



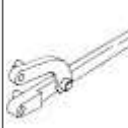


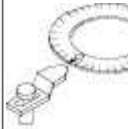
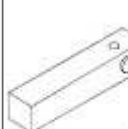
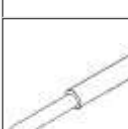

**Engine - 2.0L Duratorq-Di/TDDi (Puma)  
Diesel/2.0L Duratorq-TDCi (Puma)  
Diesel/2.2L Duratorq-TDCi (Puma) Diesel -  
Engine**

Mondeo 2001 (10/2000-02/2007)

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## Assembly

### Special Tool(s)

	Dial Indicator Gauge (Metric) 205-069
	Holding Fixture, Dial Indicator Gauge 205-070
	Universal Flange Holding Wrench 205-072
	Adapter for 205-072 205-072-01
	Gauge, Bolt Angle 303-174
	Setting Gauge, Crankshaft 303-391
	Holding Fixture, Dial Indicator Gauge (Cylinder Liner Protrusion) 303-432
	Timing Tool, Crankshaft 303-675
	Socket, Fuel Injector (21 mm) 303-677

 303678	Aligner, Fuel Injector 303-678
 303679	Remover/Installer Crankshaft Front Oil Seal 303-679
 303682	Aligner, Engine Front Cover 303-682
 303695	Installer, Fuel Injector Seal 303-695
 303698	Timing Tool, Crankshaft 303-698
 303711	Aligner, Fuel Injector 303-711
 3031055	Installer, Fuel Injector Seal 303-1055
 310083	Socket, Fuel Injection Pump 310-083
 E67614	Holding Wrench, Crankshaft 303-1310

### General Equipment

Engine hoist
Steel straight edge
Piston ring compressor
Three 6 mm drill bits


**Materials**


Name	Specification
Engine Oil - 5W-30	WSS-M2C913-A
Silicone Sealant	WSE-M4G323-A4

**Assembly**


All vehicles


**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.

 This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

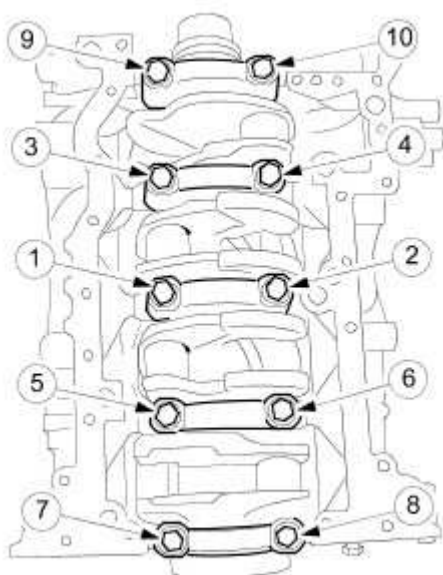
**CAUTIONS:**

 Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines.

 Do not disassemble or clean inside the fuel injection supply manifold, even with an ultrasonic cleaner. Always install a new fuel injection supply manifold and fuel lines when required.

 Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

1. Clean the mating faces of the cylinder head and cylinder block with suitable metal surface cleaner.
2. Coat the crankshaft thrust half-washers with clean [engine oil](#).
3. **NOTE:**The grooves in the crankshaft thrust half-washers must face outwards.  
Install the crankshaft thrust half-washers.
4. Coat the crankshaft and the crankshaft bearing shells with clean [engine oil](#).
5. **NOTE:**Assemble caps with arrows pointing forward. Caps are identified from front to rear, F, 2, 3, 4, R. Install the crankshaft.



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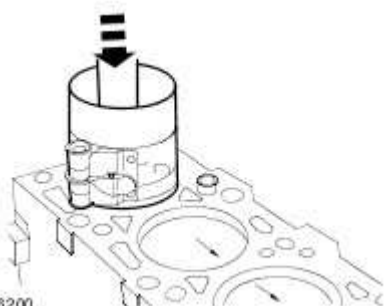
6. **CAUTION:** Crankshaft main bearing cap bolts must only be used four times.  
**NOTE:** Stamp the bolt heads with a center punch to indicate usage.  
 Install the crankshaft main bearing caps.
- Tighten the bolts in three stages in the sequence shown.
  - Stage 1: 45 Nm.
  - Stage 2: 80 Nm.
  - Stage 3: 80 degrees.

7. Coat the cylinder bores with clean **engine oil**.  
 8. Coat the bearing shells with clean **engine oil**.



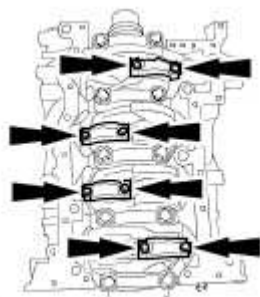
TIE0032673

9. **CAUTION:** The upper and lower bearing shells are of different material. Do not mix the upper and lower bearing shells. Install the bearing shells in the correct order.  
 Install the bearing shells.



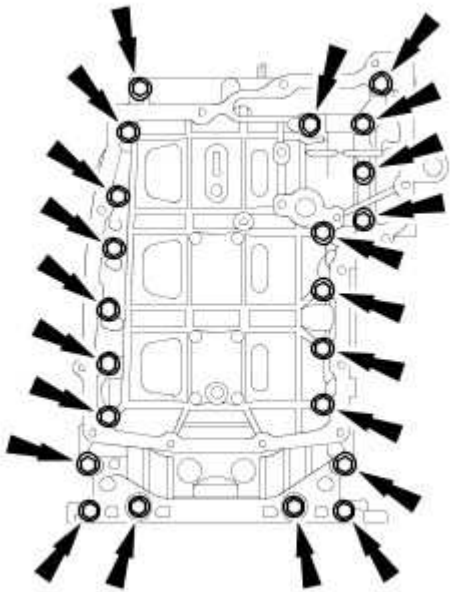
ELE0016200

10. **NOTE:** 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.  
**NOTE:** The arrow on the piston must point to the front to the engine.  
 Using a suitable **piston ring compressor**, install the pistons.



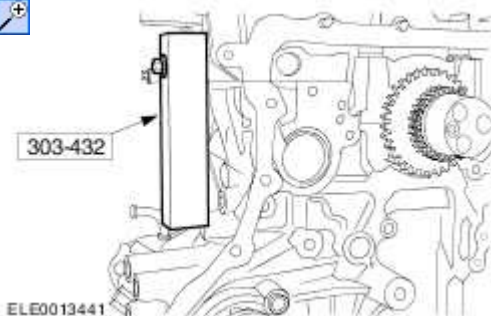
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11. **CAUTION:** Connecting rod bearing cap bolts must only be used four times.  
**NOTE:** Stamp the bolt heads with a center punch to indicate usage.  
**NOTE:** The identification marks on the big-end bearing caps must point to the front of the engine.  
 Install the connecting rod bearing caps.
- Tighten the bolts in two stages.
  - Stage 1: 30 Nm.
  - Stage 2: 80 degrees.



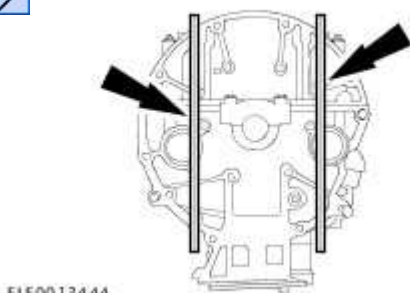
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12. **NOTE:**Install a new ladder frame gasket.  
**NOTE:**Do not fully tighten the ladder frame retaining nuts and bolts at this stage.  
 Install the ladder frame.



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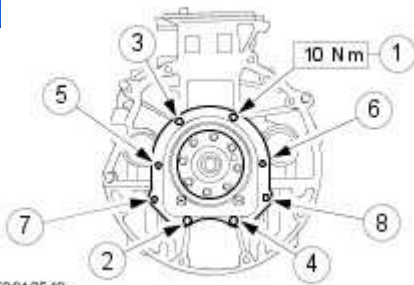
13. **CAUTION:**The ladder frame and the cylinder block must be aligned so that the side clearance does not exceed 0.05 mm overlap to 0.05 mm gap.  
 Using the special tool, align the ladder frame to the cylinder block.



ELE0013444

14. **CAUTION:**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.  
 Using a suitable **steel straight edge**, align the ladder frame to the cylinder block.

15. **CAUTION:**Do not trim the foam part of the ladder frame gasket protruding from the rear face of the cylinder block and ladder frame joint. Failure to follow this instruction may result in oil leaks.  
**NOTE:**Install a new crankshaft rear oil seal carrier and crankshaft rear oil seal carrier retaining bolts.  
**NOTE:**A new crankshaft rear oil seal carrier is supplied with an alignment sleeve that must be removed following installation.  
**NOTE:**Do not fully tighten the crankshaft rear oil seal carrier retaining bolts at this stage.  
 Install the crankshaft rear oil seal carrier.



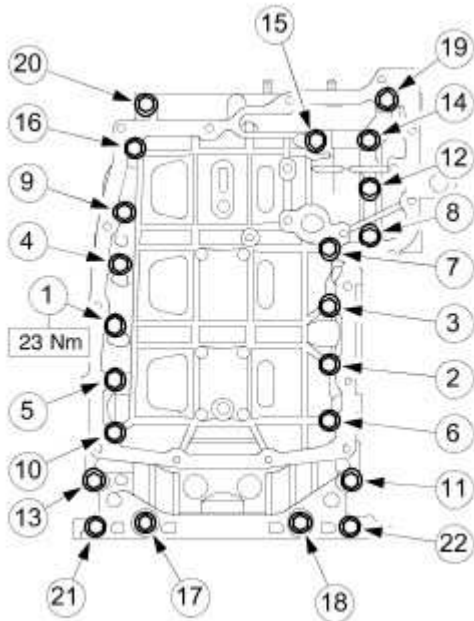
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16. Tighten the crankshaft rear oil seal carrier retaining bolts.

- Tighten the bolts in the sequence shown.

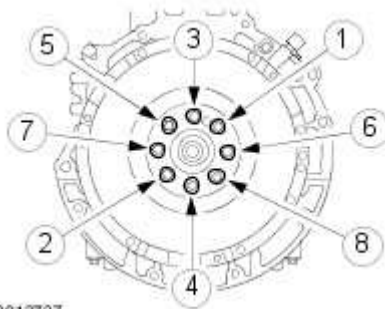
17. Tighten the ladder frame nuts and bolts.

- Tighten the nuts and bolts in the sequence shown.



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Vehicles with manual transaxle



TIE0013727

18. **NOTE:** Install new flywheel retaining bolts.

Install the flywheel.

- Tighten the retaining bolts in the sequence shown in three stages.
- Stage 1: 25 Nm
- Stage 2: 40 Nm
- Stage 3: 48 degrees

19. Install the clutch disc and pressure plate.  
For additional information, refer to: [Clutch Disc and Pressure Plate](#) (308-01A Clutch - Vehicles With: 5-Speed Manual Transmission (MTX-75), Removal and Installation).

Vehicles with automatic transaxle





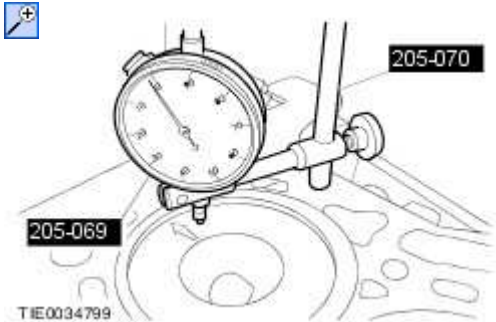
20. **NOTE:**Install new flexplate retaining bolts.  
**NOTE:**Make sure that the two locating dowels are installed.

Install the flexplate.

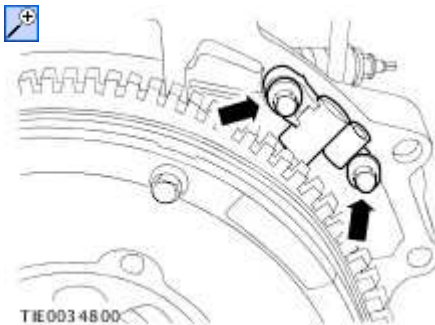
- Tighten the retaining bolts in the sequence shown in three stages.
- Stage 1: 25 Nm
- Stage 2: 40 Nm
- Stage 3: 48 degrees

All vehicles

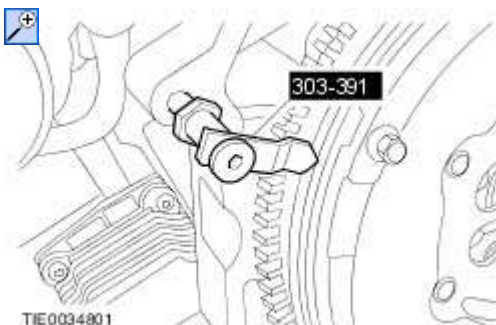
21. Install the special tools.



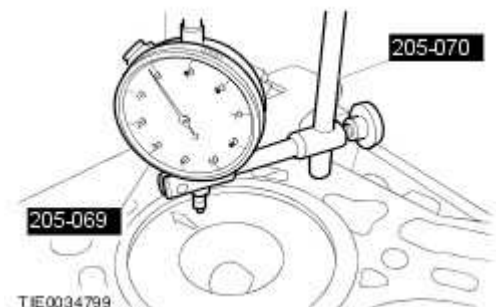
22. **NOTE:**Do not fully tighten the crankshaft position sensor bracket retaining bolts at this stage.  
Install the crankshaft position (CKP) sensor bracket.



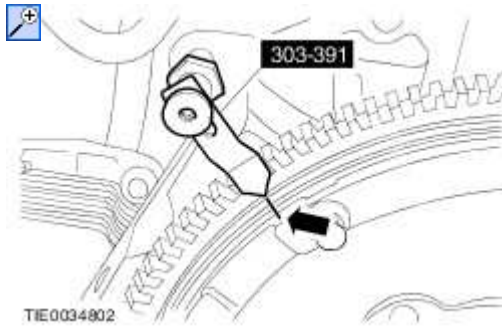
23. **NOTE:**After installation do not move the special tool.  
Install the special tool.



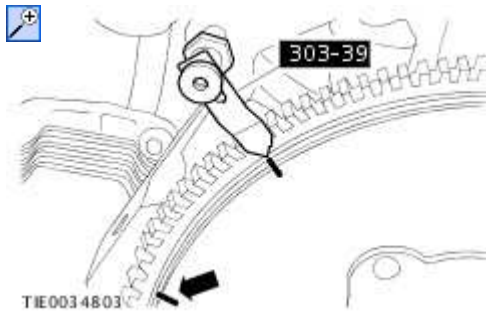
24. Rotate the crankshaft until piston No. one is approximately 10 mm before top dead center (TDC).



25. Zero the dial indicator gauge.

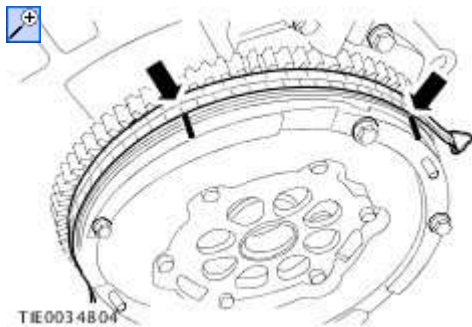


26. Mark the position on the flywheel primary mass.



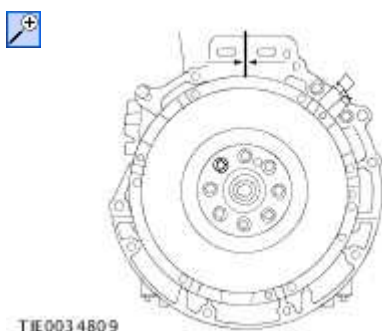
27. **NOTE: Rotate the crankshaft counterclockwise.**  
 Rotate the crankshaft until the piston No. one achieves zero on the dial indicator gauge.  
 • Mark the position on the flywheel primary mass.

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



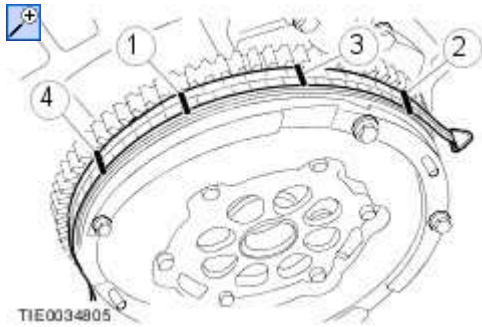
29. **NOTE: The middle of the markings is TDC.**  
 Measure the distance between the two marks.

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



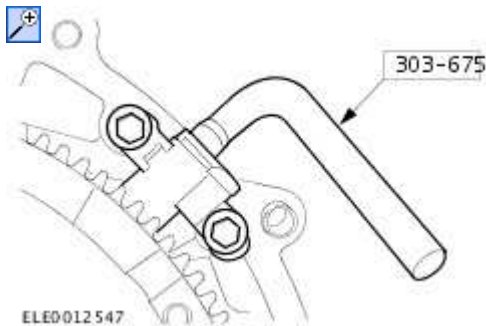
31. Measure the circumference of the flywheel primary mass.





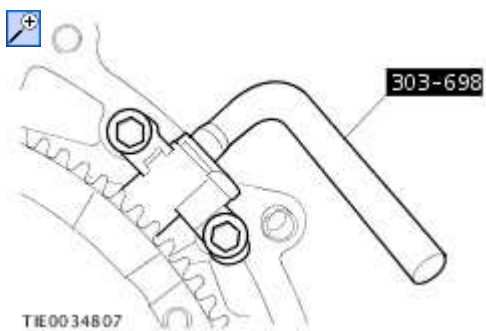
32. Multiply the circumference by 0.1388 and mark the calculated amount on the flywheel primary mass by measuring from TDC counterclockwise.
  1. First mark.
  2. Second mark.
  3. Determined TDC.
  4. Determined 50 degrees before top dead center (BTDC).

Vehicles without common rail fuel injection



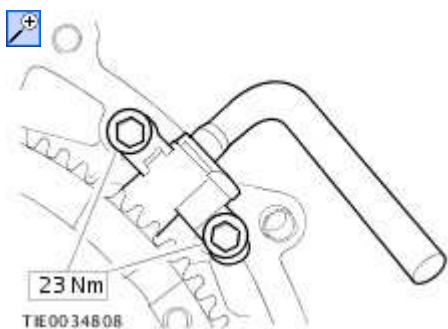
33. **NOTE:** Rotate the crankshaft in the normal direction of rotation to the mark of the calculated 50 degrees BTDC.  
Install the special tool.

Vehicles with common rail fuel injection



34. **NOTE:** Rotate the crankshaft in the normal direction of rotation to the mark of the calculated 50 degrees BTDC.  
Install the special tool.

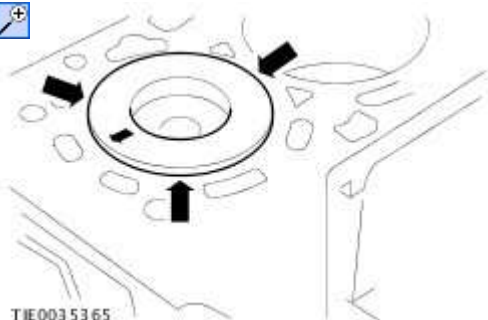
All vehicles



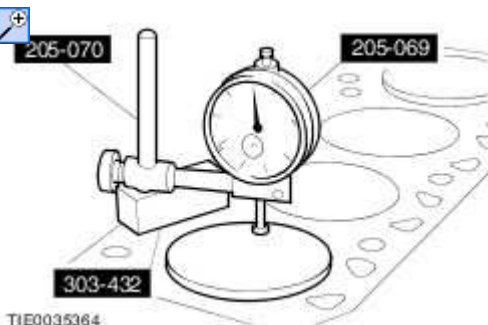
35. Tighten the CKP sensor bracket retaining bolts.

36. Remove the special tool.

37. Clean the cylinder block mating face and the piston with.

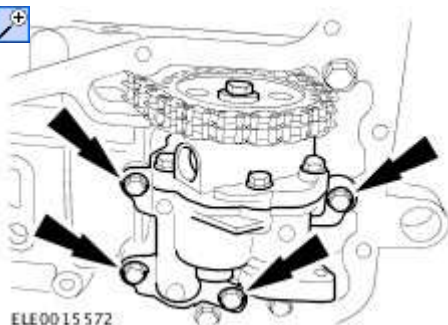


38. **NOTE:** Measure the piston protrusion of each cylinder at top dead center (TDC). Measure the distance between the piston crown and the cylinder block at the points indicated.

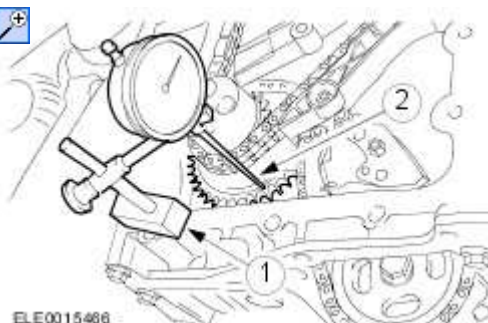


39. **NOTE:** The largest measurement determines the choice of the cylinder head gasket. Using the special tools, measure the piston protrusion.

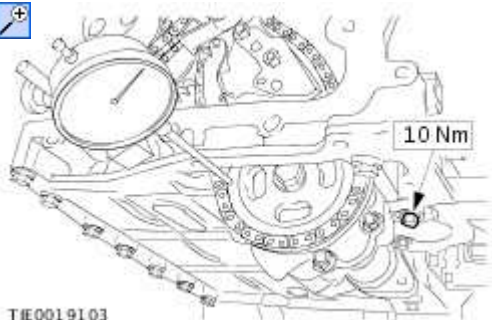
40. Determine the cylinder head gasket. For additional information, refer to: [Specifications](#) (303-01E Engine - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel, Specifications).



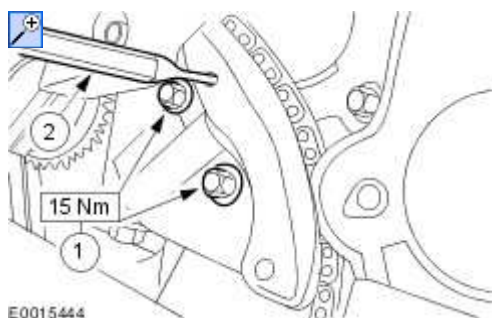
41. **NOTE:** Do not fully tighten the oil pump retaining bolts at this stage. Install the oil pump and oil pump chain.



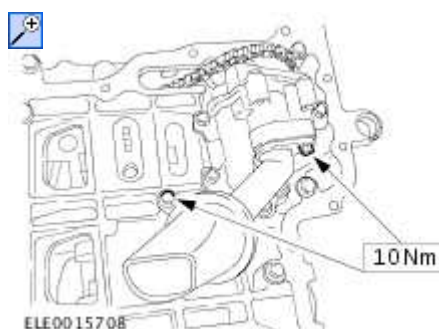
42. Using a suitable [dial indicator gauge](#) take a reference measurement from the front face of the crankshaft sprocket.
1. Position the [dial gauge holding fixture](#) on the cylinder block.
  2. Position the [dial indicator gauge](#) plunger on the crankshaft sprocket and set the dial to zero.



43. **NOTE:** Take measurements at two different points on the oil pump sprocket.  
Using the **dial indicator gauge** align the oil pump sprocket and tighten the oil pump retaining bolts.



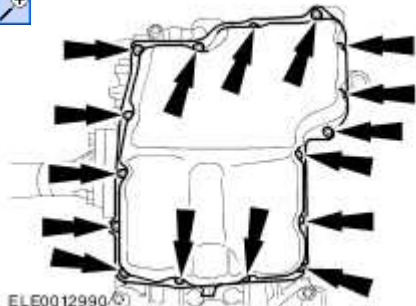
44. Check the alignment of the oil pump sprocket with the crankshaft sprocket. Repeat the alignment procedure if necessary.
45. Install the oil pump chain tensioner.
1. Install the bolts.
  2. Unlock the tensioner by removing the pin.



46. Install the oil pump pickup tube.



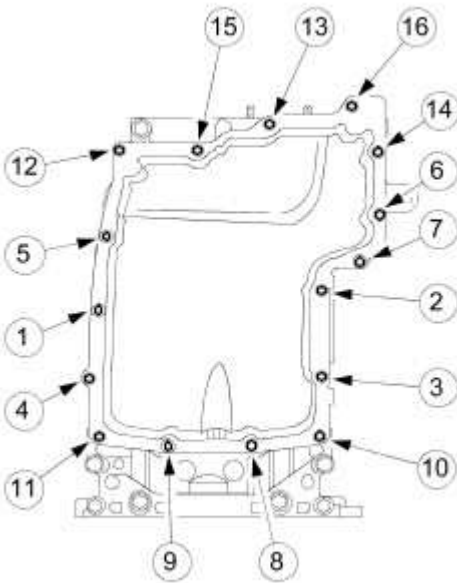
47. **CAUTION:** Install the oil pan within five minutes of applying the sealer.  
Apply a 3 mm diameter bead of **sealant** to the mating face of the oil pan.



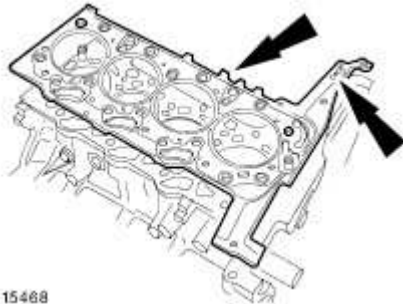
48. **NOTE:** Do not fully tighten the oil pan retaining bolts at this stage.  
Install the oil pan.

49. Tighten the oil pan retaining bolts.

- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 7 Nm.
- Stage 2: 14 Nm.



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ELE0015468

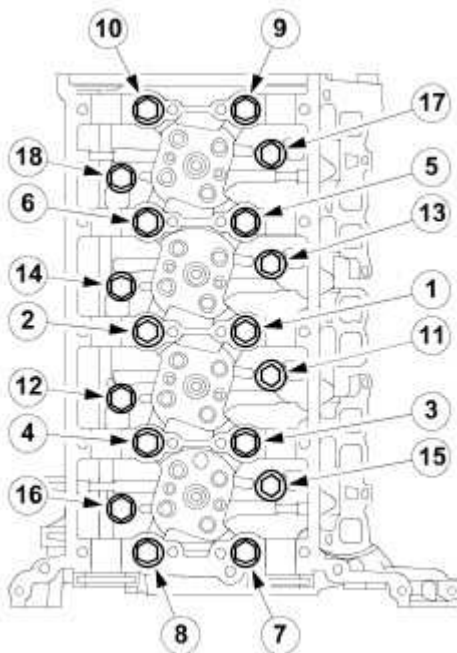
50. **CAUTION:** The thickness of the new cylinder head gasket depends on the piston protrusion (hole/tooth marked).

Determine the thickness of the cylinder head gasket required and install a new cylinder head gasket. For additional information, refer to: [Specifications](#) (303-01E Engine - 2.0L Duratorq-Di/TDDi (Puma) Diesel/2.0L Duratorq-TDCi (Puma) Diesel/2.2L Duratorq-TDCi (Puma) Diesel, Specifications).

51. **CAUTION:** Install new cylinder head bolts.

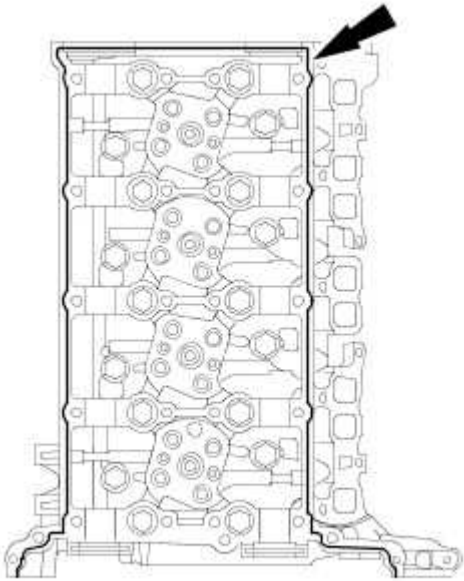
Install the cylinder head.

- Tighten the bolts in the sequence shown in six stages.
- Stage 1: Tighten bolts 1 through 10 to 20 Nm
- Stage 2: Tighten bolts 11 through 18 to 10 Nm.
- Stage 3: Tighten bolts 1 through 10 to 40 Nm.
- Stage 4: Tighten bolts 11 through 18 to 20 Nm.
- Stage 5: Tighten bolts 1 through 10 to 180 degrees.
- Stage 6: Tighten bolts 11 through 18 to 180 degrees.



TIE0017814

52. Apply a 2.5 mm diameter bead of **sealant** to the mating face of the cylinder head.

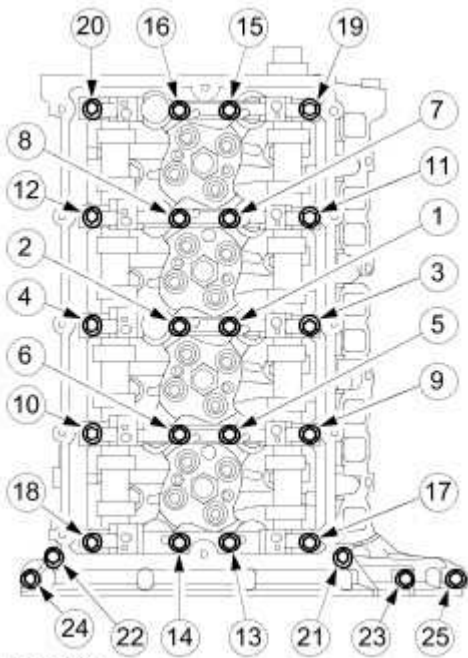


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53. Install the camshafts.

54. Install the camshaft carrier.

- Tighten the bolts in the sequence shown in two stages.
- Stage 1: Tighten bolts 1 through 22 to 23 Nm.
- Stage 2: Tighten bolts 23 through 25 to 10 Nm.



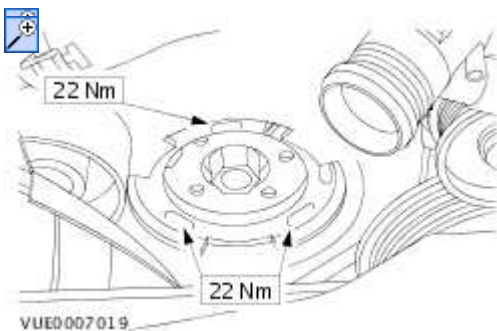
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Vehicles without common rail fuel injection

55. **NOTE:** Install a new fuel injection pump O-ring seal and gasket.

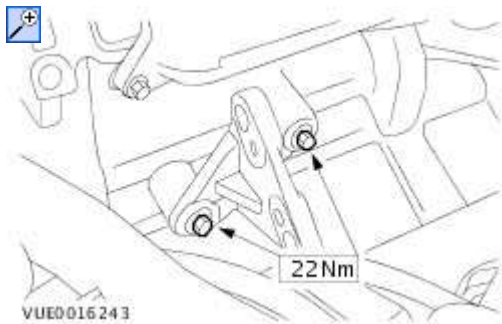
**NOTE:** Do not tighten the fuel injection pump support bracket to fuel injection pump bolts at this stage.

Install the fuel injection pump and loosely install the fuel injection pump support bracket to fuel injection pump bolts.

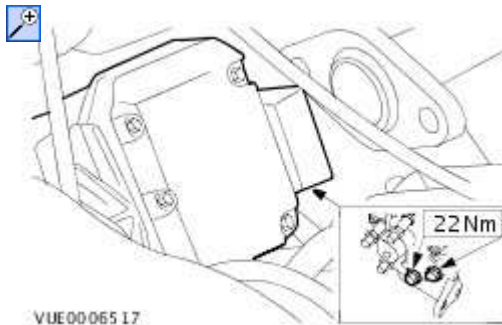


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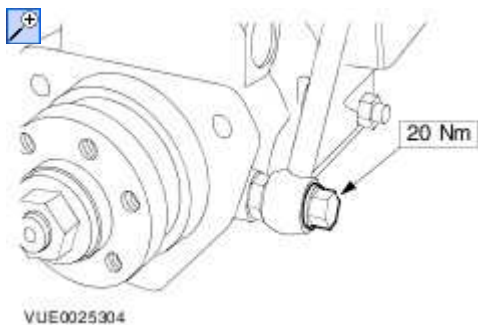


57. Tighten the fuel injection pump support bracket to cylinder block bolts (fuel injection pump shown removed for clarity).



58. Tighten the fuel injection pump support bracket to fuel injection pump bolts.

Vehicles with common rail fuel injection



59. **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.

This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

**CAUTIONS:**

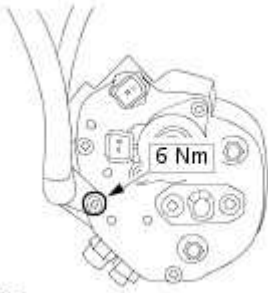
Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines.

Do not disassemble or clean inside the fuel pump, even with an ultrasonic cleaner. Always install a new fuel pump when required.

Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

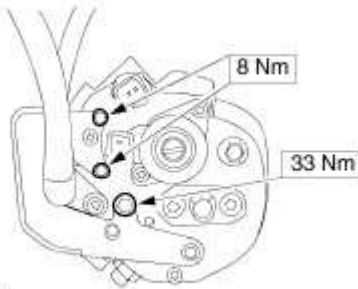
Install the fuel supply line to the fuel pump.





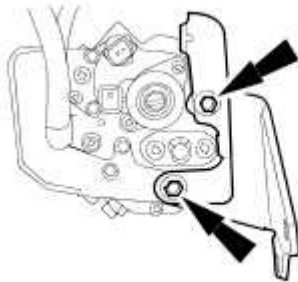
VUE0025297

60. Install the fuel return line venturi to the fuel pump.



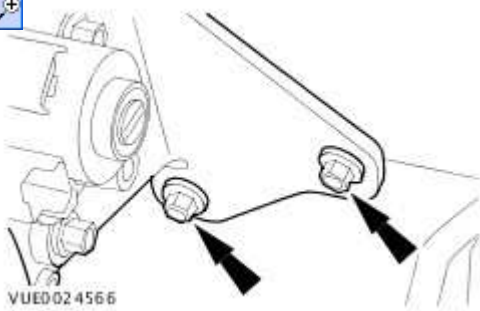
VUE0026307

61. Install the fuel pump shield to the fuel pump.



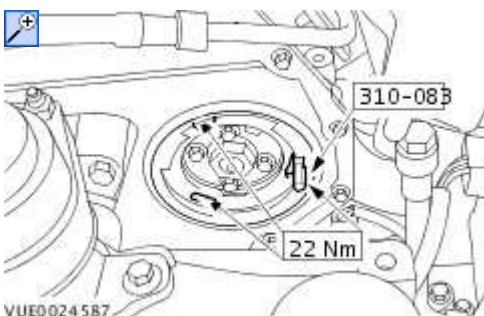
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62. **NOTE:** Do not fully tighten the fuel pump support bracket bolts at this stage.  
Install the fuel pump support bracket to the fuel pump.



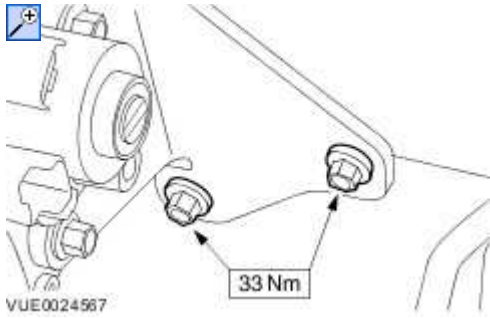
VUE0024566

63. **NOTE:** Install a new fuel pump gasket.  
**NOTE:** Apply a small bead of Loctite 572 on the fuel pump retaining bolts.  
**NOTE:** Do not tighten the fuel pump support bracket to cylinder block retaining bolts at this stage.  
**NOTE:** Do not tighten the fuel pump retaining bolts at this stage.  
**NOTE:** Install the fuel pump retaining bolts evenly in order to pull the fuel pump squarely into position.  
Install the fuel pump and fuel pump support bracket to cylinder block retaining bolts.

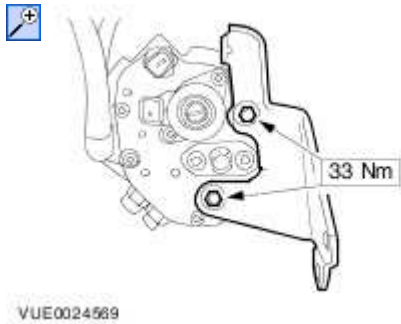


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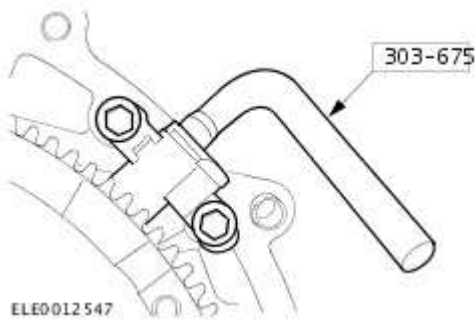
64. Tighten the fuel pump retaining bolts.



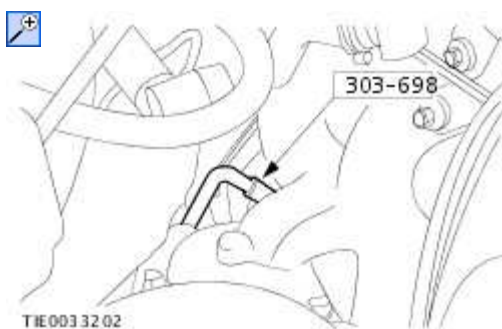
65. Tighten the fuel pump support bracket to cylinder block retaining bolts.



66. Tighten the fuel pump support bracket retaining bolts (fuel pump shown removed for clarity).

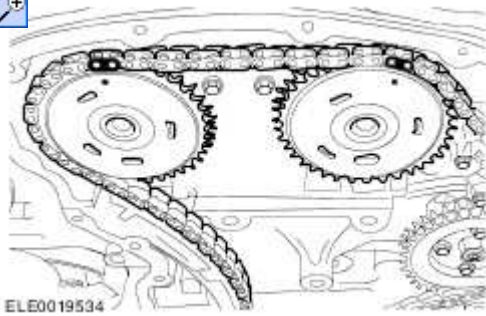


- Vehicles without common rail fuel injection
67. **CAUTION:** Do not rotate the crankshaft when the special tool is fully located into the flywheel. Failure to follow this instruction will cause damage to crankshaft position (CKP) sensor hole.  
**NOTE:** Only rotate the crankshaft in the normal direction of rotation.  
**NOTE:** The special tool must be fully inserted.  
 Insert the special tool through the CKP sensor hole to archive 50 degrees before top dead center (TDC).

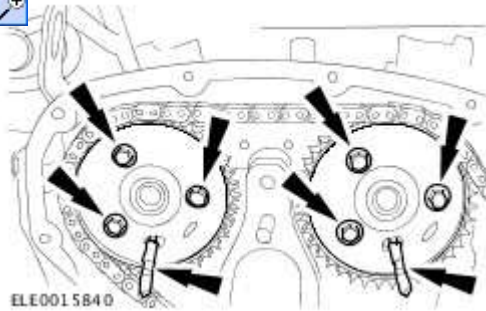


- Vehicles with common rail fuel injection
68. **CAUTION:** Do not rotate the crankshaft when the special tool is fully located into the flywheel. Failure to follow this instruction will cause damage to crankshaft position (CKP) sensor hole.  
**NOTE:** Only rotate the crankshaft in the normal direction of rotation.  
**NOTE:** The special tool must be fully inserted.  
 Insert the special tool through the CKP sensor hole to archive 50 degrees before top dead center (TDC).

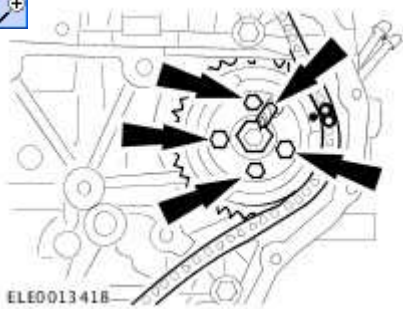
All vehicles



69. **CAUTION:** The copper links of the timing chain must align with the timing marks on the camshaft sprockets.  
Install the camshaft sprockets and the timing chain.

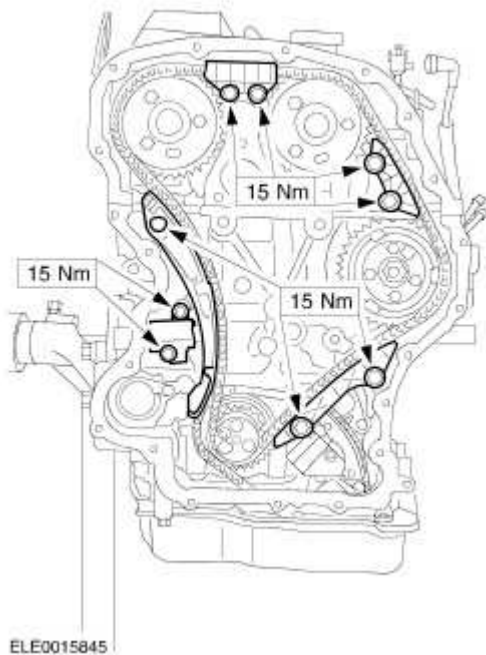


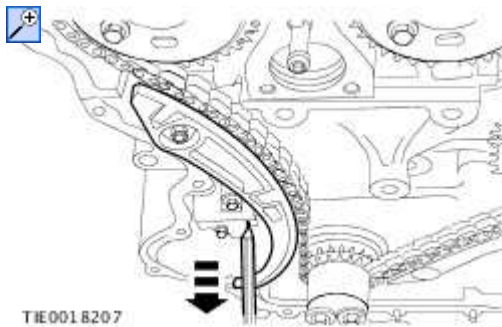
70. Insert 6 mm drill bits through the holes in the camshaft sprockets and tighten the camshaft sprocket retaining bolts finger tight.



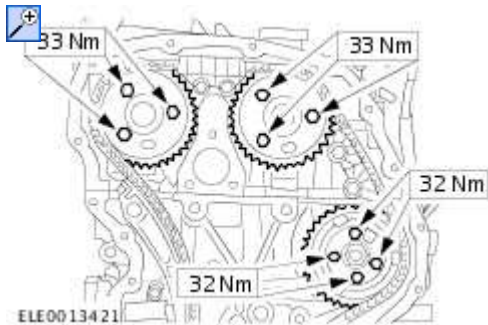
71. **CAUTION:** The copper links of the timing chain must align with the timing marks on the injection pump sprocket.  
**NOTE:** Do not tighten the fuel injection pump sprocket retaining bolts at this stage.  
Insert a 6 mm drill bit through the hole in the fuel injection pump sprocket and into the cut outs provided on the fuel injection pump. Install the fuel injection pump sprocket retaining bolts.

72. Install the timing chain guides and the timing chain tensioner.

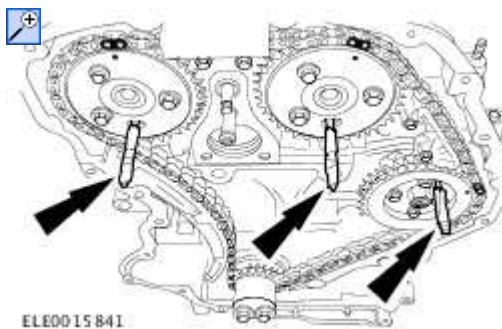




73. **NOTE:** Make sure the timing chain tensioner is completely released.  
Unlock the timing chain tensioner by removing the pin.



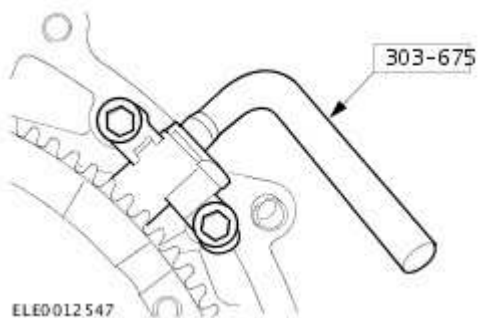
74. Tighten the camshaft sprockets and fuel injection pump sprocket retaining bolts.



75. Remove the drill bits from the holes in the camshaft sprockets and fuel injection pump sprocket.

Vehicles without common rail fuel injection

76. Remove the special tool from the CKP sensor hole.



Vehicles with common rail fuel injection

77. Remove the special tool from the CKP sensor hole.



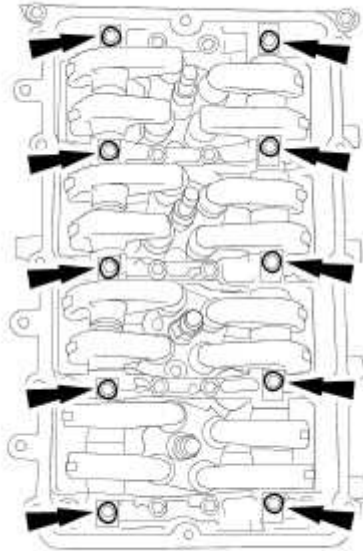


All vehicles

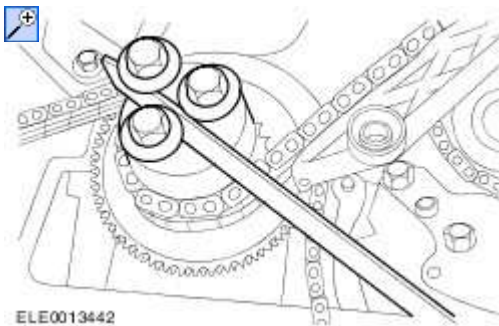
78. **NOTE:**Install new rocker shaft retaining bolts.  
**NOTE:**The oil supply holes in the rocker shafts must point down.

Install the rocker shafts.

- Tighten the bolts in two stages.
- Stage 1: 13 Nm.
- Stage 2: 45 degrees.

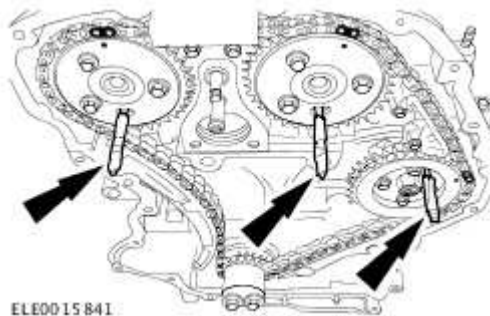


ELE0015429



ELE0013442

79. **NOTE:**Only rotate the crankshaft in the normal direction of rotation.  
**NOTE:**Install the crankshaft pulley retaining bolts and rotate the crankshaft using a screwdriver.  
 Rotate the crankshaft two revolutions.

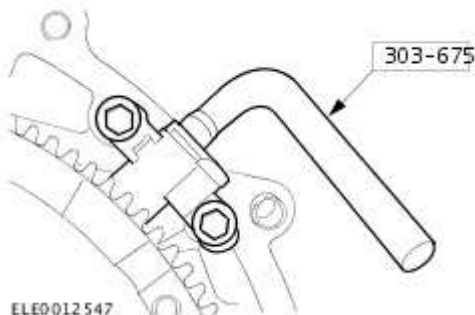


ELE0015841

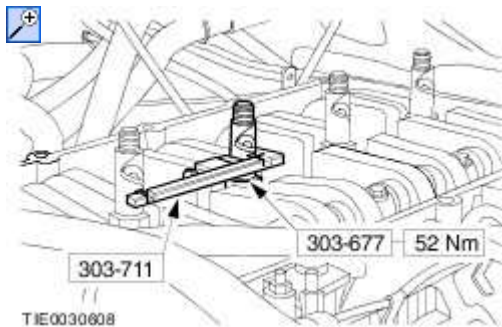
80. Check the camshaft timing by inserting the 6 mm drill bits through the holes in the camshaft sprockets and fuel injection pump sprocket.

Vehicles without common rail fuel injection

81. Check the timing by inserting the special tool in the CKP sensor hole.



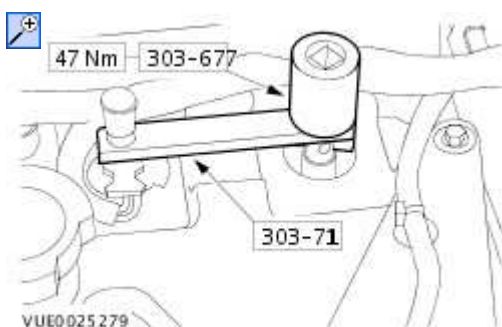
ELE0012547



82. Install the fuel injectors.

Vehicles with common rail fuel injection

83. Check the timing by inserting the special tool in the CKP sensor hole.



84. Install the fuel injectors.

All vehicles

85. Remove the special tool from the CKP sensor hole.

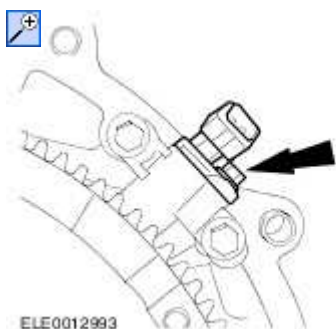
86. Remove the drill bits from the holes in the camshaft sprockets and fuel injection pump sprocket.

87. Check the tension of the timing chain.

Vehicles with common rail fuel injection

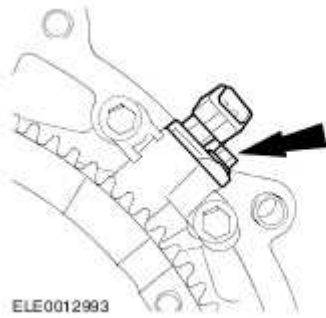
88. **NOTE:** Make sure that the trigger tooth is seen through the bracket.  
**NOTE:** Make sure that a new component is installed.  
 Install the CKP sensor.

- Install the CKP sensor onto the trigger tooth.
- Install the CKP sensor retaining bolt.



Vehicles without common rail fuel injection



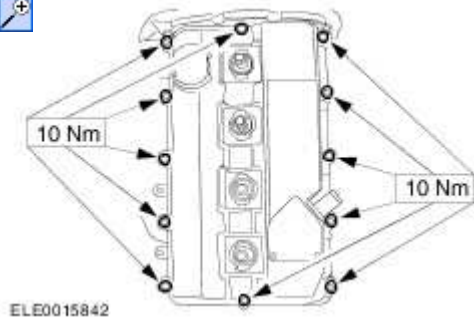


89. **NOTE:** Make sure that the trigger tooth is seen through the bracket.

Install the CKP sensor.

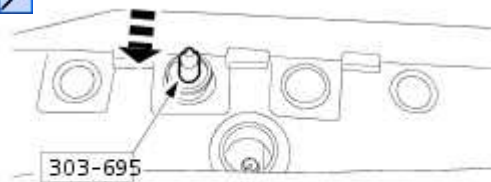
- Install the CKP sensor onto the trigger tooth.
- Install the CKP sensor retaining bolt.

All vehicles



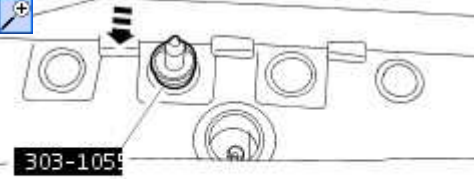
90. **NOTE:** Install a new valve cover gasket.  
Install the valve cover.

Vehicles built up to 11/2002



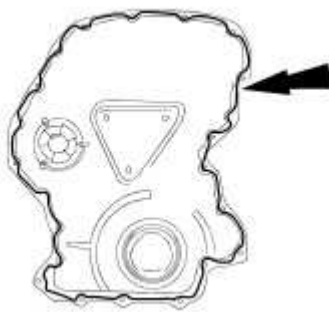
91. Using the special tool, install the valve cover fuel injector seal.

Vehicles built 11/2002 onwards



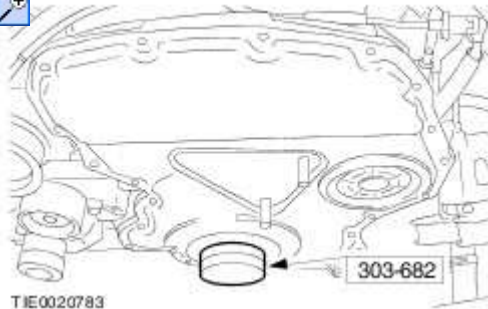
92. Using the special tool, install the valve cover fuel injector seal.

All vehicles



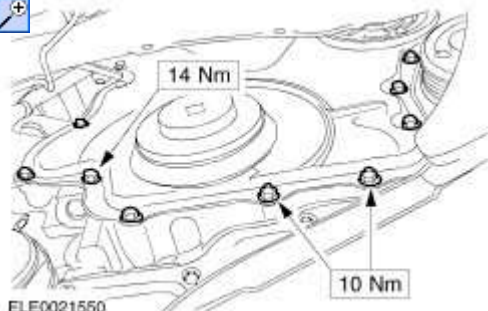
TIE0020780

93. **CAUTION:** Install the engine front cover within five minutes of applying the sealer.  
**NOTE:** Install a new engine front cover.  
 Apply a 3 mm diameter bead of sealant to the engine front cover.



TIE0020783

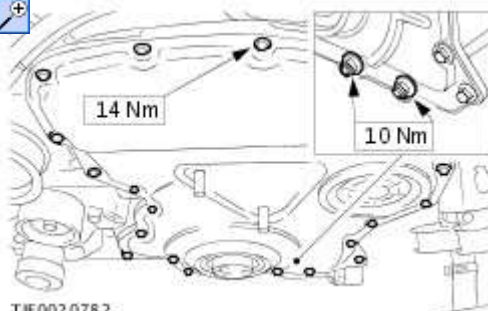
94. Using the special tool, install the engine front cover.



ELE0021550

95. **NOTE:** M6 x 14 mm engine front cover bolts should be discarded, and new M6 x 16 mm bolts installed.  
 Install the engine front cover lower retaining bolts.

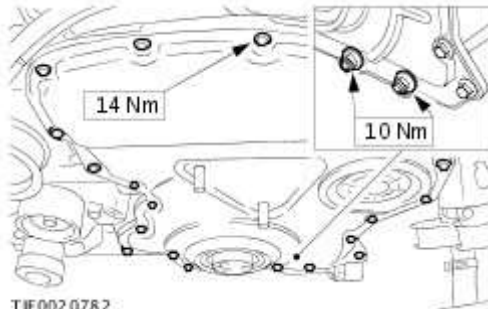
Vehicles built up to 06/2000



TIE0020782

96. **NOTE:** M6 x 14 mm engine front cover bolts should be discarded, and new M6 x 16 mm bolts installed.  
**NOTE:** Keep the special tool in position.  
 Install the engine front cover nuts and bolts.
- 2 nuts.
  - 20 bolts.

Vehicles built 06/2000 onwards

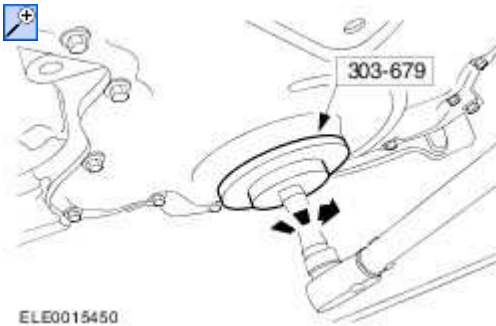


TIE0020782

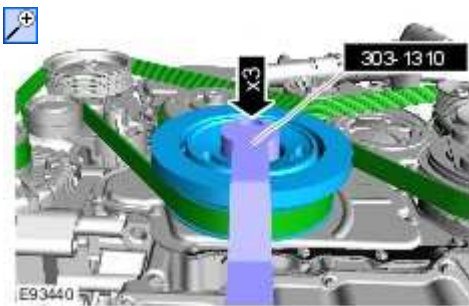
97. **NOTE:** Keep the special tool in position.  
 Install the engine front cover nuts and bolts.
- 2 nuts.
  - 20 bolts.

All vehicles

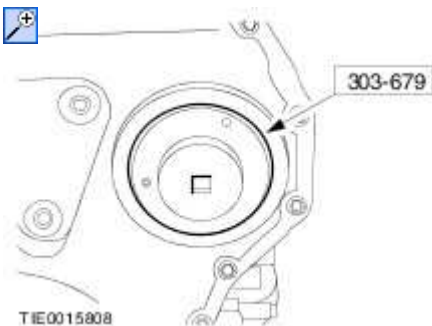
98. Remove the special tool.



99. **NOTE:** Install a new crankshaft front oil seal.  
**NOTE:** A new crankshaft front oil seal is supplied with an alignment sleeve that will be pushed out during installation.  
 Using the special tool, install the crankshaft front oil seal.

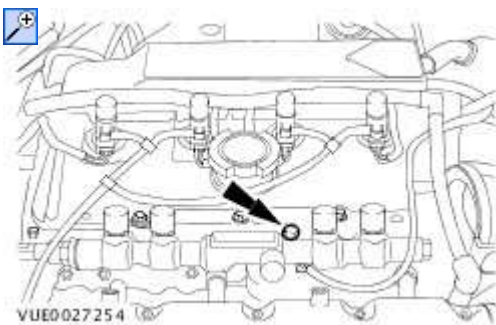


100. **CAUTION:** Crankshaft pulley retaining bolts must only be used three times.  
**NOTE:** Stamp the crankshaft pulley retaining bolt heads with a center punch to indicate usage.  
 Using the special tool, install the crankshaft pulley.
- Tighten the bolts in two stages.
  - Stage 1: 45 Nm.
  - Stage 2: 120 degrees.

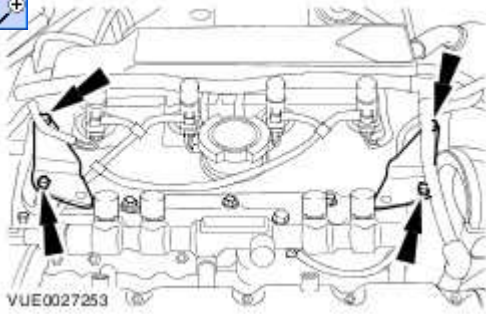


101. Using the special tool, install the fuel injection pump cover.

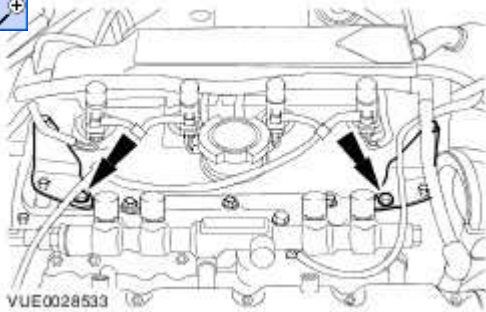
Vehicles with common rail fuel injection



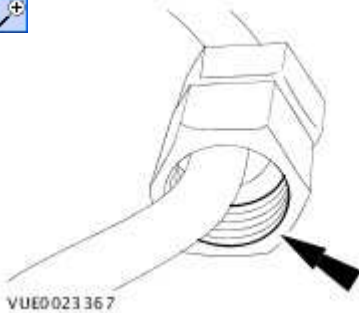
102. **CAUTIONS:**
- CAUTION:** Do not disassemble or clean inside the fuel injection supply manifold, even with an ultrasonic cleaner. Always install a new fuel injection supply manifold when required.
  - CAUTION:** Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.
- NOTE:** Install new high-pressure fuel supply lines.  
**NOTE:** Do not tighten the fuel injection supply manifold retaining bolt at this stage.  
 Install the fuel injection supply manifold.



103. **NOTE:** Do not tighten the fuel injection supply manifold support bracket bolts at this stage. Install the fuel injection supply manifold support brackets.



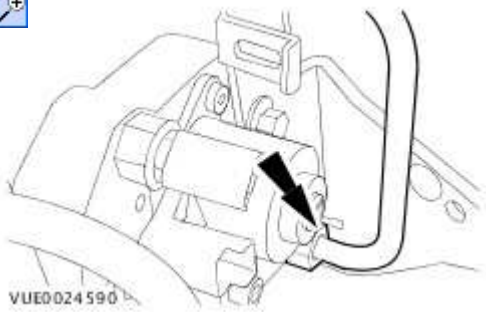
104. **NOTE:** Do not tighten the fuel injection supply manifold retaining bolts at this stage. Install the fuel injection supply manifold retaining bolts.



105. Lubricate the high-pressure fuel supply line union threads with clean **high-pressure fuel supply line lubricant**.

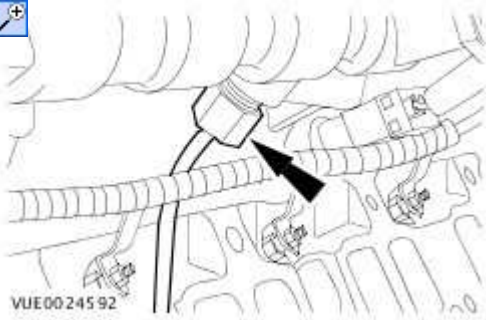
106. **CAUTION:** Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system. **NOTE:** The yellow colored collar is fitted at the fuel pump end and the blue colored collar is fitted at the fuel injection supply manifold end of the high-pressure fuel supply line. **NOTE:** To aid identification of the high-pressure fuel supply lines, the union at the fuel pump end is etched with the word Pump. Position the high-pressure fuel supply line as near to the final installation position as possible and then remove and discard the blanking plugs from the high-pressure fuel supply line.

107. Remove the blanking plugs from the fuel pump and the fuel injection supply manifold threaded ports.
- Discard the blanking plugs.



108. CAUTIONS:

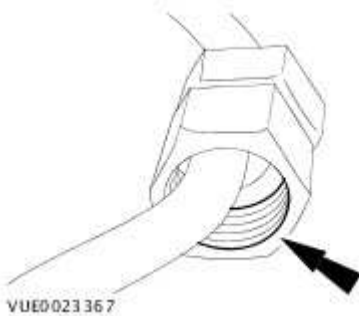
- ⚠ Do not tighten the high-pressure fuel supply line union at this stage.
- ⚠ Maintain pressure on the high-pressure fuel supply line to keep the olive in contact with the fuel pump cone while hand installing the union. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system. Install a new high-pressure fuel supply line to the fuel pump.



109. CAUTIONS:

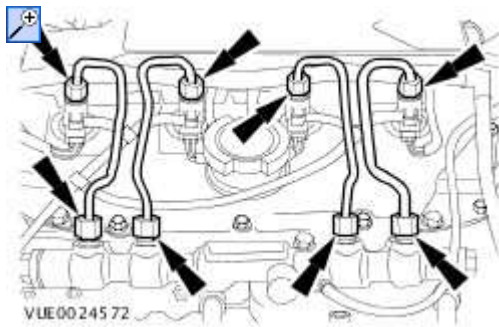
- ⚠ Do not tighten the high-pressure fuel supply line union at this stage.
- ⚠ Maintain pressure on the high-pressure fuel supply line to keep the olive in contact with the fuel injection supply manifold cone while hand installing the union. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system. Install the high-pressure fuel supply line to the fuel injection supply manifold.

110. Lubricate the high-pressure fuel supply line union threads with clean [high-pressure fuel supply line lubricant](#).

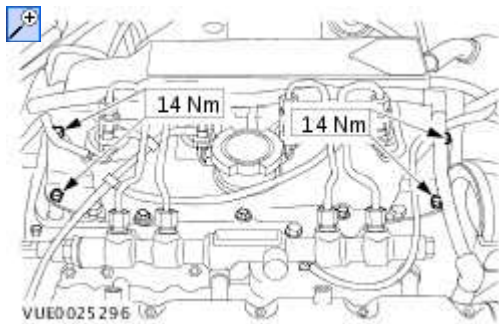


111. ⚠ CAUTION: Do not allow the unions to hit the olive ends of the high-pressure fuel supply line as this may damage the ends of the line and allow foreign matter to enter the fuel injection system.  
 NOTE: The yellow colored collar is fitted at the fuel injector end and the blue colored collar is fitted at the fuel supply manifold end of the high-pressure fuel supply line.  
 NOTE: To aid identification of the high-pressure fuel supply line, the union at the fuel injector end is etched with the cylinder number.  
 Position the high-pressure fuel supply line as near to the final installation position as possible and then remove and discard the blanking plugs from the high-pressure fuel supply line.
112. Remove the blanking plugs from the fuel injector and the fuel injection supply manifold threaded ports.
- Discard the blanking plugs.

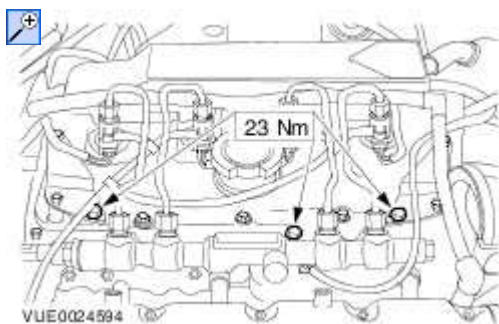




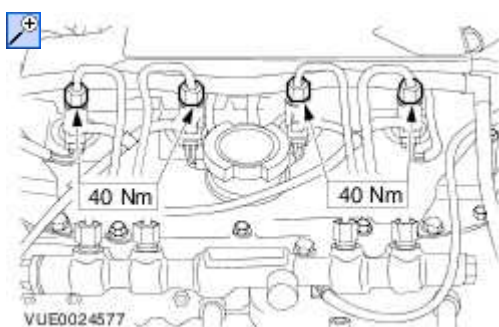
113. **CAUTION:** Maintain pressure on the high-pressure fuel supply line to keep the olives in contact with the fuel injectors and the fuel injection supply manifold cones while hand installing the unions.  
**NOTE:** Install the high-pressure fuel supply lines to the fuel injection supply manifold end first followed by the fuel injector end.  
**NOTE:** Do not tighten the high-pressure fuel supply line unions at this stage.  
 Install new high-pressure fuel supply lines.



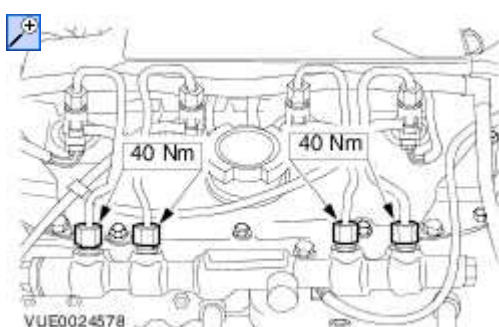
114. Tighten the fuel injection supply manifold support brackets.



115. Tighten the fuel injection supply manifold retaining bolts.

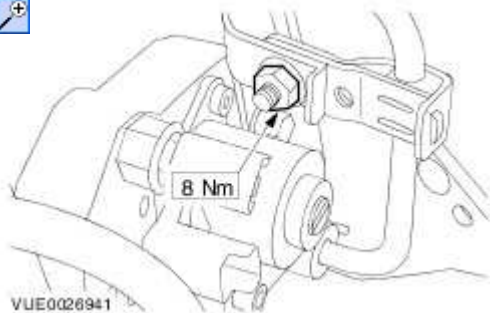


116. **CAUTIONS:**  
**CAUTION:** Make sure the tool used to tighten the high-pressure fuel supply line unions is used at the top of the union as this is where there is most material. Failure to follow this instruction may result in damage to the union.  
**CAUTION:** Make sure that the fuel injector does not move when tightening the high-pressure fuel supply lines. Failure to follow this instruction will result in damage to the fuel injector and the fuel injector sealing washer.  
 Tighten the high-pressure fuel supply line unions at the fuel injectors.

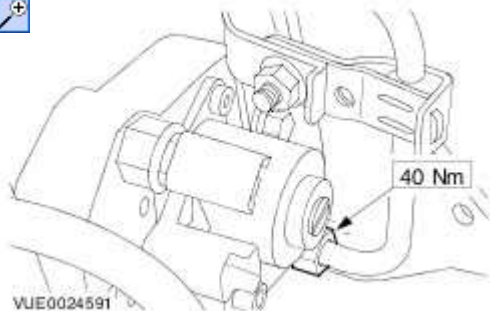


117. **CAUTION:** Make sure the tool used to tighten the high-pressure fuel supply line unions is used at the top of the union as this is where there is most material. Failure to follow this instruction may result in damage to the union.  
 Tighten the high-pressure fuel supply line unions at the fuel injection supply manifold.





118. Install the high-pressure fuel supply line clamp.



119. CAUTIONS:

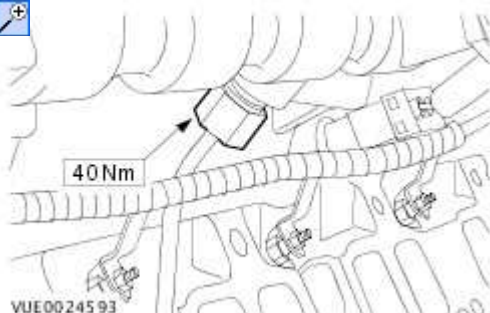


Make sure the tool used to tighten the high-pressure fuel supply line union is used at the top of the union as this is where there is most material. Failure to follow this instruction may result in damage to the union.



Make sure the tool used to tighten the high-pressure fuel supply line union does not come into contact with the inlet metering valve while tightening the high-pressure fuel supply line union. Failure to follow this instruction may result in fuel leaking from the union.

Tighten the high-pressure fuel supply line union at the fuel pump.

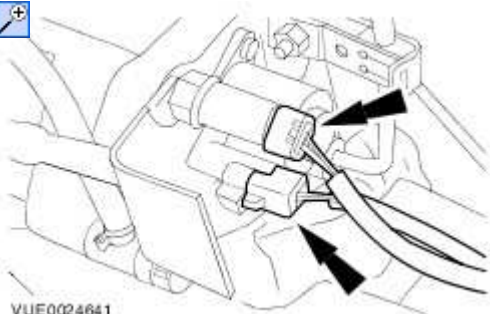


120.

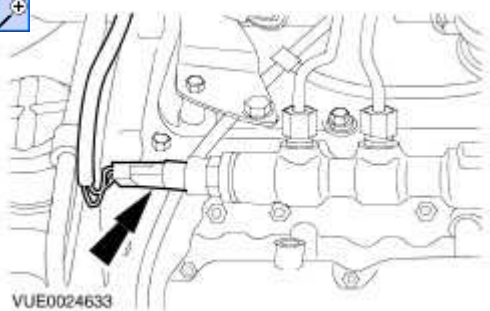


CAUTION: Make sure the tool used to tighten the high-pressure fuel supply line union is used at the top of the union as this is where there is most material. Failure to follow this instruction may result in damage to the union.

Tighten the high-pressure fuel supply line union at the fuel injection supply manifold.

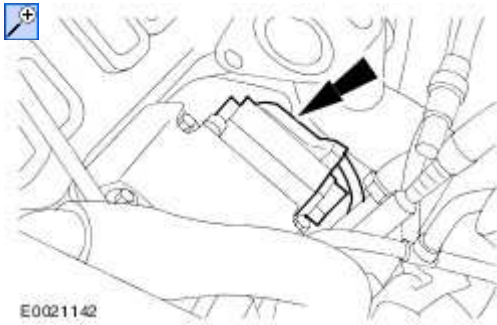


121. Connect the fuel metering valve and fuel temperature sensor electrical connectors.

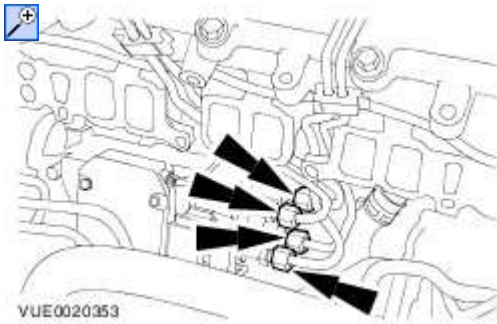


122. Connect the fuel pressure sensor electrical connector.

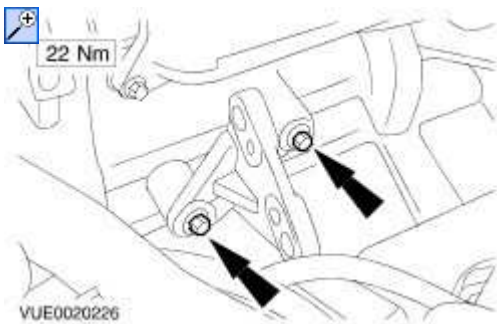
Vehicles without common rail fuel injection



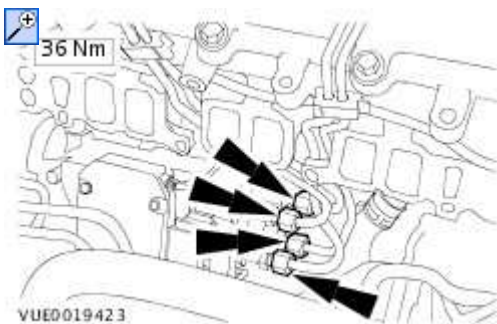
123. **NOTE:** Make sure the fuel injection pump electrical connector pins are clean.  
Install the fuel injector pump control unit electrical connector.



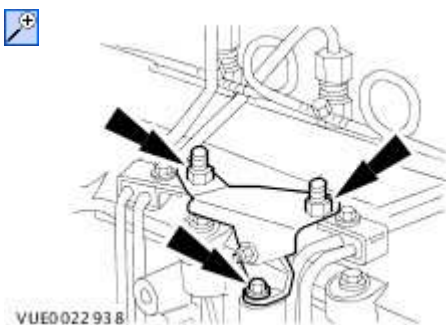
124. **NOTE:** Install new high-pressure fuel supply lines.  
**NOTE:** Do not tighten the high-pressure fuel supply line unions to the fuel injection pump at this stage.  
Connect the high-pressure fuel supply line unions to the fuel injection pump.



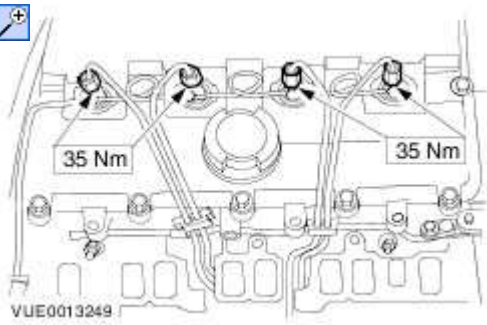
125. **NOTE:** Do not tighten the high-pressure fuel supply line unions to the fuel injectors at this stage.  
Connect the high-pressure fuel supply line unions to the fuel injectors.



126. Tighten the high-pressure fuel supply line unions to the fuel injection pump.

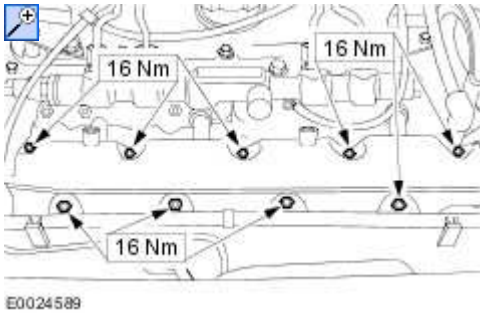


127. Install the high-pressure fuel supply line support bracket.



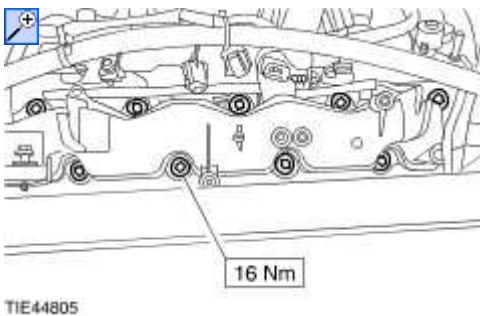
128. Tighten the high-pressure fuel supply line unions to the fuel injectors.

Vehicles built up to 07/2002

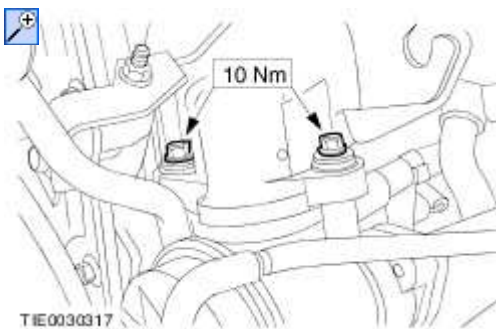


129. Install the intake manifold.

Vehicles built 07/2002 onwards

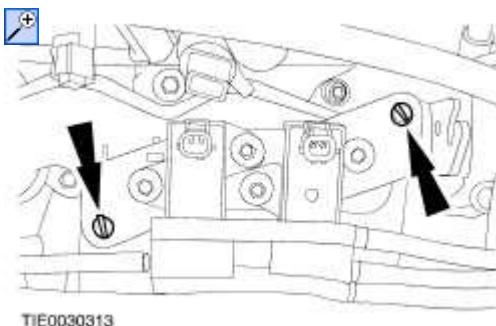


130. Install the intake manifold.

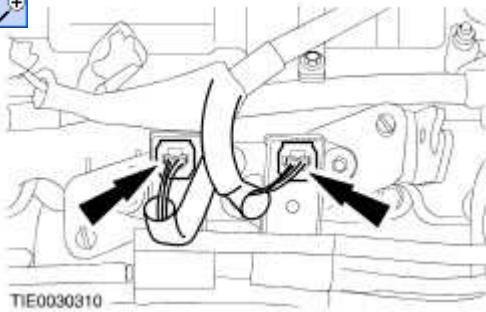


131. Attach the throttle body to the EGR valve.

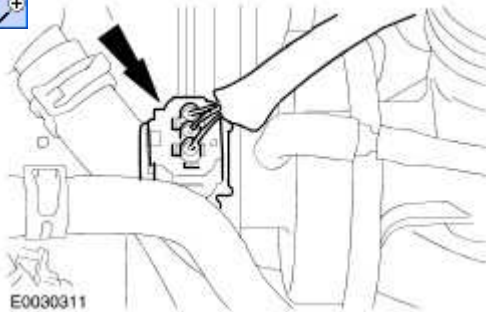
Vehicles with variable vane turbocharger



132. Attach the EGR control solenoids bracket.

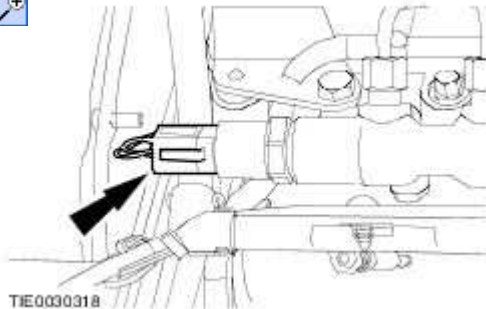


133. Connect the exhaust gas recirculation (EGR) control solenoids electrical connectors.



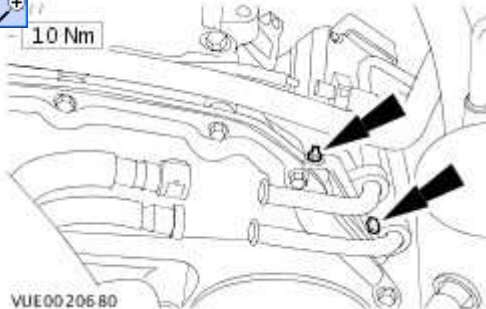
134. Connect the EGR valve electrical connector.

Vehicles with common rail fuel injection

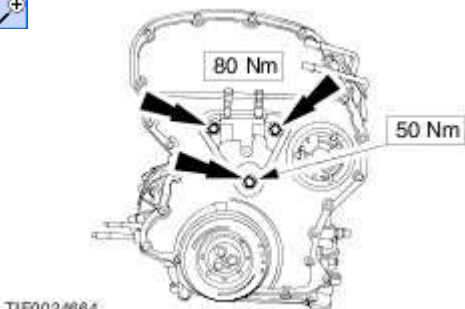


135. Disconnect the fuel pressure sensor electrical connector.

All vehicles

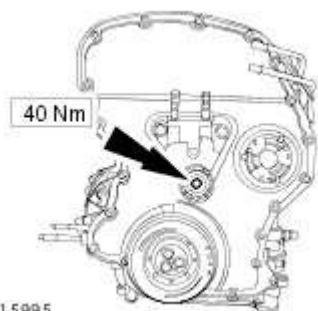


136. Install the fuel injection pump supply and return line retaining brackets.

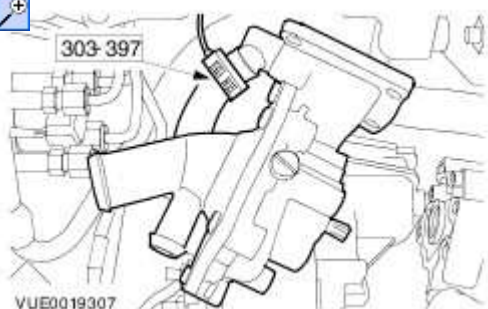


137. Install the engine front mount bracket.

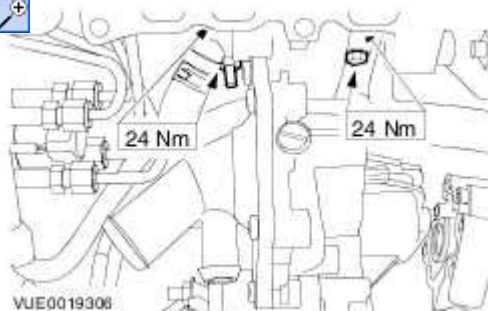




138. Install the accessory drive belt idler pulley.



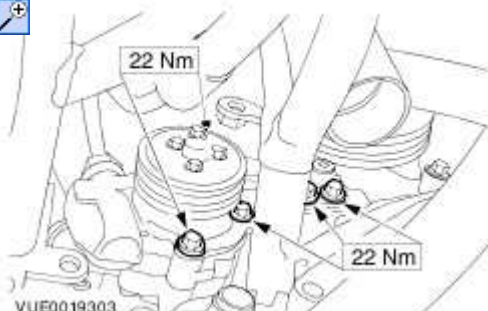
139. **NOTE:** Install a new water pump gasket.  
Connect the coolant hose and attach the water pump to the cylinder block.



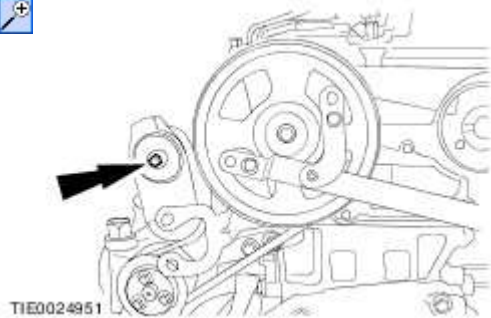
140. Install the water pump retaining bolts.



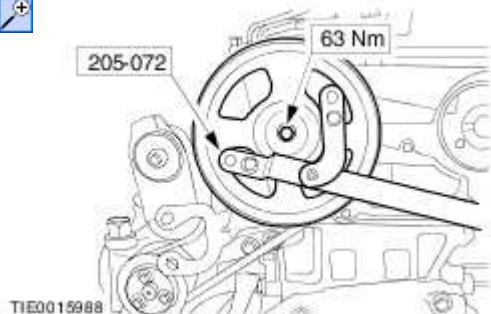
141. Using the special tool, connect the coolant hoses to the water pump.



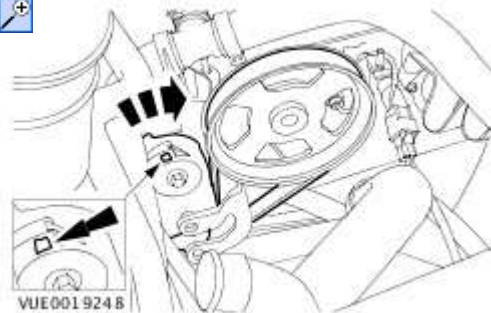
142. Install the power steering pump.



143. Install the power steering pump belt tensioner.

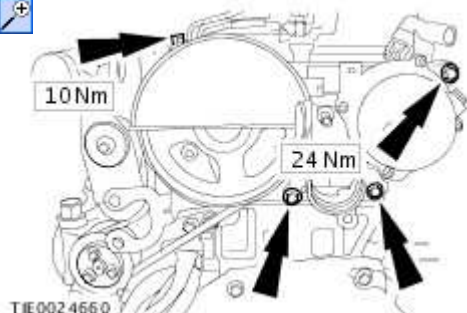


144. Using the special tool, install the power steering pump pulley.



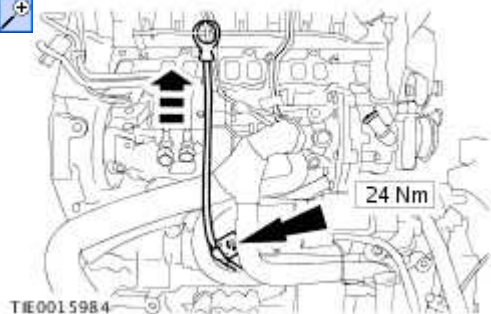
145. Install the power steering pump belt.

- Rotate the tensioner clockwise.



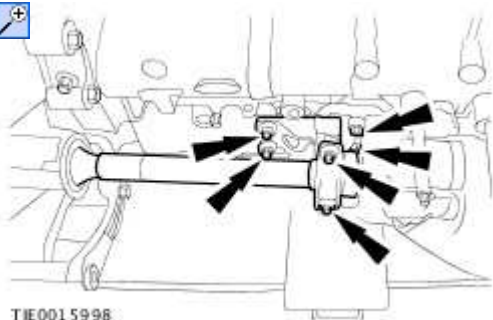
146. Install the brake vacuum pump.

- Install the power steering pump belt cover.



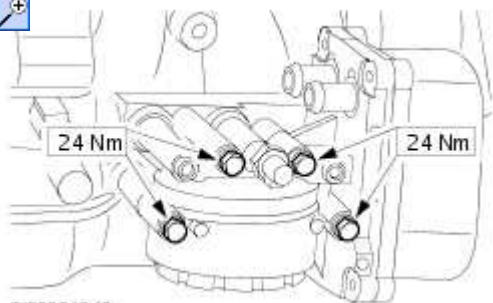
147. Install the oil level indicator and tube.





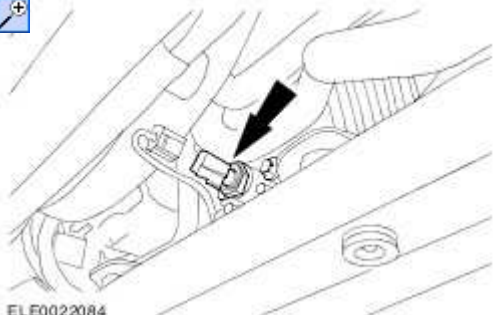
TIE0015998

148. **NOTE:** Install a new intermediate driveshaft center bearing cap and retaining nuts. Install the intermediate driveshaft bracket and center bearing cap.



TIE0024949

149. Install the engine oil cooler assembly.



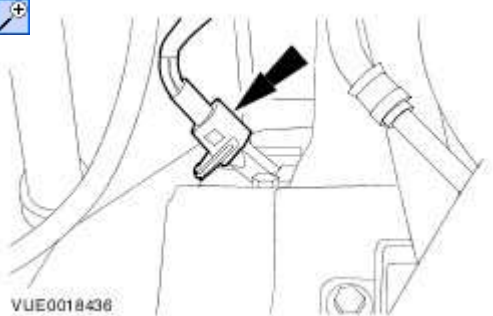
ELE0022084

150. Install the oil pressure switch.



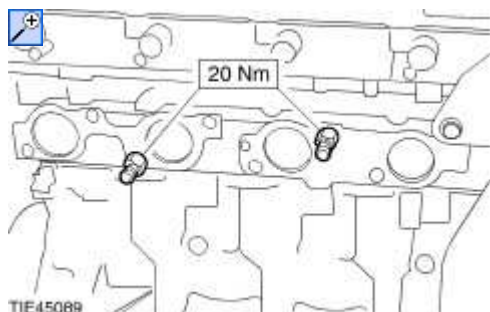
ELE0018598

151. Connect the oil pressure switch electrical connector.

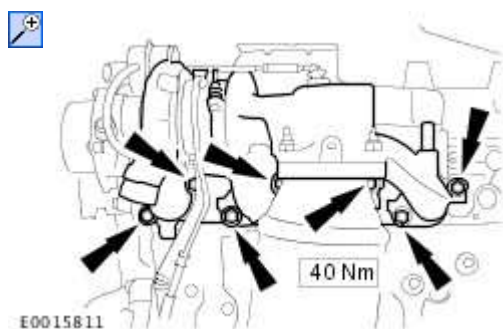


VUE0018436

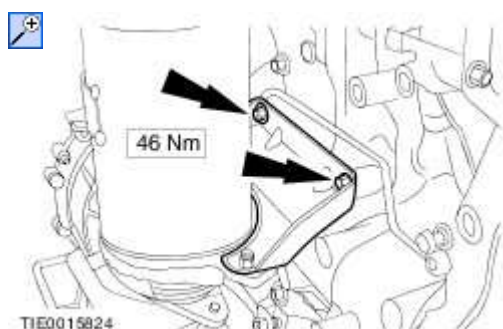
152. Connect the CKP sensor electrical connector.



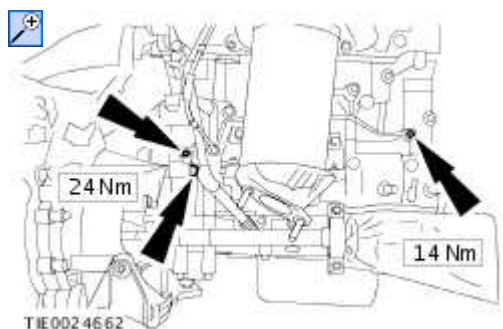
153. **NOTE:**Install new exhaust manifold studs.  
Install the exhaust manifold studs.



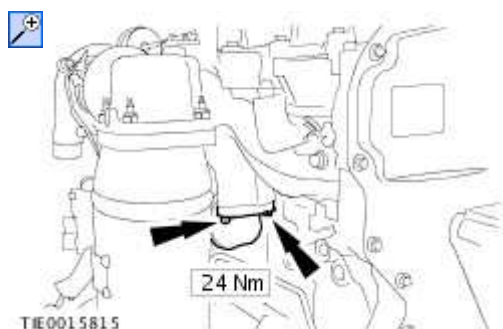
154. **NOTE:**Install new exhaust manifold bolts and nuts.  
Install the turbocharger and exhaust manifold assembly.



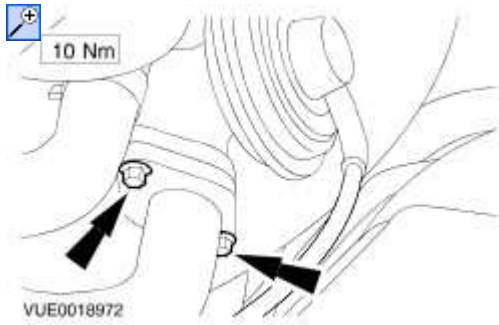
155. Install the catalytic converter support bracket.



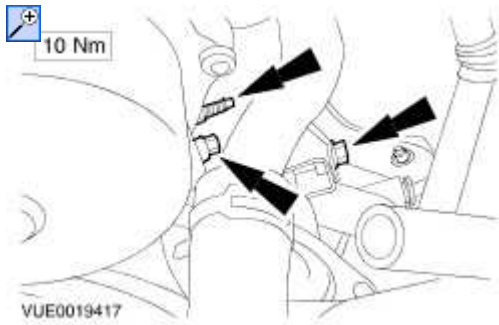
156. **NOTE:**Install new engine oil supply and return tube gasket, O-ring seal and sealing washers.  
Connect the engine oil supply and return tube to the turbocharger.
- Install the engine oil return tube bracket retaining bolt.



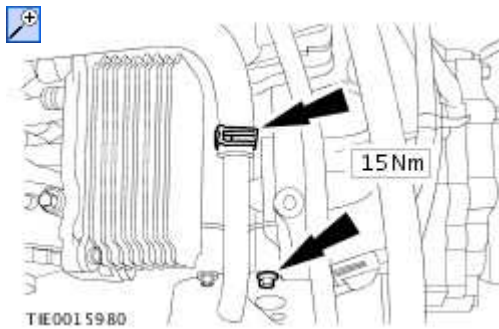
157. **NOTE:**Install a new exhaust gas recirculation (EGR) cooler gasket.  
Connect the EGR cooler to the exhaust manifold.



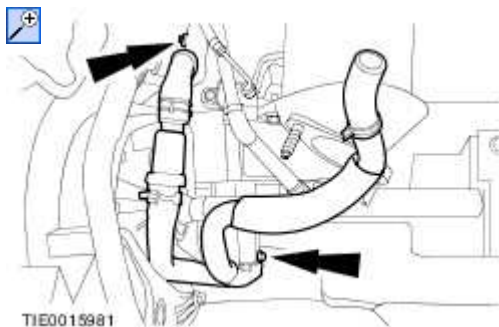
158. **NOTE: Install a new gasket.**  
Connect the exhaust gas recirculation (EGR) valve outlet tube from the EGR valve.



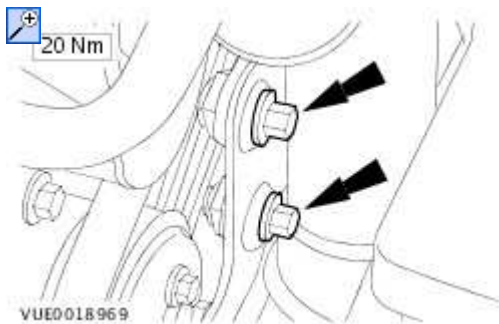
159. Install the EGR valve outlet tube retaining bolts.



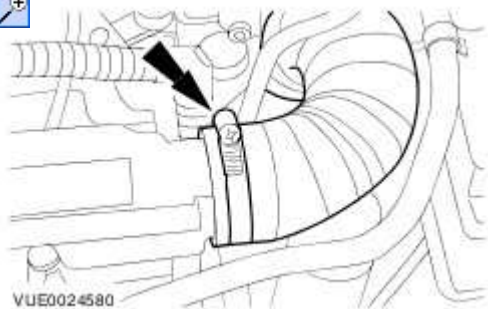
160. Connect the EGR coolant hose.  
• Attach the coolant hose support bracket.



161. Connect the EGR cooler coolant hose.



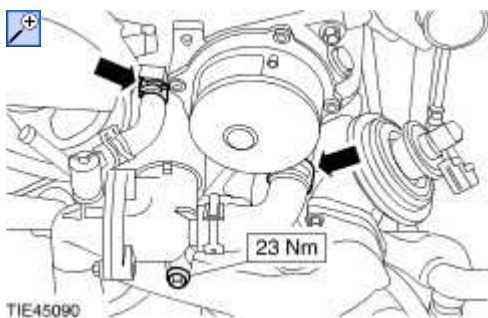
162. Connect the EGR valve tube to the turbocharger.



163. Connect the intake manifold air intake pipe.



164. Install the coolant hose bracket retaining bolt.

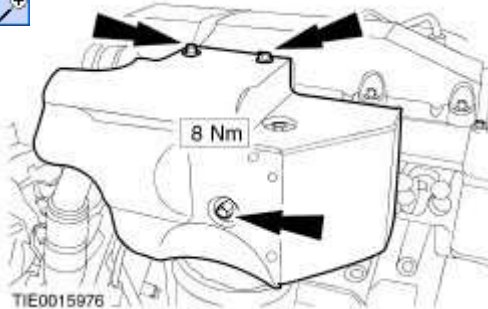


165. **NOTE:** Install a new thermostat housing gasket.  
Install the thermostat housing.

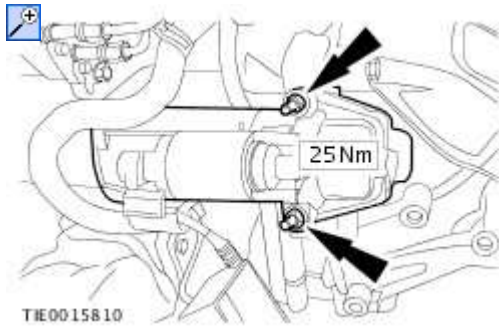
- Connect the coolant hoses to the thermostat housing.



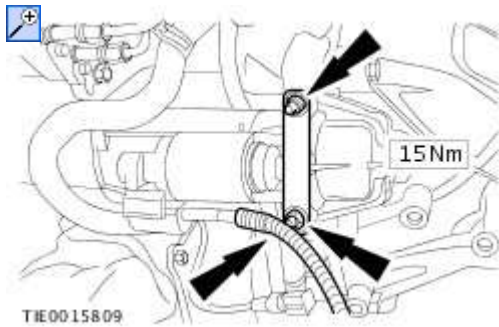
166. Install the air cleaner outlet pipe to the turbocharger.



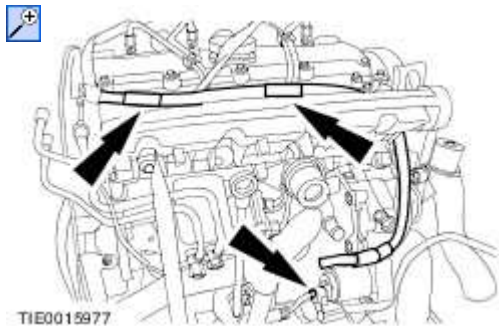
167. Install the turbocharger heat shield.



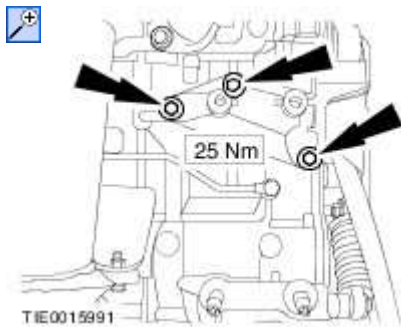
168. **NOTE:** Install a new starter motor gasket.  
Install the starter motor.



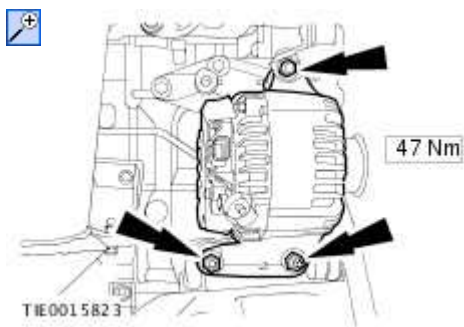
169. Install the the starter motor wiring harness retaining bracket.



170. Connect the starter motor electrical connectors.  
• Attach the starter motor wiring harness to the retaining clips.

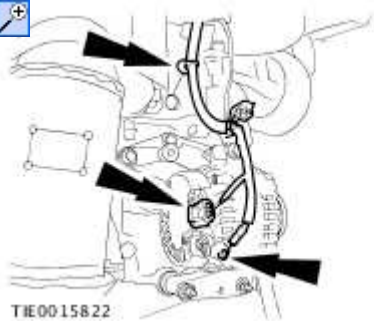


171. Install the accessory drive belt tensioner bracket.



172. Install the generator.  
• Attach the generator wiring harness support bracket to the generator upper retaining bolt.





173. Connect the generator electrical connectors.

- Attach the generator wiring harness to the retaining clip.