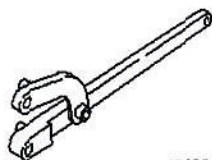


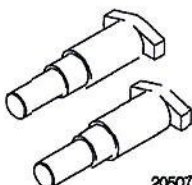
## Engine (211348)

### Special Service Tool(s)



16030A

### Universal Flange Holding Wrench 205-072 (15-030A)



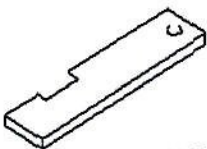
20507202

### Adapter for 205-072 205-072-02 (15-030A-02)



21068A

### Lifting Bracket, Engine 303-122 (21-068A)



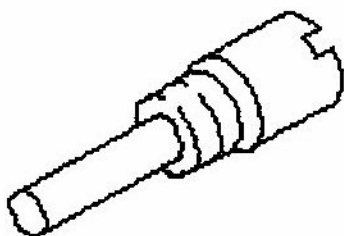
21162B

### Alignment Plate, Camshaft 303-376 (21-162B)



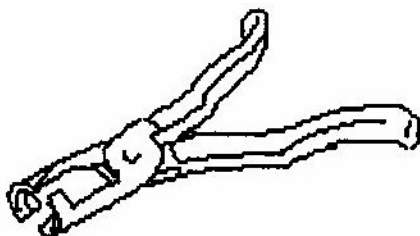
24003

### Remover/Installer, Hose Clamp 303-397 (24-003)



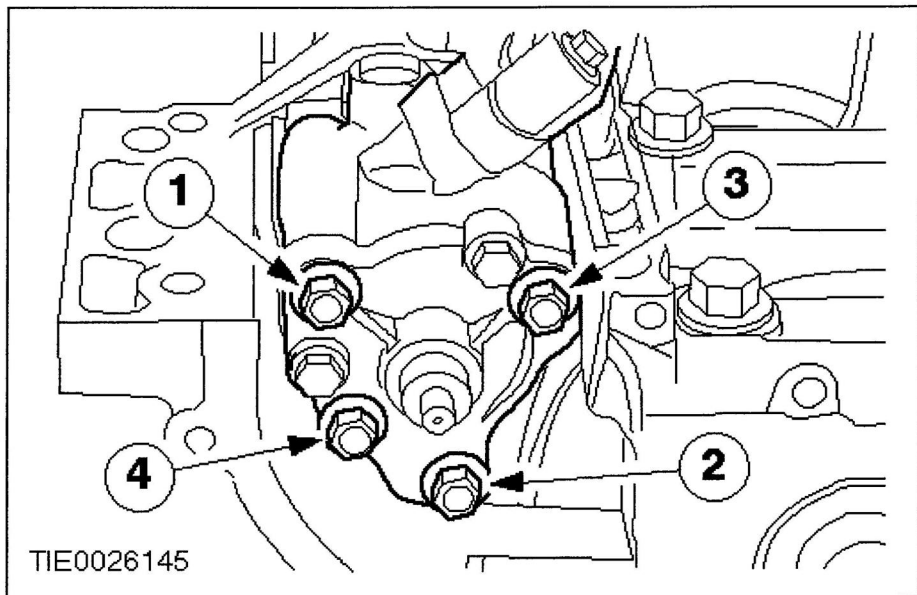
PZ21210

## Timing Peg, Crankshaft TDC 303-507 (21-210)



PZ21211

## Pliers, Valve Stem Seal 303-508 (21-211)

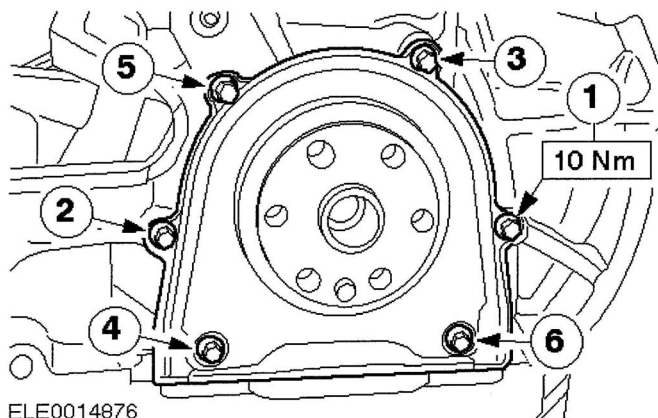


TIE0026145

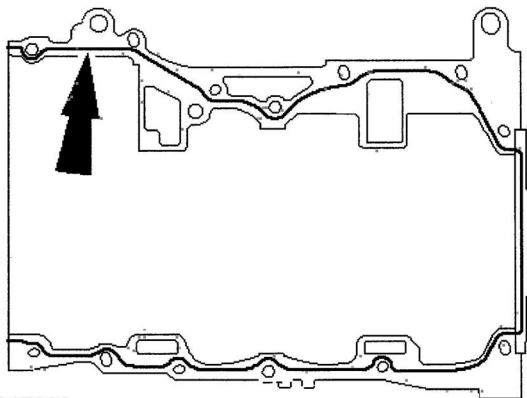
1. **Note:**  
Install a new oil pump gasket.

Install the oil pump.

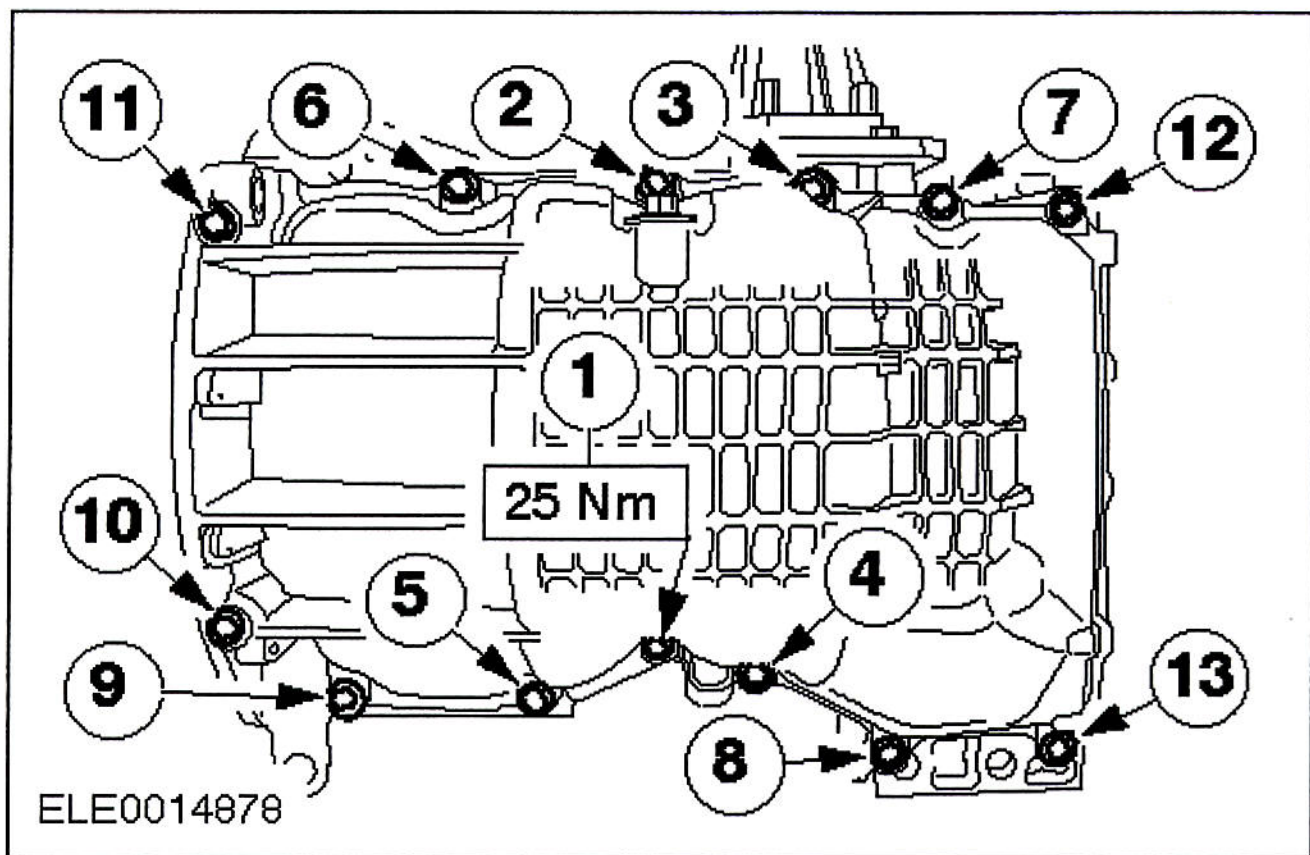
- Tighten the bolts in the sequence shown in two stages.
- Stage 1: 10 Nm.
- Stage 2: 23 Nm.



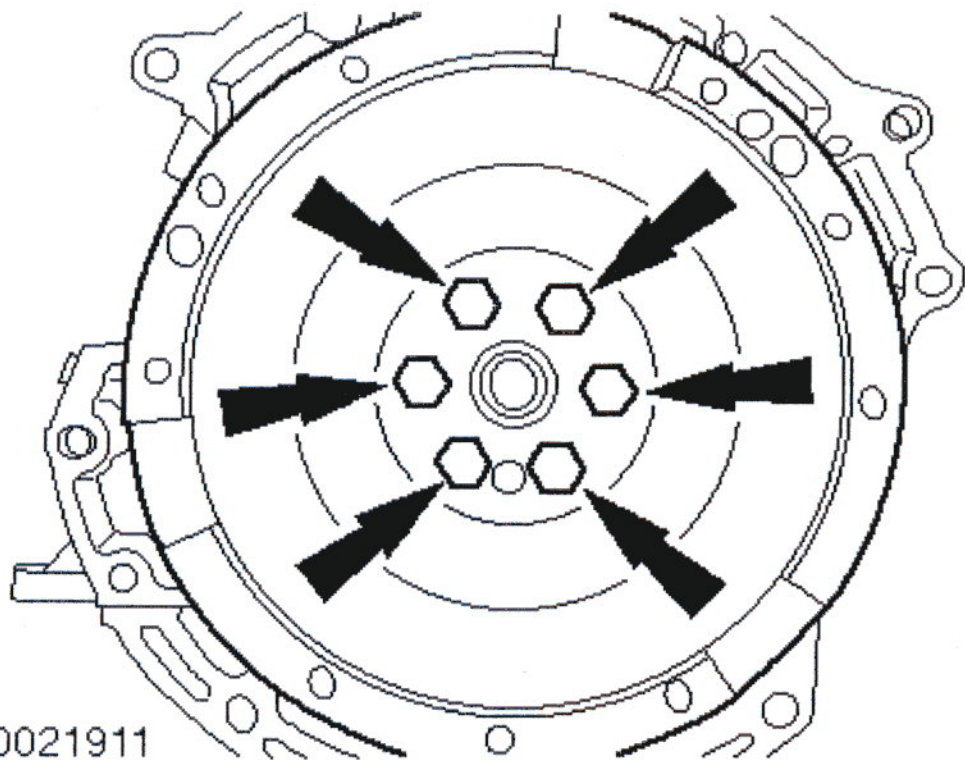
2. **Note:**  
 Install a new crankshaft rear seal carrier.  
 Install the crankshaft rear seal carrier.
- Tighten the bolts in the sequence shown.
3. Clean the mating faces of the cylinder block and of the oil pan with suitable metal surface cleaner.



- 6.** **Note:**  
Install the oil pan within 10 minutes of applying the sealant and tighten the retaining bolts within a further 5 minutes.
- Apply a 3 mm bead of sealant to the oil pan.
- 5.** Using a suitable straight edge, align the oil pan to the cylinder block mating face on the timing chain side.



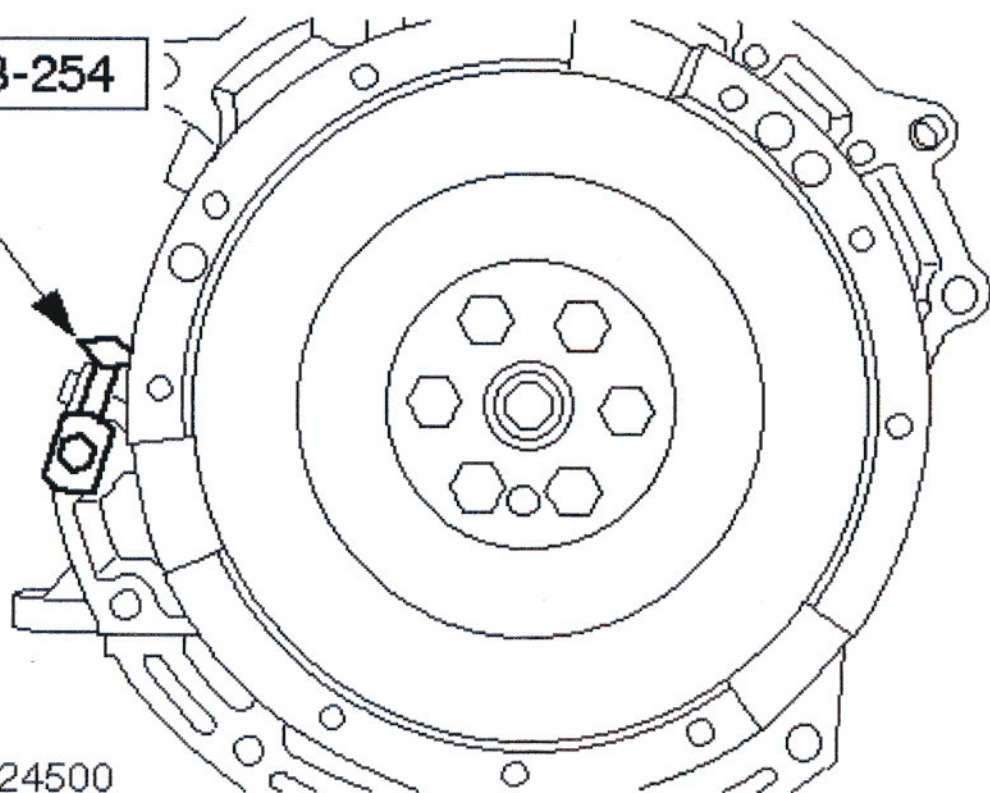
- 6.** Tighten the oil pan retaining bolts.
- Tighten the bolts in the sequence shown.



ELE0021911

7. **Note:**  
Install new flywheel bolts.  
Install the flywheel.

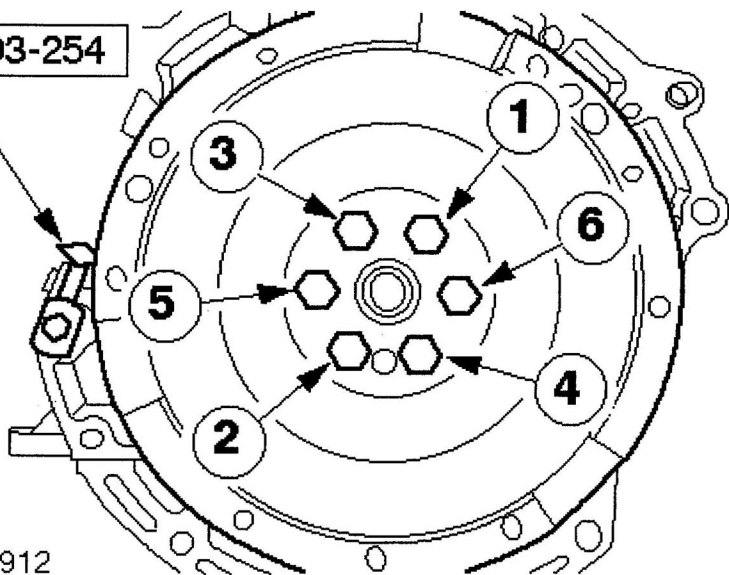
303-254



TIE0024500

8. Using the special tool, lock the flywheel in position.

303-254



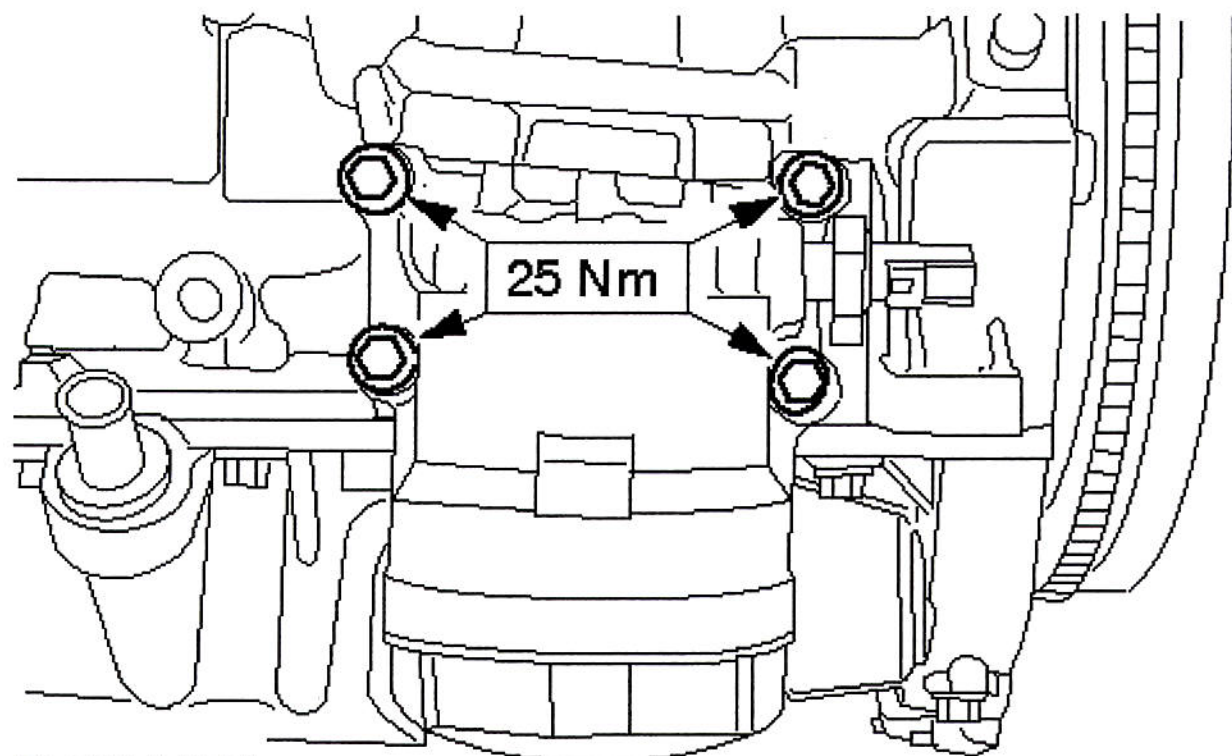
ELE0021912

9 Tighten the flywheel bolts.

- - Tighten the bolts in the sequence shown in three stages.
- Stage 1: 50 Nm.
- Stage 2: 80 Nm.
- Stage 3: 112 Nm.

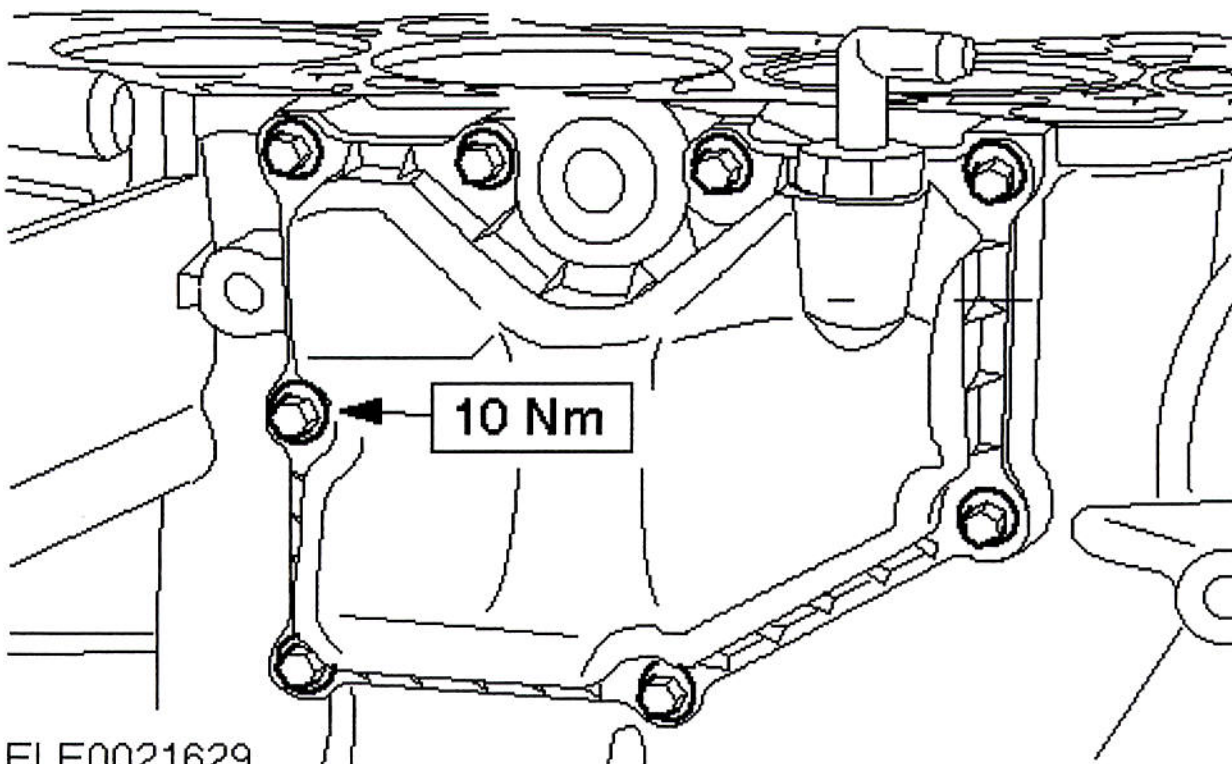
10. Remove the special tool.

11. Install the clutch disc and pressure plate. For additional information, refer to «Section 308-01A». For additional information, refer to «Section 308-01B».



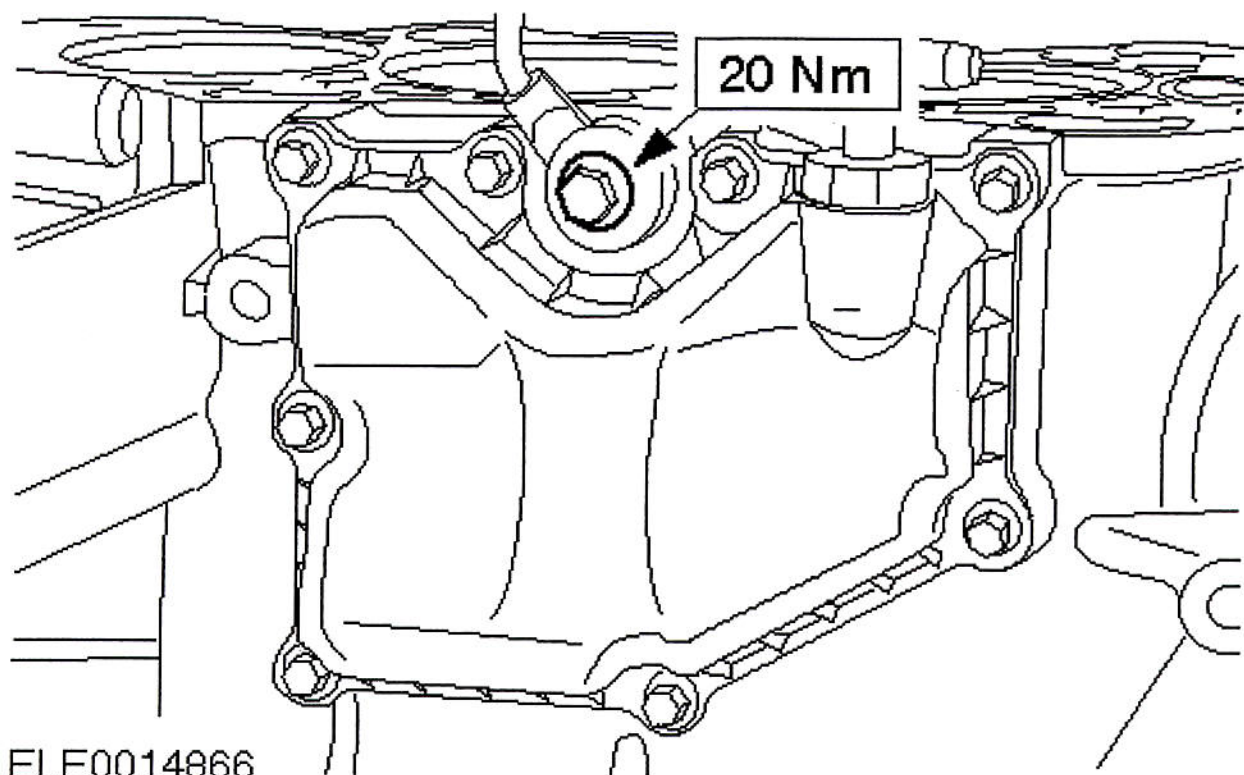
ELE0014868

- Ⓒ 12. **Note:**  
Install a new oil filter adapter gasket.  
Install the oil filter adapter.



ELE0021629

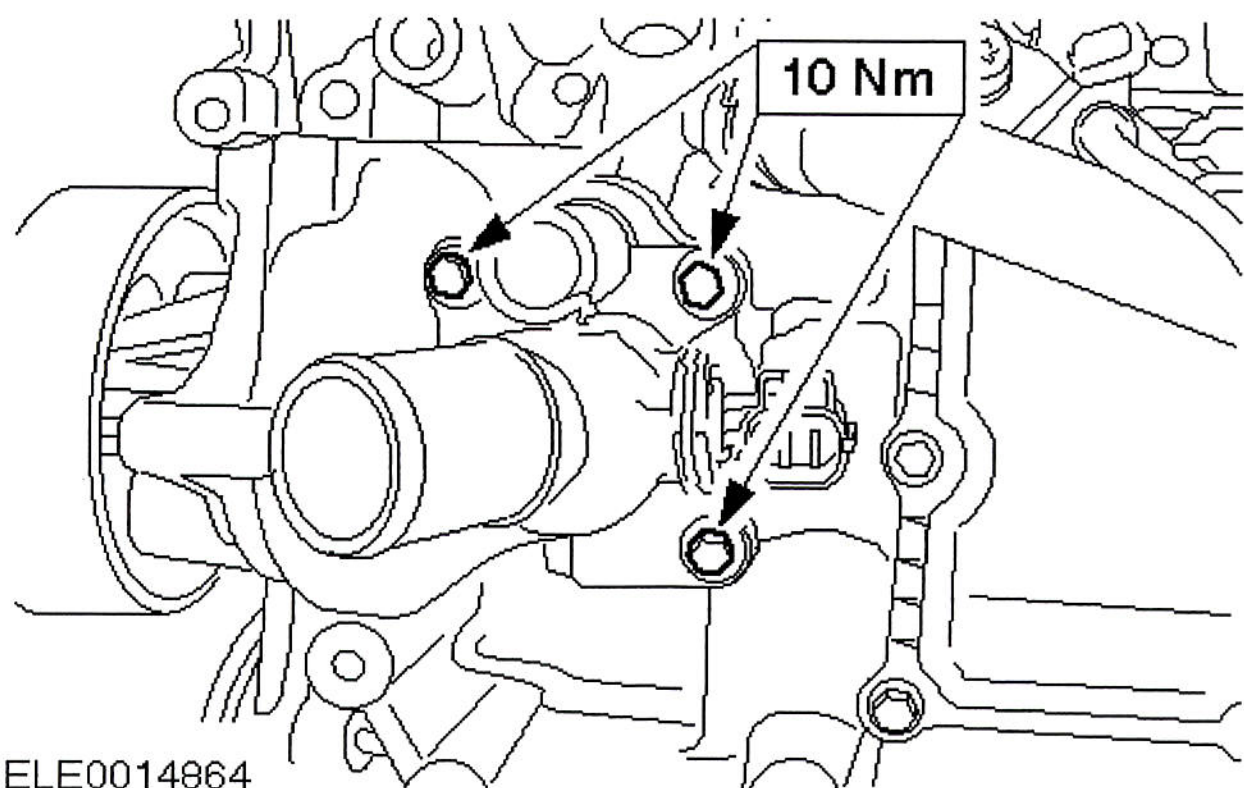
- Ⓒ 13. Install the crankcase vent oil separator.



ELE0014866

14. **Note:**  
Rotate the knock sensor (KS) as far counter-clockwise as possible without touching the PCV housing.

Install the KS.

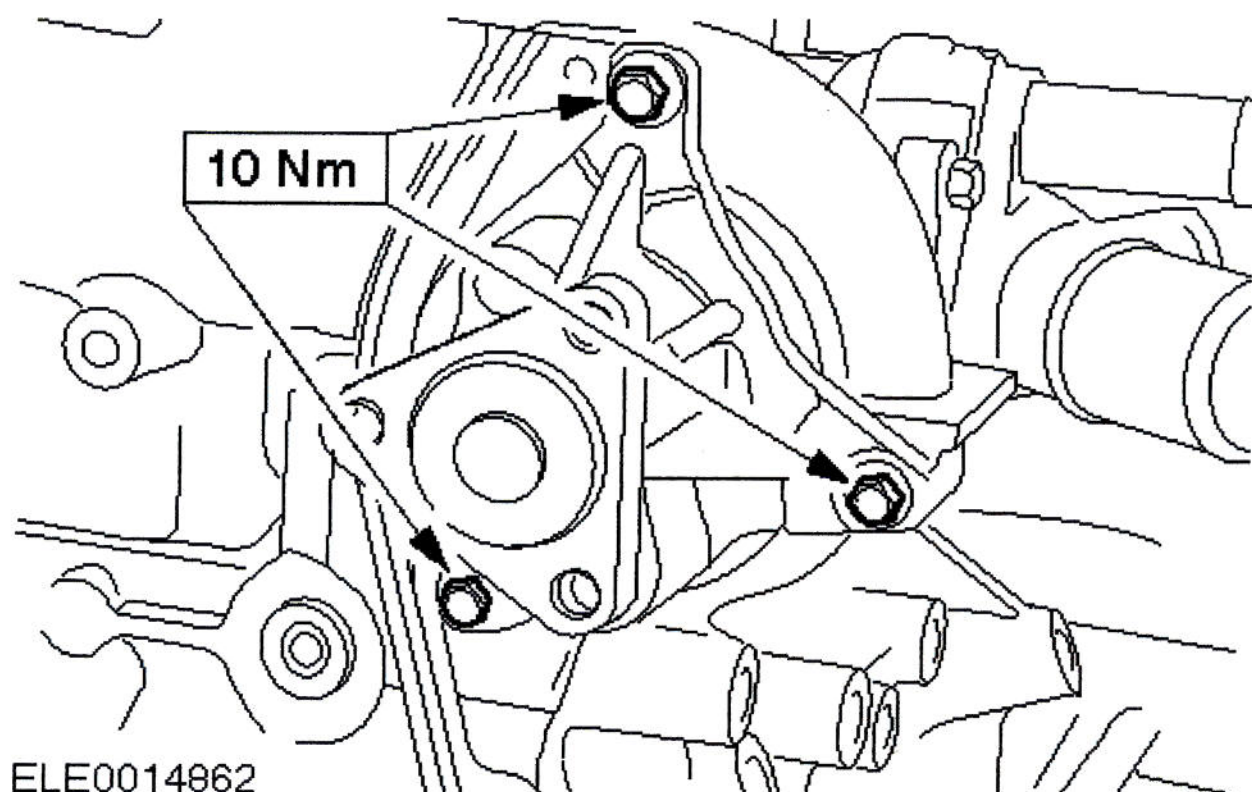


ELE0014864

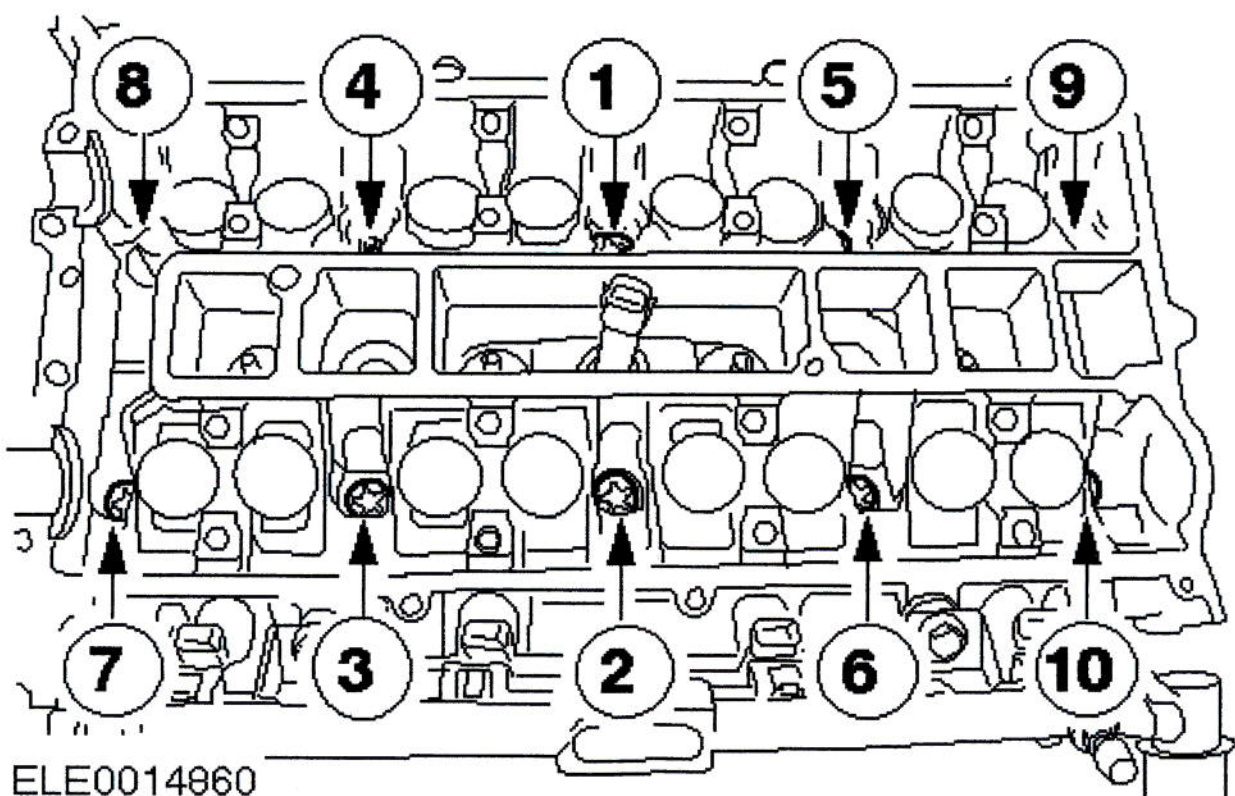
15. **Note:**  
Install a new thermostat housing gasket.



Install the thermostat housing.



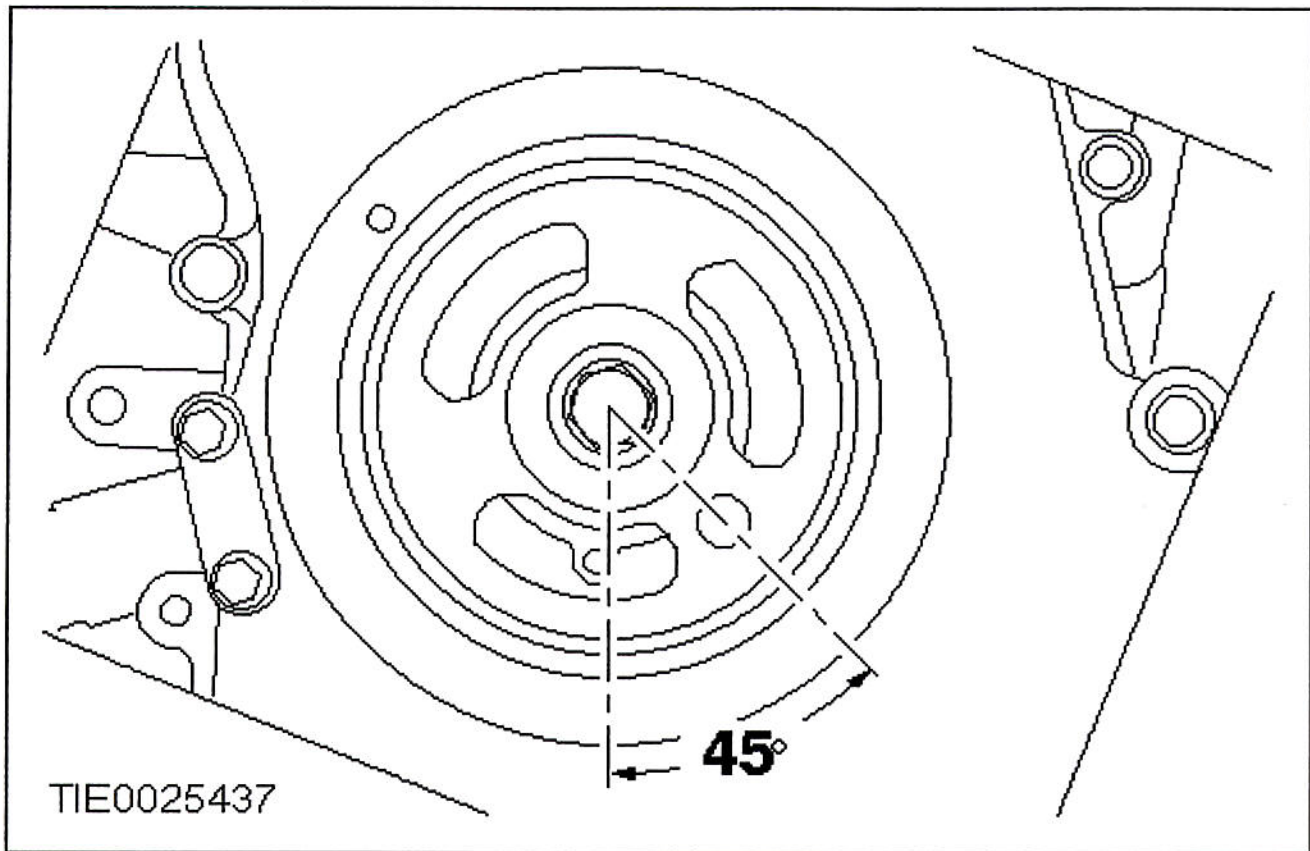
16. **Note:**  
Install a new coolant pump O-ring.  
Install the coolant pump.



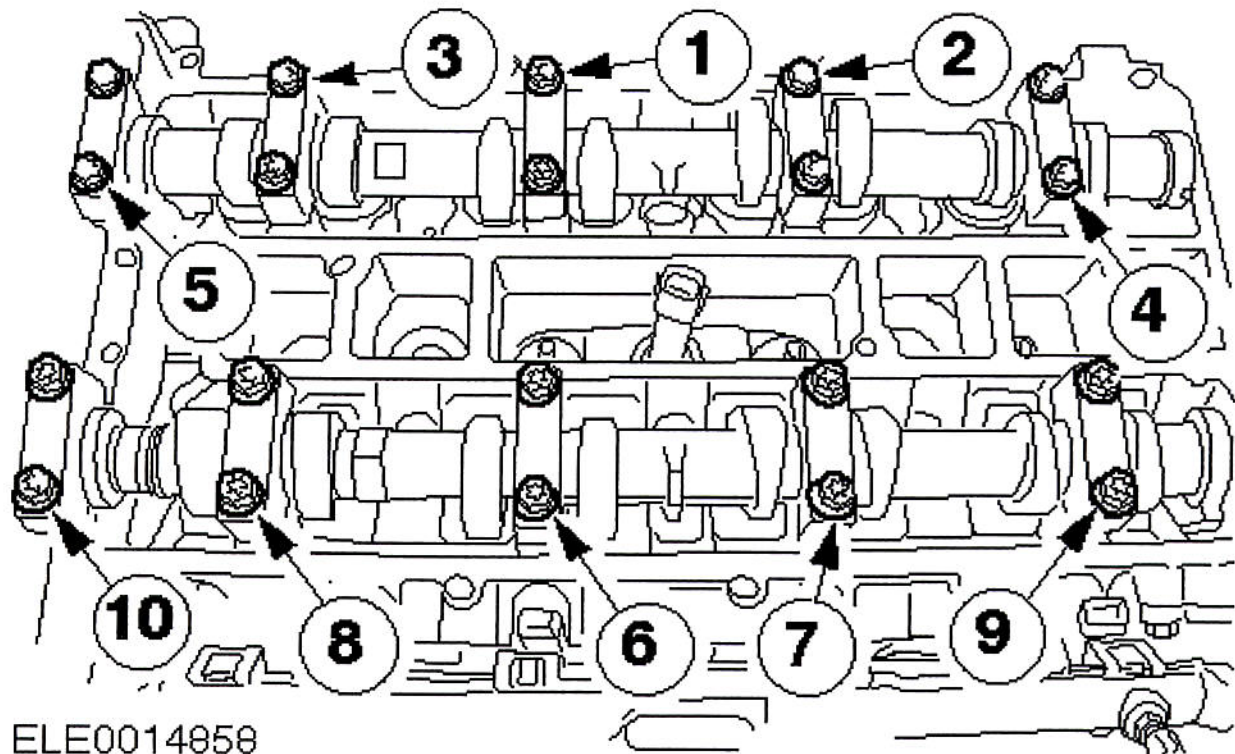
17. **Note:**  
Install new cylinder head bolts and gasket.

Install the cylinder head.

- Tighten the cylinder head bolts in five stages.
- 1. Stage: 5 Nm.
- 2. Stage: 15 Nm.
- 3. Stage: 45 Nm.
- 4. Stage: 90 degrees.
- 5. Stage: 90 degrees.



- 18. **Note:**  
Only rotate the crankshaft in its normal direction of rotation.  
Rotate the crankshaft until piston No. 1 is approximately 45 degrees before top dead center (TDC).
19. Install the valve tappets.

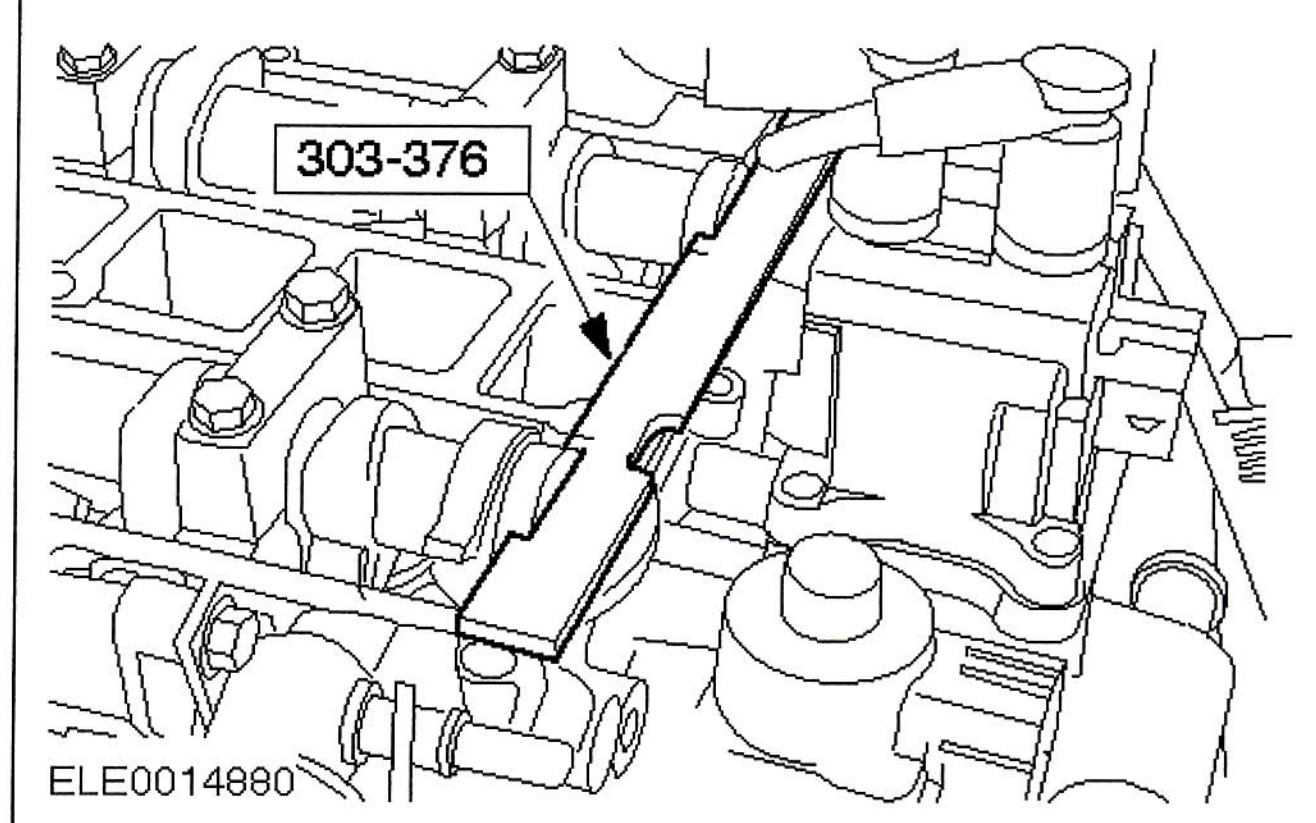


ELE0014858

20. **CAUTION:**  
**Install the camshafts approximately at valve overlap position cylinder No. 4.**

Install the camshafts.

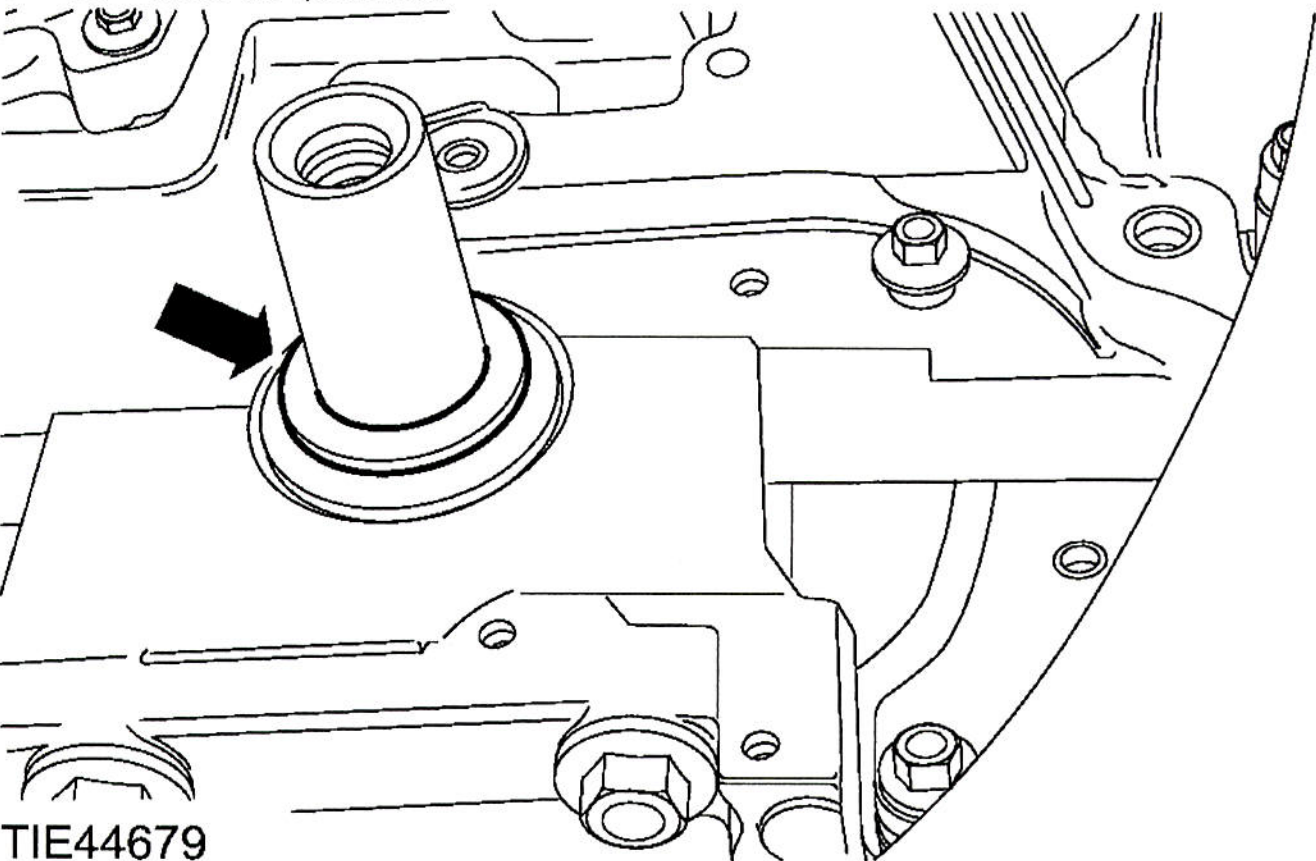
- Working in several stages, evenly tighten the camshaft bearing cap bolts in the sequence shown, one half turn at a time.
- Coat the camshaft bearing caps with oil.
- Tighten the bolts in two stages.
- Stage 1: 7 Nm.
- Stage 2: 16 Nm.



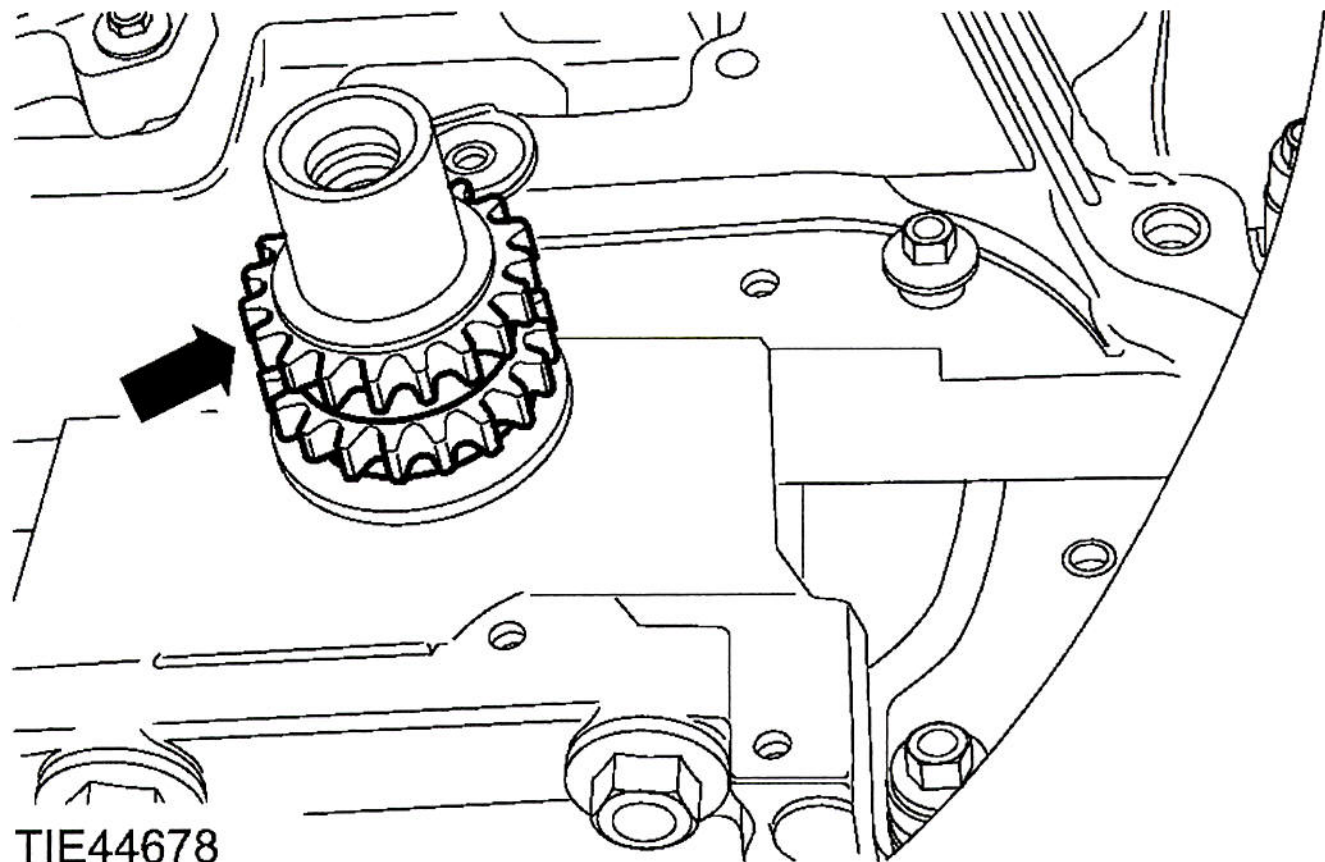
303-376

ELE0014880

21. Install the special tool.

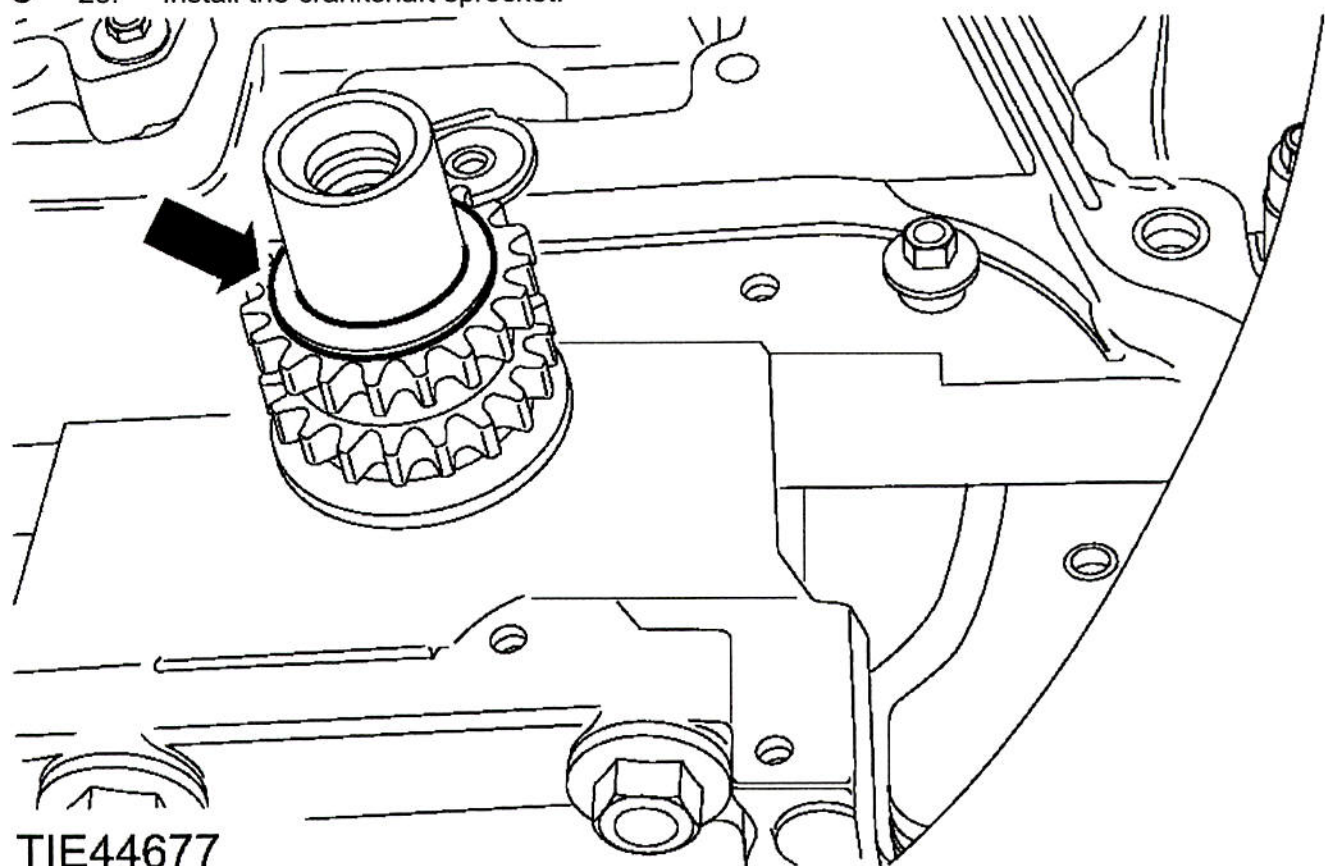


22. **Note:**  
Install a new rear friction washer.  
Install the rear friction washer.



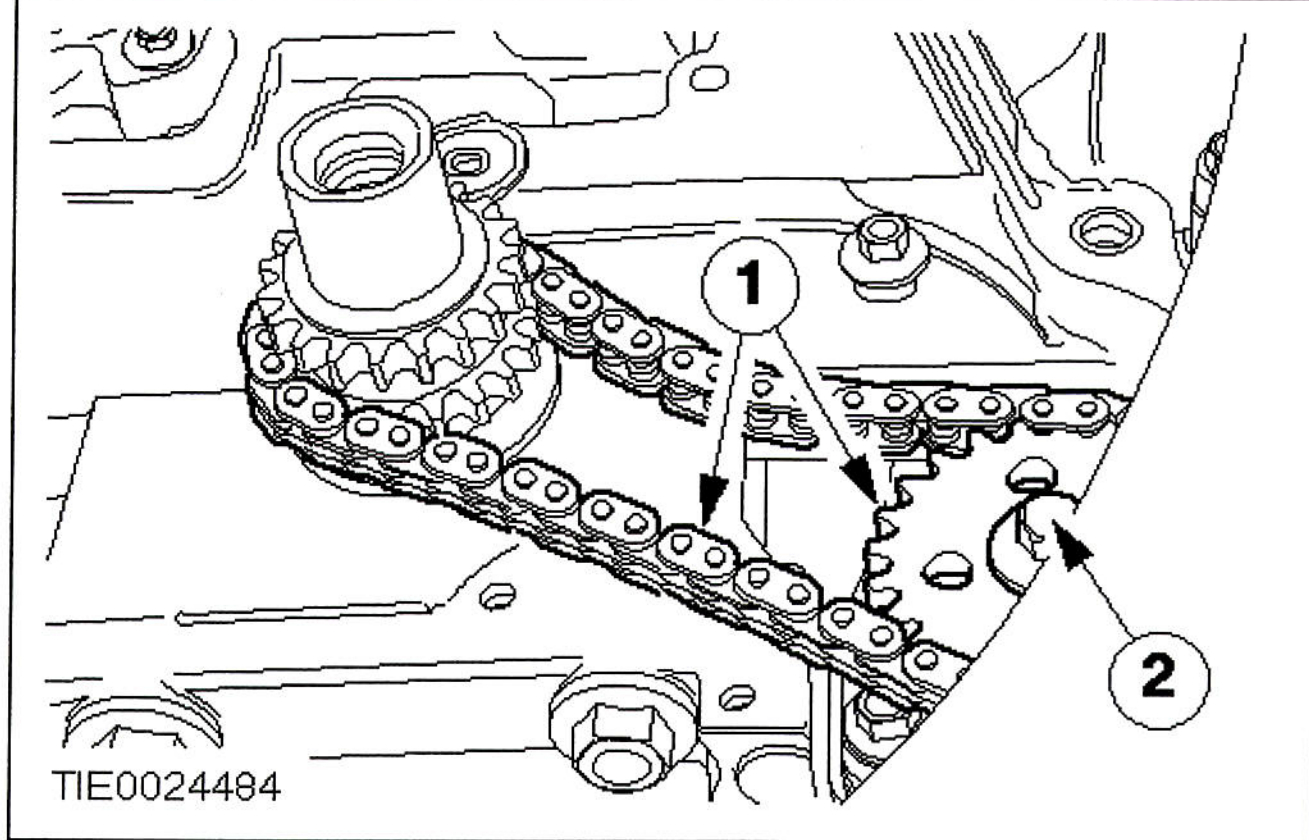
TIE44678

- 23. Install the crankshaft sprocket.

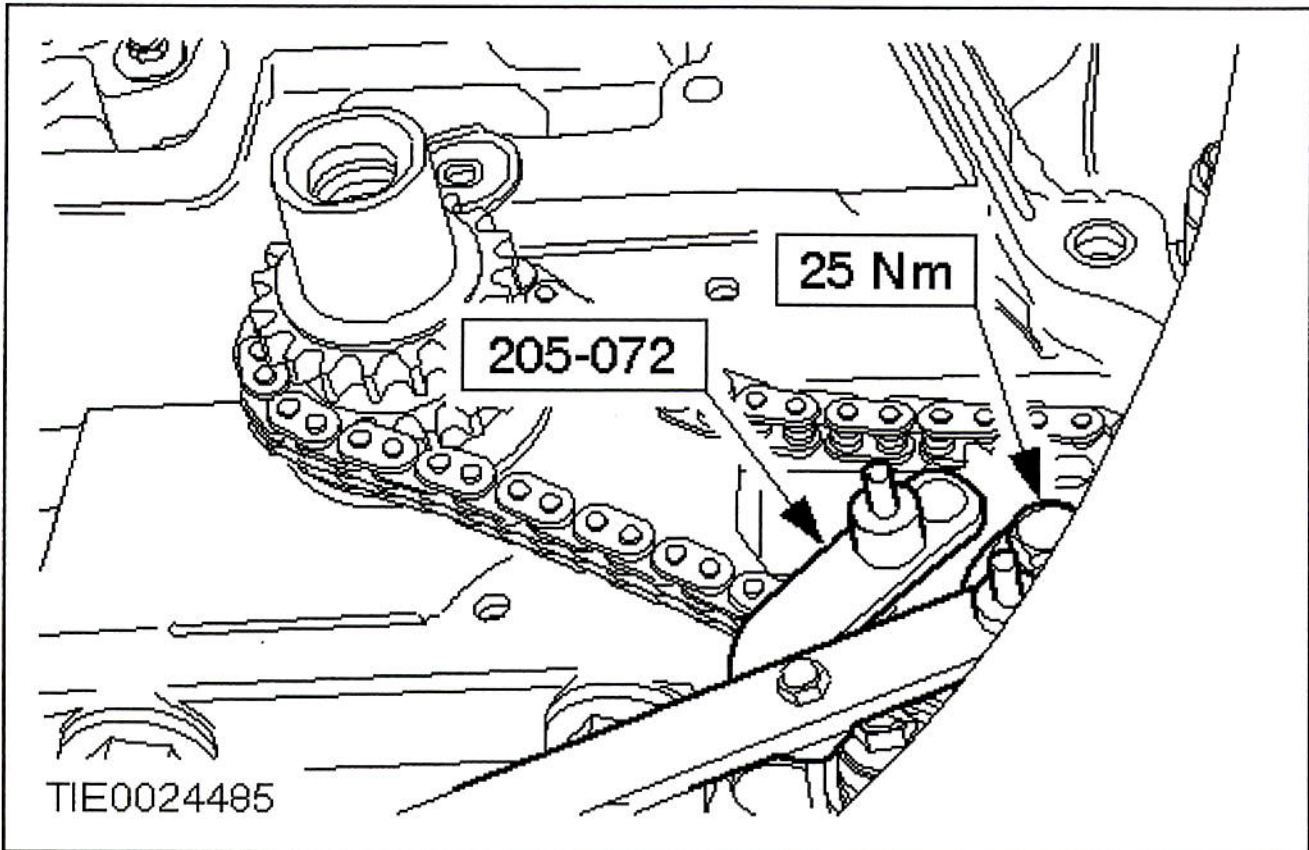


TIE44677

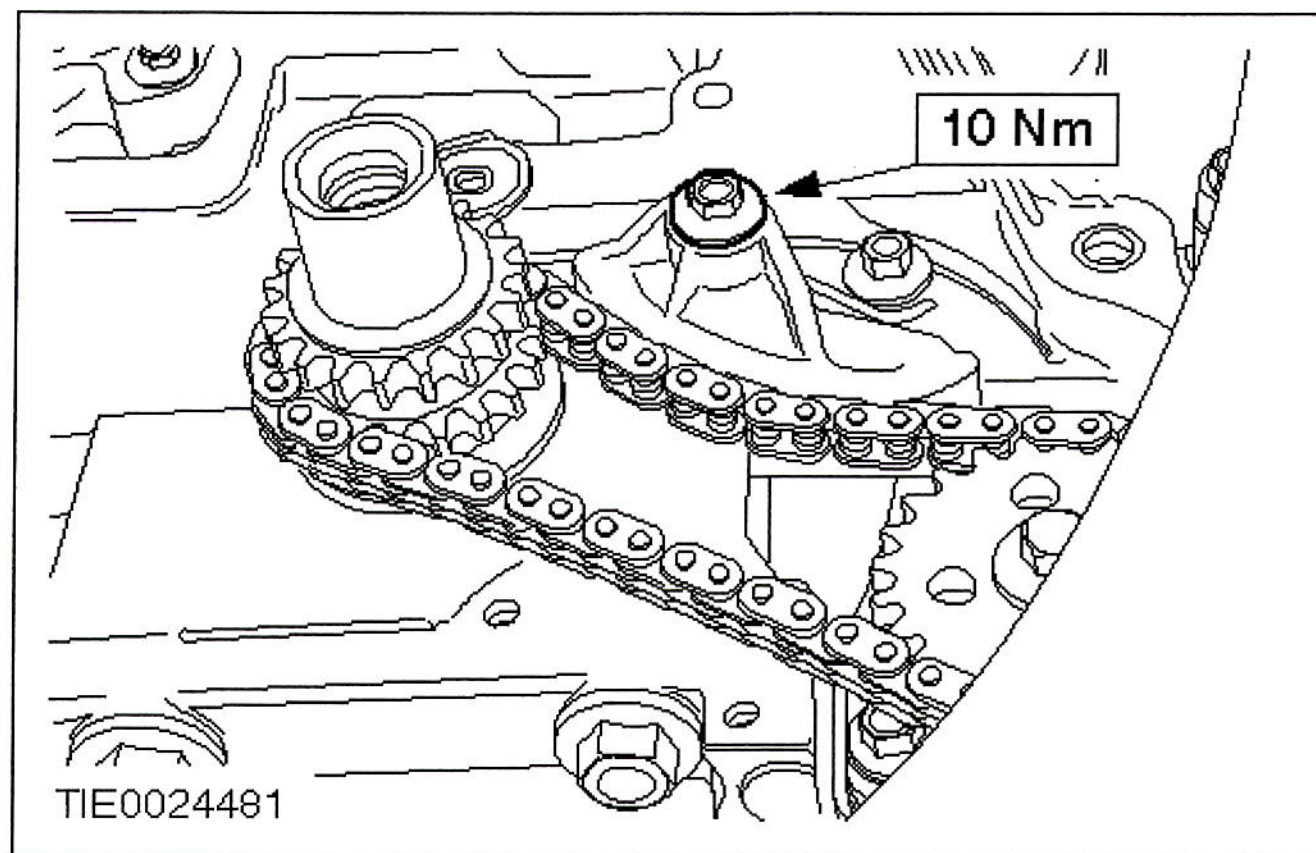
- 24. **Note:**  
Install a new front friction washer.  
Install the front friction washer.



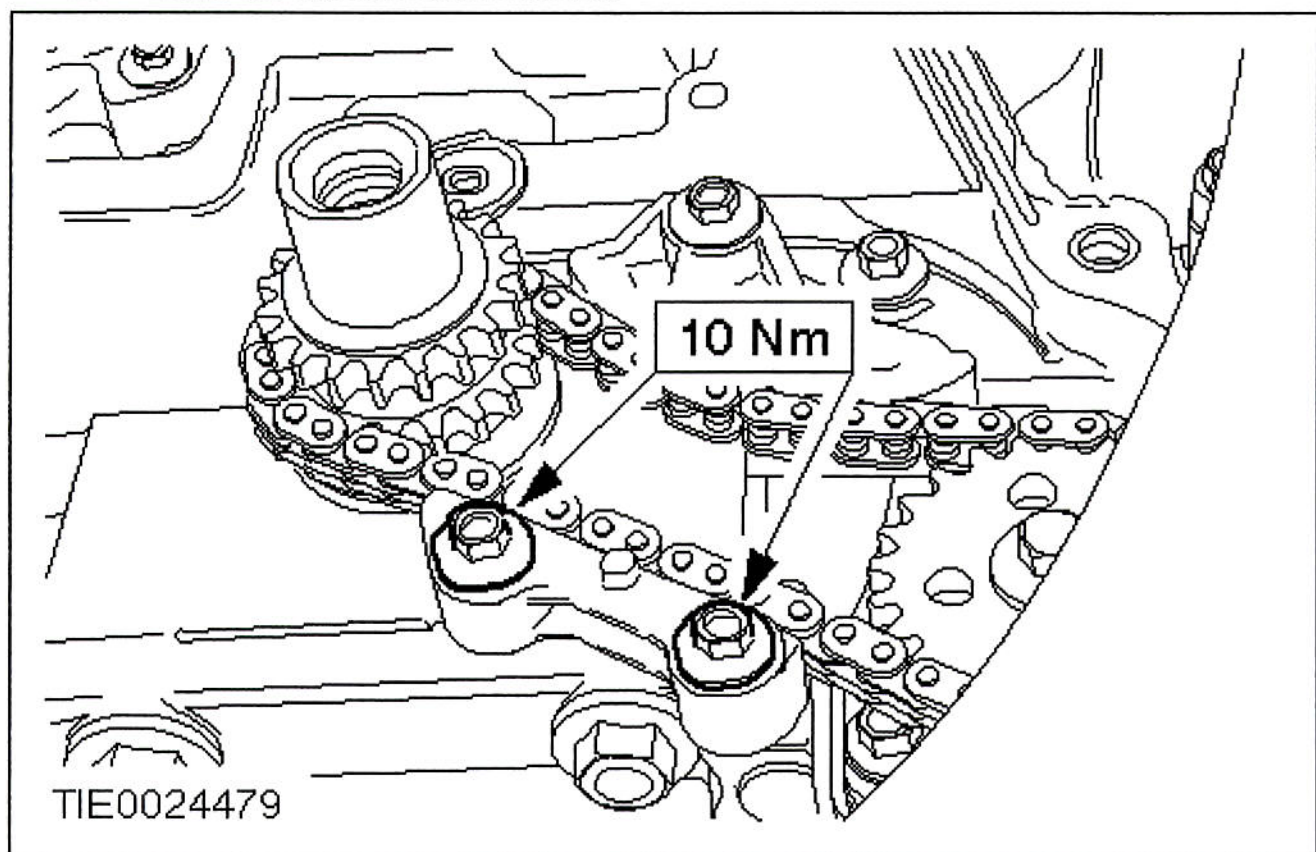
- 25. Install the oil pump chain.
  - 1 Install the oil pump chain and the oil pump sprocket.
  - 2 Install the oil pump sprocket retaining bolt.



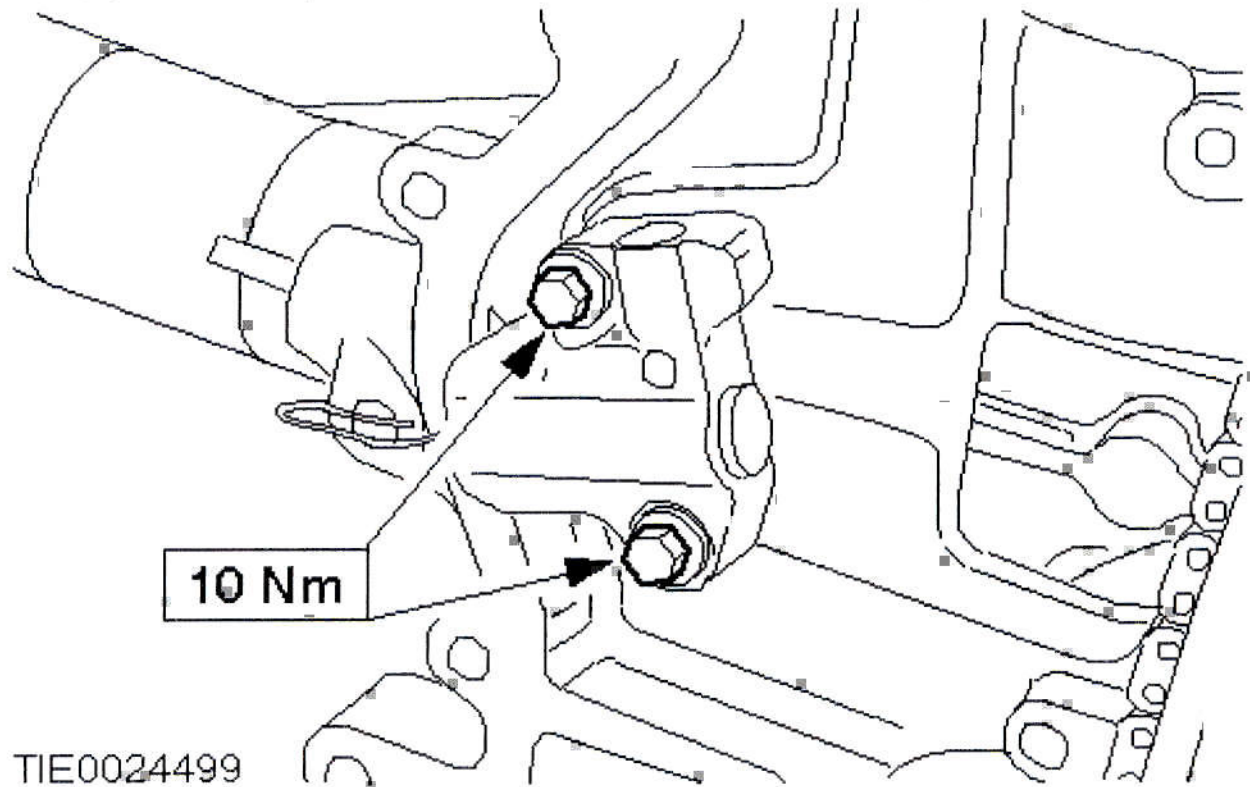
- 26. Using the special tool, tighten the oil pump sprocket retaining bolt.



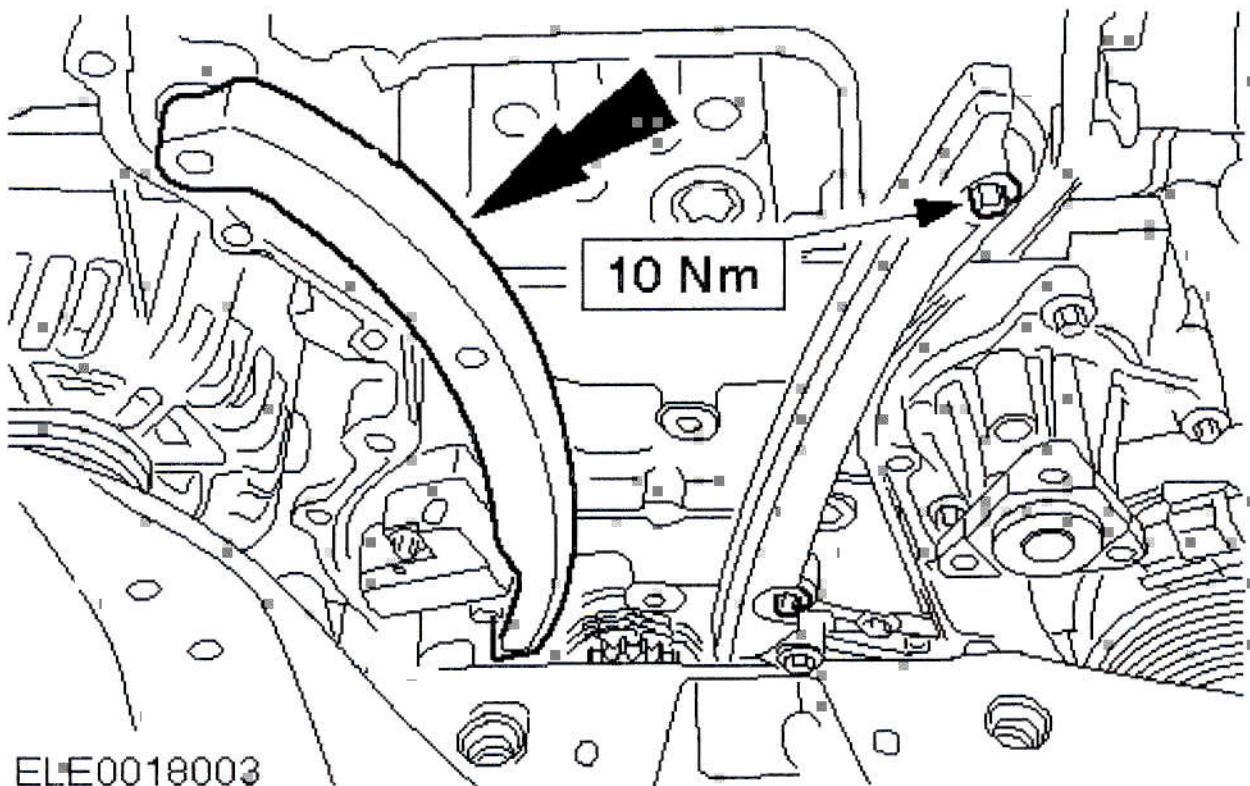
27. Install the oil pump chain tensioner.



28. Install the oil pump chain guide.

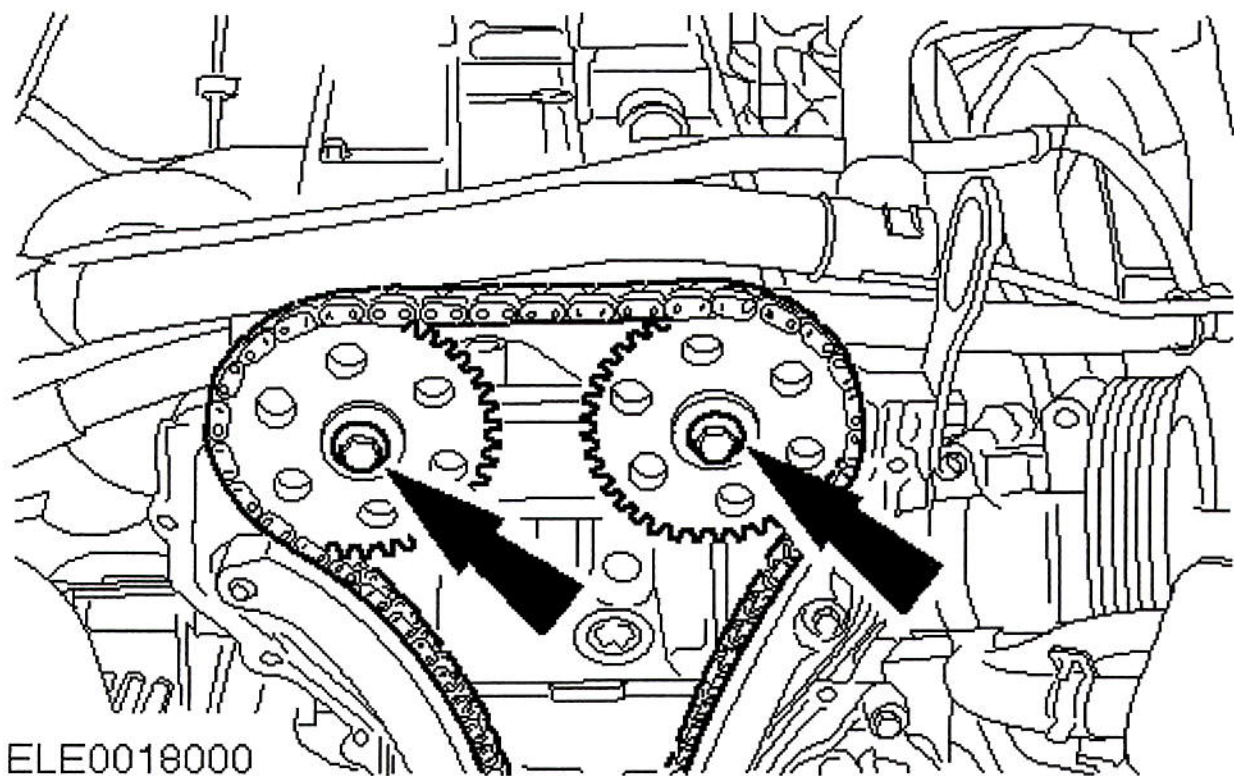


29. Install the timing chain tensioner.



30. Install the timing chain guides.



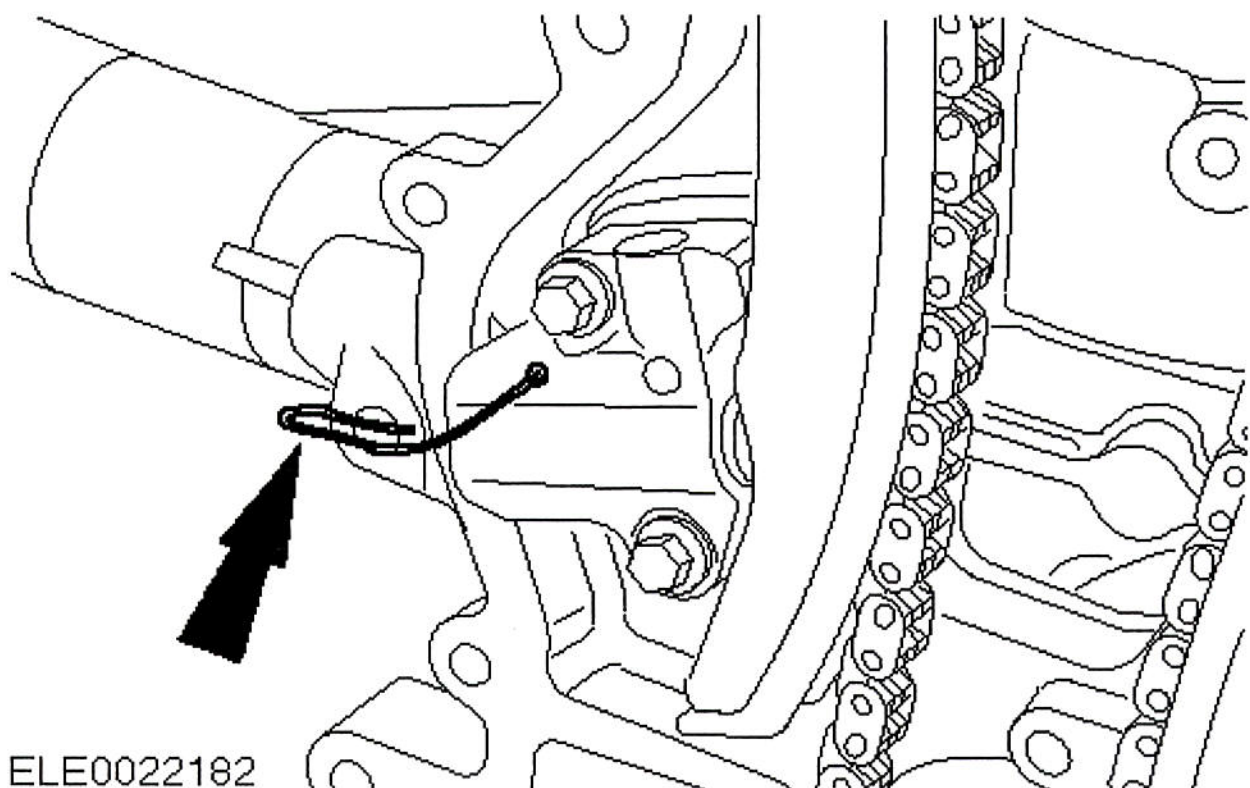


ELE0018000

31. **CAUTION:**  
Do not fully tighten the camshaft sprocket retaining bolts at this stage. Make sure the camshaft sprockets turn on the camshafts.

Install the camshaft sprockets.

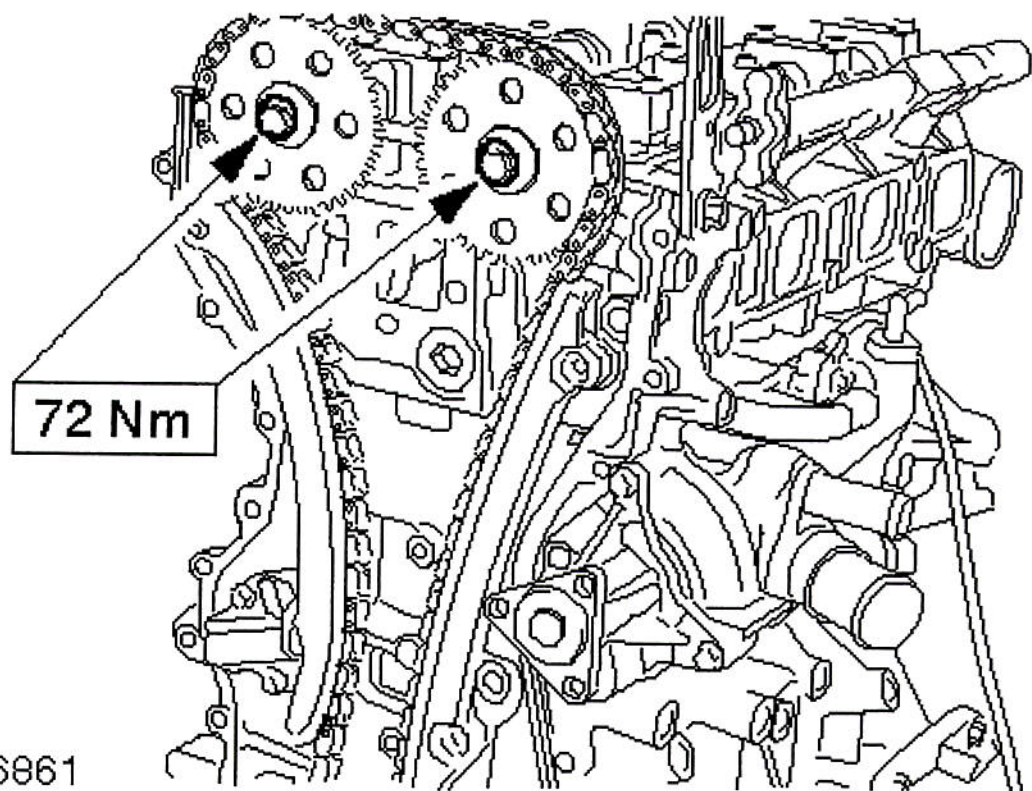
- Install the timing chain.



ELE0022182

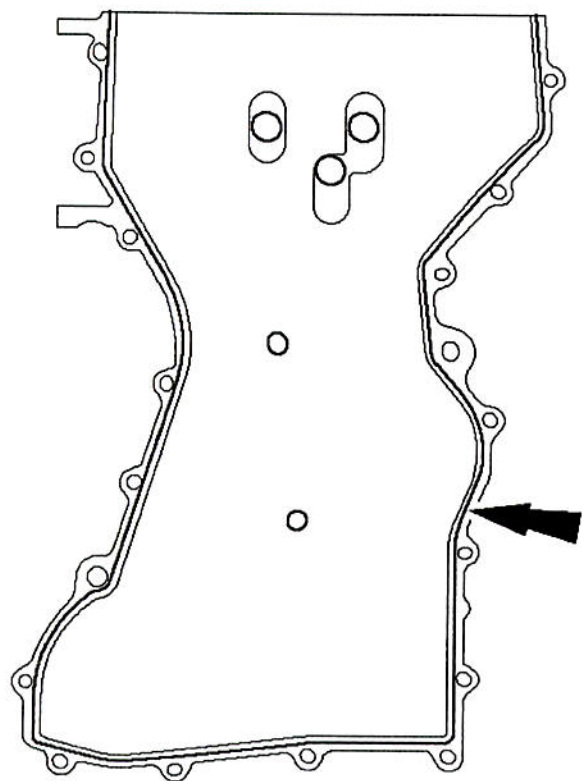
32. Tension the timing chain.

- Apply pressure to the timing chain and remove the securing pin.



TIE0016861

- 33. **⚠ CAUTION:**  
**Hold each camshaft by the hexagon with an open-ended wrench to stop it from turning.**  
Tighten the camshaft sprockets retaining bolts.
34. Clean mating face of the engine front cover with suitable metal surface cleaner.

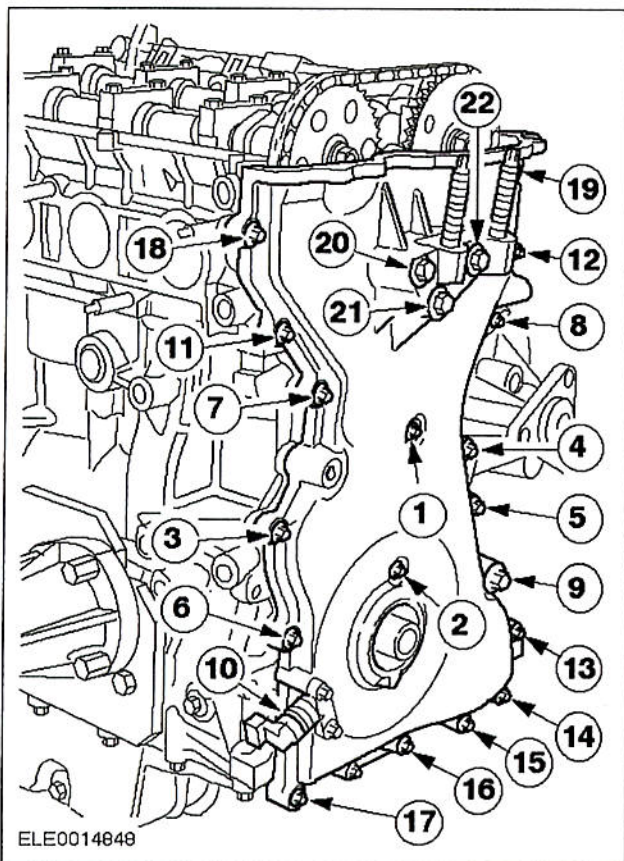


35.

**Note:**

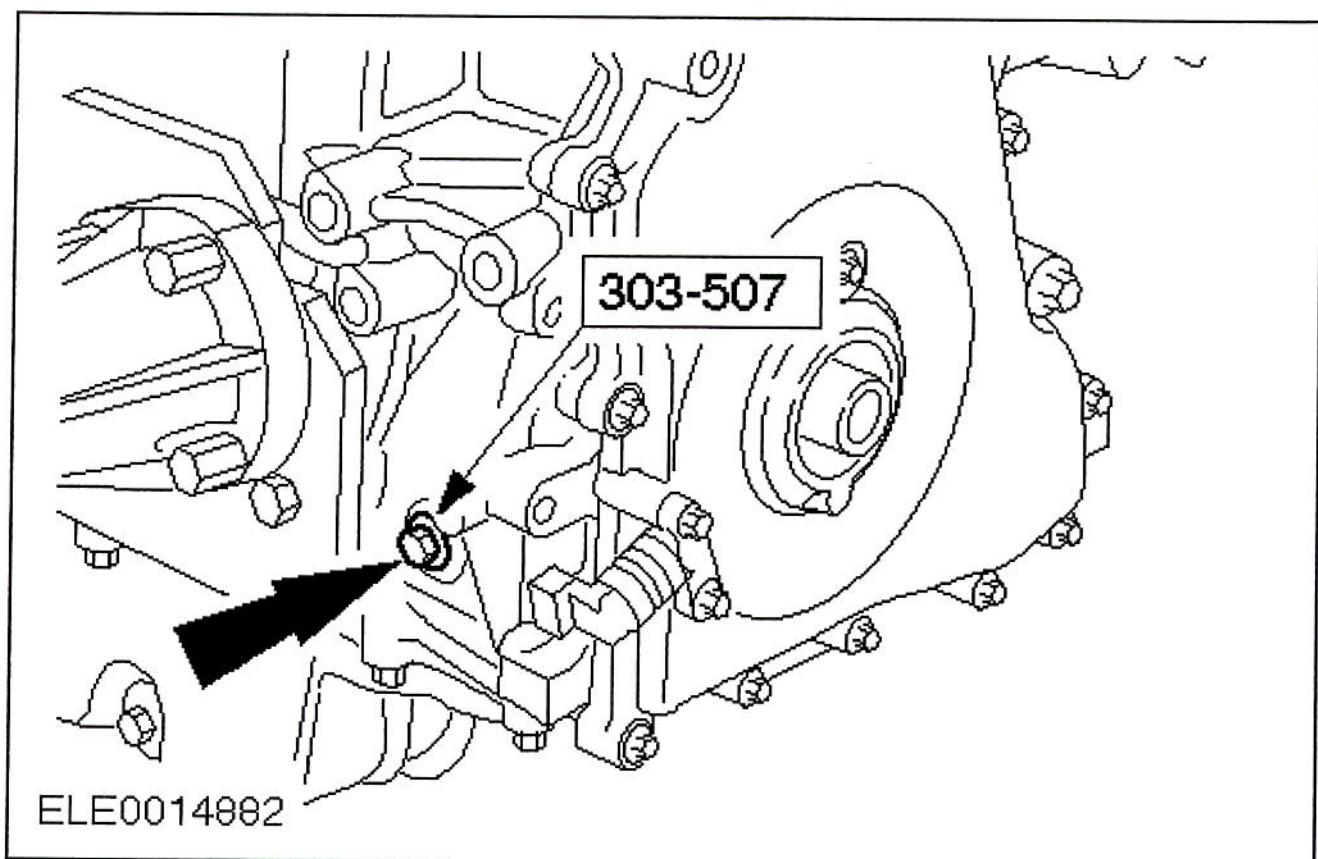
Install the engine front cover within 10 minutes of applying the sealant.

Apply a 3 mm bead of sealant to the engine front cover.

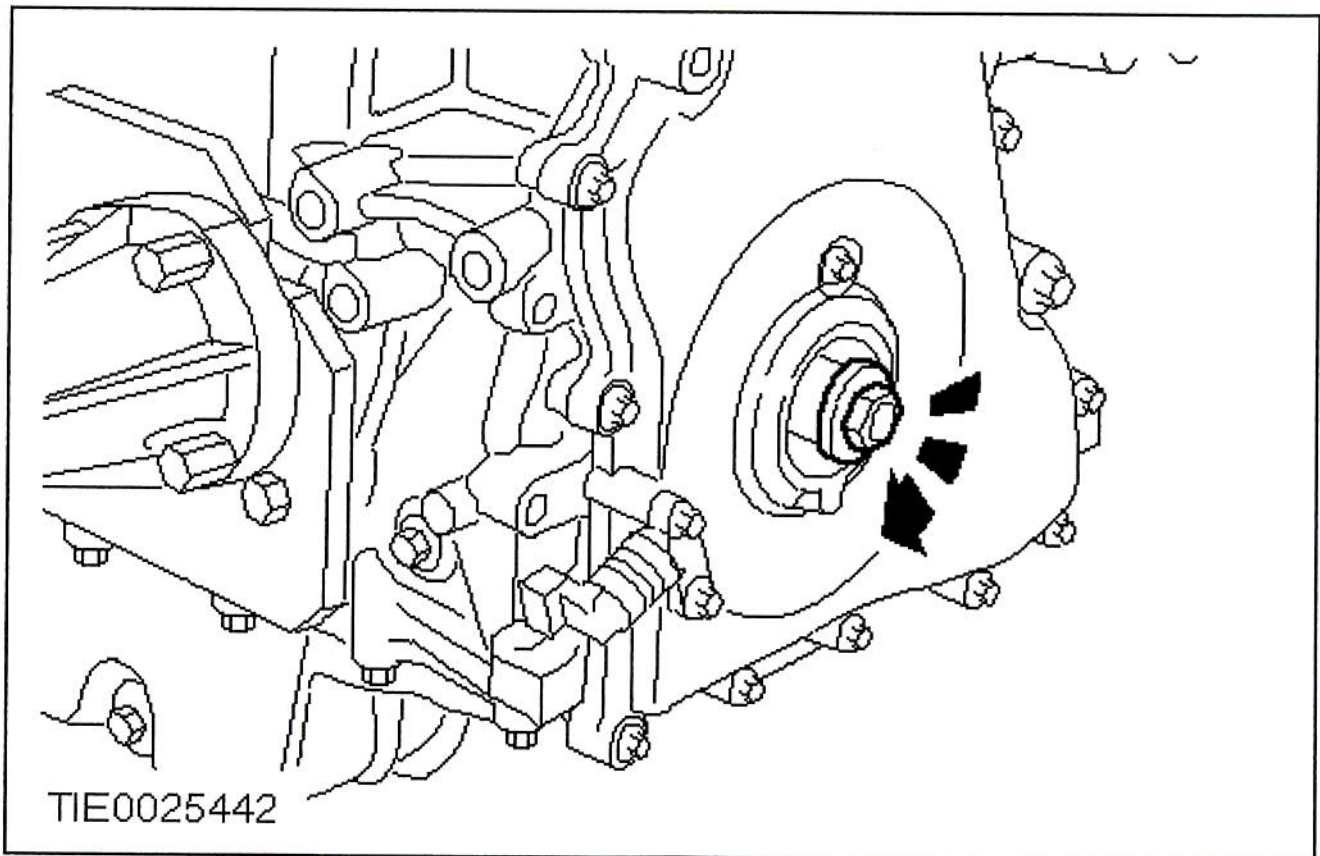


36. Install the engine front cover.

- Tighten the bolts in the sequence shown.
- Bolts 1 through 8 to 10 Nm
- Bolt 9: 48 Nm
- Bolts 10 through 19 to 10 Nm
- Bolts 20 through 22 to 48 Nm

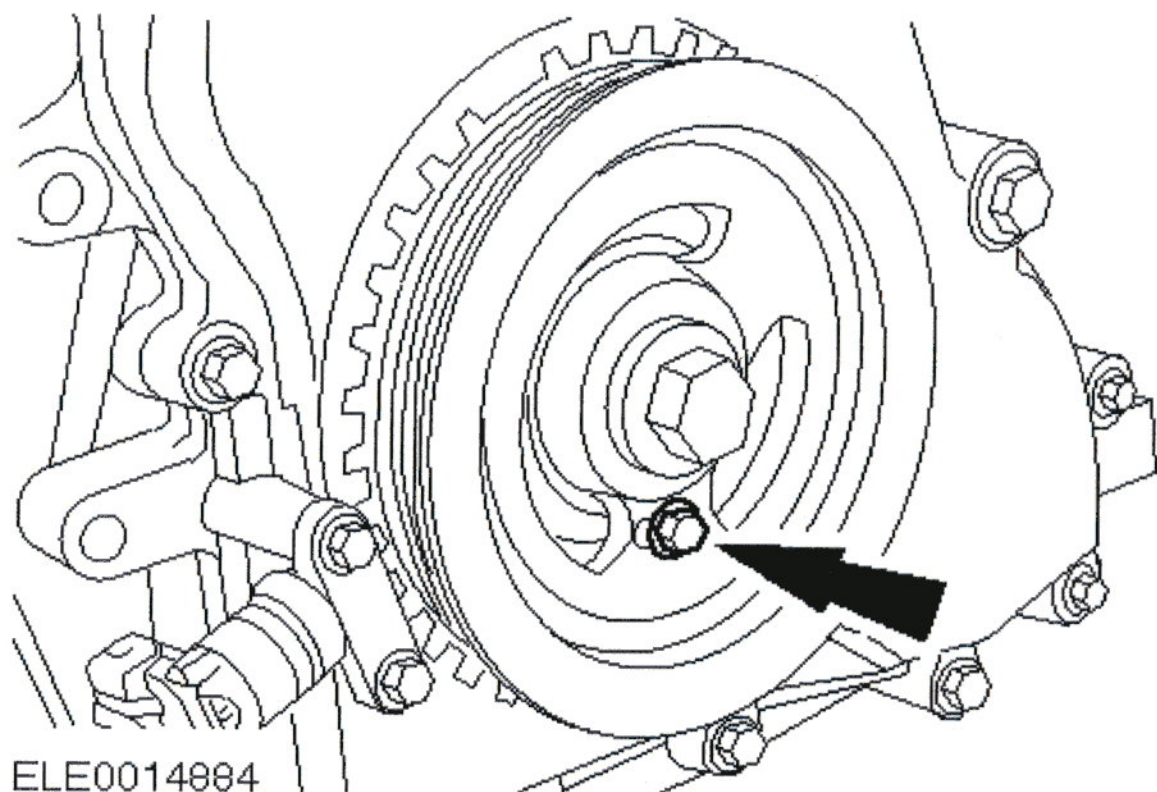


37. Remove the cylinder block lower blanking plug from the cylinder block and install the special tool.



38. **Note:**  
Only rotate the crankshaft in the normal direction of rotation.  
Using the crankshaft pulley retaining bolt, rotate the crankshaft until piston No. 1 is at TDC.
39. Remove the crankshaft pulley retaining bolt.

Discard the bolt.

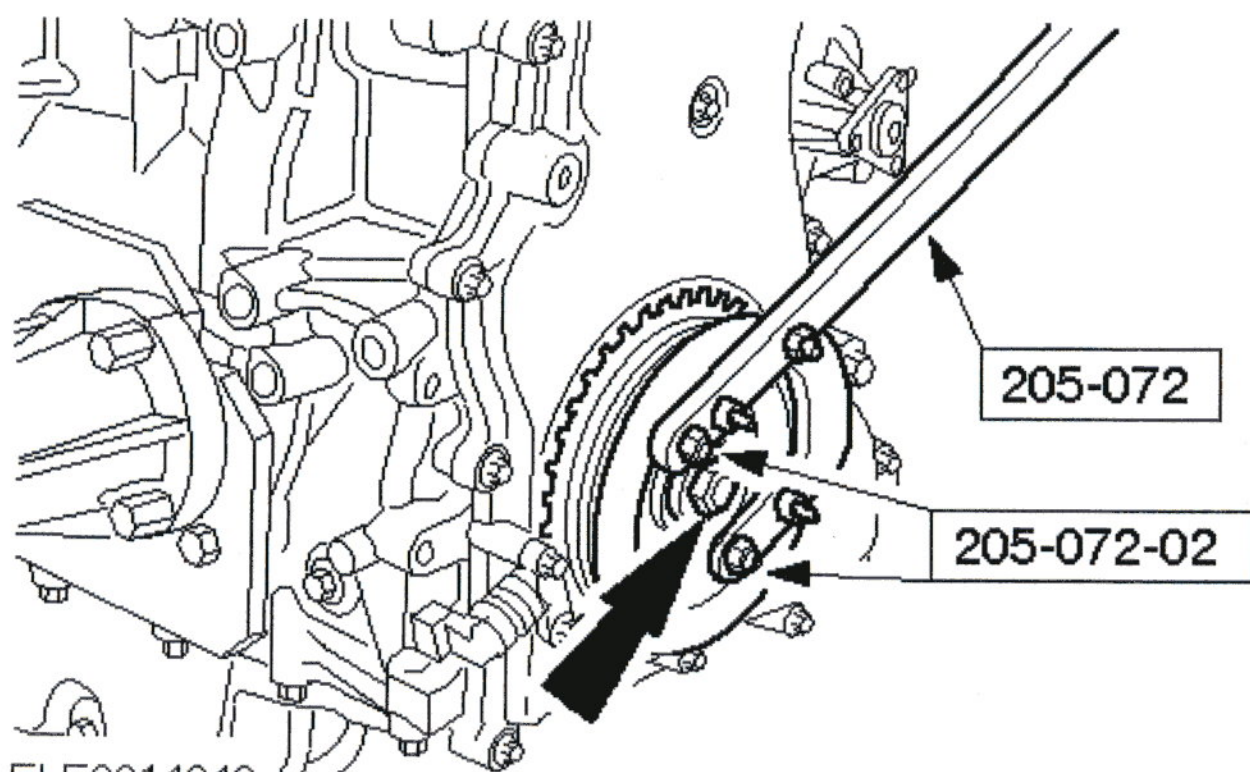


ELE0014884

40. **CAUTION:**

**Only tighten the crankshaft pulley securing bolt finger tight.**

Install the crankshaft pulley onto the crankshaft and secure the crankshaft pulley to the front cover using a M6 x 18 mm bolt.



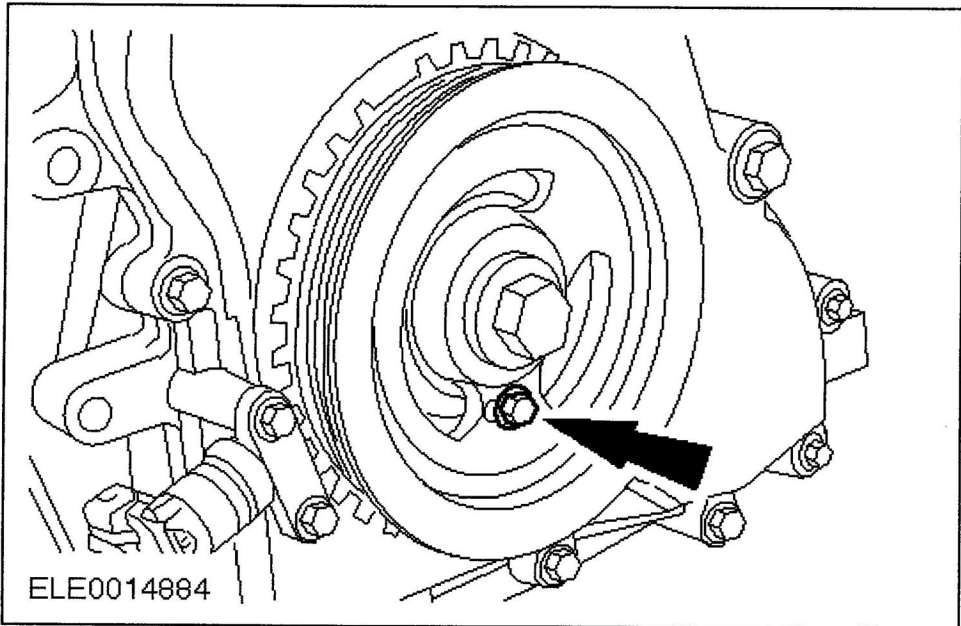
ELE0014846

41. **Note:**

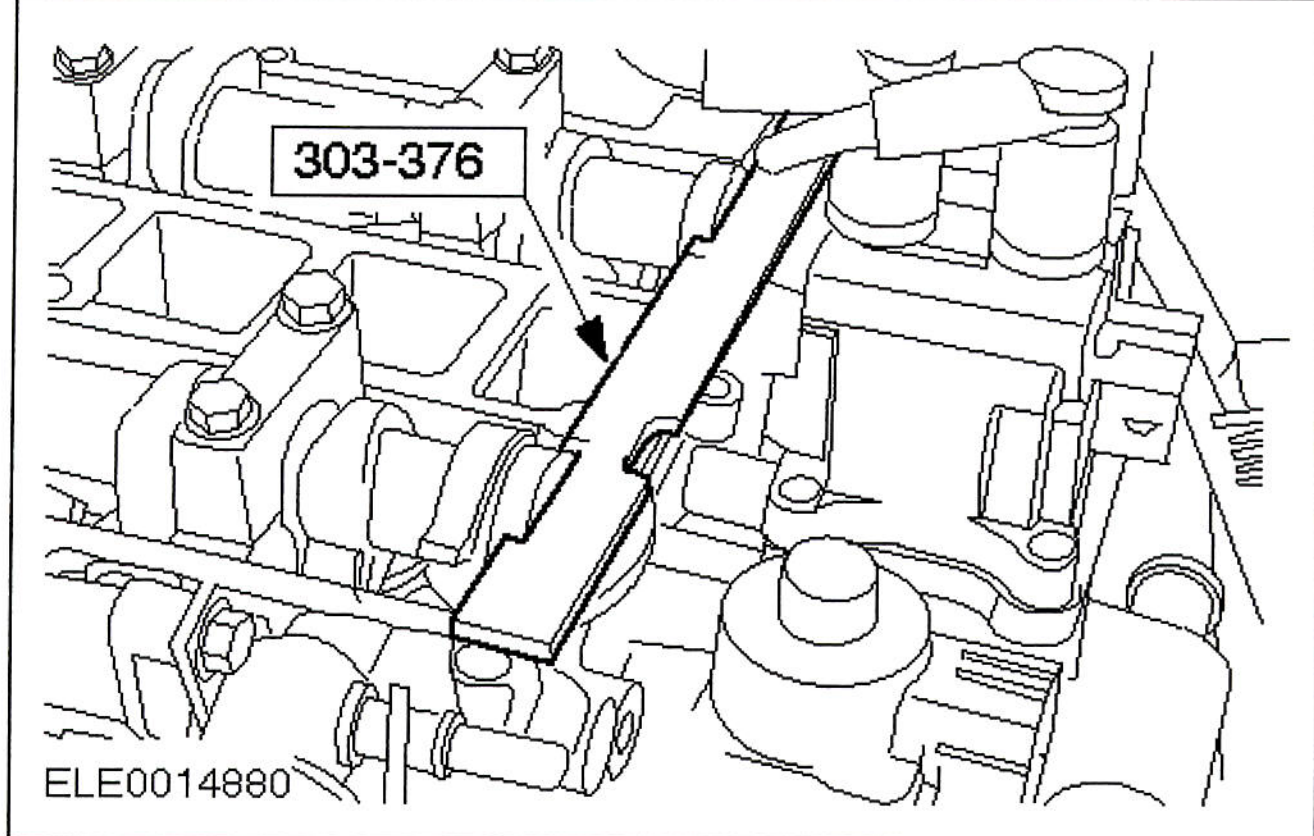
Install a new crankshaft pulley retaining bolt.

Using the special tools, prevent the crankshaft pulley from rotating and tighten the crankshaft pulley retaining bolt.

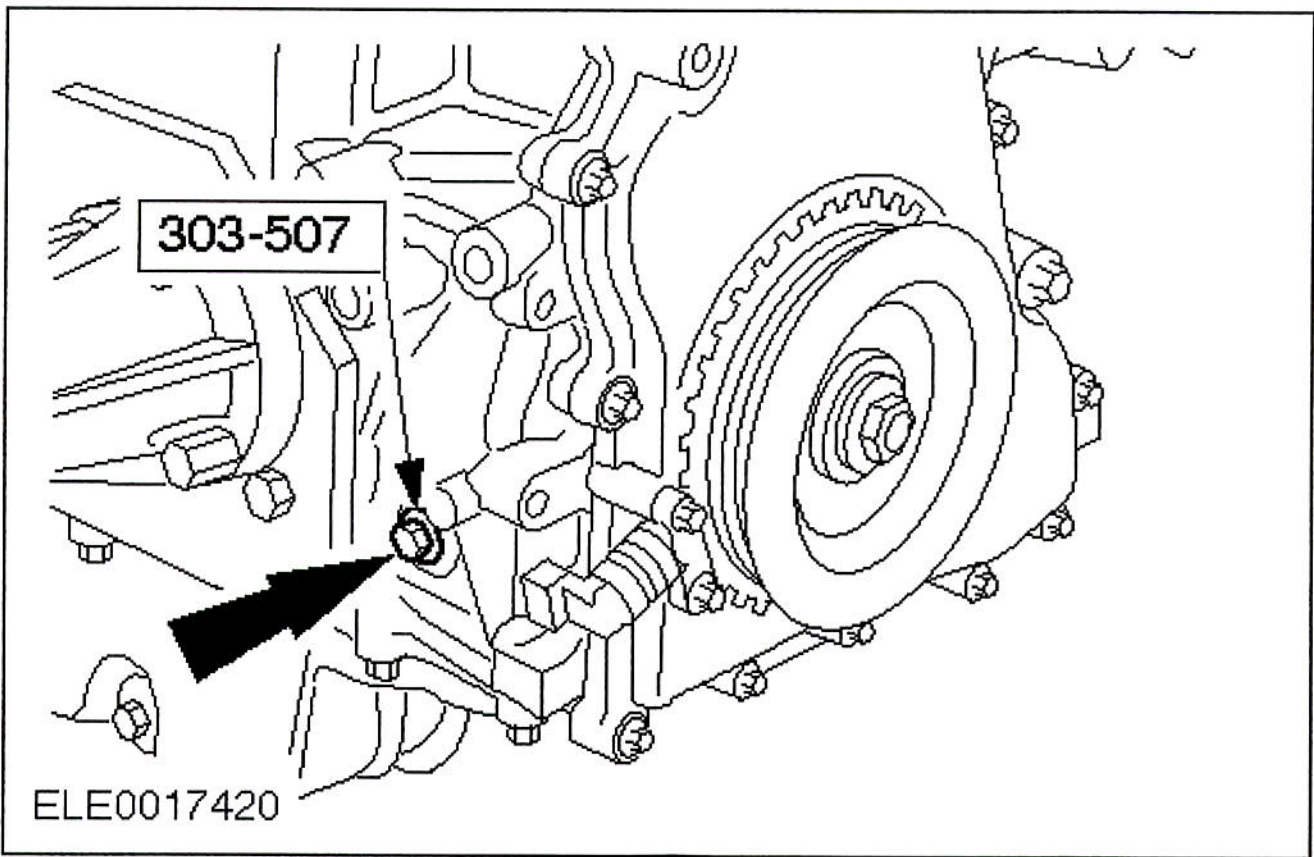
- Tighten the bolt in two stages.
- Stage 1: 100 Nm.
- Stage 2: 90 degrees.



42. Remove the crankshaft pulley securing bolt.

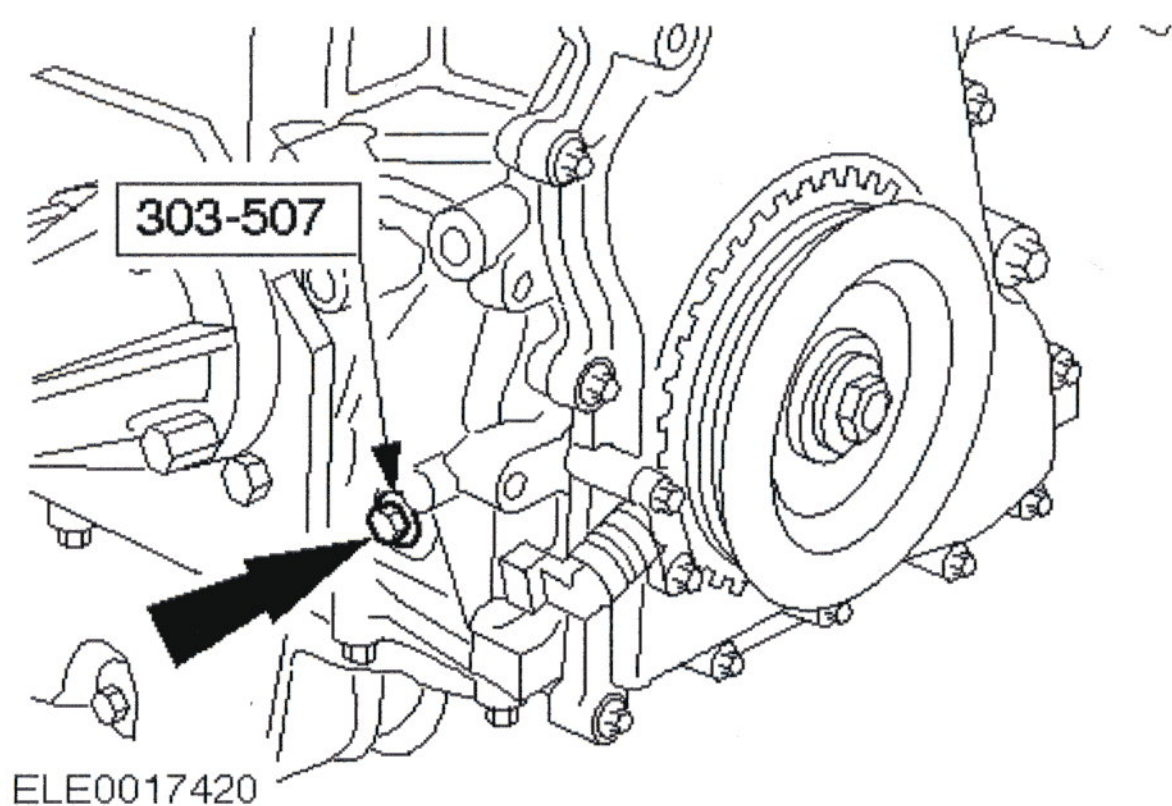


43. Remove the special tool.



44. Remove the special tool.

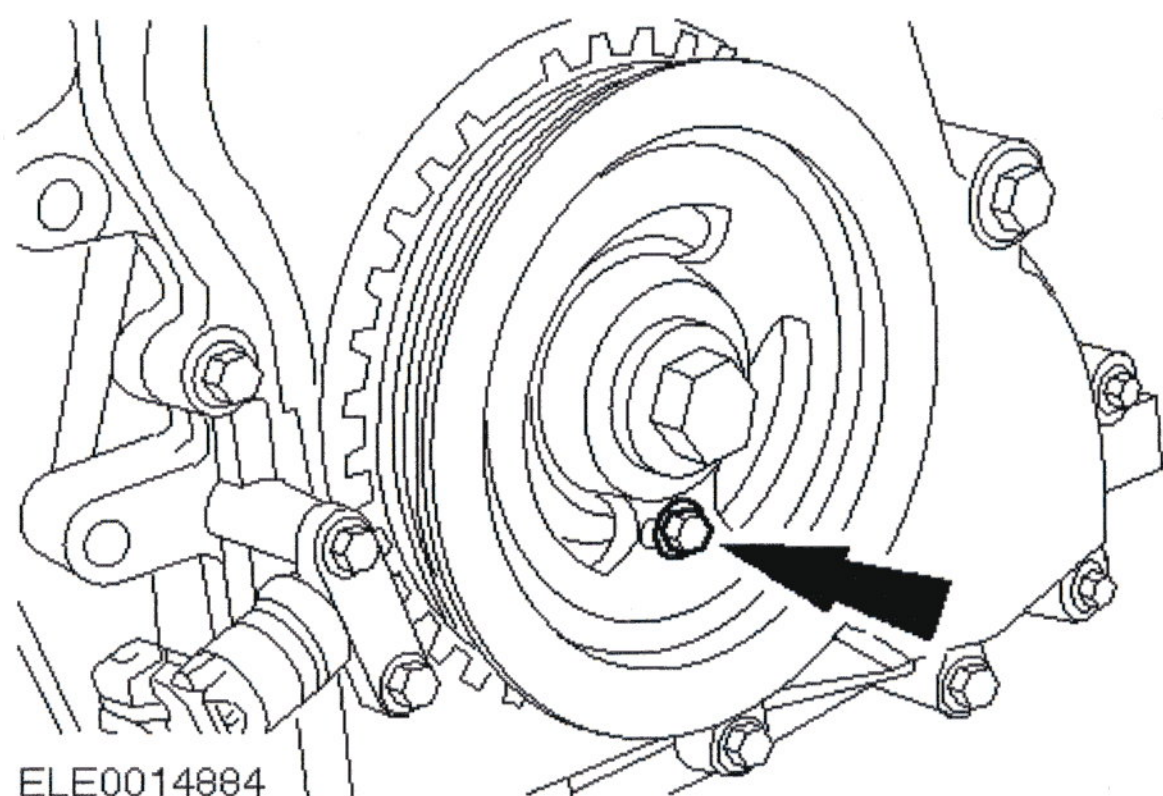
45. **Note:**  
Only rotate the crankshaft in the normal direction of rotation.  
Rotate the crankshaft two revolutions.



46. Install the special tool.

47. **Note:**  
Only rotate the crankshaft in the normal direction of rotation.

Rotate the crankshaft until piston No. 1 is at TDC.



48. **CAUTION:**

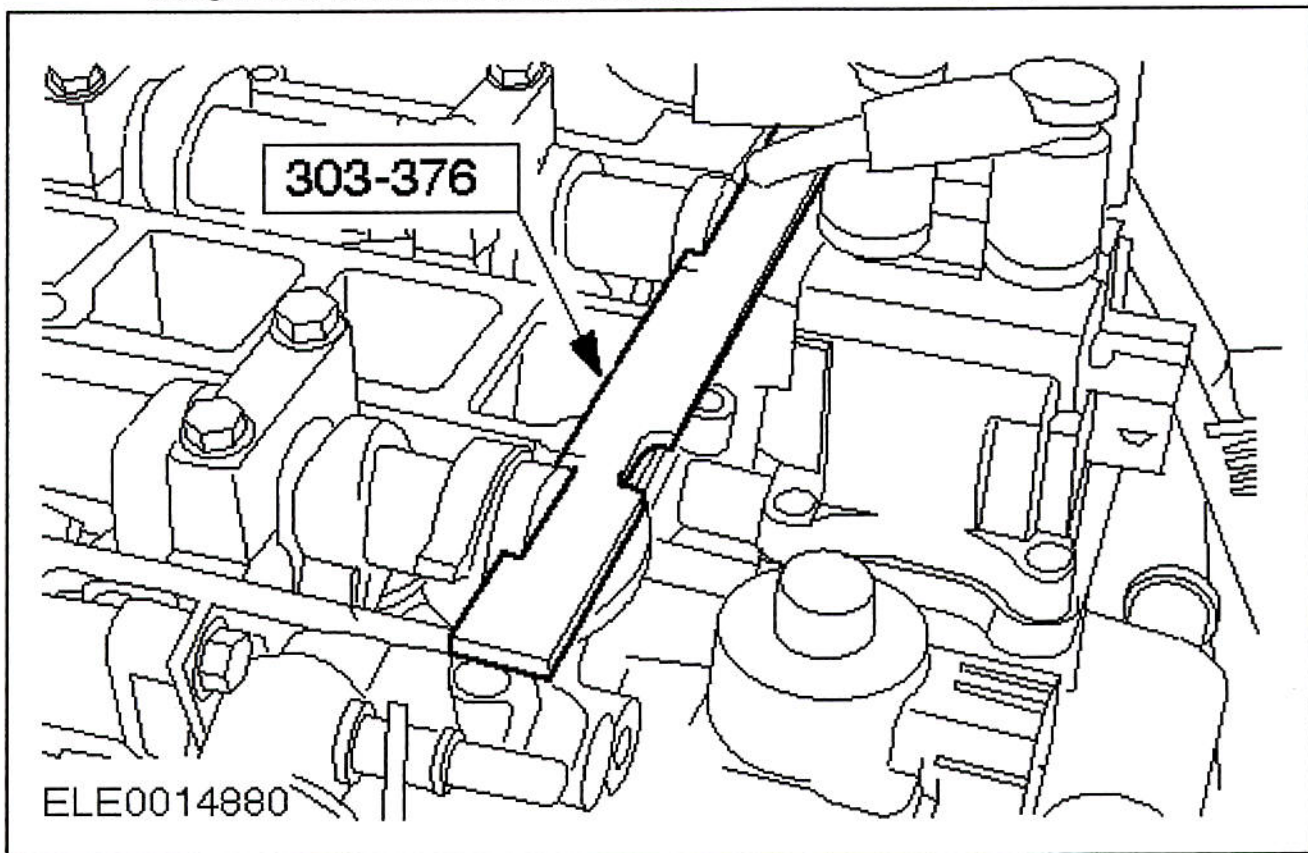


**Only tighten the crankshaft pulley securing bolt finger tight.**

**Note:**

If it is not possible to install the crankshaft pulley securing bolt, correct the engine timing.

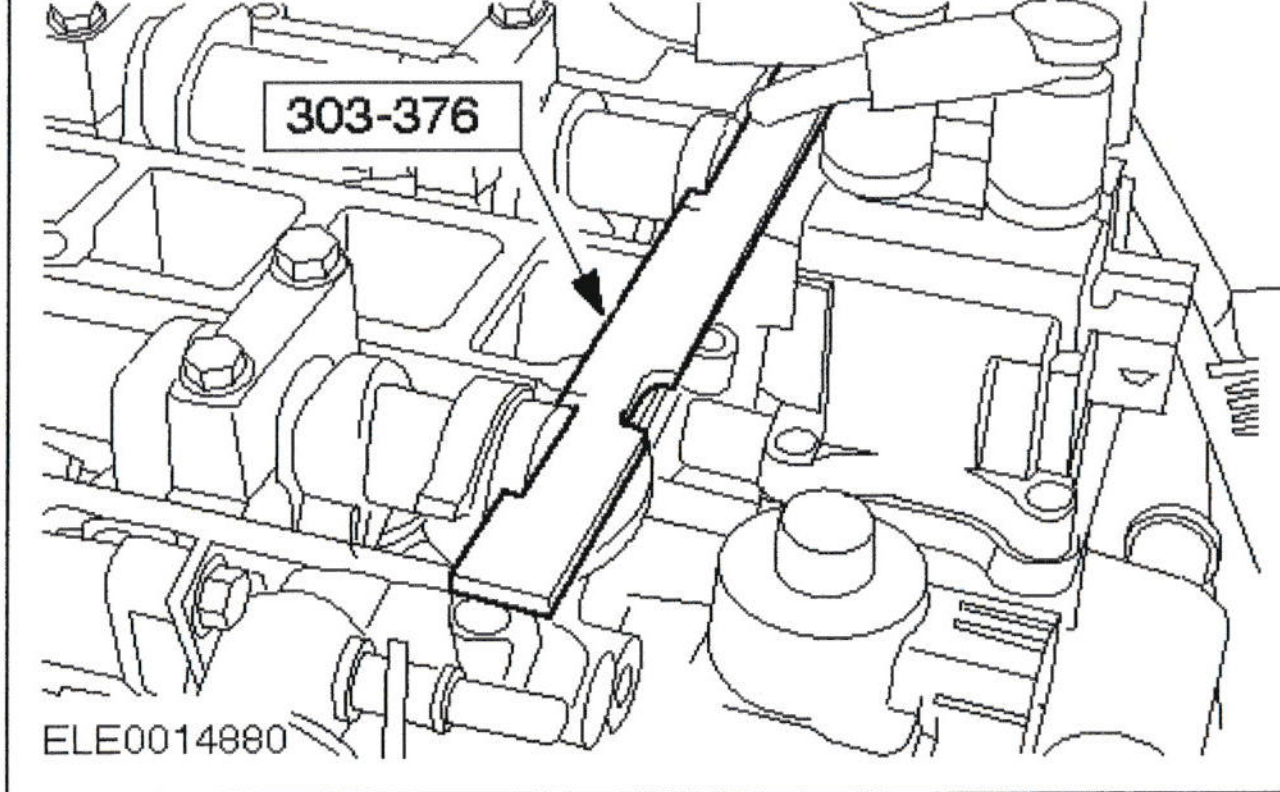
Using a M6 x 18 mm bolt, check the position of the crankshaft pulley.



**49. Note:**

If it is not possible to install the special tool, correct the engine timing.

Using the special tool, check the position of the camshafts.

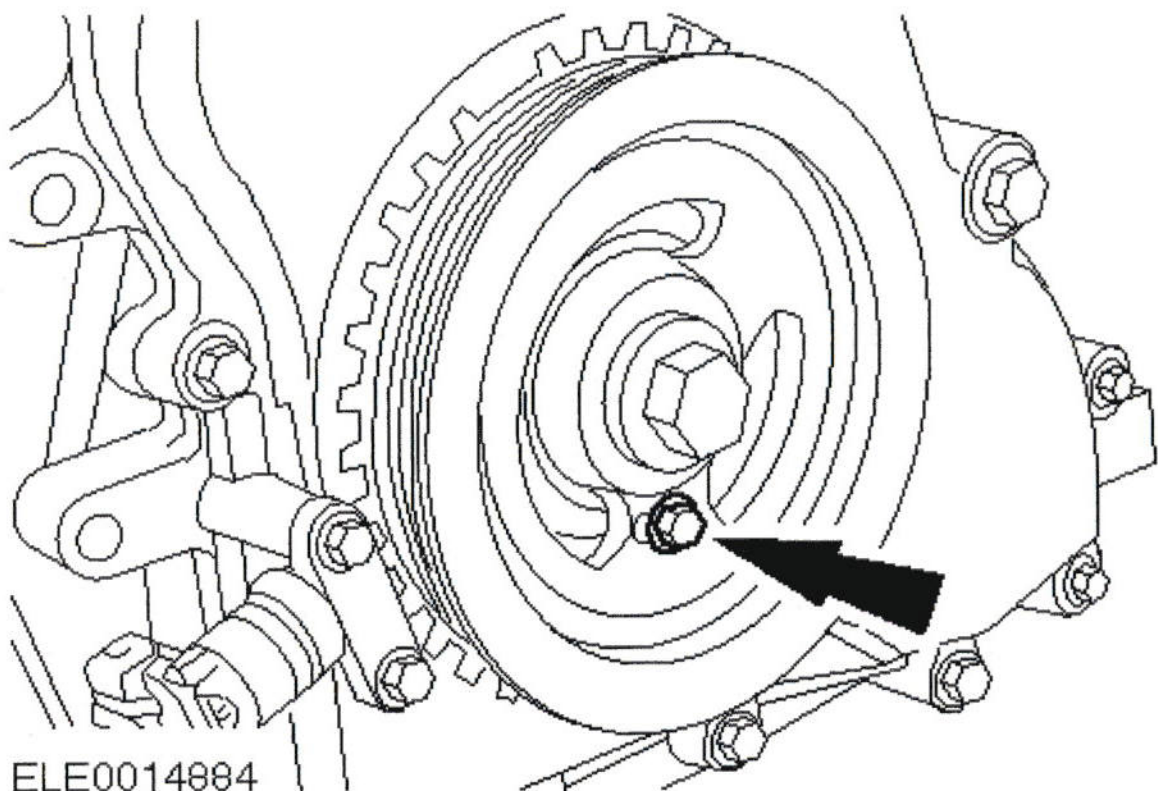


303-376

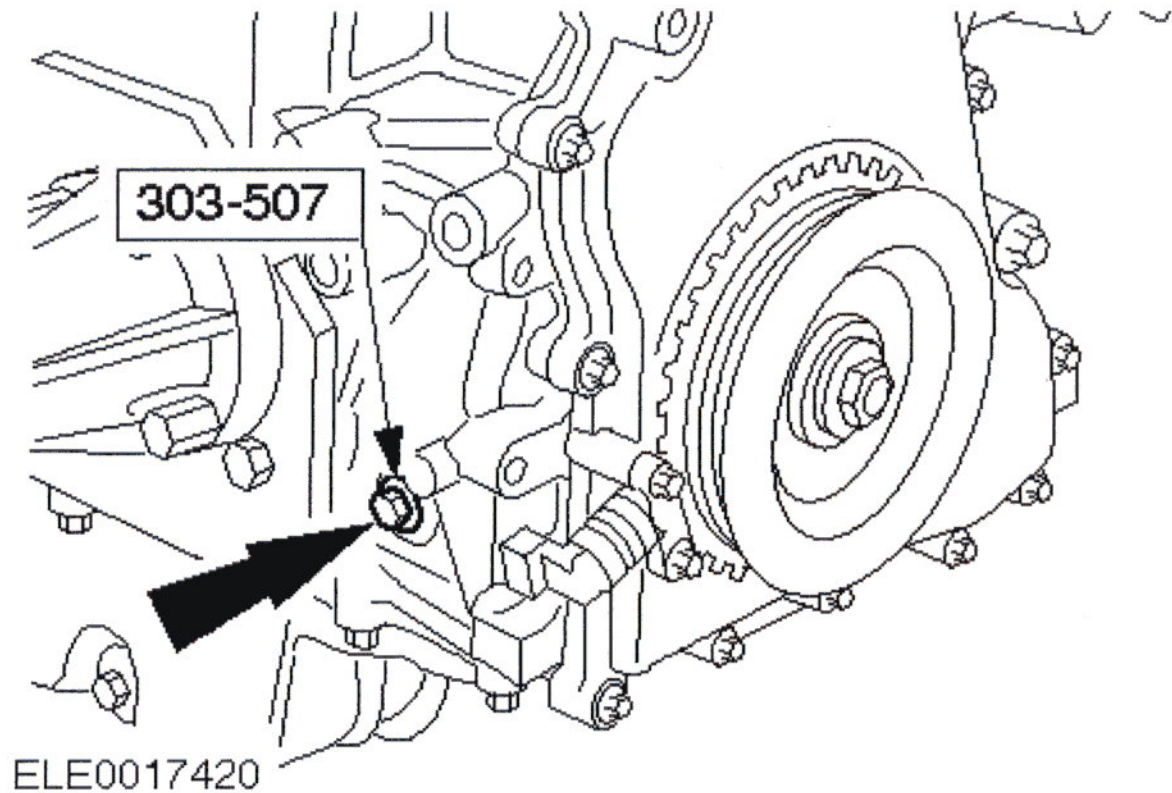
A technical line drawing of an engine component, likely a timing cover or similar. A long, thin, rectangular special tool is inserted into a slot. An arrow points to the tool. The tool has the number '303-376' printed on it. The drawing shows various bolts, nuts, and mechanical parts of the engine.

ELE0014880

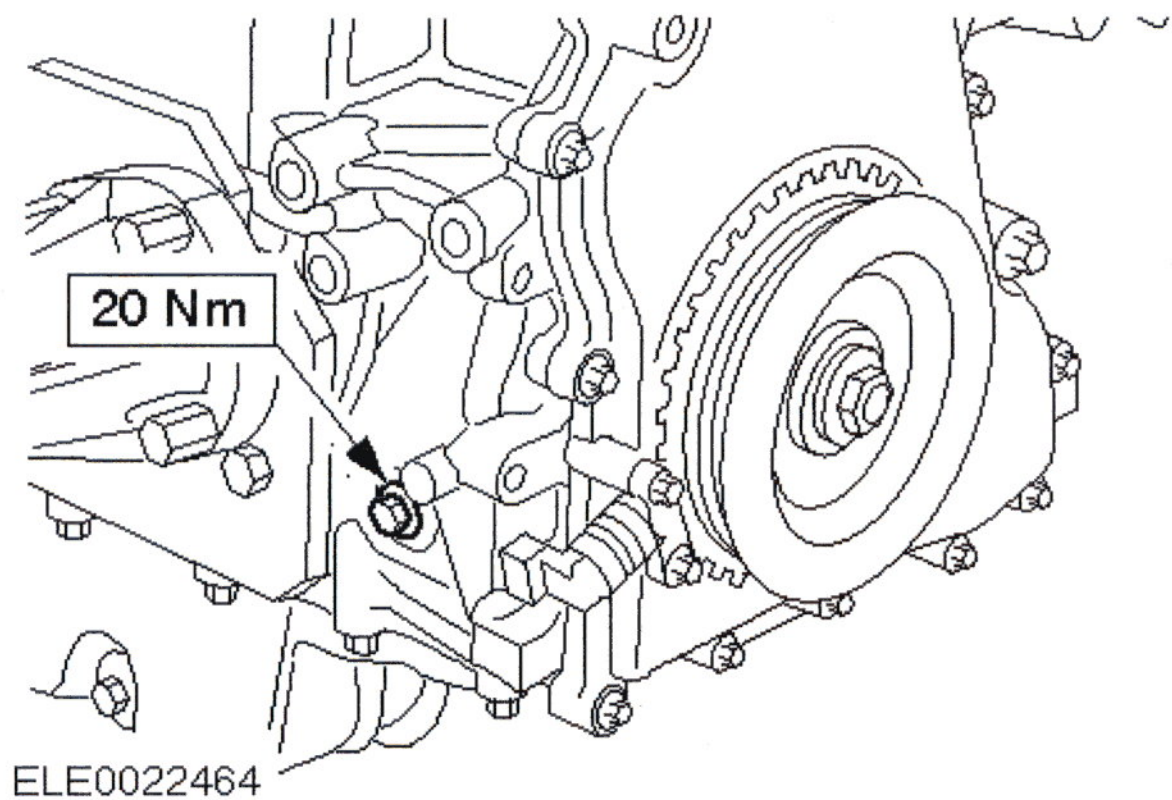
50. Remove the special tool.



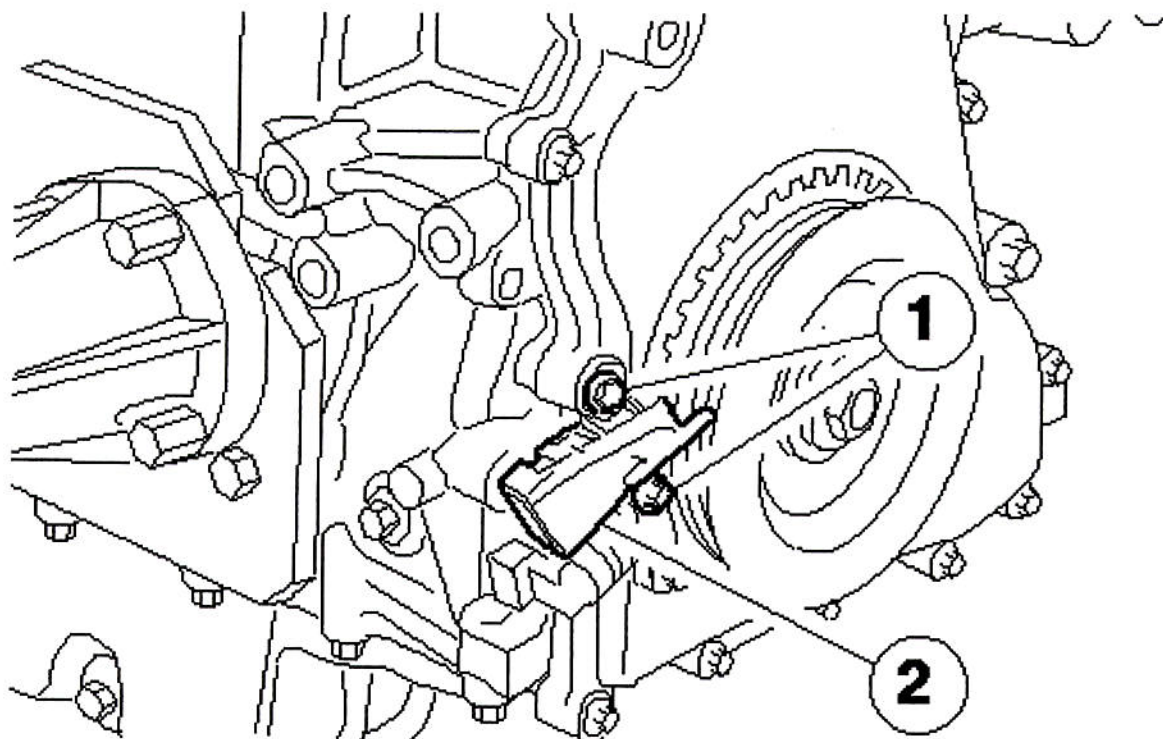
51. Remove the crankshaft pulley securing bolt.



52. Remove the special tool.



53. Install the cylinder block lower blanking plug.



TIE0017984

54. **Note:**

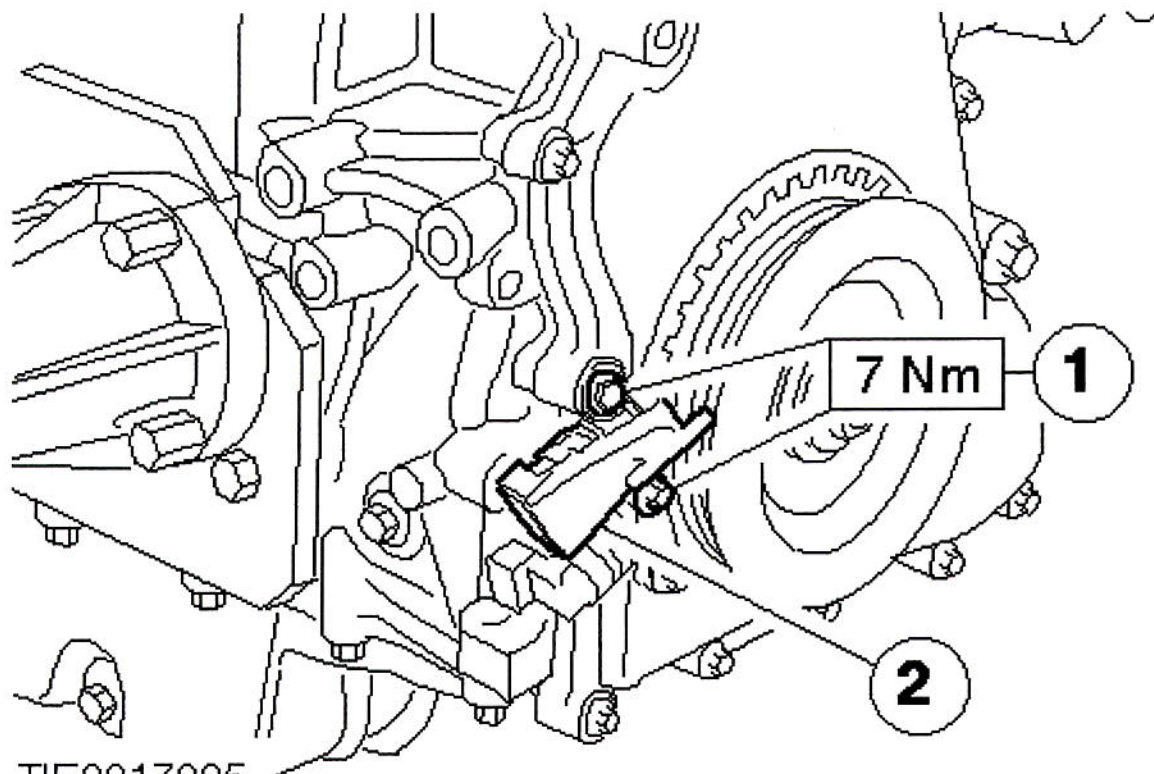
When installing a new crankshaft pulley or engine front cover, the crankshaft position (CKP) sensor must be aligned using the alignment tool supplied with the new component.

**Note:**

Do not tighten the bolts at this stage.

Align the CKP sensor.

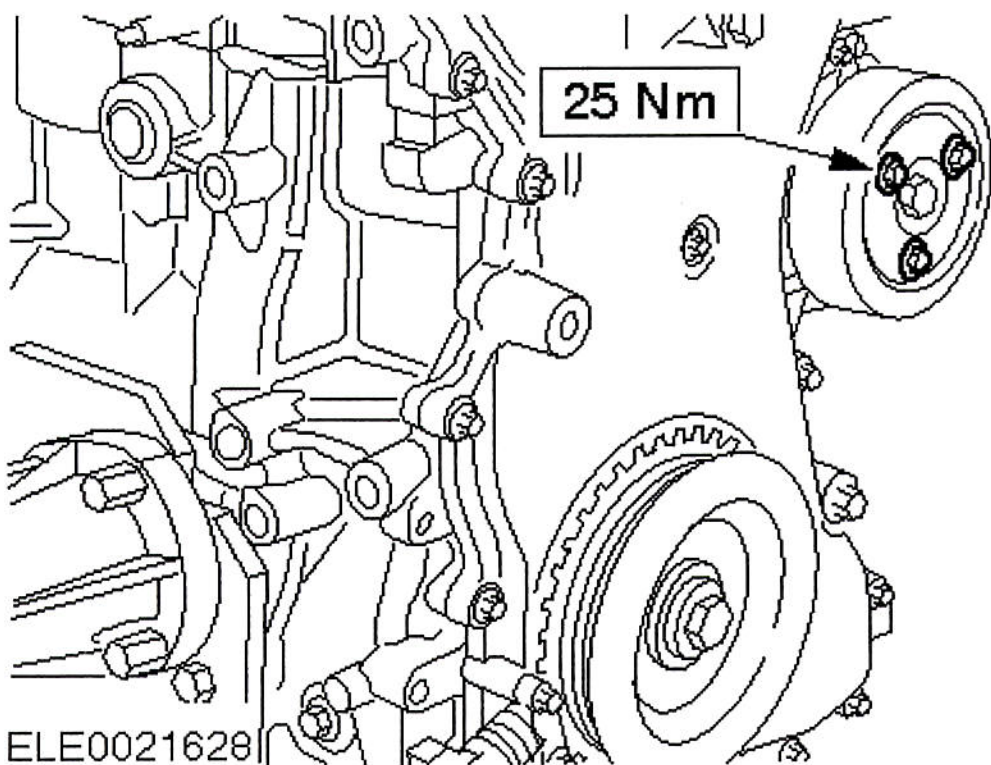
- 1 Loosen the CKP sensor retaining bolts.
- 2 Insert the tool supplied, so that its hooked in the crankshaft pulley teeth.



TIE0017985

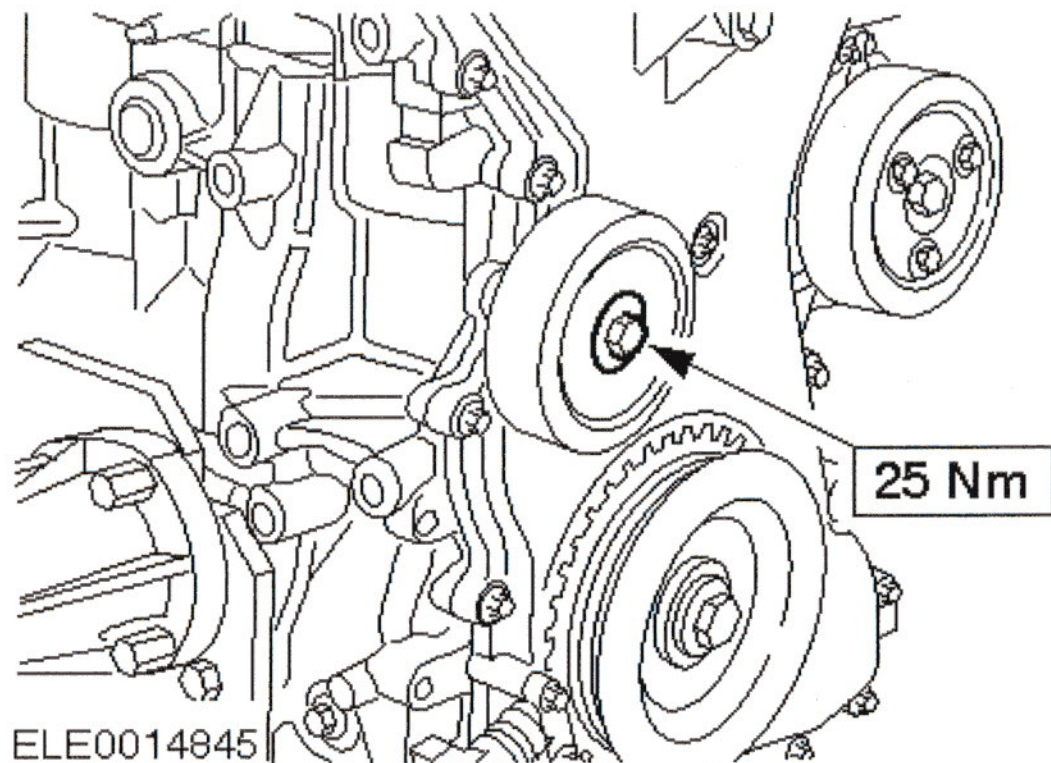
55. Install the CKP sensor.

- 1 Tighten the CKP sensor retaining bolts.
- 2 Remove the alignment tool.



ELE0021628

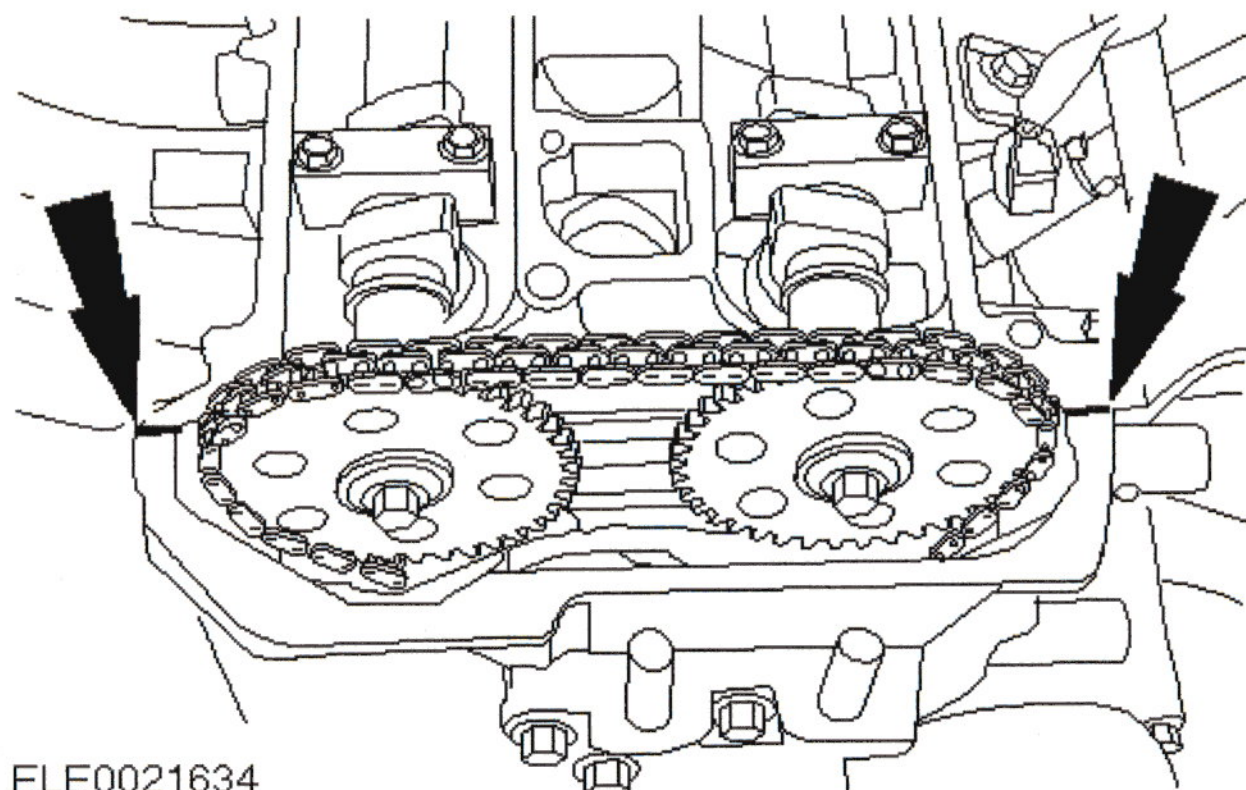
56. Install the coolant pump pulley.



ELE0014845

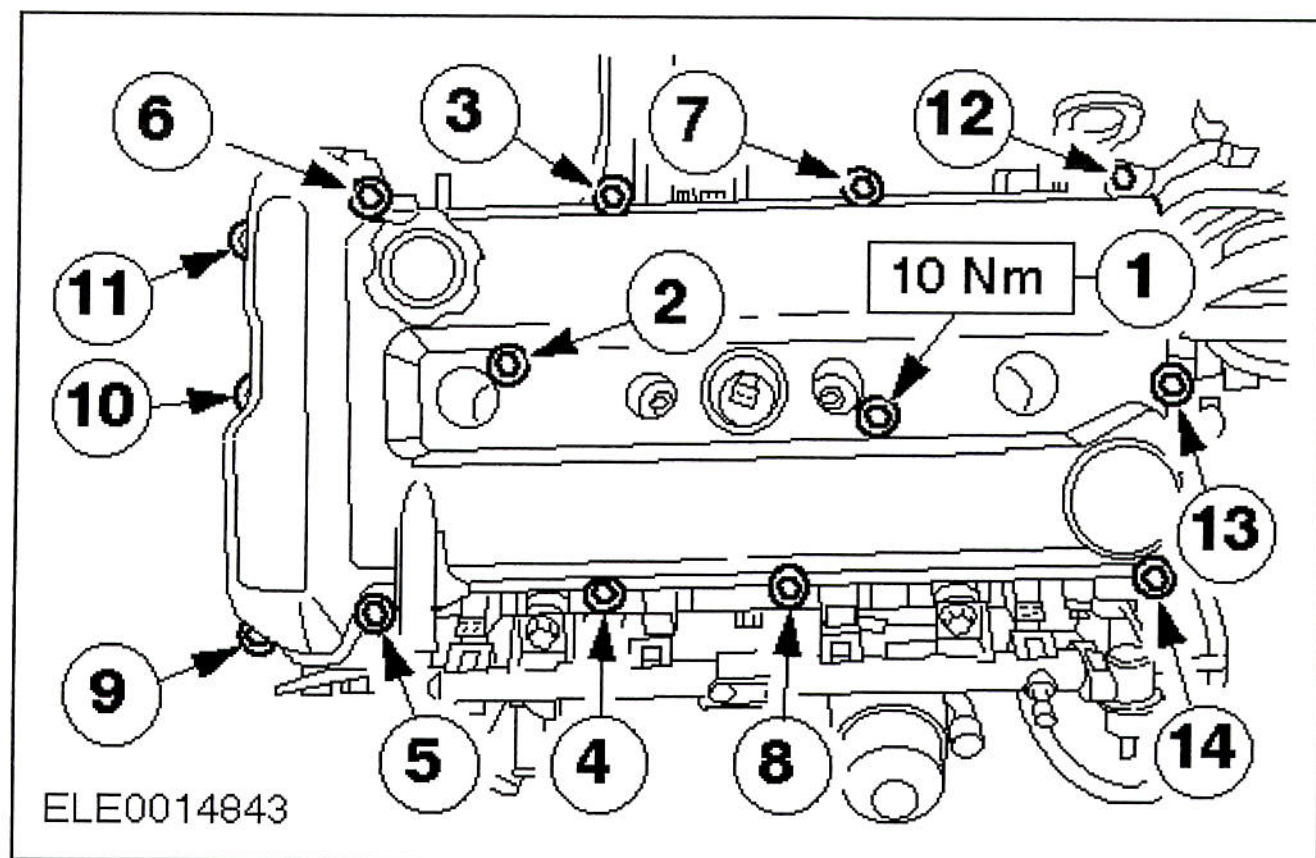
25 Nm

57. Install the accessory drive belt idler pulley.

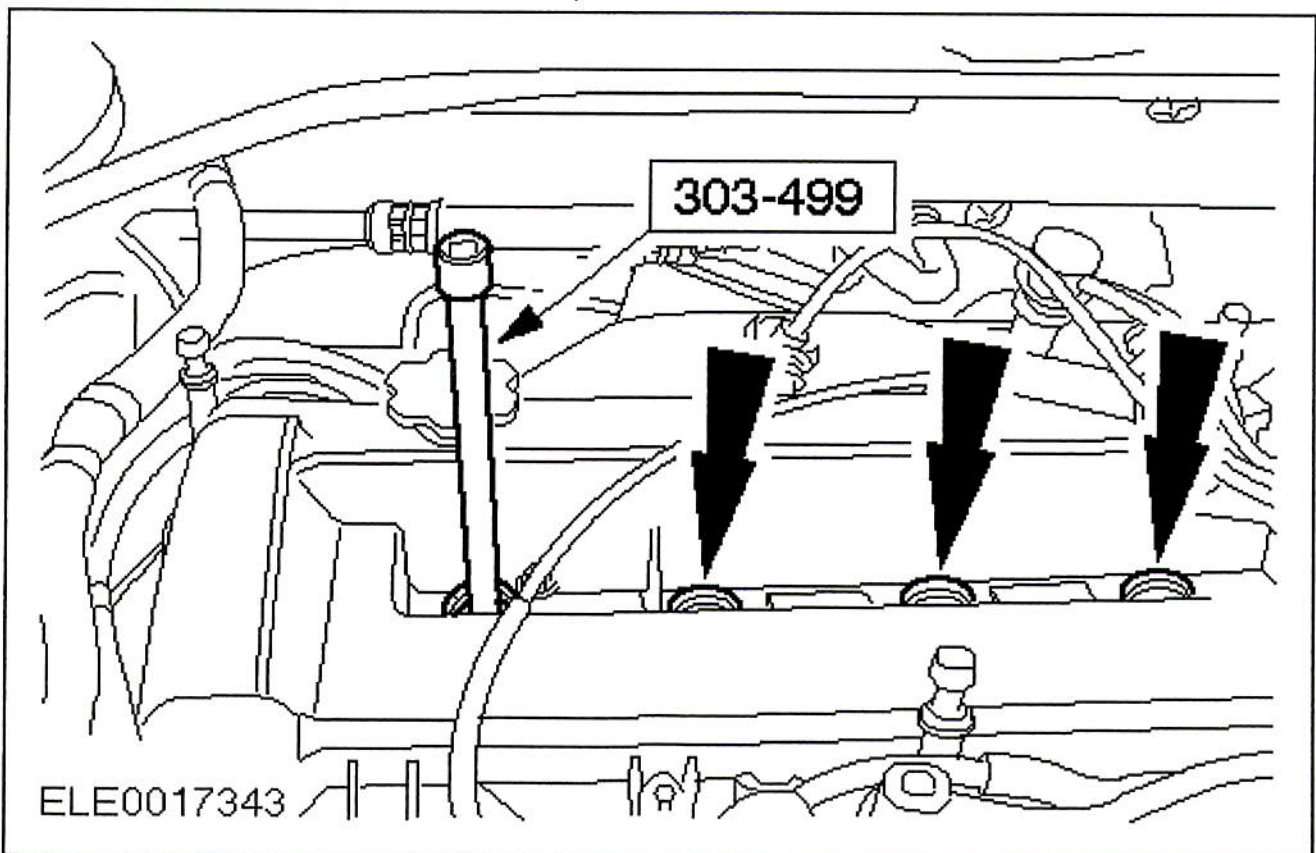


ELE0021634

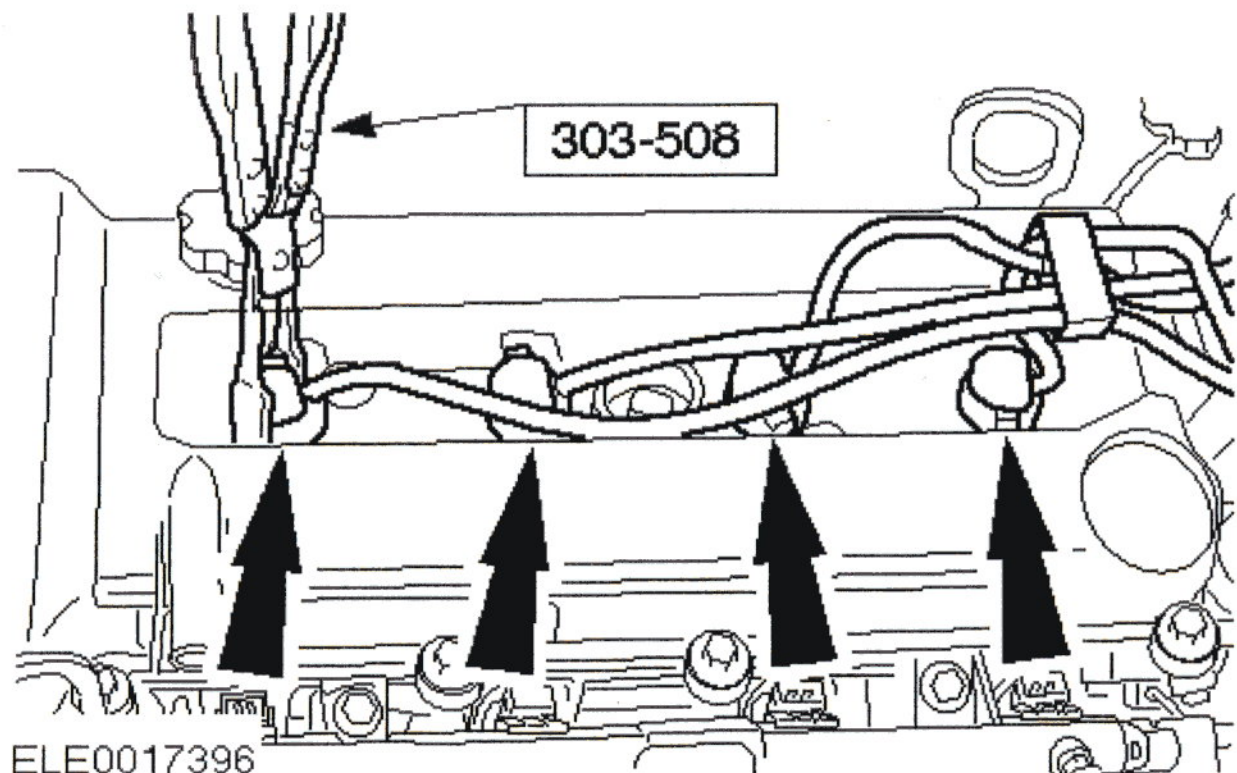
58. Apply a small bead of sealant to the areas as shown.



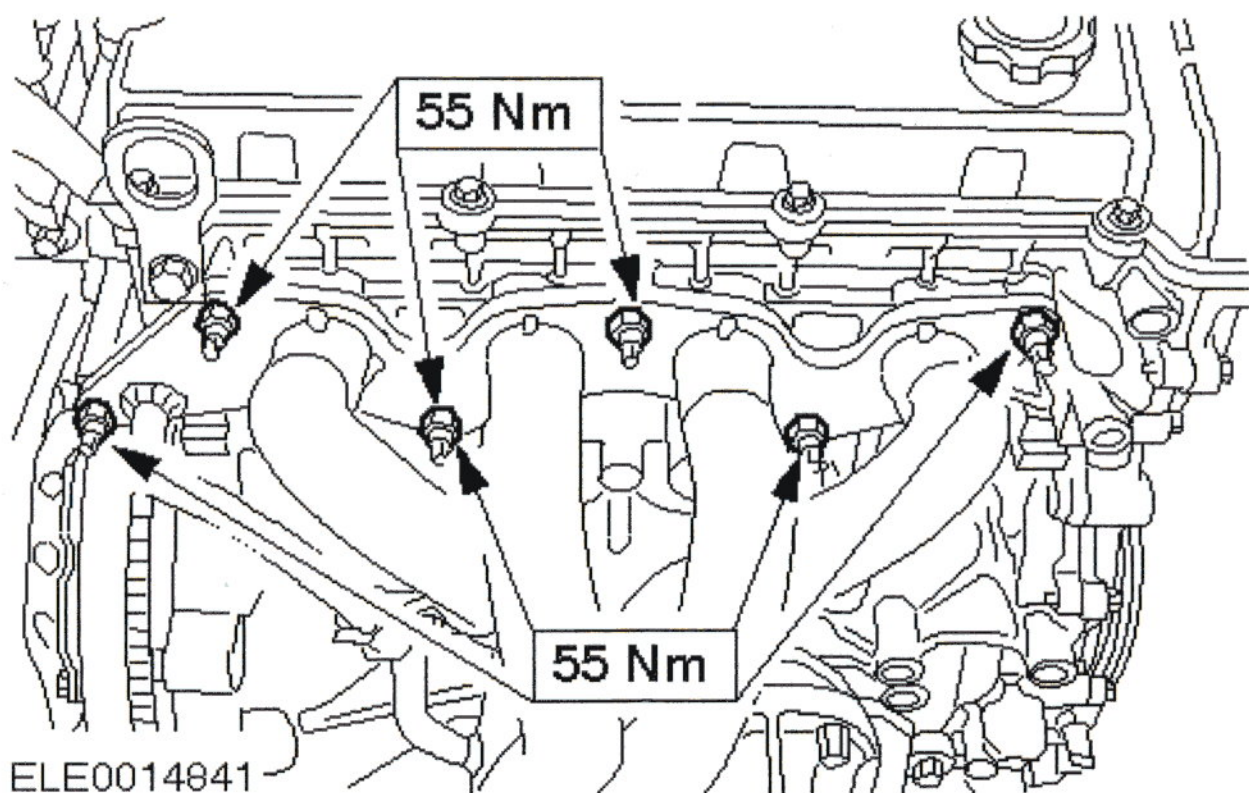
59. **Note:**  
 Install a new valve cover gasket if necessary.  
 Install the valve cover.
- Tighten the bolts in the sequence shown.



60. Using the special tool, install the spark plugs.



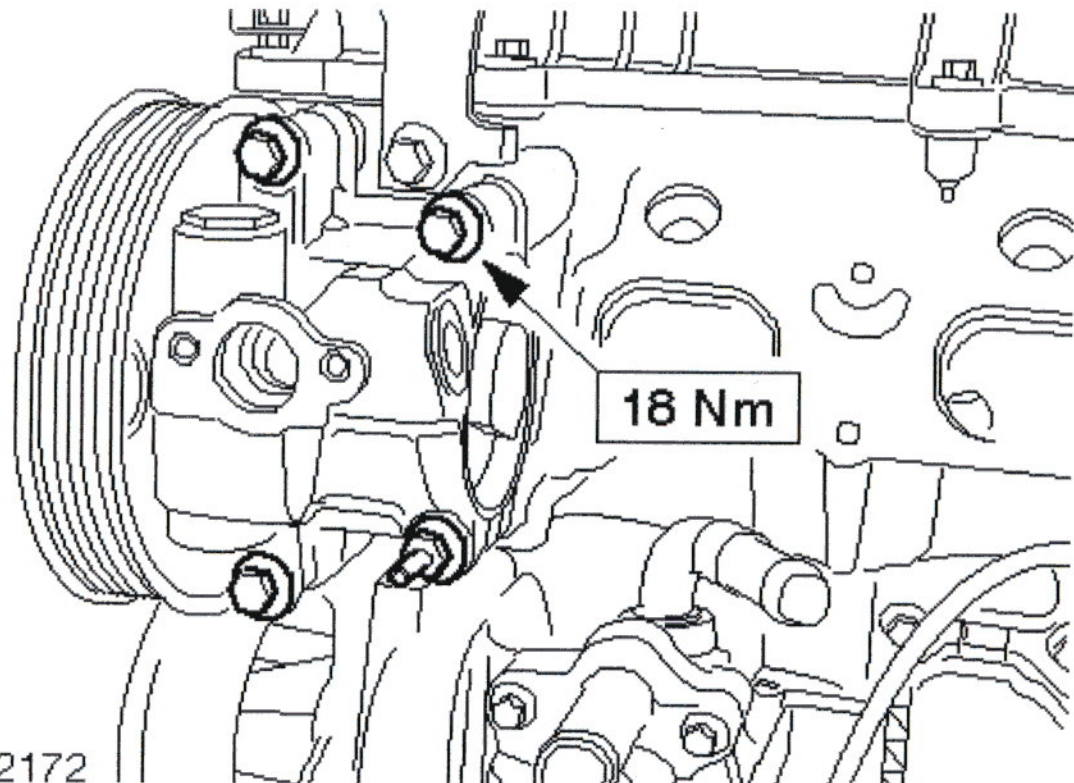
61. Using the special tool, connect the spark plug electrical connectors.



62. **Note:**  
Install a new exhaust manifold gasket.

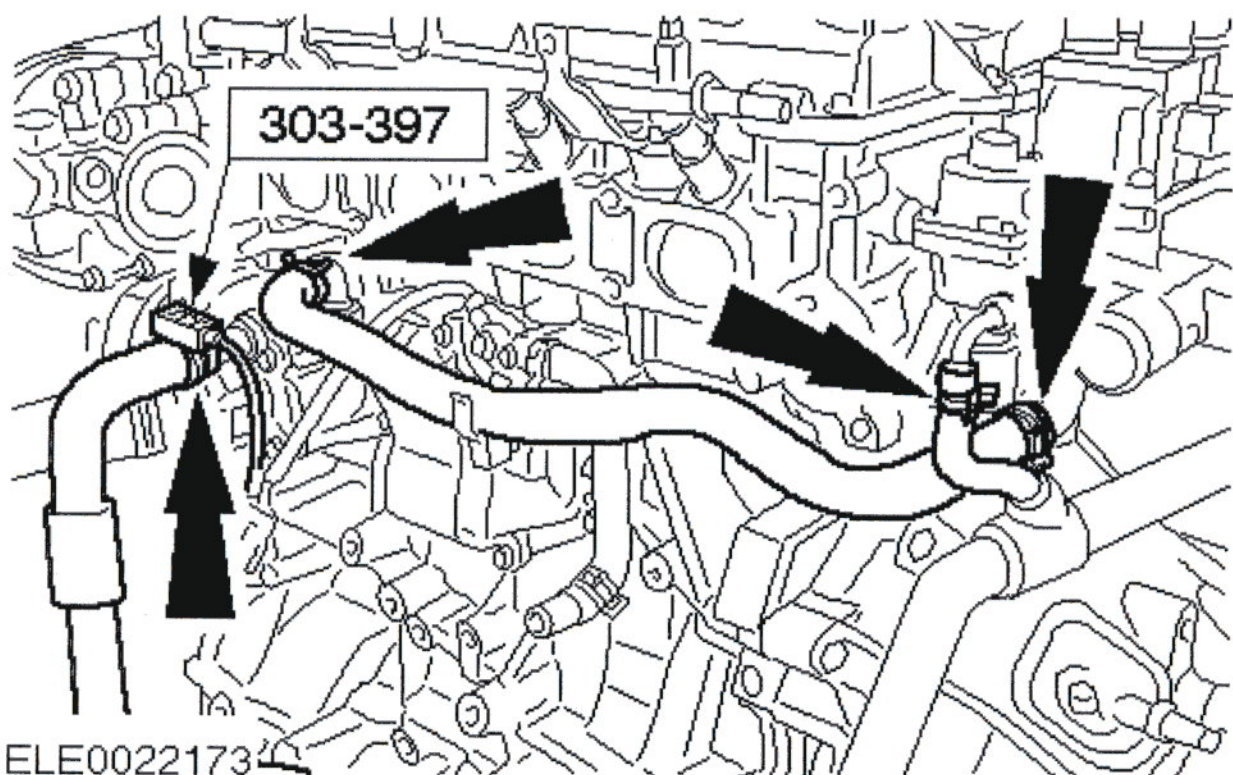
Install the exhaust manifold.





ELE0022172

63. Install the power steering pump.



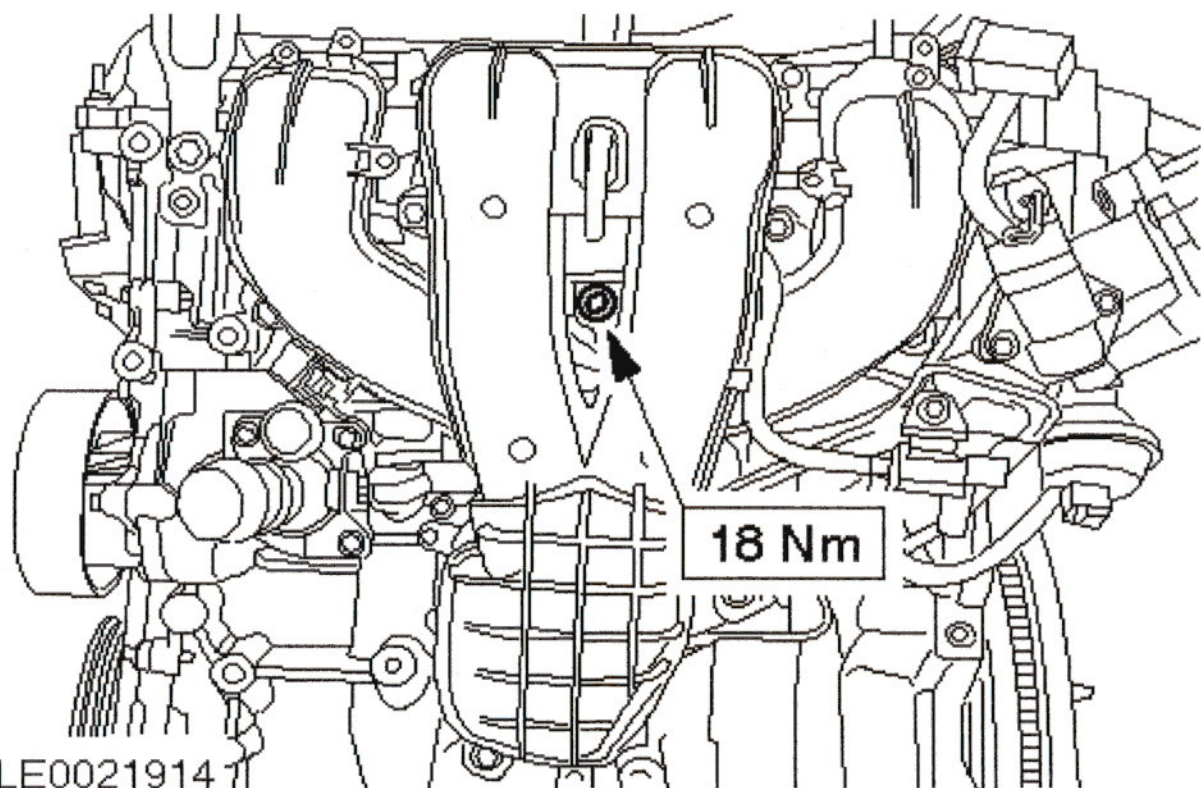
ELE0022173

64. Using the special tool, install the coolant hoses.



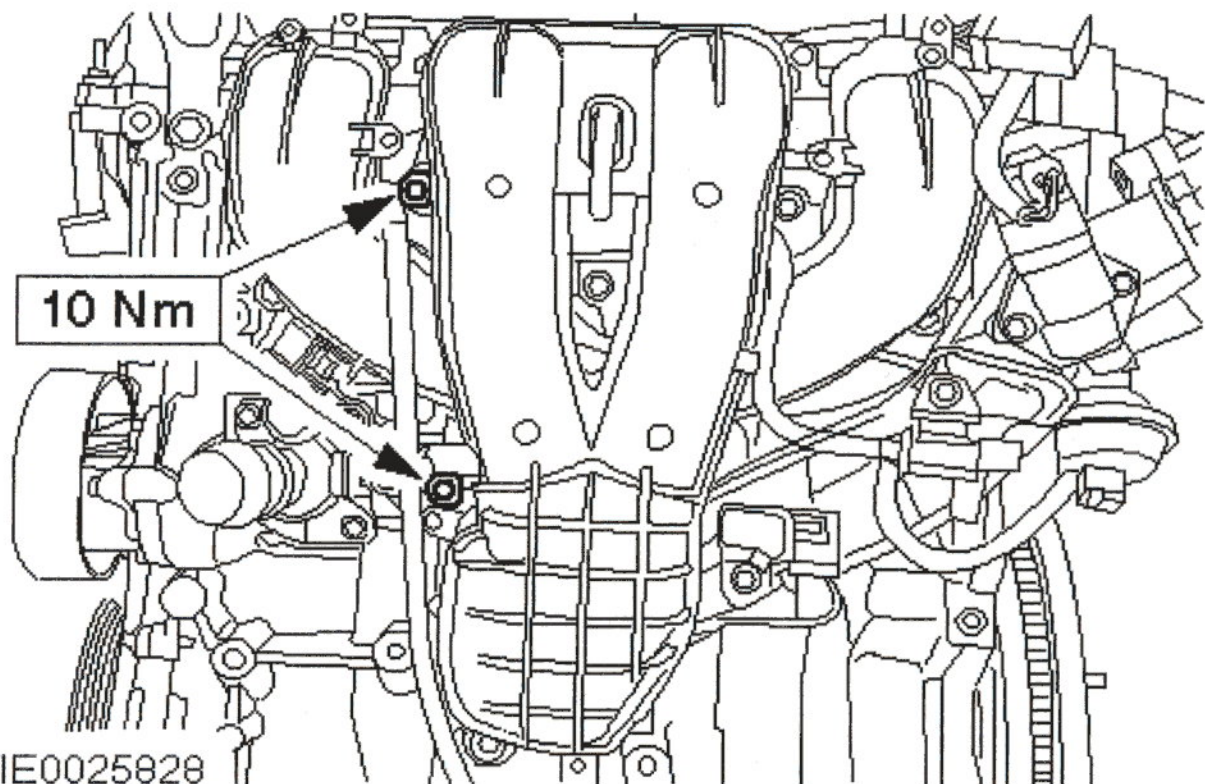
ELE0017407

65. Connect the positive crankcase ventilation hose (PCV) to the intake manifold.

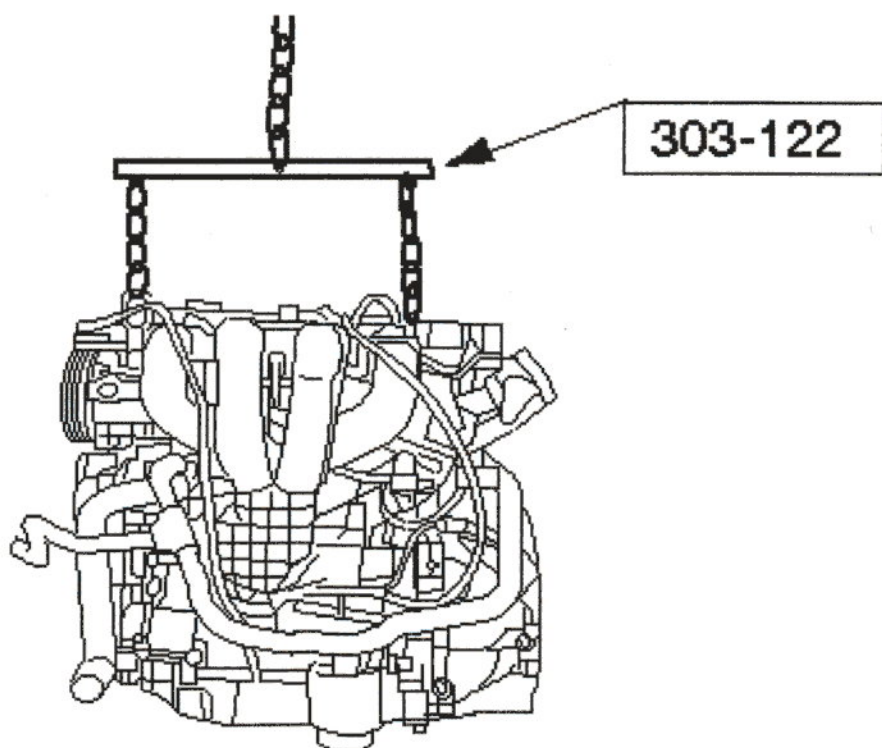


ELE0021914

66. Install the intake manifold.



67. Install the oil level indicator tube and oil level indicator tube.
68. Fill the engine with engine oil. For additional information, refer to «Specification» in this Section.



69. Using the special tool and an engine hoist, support the engine.

303-435



TIE0017395

303-435-06

303-435-11A

70. Remove the special tools.