

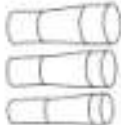


INSTALLATION

ENGINE

Special Tools

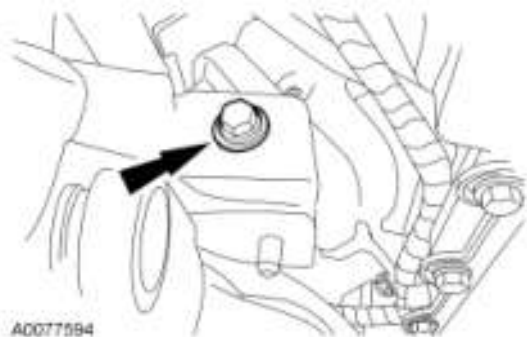
Illustration	Tool Name	Tool Number
 ST1377-A	Modular Engine Lift Bracket	303-F047 (014-00073) or equivalent
 ST1586-A	Installer, Power Steering Pump Pulley	211-185 (T91P-3A733-A)
 ST1444-A	Installer Set, Teflon® Seal	211-D207 (D90P-3517-A) or equivalent

Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Threadlock 262 TA-26	WSK-M2G351-A6

1. Using a suitable floor crane, position the engine assembly into the vehicle.

CAUTION: Only use hand tools when installing the LH engine mount bolt or damage to the engine mount can occur.



A0077594

Fig. 534: Locating LH Engine Support Insulator Bolt
Courtesy of FORD MOTOR CO.

2. Apply Threadlock 262 to the bolt threads and install the LH engine support insulator bolt.
 - Tighten to 350 Nm (258 lb-ft).

CAUTION: Make sure the RH engine support insulator mating surfaces and the washer mating surface are free of foreign material and corrosion before installation. Install a new washer.

CAUTION: Only use hand tools when installing the RH engine mount nuts or damage to the engine mount can occur.

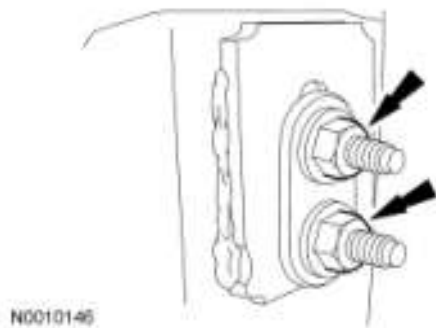


Fig. 535: Locating RH Engine Support Insulator Washer And Nuts
Courtesy of FORD MOTOR CO.

3. Apply Threadlock 262 to the stud threads and install the RH engine support insulator washer and nuts.
 - Tighten to 250 Nm (184 lb-ft).
4. Remove the special tool.

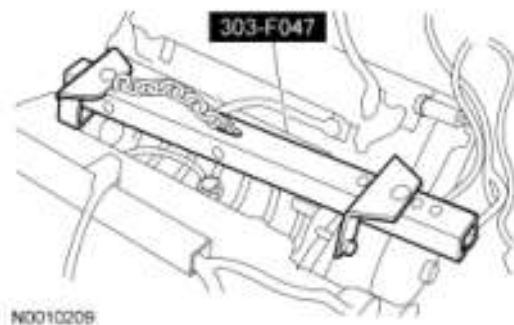


Fig. 536: Identifying Special Tool
Courtesy of FORD MOTOR CO.

NOTE: The upper 2 transmission-to-engine bolts will be installed later.

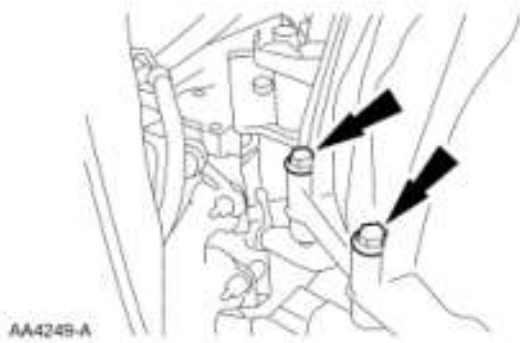


Fig. 537: Installing Lower Transmission-To-Engine Bolts
 Courtesy of FORD MOTOR CO.

5. Install the lower 5 transmission-to-engine bolts.
 - Tighten to 60 N.m (44 lb-ft).
6. Position the shift cable bracket and install the bolts and connect the shift cable.
 - Tighten to 25 N.m (18 lb-ft).

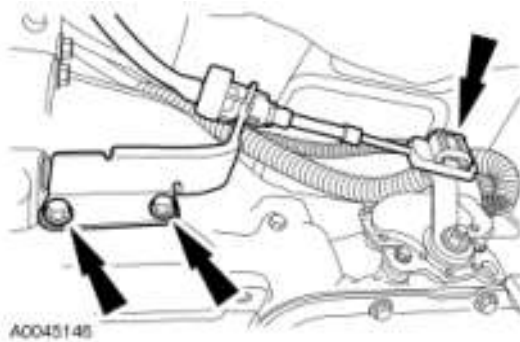


Fig. 538: Locating Shift Cable End And Bracket
 Courtesy of FORD MOTOR CO.

7. Install 4 new torque converter-to-flexplate nuts.
 - Tighten to 36 N.m (27 lb-ft).



Fig. 539: Locating Torque Converter-To-Flexplate Nuts
 Courtesy of FORD MOTOR CO.

8. Install the cylinder block opening cover.

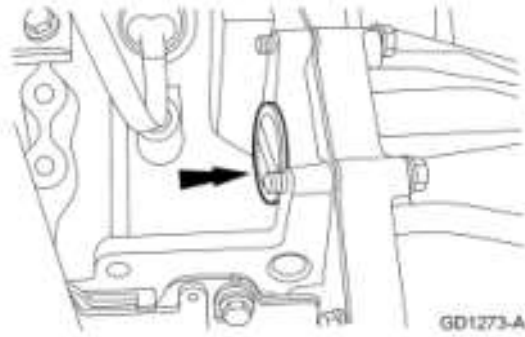


Fig. 540: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

9. Install the flexplate inspection cover and the 2 bolts.
 - Tighten to 34 N.m (25 lb-ft).

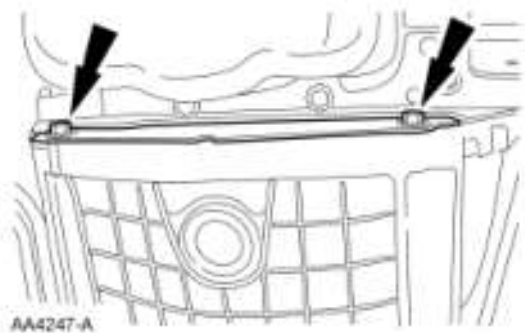


Fig. 541: Locating Flexplate Inspection Cover Bolts
Courtesy of FORD MOTOR CO.

10. Install the starter. For additional information, refer to **STARTING SYSTEM** article.
11. Position the transmission cooler tube support bracket and install the bolt.
 - Tighten to 10 N.m (89 lb-in).

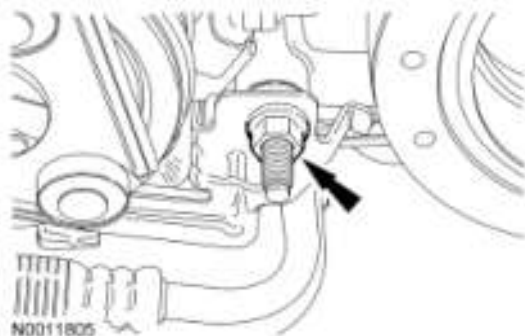


Fig. 542: Identifying Cooler Tube/Electrical Harness Support Bracket Bolt
Courtesy of FORD MOTOR CO.

12. If equipped, connect the block heater electrical connector.



Fig. 543: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

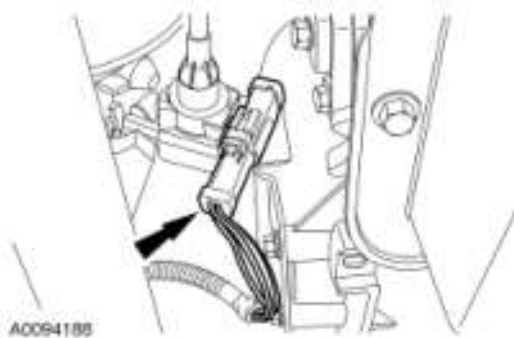


Fig. 544: Connecting LH And RH Heated Exhaust Gas Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

13. Connect the LH and RH heated exhaust gas oxygen sensor (HO2S) electrical connector and attach the electrical connector retainer.
14. Attach the starter electrical harness support bracket.

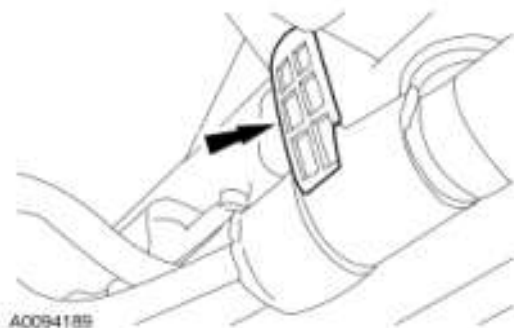


Fig. 545: Attaching Starter Electrical Harness Support Bracket
Courtesy of FORD MOTOR CO.

15. Position the A/C compressor and install the 3 bolts.
 - Tighten to 25 N.m (18 lb-ft).

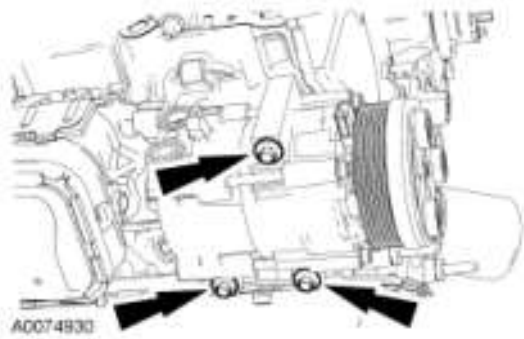


Fig. 546: Installing A/C Compressor Bolts
 Courtesy of FORD MOTOR CO.

16. Install the 4 exhaust manifold flange nuts.
 - Tighten to 40 N.m (30 lb-ft).

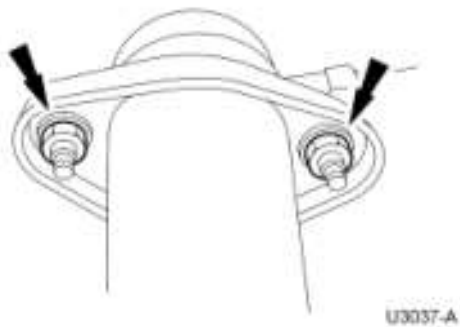


Fig. 547: Locating Exhaust Manifold Flange Nuts
 Courtesy of FORD MOTOR CO.

17. Install the upper 2 transmission-to-engine bolts.
 - Tighten to 60 N.m (44 lb-ft).

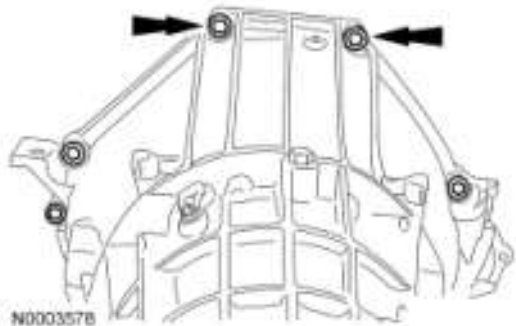


Fig. 548: Locating Upper Transmission-To-Engine Bolts
 Courtesy of FORD MOTOR CO.

18. Position the transmission filler tube and install the bolt.
 - Tighten to 20 N.m (15 lb-ft).

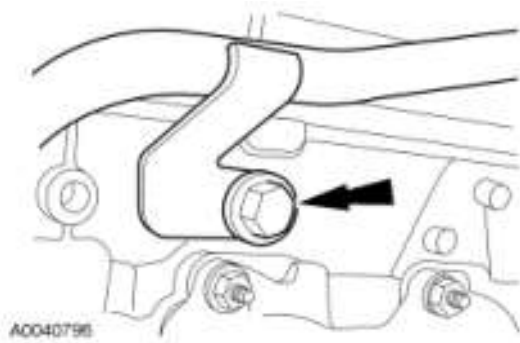


Fig. 549: Installing Transmission Fluid Filler Tube Bolt
Courtesy of FORD MOTOR CO.

19. Connect the crankshaft position (CKP) sensor wiring harness retainer to the starter motor wiring harness.

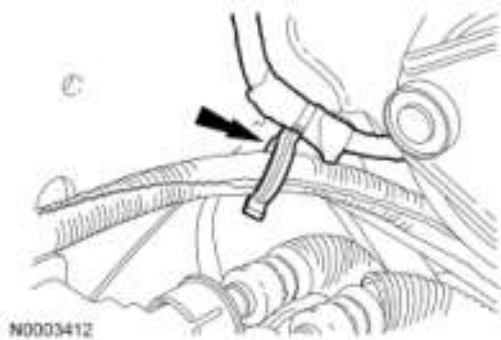


Fig. 550: Locating Crankshaft Position (CKP) Sensor Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

20. Connect the generator wiring harness retainer to the RH cylinder head.

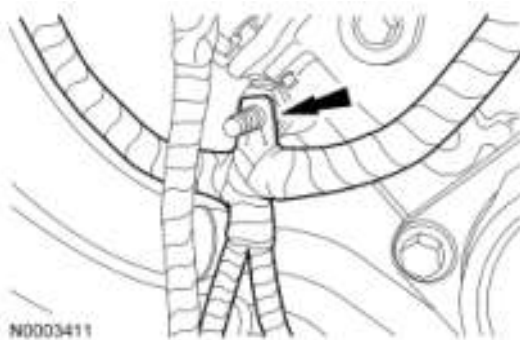


Fig. 551: Locating Generator Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

21. Connect the A/C compressor and the A/C high pressure cut-off switch electrical connectors.

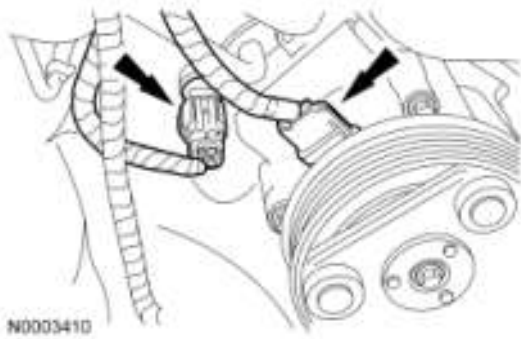


Fig. 552: Locating A/C Compressor And A/C High Pressure Cut-Off Switch Electrical Connectors

Courtesy of FORD MOTOR CO.

22. Connect the generator wiring harness retainer to the RH cylinder head.

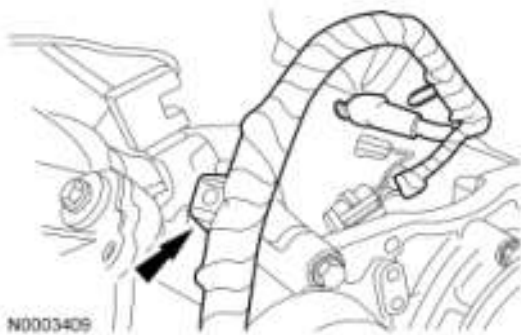


Fig. 553: Identifying Generator Wiring Harness Retainer

Courtesy of FORD MOTOR CO.

23. Position the power steering pump assembly and install the 3 bolts.
 - Tighten to 25 N.m (18 lb-ft).

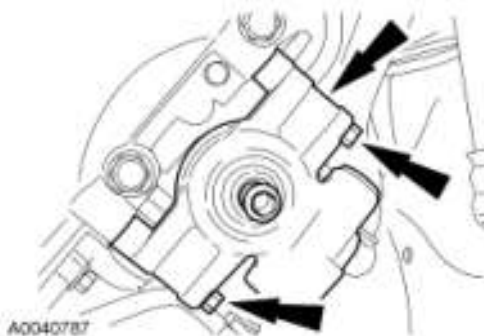


Fig. 554: Locating Power Steering Pump Assembly Bolts

Courtesy of FORD MOTOR CO.

24. Using the special tool, install a new O-ring seal on the pressure line fitting.

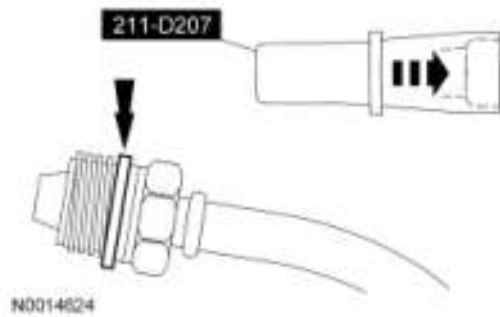


Fig. 555: Locating O-Ring Seal On Pressure Line Fitting
 Courtesy of FORD MOTOR CO.

25. Connect the power steering pressure tube.
 - Tighten to 65 N.m (48 lb-ft).

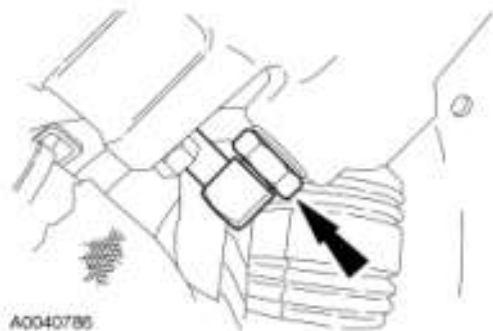


Fig. 556: Connecting Power Steering Pressure Tube
 Courtesy of FORD MOTOR CO.

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

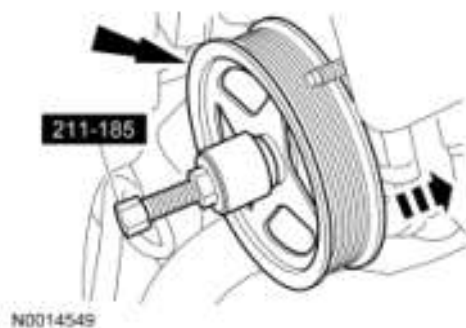


Fig. 557: Installing Power Steering Pump Pulley
 Courtesy of FORD MOTOR CO.

27. Position the power steering pressure hose support bracket and install the nut.
 - Tighten to 40 N.m (30 lb-ft).

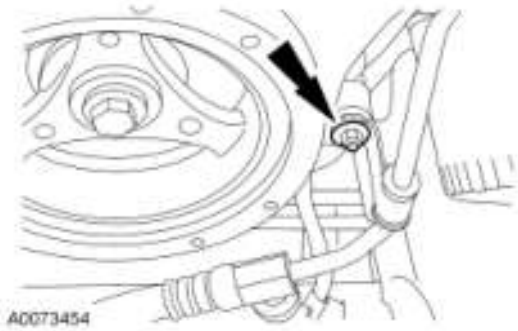


Fig. 558: Locating Power Steering Pressure Hose Support Bracket Nut
Courtesy of FORD MOTOR CO.

28. Position the power steering reservoir assembly and install the bolt.
 - Tighten to 25 N.m (18 lb-ft).

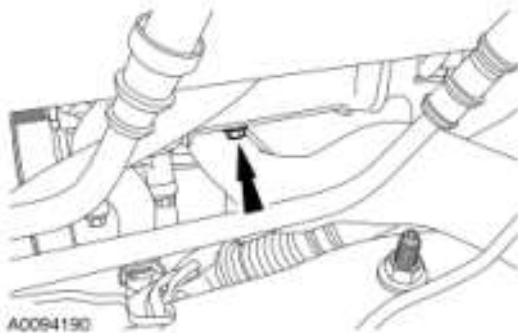


Fig. 559: Installing Power Steering Reservoir Assembly Bolt
Courtesy of FORD MOTOR CO.

29. Using a new O-ring seal, connect the A/C manifold and tube assembly and install the nut.
 - Tighten to 25 N.m (18 lb-ft).



Fig. 560: Using New O-Ring Seal To Connect A/C Manifold And Tube Assembly And Install Nut
Courtesy of FORD MOTOR CO.

30. Position the A/C manifold and tube assembly support bracket and install the nut.
 - Tighten to 25 N.m (18 lb-ft).

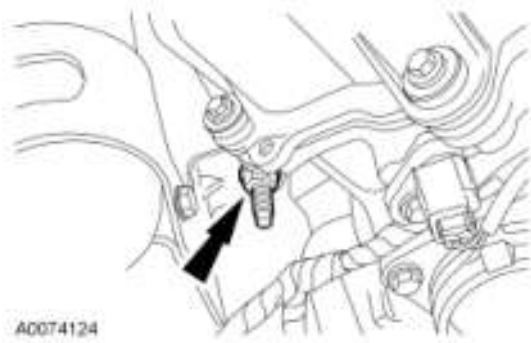


Fig. 561: Installing A/C Manifold And Tube Assembly Support Bracket Nut
Courtesy of FORD MOTOR CO.

31. Connect the heater hose.



Fig. 562: Connecting Heater Hose
Courtesy of FORD MOTOR CO.

32. Disconnect the coolant hose.

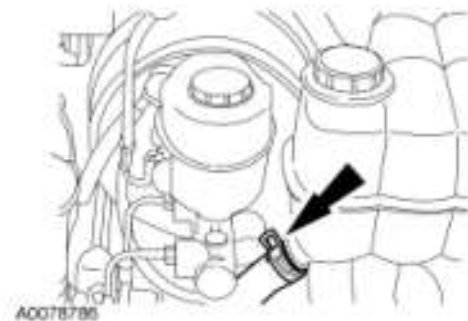


Fig. 563: Disconnecting Coolant Hose
Courtesy of FORD MOTOR CO.

33. Connect the electrical connector and position the ground strap and install the bolt.
- Tighten to 10 N.m (89 lb-in).

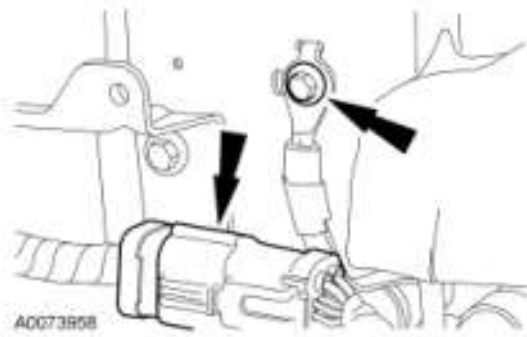


Fig. 564: Connecting Electrical Connector And Installing Bolt
 Courtesy of FORD MOTOR CO.

34. Position the cowl extension panel and install the bolts.

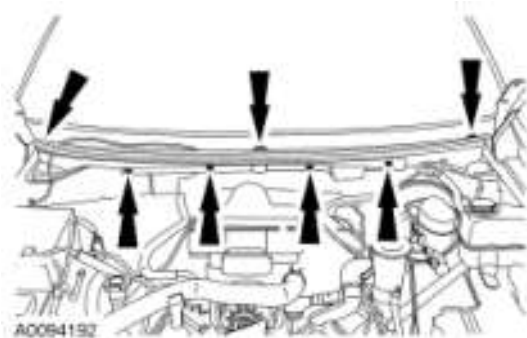


Fig. 565: Installing Cowl Extension Panel Bolts
 Courtesy of FORD MOTOR CO.

35. Attach the wiring harness and the windshield washer hose retainers to the cowl panel extension.

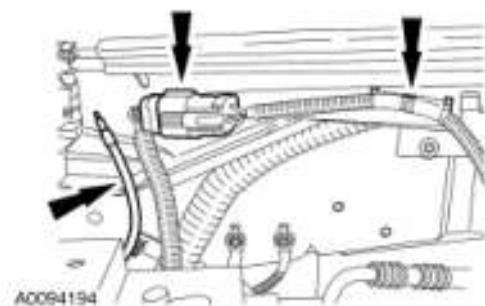









Fig. 566: Attaching Wiring Harness And Windshield Washer Hose Retainers To Cowl Panel Extension
 Courtesy of FORD MOTOR CO.


36. Install the intake manifold. For additional information, refer to **Intake Manifold** in this article.
37. Install the radiator. For additional information, refer to **ENGINE COOLING** article.
38. Install the powertrain control module (PCM). For additional information, refer to **ELECTRONIC ENGINE CONTROLS** article.
39. Install the cowl. For additional information, refer to **FRONT END BODY PANELS** article.
40. Install the hood.

41. Fill the crankcase with clean engine oil.
42. Evacuate and charge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.
43. Fill and bleed the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.

CYLINDER HEAD

Special Tools

Illustration	Tool Name	Tool Number
 <p>ST1688-A</p>	Remover/Installer, Cylinder Head	303-572 (T97T-6000-A)
 <p>ST2804-A</p>	Compressor, Valve Spring	303-1039
 <p>ST2807-A</p>	Locking Tool, Camshaft Phaser Sprocket	303-1046
 <p>ST2428-A</p>	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 <p>ST2197-A</p>	Installer, Crankshaft Front Seal	303-635
 <p>ST1328-A</p>	Installer, Front Cover Seal	303-335 (T88T-6701-A)
 <p>ST1335-A</p>	Holding Tool, Crankshaft	303-448 (T93P-6303-A)

 <small>ST2806-A</small>	Alignment Pins, Cylinder Head	303-1040 (SR-015486)
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Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft Metal Surface Prep ZC-31	-
Silicone Gasket Remover ZC-30	-
Threadlock 262 TA-26	WSK-M2G351-A6
Hydraulic Chain Tensioner Retaining Clip 1L3Z-6P250-AA	-

All cylinder heads

1. Position the crankshaft with the special tool, then remove the tool.



Fig. 567: Positioning Crankshaft With Special Tool
 Courtesy of FORD MOTOR CO.

CAUTION: Make sure all coolant residue and foreign material are cleaned from the block surface and cylinder bore.

CAUTION: The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

CAUTION: The cylinder head bolts must be discarded and new bolts installed. They are tighten-to-yield designed and cannot be reused.

NOTE: Do not turn the crankshaft until instructed to do so.

NOTE: LH shown, RH similar.

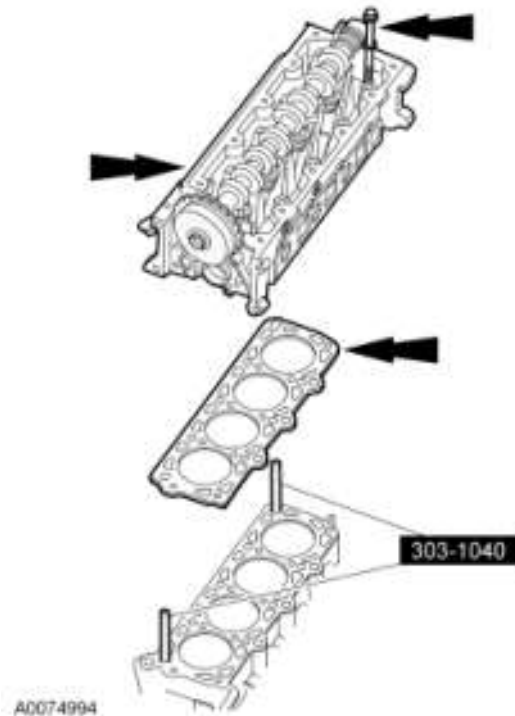
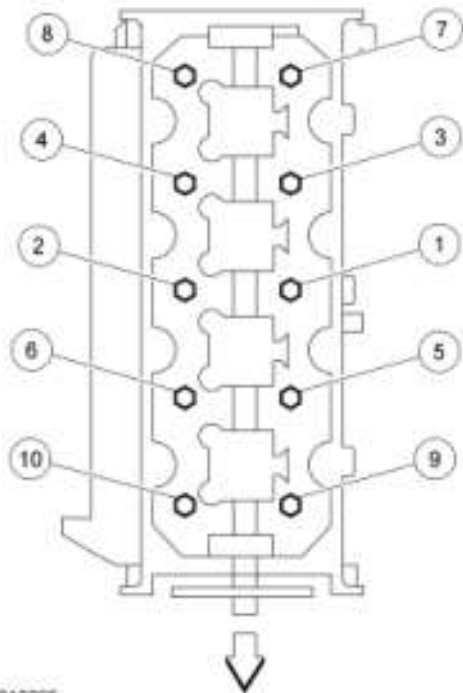


Fig. 568: Locating Cylinder Head And Gaskets Using Special Tool
Courtesy of FORD MOTOR CO.

2. Using the special tools, position the cylinder head gaskets and cylinder heads over the dowels and install the cylinder head bolts loosely.
3. Tighten the bolts in 3 stages, in the sequence shown.

RH shown, LH similar.

- Stage 1: Tighten to 40 N.m (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees.
- Stage 3: Tighten an additional 90 degrees.



N0010205

Fig. 569: Identifying Tightening Bolts In Sequence
 Courtesy of FORD MOTOR CO.

LH cylinder head

1. Remove the special tool from the LH cylinder head.

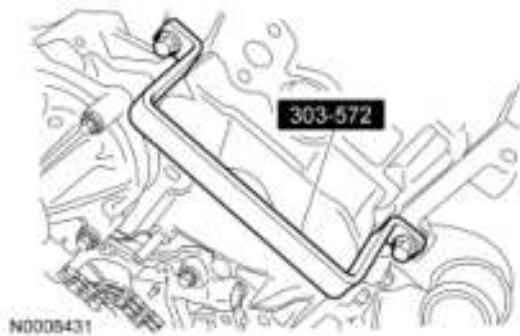
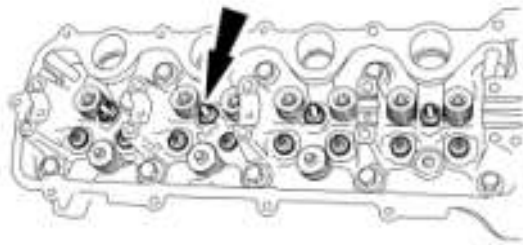


Fig. 570: Identifying Special Tool Onto Cylinder Head
 Courtesy of FORD MOTOR CO.

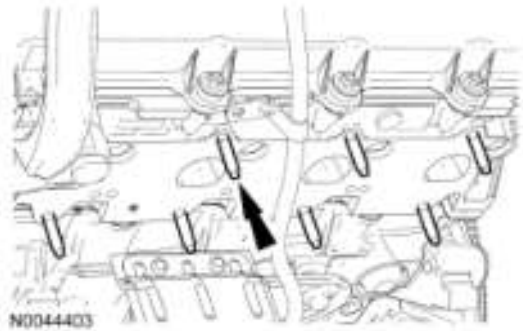
2. Install the hydraulic lash adjusters into the LH cylinder head.
 - Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.



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Fig. 571: Identifying Hydraulic Lash Adjusters
 Courtesy of FORD MOTOR CO.

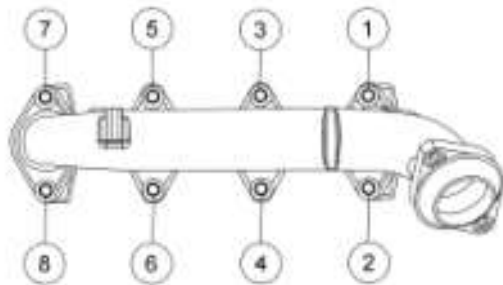
3. Install 8 new LH exhaust manifold-to-cylinder head studs.
 - Tighten to 12 Nm (9 lb-ft).



N0044403

Fig. 572: Locating LH Exhaust Manifold-To-Cylinder Head Studs
 Courtesy of FORD MOTOR CO.

4. Position a new gasket, the LH exhaust manifold and tighten the 8 new nuts in the sequence shown.
 - Tighten to 25 N.m (18 lb-ft).



N0010196

Fig. 573: Identifying Tightening Sequence Of LH Exhaust Manifold Bolts
 Courtesy of FORD MOTOR CO.

RH cylinder head

1. Remove the special tool from the RH cylinder head.



Fig. 574: Identifying Special Tool On Cylinder Head
 Courtesy of FORD MOTOR CO.

2. Install the hydraulic lash adjusters into the RH cylinder head.
 - Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.

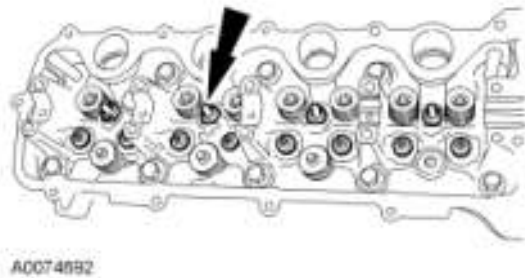


Fig. 575: Identifying Hydraulic Lash Adjusters
 Courtesy of FORD MOTOR CO.

3. Install 8 new RH exhaust manifold-to-cylinder head studs.
 - Tighten to 12 Nm (9 lb-ft).

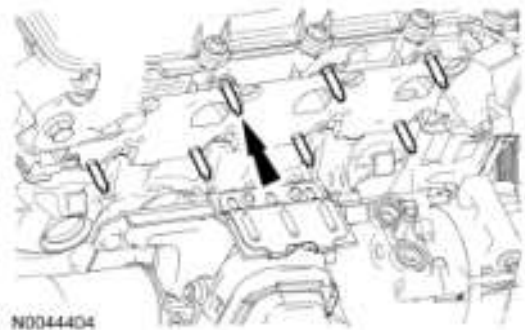
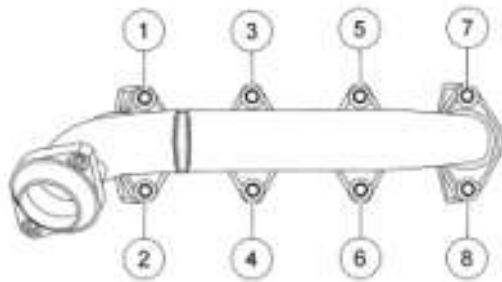


Fig. 576: Locating RH Exhaust Manifold-To-Cylinder Head Studs
 Courtesy of FORD MOTOR CO.

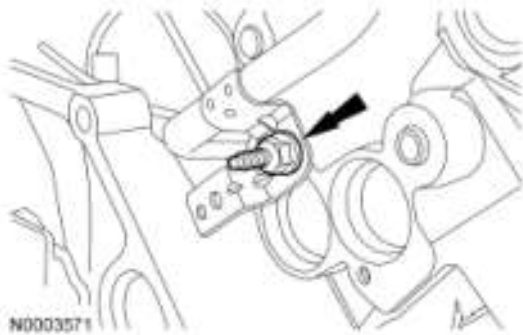
4. Position a new gasket, the RH exhaust manifold and tighten the 8 new nuts in the sequence shown.
 - Tighten to 25 N.m (18 lb-ft).



N0005433

Fig. 577: Identifying Tightening Sequence Of RH Exhaust Manifold Bolts
 Courtesy of FORD MOTOR CO.

5. Install the coolant tube and the stud bolt.
 - Tighten to 10 N.m (89 lb-in).



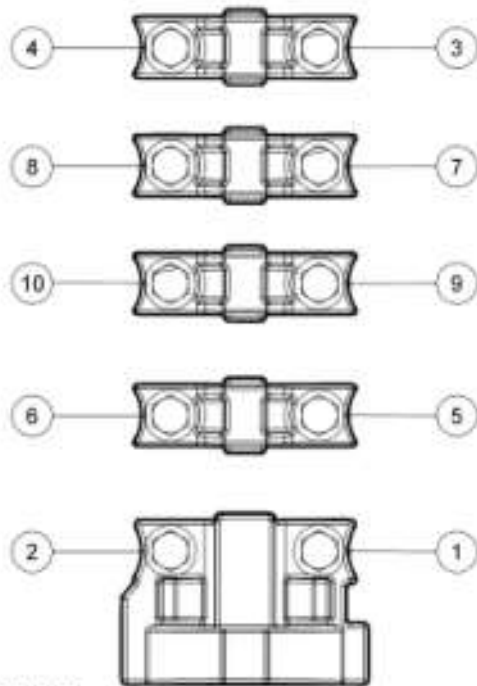
N0003571

Fig. 578: Identifying Coolant Tube Stud Bolt
 Courtesy of FORD MOTOR CO.

All cylinder heads

1. Install the LH and RH camshafts.
 - Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.

NOTE: LH shown, RH similar.



N0010190

Fig. 579: Identifying Camshaft Bearing Caps Loosening/Tightening Sequence
 Courtesy of FORD MOTOR CO.

2. Install the LH and RH camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the bolts loosely.
 - Tighten to 10 N.m (89 lb-in) in the sequence shown.

CAUTION: Damage to the variable camshaft timing (VCT) phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: LH shown, RH similar.

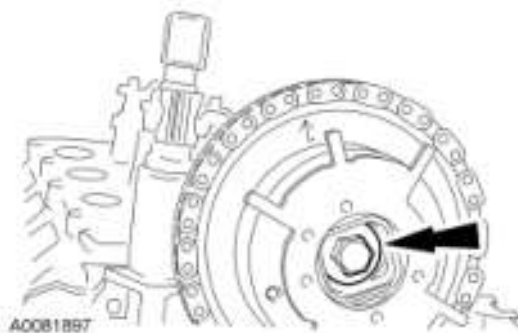


Fig. 580: Identifying Camshaft Phaser And Sprocket Assembly Bolt
 Courtesy of FORD MOTOR CO.

3. Install the VCT phaser sprockets and new VCT phaser sprocket bolts finger tight.

CAUTION: Damage to the VCT phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

CAUTION: Only use hand tools to remove the VCT phaser sprocket assembly or damage may occur to the camshaft or VCT phaser sprocket.

NOTE: LH shown, RH similar.

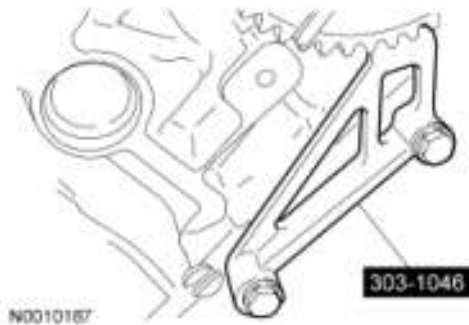


Fig. 581: Identifying Special Sprocket Phaser Tool
Courtesy of FORD MOTOR CO.

4. Using the special tool, tighten the LH and RH VCT phaser sprocket bolts in 2 stages.
- Stage 1: Tighten to 40 N.m (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

CAUTION: Timing chain procedures must be followed exactly or damage to valves and pistons will result.

CAUTION: Prior to installation, inspect the tensioner-sealing bead for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner.

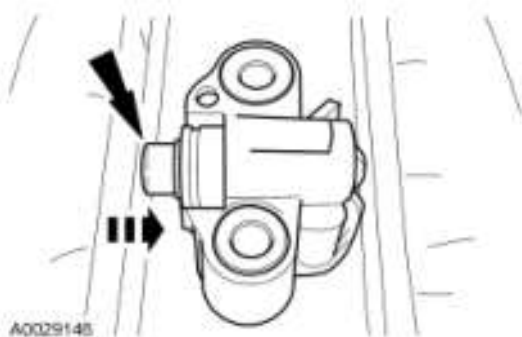


Fig. 582: Compressing Tensioner Plunger
Courtesy of FORD MOTOR CO.

5. Compress the tensioner plunger, using a vise.
6. Install a retaining clip on the tensioner to hold the plunger in during installation.

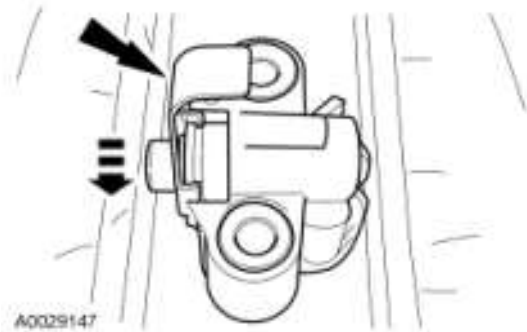


Fig. 583: Identifying Retaining Clip on Tensioner
 Courtesy of FORD MOTOR CO.

7. Remove the tensioner from the vise.
8. If the copper links are not visible, mark 2 links on one end and 1 link on the other end, and use as timing marks.

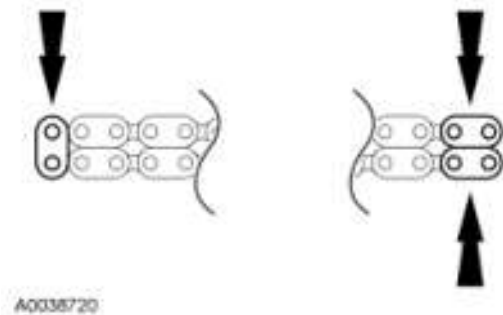


Fig. 584: Locating Timing Chain Marks
 Courtesy of FORD MOTOR CO.

9. Install the crankshaft sprocket, making sure the flange faces forward.

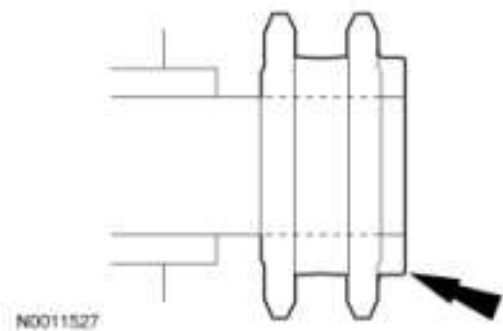
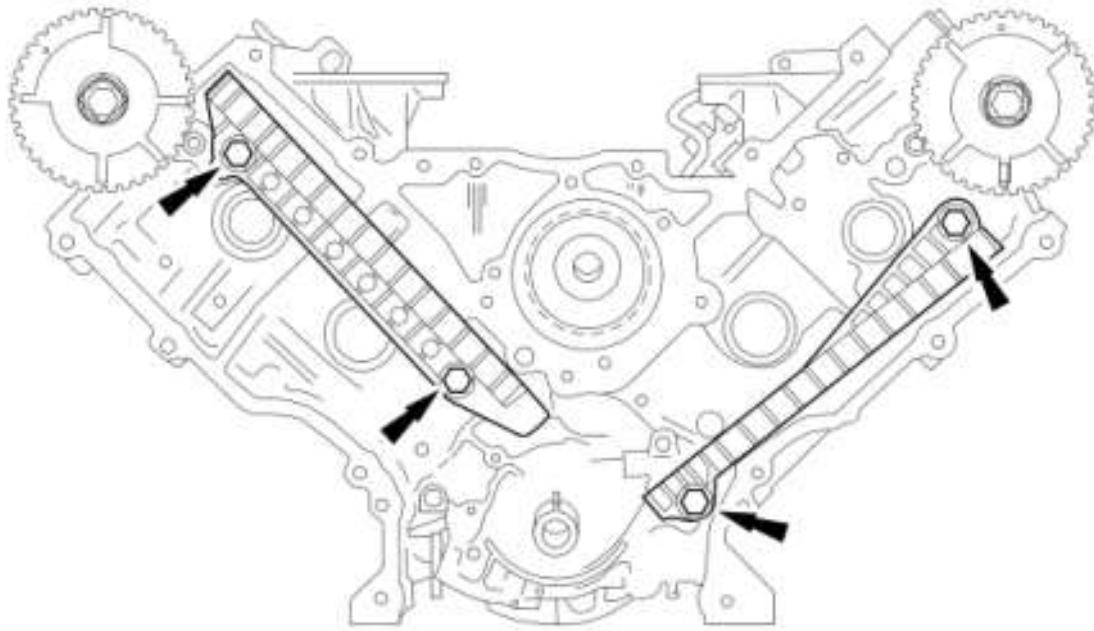


Fig. 585: Identifying Crankshaft Sprocket
 Courtesy of FORD MOTOR CO.

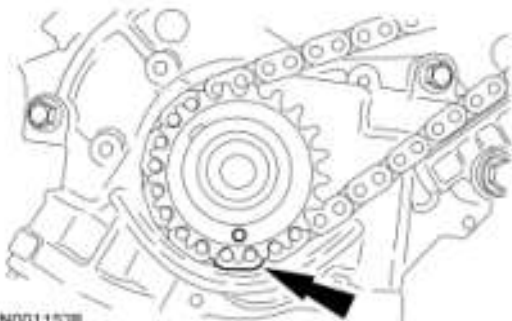
10. Install the 4 bolts and the LH and RH timing chain guides.
 - Tighten to 10 N.m (89 lb-in).



N0006303

Fig. 586: Identifying Timing Chain Guides
Courtesy of FORD MOTOR CO.

11. Position the lower end of the LH (inner) timing chain on the crankshaft sprocket, aligning the timing mark on the outer flange of the crankshaft sprocket with the single copper (marked) link on the chain.



N0011528

Fig. 587: Aligning Crankshaft Sprocket Timing Mark And LH Timing Chain Link
Courtesy of FORD MOTOR CO.

NOTE: Make sure the upper half of the timing chain is below the tensioner arm dowel.

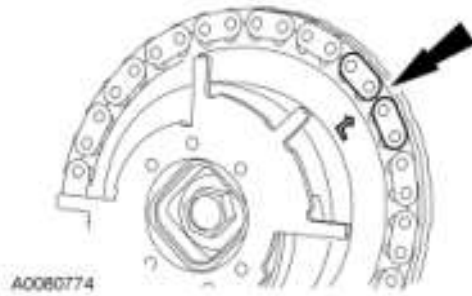


Fig. 588: Identifying Copper Links Of Timing Chain On VCT Phaser Sprocket
 Courtesy of FORD MOTOR CO.

12. Position the timing chain on the camshaft sprocket with the camshaft sprocket timing mark positioned between the 2 copper (marked) chain links.

NOTE: The LH timing chain tensioner arm has a bump near the dowel hole for identification.

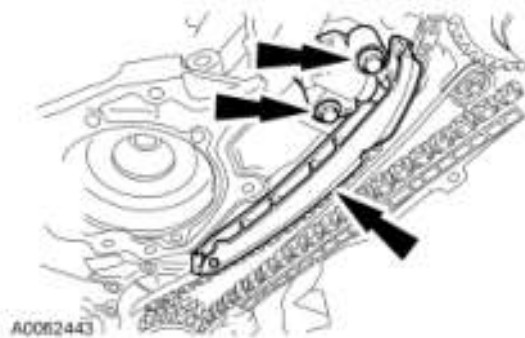


Fig. 589: Identifying LH Timing Chain Tensioner & Tensioner Arm
 Courtesy of FORD MOTOR CO.

13. Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner and bolts.
 - Tighten to 25 N.m (18 lb-ft).
14. Remove the retaining clip from the LH timing chain tensioner.

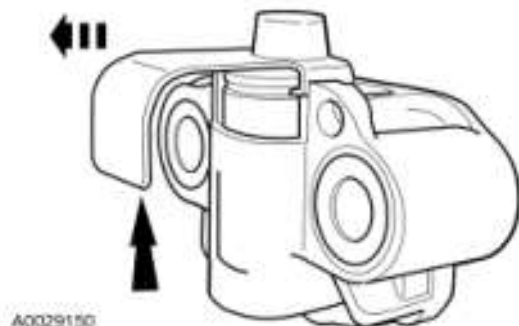


Fig. 590: View Of Retaining Clip And Timing Chain Tensioner
 Courtesy of FORD MOTOR CO.

15. Position the lower end of the RH (outer) timing chain on the crankshaft sprocket, aligning the timing

mark on the sprocket with the single copper (marked) chain link.

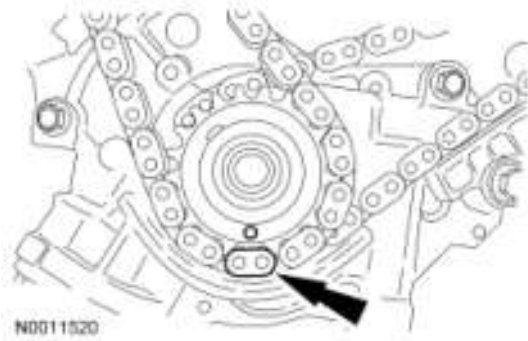


Fig. 591: Aligning Crankshaft Sprocket Timing Mark And RH Timing Chain Link
Courtesy of FORD MOTOR CO.

NOTE: The lower half of the timing chain must be positioned above the tensioner arm dowel.

NOTE: The camshaft phaser and sprocket will be stamped with one of the illustrated timing marks for the RH camshaft.

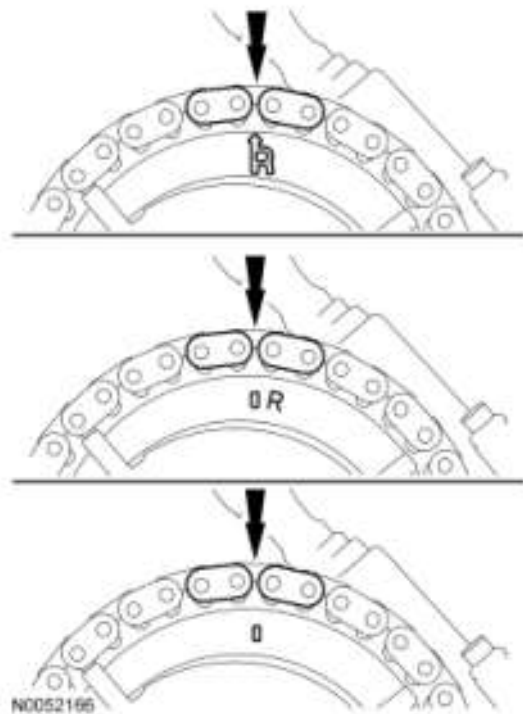


Fig. 592: Positioning RH Timing Chain On Camshaft Sprocket
Courtesy of FORD MOTOR CO.

16. Position the RH timing chain on the camshaft sprocket. Make sure the camshaft sprocket timing mark is positioned between the 2 copper (marked) chain links.
17. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and bolts.
 - Tighten to 25 N.m (18 lb-ft).



Fig. 593: Identifying RH Timing Chain Tensioner, Tensioner Arm And Bolts
 Courtesy of FORD MOTOR CO.

18. Remove the retaining clip from the RH timing chain tensioner.

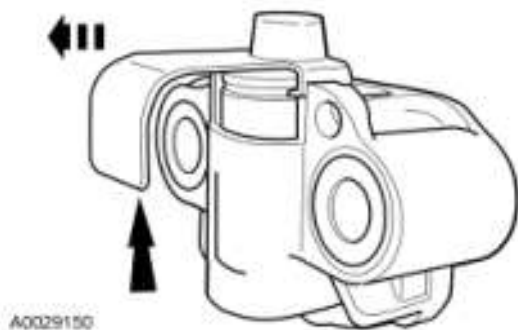
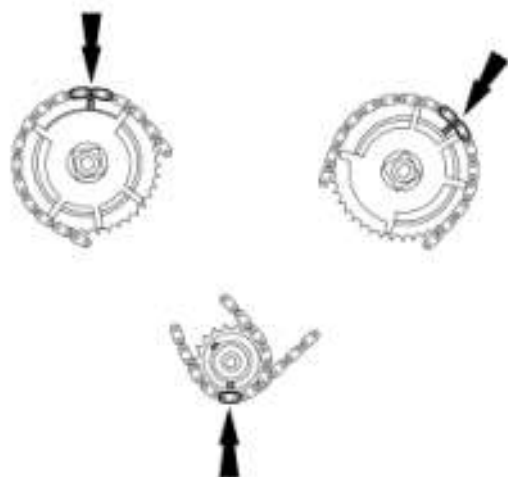


Fig. 594: View Of Retaining Clip And Timing Chain Tensioner
 Courtesy of FORD MOTOR CO.

19. As a post-check, verify correct alignment of all timing marks.



N0011529

Fig. 595: Identifying Alignment Of All Timing Marks

Courtesy of FORD MOTOR CO.

20. Install the crankshaft sensor ring on the crankshaft.

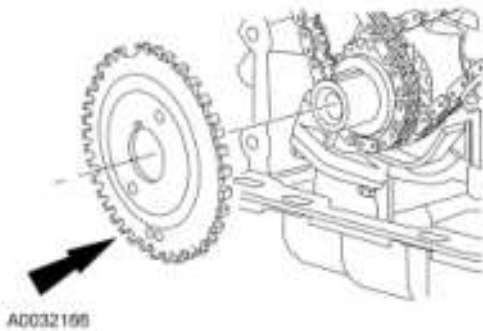


Fig. 596: View Of Crankshaft Sensor Ring At Crankshaft
Courtesy of FORD MOTOR CO.

21. Using the special tool, install all of the camshaft roller followers.
 - Lubricate the roller followers with clean engine oil prior to installation.



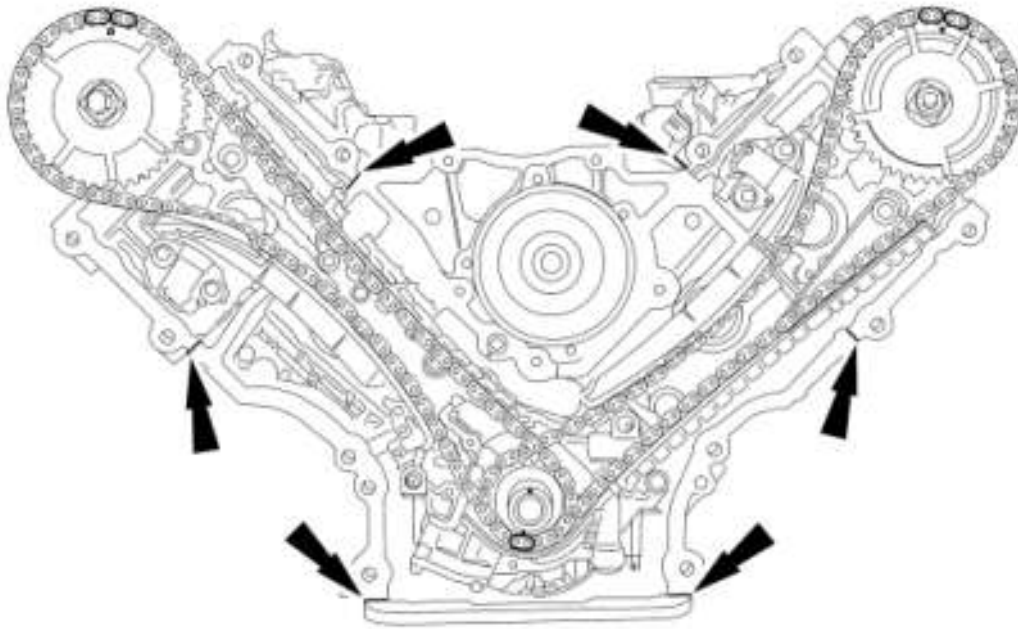
Fig. 597: Compressing Spring Using Special Tool
Courtesy of FORD MOTOR CO.

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. Use a plastic scraping tool to remove all traces of old sealant.

NOTE: If the engine front cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing

area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. 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.

NOTE: Make sure that the engine front cover gasket is in place on the engine front cover before installation.



A0080776

Fig. 598: Applying Bead Of Silicone Gasket And Sealant Along Cylinder Head-To-Cylinder And Oil Pan-To-Cylinder Block Surface
Courtesy of FORD MOTOR CO.

22. Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface and the oil pan-to-cylinder block surface, at the locations shown.
23. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.

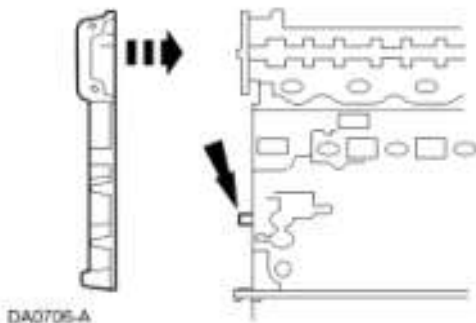
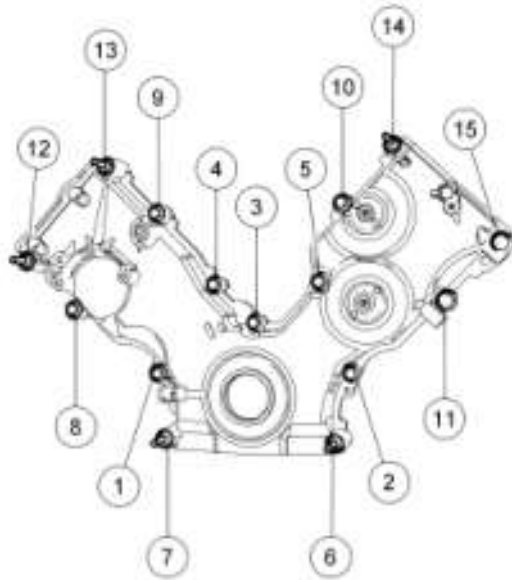


Fig. 599: Installing Engine Front Cover Gasket
Courtesy of FORD MOTOR CO.

24. Tighten the engine front cover fasteners in the sequence shown in 2 stages.

Stage 1: Tighten fasteners 1 through 15 to 25 Nm (18 lb-ft).

Stage 2: Tighten fasteners 6 and 7 to 48 Nm (35 lb-ft).



N0010206

Fig. 600: Identifying Tightening Sequence Of Engine Front Cover Fasteners
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot,

		M8 x 1.25 x 50
5	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
6	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
7	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
8	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
9	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
10	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
11	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
12	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
		Stud and Washer, Hex Head

14	W709573	Pilot, M8 x 1.25 x 1.25 x 94
15	W706605	Bolt, Hex Head Pilot, M8 x 1.25 x 56

25. Loosely install the bolts, then tighten the bolts in 2 stages, in the sequence shown.

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

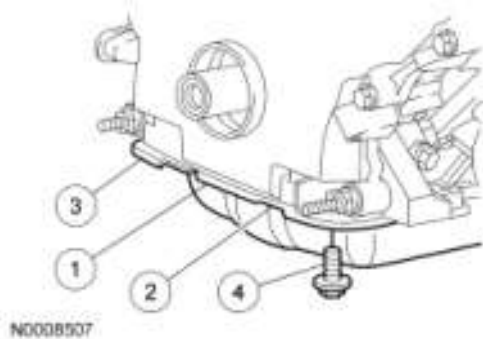


Fig. 601: Identifying Tightening Sequence Of Front Oil Pan Bolts
 Courtesy of FORD MOTOR CO.

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

26. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. 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.

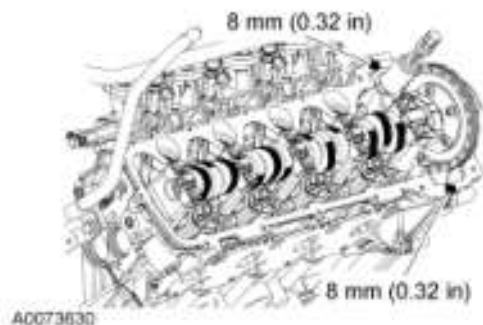


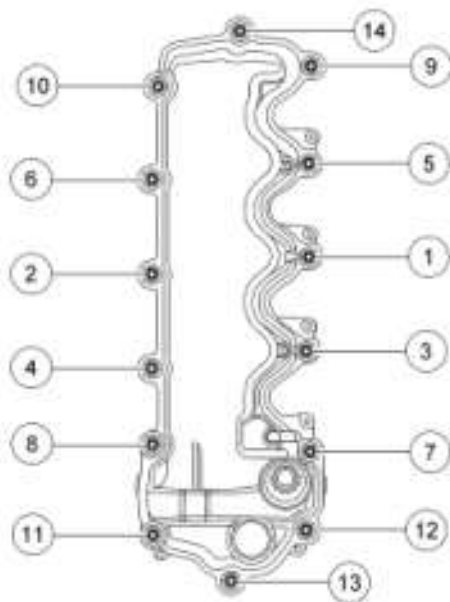
Fig. 602: Applying Bead Of Silicone Gasket And Sealant In 2 Places Where Engine Front Cover Meets Cylinder Head

Courtesy of FORD MOTOR CO.

27. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

Early build vehicles

CAUTION: When installing the valve cover, make sure to avoid damaging the VCT solenoid.



N0005317

Fig. 603: Identifying Tightening Sequence Of Valve Cover Bolts

Courtesy of FORD MOTOR CO.

1. Position the RH valve cover and gasket on the cylinder head and tighten the fasteners in the sequence shown.
 - Tighten to 10 N.m (89 lb-in).

Late build vehicles

CAUTION: When installing the valve cover, make sure to avoid damaging the VCT solenoid.

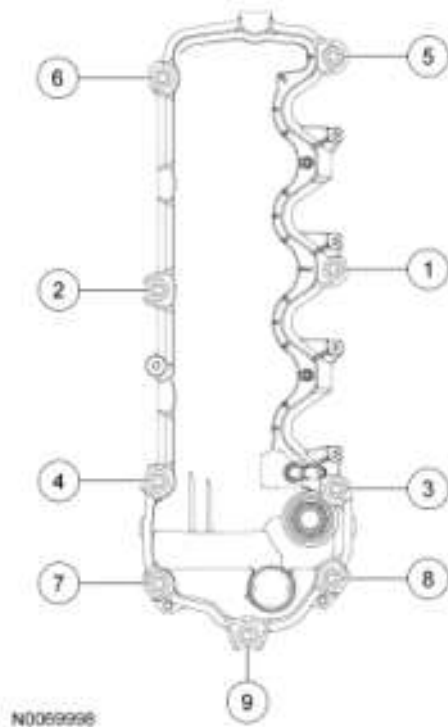


Fig. 604: Tightening RH Valve Cover In Sequence
Courtesy of FORD MOTOR CO.

1. Position the RH valve cover and new gasket on the cylinder head and tighten the fasteners in the sequence shown.
 - Tighten to 10 Nm (89 lb-in).

All vehicles

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

1. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. 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.

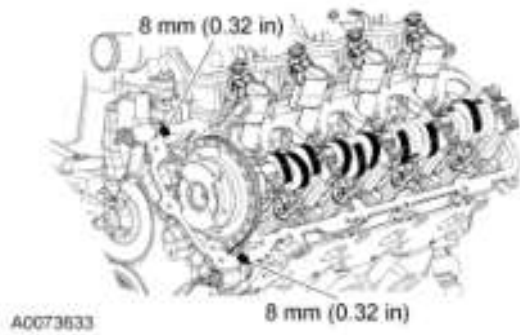
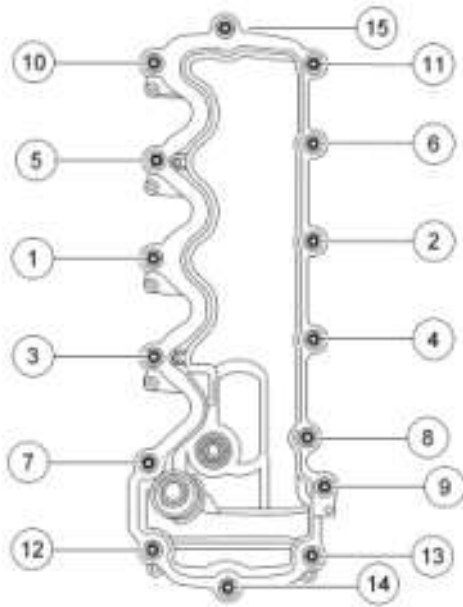


Fig. 605: Applying Bead Of Silicone Gasket And Sealant In 2 Places Where Engine Front Cover Meets Cylinder Head
 Courtesy of FORD MOTOR CO.

2. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

Early build vehicles

CAUTION: When installing the valve cover, make sure to avoid damaging the VCT solenoid.



N0005318

Fig. 606: Identifying Tighten Sequence Of Valve Cover Bolts
 Courtesy of FORD MOTOR CO.

1. Position the LH valve cover and gasket on the cylinder head and tighten the fasteners in the sequence shown.
 - Tighten to 10 N.m (89 lb-in).

Late build vehicles

CAUTION: When installing the valve cover, make sure to avoid damaging the VCT solenoid.

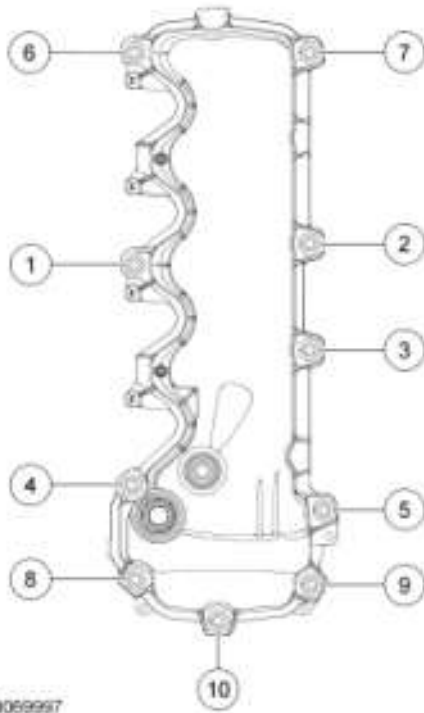


Fig. 607: Identifying LH Valve Cover In Sequence
Courtesy of FORD MOTOR CO.

1. Position the LH valve cover and new gasket on the cylinder head and tighten the fasteners in the sequence shown.
 - Tighten to 10 Nm (89 lb-in).

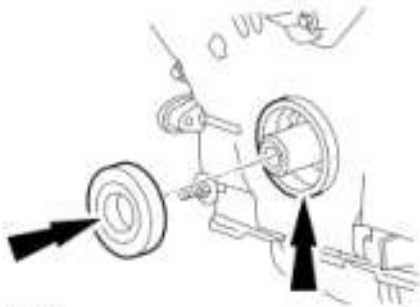
All vehicles

1. Install the oil level indicator tube and the bolt.
 - Install a new O-ring seal and lubricate the O-ring seal with clean engine oil prior to installation.
 - Tighten to 10 Nm (89 lb-in).



Fig. 608: Installing Oil Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

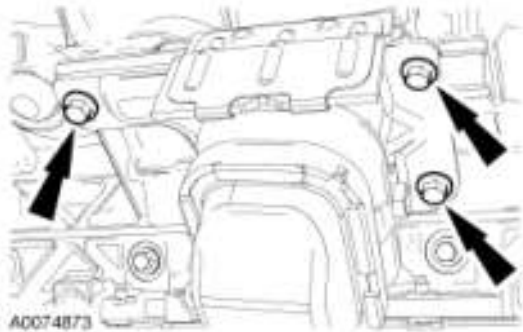
2. Lubricate the engine front cover and the crankshaft seal inner lip with clean engine oil.



A0029187

Fig. 609: Locating Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

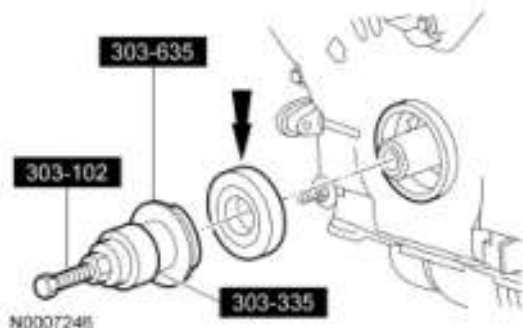
CAUTION: Clean the engine support insulator-to-cylinder block mating surfaces of any dirt or foreign material prior to installation.



A0074873

Fig. 610: Identifying RH Engine Support Insulator Bolts
Courtesy of FORD MOTOR CO.

3. Position the RH engine support insulator and install the 3 bolts.
 - Apply threadlock to the bolt threads prior to installation.
 - Tighten to 63 Nm (46 lb-ft).
4. Use the special tools to install a new crankshaft seal into the engine front cover.



N0007246

Fig. 611: Installing Crankshaft Front Seal Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. 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.

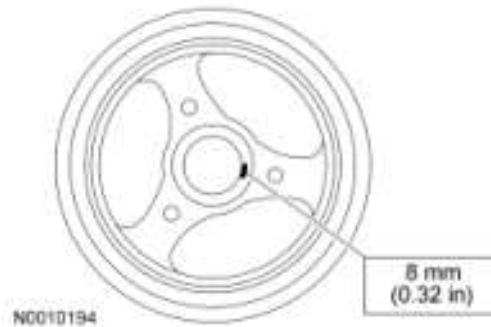


Fig. 612: Applying Silicone Gasket And Sealant To Woodruff Key Slot On Crankshaft Pulley
Courtesy of FORD MOTOR CO.

5. Apply silicone gasket and sealant to the Woodruff key slot on the crankshaft pulley.
6. Use the special tool to install the crankshaft pulley.



Fig. 613: Using Special Tool To Install Crankshaft Pulley
Courtesy of FORD MOTOR CO.

7. Tighten the new crankshaft pulley bolt in 4 stages.
 - Stage 1: Tighten to 90 N.m (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 50 N.m (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

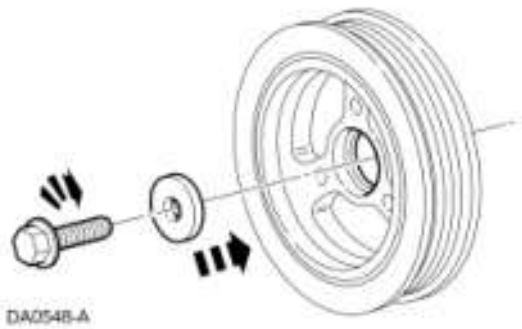


Fig. 614: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the new O-ring seal with clean engine oil prior to installation.

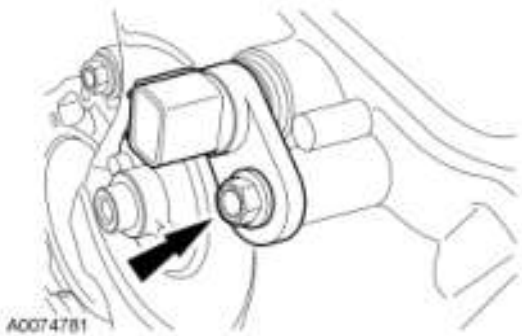


Fig. 615: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

8. Using a new O-ring seal, install the LH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 N.m (89 lb-in).

NOTE: Lubricate the new O-ring seal with clean engine oil prior to installation.

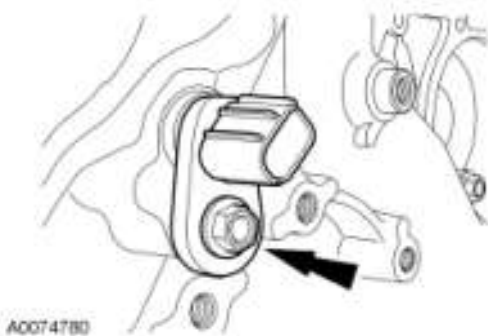


Fig. 616: Locating Camshaft (CMP) Sensor Bolt
Courtesy of FORD MOTOR CO.

9. Using a new O-ring seal, install the RH CMP sensor and the bolt.
 - Tighten to 10 N.m (89 lb-in).
10. Position the crankshaft position (CKP) sensor and the bolt.
 - Install a new O-ring seal and lubricate the O-ring seal with clean engine oil prior to installation.

- Tighten to 10 N.m (89 lb-in).

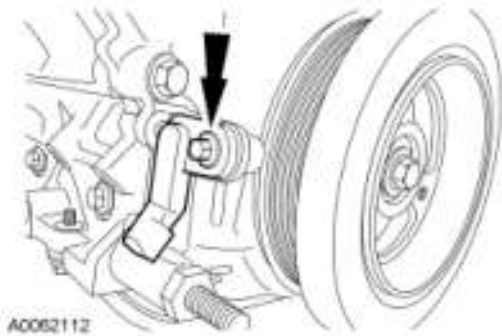


Fig. 617: Locating Crankshaft Position (CKP) Sensor Bolt
Courtesy of FORD MOTOR CO.

11. Position the accessory drive belt tensioner and install the 3 bolts.
 - Tighten to 25 N.m (18 lb-ft).

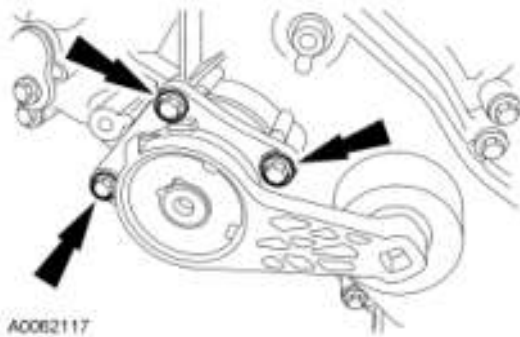


Fig. 618: Identifying Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

12. Install the 3 accessory drive belt idler pulleys, the coolant pump pulley and the 7 bolts.
 - Tighten to 25 N.m (18 lb-ft).

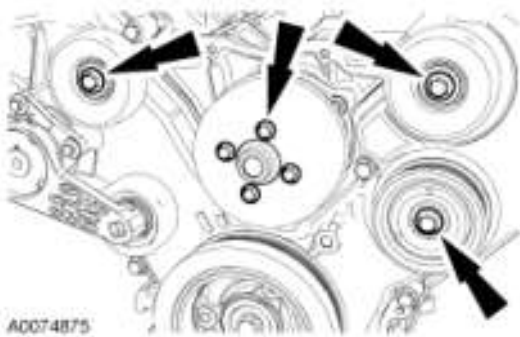


Fig. 619: Locating Coolant Pump Pulley And Accessory Drive Belt Idler Pulley Bolts
Courtesy of FORD MOTOR CO.

13. Position the electrical harness on the engine assembly.
14. Connect the CKP sensor electrical connector.

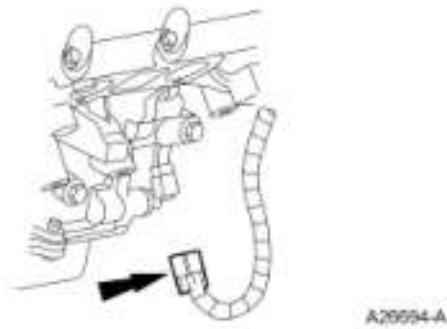


Fig. 620: Connecting CKP Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

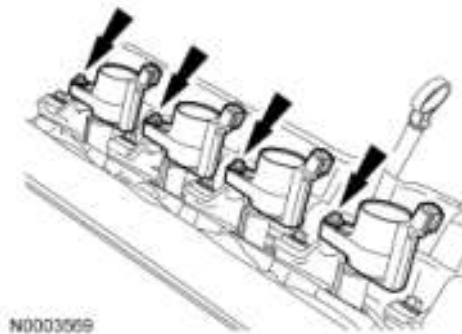


Fig. 621: Identifying Ignition Coils And Bolts
 Courtesy of FORD MOTOR CO.

15. Install the 8 ignition coils and the 8 bolts.
 - Tighten to 6 N.m (53 lb-in).
16. Install the LH radio ignition interference capacitor and the stud bolt.
 - Tighten to 10 N.m (89 lb-in).

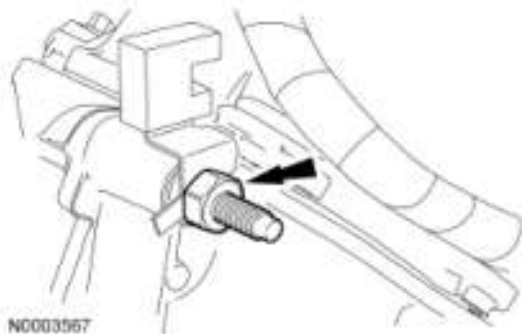


Fig. 622: Identifying LH Radio Ignition Interference Capacitor And Stud Bolt
 Courtesy of FORD MOTOR CO.

17. Connect the cylinder head temperature (CHT) sensor electrical connector.

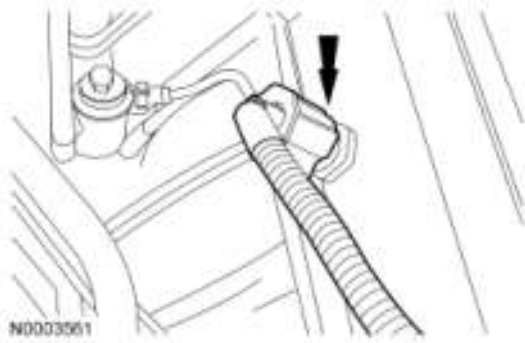


Fig. 623: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

18. Connect the 4 RH ignition coil electrical connectors.

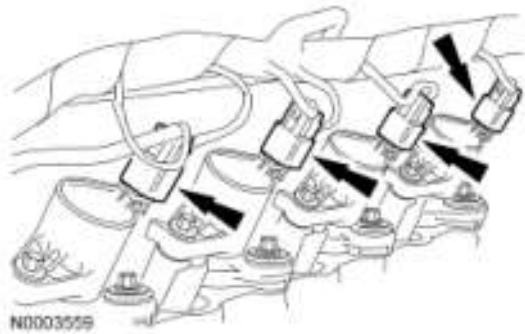


Fig. 624: Locating Ignition Coil Electrical Connectors
Courtesy of FORD MOTOR CO.

19. Connect the electrical connector retainer to the coolant tube.



Fig. 625: Locating Electrical Connector Retainer At Coolant Tube Support Bracket
Courtesy of FORD MOTOR CO.

20. Connect the 2 engine wiring harness retainers from the RH valve cover studs.

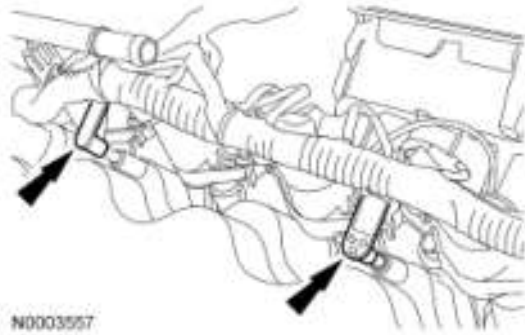


Fig. 626: Locating Engine Wiring Harness Retainers At RH Valve Cover
Courtesy of FORD MOTOR CO.

21. Connect the RH VCT solenoid electrical connector.

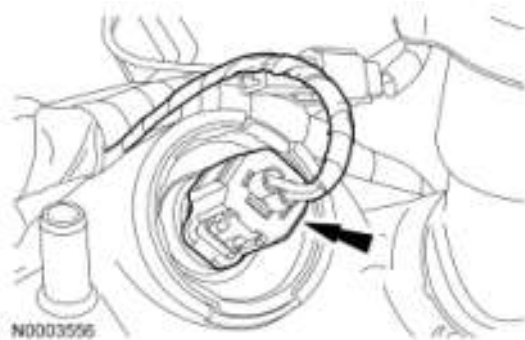


Fig. 627: Locating Camshaft Timing (VCT) Solenoid Electrical Connectors
Courtesy of FORD MOTOR CO.

22. Install the RH radio ignition interference capacitor and the stud bolt.
 - Tighten to 10 N.m (89 lb-in).



Fig. 628: Identifying RH Radio Ignition Interference Capacitor Stud Bolt
Courtesy of FORD MOTOR CO.

23. Connect the RH CMP sensor electrical connector.



Fig. 629: Identifying RH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

24. Using a suitable floor crane, remove the engine from the engine stand.
25. Install the flexplate and the 8 bolts in the sequence shown.
 - Tighten to 80 N.m (59 lb-ft).

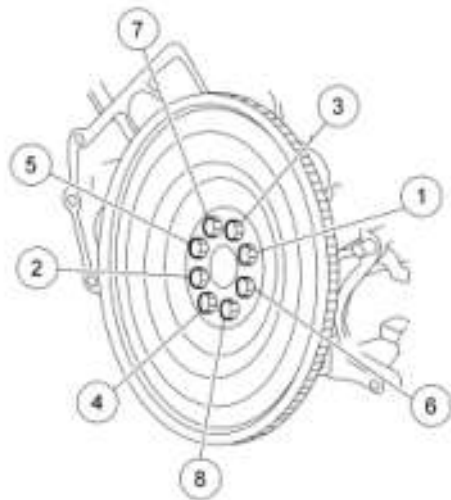


Fig. 630: Identifying Tightening Sequence For Flexplate Or Flywheel Bolts
Courtesy of FORD MOTOR CO.

26. Install the engine. For additional information, refer to **Engine** in this article.