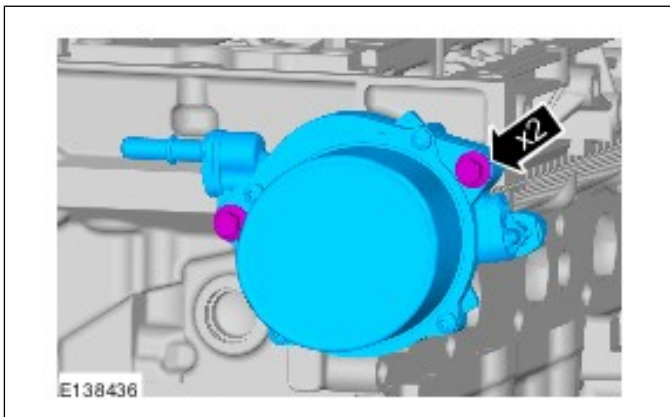


REMOVAL

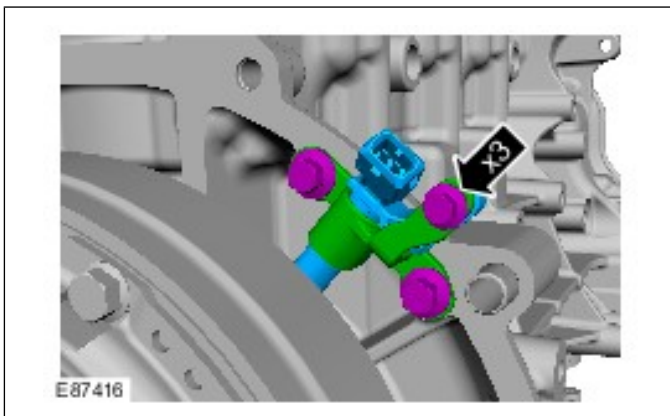
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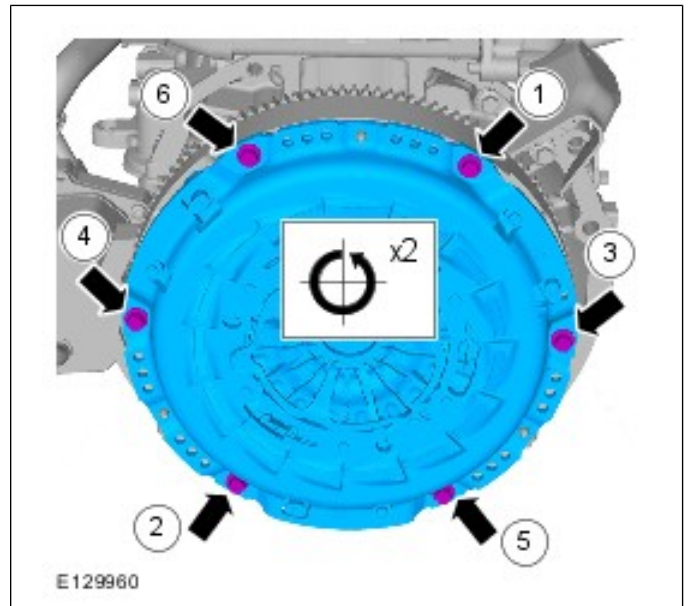
27.



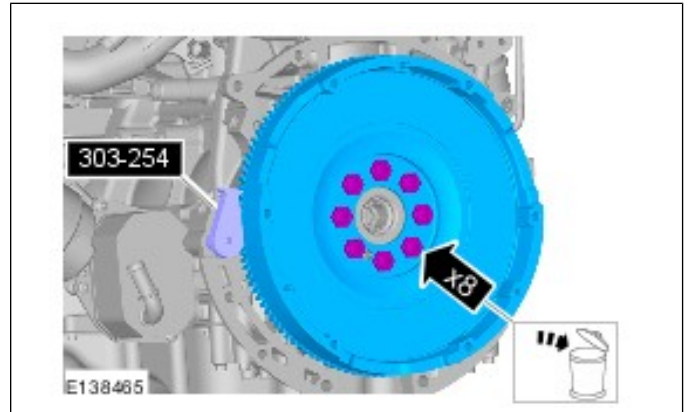
28.



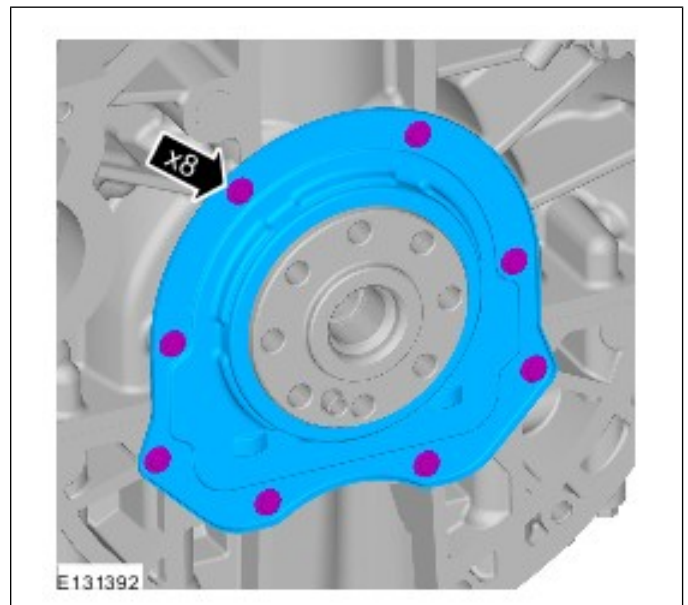
29. **NOTE:** Do not loosen the bolts more than 2 turns.



30. Special Tool(s): 303-254

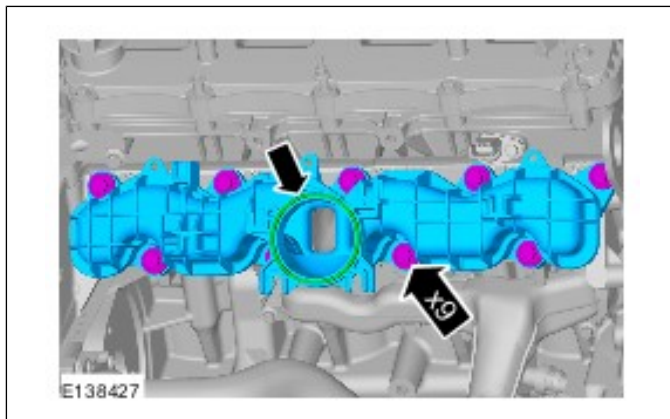


31.

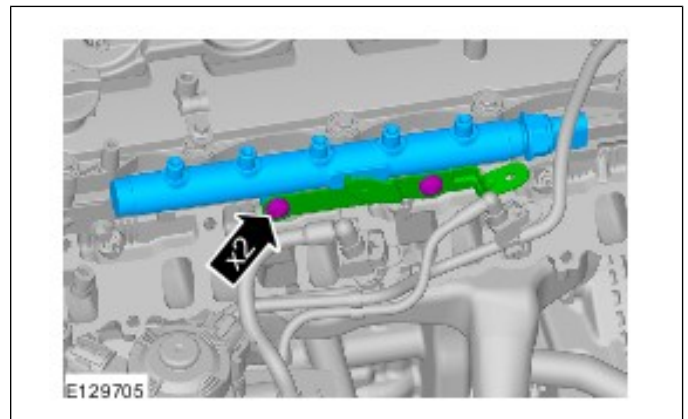


REMOVAL

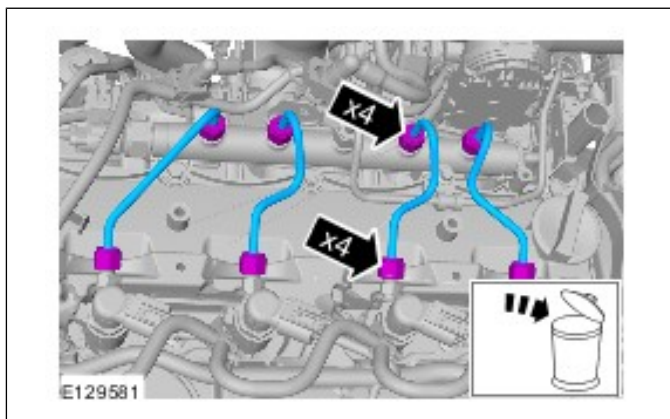
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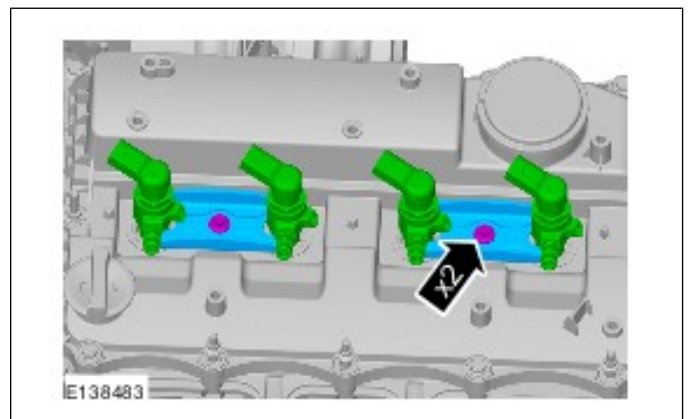
35.



33.



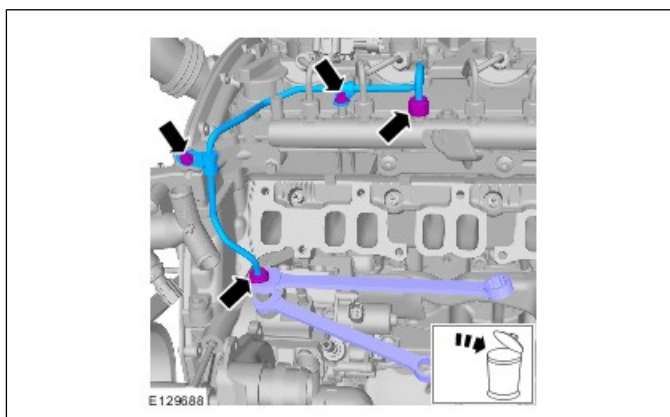
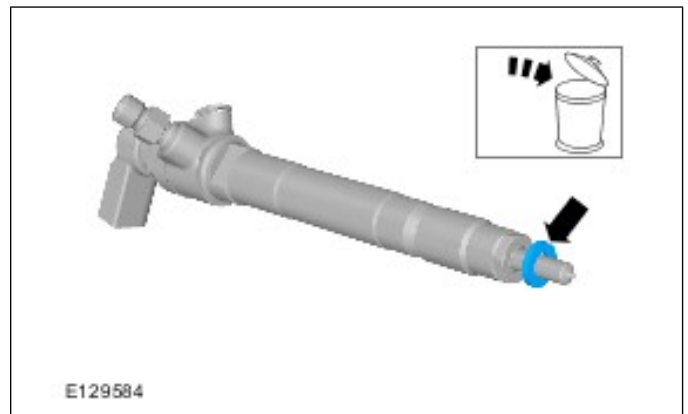
36.



34. CAUTIONS:

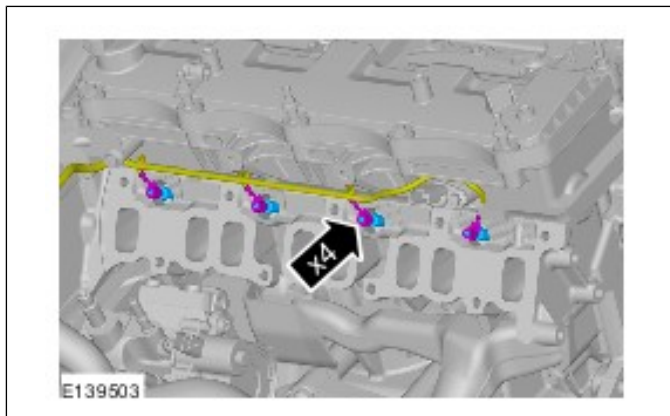
- ⚠ Make sure that the fuel line remains in contact at both ends until both unions nuts have been unscrewed and the area around the joints thoroughly cleaned.
- ⚠ Make sure that the high-pressure fuel supply line remains in contact with both the fuel pump and the fuel rail until both unions have been detached and cleaned.
- ⚠ Make sure that all openings are sealed. Use new blanking caps.

37.

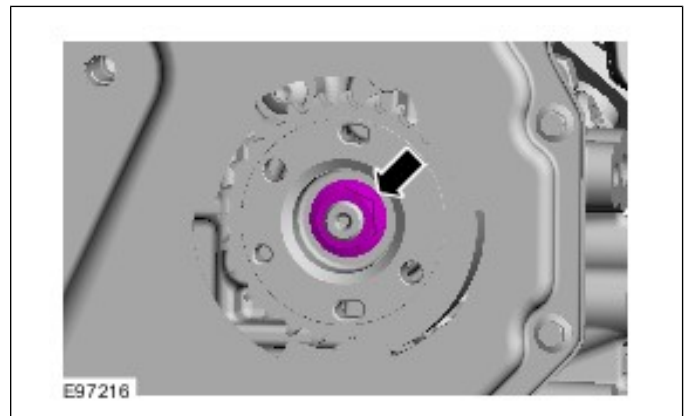


REMOVAL

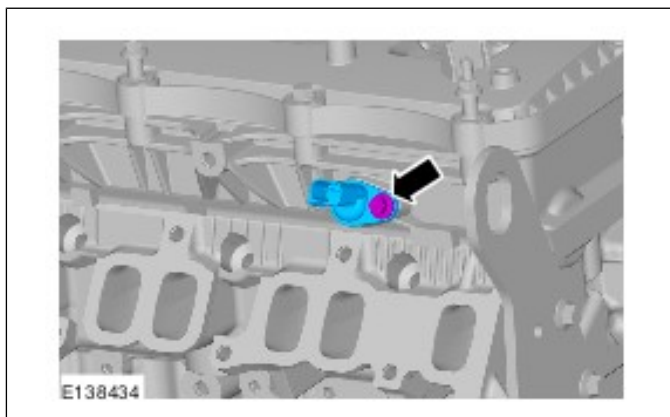
38.



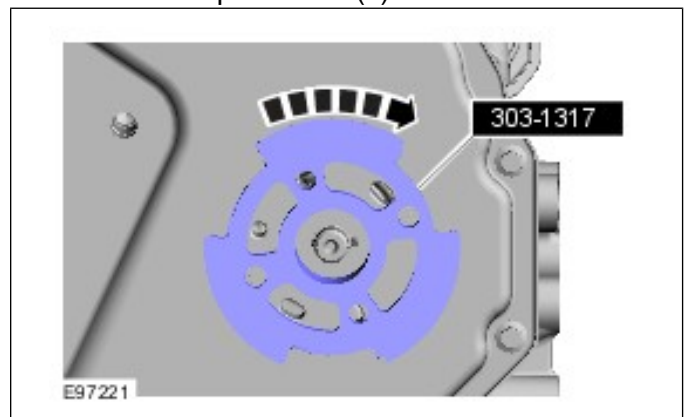
41.



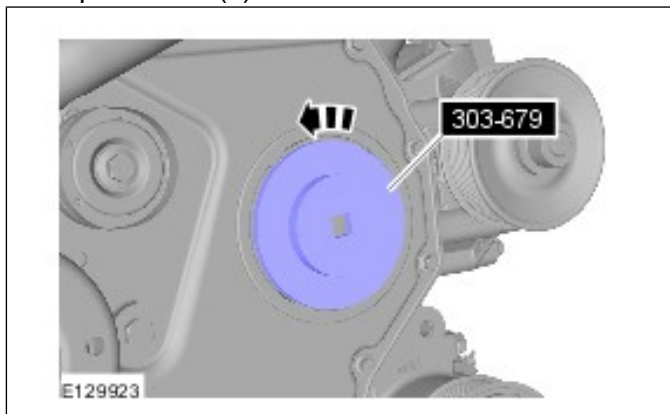
39.



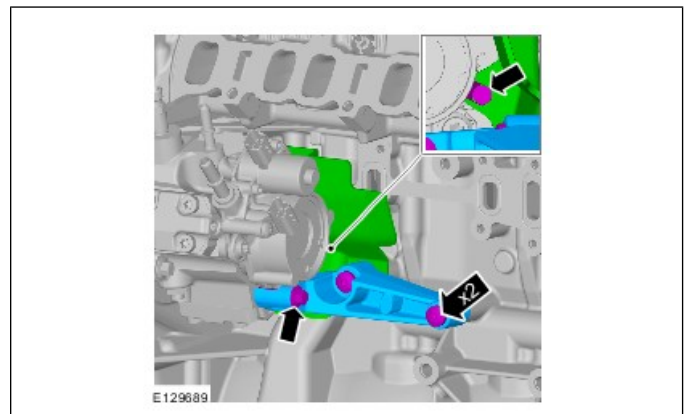
42. Install the Special Tool(s): 303-1317



40. Special Tool(s): 303-679

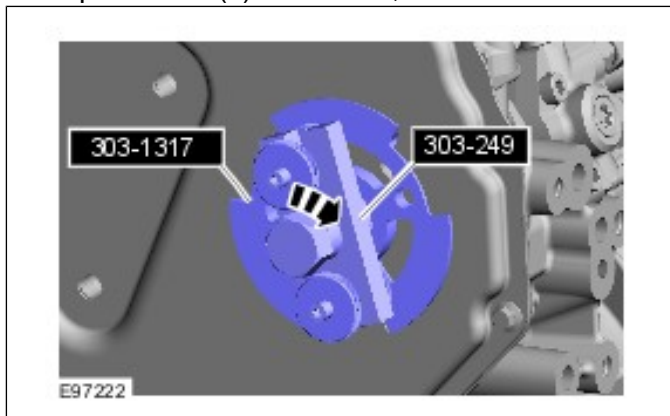


43.

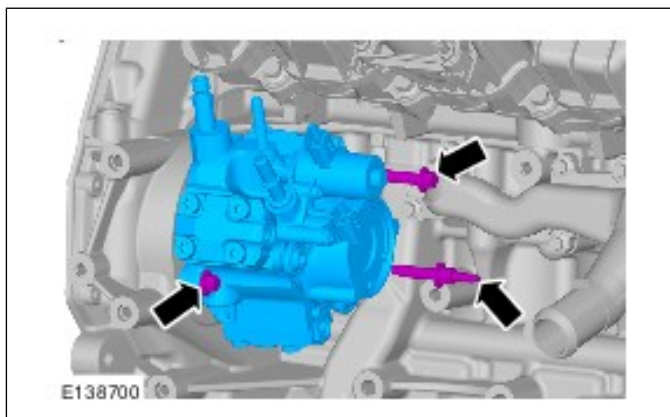


REMOVAL

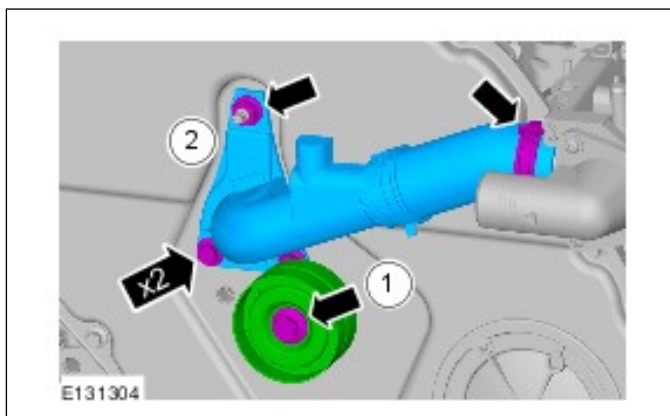
44. Special Tool(s): 303-1317, 303-249



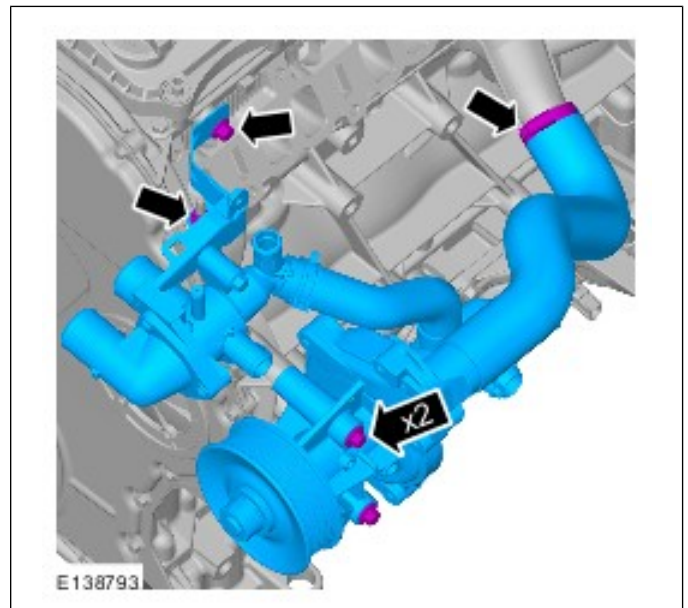
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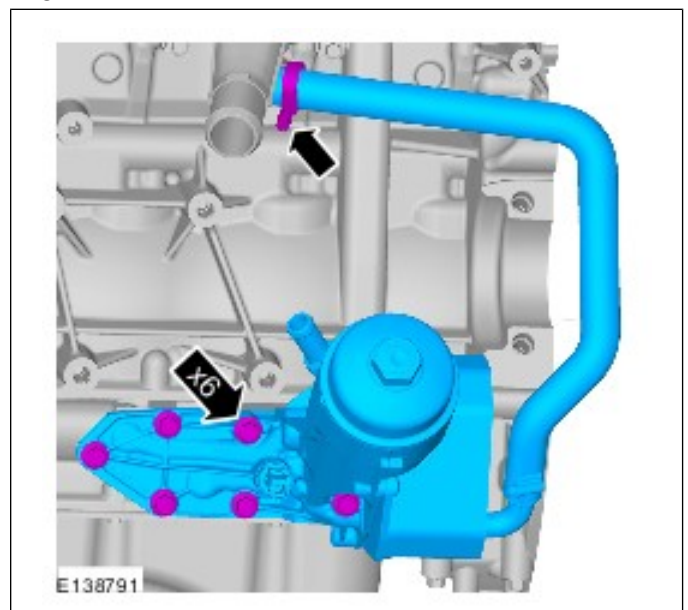
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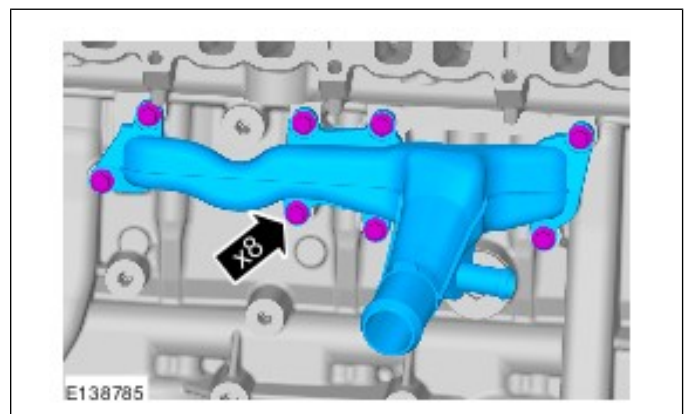
47.



48.

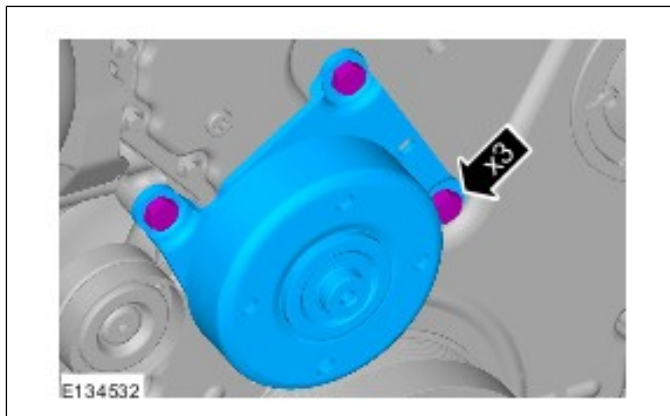


49.

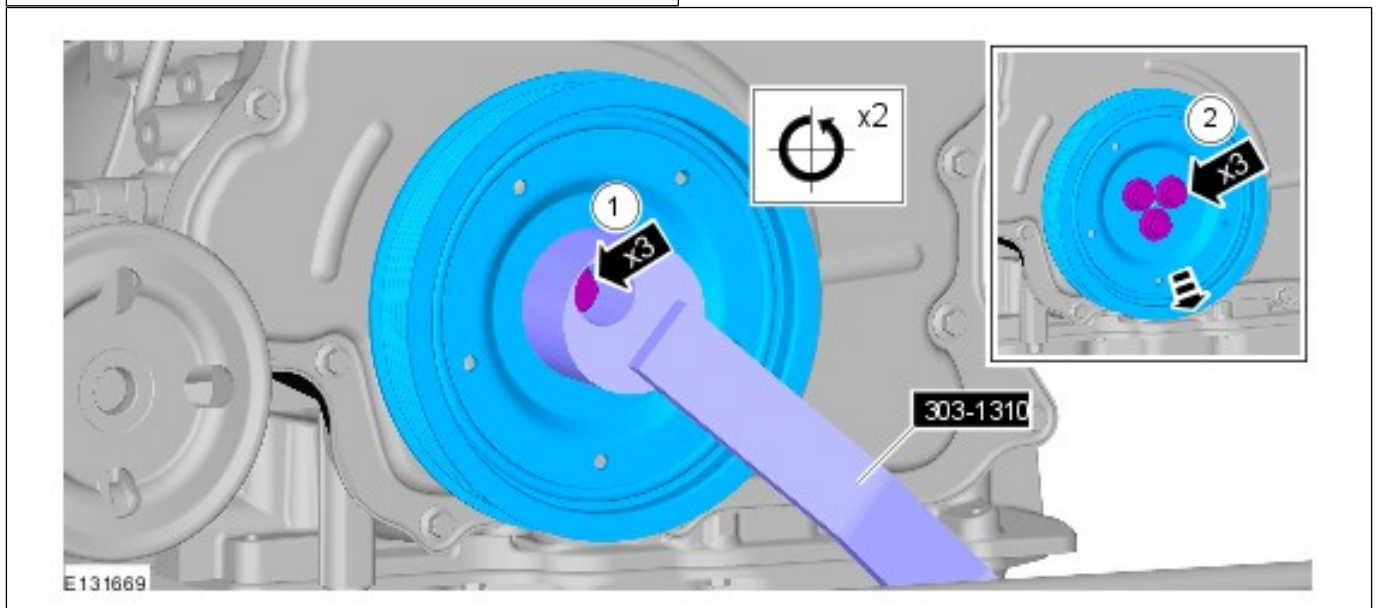


REMOVAL

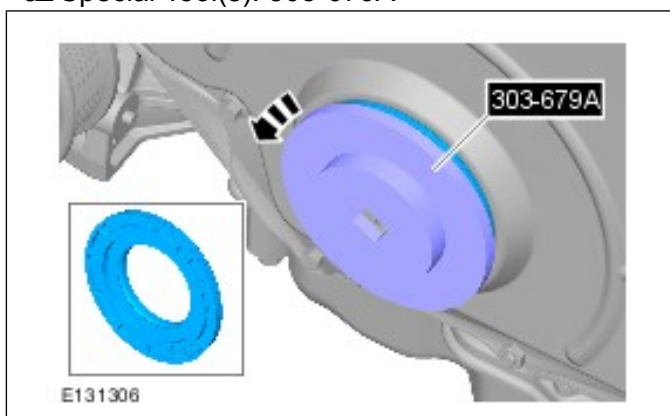
50.



51. Special Tool(s): 303-1310



52. Special Tool(s): 303-679A



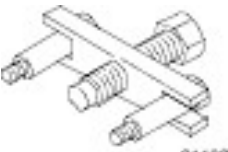

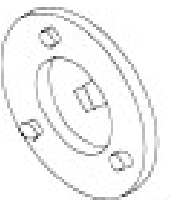


DISASSEMBLY

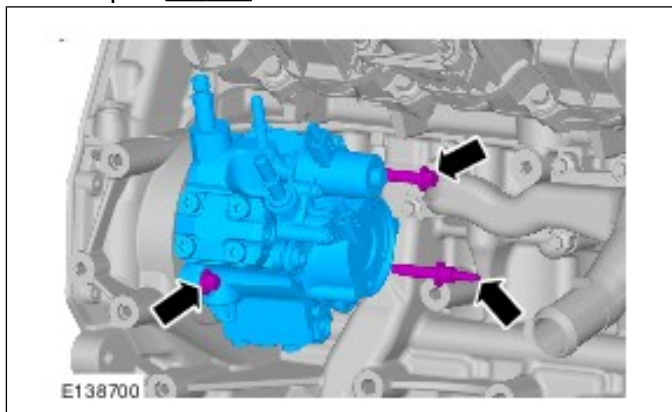
Engine(21 134 8)

Disassembly

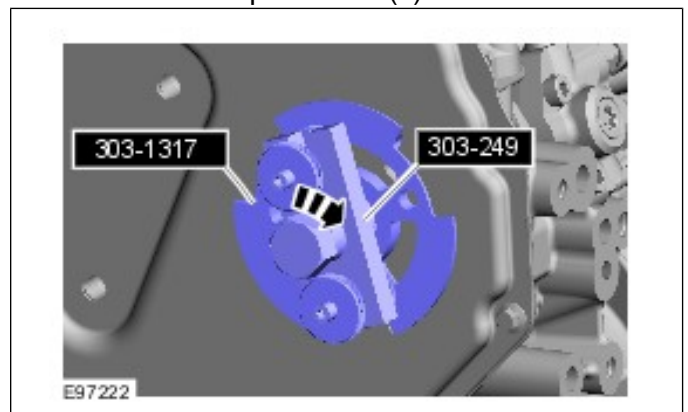
Special Tool(s) / General Equipment

 <p>17063</p>	<p>100-010 Remover, O-Ring Seal</p>
 <p>E 753 78</p>	<p>303-1317 Locking Tool, Fuel Injection Pump Sprocket</p>
 <p>21132</p>	<p>303-249 Remover, Crankshaft Timing Pulley</p>
 <p>21179</p>	<p>303-428 Separator, Oil Pan</p>
 <p>303679</p>	<p>303-679 Remover/Installer, Engine Front Cover Inspection Plate</p>
<p>2 mm Punch</p>	

1. Torque: 25 Nm



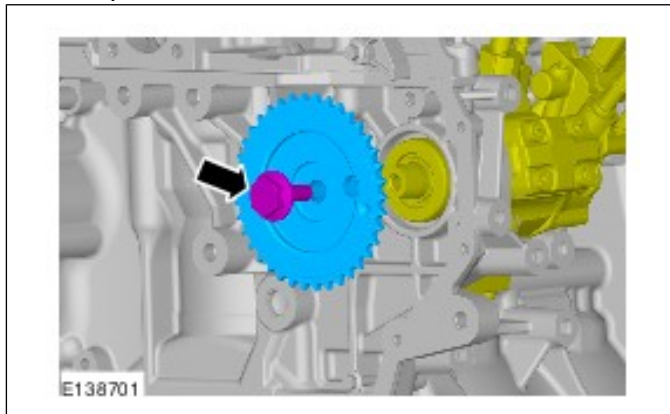
2. Remove the Special Tool(s): 303-249



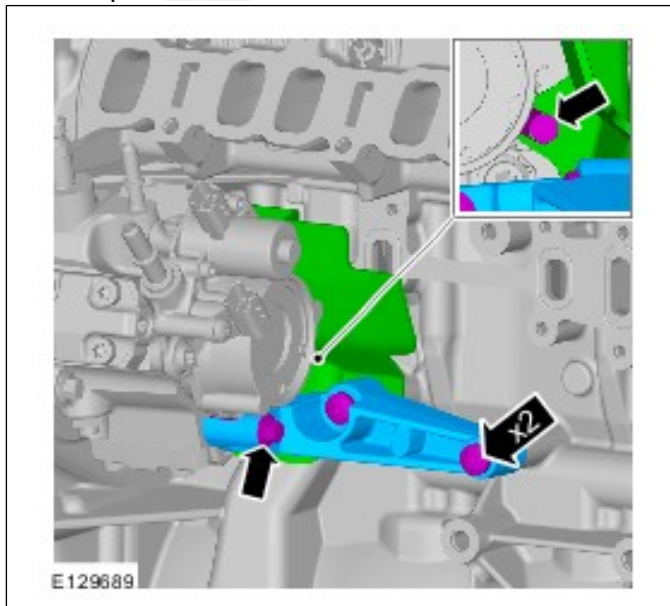
DISASSEMBLY

3. **NOTE:** Make sure that a new component is installed.

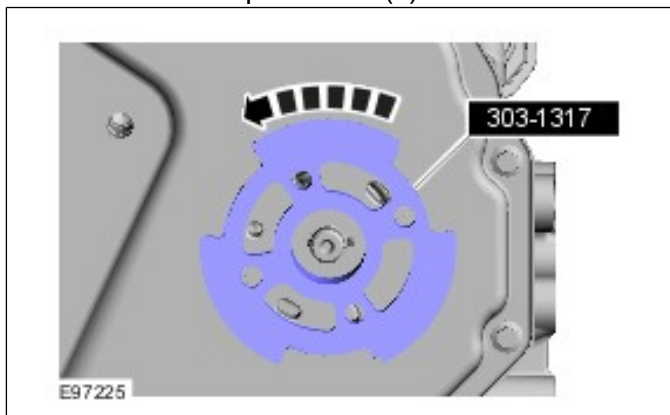
Torque: 45 Nm



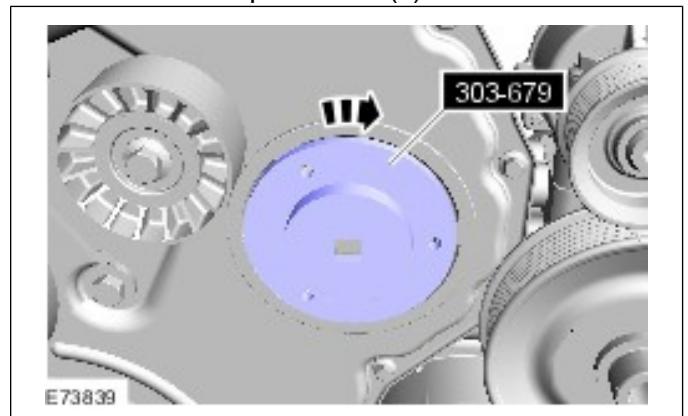
4. Torque: 22 Nm



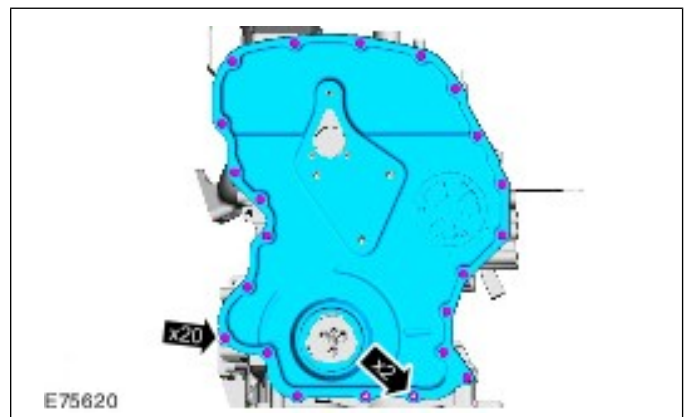
5. Remove the Special Tool(s): 303-1317



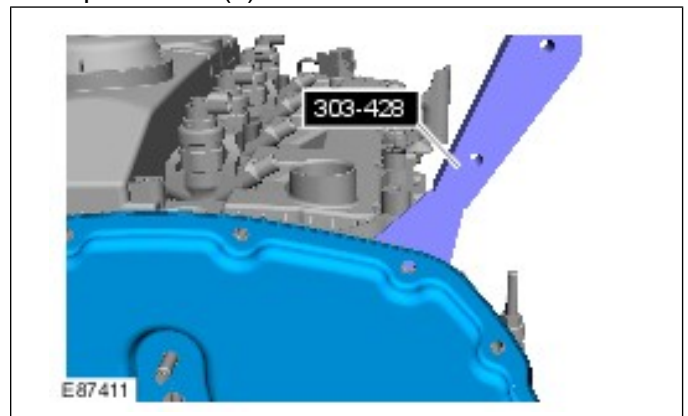
6. Remove the Special Tool(s): 303-679



- 7.

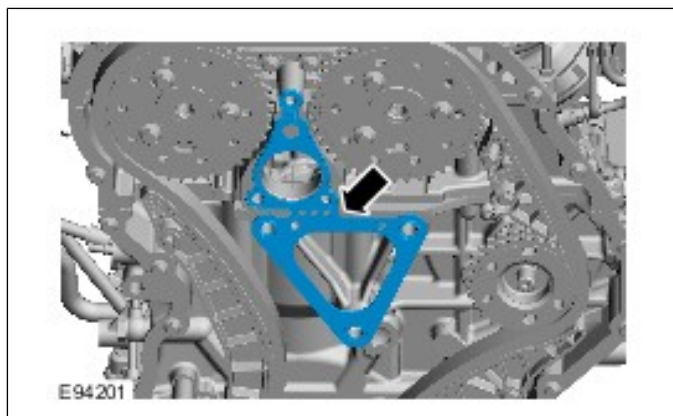


8. Special Tool(s): 303-428

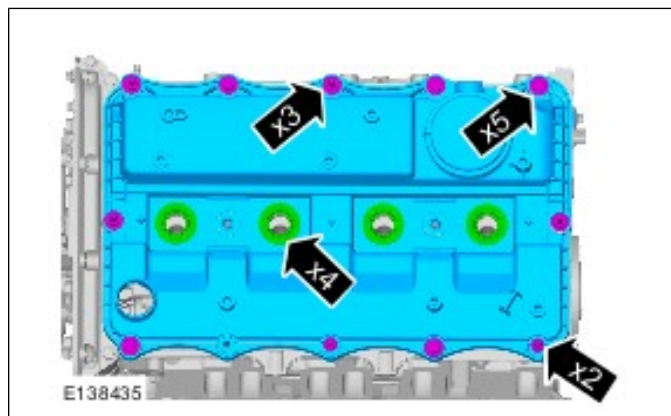


DISASSEMBLY

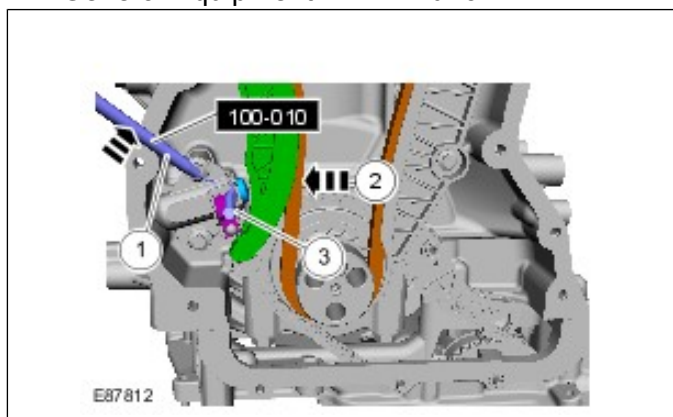
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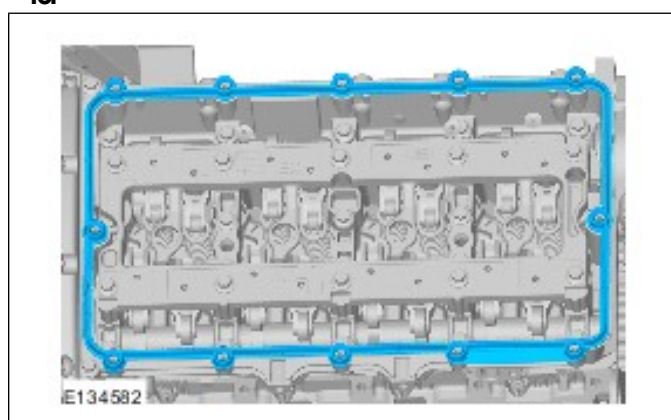
12.



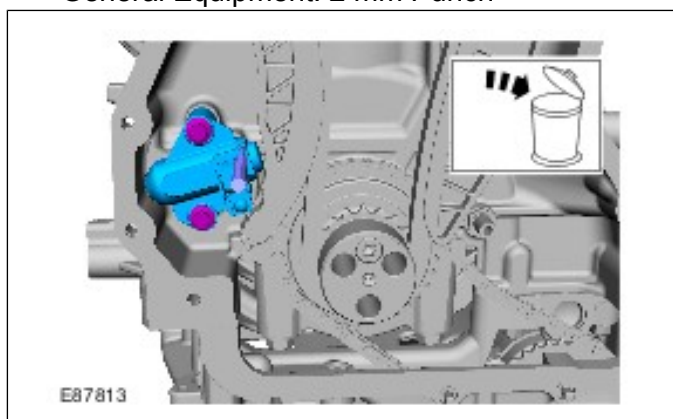
10. Special Tool(s): 100-010
General Equipment: 2 mm Punch



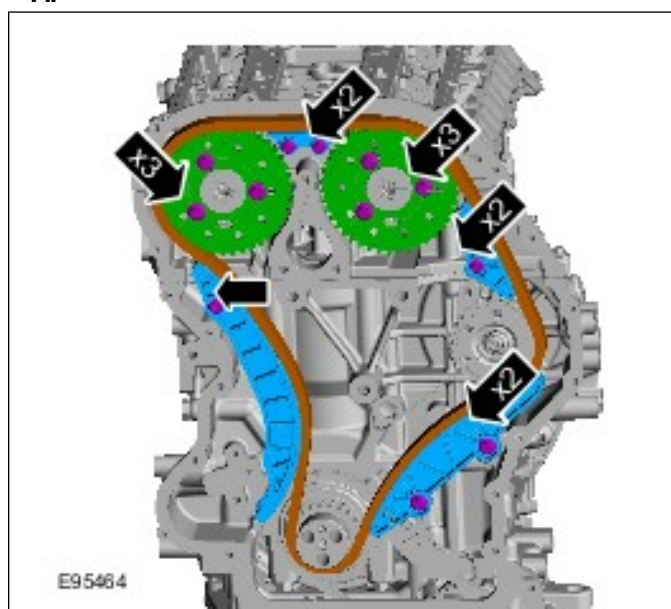
13.



11. Remove and discard the timing chain tensioner.
General Equipment: 2 mm Punch

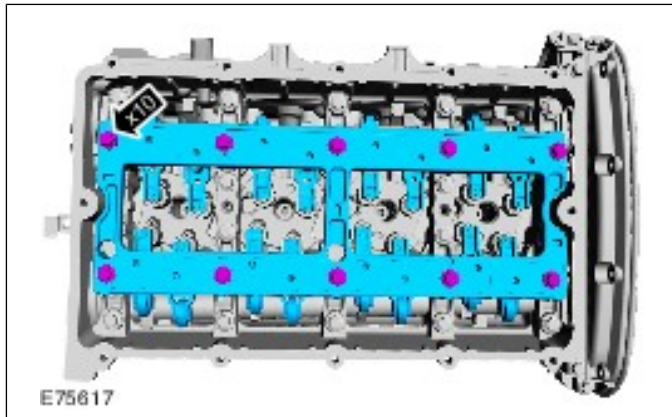


14.

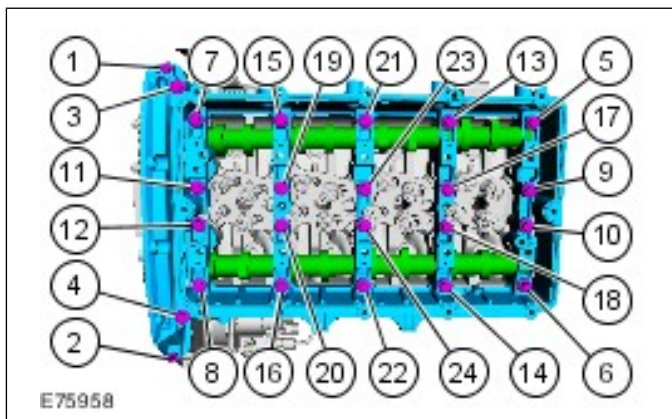


DISASSEMBLY

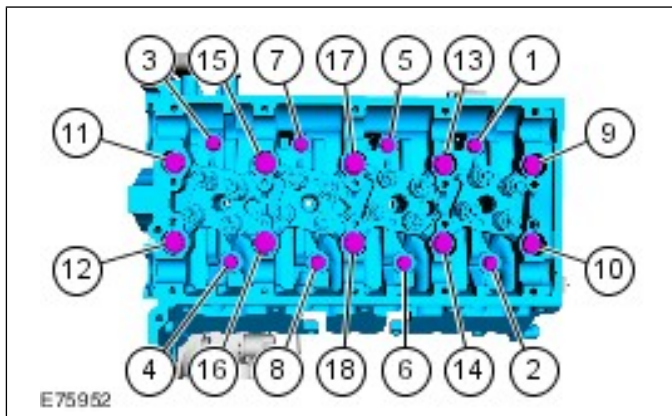
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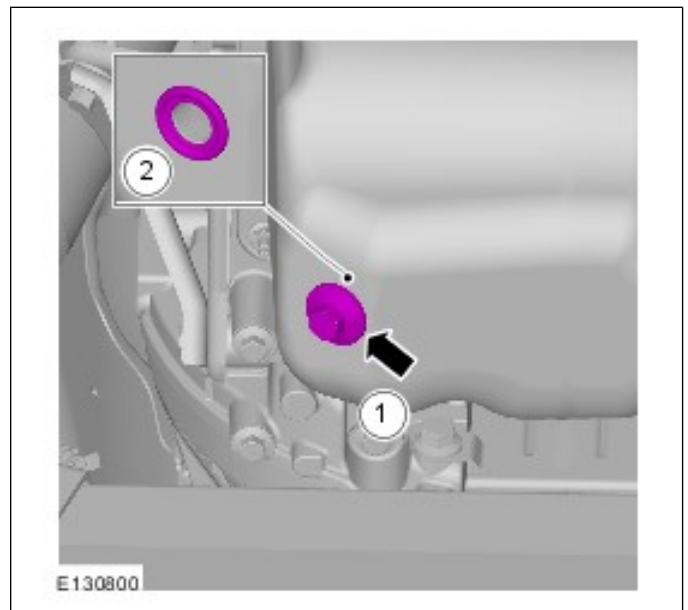
16.



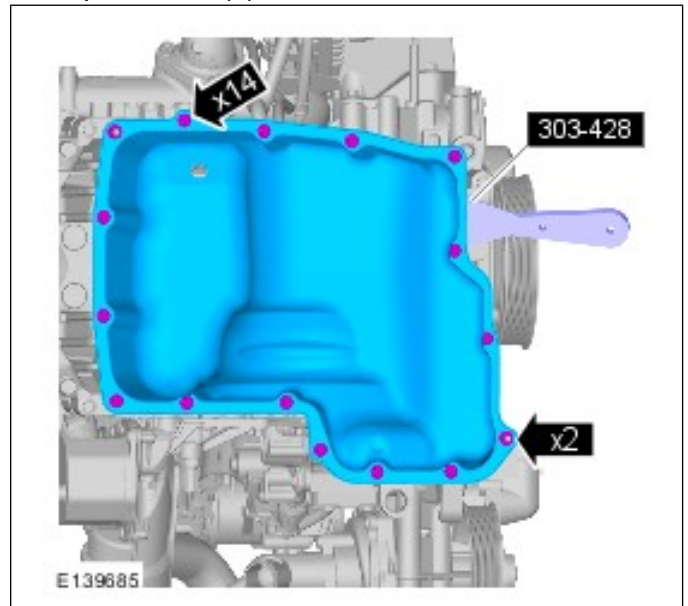
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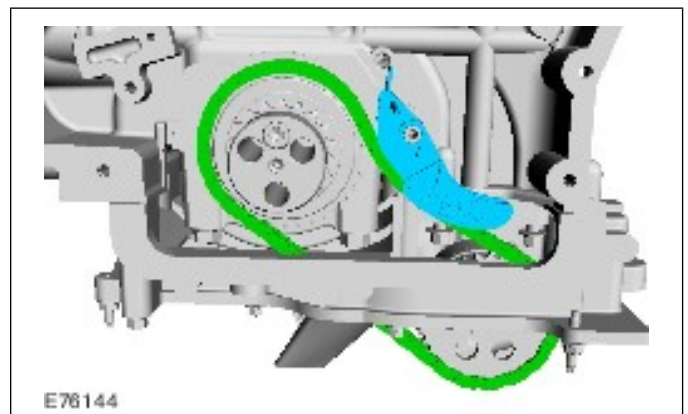
18. **⚠ WARNING:** Be prepared to collect escaping fluid.



19. Special Tool(s): 303-428

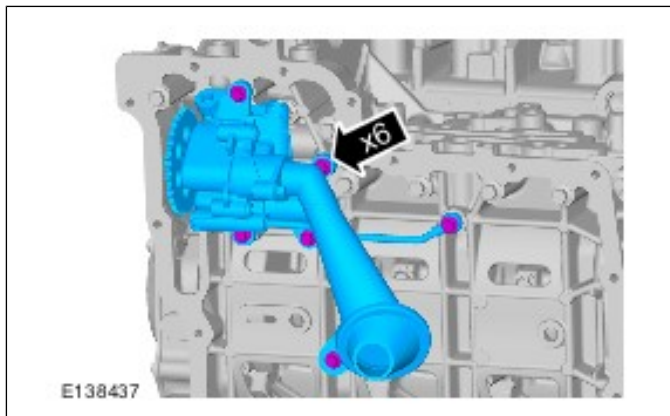


20.

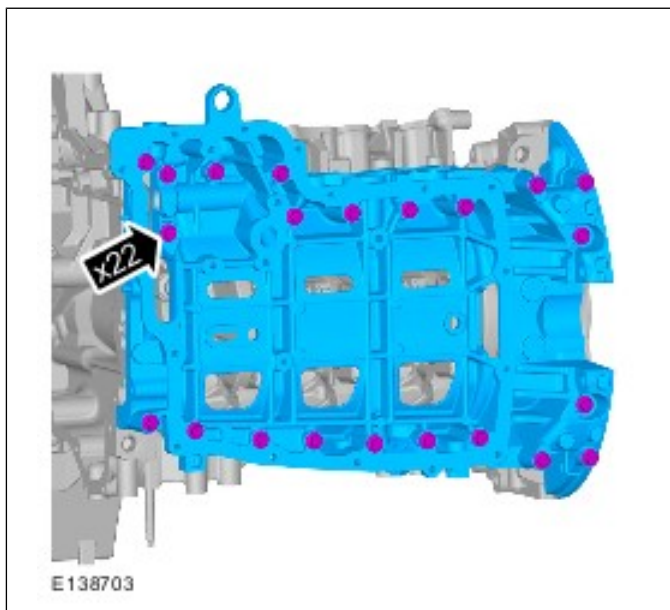


DISASSEMBLY

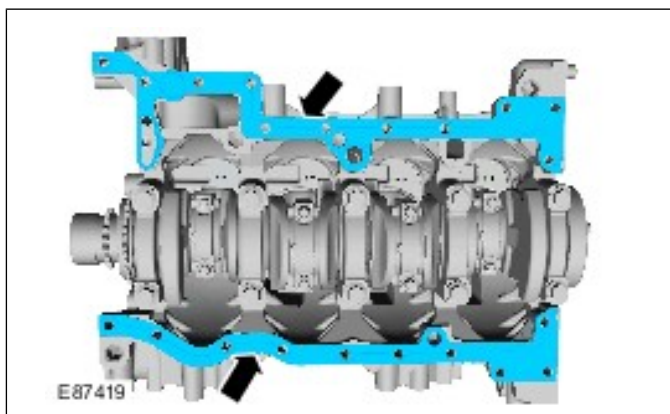
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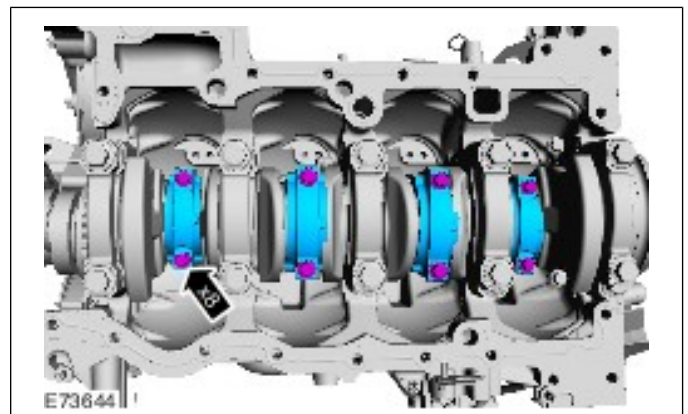
22.



23.



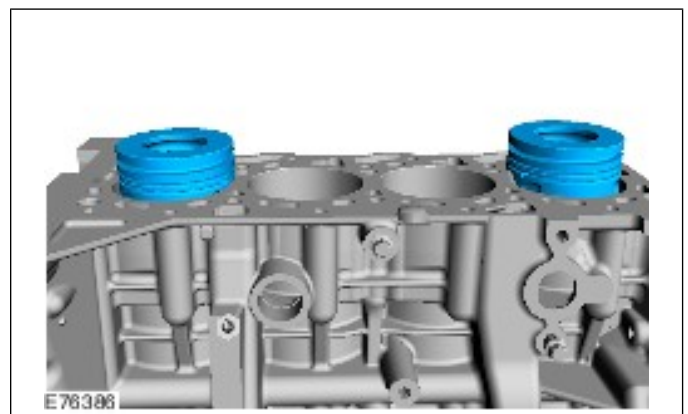
24. NOTE: Note the position of each component before removal.



25. NOTE: Note the position of each component before removal.

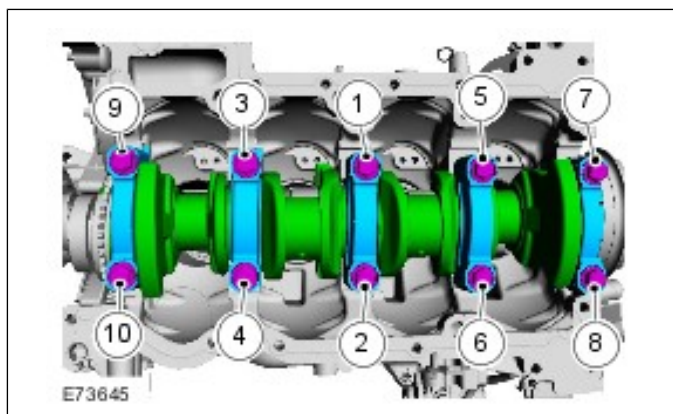


26.



DISASSEMBLY

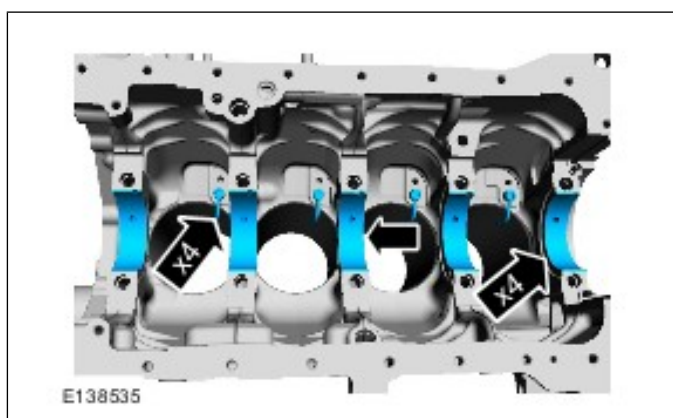
27. NOTE: Note the position of each component before removal.



28. NOTE: Note the position of each component before removal.



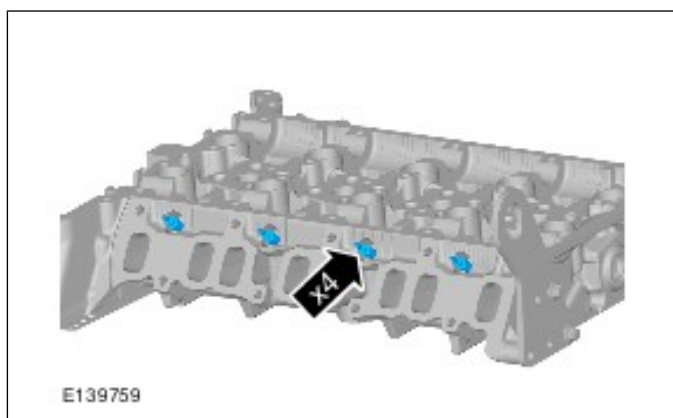
29. NOTE: Note the position of each component before removal.



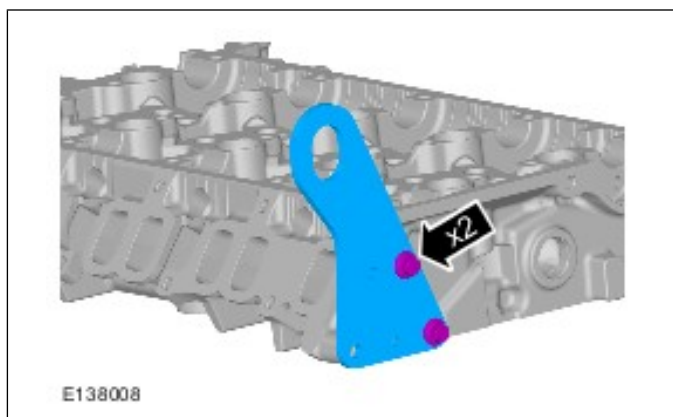
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES**Cylinder Head(21 165 6)****Disassembly**

1. For additional information, refer to: **Valves**
(303-01 Engine - 2.2L Duratorq-TDCi
(88kW/120PS) - Puma/2.2L Duratorq-TDCi
(96kW/130PS) - Puma/2.2L Duratorq-TDCi
(110kW/150PS) - Puma, Removal and
Installation).

2. Torque : 13 Nm



3. Torque : 23 Nm

**Assembly**

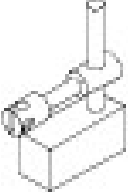

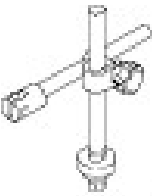

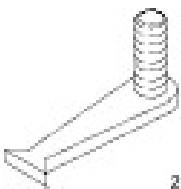
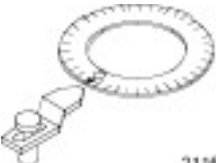

1. To assemble, reverse the disassembly procedure.

ASSEMBLY

Engine(21 134 8)

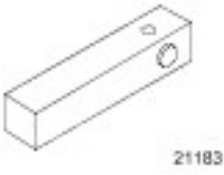

Assembly

Special Tool(s) / General Equipment

 <p>13008</p>	<p>205-044 Holding Fixture, Dial Indicator Gauge</p>
 <p>13046</p>	<p>205-069 Dial Indicator Gauge (Metric)</p>
 <p>15022A</p>	<p>205-070 Holding Fixture, Dial Indicator Gauge</p>
 <p>E 131853</p>	<p>303-1562 Timing Tool</p>
 <p>21135</p>	<p>303-254 Locking Tool, Flywheel</p>
 <p>21166</p>	<p>303-391 Setting Gauge, Crankshaft</p>
 <p>21179</p>	<p>303-428 Separator, Oil Pan</p>

ASSEMBLY

Special Tool(s) / General Equipment

	303-432 Holding Fixture, Dial Indicator Gauge (Cylinder Liner Protrusion)
	303-682 Aligner, Engine Front Cover
6 mm Drill Bit	
Piston Ring Compressor	
Round-Ended Steel Rule	

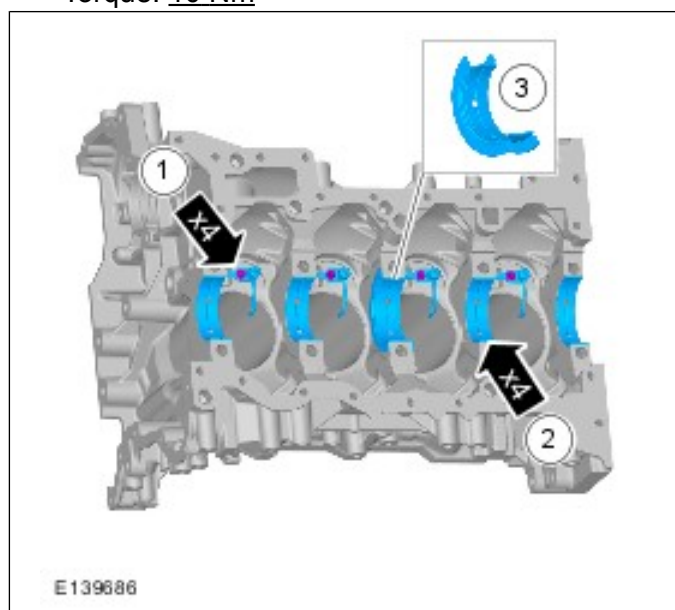
Materials

Name	Specification
Silicone Sealant LB 2U7J-M4G323-AA	WSE-M4G323-A4
Silicone Gasket and Sealant TA-30	
Engine Oil - 5W-30	WSS-M2C913-C

1. **NOTE:** Make sure that these components are installed to the noted removal position.

Material: engine oil WSS-M2C913-C (Engine Oil - 5W-30)

Torque: 10 Nm



2. **NOTE:** Make sure that these components are installed to the noted removal position.

Material: engine oil WSS-M2C913-C (Engine Oil - 5W-30)



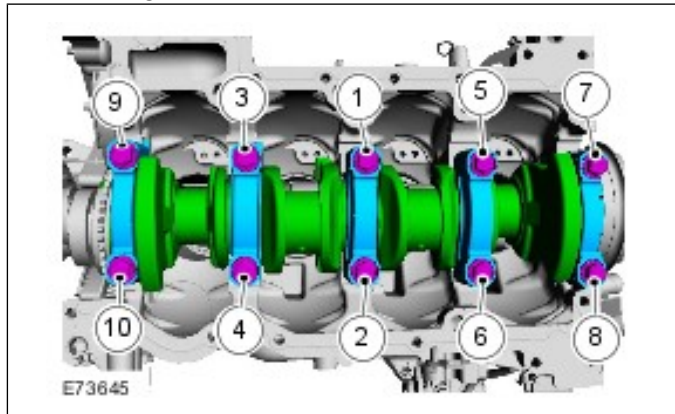
3. **NOTE:** Make sure that these components are installed to the noted removal position.

NOTE: Install all the bolts finger tight before final tightening.

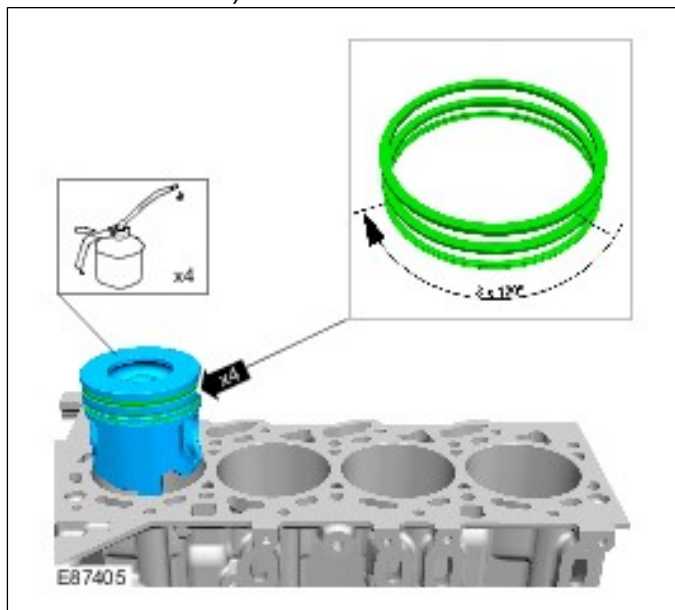
ASSEMBLY

Torque:

- Stage 1: 15 Nm
- Stage 2: 20 Nm
- Stage 3: 35 Nm
- Stage 4: 80 Nm
- Stage 5: 90°



4. General Equipment: Piston Ring Compressor
Material: engine oil WSS-M2C913-C (Engine Oil - 5W-30)



5. **NOTE:** Make sure that these components are installed to the noted removal position.

Material: engine oil WSS-M2C913-C (Engine Oil - 5W-30)

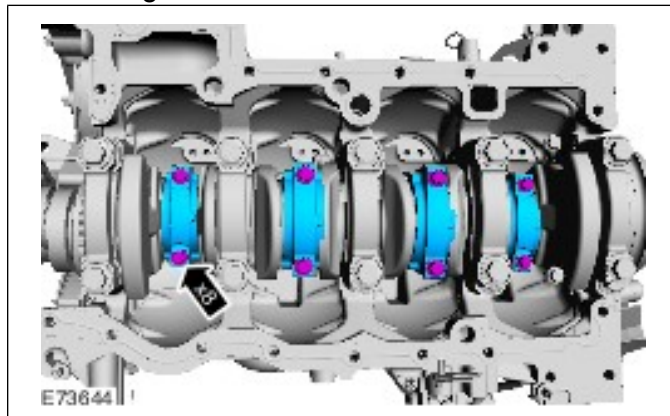


6. **NOTE:** Make sure that these components are installed to the noted removal position.

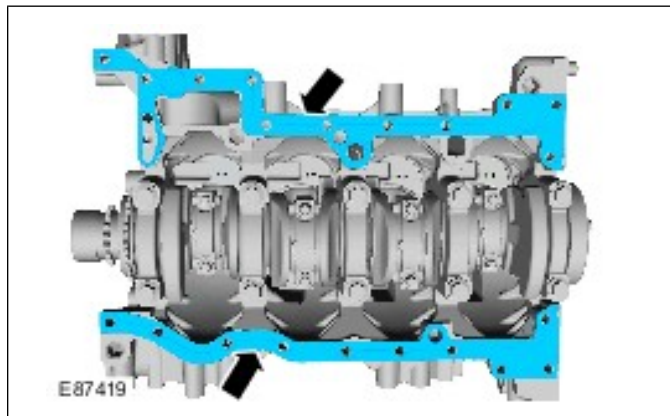
NOTE: Install all the bolts finger tight before final tightening.

Torque:

- Stage 1: 25 Nm
- Stage 2: 60 Nm
- Stage 3: 90°

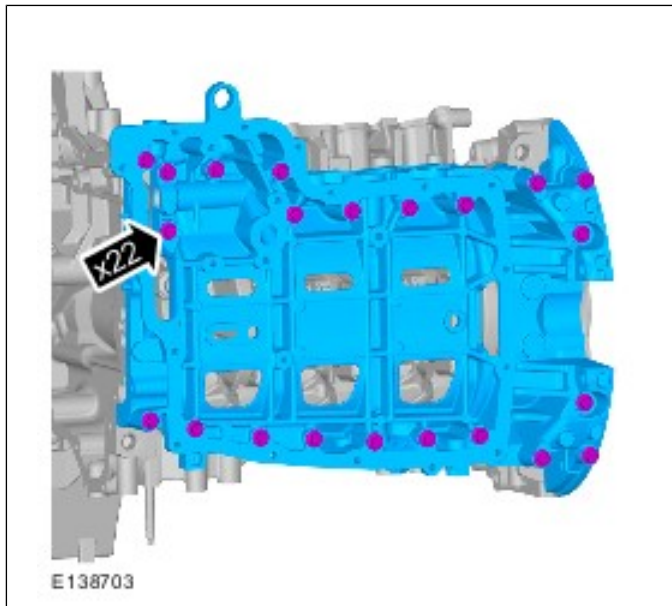


7.



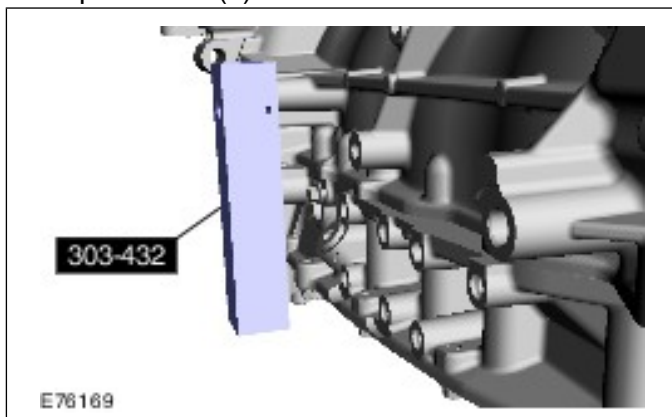
ASSEMBLY

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



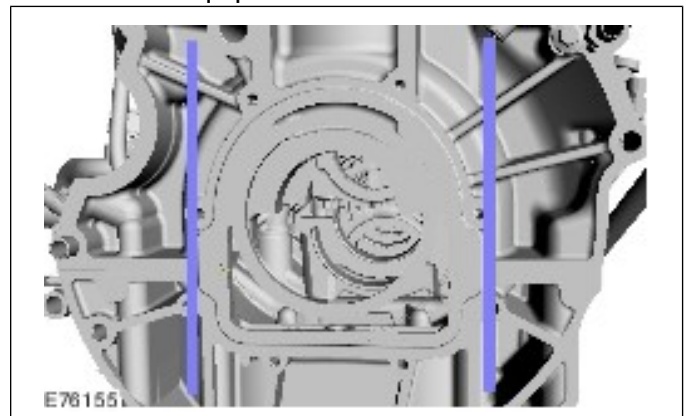
9. The ladder frame and the cylinder block must be aligned so that the side clearance does not exceed 0.05 mm overlap to 0.05 mm gap.

Special Tool(s): 303-432

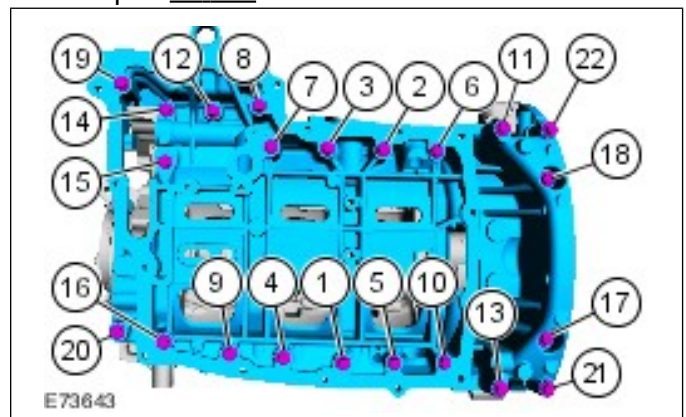


10. The ladder frame and the cylinder block must be aligned so that the rear clearance does not exceed 0.01 mm overlap to 0.2 mm gap.

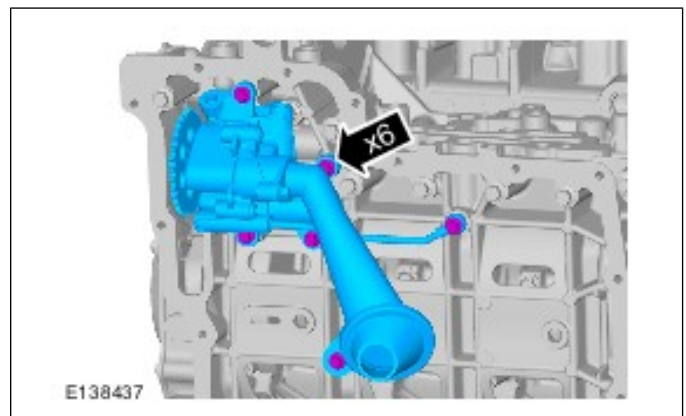
General Equipment: Round-Ended Steel Rule



11. Torque: 23 Nm



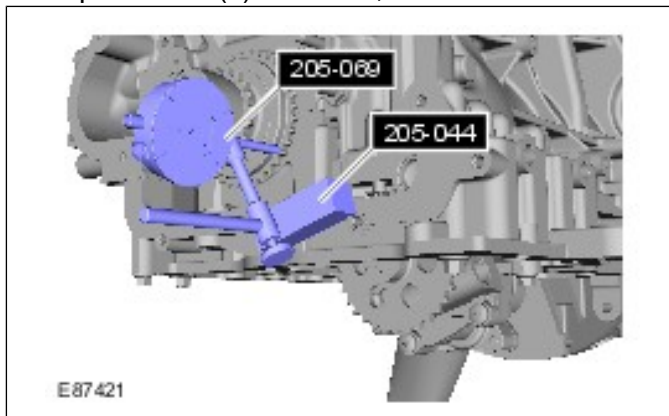
- 12 **NOTE:** Only tighten the bolts finger tight at this stage.



13. Take a reference measurement from the front face of the crankshaft sprocket.

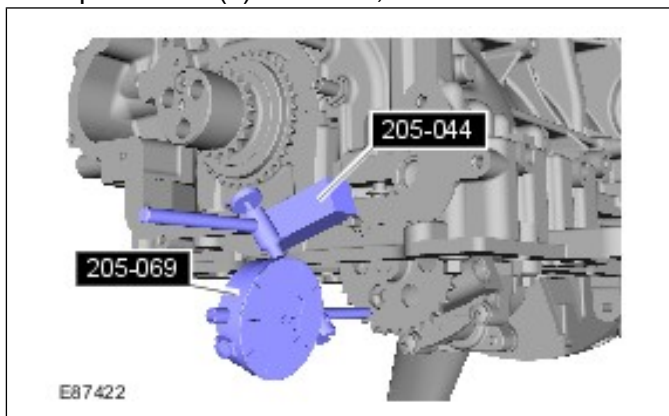
ASSEMBLY

Special Tool(s): 205-044, 205-069

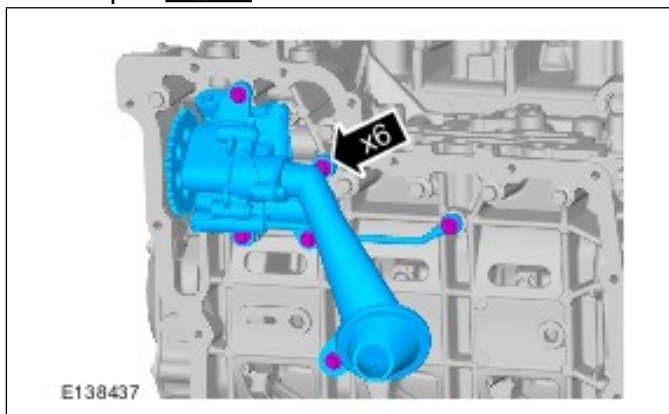


- 14.** Take measurements at two different points on the oil pump sprocket and align the oil pump sprocket.

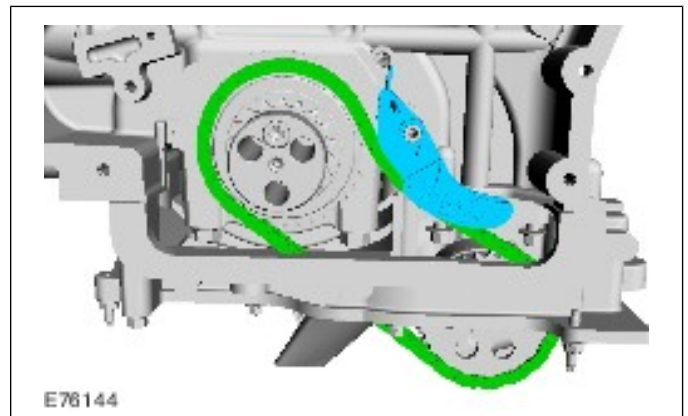
Special Tool(s): 205-044, 205-069



- 15.** Torque: 10 Nm

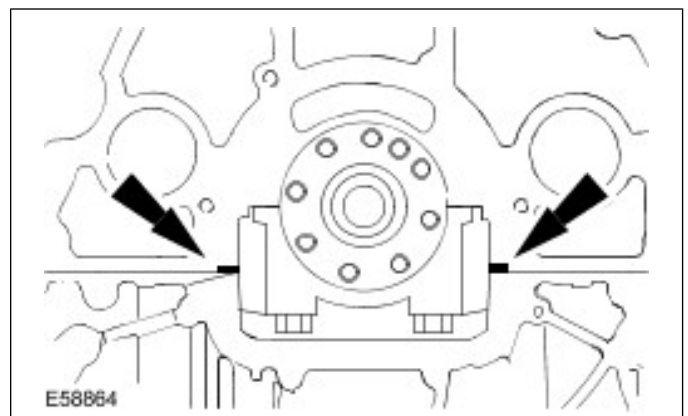


16.



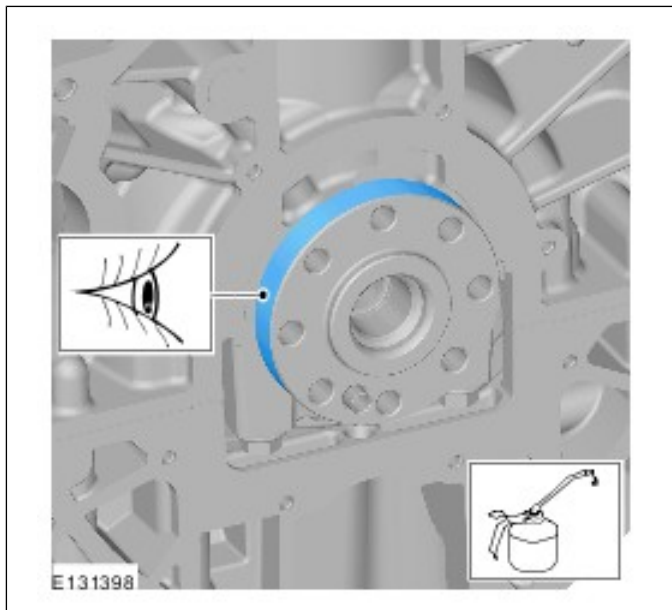
- 17. NOTE:** A new crankshaft rear seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft rear seal is fully installed. Failure to follow this instruction may result in damage to the vehicle.

- Clean the area on the engine before installing a new crankshaft rear seal carrier.
- Check the two foam pads are located as shown on the ladder frame gasket.



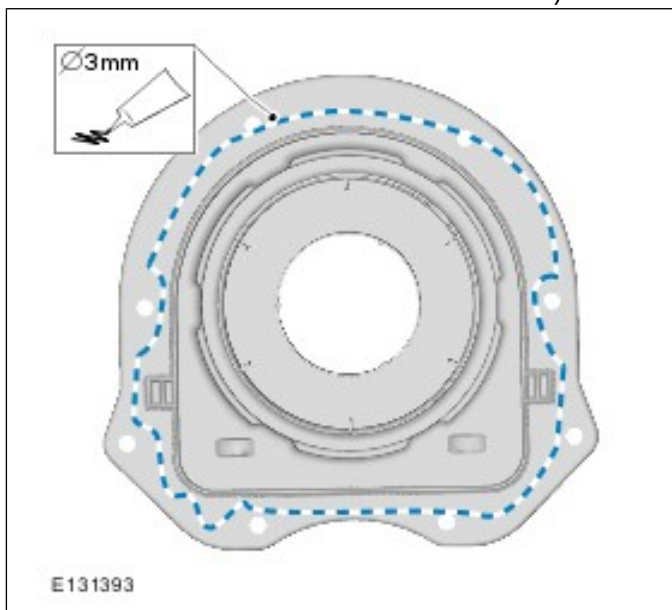
ASSEMBLY

18.



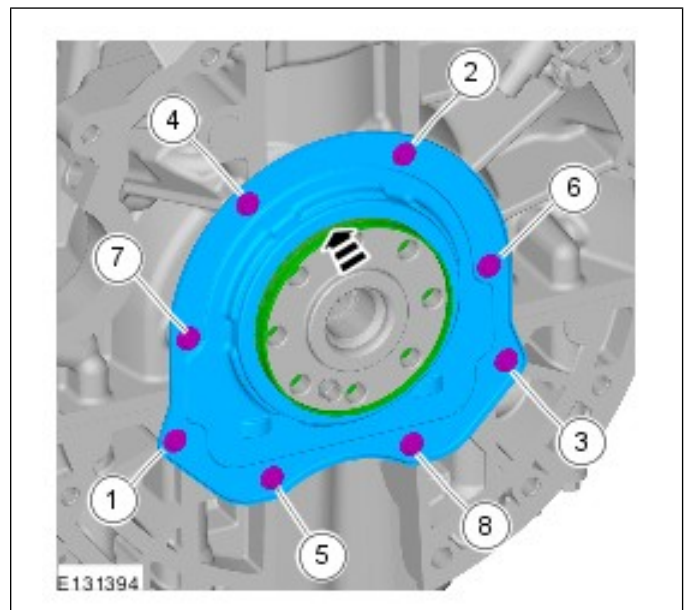
19. NOTE: Install new crankshaft rear seal carrier with in five minutes after applying the recommended sealant.

Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)



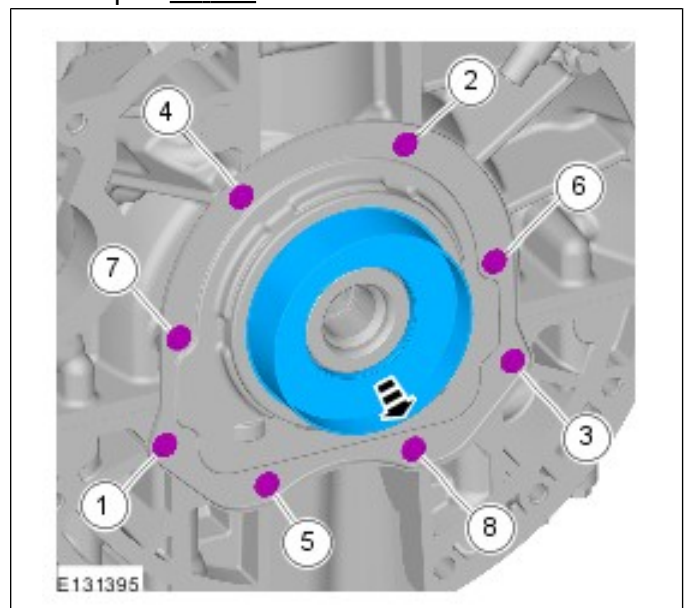
20. CAUTION: A new crankshaft rear seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft rear seal is fully installed. Failure to follow this instruction may result in damage to the vehicle.

NOTE: Initially hand tighten the fasteners.



21. NOTE: New crankshaft seal carriers are supplied with an alignment sleeve which must be removed after installation.

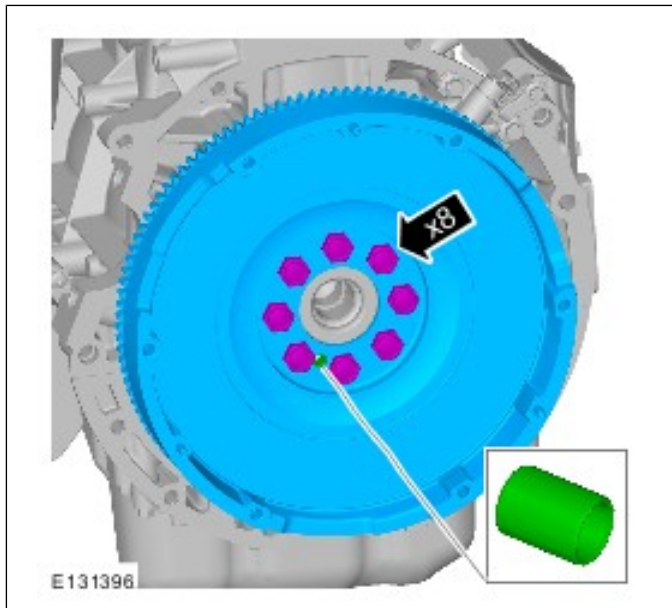
Torque: 20 Nm



22. NOTE: Make sure that flywheel is in full contact with flywheel flange before installing the flywheel bolts.

ASSEMBLY

NOTE: Only tighten the bolts finger tight at this stage.

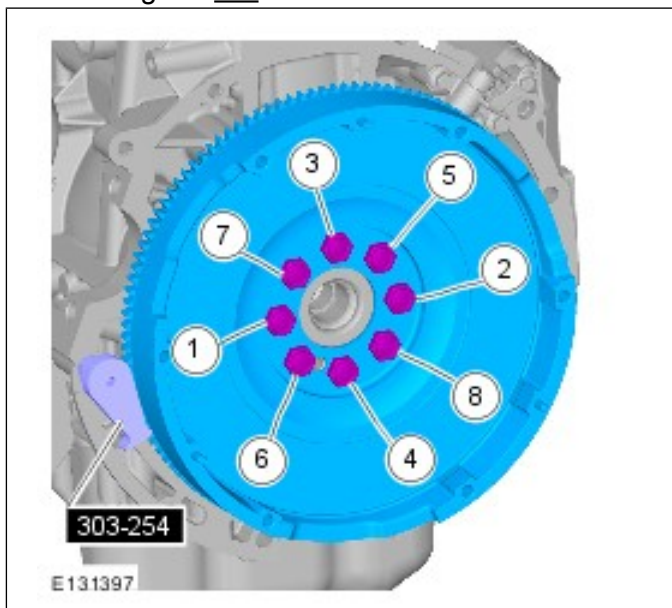


23. **CAUTION:** Make sure that the flywheel is in full contact with the crankshaft flange before installing the flywheel bolts.

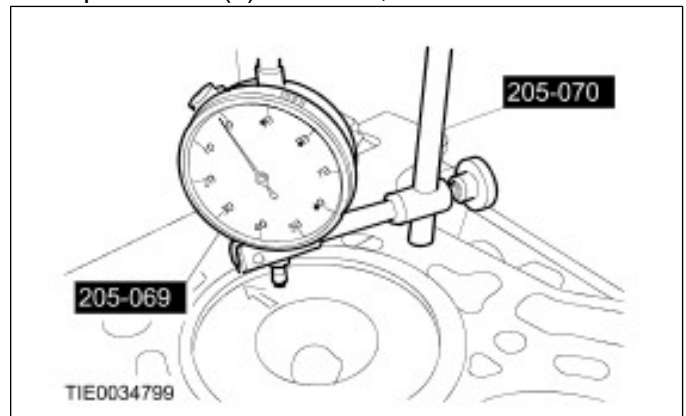
Special Tool(s): 303-254

Torque:

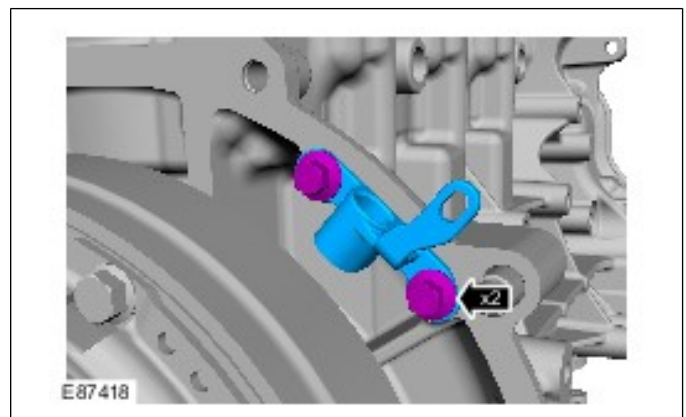
- Stage 1: 15 Nm
- Stage 2: 30 Nm
- Stage 3: 75 Nm
- Stage 4: 45°



24. Special Tool(s): 205-069, 205-070

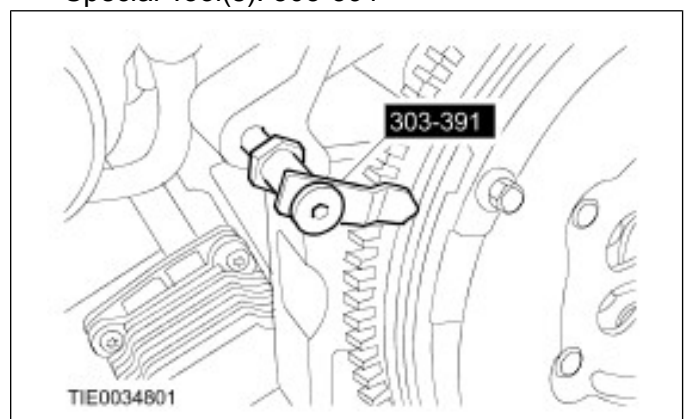


25. **NOTE:** Do not fully tighten the crankshaft position sensor bracket retaining bolts at this stage.



26. **NOTE:** After installation do not move the special tool.

Special Tool(s): 303-391

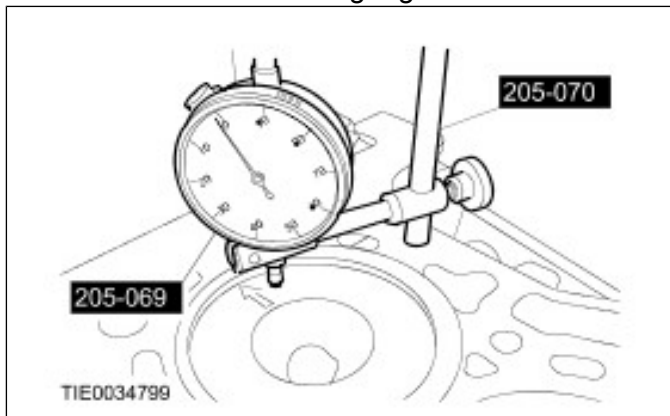


27. Rotate the crankshaft until piston No. one is approximately 10 mm before top dead center (TDC).

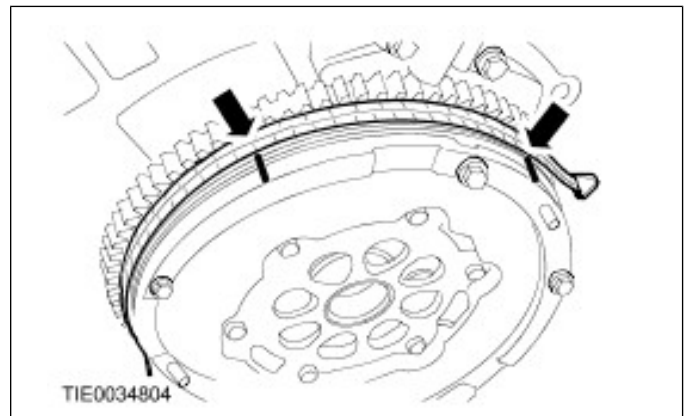
Special Tool(s): 205-069, 205-070

ASSEMBLY

28. Zero the dial indicator gauge.

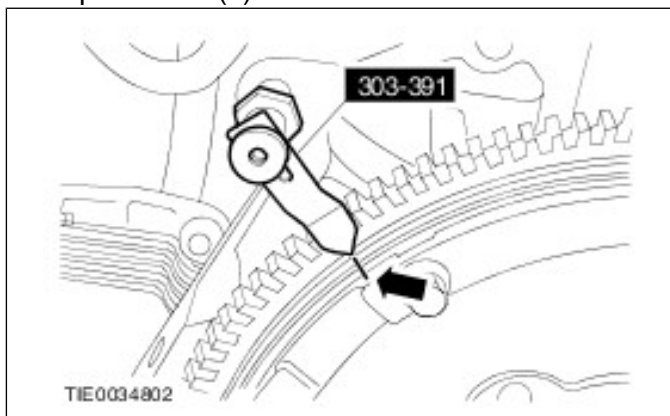


Measure the distance between the two marks.



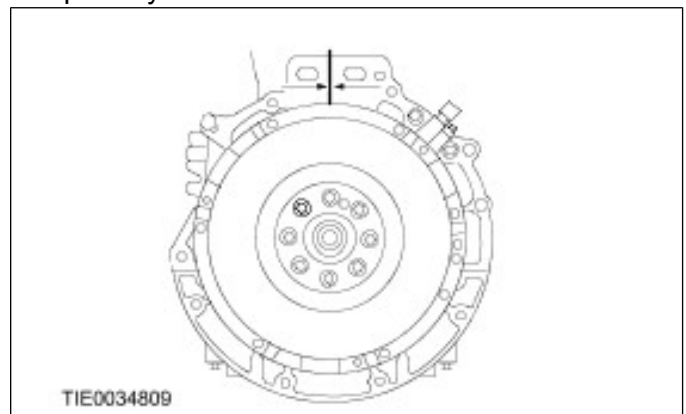
29. Mark the position on the flywheel primary mass.

Special Tool(s): 303-391



33. Divide the amount by two and mark the position TDC on the flywheel primary mass.

34. Measure the circumference of the flywheel primary mass.

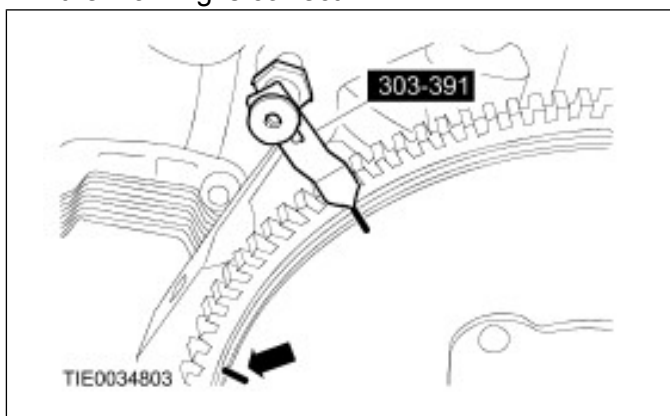


30. **NOTE:** Rotate the crankshaft counterclockwise.

1. Rotate the crankshaft until the piston No. one achieves zero on the dial indicator gauge.
2. Mark the position on the flywheel primary mass.

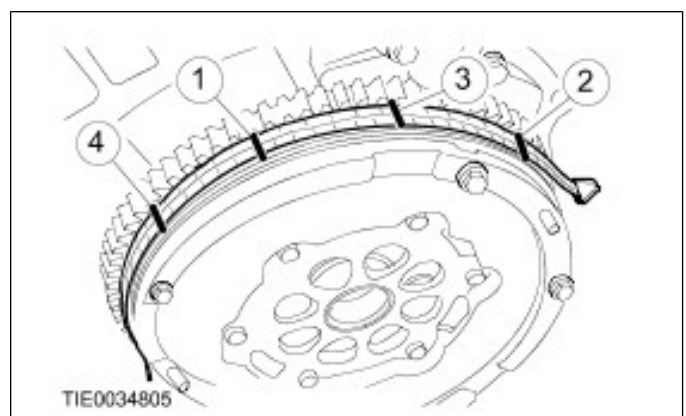
Special Tool(s): 303-391

31. Repeat the previous steps to make sure that the marking is correct.




35. Multiply the circumference by 0.1388 and mark the calculated amount on the flywheel primary mass by measuring from TDC counterclockwise.

36. 1. First mark.
2. Second mark.
3. Determined TDC.
4. Determined 50 degrees before top dead center (BTDC).



32. **NOTE:** The middle of the markings is TDC.

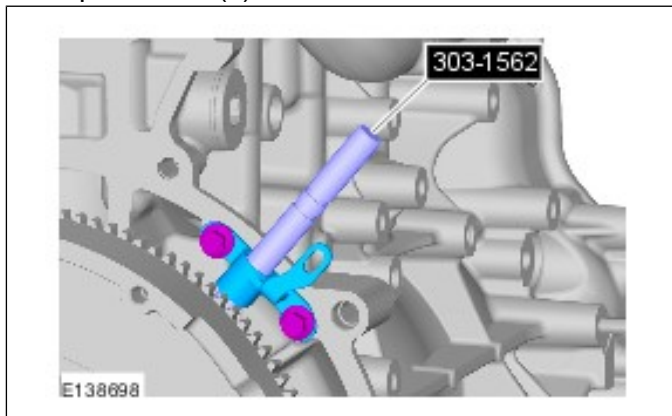
ASSEMBLY

37.  **CAUTION:** Do not turn the crankshaft when the special tool is fully located into the flywheel. Failure to follow this instruction will cause damage to the CKP sensor hole.

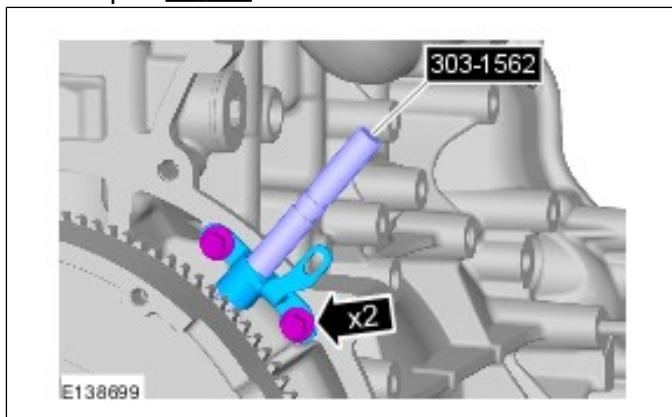
NOTE: Rotate the crankshaft in the normal direction of rotation to the mark of the calculated 50 degrees BTDC.


NOTE: Make sure that the special tool is fully located in the flywheel so that the engine cannot be rotated in either direction.

Special Tool(s): 303-1562

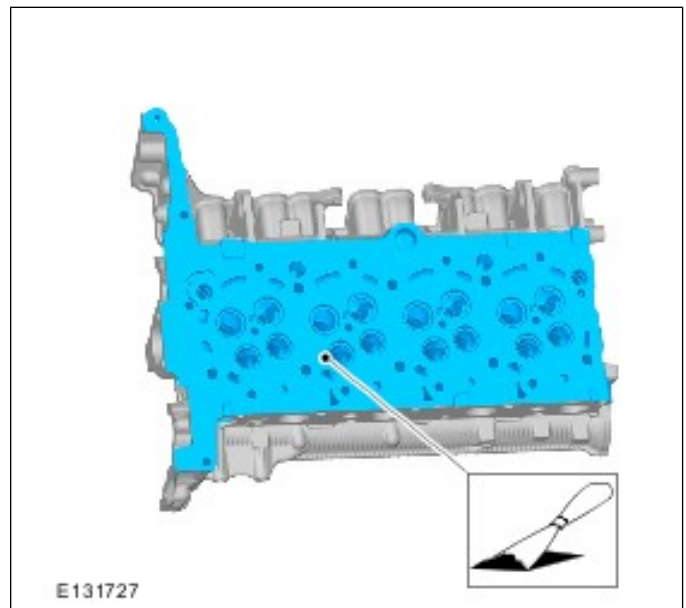


38. Remove the Special Tool(s): 303-1562
Torque: 25 Nm



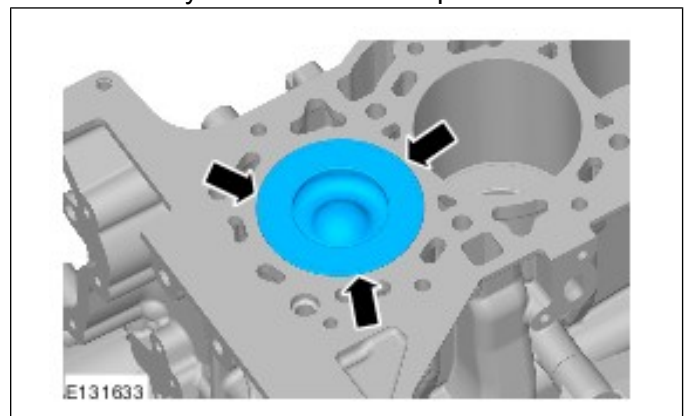
39.  **WARNING:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak

paths. Use a plastic scraping tool to remove all traces of the head gasket.



40. **NOTE:** Measure the piston protrusion of each cylinder at top dead center (TDC).

Measure the distance between the piston crown and the cylinder block at the points indicated.

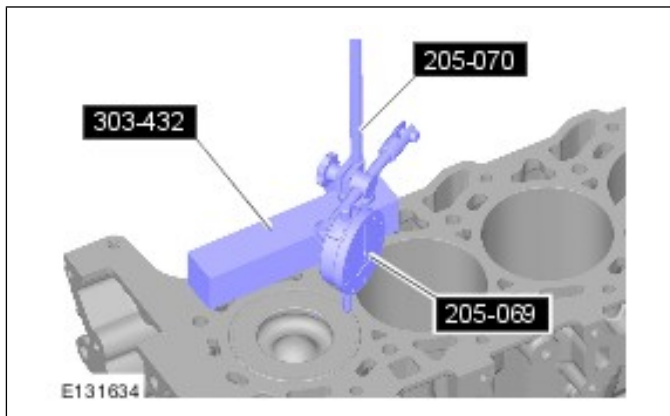


41. **NOTE:** The largest measurement determines the choice of the cylinder head gasket.

- Using the special tools, measure the piston protrusion.

ASSEMBLY

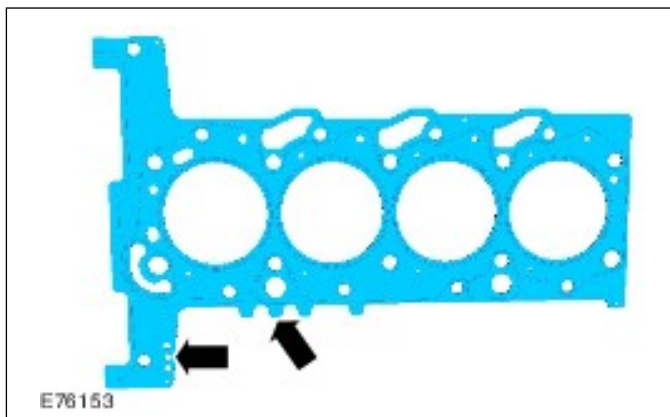
Special Tool(s): 205-070, 205-069, 303-432



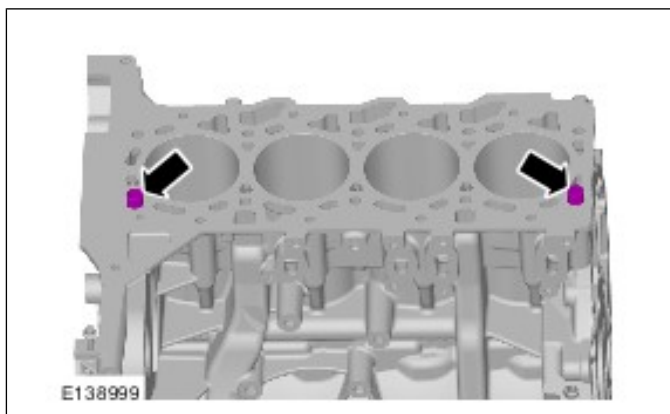
42. Determine the cylinder head gasket.

Refer to: [Specifications](#) (303-01 Engine - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Specifications).

43. NOTE: Make sure that a new component is installed.

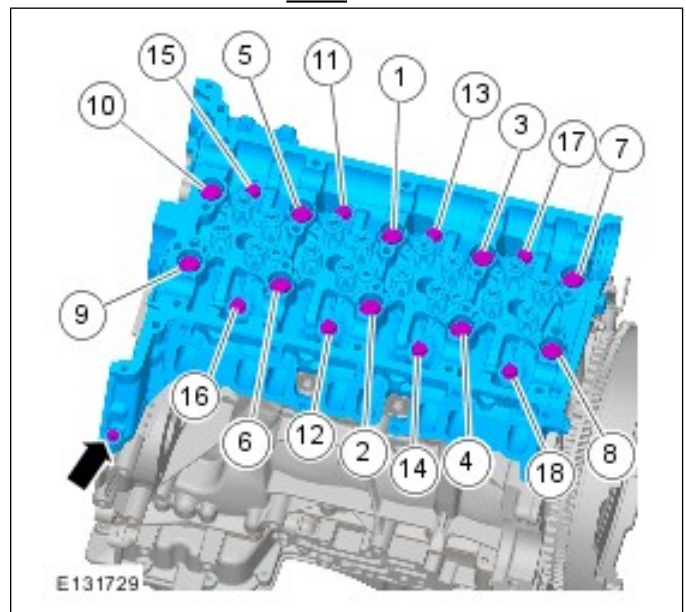


44.

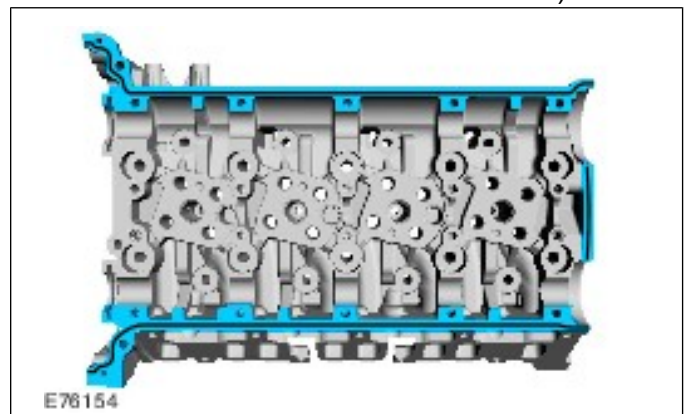


Torque:

- Bolts 1 to 10 10 Nm
- Bolts 11 to 18 5 Nm
- Bolts 1 to 10 20 Nm
- Bolts 11 to 18 10 Nm
- Bolts 1 to 10 40 Nm
- Bolts 11 to 18 20 Nm
- Bolts 1 to 10 180°
- Bolts 11 to 18 180°



46. Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)

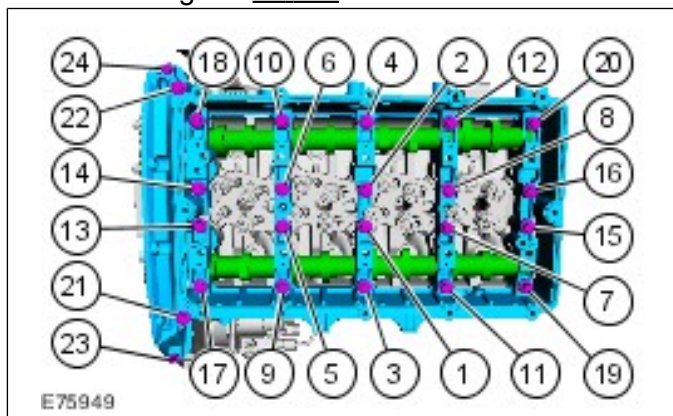


45. NOTE: Install all the bolts finger tight before final tightening.

ASSEMBLY

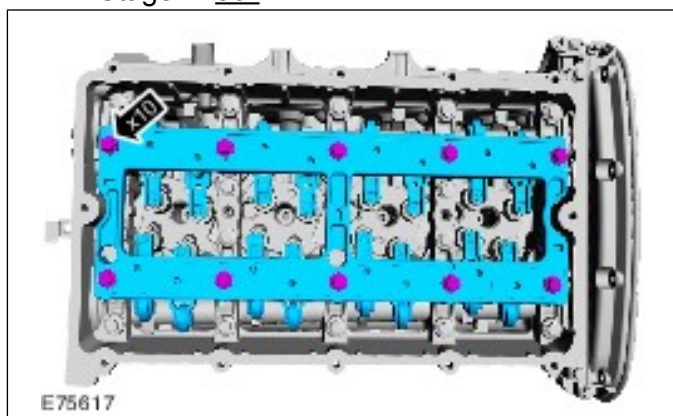
47. Torque:

- Bolts 1 to 22
 - Stage 1: 5 Nm
 - Stage 2: 23 Nm
- Bolts 23 to 24
 - Stage 1: 5 Nm
 - Stage 2: 10 Nm

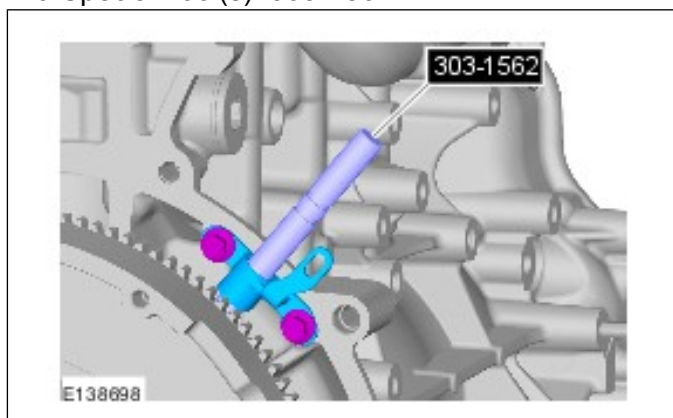


48. Torque:

- Stage 1: 10 Nm
- Stage 2: 30°



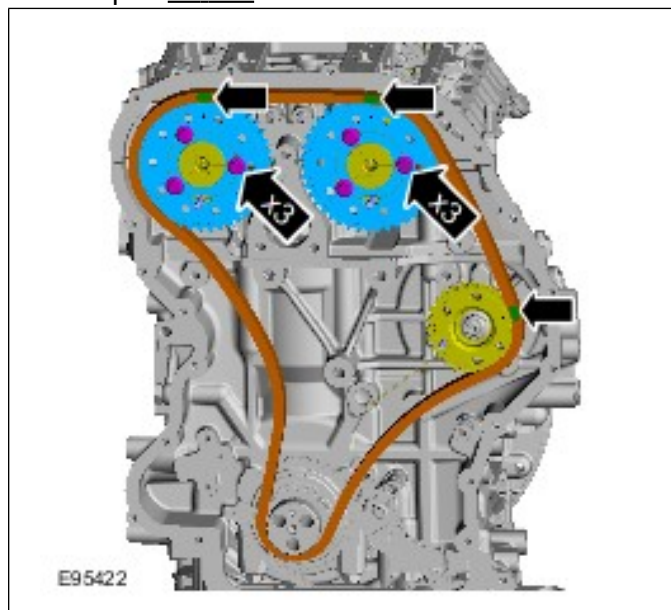
49. Special Tool(s): 303-1562



50. NOTE: Make sure that the installation marks are aligned.

General Equipment: 6 mm Drill Bit

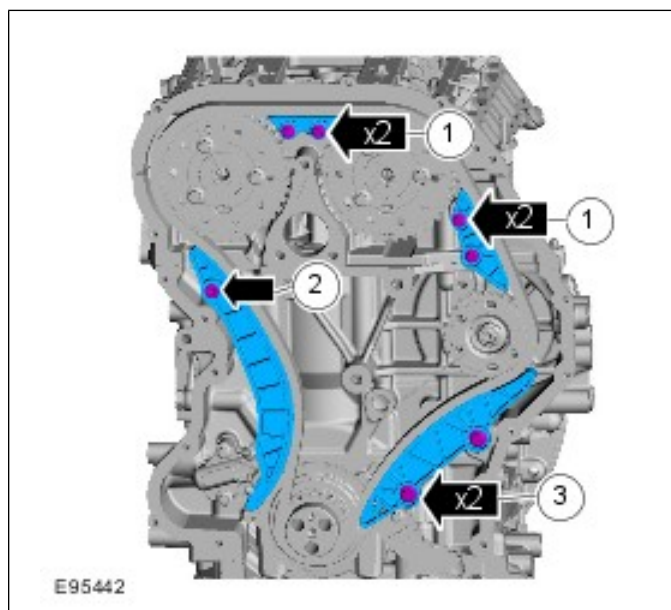
Torque: 33 Nm



51. Remove the 6 mm drill bits.

52. ⚠ CAUTION: Make sure that new bolts are installed.

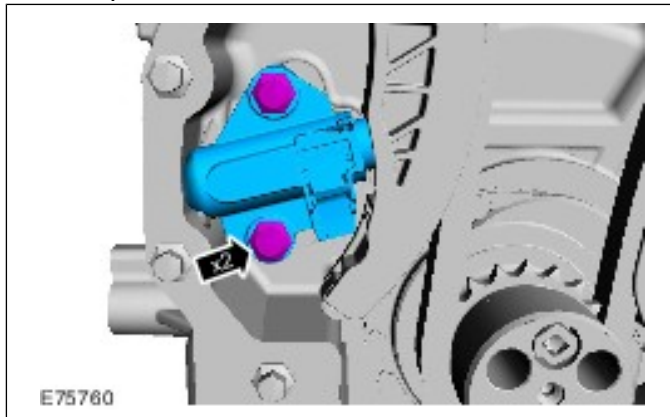
1. Torque: 15 Nm
2. Torque: 40 Nm



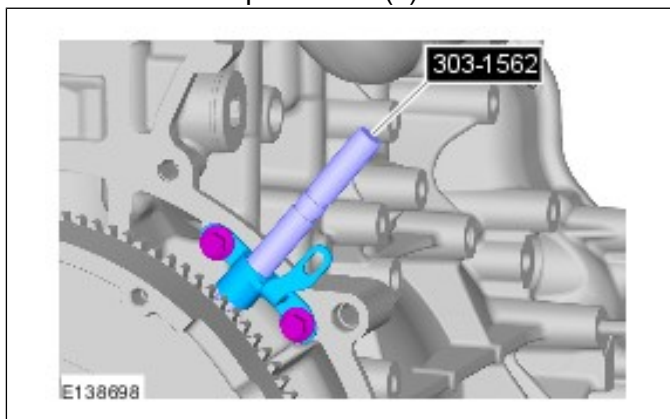
53. NOTE: Make sure that a new component is installed.

ASSEMBLY

Torque: 15 Nm

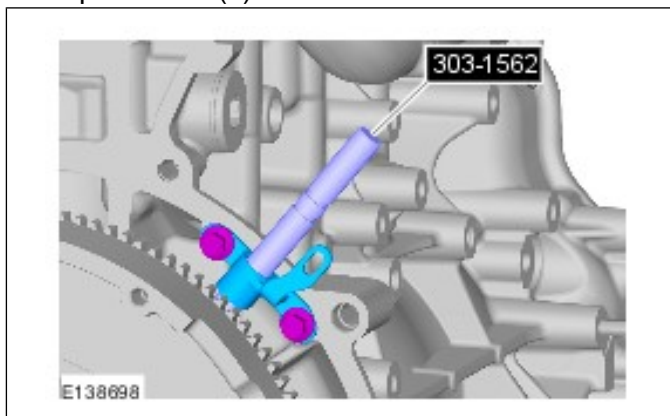


54. Remove the Special Tool(s): 303-1562



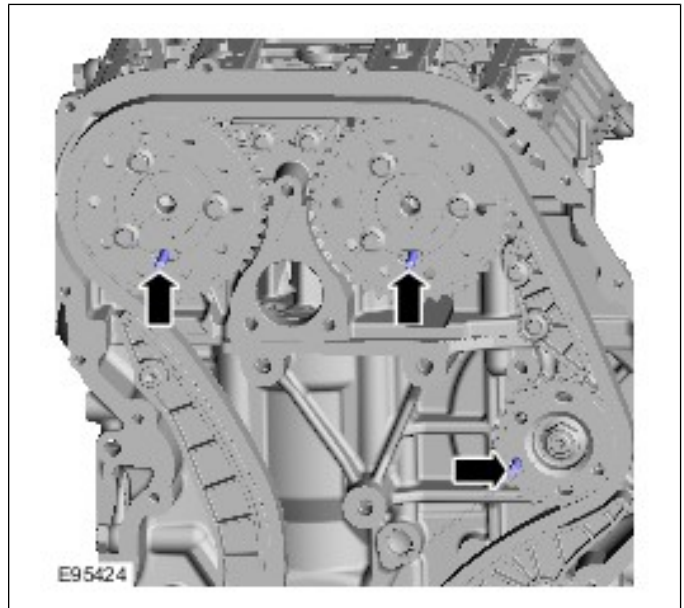
55. Rotate the engine two revolutions.

56. Special Tool(s): 303-1562

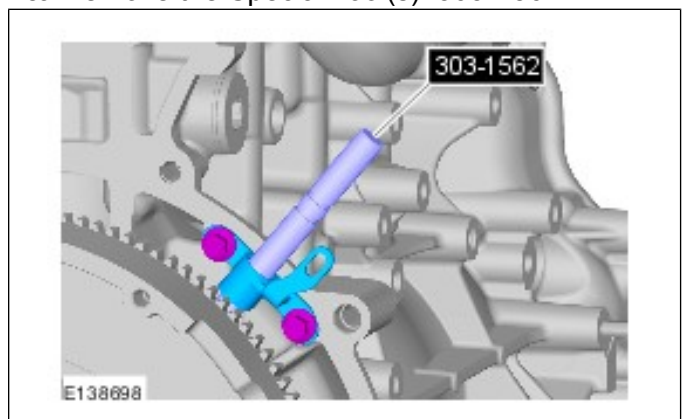


57. Check the position of the timing marks and correct if necessary.

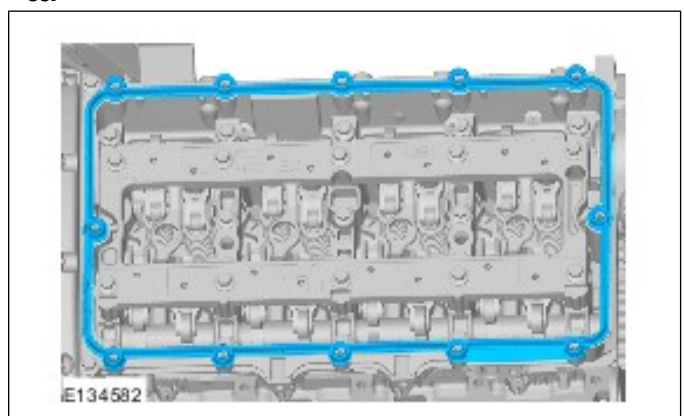
58. Remove the 6 mm drill bits.



59. Remove the Special Tool(s): 303-1562

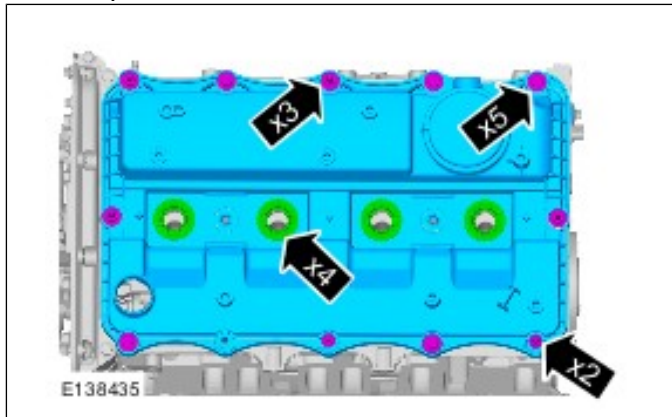


60.

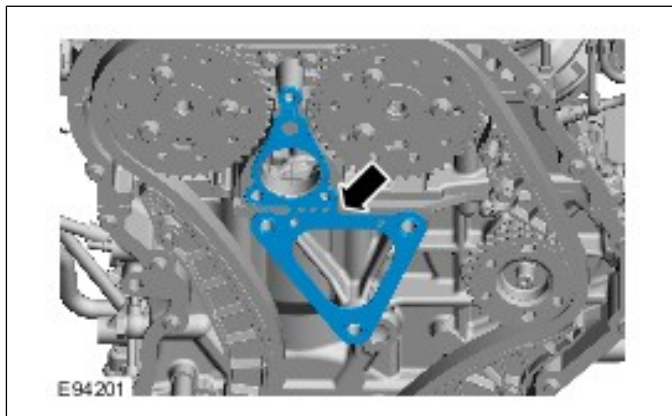


ASSEMBLY

61. Torque: 10 Nm



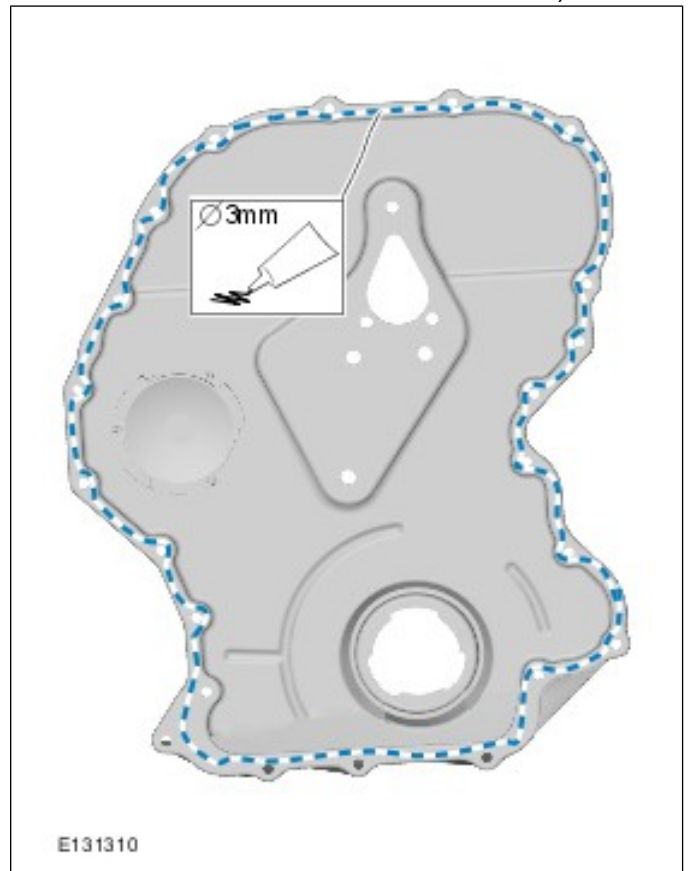
62 **NOTE:** Make sure that a new component is installed.



63. **NOTE:** The component must be installed within 5 minutes of applying the sealant.

NOTE: Make sure that a new component is installed.

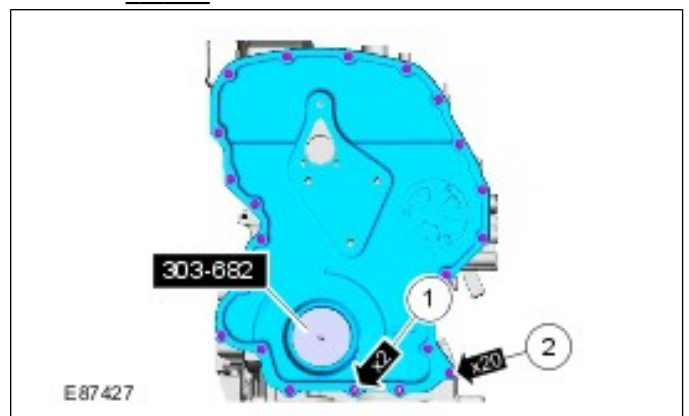
Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)



64. Special Tool(s): 303-682

Torque:

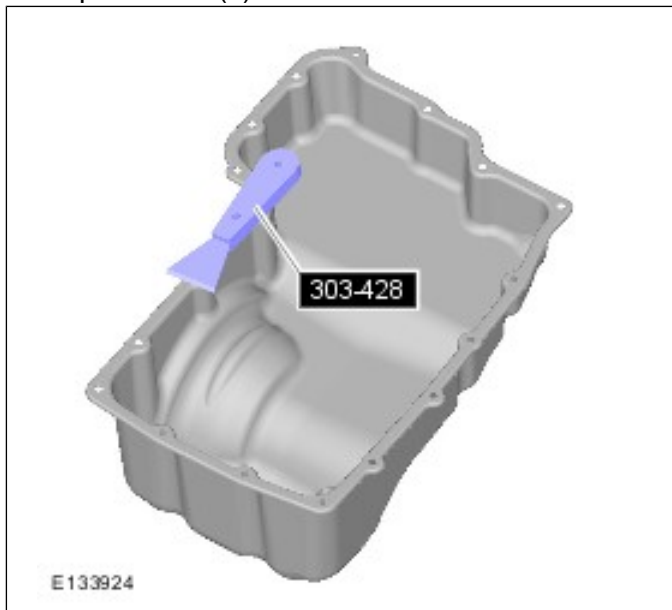
- 1 10 Nm
- 2 11 Nm



65. **NOTE:** Do not damage the mating faces.

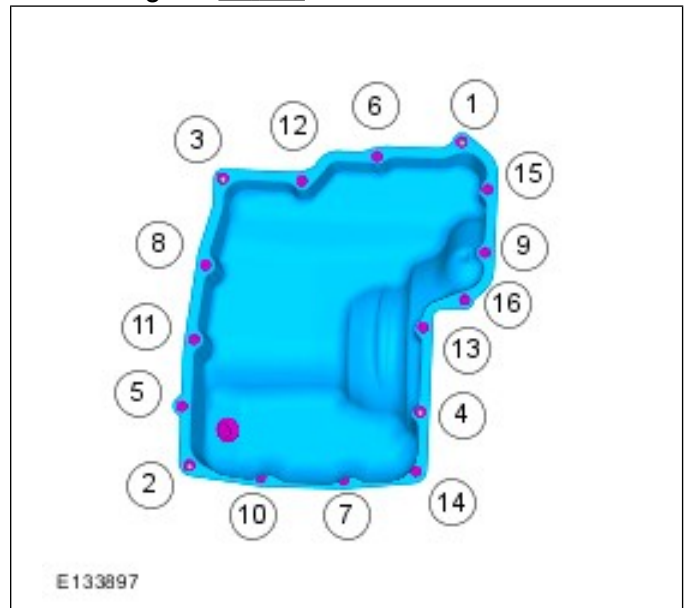
ASSEMBLY

Special Tool(s): 303-428



67. Torque:

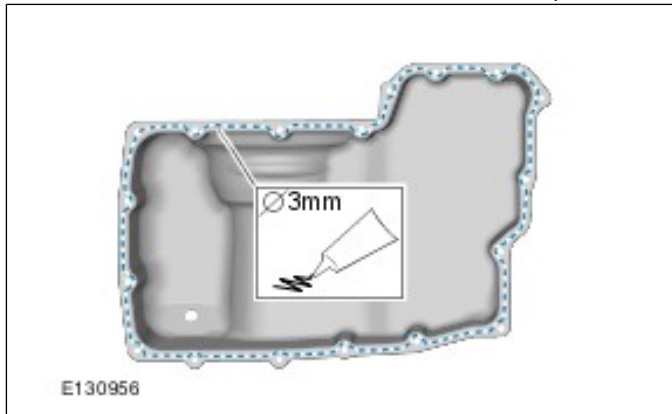
- Stage 1: 7 Nm
- Stage 2: 14 Nm



66. **CAUTION:** Install the oil pan within five minutes of applying the sealer.

NOTE: Do not damage the mating faces.

Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)

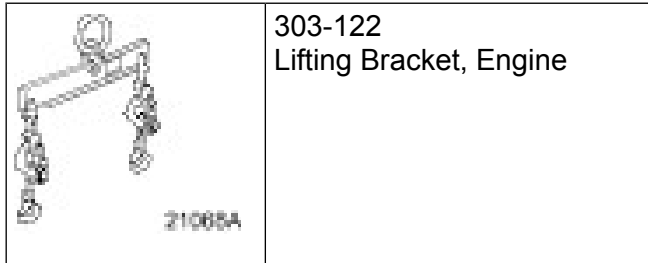


INSTALLATION

Engine — Vehicles With: 5-Speed Manual Transmission - MT75(21 132 0; 21 132 6; 21 132 7)

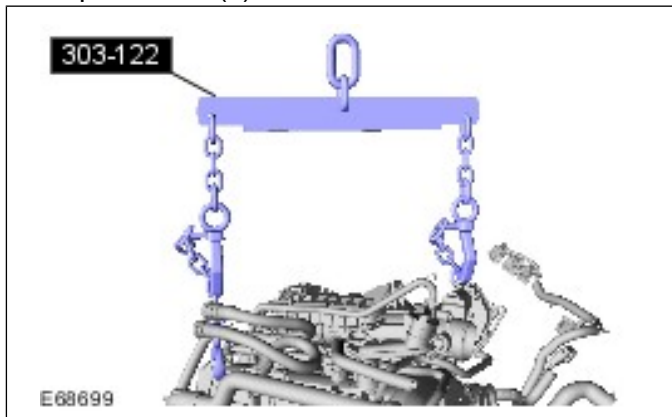
Installation

Special Tool(s)

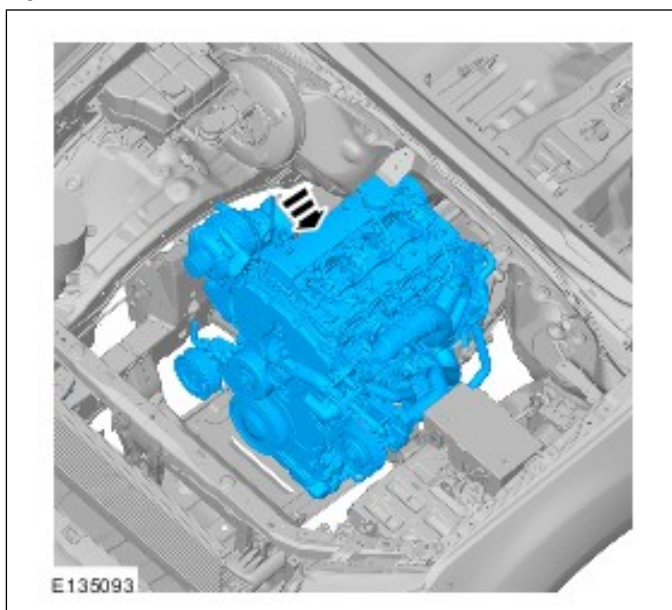


1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

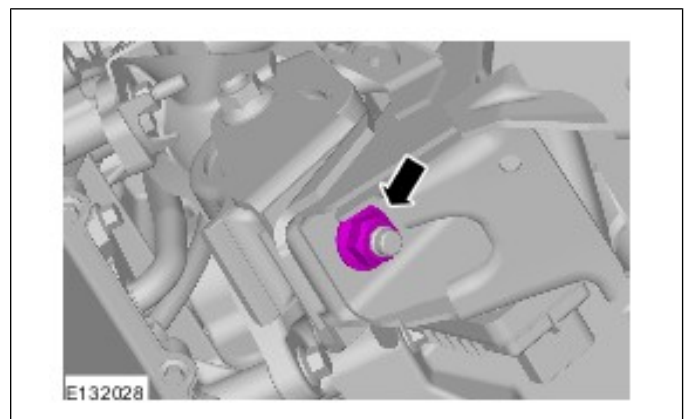
2. Special Tool(s): 303-122



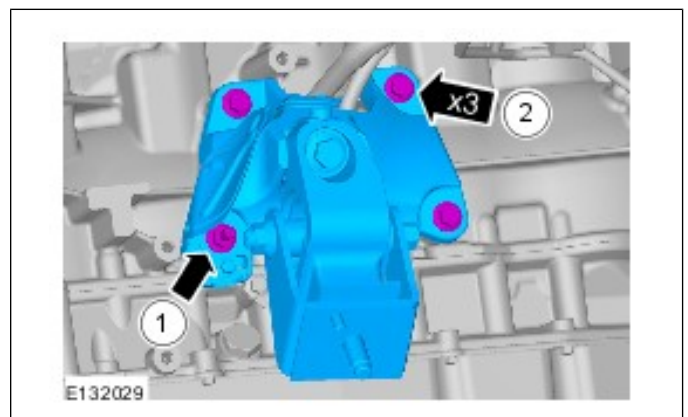
3.



4. **NOTE:** Hand tighten the nut at this stage.

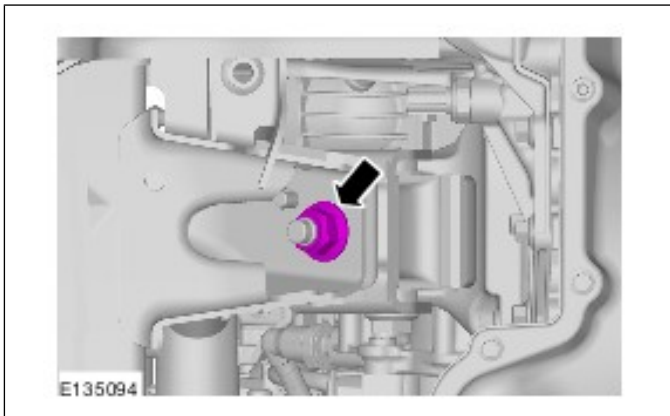


5. **NOTE:** Hand tighten the nut at this stage.



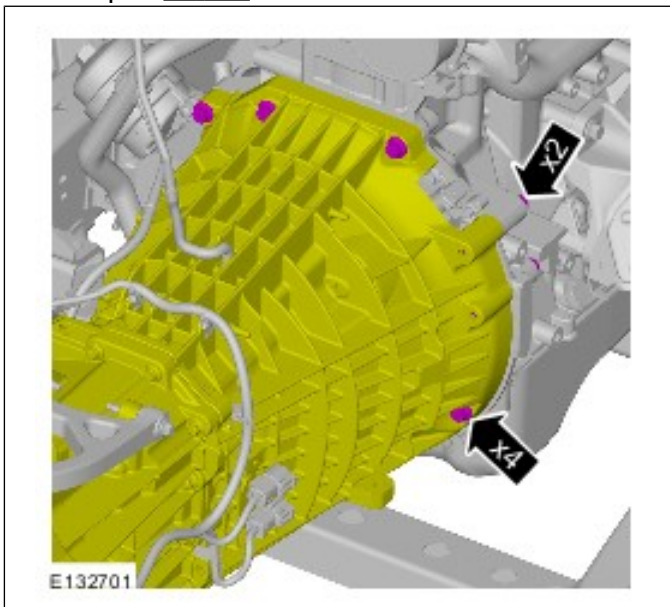
INSTALLATION

6. **NOTE:** Hand tighten the nut at this stage.



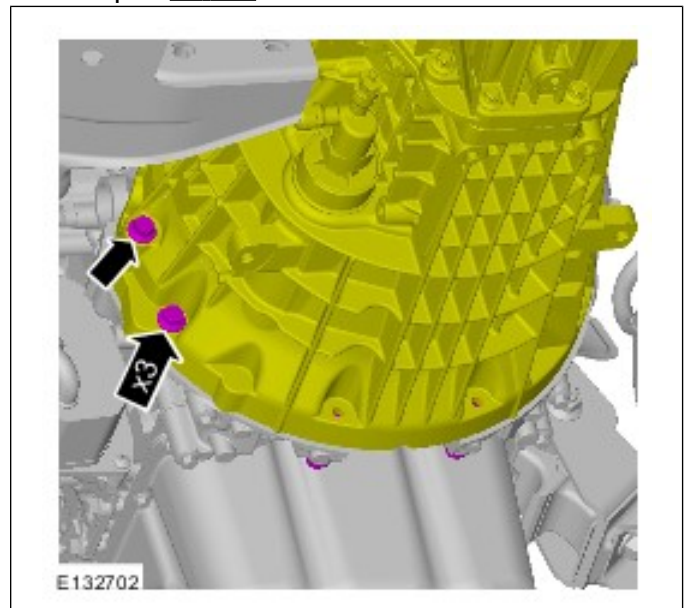
7. Initially hand tighten the fasteners.

Torque: 48 Nm

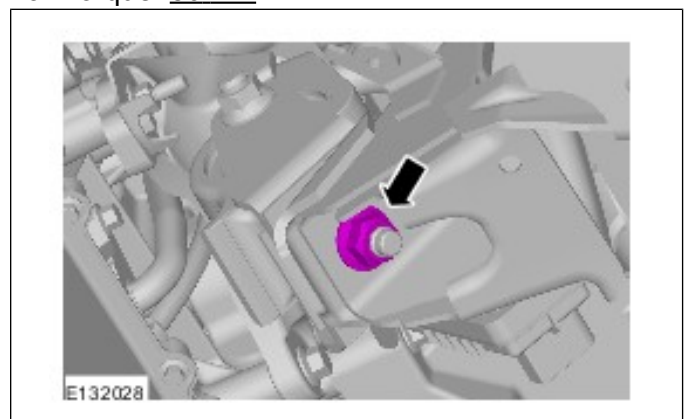


8. Initially hand tighten the fasteners.

Torque: 48 Nm

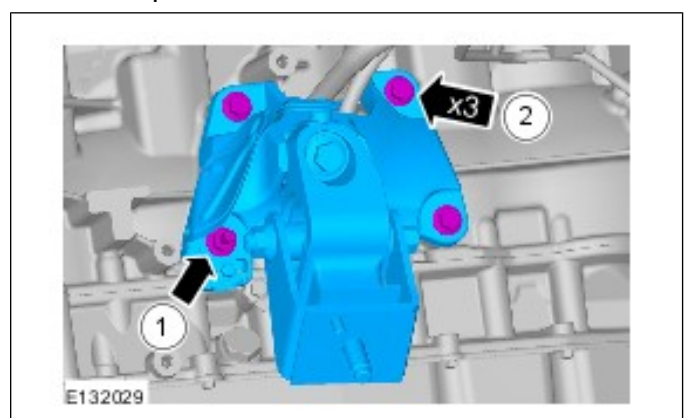


9. Torque: 80 Nm



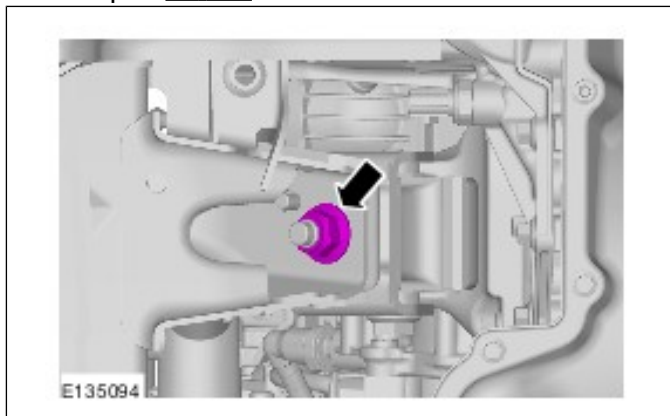
10. 1. Torque: 48 Nm

2. Torque: 48 Nm

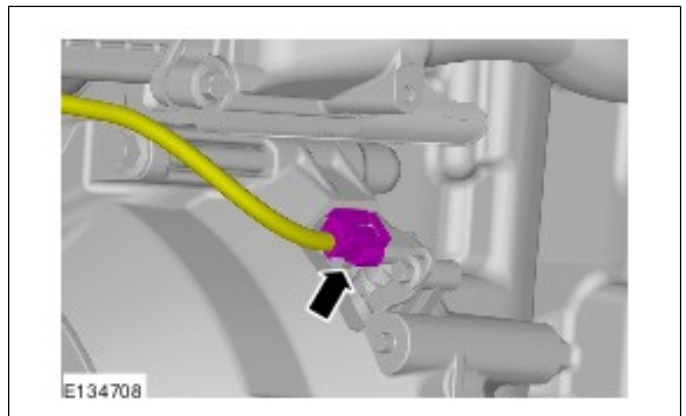


INSTALLATION

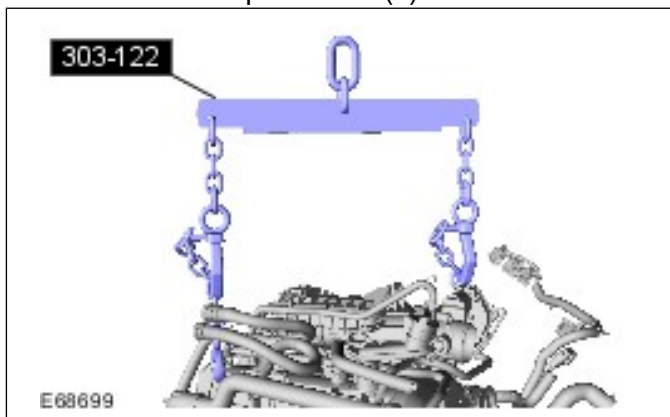
11. Torque: 80 Nm



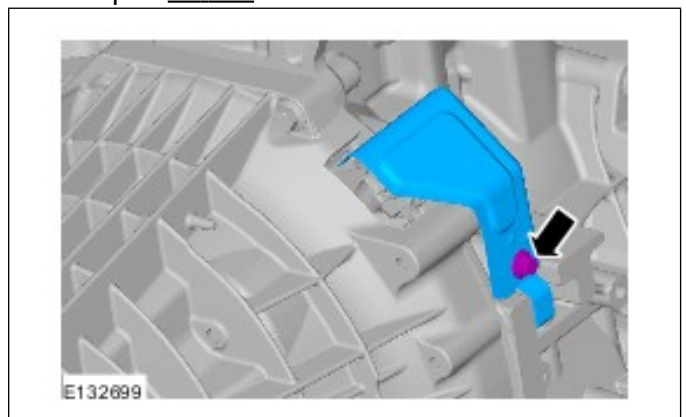
14.



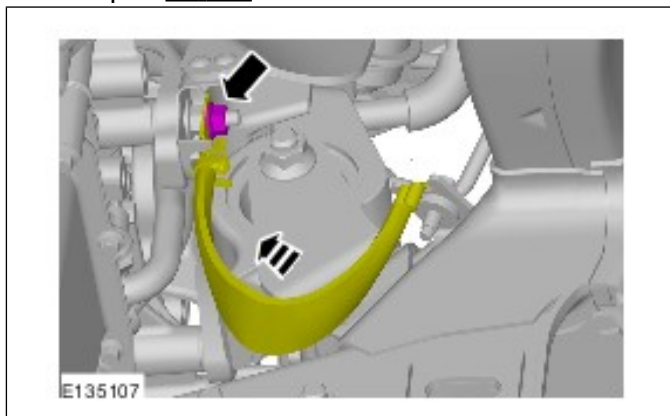
12 Remove the Special Tool(s): 303-122



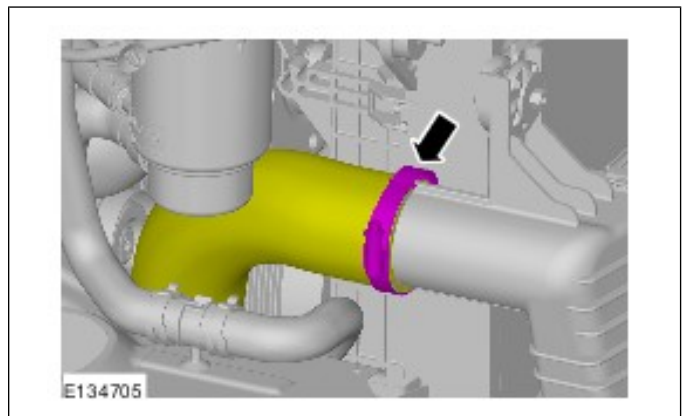
15. Torque: 22 Nm



13. Torque: 13 Nm

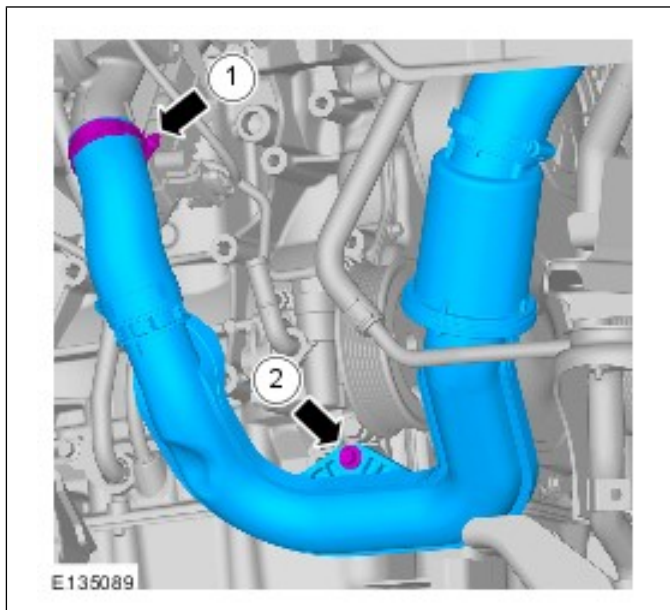


16.

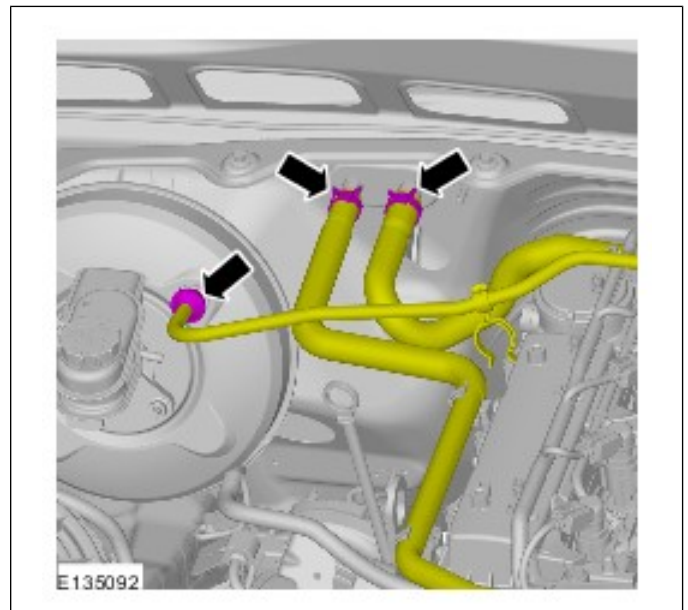


INSTALLATION

17.2. Torque: 10 Nm



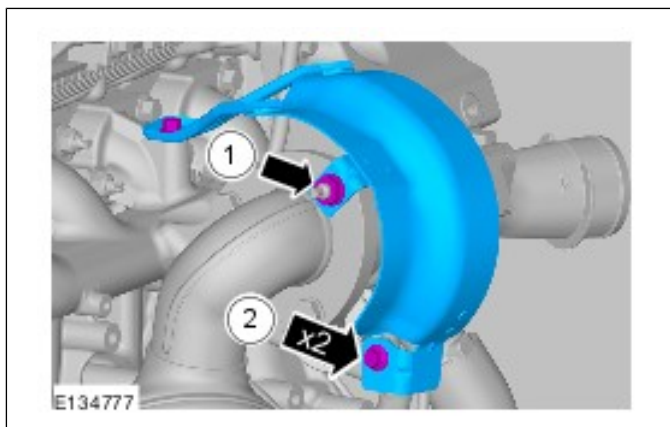
20.



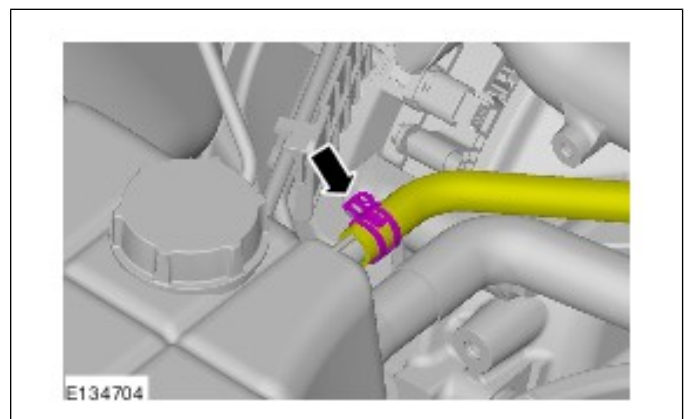
18. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

19. 1. Torque: 47 Nm

2. Torque: 22 Nm



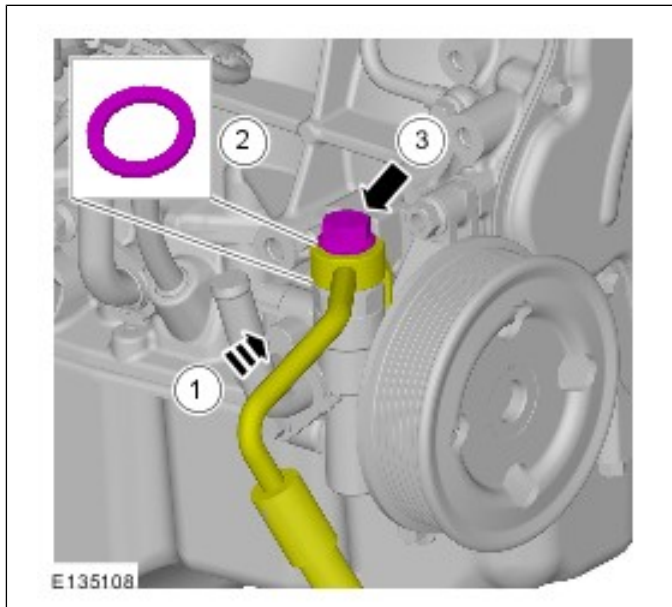
21.



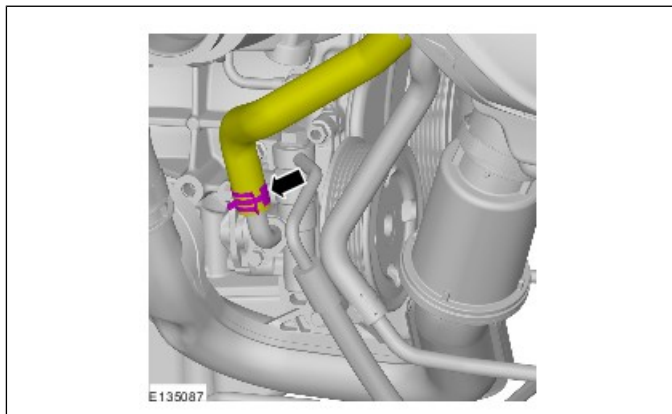
INSTALLATION

22 NOTE: The washers can be reused unless damaged.

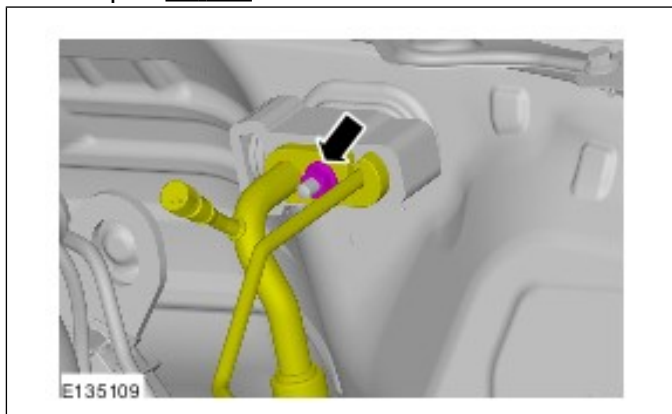
3. Torque: 35 Nm



23.

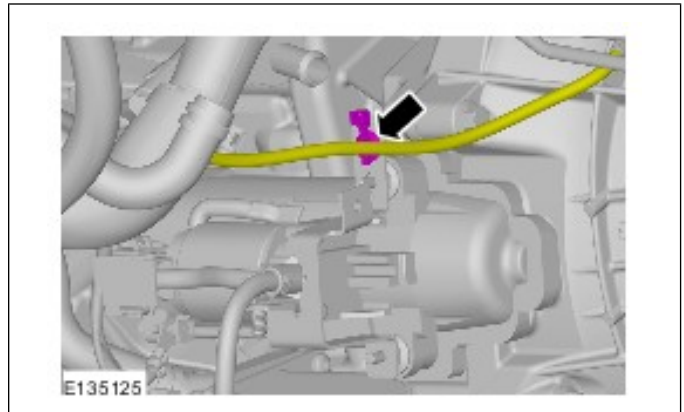


24. Torque: 22 Nm



25. Refer to: [Starter Motor - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma \(303-06 Starting System - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma, Removal and Installation\).](#)

26.



27. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma \(412-01 Climate Control, Removal and Installation\).](#)

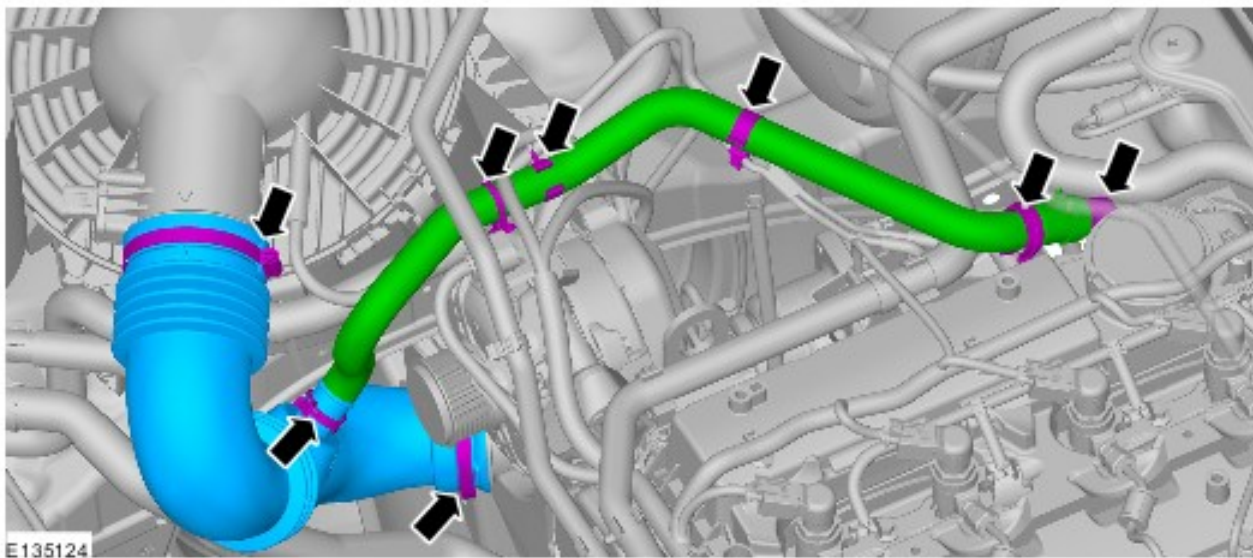
28. Refer to: [Radiator \(303-03 Engine Cooling - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, Removal and Installation\).](#)

29. Refer to: [Cooling Fan Motor and Shroud \(303-03 Engine Cooling - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, Removal and Installation\).](#)

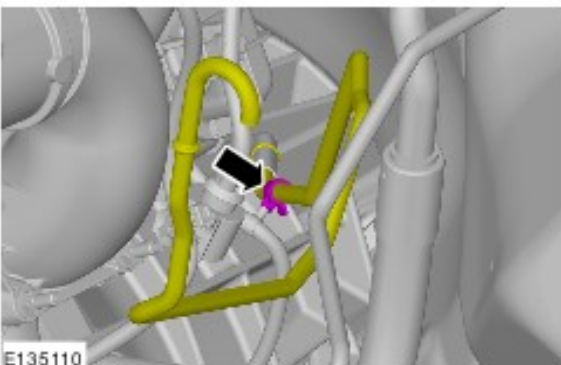
30. Refer to: [Air Cleaner - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma \(303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma, Removal and Installation\).](#)

31.

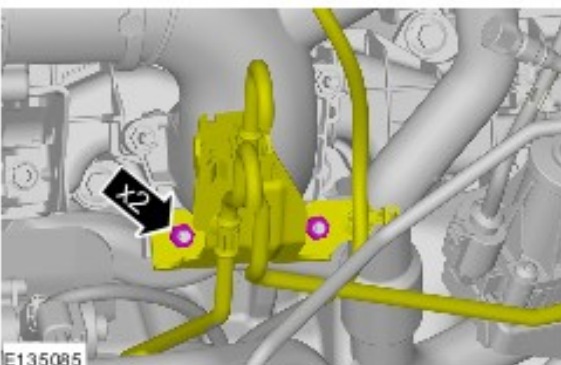
INSTALLATION



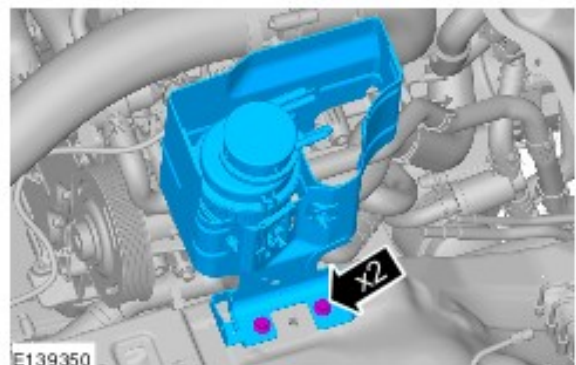
32



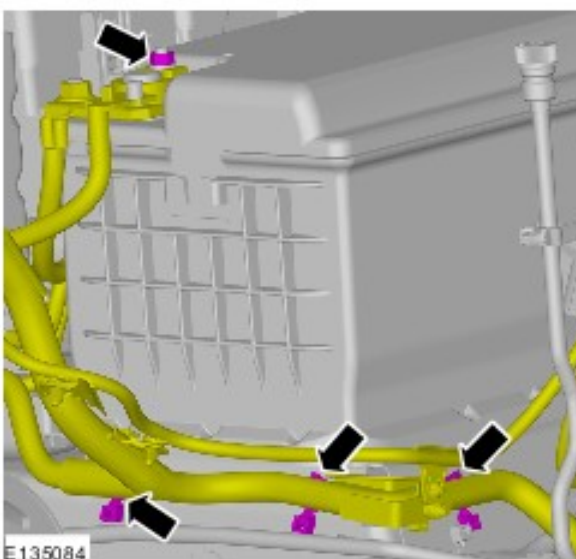
33. Torque: 10 Nm



34. Torque: 18 Nm

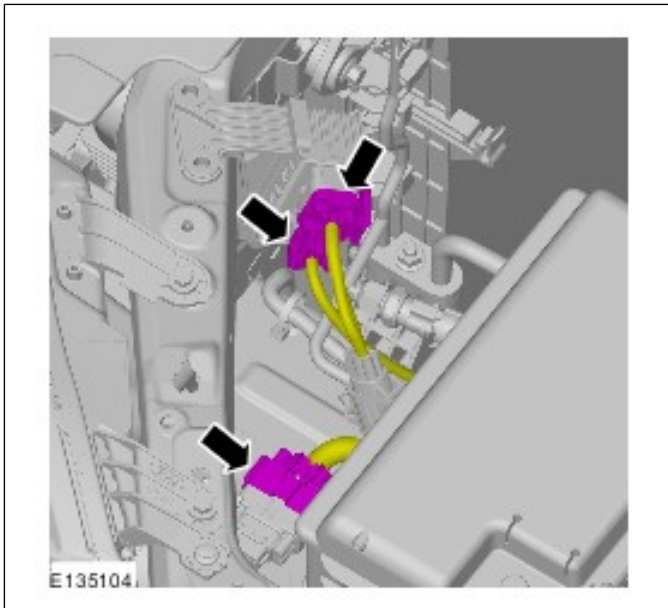


35. Torque: 5 Nm

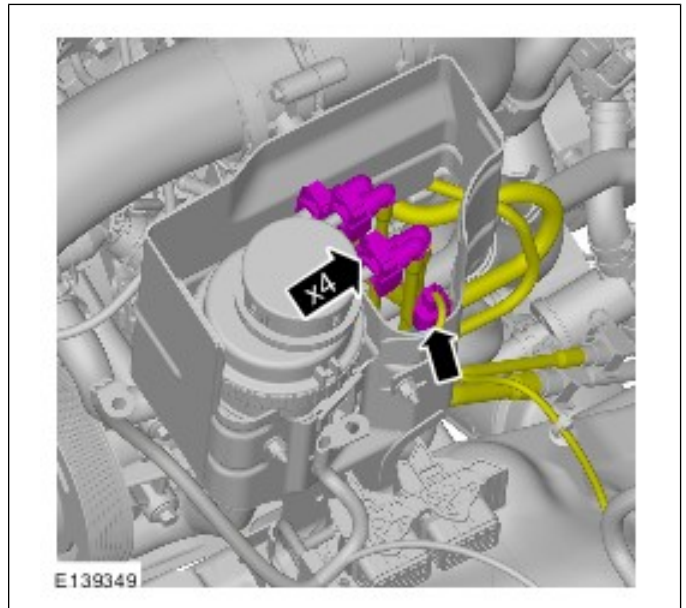


INSTALLATION

36.



37.



38. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.5L Duratec-HE (122kW/165PS) - MI4, Removal and Installation).

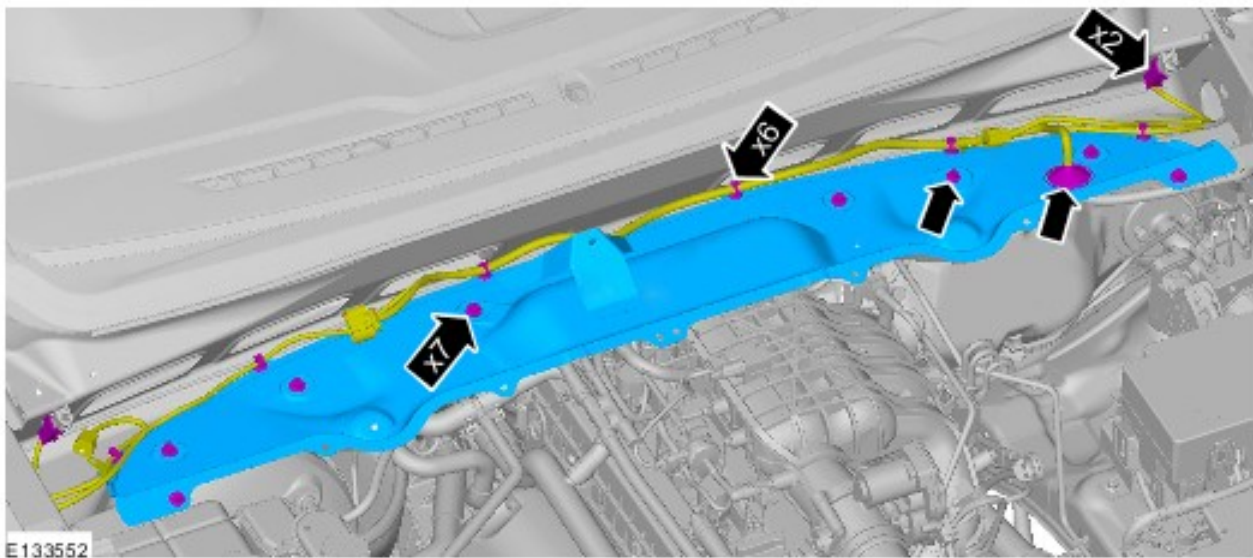
Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

39. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

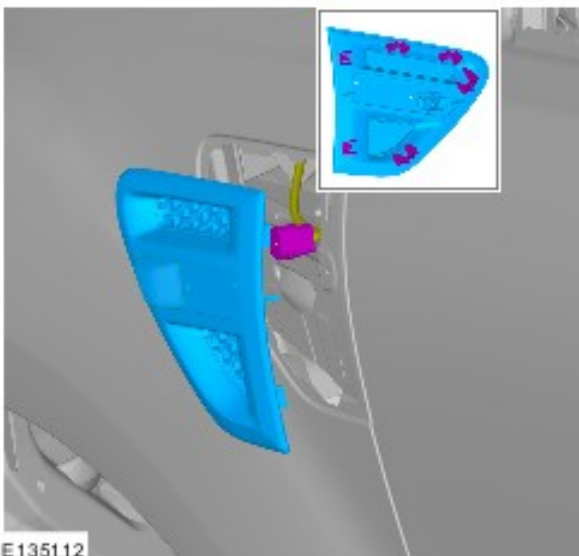
40. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

41. Torque: 10 Nm

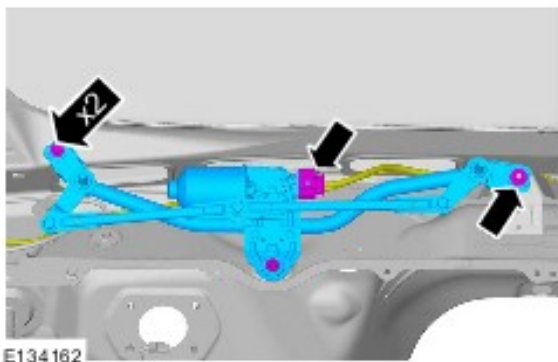
INSTALLATION



42. On both sides.

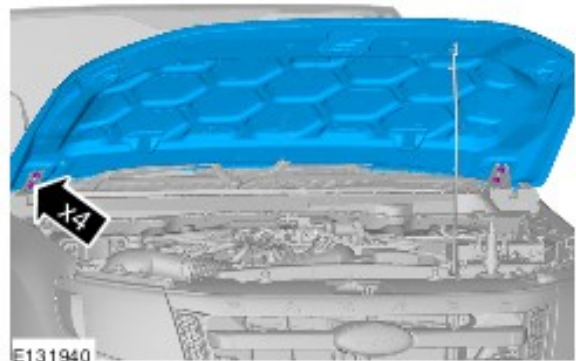


43. Torque: 10 Nm

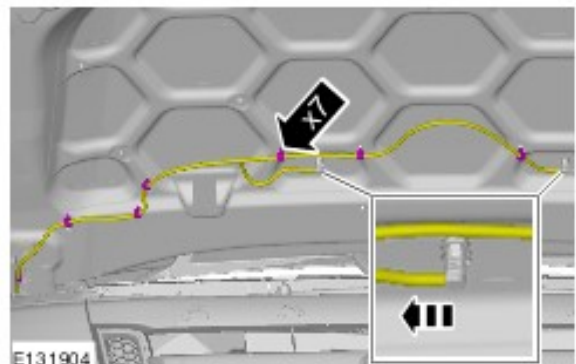


44. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

45. Torque: 25 Nm

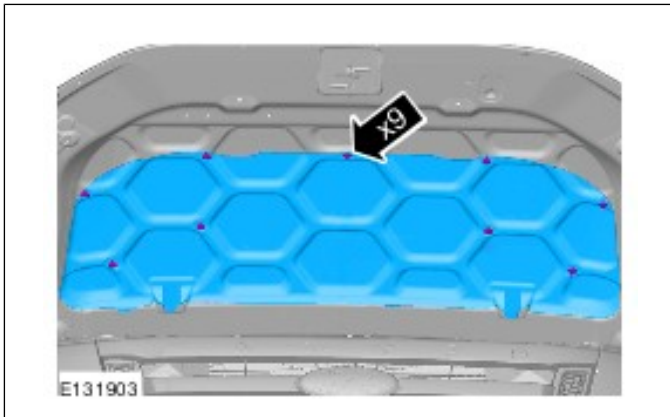


46.

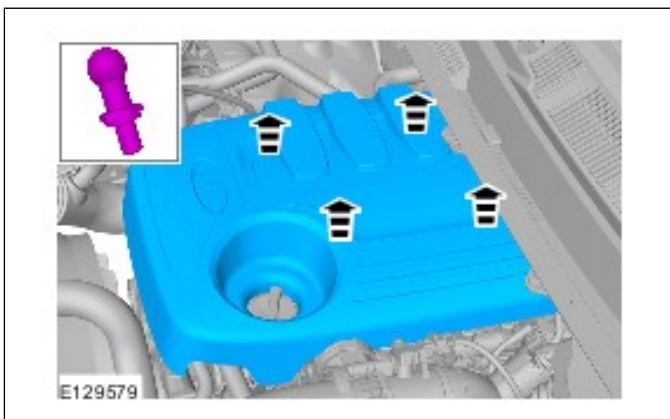


INSTALLATION

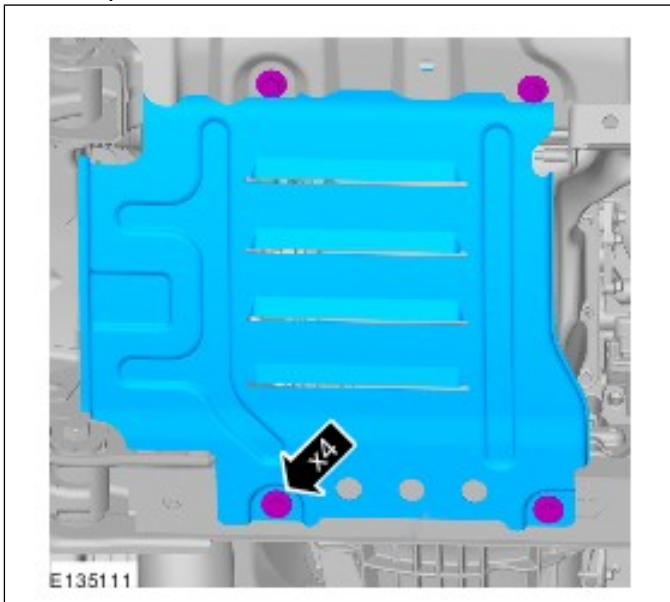
47.



48.



49. Torque: 30 Nm



50. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

51. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).

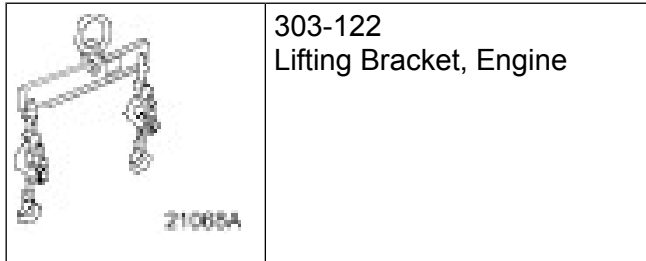
52. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

INSTALLATION

Engine — Vehicles With: 6-Speed Manual Transmission - MT82(21 132 0; 21 132 6; 21 132 7)

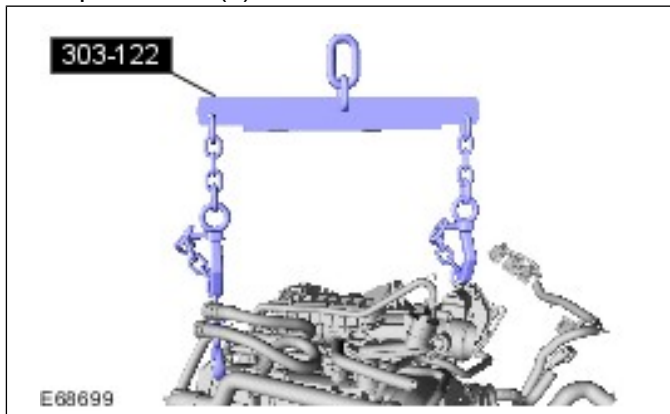
Installation

Special Tool(s)

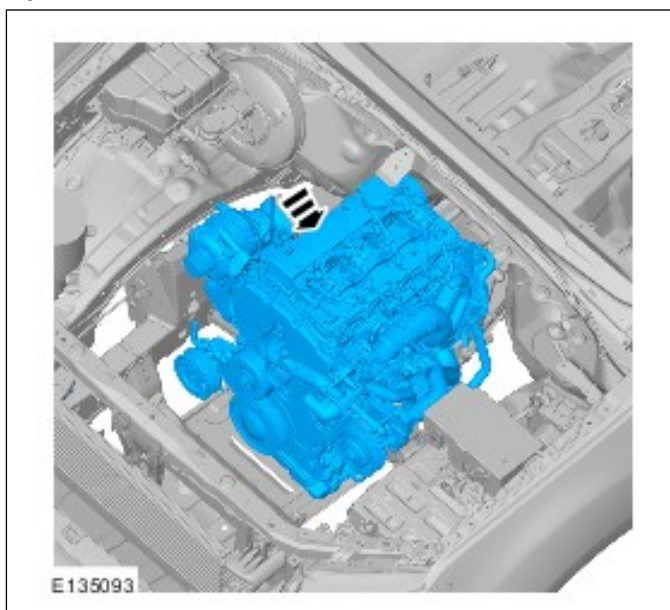


1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

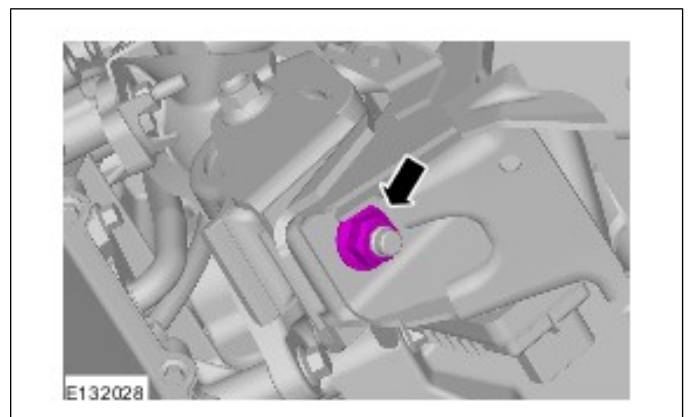
2. Special Tool(s): 303-122



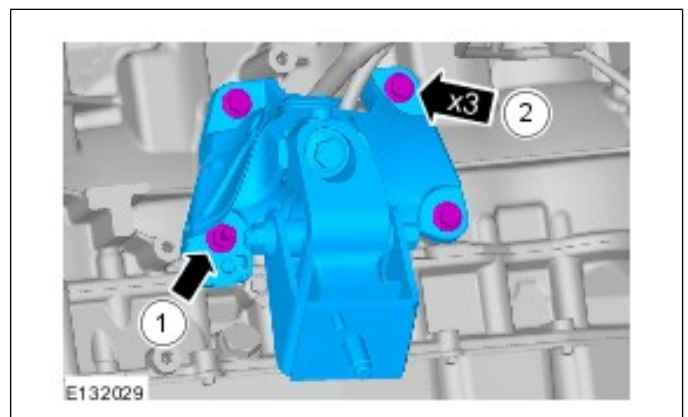
3.



4. **NOTE:** Hand tighten the nut at this stage.

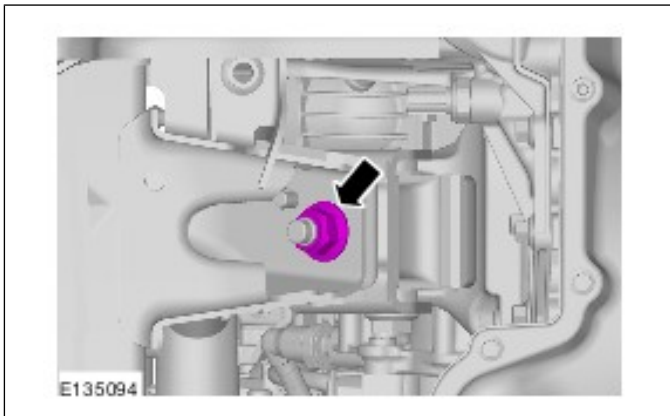


5. **NOTE:** Hand tighten the nut at this stage.

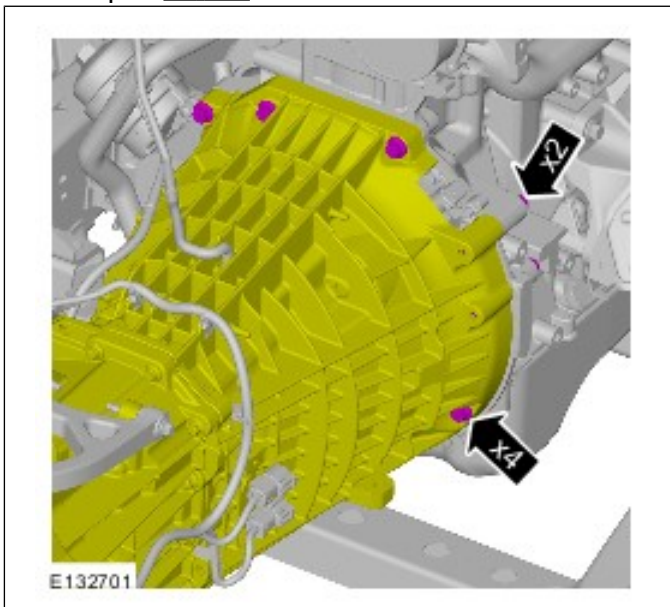


INSTALLATION

6. **NOTE:** Hand tighten the nut at this stage.

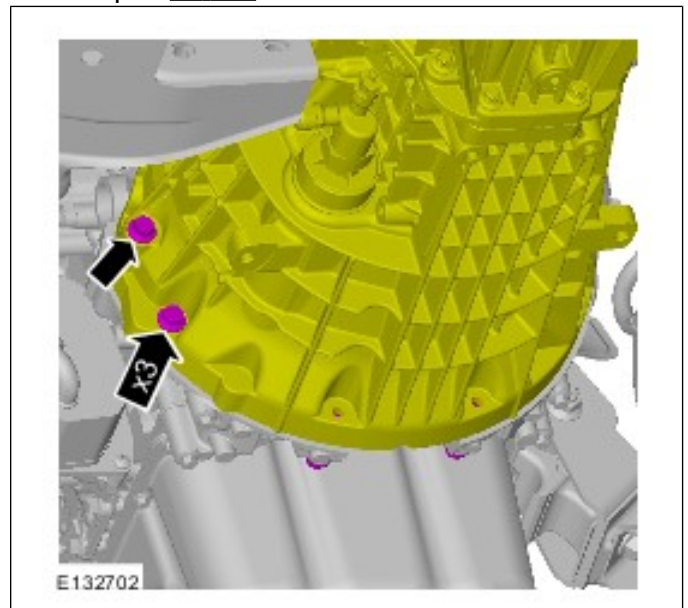


7. Initially hand tighten the fasteners.
Torque: 48 Nm

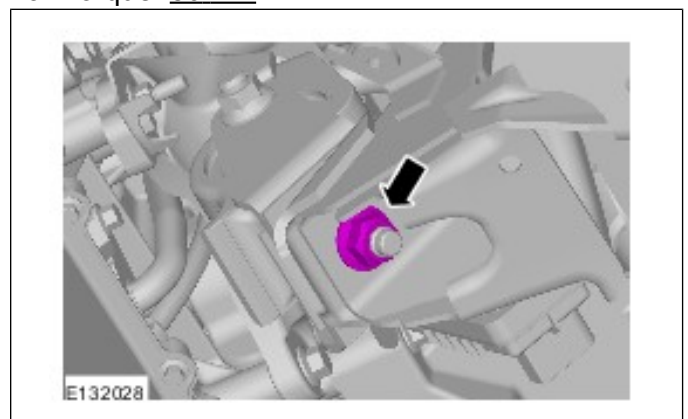


8. Initially hand tighten the fasteners.

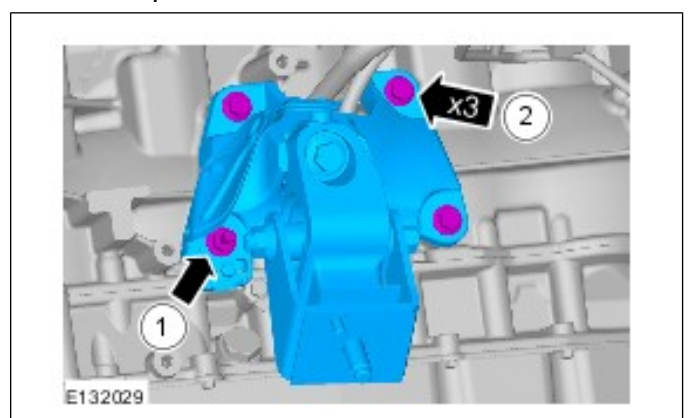
Torque: 48 Nm



9. Torque: 80 Nm

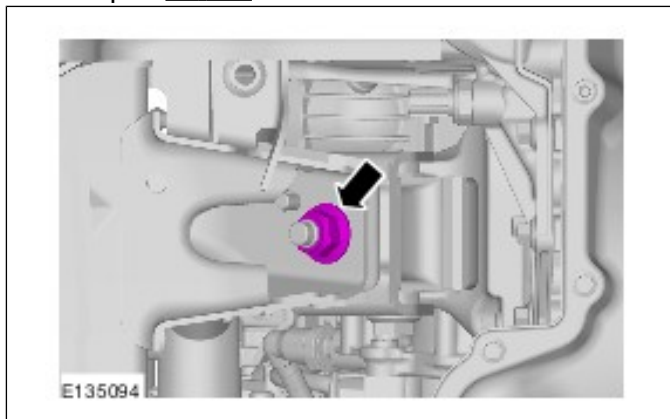


10. 1. Torque: 48 Nm
2. Torque: 48 Nm

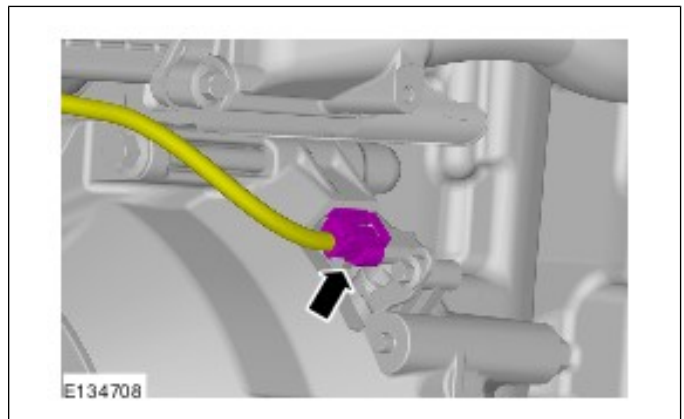


INSTALLATION

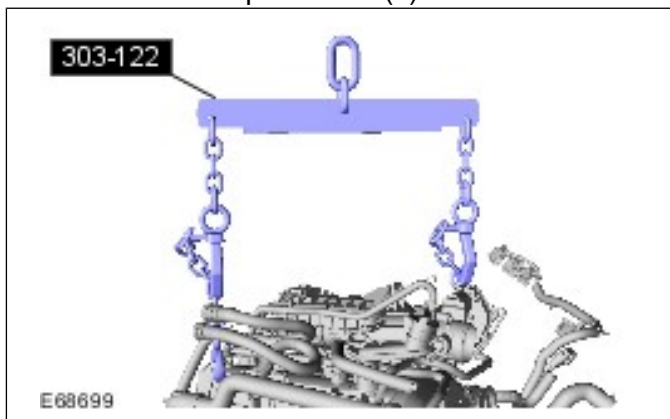
11. Torque: 80 Nm



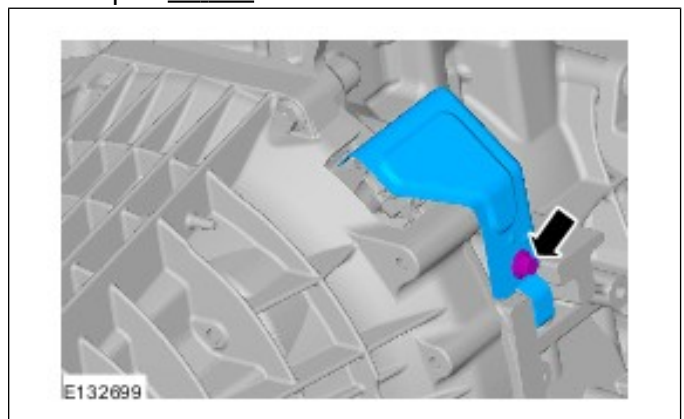
14.



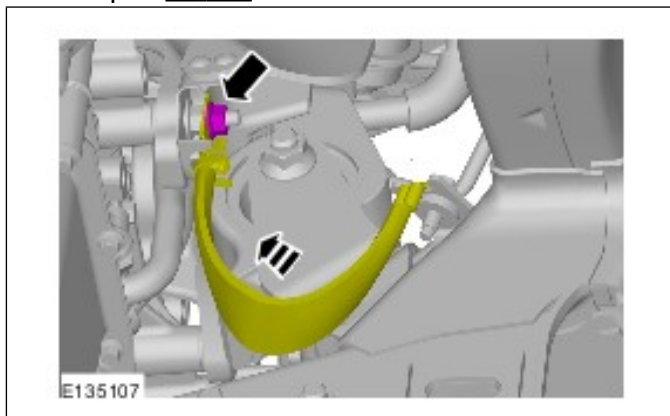
12 Remove the Special Tool(s): 303-122



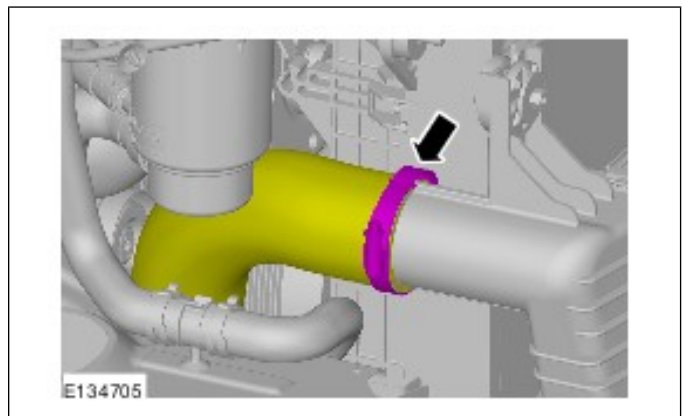
15. Torque: 22 Nm



13. Torque: 13 Nm

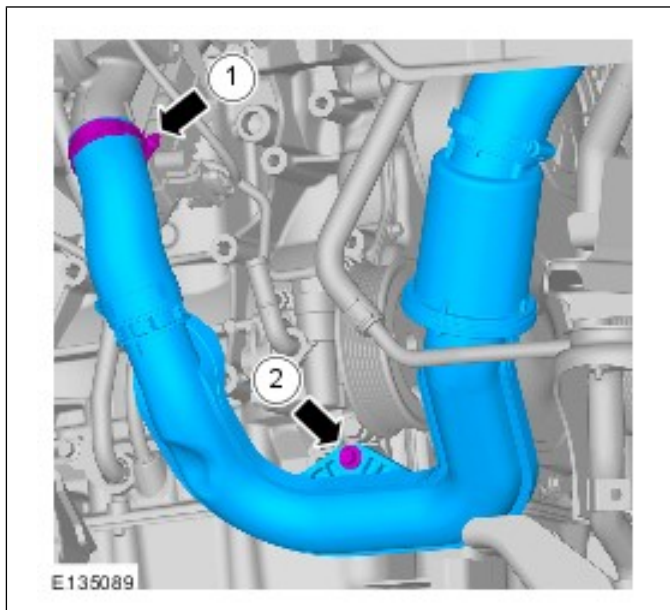


16.

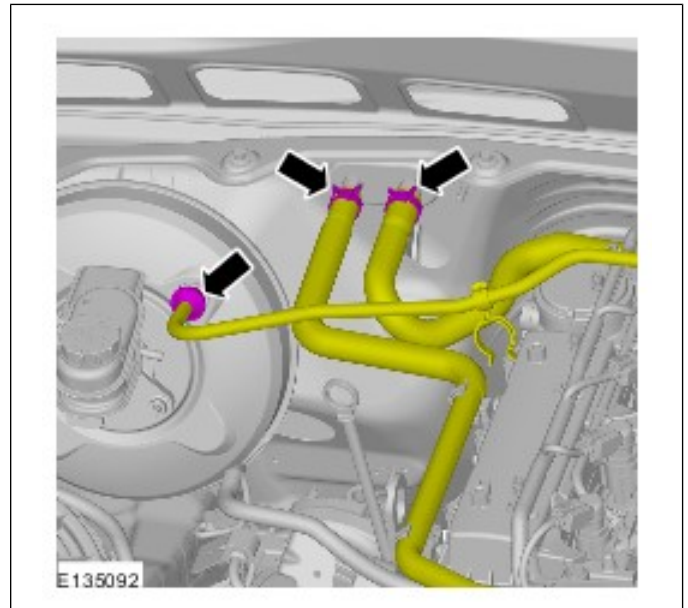


INSTALLATION

17.2. Torque: 10 Nm

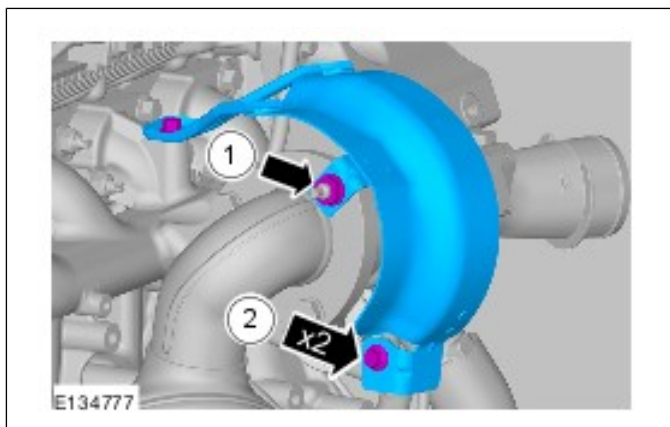


20.

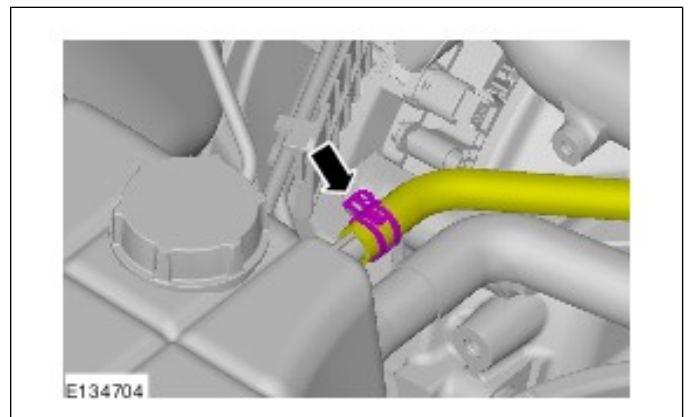


18. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

19. 1. Torque: 47 Nm
2. Torque: 22 Nm



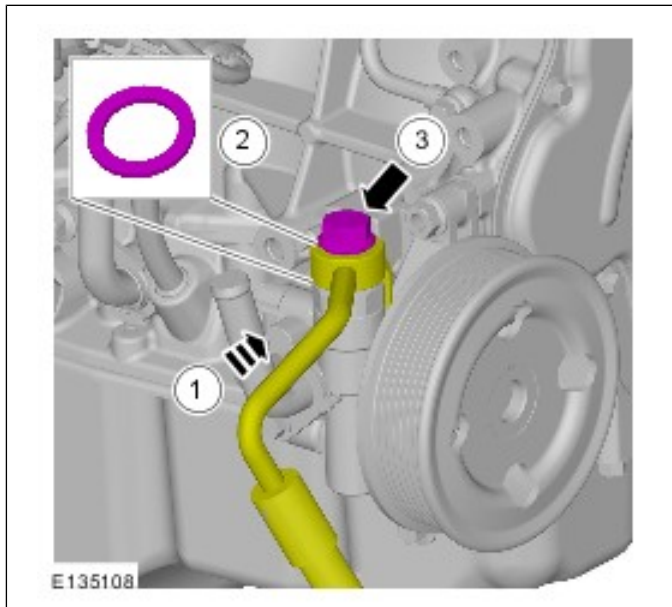
21.



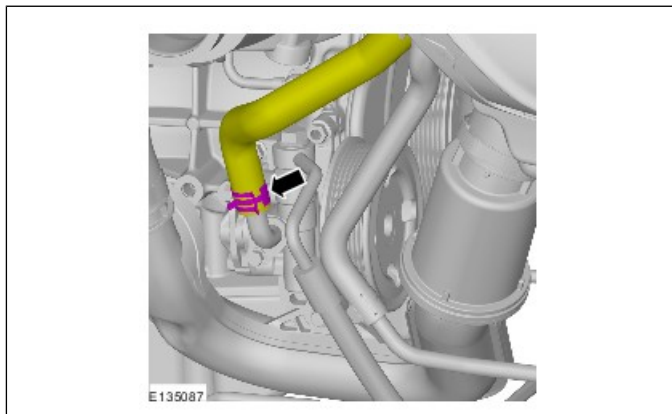
INSTALLATION

22 NOTE: The washers can be reused unless damaged.

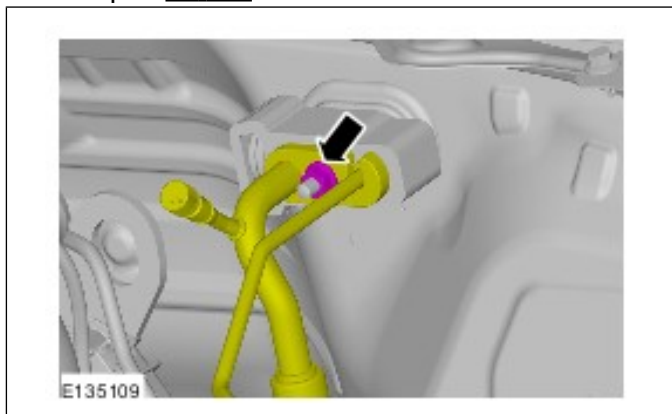
3. Torque: 35 Nm



23.

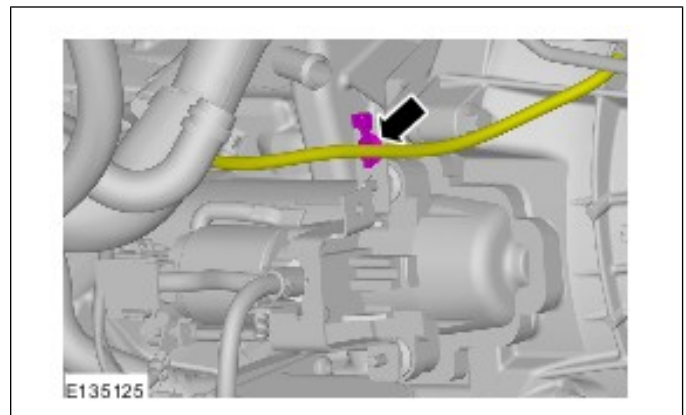


24. Torque: 22 Nm



25. Refer to: [Starter Motor - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma \(303-06 Starting System - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma, Removal and Installation\).](#)

26.



27. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma \(412-01 Climate Control, Removal and Installation\).](#)

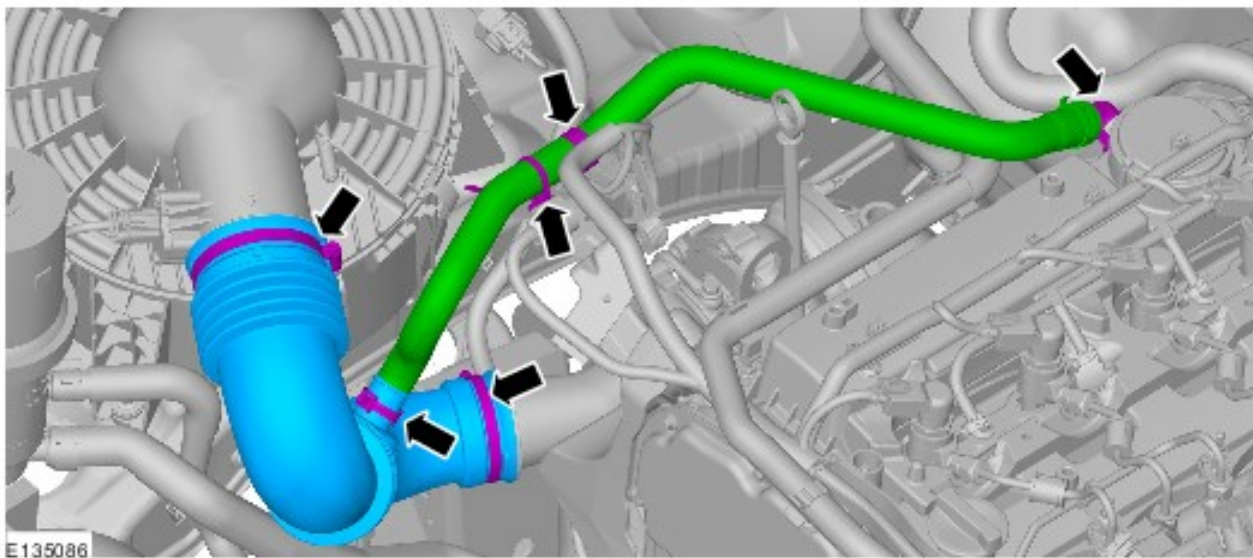
28. Refer to: [Radiator \(303-03 Engine Cooling - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, Removal and Installation\).](#)

29. Refer to: [Cooling Fan Motor and Shroud \(303-03 Engine Cooling - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma, Removal and Installation\).](#)

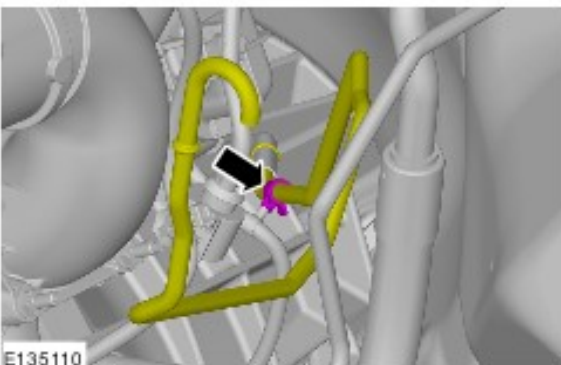
30. Refer to: [Air Cleaner - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma \(303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma, Removal and Installation\).](#)

31.

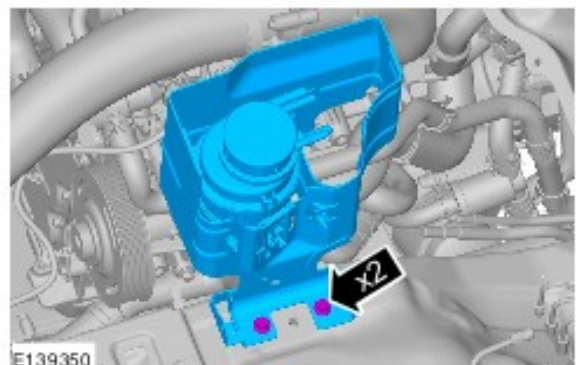
INSTALLATION



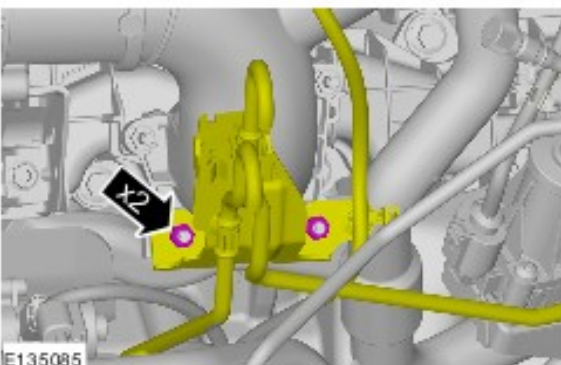
32



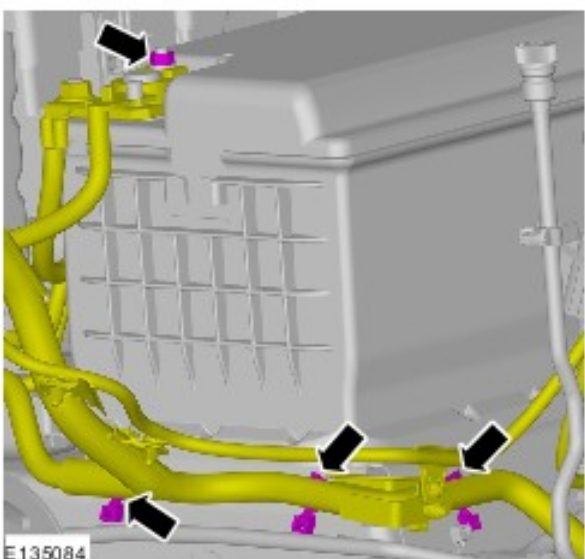
34. Torque: 18 Nm



33. Torque: 10 Nm

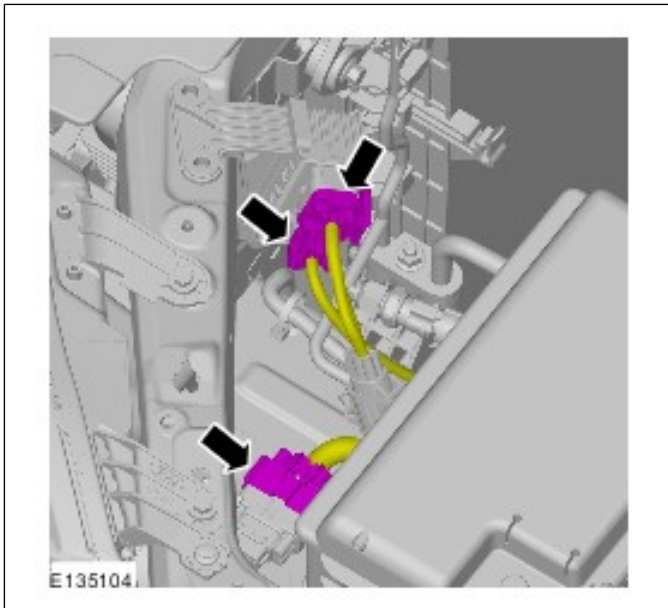


35. Torque: 5 Nm

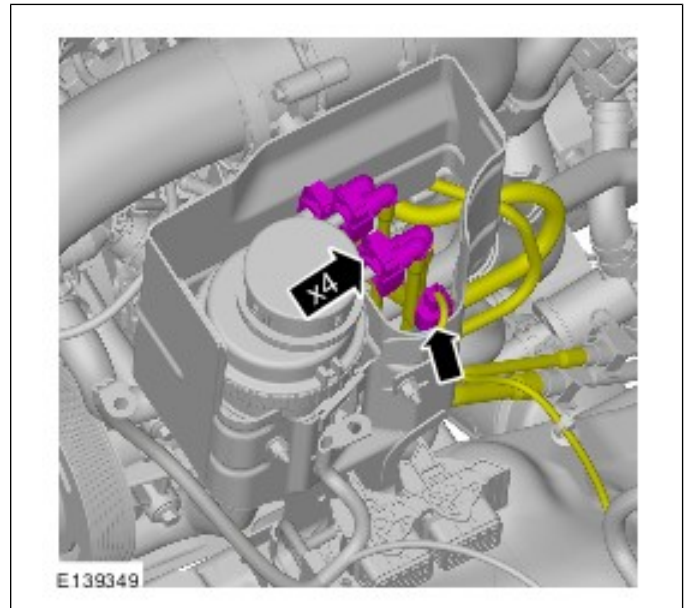


INSTALLATION

36.



37.



38. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.5L Duratec-HE (122kW/165PS) - MI4, Removal and Installation).

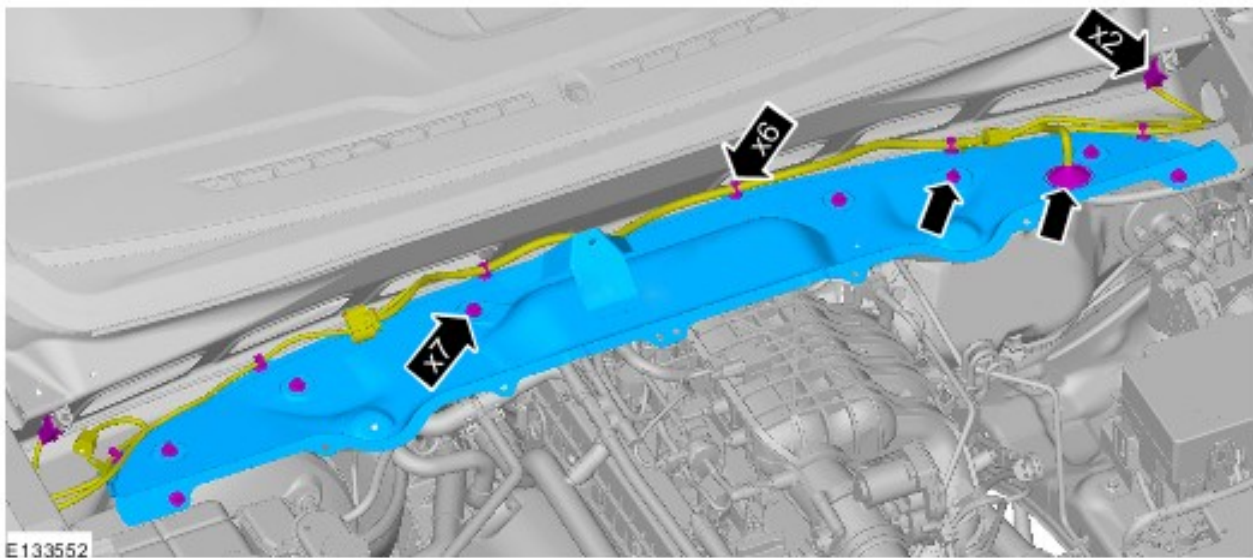
Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

39. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

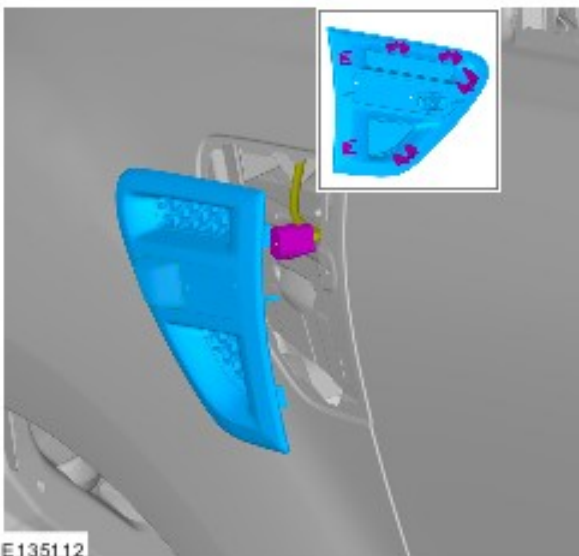
40. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).

41. Torque: 10 Nm

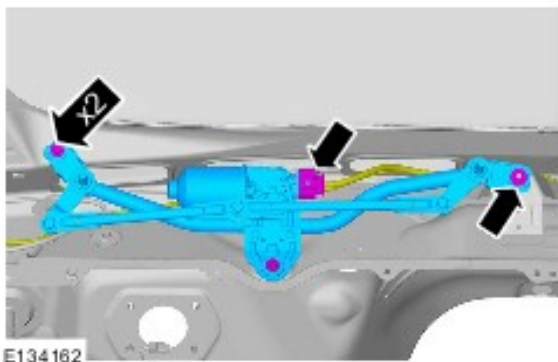
INSTALLATION



42. On both sides.

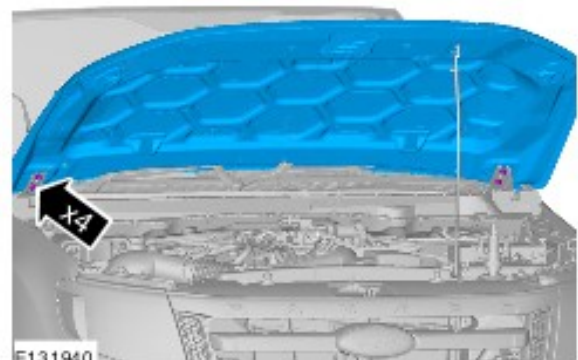


43. Torque: 10 Nm

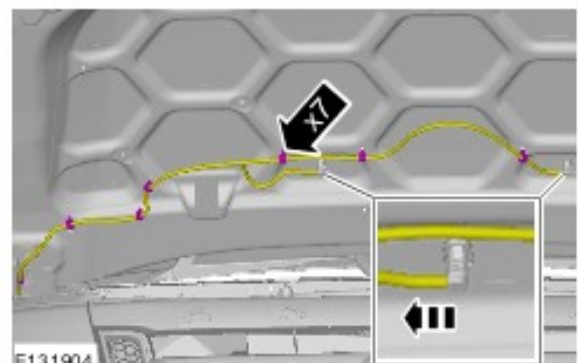


44. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

45. Torque: 25 Nm

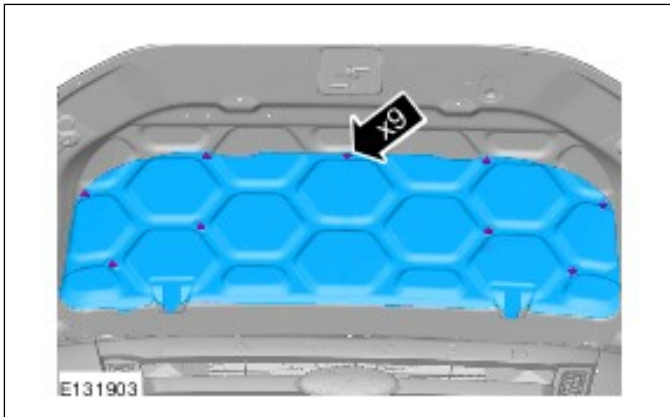


46.

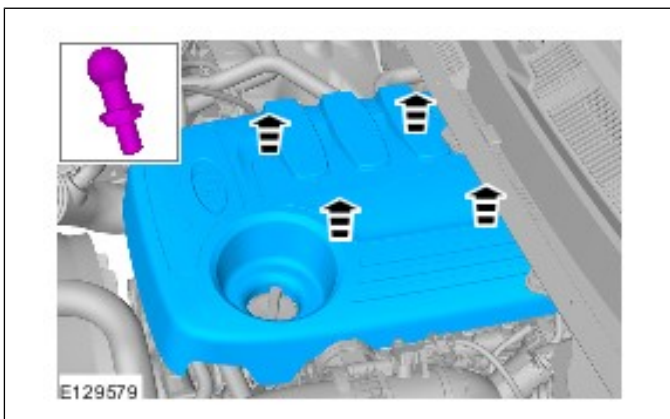


INSTALLATION

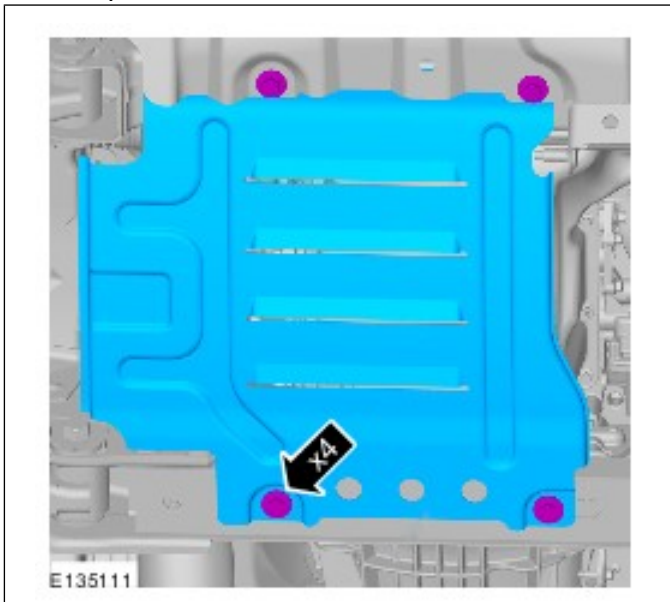
47.



48.



49. Torque: 30 Nm



50. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

51. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).

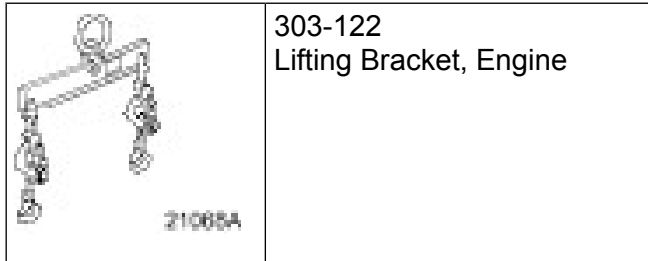
52. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

INSTALLATION

Engine — Vehicles With: 6-Speed Automatic Transmission - 6R80(21 132 0; 21 132 6; 21 132 7)

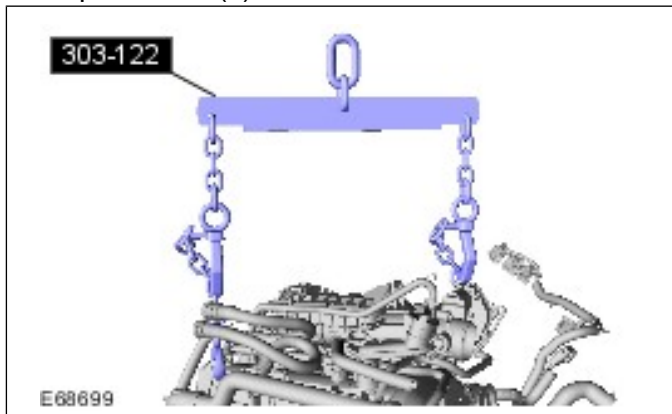
Installation

Special Tool(s)

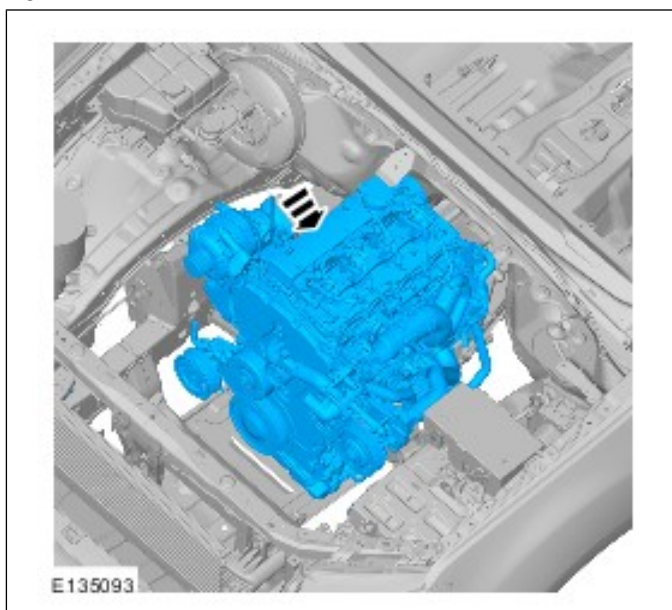


1. Refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

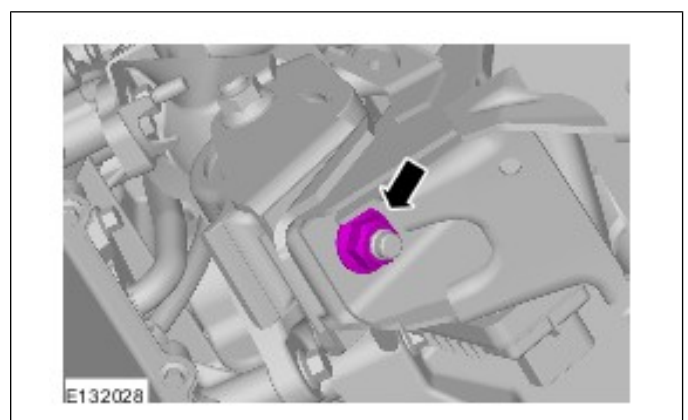
2. Special Tool(s): 303-122



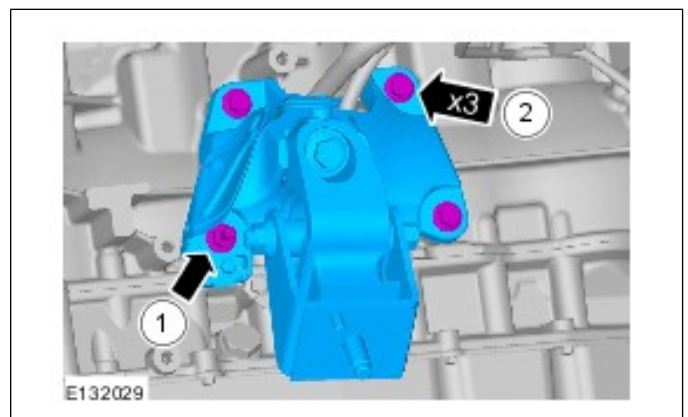
3.



4. **NOTE:** Hand tighten the nut at this stage.

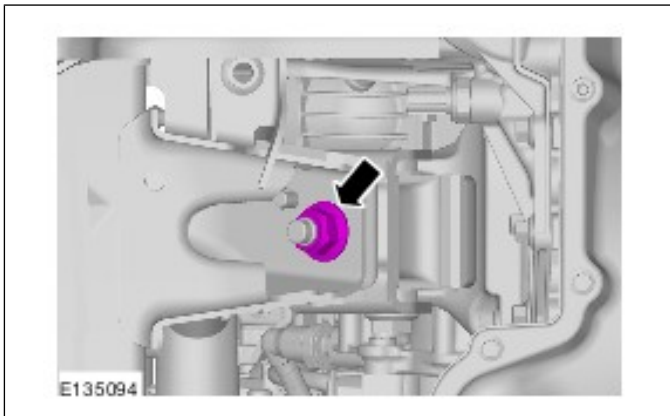


5. **NOTE:** Hand tighten the nut at this stage.



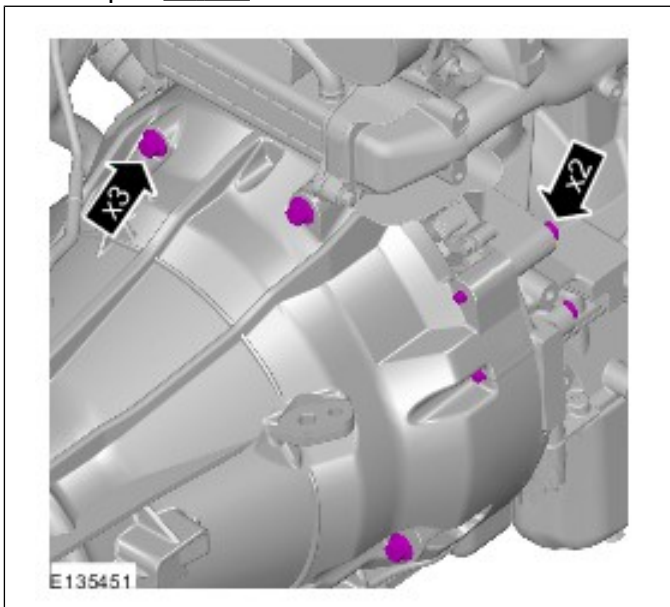
INSTALLATION

6. **NOTE:** Hand tighten the nut at this stage.



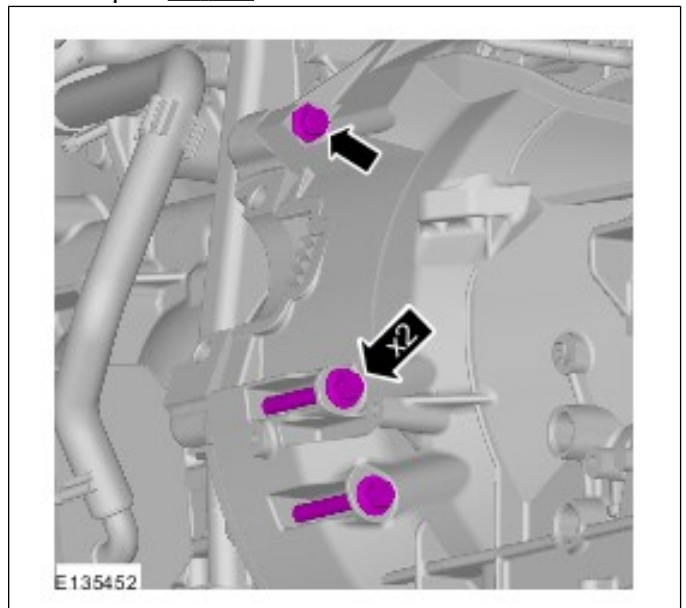
7. Initially hand tighten the fasteners.

Torque: 48 Nm

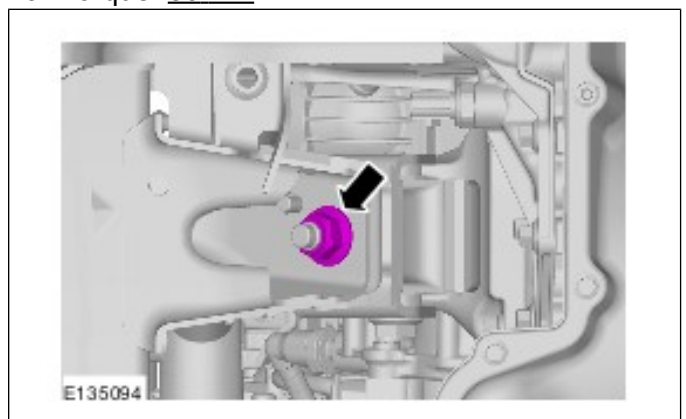


8. Initially hand tighten the fasteners.

Torque: 48 Nm

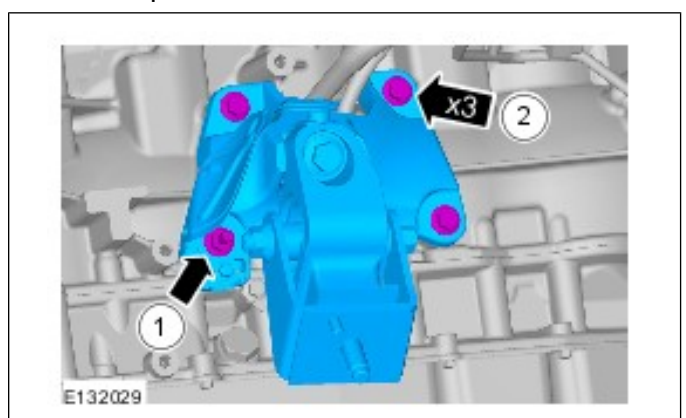


9. Torque: 80 Nm



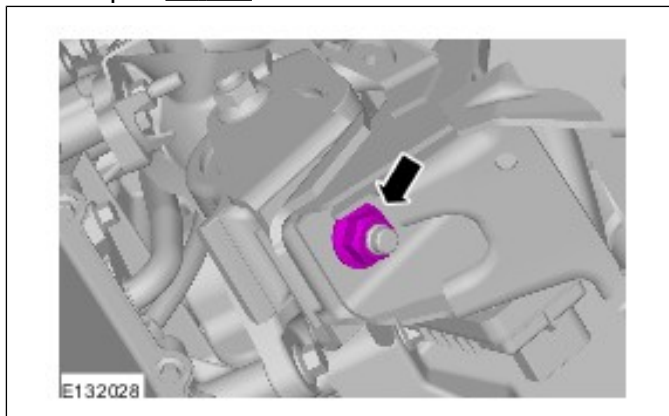
10. 1. Torque: 48 Nm

2. Torque: 48 Nm

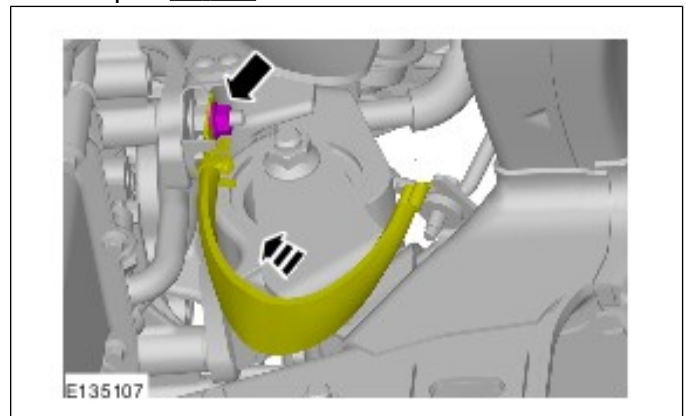


INSTALLATION

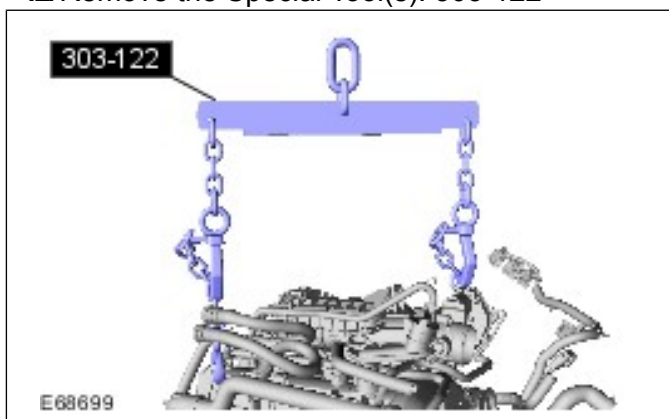
11. Torque: 80 Nm



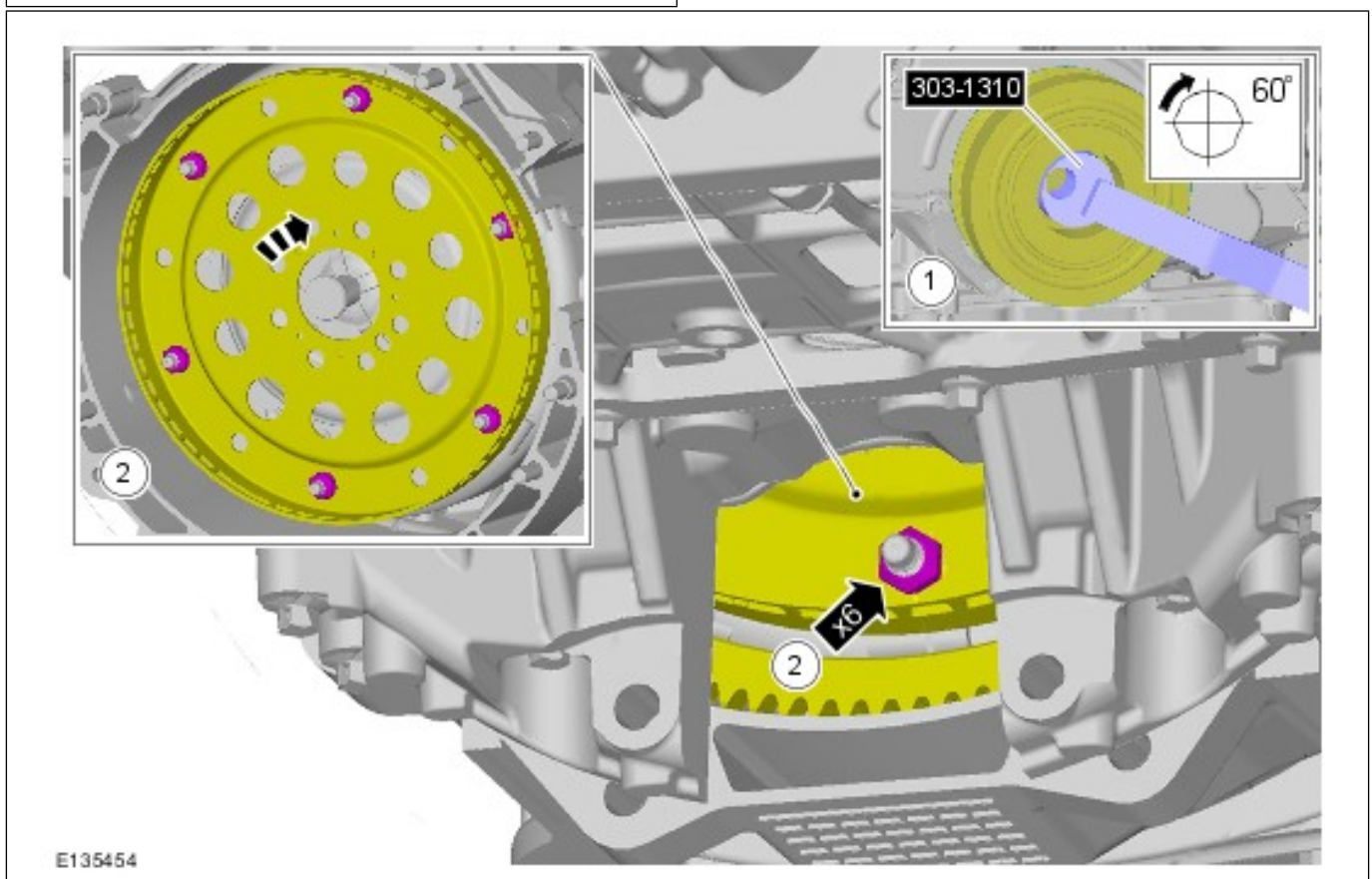
13. Torque: 13 Nm



12 Remove the Special Tool(s): 303-122

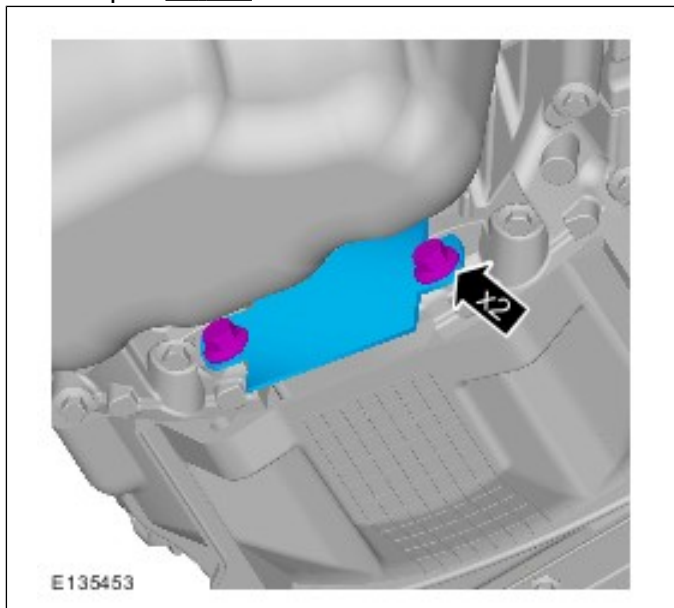


14. Torque: 40 Nm

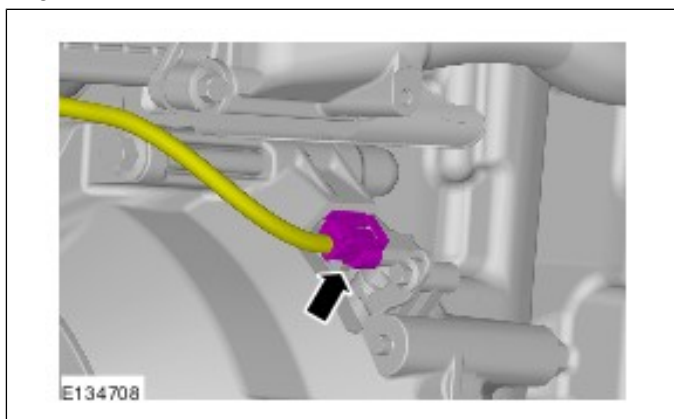


INSTALLATION

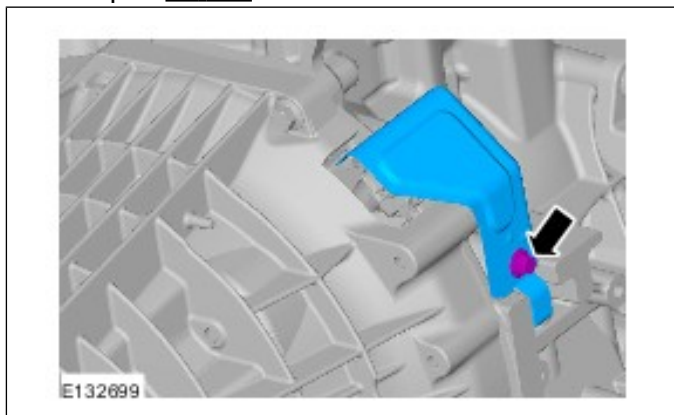
15. Torque: 22 Nm



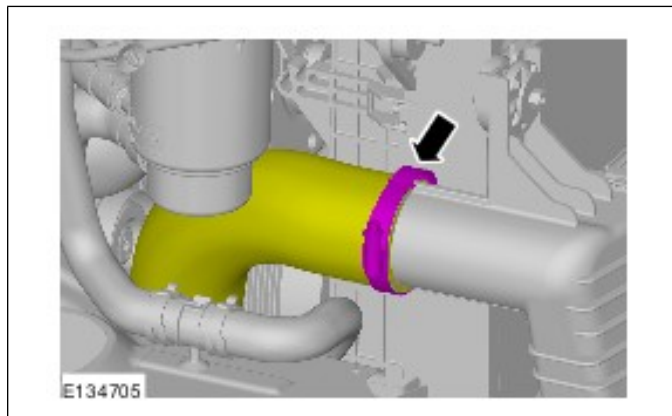
16.



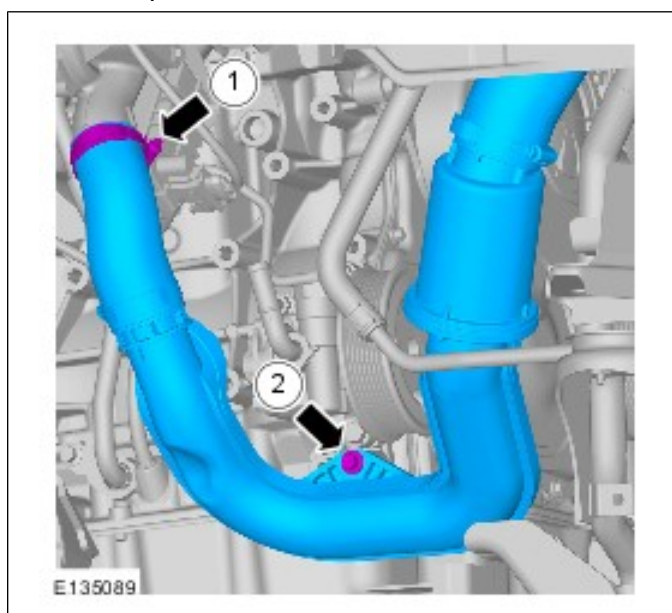
17. Torque: 22 Nm



18.



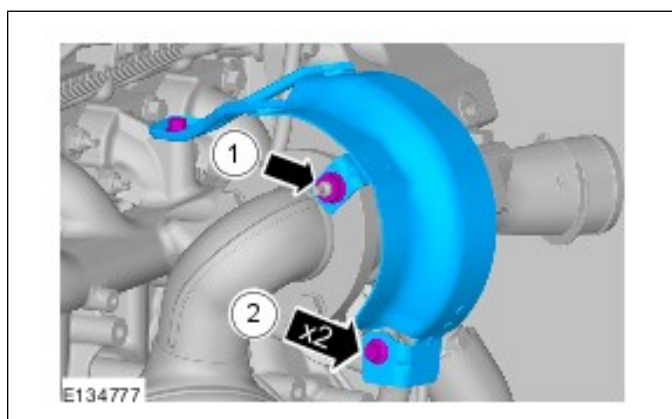
19. 2. Torque: 10 Nm



20. Refer to: [Catalytic Converter](#) (309-00 Exhaust System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

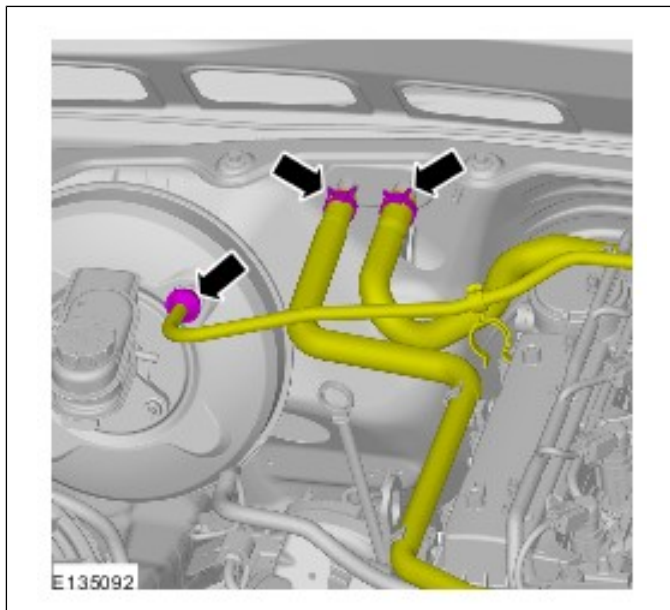
21. 1. Torque: 47 Nm

2. Torque: 22 Nm



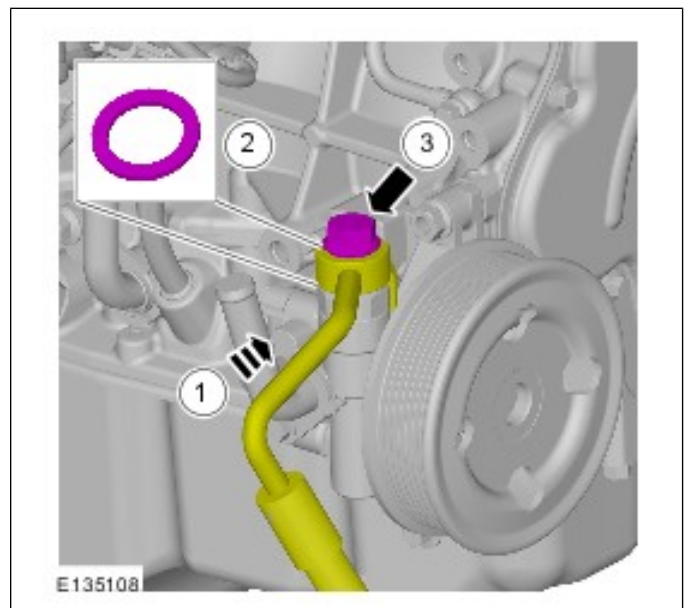
INSTALLATION

22.

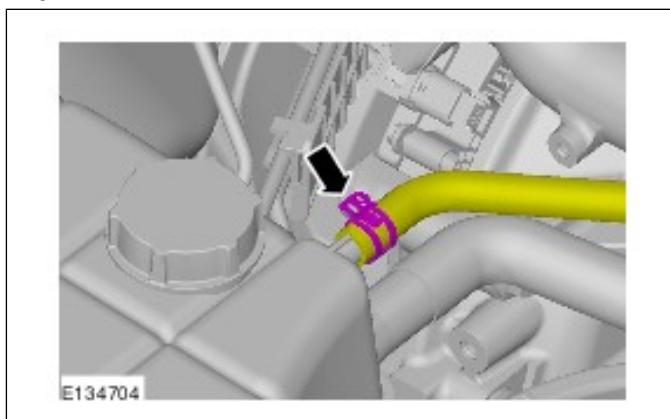


24. NOTE: The washers can be reused unless damaged.

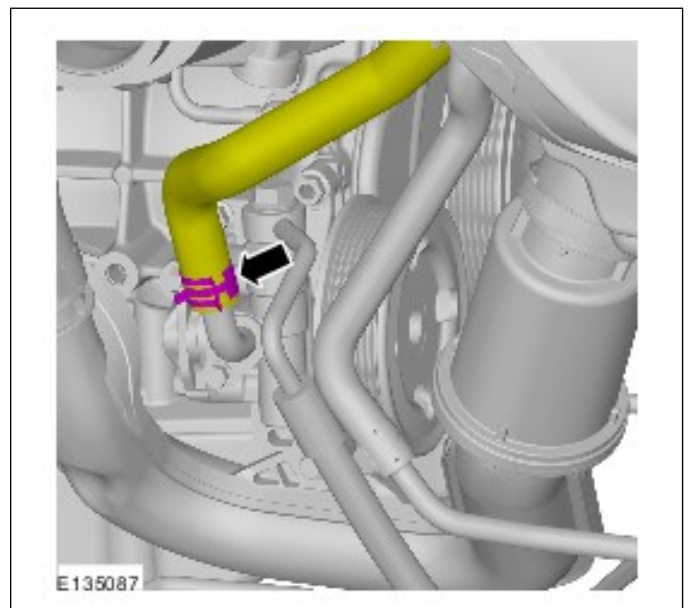
3. Torque: 35 Nm



23.

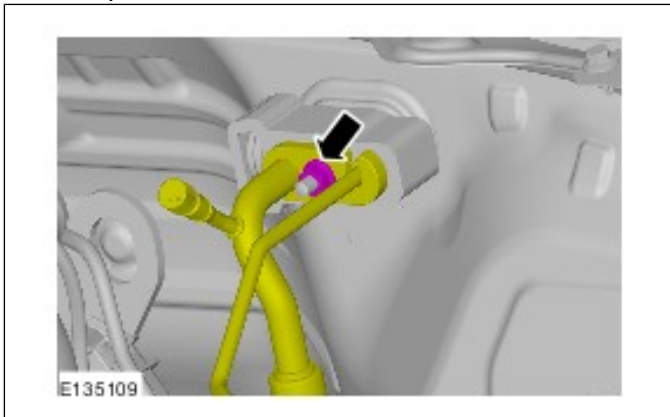


25.



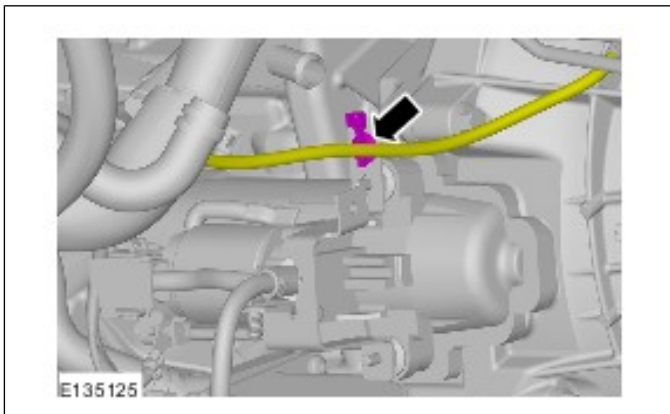
INSTALLATION

26. Torque: 22 Nm



27. Refer to: [Starter Motor - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (303-06 Starting System - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

28.



29. Refer to: [Transmission Fluid Cooler](#) (307-02 Transmission Cooling, Removal and Installation).

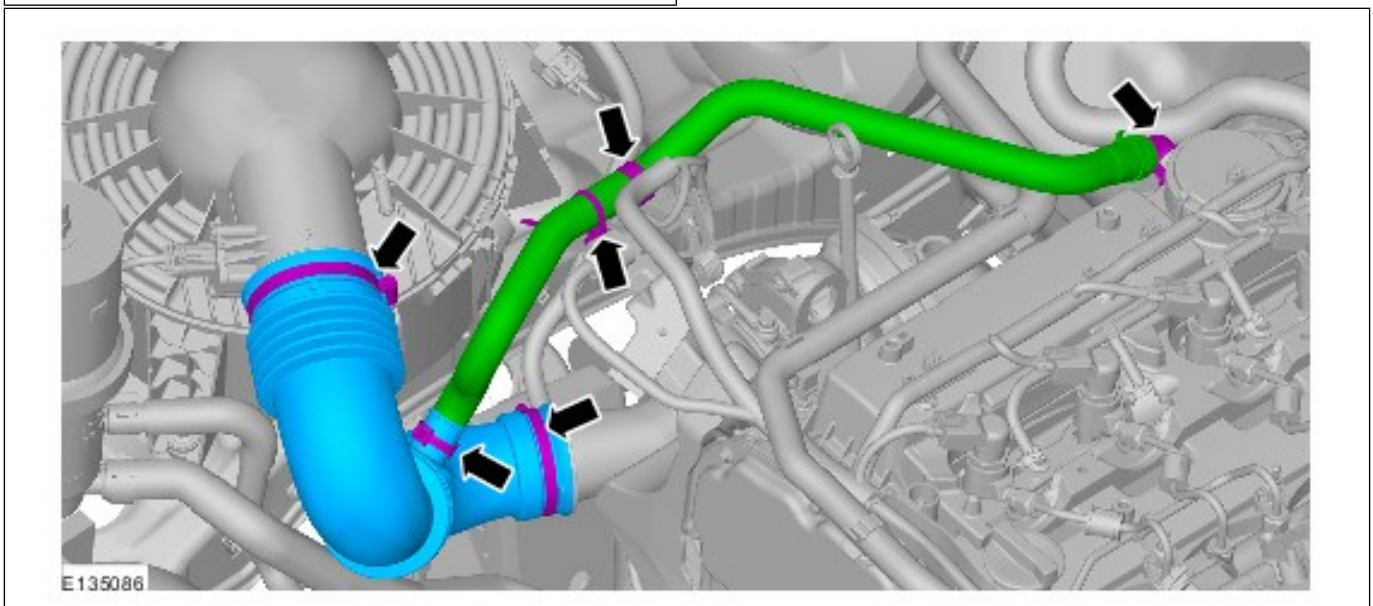
30. Refer to: [Condenser - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma/3.2L Duratorq-TDCi \(148kW/200PS\) - Puma](#) (412-01 Climate Control, Removal and Installation).

31. Refer to: [Radiator](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

32. Refer to: [Cooling Fan Motor and Shroud](#) (303-03 Engine Cooling - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, Removal and Installation).

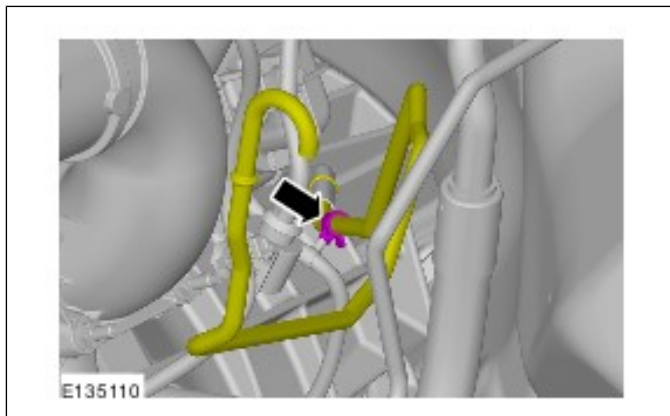
33. Refer to: [Air Cleaner - 2.2L Duratorq-TDCi \(88kW/120PS\) - Puma/2.2L Duratorq-TDCi \(96kW/130PS\) - Puma/2.2L Duratorq-TDCi \(110kW/150PS\) - Puma](#) (303-12 Intake Air Distribution and Filtering - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).

34.

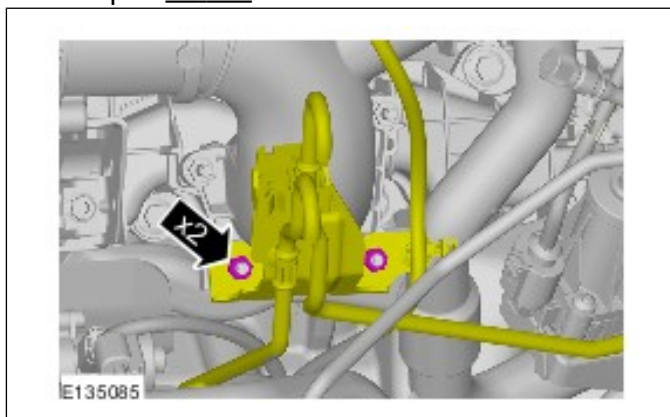


INSTALLATION

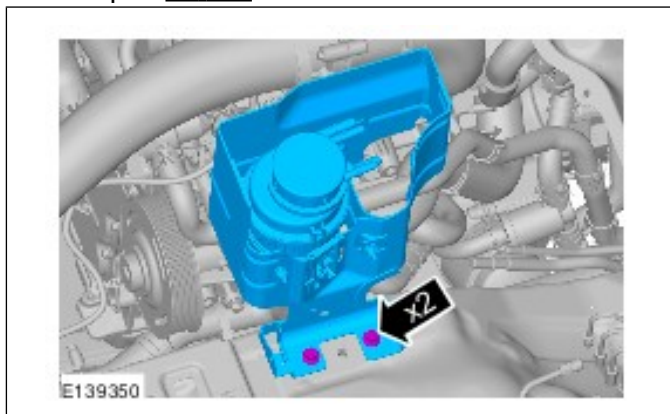
35.



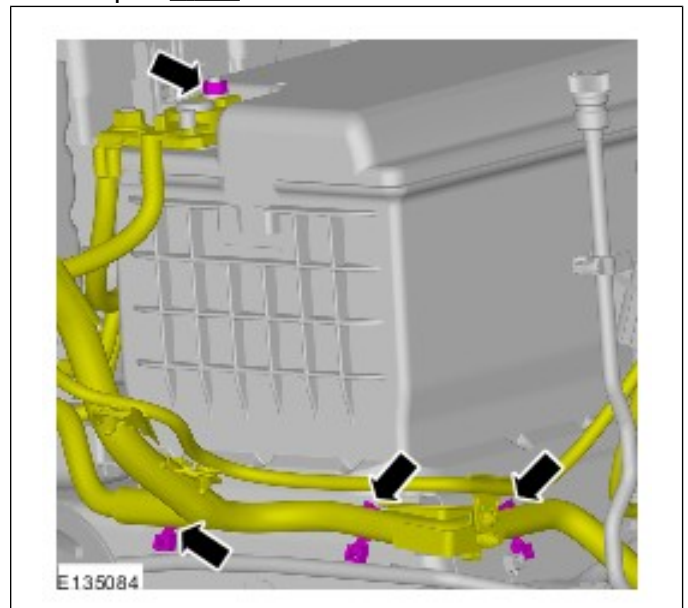
36. Torque: 10 Nm



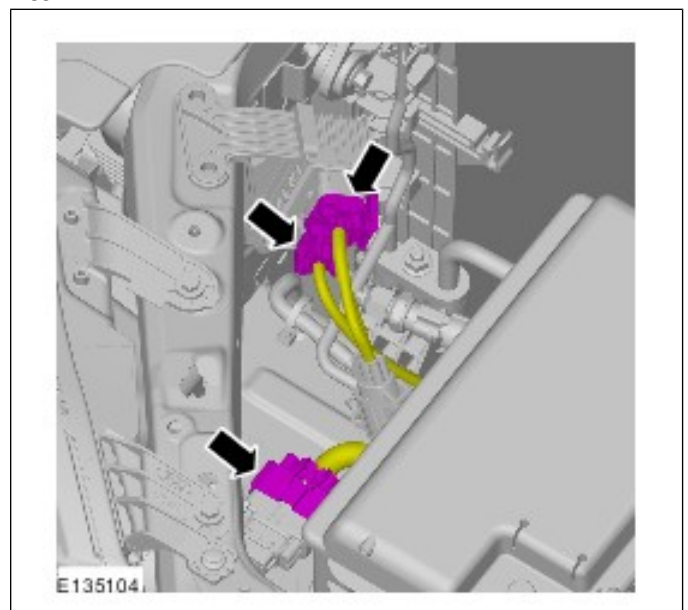
37. Torque: 18 Nm



38. Torque: 5 Nm

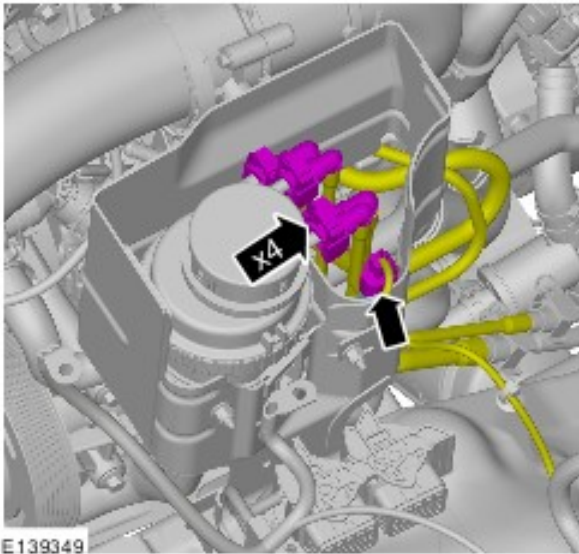


39.



INSTALLATION

40.

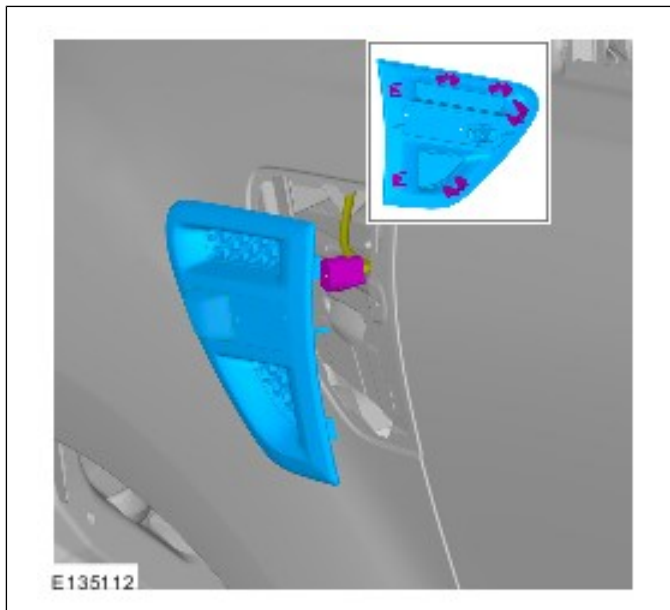


41. Refer to: [Powertrain Control Module \(PCM\)](#) (303-14 Electronic Engine Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma, Removal and Installation).
42. Refer to: [Battery Tray](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
43. Refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
44. Torque: 10 Nm

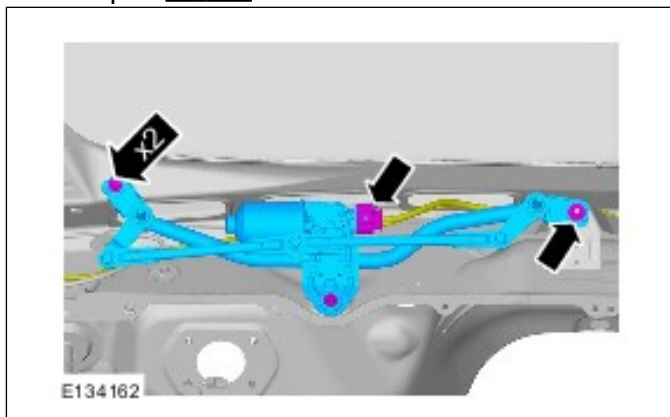


INSTALLATION

45. On both sides.

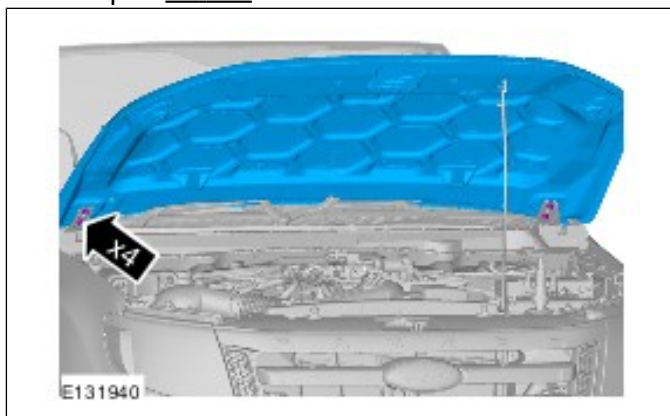


46. Torque: 10 Nm

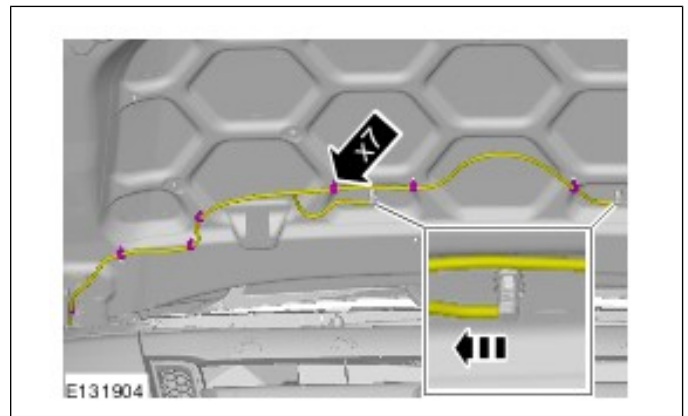


47. Refer to: [Cowl Panel Grille](#) (501-02 Front End Body Panels, Removal and Installation).

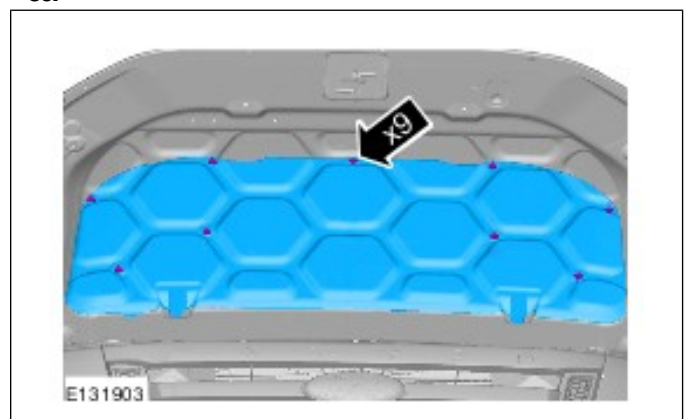
48. Torque: 25 Nm



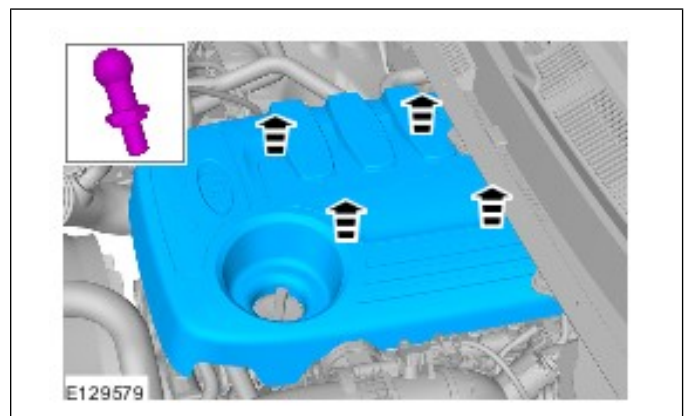
49.



50.



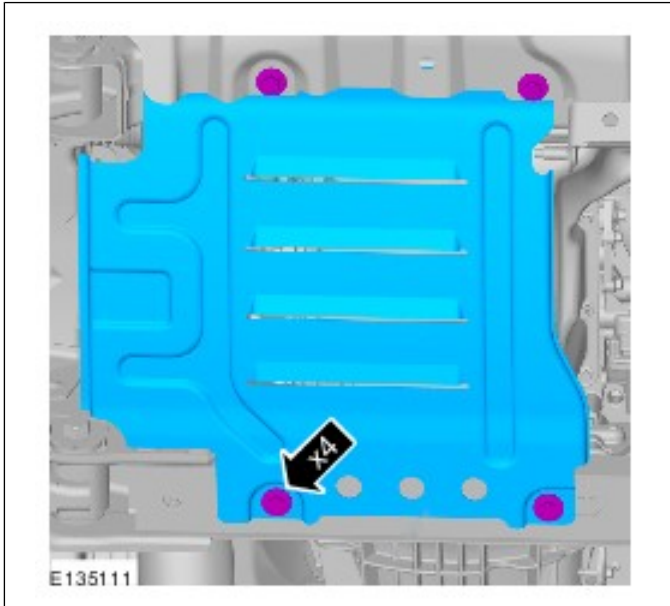
51.



INSTALLATION

52. Refer to: [Lifting](#) (100-02 Jacking and Lifting, Description and Operation).

53. Torque: 30 Nm



54. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

55. Refer to: [Cooling System Draining, Filling and Bleeding](#) - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma/3.2L Duratorq-TDCi (148kW/200PS) - Puma (303-03 Engine Cooling - 3.2L Duratorq-TDCi (148kW/200PS) - Puma, General Procedures).

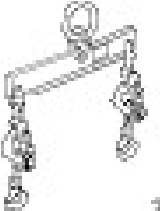


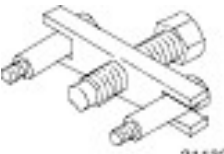
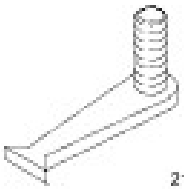

56. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

INSTALLATION

Engine Accessories(21 139 4)

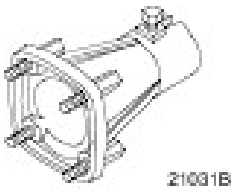
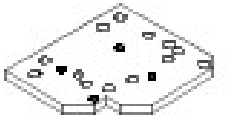
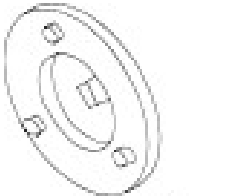
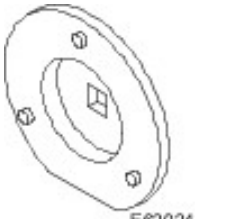
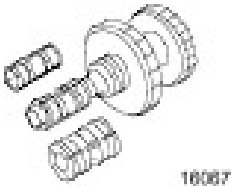
Installation

Special Tool(s) / General Equipment

 <p>210854</p>	<p>303-122 Lifting Bracket, Engine</p>
 <p>E87 614</p>	<p>303-1310 Holding Wrench, Crankshaft</p>
 <p>E 753 78</p>	<p>303-1317 Locking Tool, Fuel Injection Pump Sprocket</p>
 <p>21132</p>	<p>303-249 Remover, Crankshaft Timing Pulley</p>
 <p>21126</p>	<p>303-254 Locking Tool, Flywheel</p>
 <p>21187</p>	<p>303-435 Mounting Stand</p>

INSTALLATION

Special Tool(s) / General Equipment

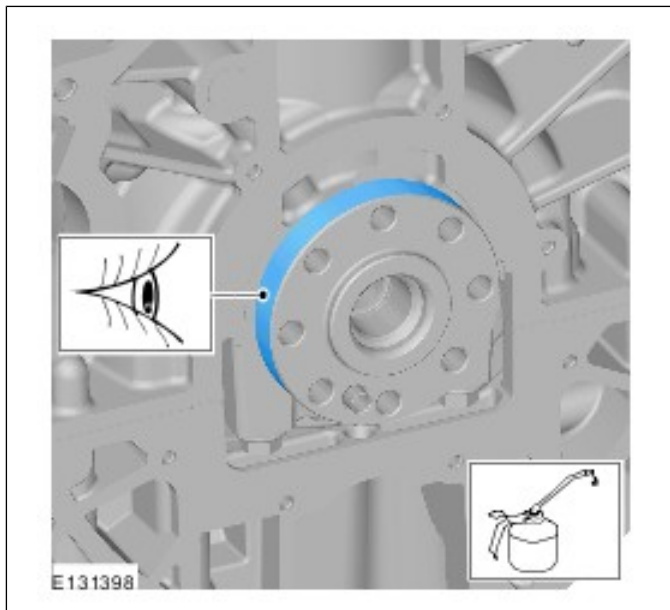
 21031B	303-435-06 Mounting Bracket for 303-435
 E68388	303-435-11B Mounting Plate for 303-435-06
 303679	303-679 Remover/Installer, Engine Front Cover Inspection Plate
 E62024	303-679A Remover/Installer, Engine Front Cover Inspection Plate
 16067	308-204 Aligner, Clutch Disc
1/2 Inch Square Drive Breaker Bar	
Dowel with a Diameter of 6 mm	

Materials

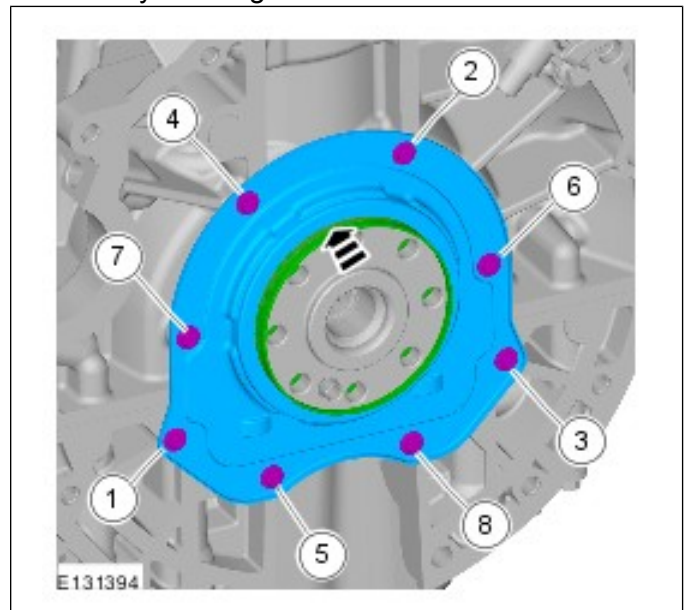
Name	Specification
Silicone Sealant LB 2U7J-M4G323-AA	WSE-M4G323-A4
Silicone Gasket and Sealant TA-30	

INSTALLATION

1.



Initially hand tighten the fasteners.

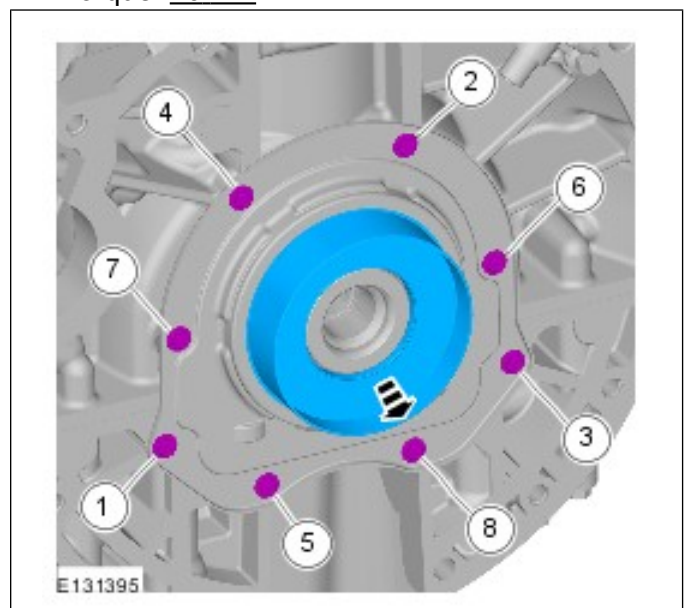
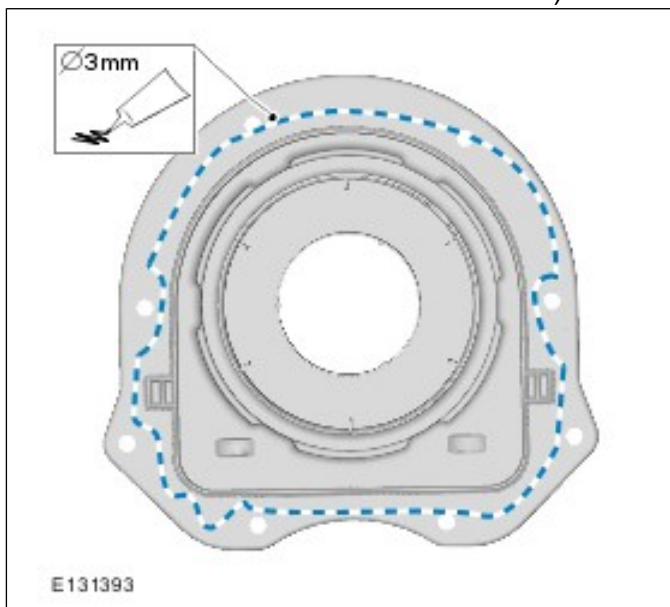


2. **NOTE:** Install the new crankshaft rear seal carrier within five minutes of applying the recommended sealant.

Material: sealant WSE-M4G323-A4 (Silicone Sealant LB / 2U7J-M4G323-AA; Silicone Gasket and Sealant / TA-30)

4. **NOTE:** New crankshaft rear seal carriers are supplied with an alignment sleeve which must be removed after installation.

Torque: 10 Nm

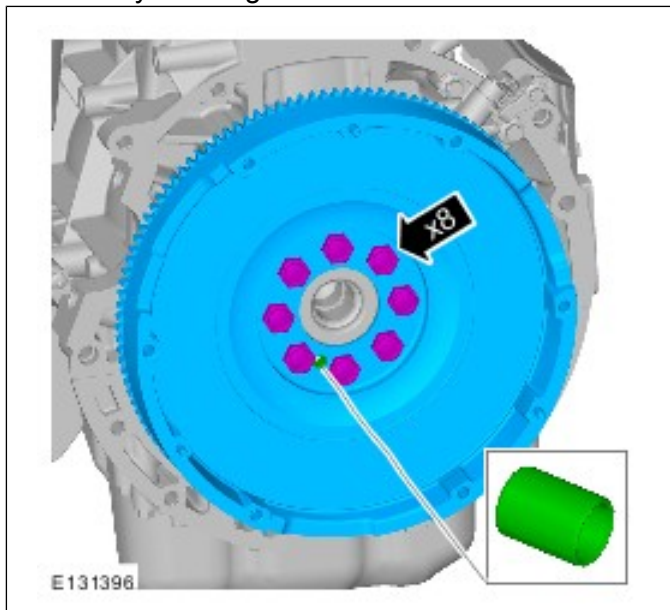


3. **CAUTION:** A new crankshaft rear seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft rear seal is fully installed. Failure to follow this instruction may result in damage to the vehicle.

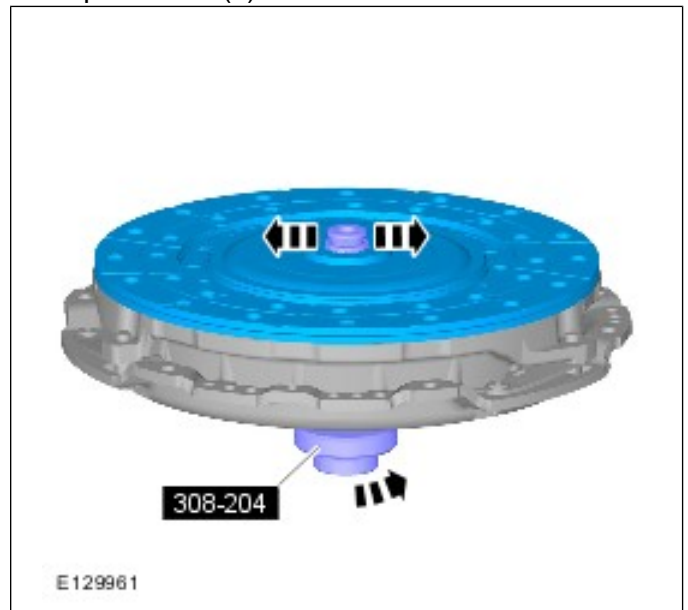
5. **NOTE:** Make sure that the flywheel is in full contact with the crankshaft flange before installing the flywheel bolts.

INSTALLATION

Initially hand tighten the fasteners.



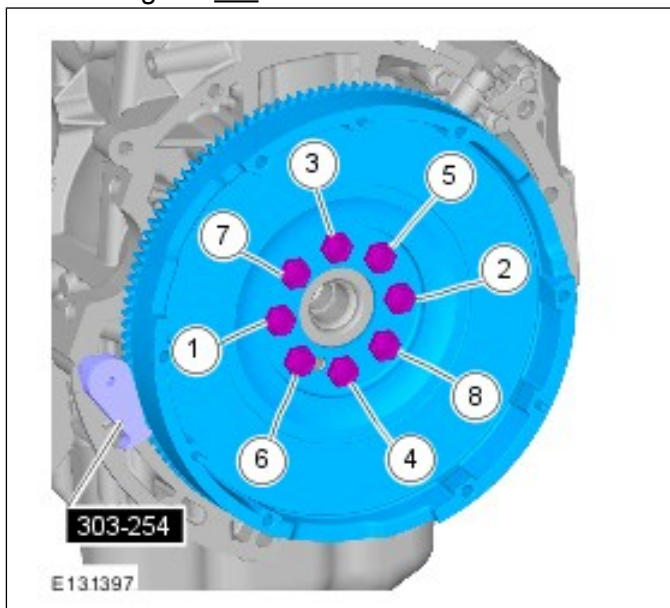
Special Tool(s): 308-204



6. Special Tool(s): 303-254

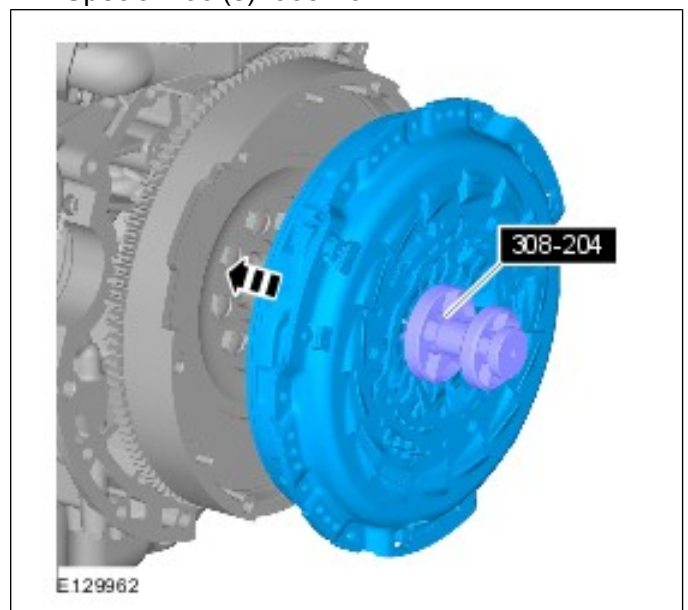
Torque:

- Stage 1: 15 Nm
- Stage 2: 30 Nm
- Stage 3: 75 Nm
- Stage 4: 45°



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

Special Tool(s): 308-204



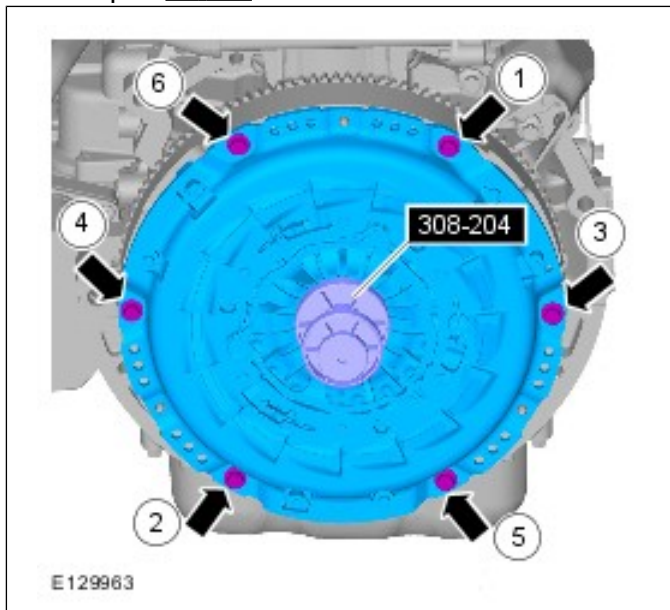
7. **NOTE:** The cone on the special tool must only be tightened finger tight to prevent damage to the clutch disc.

9. **CAUTION:** Tighten the clutch pressure plate retaining bolts by two turns at a time in the sequence shown.

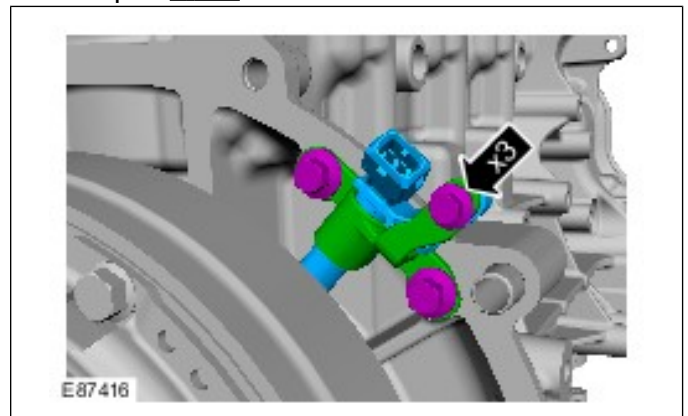
Special Tool(s): 308-204

INSTALLATION

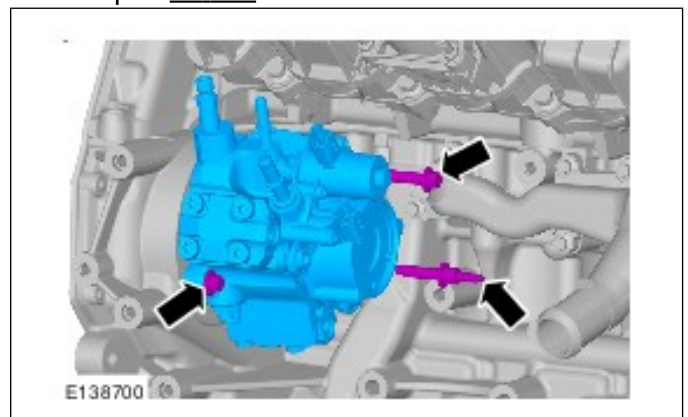
Torque: 45 Nm



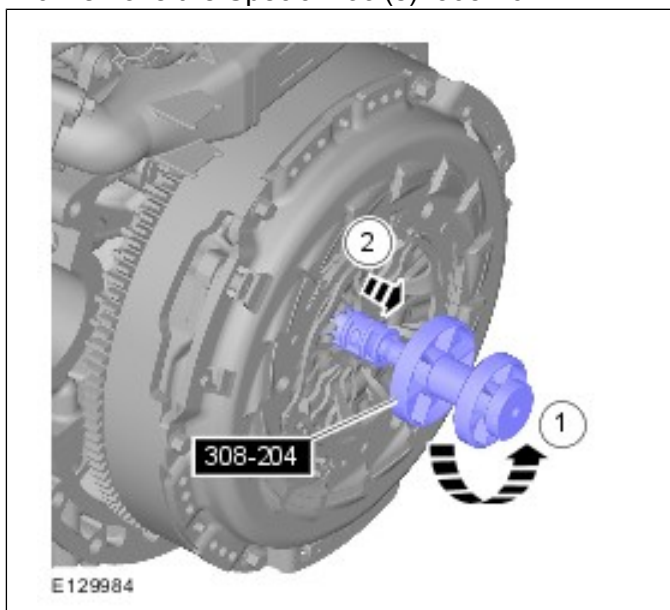
Torque: 7 Nm



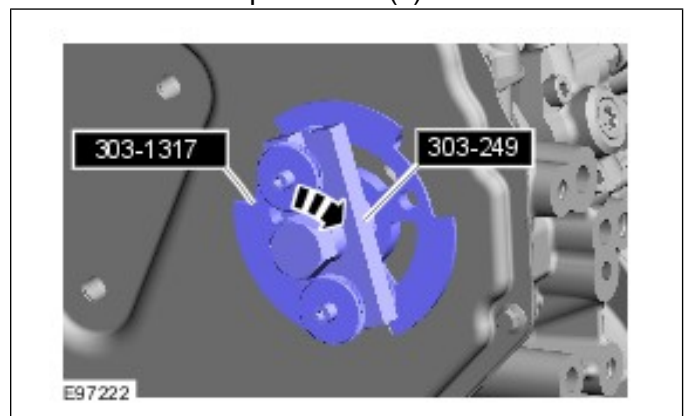
12 Torque: 25 Nm



10. Remove the Special Tool(s): 308-204



13. Remove the Special Tool(s): 303-249

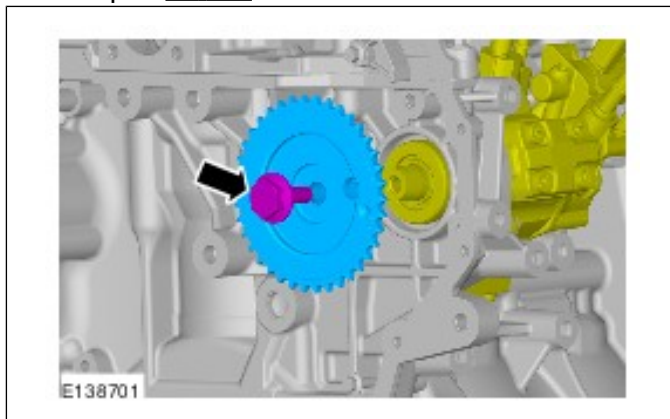


11. **NOTE:** Make sure that a new component is installed.

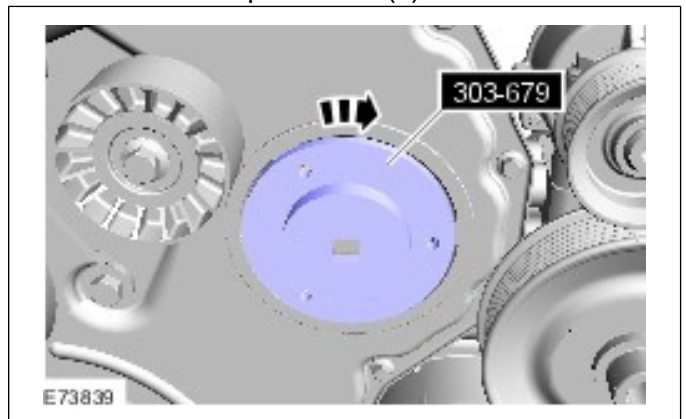
14. **NOTE:** Make sure that a new component is installed.

INSTALLATION

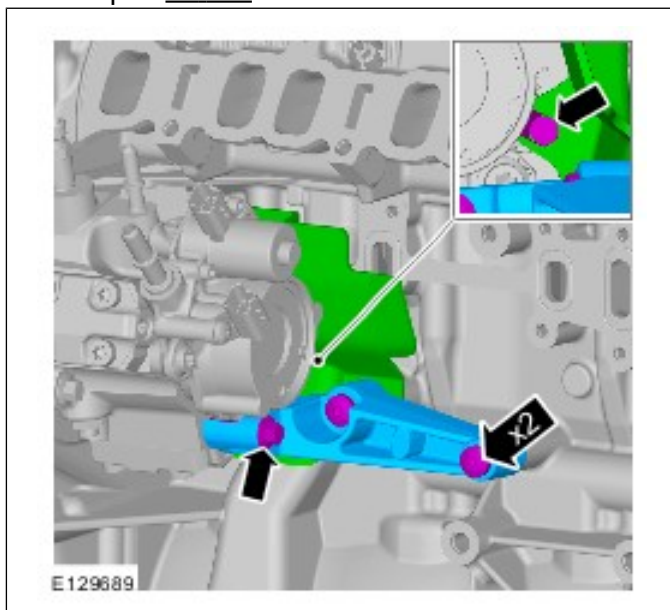
Torque: 45 Nm



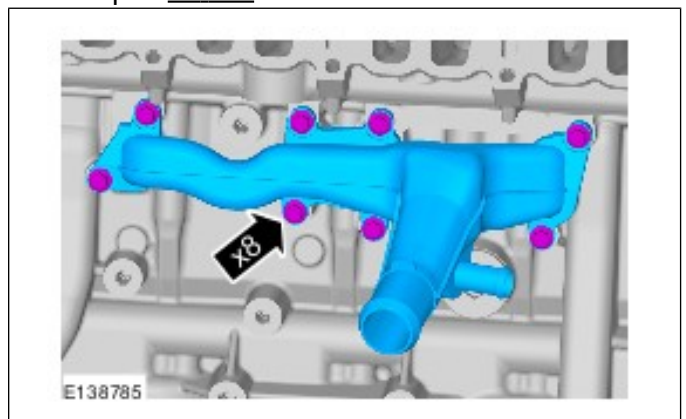
17. Remove the Special Tool(s): 303-679



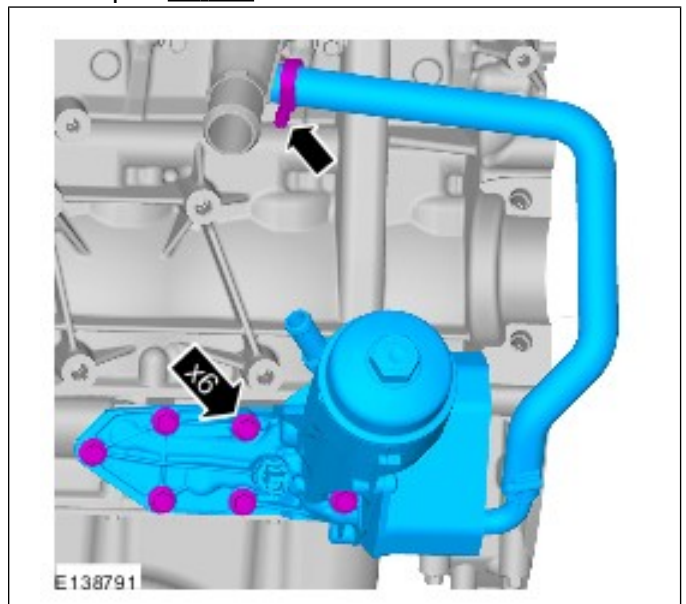
15. Torque: 22 Nm



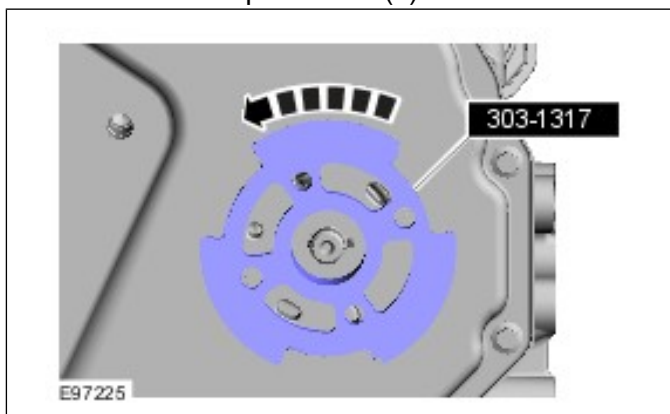
18. Torque: 12 Nm



19. Torque: 23 Nm

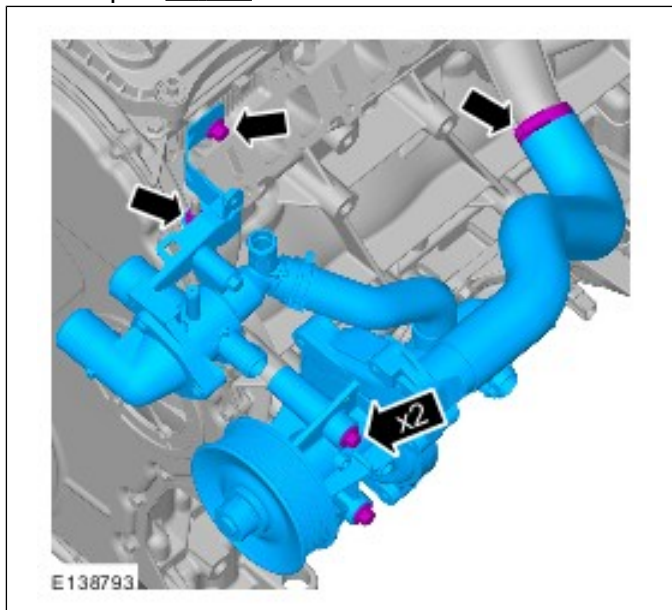


16. Remove the Special Tool(s): 303-1317



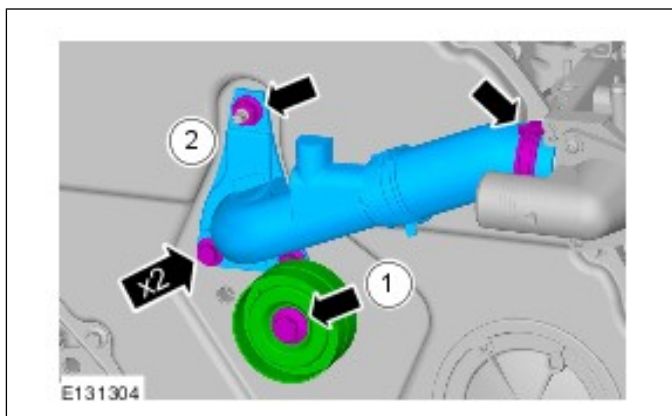
INSTALLATION

20. Torque: 23 Nm

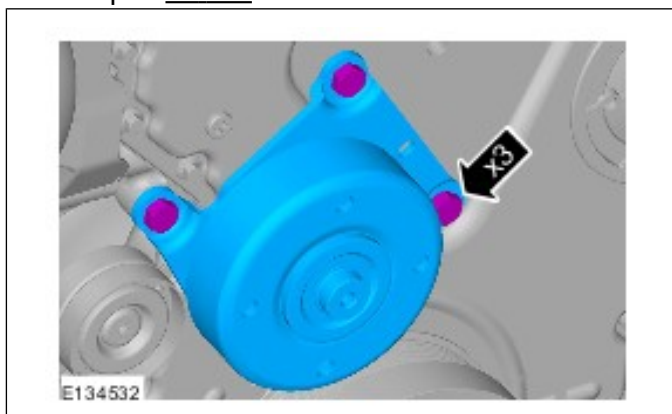


21. 1. Torque: 48 Nm

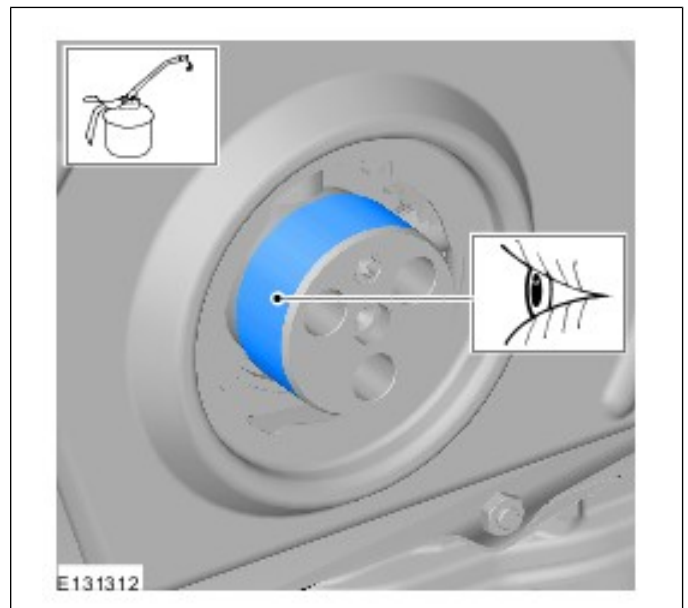
2. Torque: 23 Nm



22. Torque: 48 Nm



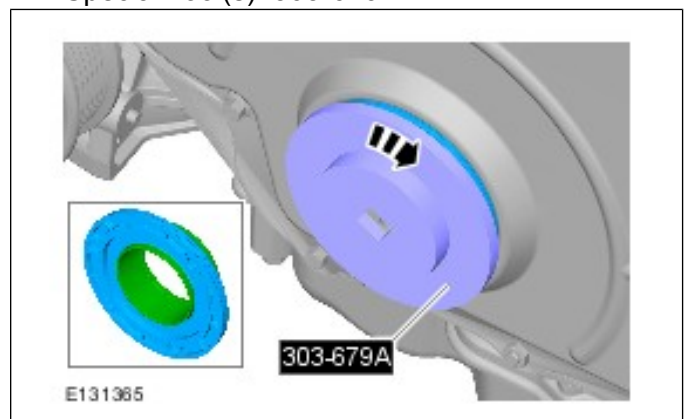
23. **NOTE:** Make sure that the mounting face is clean and lubricated.



24. **CAUTION:** Rotate the seal assembly until it locks. Failure to follow this instruction may result in damage to the seal assembly.

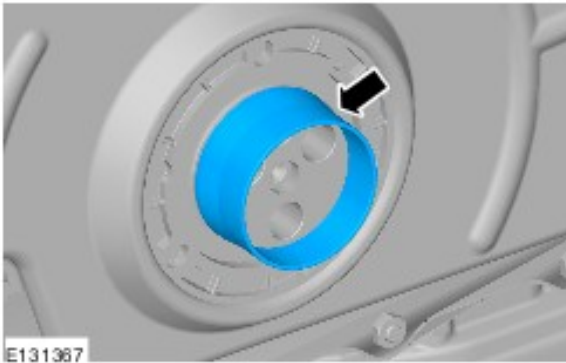
NOTE: A new crankshaft front seal carrier is supplied with an alignment sleeve that must not be removed until the crankshaft rear seal is fully installed.

Special Tool(s): 303-679A



INSTALLATION

25. Remove the alignment sleeve after the seal is fully installed.



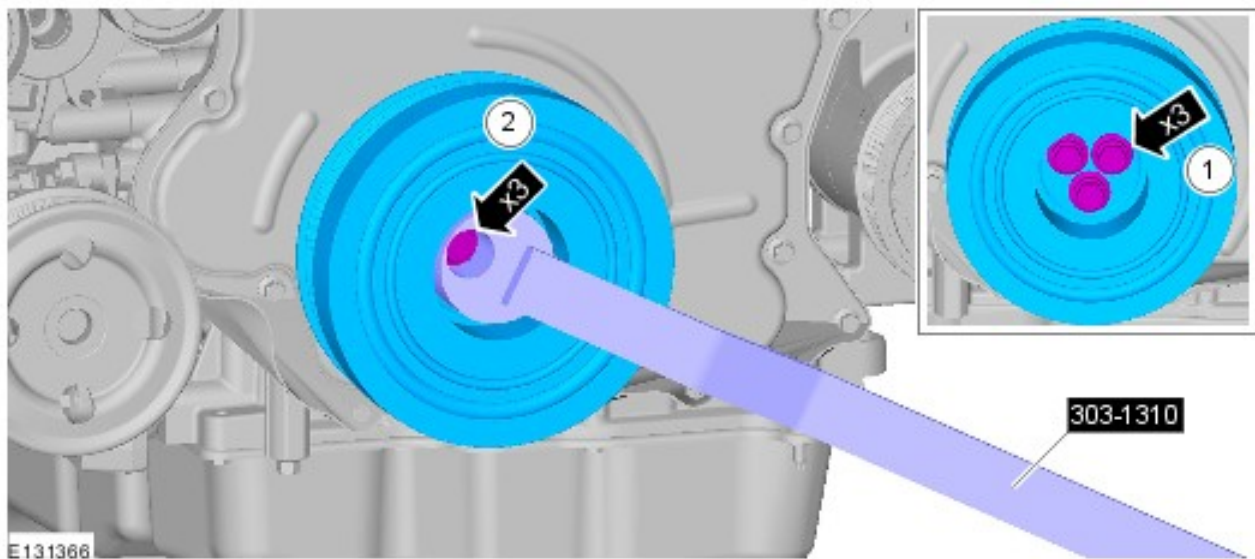
26. **CAUTION:** Crankshaft pulley retaining bolts must only be used three times.

NOTE: Initially hand tighten the fasteners.

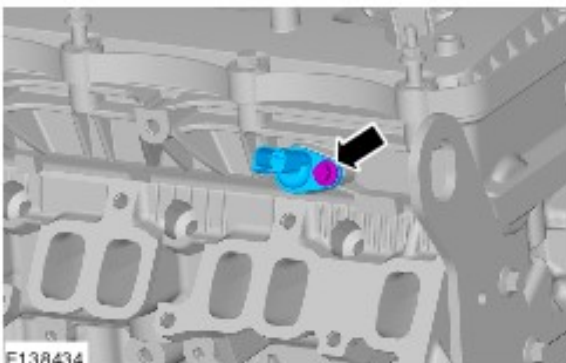
Special Tool(s): 303-1310

Torque:

- Stage 1: 45 Nm
- Stage 2: 120°

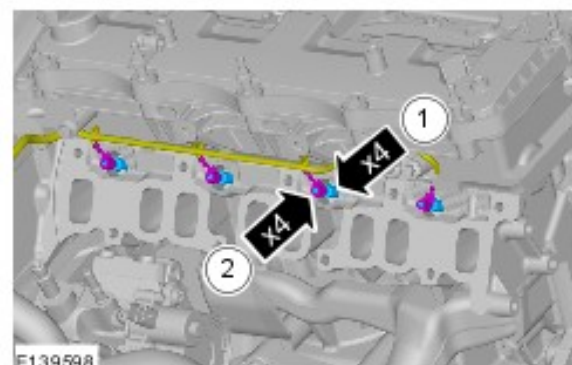


27. Torque: 9 Nm



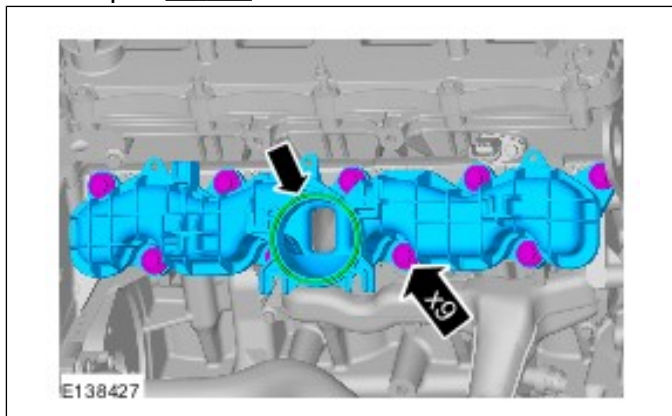
28. 1. Torque: 13 Nm

2. Torque: 3 Nm

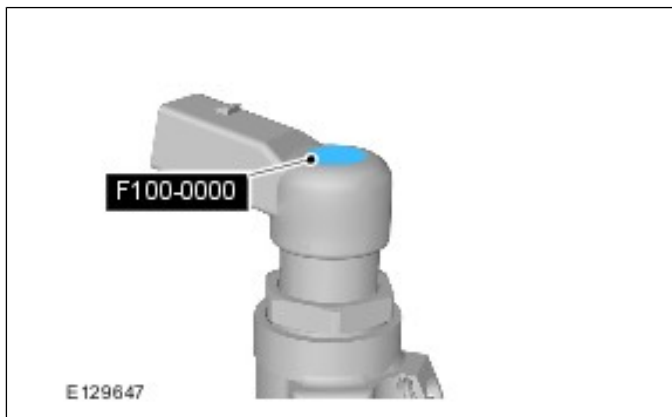


INSTALLATION

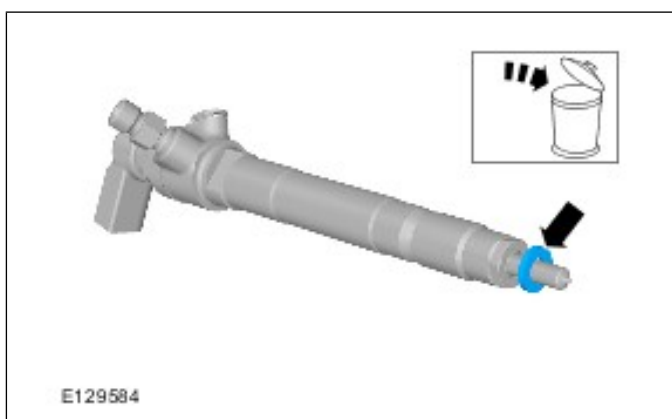
29. Torque: 10 Nm



30. Record the new fuel injector correction factor code.



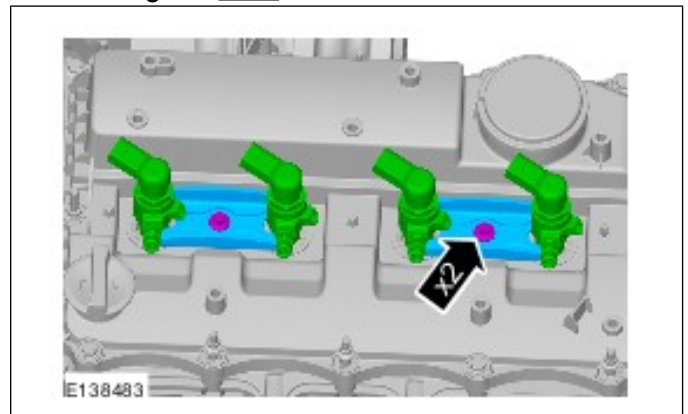
31. **NOTE:** Using a socket (or similar), press the new fuel injector copper seals onto the fuel injectors making sure that the copper seals are pushed fully home to prevent uneven clamping.



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

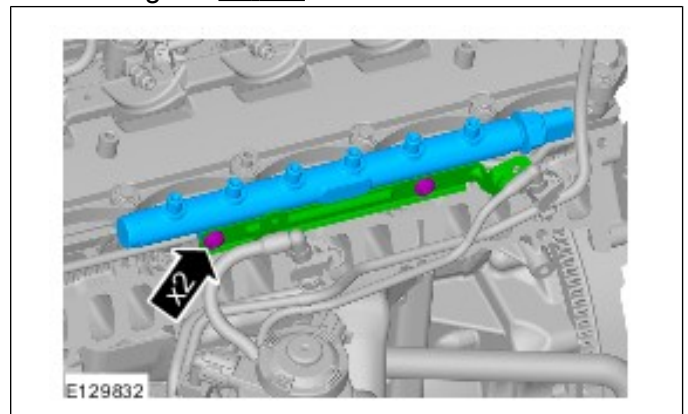
Torque:

- Stage 1: 5 Nm
- Stage 2: 180°



33. Torque:

- Stage 1: 6 Nm
- Stage 2: 23 Nm



34. **CAUTIONS:**

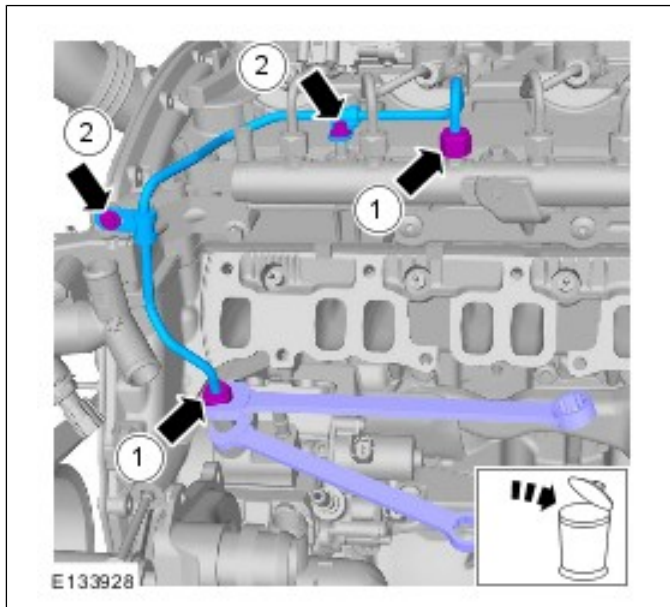
- ⚠ Make sure that the fuel line remains in contact at both ends until both unions nuts have been unscrewed and the area around the joints thoroughly cleaned.
- ⚠ Make sure that all openings are sealed. Use new blanking caps.

INSTALLATION

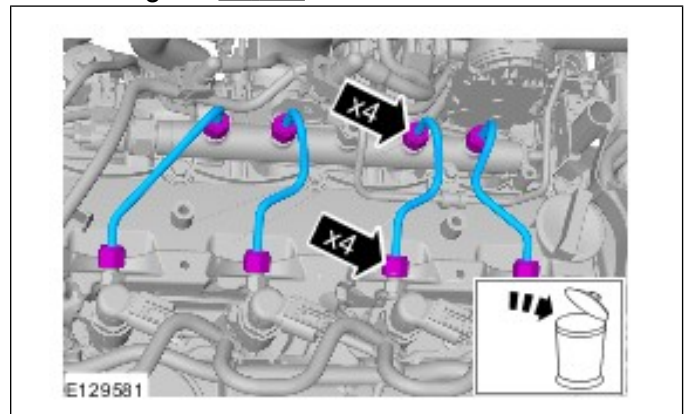
NOTE: Vacuum foreign material from the high-pressure fuel supply line, the fuel pump and the fuel rail.

1. Torque:
 - Stage 1: 10 Nm
 - Stage 2: 35 Nm
2. Refer to: [Fuel Injection Component Cleaning](#) (303-04 Fuel Charging and Controls - 2.2L Duratorq-TDCi (88kW/120PS) - Puma/2.2L Duratorq-TDCi (96kW/130PS) - Puma/2.2L Duratorq-TDCi (110kW/150PS) - Puma, General Procedures).

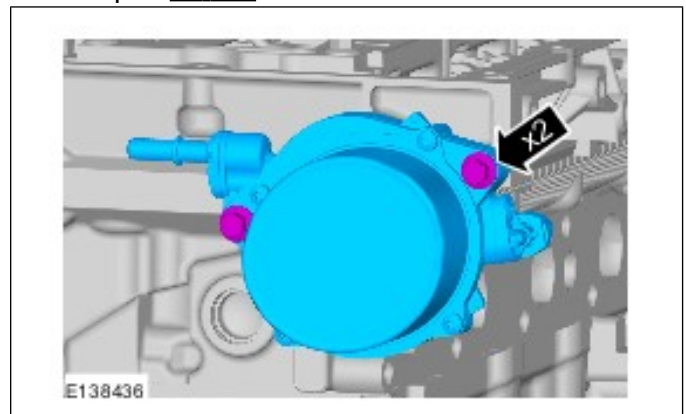
Torque: 12 Nm



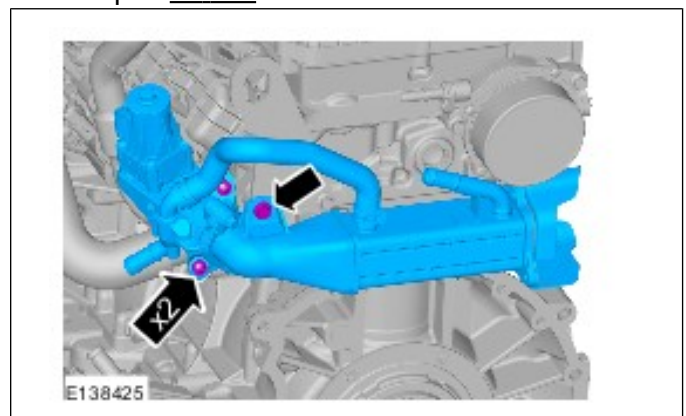
35. Torque:
 - Stage 1: 20 Nm
 - Stage 2: 25 Nm



36. Torque: 22 Nm

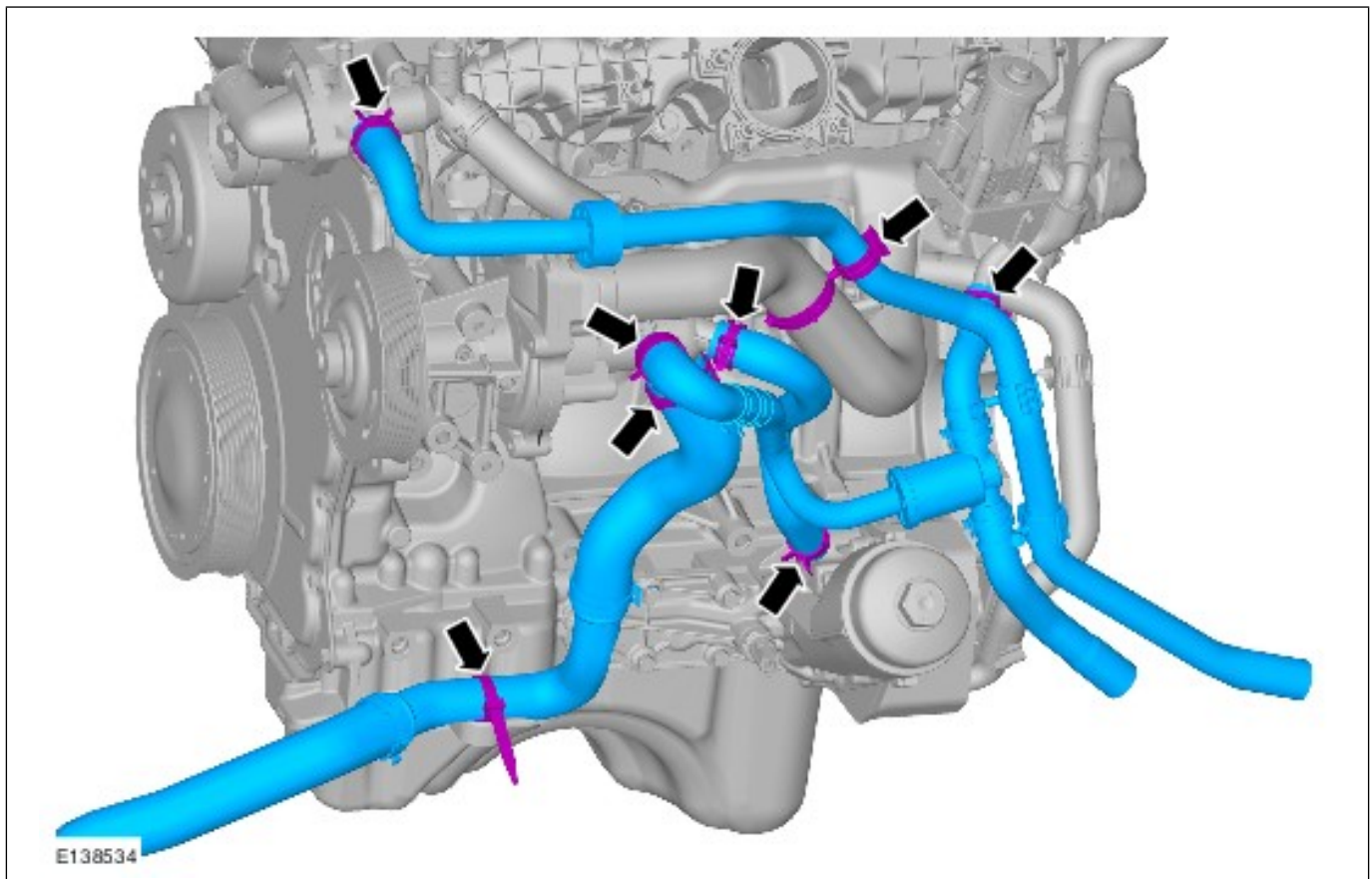


37. Torque: 12 Nm

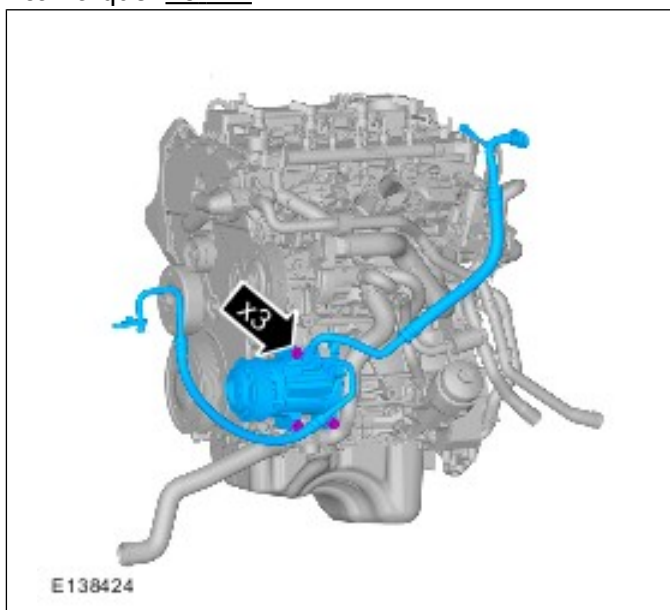


- 38.

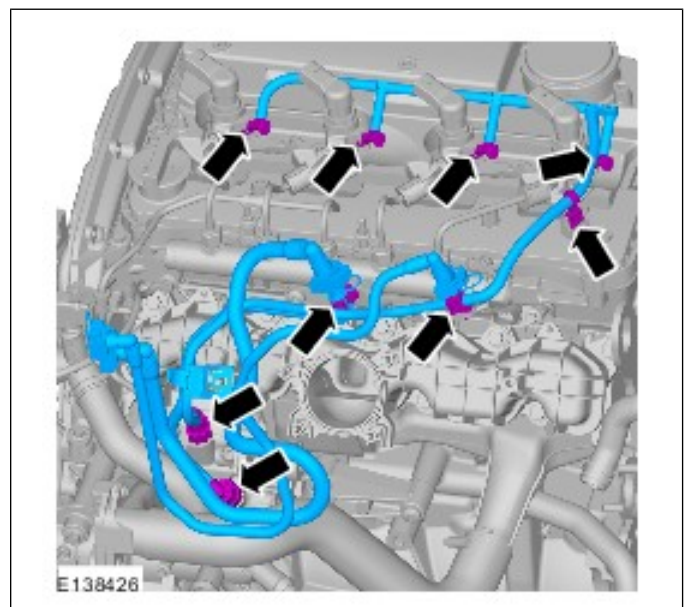
INSTALLATION



39. Torque: 25 Nm

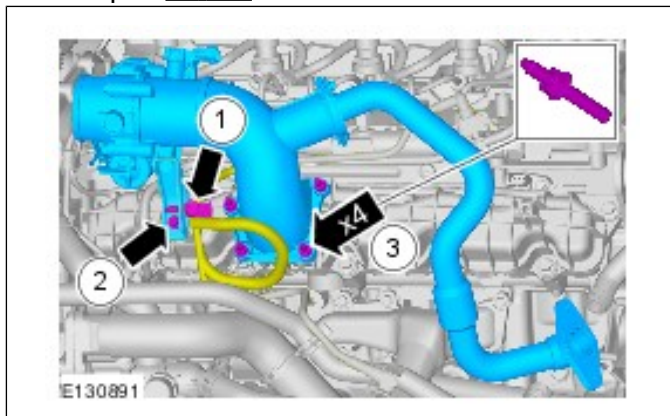


40.  **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.

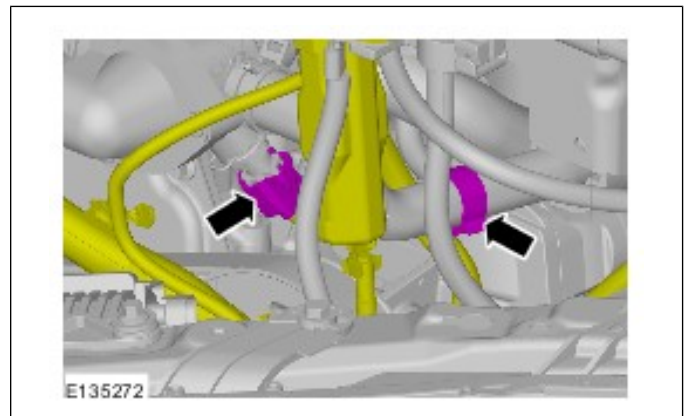


INSTALLATION

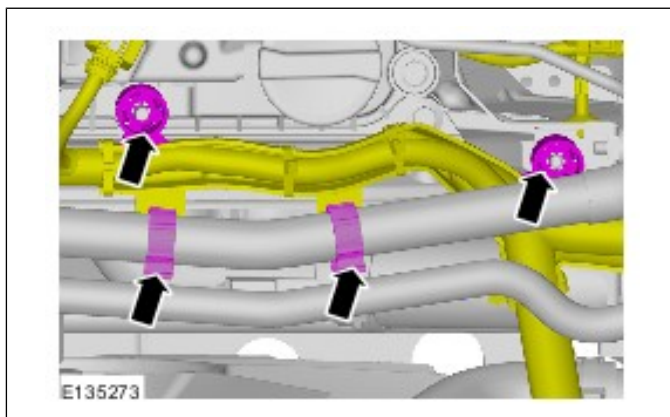
41. Torque: 25 Nm



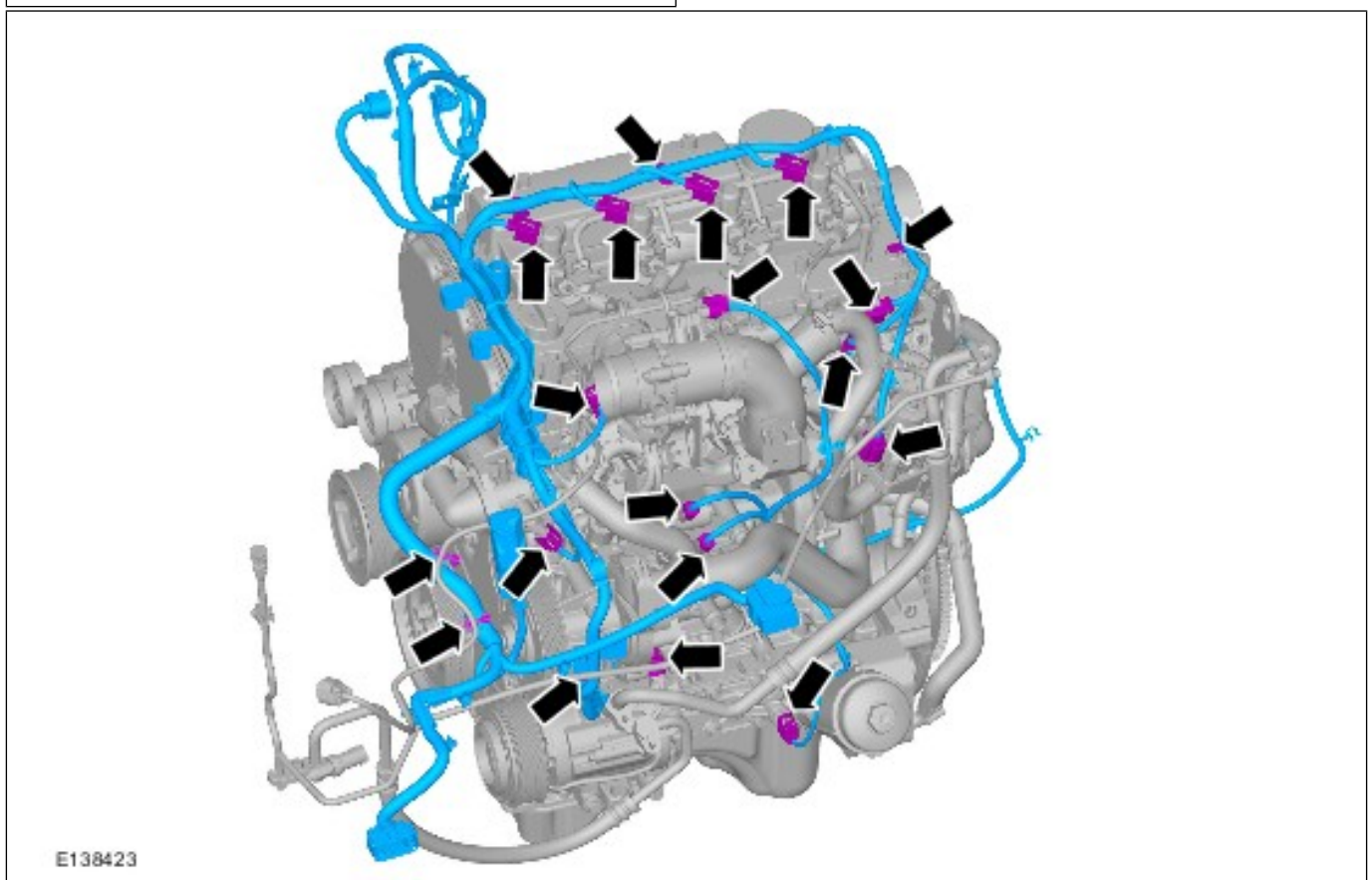
43.



42.

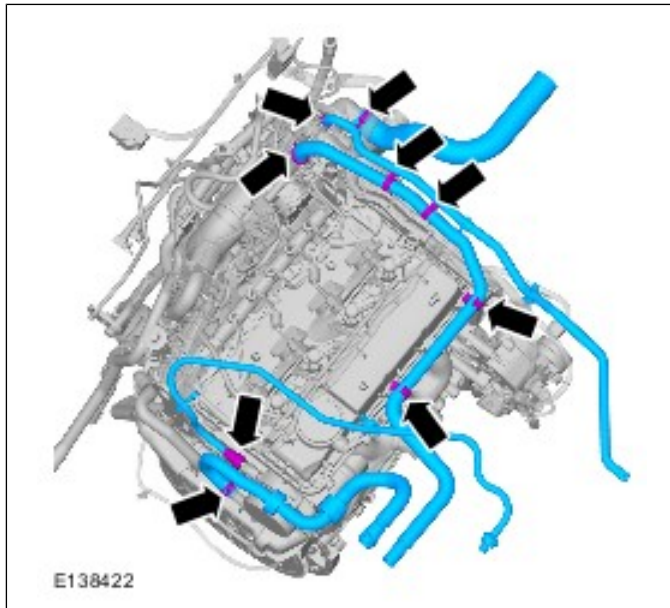


44.



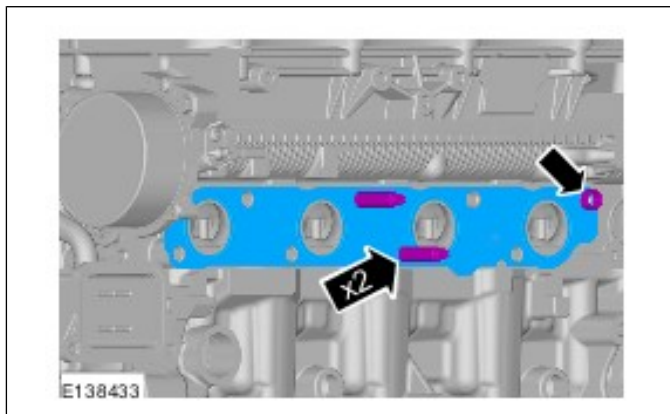
INSTALLATION

45.

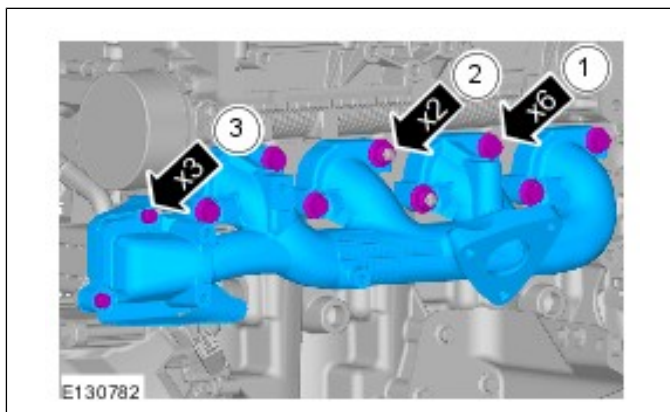


46. NOTE: The gasket is to be reused unless damaged.

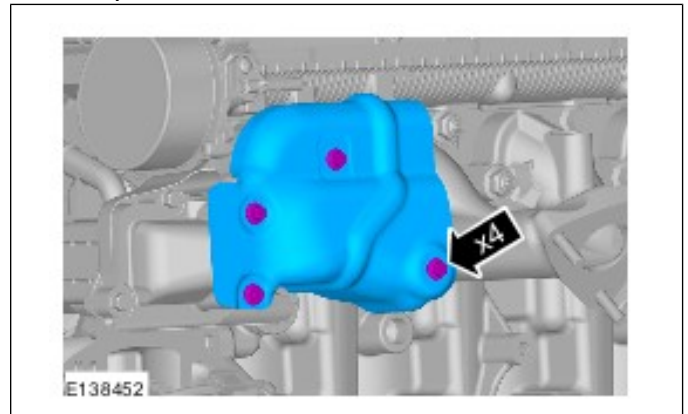
NOTE: The studs are to be reused unless damaged.



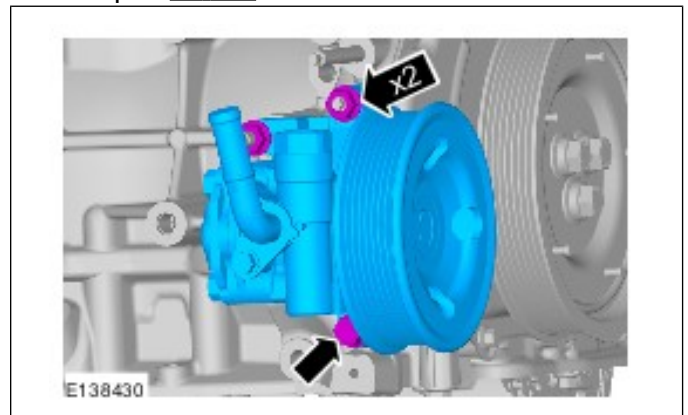
47. 1. Torque: 55 Nm
2. Torque: 40 Nm
3. Torque: 15 Nm



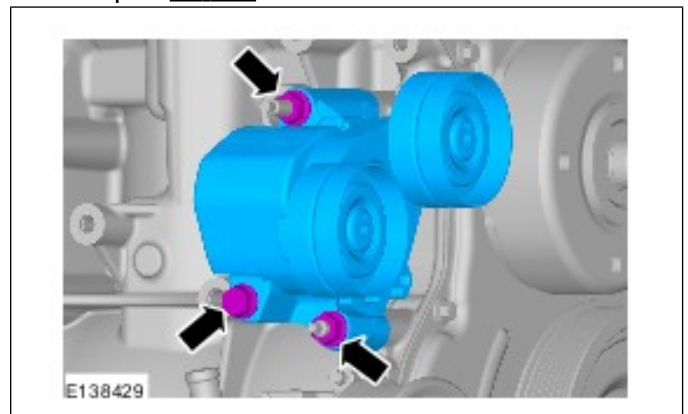
48. Torque: 9 Nm



49. Torque: 25 Nm

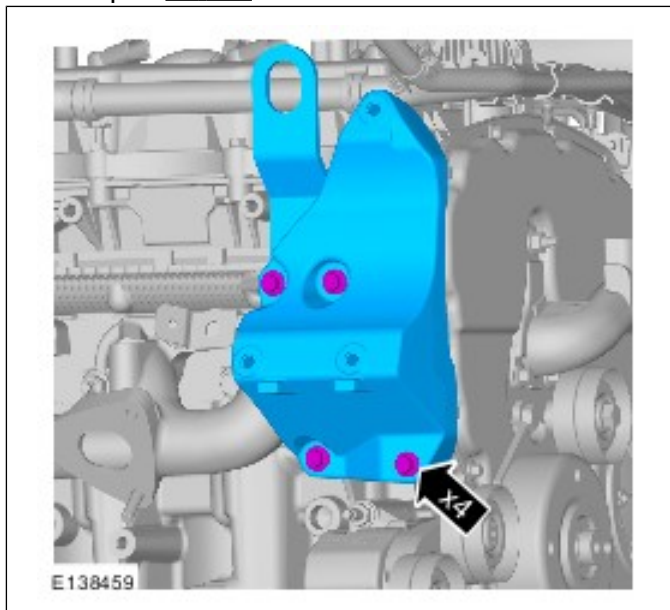


50. Torque: 25 Nm



INSTALLATION

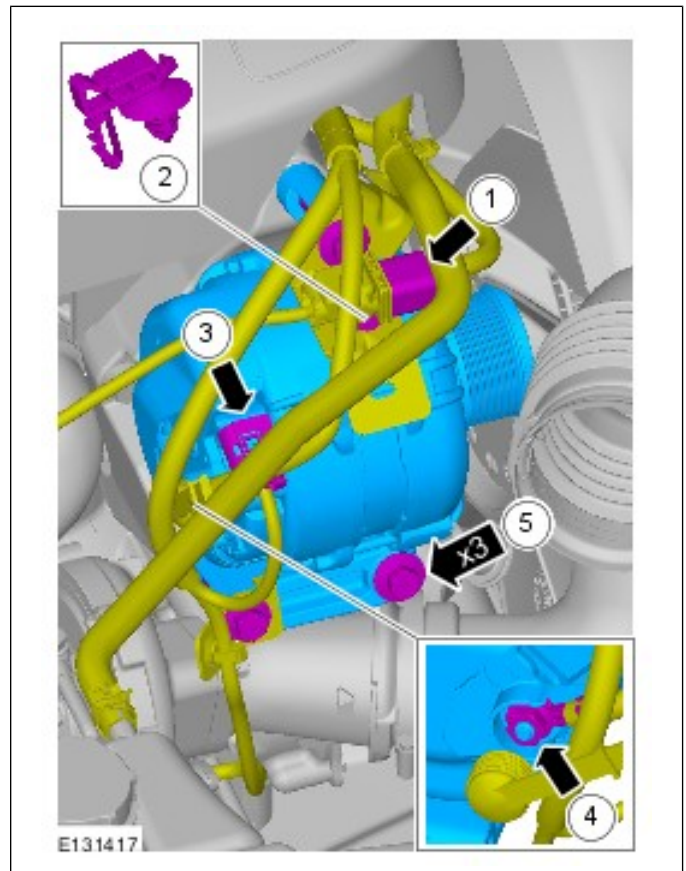
51. Torque: 25 Nm



52. **⚠ CAUTION:** Take extra care not to damage the wiring harnesses.

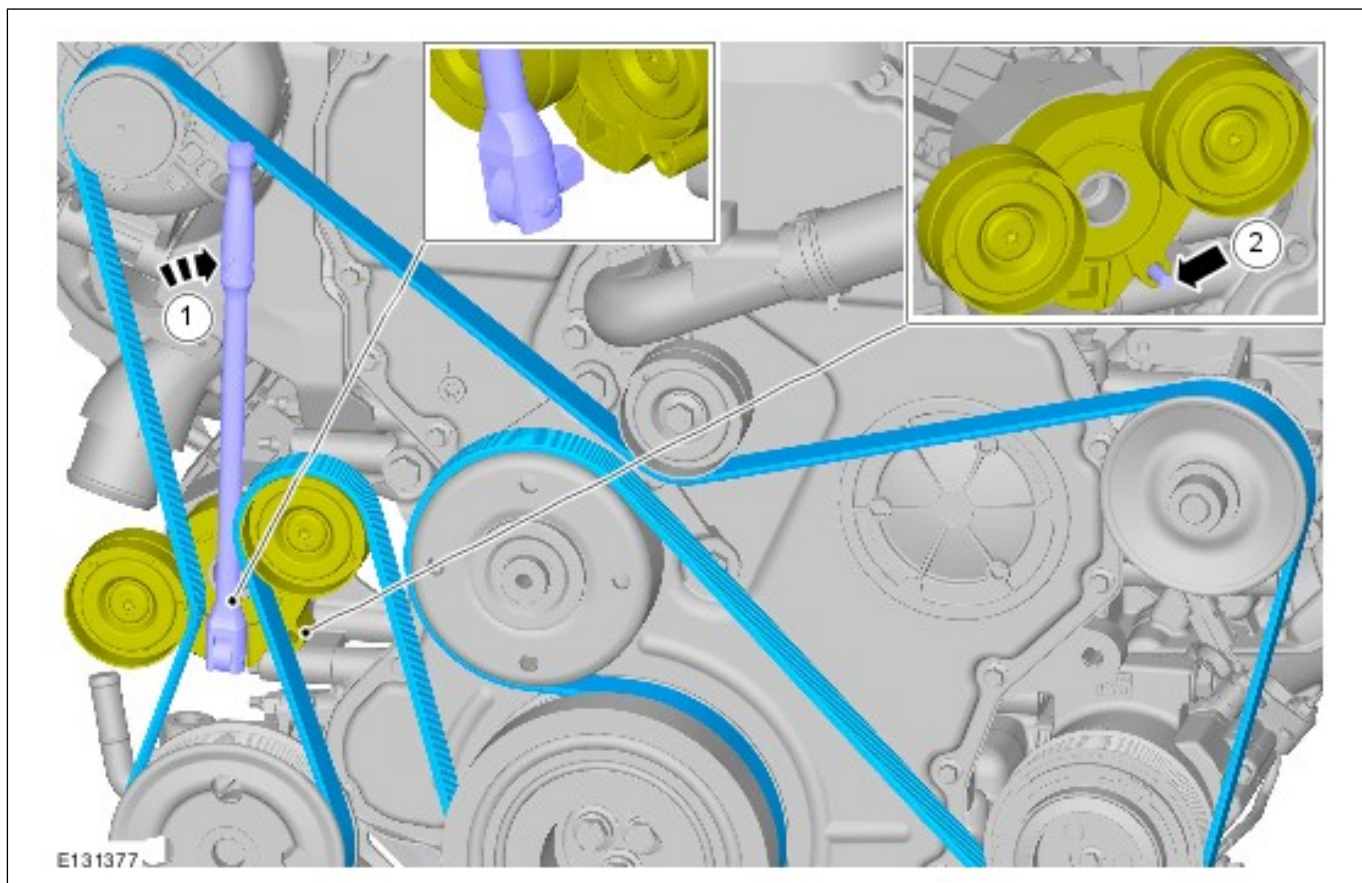
4. Torque: 15 Nm

5. Torque: 48 Nm

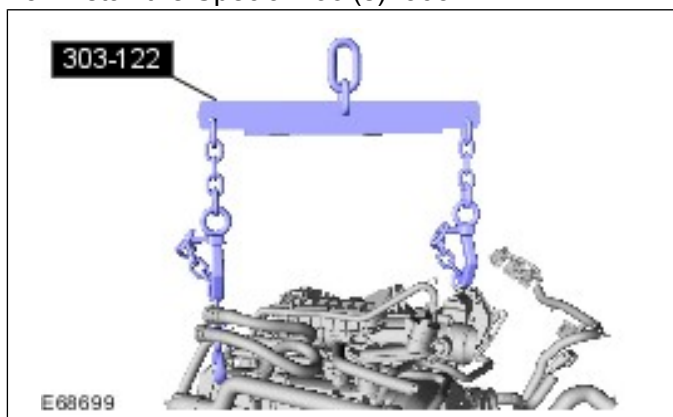


53. General Equipment: 1/2 Inch Square Drive
Breaker Bar
General Equipment: Dowel with a Diameter of
6 mm

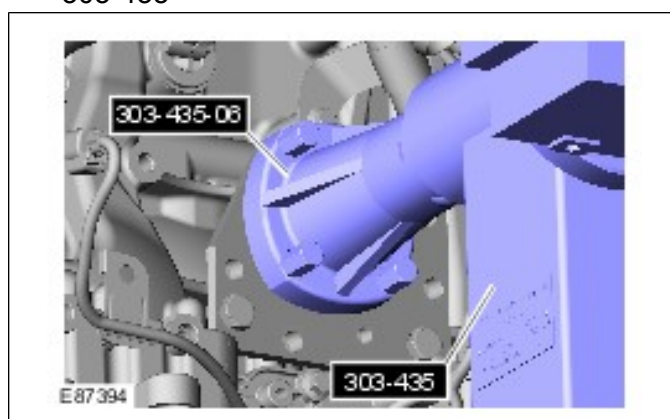
INSTALLATION



54. Install the Special Tool(s): 303-122

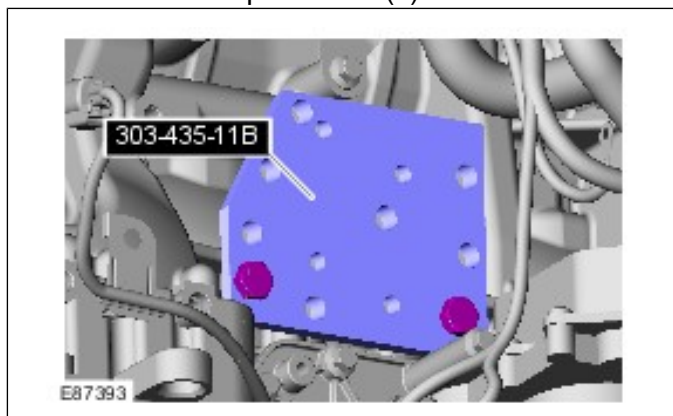


55. Remove the Special Tool(s): 303-435-06, 303-435

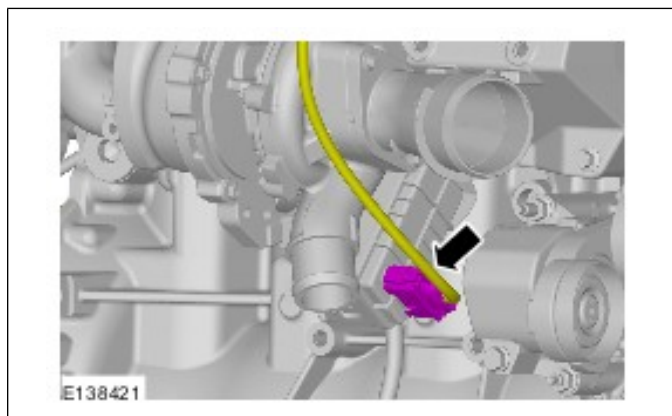


INSTALLATION

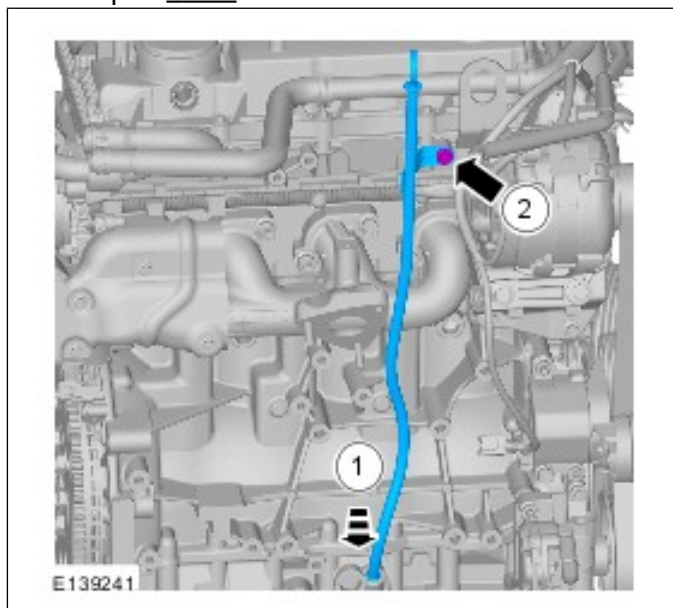
56. Remove the Special Tool(s): 303-435-11B



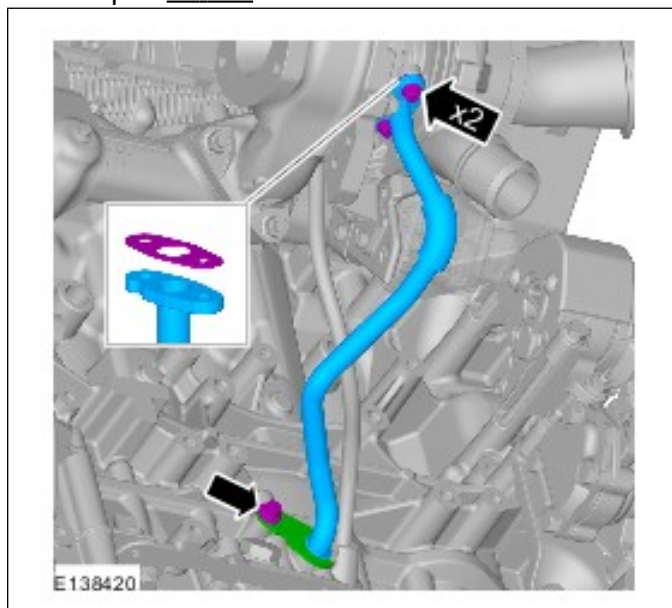
59.



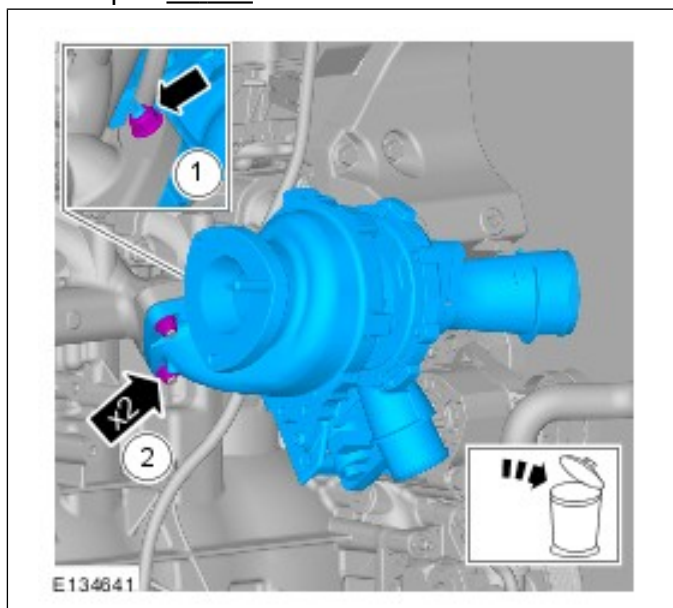
57. Torque: 9 Nm



60. Torque: 10 Nm



58. Torque: 23 Nm



61. 1. Torque: 35 Nm

2. Torque: 32 Nm

