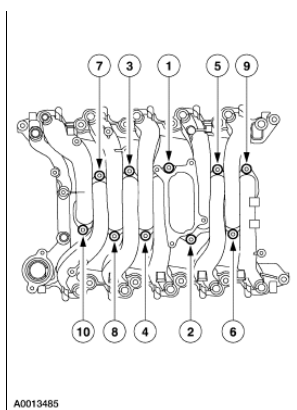


2. **NOTE:** Tighten the bolts in two stages.

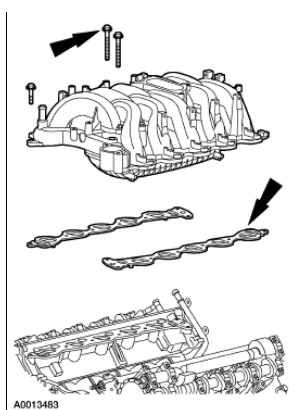
Tighten the bolts in the sequence shown.

- Stage 1: Tighten to 2 Nm (18 lb-in).
- Stage 2: Tighten to 10 Nm (89 lb-in).



3. Install the upper intake manifold.

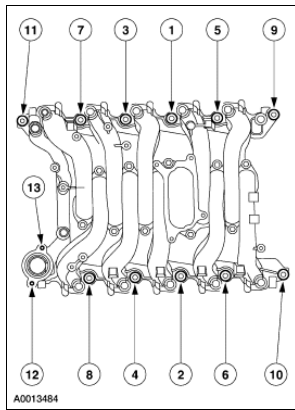
- Position the upper intake manifold gaskets and the intake manifold, and loosely install the bolts.



4. **NOTE:** Be sure to tighten the bolts in two stages.

Tighten the bolts in the sequence shown.

- Stage 1: Tighten to 2 Nm (18 lb-in).
- Stage 2: Tighten to 25 Nm (18 lb-ft).



5. Install the thermostat.

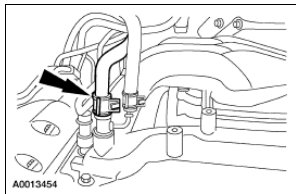
6. Install the throttle body adapter gasket and the throttle body adapter. Tighten the bolts in two stages:

- Stage 1: Tighten the bolts to 9 Nm.
- Stage 2: Tighten the bolts an additional 90 degrees (1/4 turn).

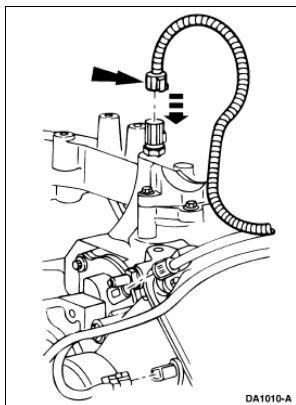
7. **NOTE:** Leave the engine cover off.

Install the throttle body. For additional information, refer to [Section 303-04C](#).

8. Install the heater water hose and position the clamp.



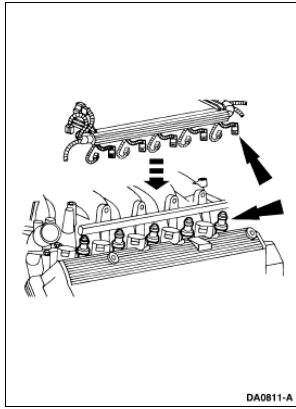
9. Connect the water temperature indicator sending unit electrical connector.



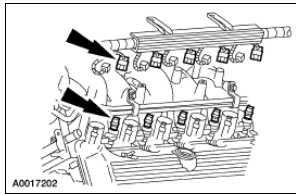
10. Install the generator. For additional information, refer to [Section 414-02A](#).

11. Install the ignition coils. For additional information, refer to [Section 303-07C](#).

12. Connect the five LH fuel injector electrical connectors.

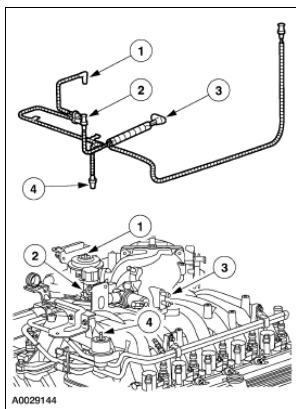


13. Connect the five RH fuel injector electrical connectors.

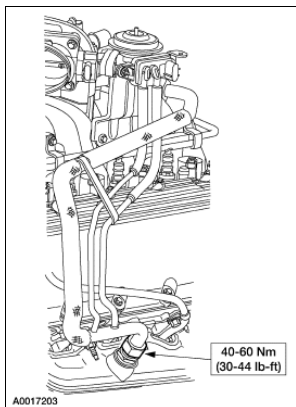


14. Connect the engine emission vacuum harness.

1. EGR valve, if equipped
2. EGR vacuum regulator solenoid, if equipped
3. vacuum source
4. fuel pressure regulator

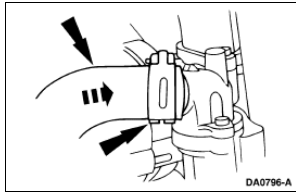


15. If equipped, connect the EGR valve to exhaust manifold tube lower fitting.



16. Connect the fuel lines. For additional information, refer to [Section 310-00A](#).

17. Connect the engine water outlet hose and position the hose clamp.



18. Install the air cleaner assembly and tubes. For additional information, refer to [Section 303-12](#) .

19. Fill the cooling system. For additional information, refer to [Section 303-03](#) .

20. Install the engine cover. For additional information, refer to [Section 501-05](#) .

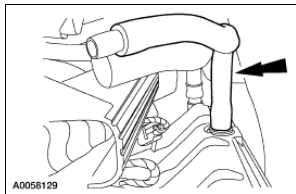
21. Connect the battery ground cable.

Valve Cover LH**Material**

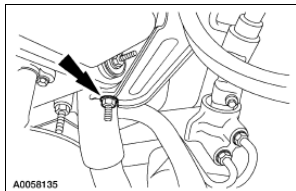
Item	Specification
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4
Metal Surface Cleaner F4AZ-19A536-RA	WSE-M5B392-A

Removal

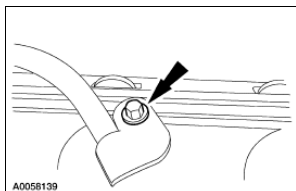
1. Remove the engine cover. For additional information, refer to [Section 501-05](#) .
2. Remove the engine air cleaner assembly and the air cleaner outlet tube. For additional information, refer to [Section 303-12](#) .
3. Disconnect the crankcase vent tube from the valve cover.



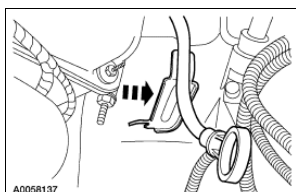
4. Remove the nut attaching the oil level indicator tube to the front of the engine.



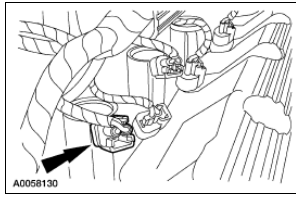
5. Remove the bolt attaching the oil level indicator tube to the rear of the engine.



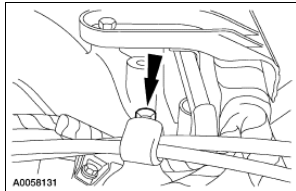
6. Position the oil level indicator tube aside.



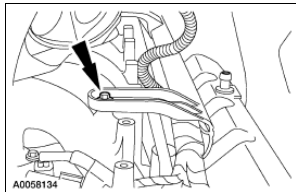
7. Disconnect the five LH ignition coil electrical connectors.



8. Remove the throttle cable clamp bolt.



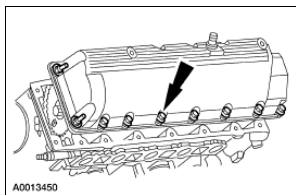
9. Remove the bolts from the front and rear wiring harness brackets and position the wiring harness aside.



10. **NOTE:** If the vehicle is equipped with rear auxiliary heat, the valve cover can be removed from the front of the vehicle.

NOTE: The bolts are part of the valve cover and are not to be removed.

Loosen the 14 bolts and remove the valve cover and gasket.



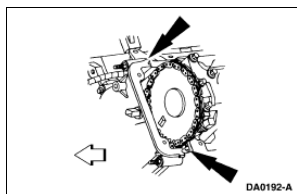
Installation

1. **⚠ CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the cylinder head. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean and inspect the mating surfaces of the cylinder head.

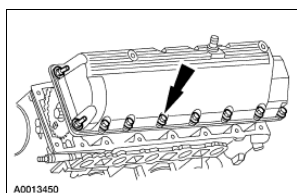
2. **NOTE:** If not secured within four minutes, sealant must be removed and the sealant area cleaned with metal surface cleaner. Allow to dry until there is no sign of wetness or four minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

Apply sealant in the two places where the engine front cover meets the cylinder head.

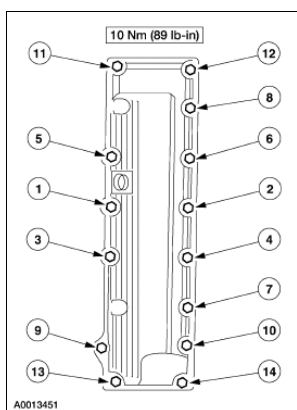


3. **NOTE:** If equipped with rear auxiliary heat, the valve cover can be installed from the front of the vehicle.

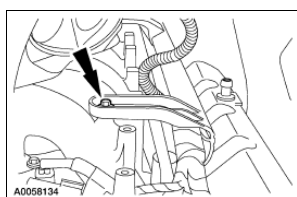
Position the valve cover and the valve cover gasket on the cylinder head and loosely install the bolts.



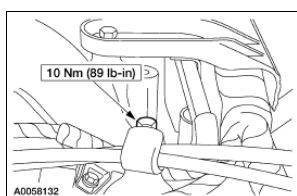
4. Tighten the bolts in the sequence shown.



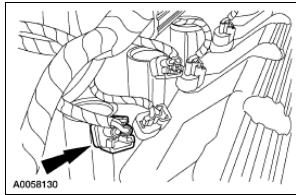
5. Position the wiring harness and install the bolts at the front and rear wiring harness brackets.



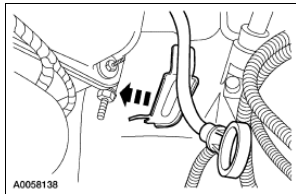
6. Install the throttle cable clamp bolt.



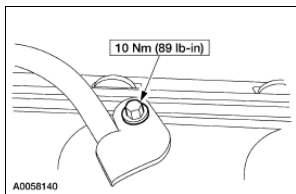
7. Connect the five LH ignition coil electrical connectors.



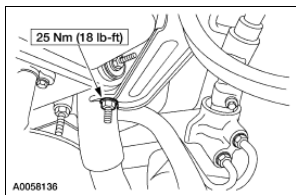
8. Position the oil level indicator tube.



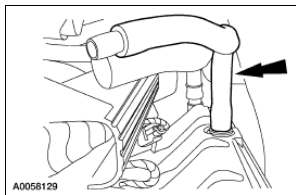
9. Install the bolt attaching the oil level indicator tube to the rear of the engine.



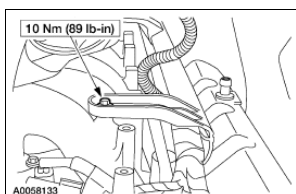
10. Install the nut attaching the oil level indicator tube to the front of the engine.



11. Connect the crankcase vent tube to the valve cover.



12. Install the engine air cleaner assembly and the air cleaner outlet tube. For additional information, refer to Section 303-12 .



13. Install the engine cover. For additional information, refer to Section 501-05 .

Valve Cover Right**Material**

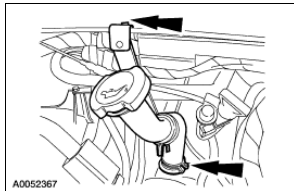
Item	Specification
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4
Metal Surface Cleaner F4AZ-19A536-RA	WSE-M5B392-A

Removal

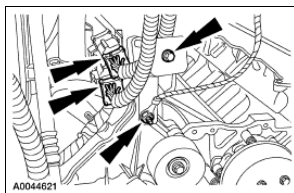
⚠ WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and can be ignited, resulting in possible personal injury.

⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running.

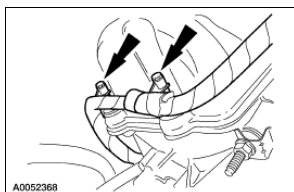
1. Remove the intake manifold. For additional information, refer to Intake Manifold in this section.
2. Remove the bolt, the clamp and the oil filler assembly.



3. Disconnect the 42-pin and the two 16-pin electrical connectors. Remove the ground strap retaining nut and the wiring harness mounting bracket.



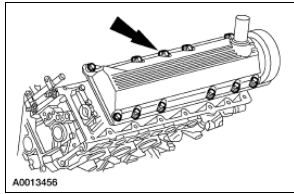
4. Unclip the wiring harness from the valve cover studs.



5. **NOTE:** The bolts are a part of the valve cover and are not to be removed.

Remove the valve cover.

- Fully loosen the 14 bolts, and remove the valve cover and the valve cover gasket.



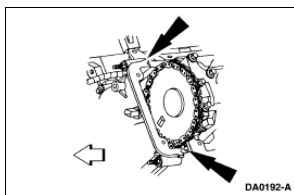
Installation

1. **⚠ CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the gasket mating surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

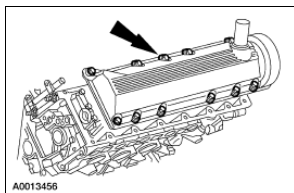
Clean and inspect the mating surface of the cylinder head.

2. **NOTE:** If not secured within four minutes, sealant must be removed and the sealing area cleaned with metal surface cleaner. Allow to dry until there is no sign of wetness, or four minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

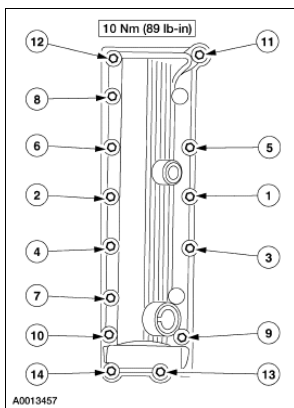
Apply silicone gasket and sealant in two places where the engine front cover meets the cylinder head.



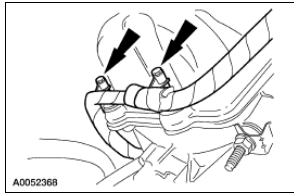
3. Position the valve cover on the cylinder head and loosely install the 14 bolts.



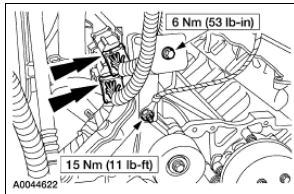
4. Tighten the bolts in the sequence shown.



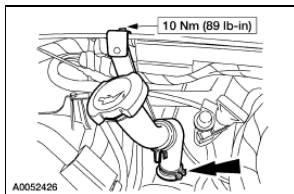
5. Clip the wiring harness to the valve cover studs.



6. Position the mounting bracket and install the ground strap and nut. Connect the 42-pin and the two 16-pin electrical connectors.




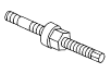
7. Install the oil filler assembly, the clamp and the bolt.



8. Install the intake manifold. For additional information, refer to [Intake Manifold](#) in this section.
-

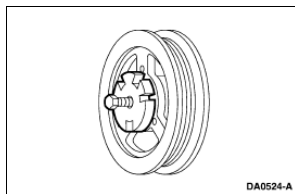
Crankshaft Pulley

Special Tool(s)

 ST1266-A	Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)
 ST1267-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)

Removal

1. Remove the engine cooling fan and fan shroud. For additional information, refer to [Section 303-03](#).
2. Remove the drive belt (8620). For additional information, refer to [Section 303-05](#).
3. Raise and support the vehicle. For additional information, refer to [Section 100-02](#).
4. Remove the crankshaft pulley bolt (6A340).
5. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley (6312).

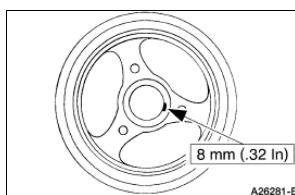


Installation

1. **NOTE:** If not secured within 4 minutes, sealant must be removed and the sealing area cleaned with Metal Surface Cleaner F4AZ-19A536-RA or equivalent meeting Ford specification WSE-M5B392-A. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

Apply silicone to the Woodruff key slot on the crankshaft pulley.

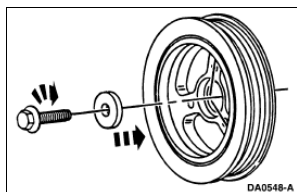
- Use Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



2. Use the Crankshaft Vibration Damper Installer to install the crankshaft pulley.



3. Tighten the crankshaft pulley bolt in four stages.
- Stage 1: Tighten to 90 Nm (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 47-53 Nm (35-39 lb-ft).
 - Stage 4: Tighten an additional 85-90 degrees.



4. Lower the vehicle.
5. Install the drive belt. For additional information, refer to [Section 303-05](#) .
6. Install the engine cooling fan and the fan shroud. For additional information, refer to [Section 303-03](#) .
-

Crankshaft Front Seal

Special Tool(s)

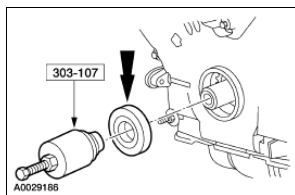
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST1288-A	Remover, Crankshaft Front Oil Seal 303-107 (T74P-6700-A)
 ST2197-A	Installer, Crankshaft Front Oil Seal 303-635
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)

Material

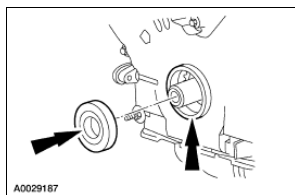
Item	Specification
Motorcraft SAE 5W-30 Super Premium Motor Oil XO-5W30-QSP or equivalent	WSS-M2C153-G

Removal

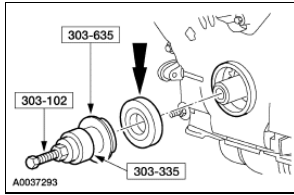
1. Remove the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
2. Using the special tool, remove the crankshaft front seal.

**Installation**

1. Lubricate the engine front cover and the crankshaft front seal inner lip with clean engine oil.



2. Using the special tools, install the crankshaft front seal into the engine front cover.



3. Install the crankshaft pulley. Refer to Crankshaft Pulley in this section.
-

Engine Front Cover

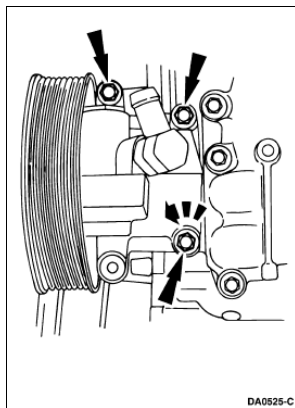
Removal

⚠ 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 can be ignited, resulting in possible personal injury.

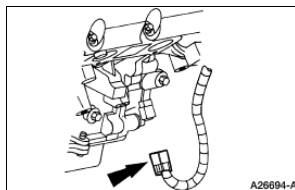
⚠ WARNING: Fuel in the fuel system remains under high pressure even when the engine is not running.

1. Disconnect the battery ground cable (14301).
2. Remove the valve covers (6582). Refer to Valve Cover LH and Valve Cover Right in this section.
3. Remove the radiator (8005). Refer to Section 303-03 .
4. Disconnect the camshaft position sensor (CMP sensor) (6B288).
5. Remove the water pump (8501). Refer to Section 303-03 .
6. Raise and support the vehicle. Refer to Section 100-02 .
7. **NOTE:** Only three bolts are required to secure the power steering pump (3A674).

Remove the bolts and position the power steering pump aside.

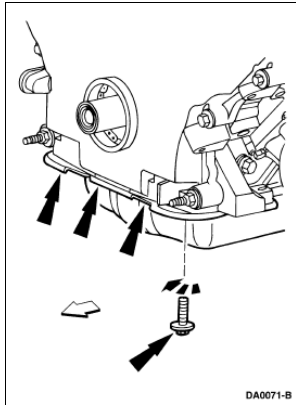


8. Disconnect the crankshaft position (CKP) sensor electrical connector.



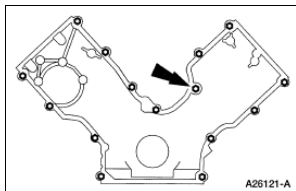
9. Remove the drain plug and drain the engine oil.
10. Remove the crankshaft front seal (6700). Refer to Crankshaft Front Seal in this section.

11. Remove the bolts.

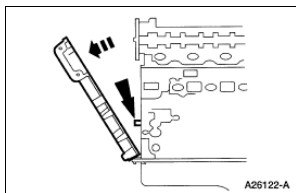


12. Lower the vehicle.

13. Remove the engine front cover fasteners.



14. Remove the engine front cover (6019) from the front cover to cylinder block dowels (6C002).



15. **⚠ CAUTION:** 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, which make leak paths.

Clean the sealing surfaces.

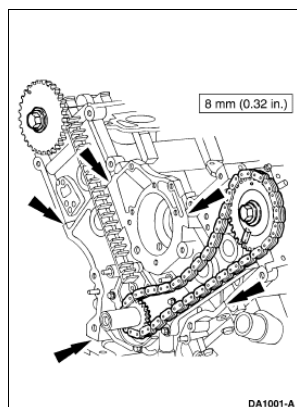
Installation

1. **NOTE:** The timing chain is removed for clarity.

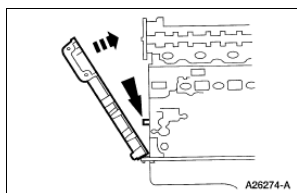
NOTE: If not secured within 4 minutes, sealant must be removed and the sealing area cleaned with solvent. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

Apply a bead of silicone along the cylinder head to block surface and the oil pan to block surface.

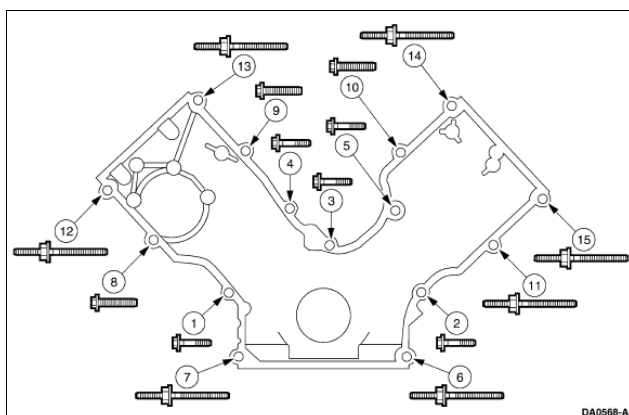
- Use Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4.



2. Install a new engine front cover gasket (6020) on the engine front cover, then position the engine front cover on the front cover to cylinder block dowels.



3. Loosely install the cover fasteners.



Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 53
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 53
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 53
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 53
5	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 53
6	N808529	Stud, Hex-Head Pilot, M10 x 1.5 x 1.5 x 103.1
7	N808529	Stud, Hex-Head Pilot, M10 x 1.5 x 1.5 x 103.1
8	N808142	Screw and Washer, Hex Pilot, M10 x 1.5 x 57.5
9	N808142	Screw and Washer, Hex Pilot, M10 x 1.5 x 57.5
10	N808142	Screw and Washer, Hex Pilot, M10 x 1.5 x 57.5
11	N808140	Stud and Washer, Hex-Head Pilot, M10 x 1.5 x M8 x 1.25 x 109.6
12	N808140	Stud and Washer, Hex-Head Pilot, M10 x 1.5 x M8 x 1.25 x 109.6

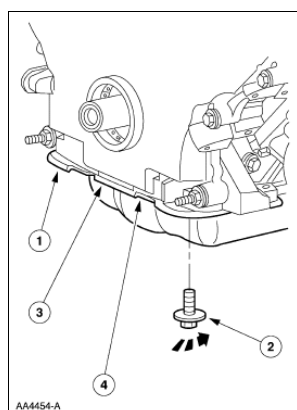
13	N808140	Stud and Washer, Hex-Head Pilot, M10 x 1.5 x M8 x 1.25 x 109.6
14	N808140	Stud and Washer, Hex-Head Pilot, M10 x 1.5 x M8 x 1.25 x 109.6
15	N808140	Stud and Washer, Hex-Head Pilot, M10 x 1.5 x M8 x 1.25 x 109.6

4. Tighten the fasteners in two stages following the sequence shown.
 - Stage 1: Tighten fasteners 1 through 5 to 20-30 Nm (15-22 lb-ft)
 - Stage 2: Tighten fasteners 6 through 15 to 40-55 Nm (30-41 lb-ft)

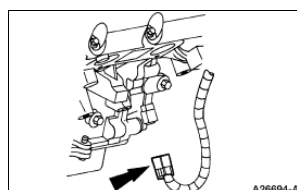
5. **NOTE:** Be sure to tighten the bolts in two stages.

Tighten the bolts in the sequence shown.

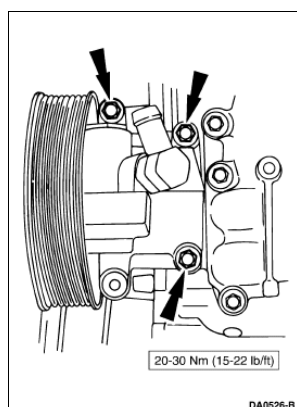
- Stage 1: Tighten to 20 Nm (15 lb-ft)
- Stage 2: Tighten an additional 60 degrees



6. Connect the CKP sensor electrical connector.



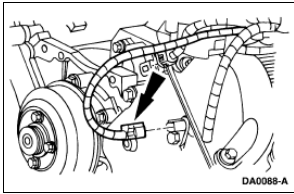
7. Install the bolts.



8. Lower the vehicle.

9. Install the water pump. Refer to Section 303-03 .

10. Connect the CMP electrical connector.



11. Raise and support the vehicle.

12. Install a new crankshaft front seal. For additional information, refer to Crankshaft Front Seal in this section.

13. Lower the vehicle.

14. Install the valve covers. Refer to Valve Cover LH and Valve Cover Right in this section.

15. Install the radiator and fill the cooling system. Refer to Section 303-03 .

16. Install the engine air cleaner (ACL) (9600) and the air cleaner outlet tube (9B659). Refer to Section 303-12 .

17. Connect the battery ground cable.

18. Fill the engine (6007) with oil.

- Use engine oil meeting Ford specification WSS-M2C153-G.