

ENGINE FRONT COVER REPLACEMENT

AFFECTED VEHICLES:

CERTAIN 1996-1997 COUGAR, MUSTANG AND THUNDERBIRD

EQUIPPED WITH 3.8L ENGINE AND 1997 F-SERIES

EQUIPPED WITH 4.2L ENGINE

SERVICE KIT PART NUMBER: XU2Z-6020-AA

KIT CONTENTS

Part Number	Description	Quantity
-6700-	Seal Assembly	1
	Crankshaft, Front	
-8507-	Gasket - Water Pump	1
N804758-S100	Nut - M8 x 1.25 Hex	3
N804853-S309	Stud - M8 x 1.25 - 1.25 x 156.0 Pilot	2
N805757-S104	Stud - M8 x 1.25 x 1.25 x 137.5 Pilot	1
W701927-S430	Stud - M8 x 13.2 + M8 x 41.5	1
-6020-	Gasket - Cylinder Front Cover	1
SKXU2E-6019-AA	Instruction Sheet	1

F-SERIES

FRONT COVER REMOVAL

1. Install memory saver, then disconnect the battery negative cable.
2. Raise and support the vehicle.
3. Completely drain the radiator of coolant.
4. Disconnect the knock sensor electrical connector. Route the wiring to the front of the engine.
5. Disconnect the crankshaft position sensor electrical connector.
6. Disconnect the oil pressure sender electrical connector.

7. Lower the vehicle.
8. Remove the jack handle.
9. Remove the front air deflector.
10. Remove the upper radiator hose.
11. Remove the engine cooling fan and the fan shroud.
12. Remove the drive belt.
13. Disconnect the camshaft position sensor electrical connector.
14. Detach the engine wiring harness pushpin from the water outlet tube flange.
15. Route the front of the engine wiring harness away from the engine front cover.
16. Disconnect the throttle position sensor electrical connector.
17. Remove the vacuum line from the EGR valve.
18. Disconnect the heater hose from the fitting on the lower intake manifold, next to the thermostat housing.
19. Disconnect the EGR tube from the EGR valve only.
20. Disconnect the three (3) coolant hoses shown in Figure 1, from the water outlet tube.

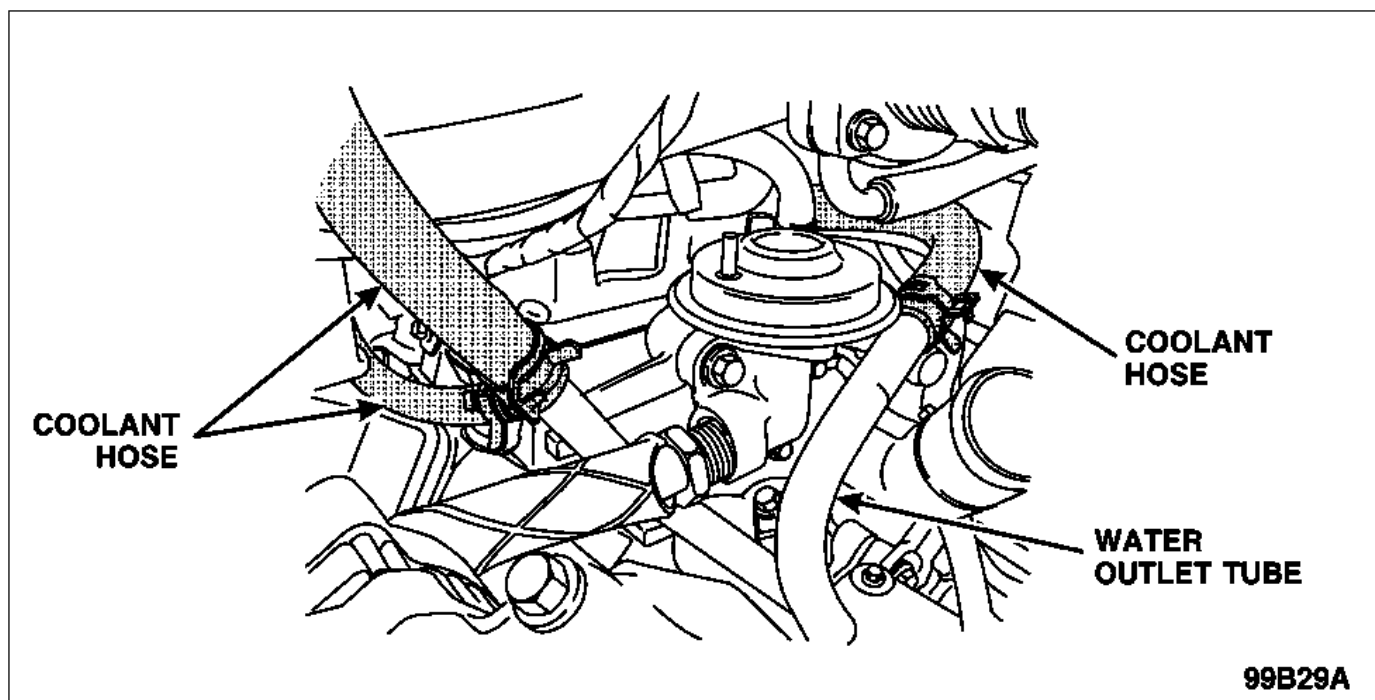


FIGURE 1

21. Remove the water outlet tube retaining bolt.
22. Reposition the water outlet tube to access the remaining coolant hose. See Figure 2.

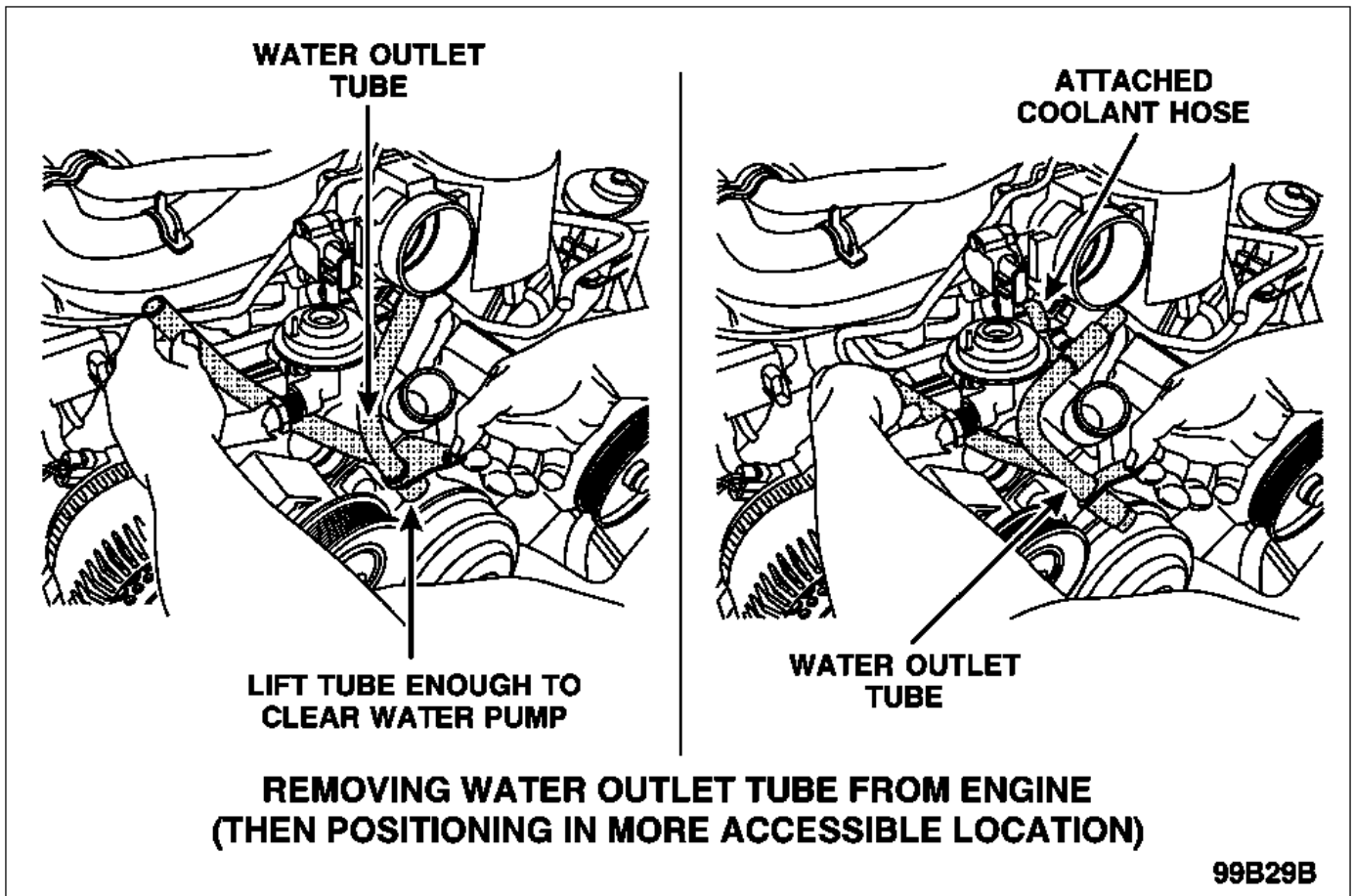


FIGURE 2

23. Remove the coolant hose from the water outlet tube, then remove the water outlet tube.
24. Remove the camshaft position sensor.
25. Remove the camshaft synchronizer assembly. See Figure 3.

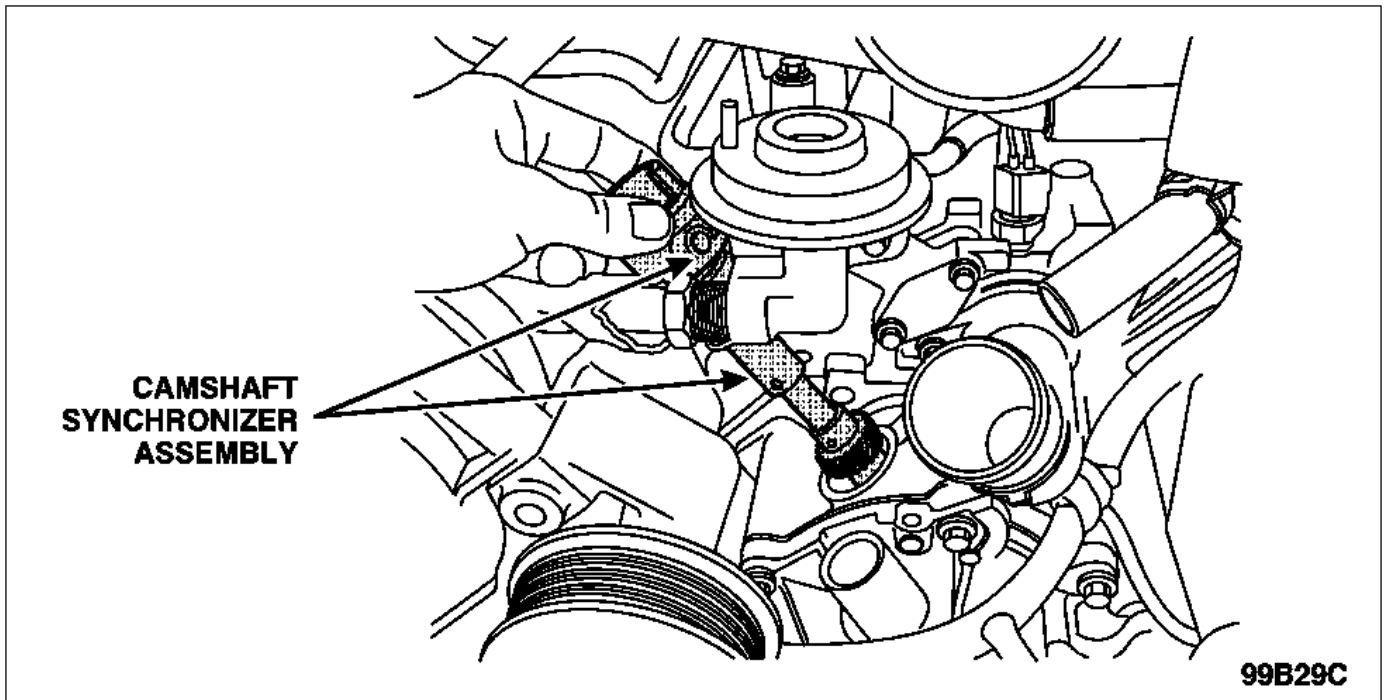


FIGURE 3

26. Using Power Steering Pump Pulley Remover (T69L-10300-B), remove the power steering pump pulley.
27. Remove the power steering pump bracket. See Figure 4.
28. Remove the top drive belt idler pulley. See Figure 4.
29. Remove the drive belt tensioner. See Figure 4.

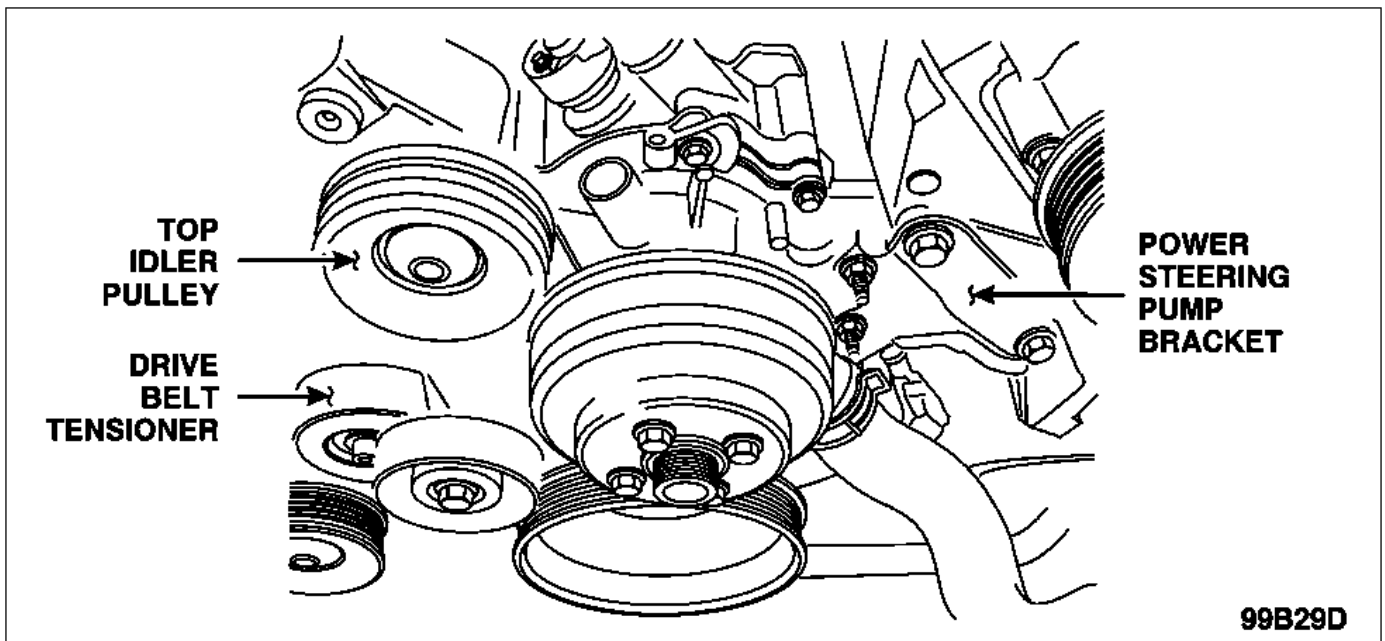


FIGURE 4

30. Disconnect the lower radiator hose from the water pump.
31. Remove the water pump pulley, then the water pump.

32. Remove the crankshaft pulley.
33. Using Crankshaft Damper Remover (T58P-6316-D) and Vibration Damper Remover Adapter (T82L-6316-B), remove the crankshaft damper.

CAUTION

Do not damage the front cover or the crankshaft as possible engine oil leakage may occur.

34. Remove the crankshaft front seal from the engine front cover.
35. Install double nuts on the water pump studs, then remove the studs.
36. Remove the oil filter.
37. Remove the remaining front cover retainers.
38. Remove the front cover and the oil filter adapter as an assembly.
39. Remove the camshaft position sensor drive gear. This will expose the camshaft and balance shaft timing marks.
40. Reinstall crankshaft damper bolt.
41. Rotate the crankshaft until the timing marks and the keyways are aligned. See Figure 5. This will position cylinder number 1 at TDC of the compression stroke, which is also required for camshaft synchronizer assembly installation.

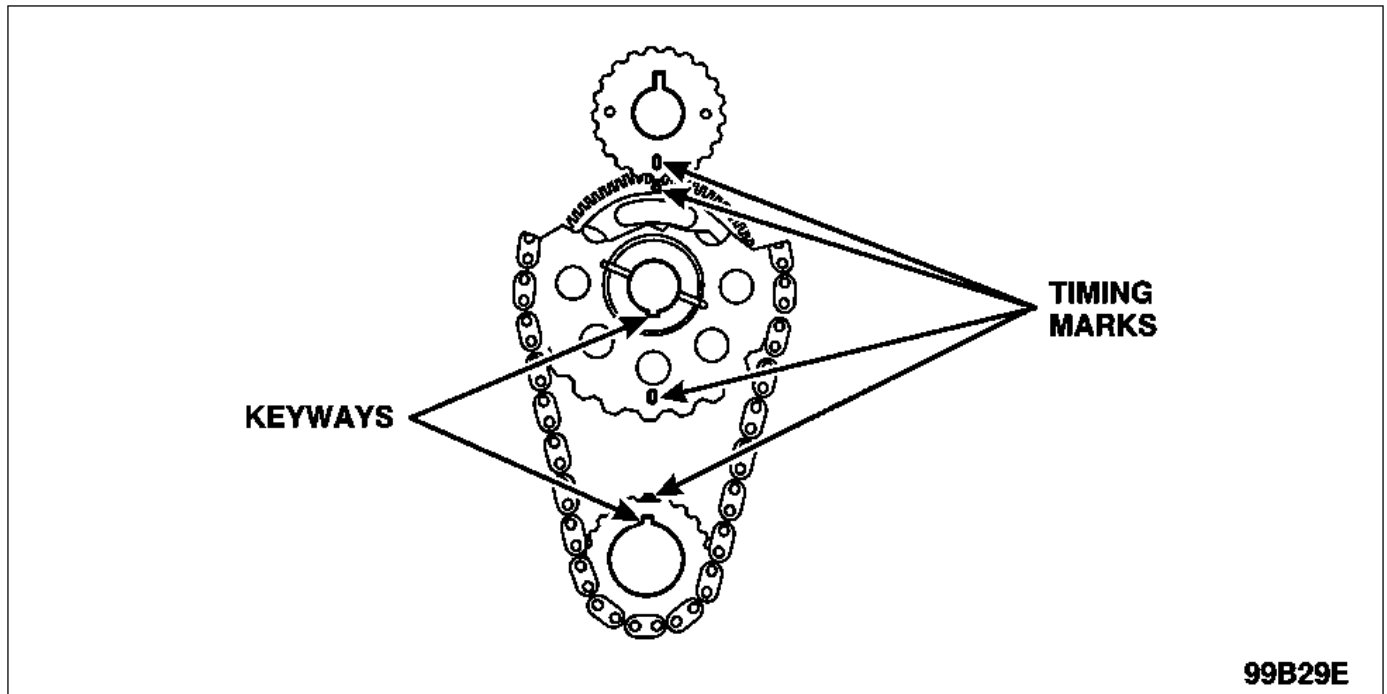


FIGURE 5

42. Release tension on the timing chain as follows:
 - Using pliers, compress the timing chain tensioner. See Figure 6.
 - Insert a pick through the tensioner housing and into the tensioner. See Figure 6.

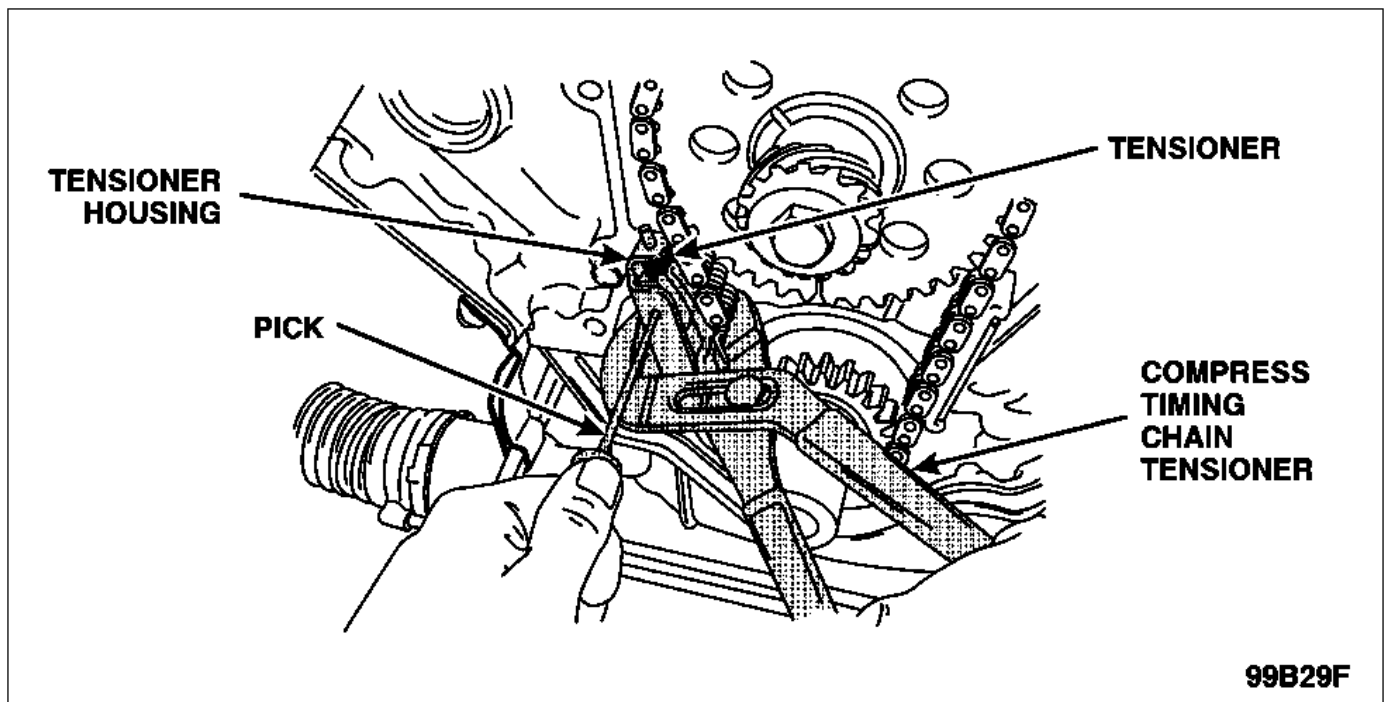


FIGURE 6

NOTE:

The timing chain and sprockets are being removed to keep debris from collecting on these parts, and to allow more room for cleaning the block front cover mating surface.

NOTE:

Do not remove the balance shaft sprocket or the balance shaft.

43. Remove the camshaft sprocket, crankshaft sprocket and the timing chain as an assembly.
44. Remove the timing chain tensioner.

CLEAN AND INSPECT

1. Clean the engine block and the oil pan portion of the front cover gasket surface as follows:
 - Cover the balance shaft sprocket with a clean shop towel.
 - Pack the exposed portion of the oil pan with shop towel(s).

CAUTION

Do not use a Scotch-Brite® disk to clean this surface. Fibers from the disk could get into the oil pan and oil, and clog the oil by-pass valve.

- It is recommended that a Roloc® “Bristle Disk” be used to clean this gasket surface. The most appropriate disk for this surface is a Yellow, 2-inch disk, model #07525.
 - After the gasket surface is cleaned, blow out the oil galleys using compressed air.
2. Clean and inspect the gasket surface of the front cover.
 3. Clean all gasket surfaces that require RTV sealant with Metal Surface Cleaner F4AZ-19A536-RA.

4. Clean and inspect the water pump gasket surface.
5. Raise and support the vehicle.
6. Drain the engine oil. Tighten the drain plug to 11-16 Nm (97-141 lb-in).
7. Lower the vehicle.

FRONT COVER INSTALLATION

1. Install the timing chain tensioner. Tighten the retaining bolts to 8-14 Nm (6-10 lb-ft).
2. Make sure the balance shaft timing mark is at the 6 o'clock position. See Figure 7.

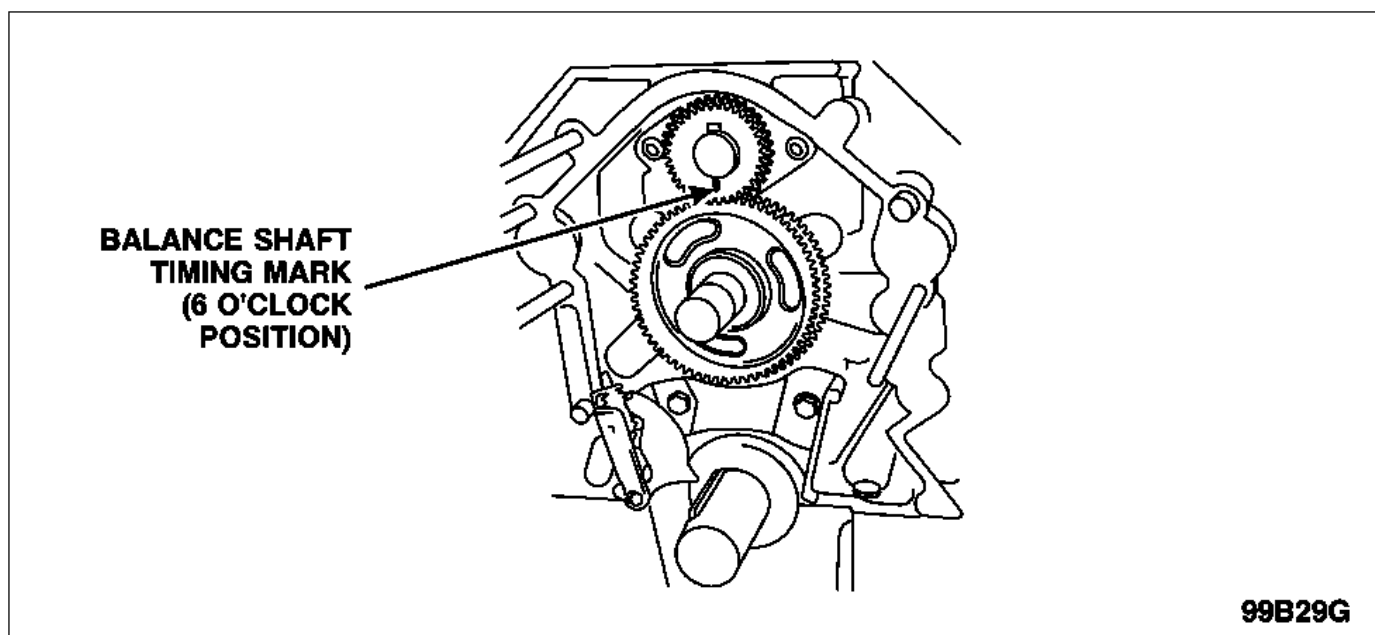


FIGURE 7

3. Install the timing chain, crankshaft sprocket and camshaft sprocket as an assembly.
4. Make sure the timing marks and the keyways are aligned. See Figure 8.

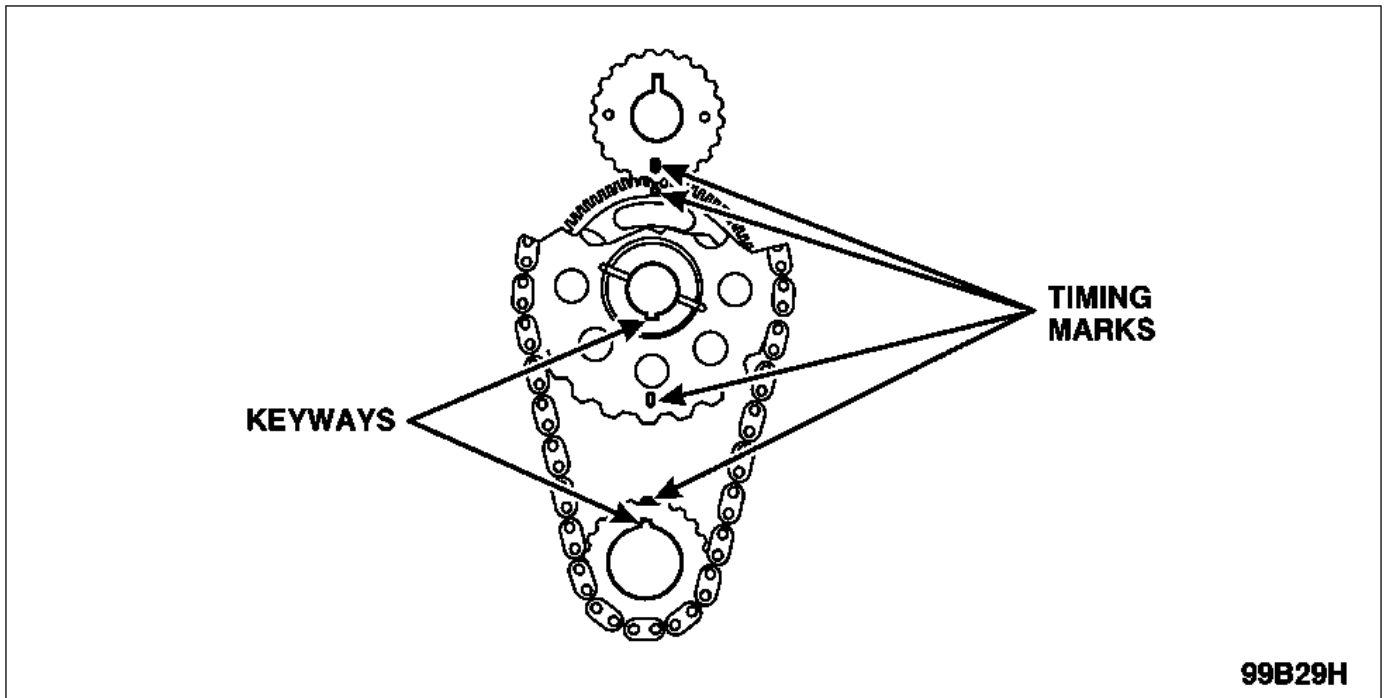


FIGURE 8

5. Apply tension to the timing chain by removing the pick from the tensioner housing.
6. Install the camshaft position sensor drive gear. Tighten the retaining bolt to 40-50 Nm (30-36 lb-ft).
7. Position the **new** front cover gasket on the engine block.
8. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the exposed portion of the oil pan.
9. Position the front cover assembly onto the engine block.
10. Install four (4) water pump studs in the locations shown in Figure 9. The two (2) studs with thread sealer must be installed in the proper positions. Using double nuts, tighten the studs to 7 Nm (62 lb-in). Remove the double nuts after the studs have been tightened.

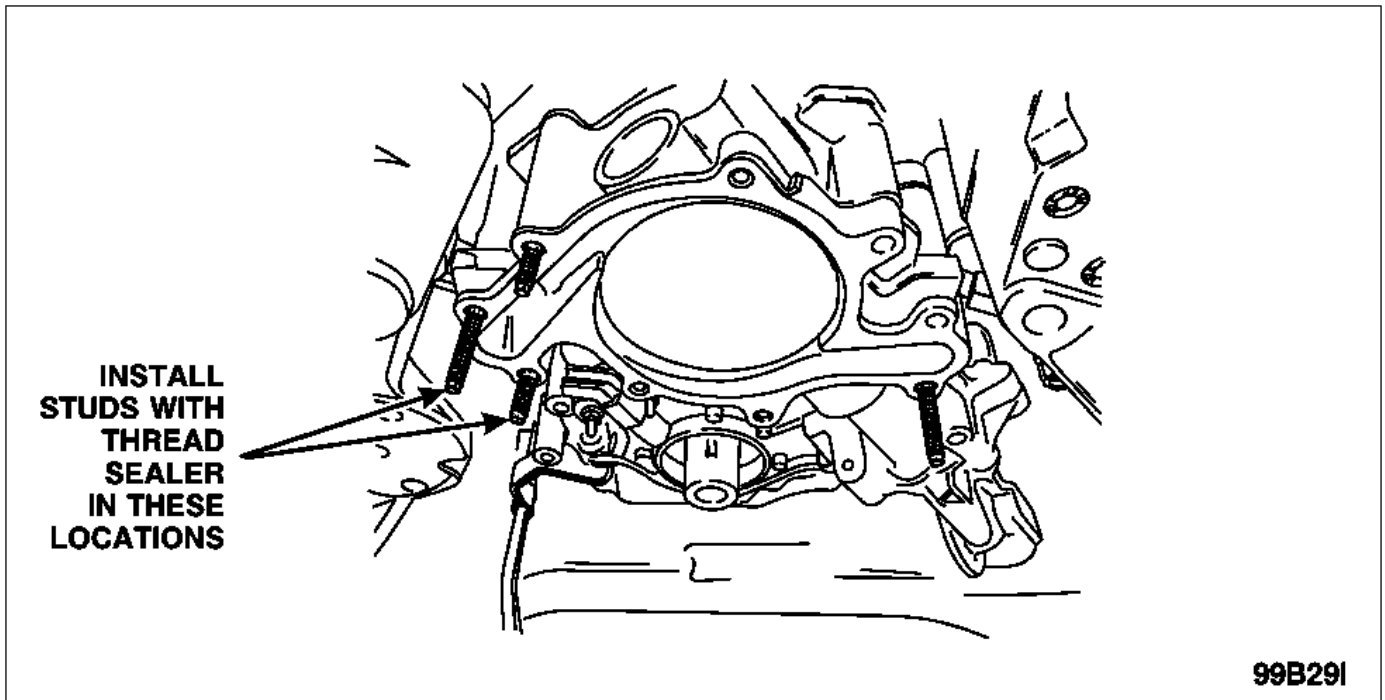


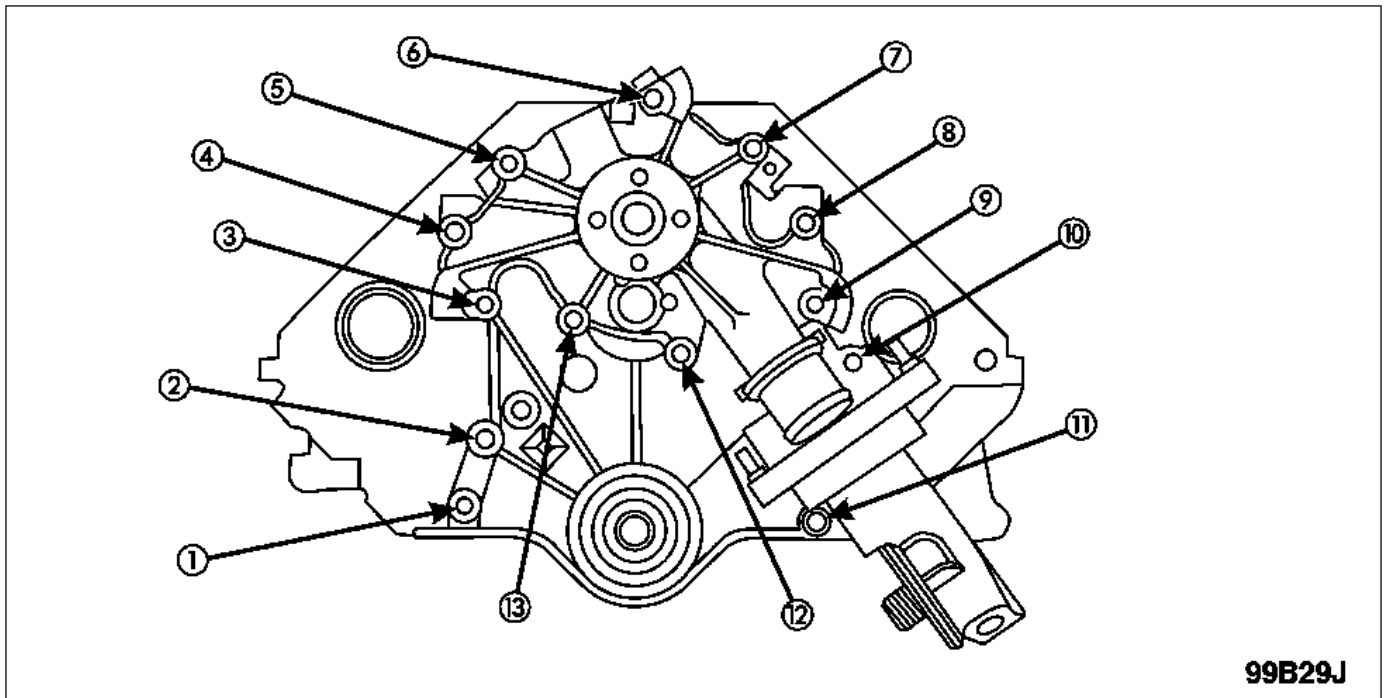
FIGURE 9

11. Install the remaining three (3) front cover retaining bolts.
12. Apply Loctite® to the Allen head capscrew, then install the capscrew into the lower part of the front cover.
13. Seat the front cover on the engine block by partially tightening all installed front cover bolts. Do not final tighten the bolts at this time.
14. Position the **new** water pump gasket on the front cover.
15. Position the water pump on the front cover.
16. Install the water pump retaining bolts.
17. Install the stud nuts on all front cover/water pump studs.

NOTE:

The torque specifications in the following step have been revised and are different from the service manual.

18. Tighten the front cover/water pump retainers in the sequence shown in Figure 10, to 28 Nm (20 lb-ft). Tighten the Allen head capscrew 11 to 22 Nm (16 lb-ft).



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FIGURE 10

19. Install the crankshaft seal in the front cover as follows:
 - Lubricate the crankshaft front oil seal lip with clean engine oil.
 - Place Front Crankshaft Seal Replacer (T94P-6701-AH) and the crankshaft front seal on Front Crankshaft Seal Installer/Aligner (T88T-6701-A1).
 - Place above assembly over the crankshaft.
 - Insert the forcing screw from Damper/Front Cover Seal Replacer (T82L-6316-A), into Front Crankshaft Seal Installer/Aligner (T88T-6701-A2).
 - Thread the forcing screw into the crankshaft.
 - Hold the forcing screw with a wrench and tighten the draw nut until the flange of the aligner is flush with the front cover surface.
20. Lubricate the crankshaft front oil seal surface on the crankshaft vibration damper with clean engine oil.
21. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the crankshaft damper keyway.
22. Using Damper/Front Cover Seal Replacer (T82L-6316-A), install the crankshaft vibration damper.
23. Install the crankshaft damper retaining bolt. Tighten the bolt to 140-180 Nm (103-132 lb-ft).
24. Install the crankshaft pulley. Tighten the retainers to 26-38 Nm (19-28 lb-ft).
25. Install the water pump pulley to the water pump. Tighten the retainers to 8-11 Nm (71-101 lb-in).
26. Lubricate and install the engine oil filter.
27. Connect the lower radiator hose to the water pump.

28. Install the drive belt tensioner pulley. Tighten the retainer to 47-63 Nm (35-46 lb-ft).
29. Install the top drive belt idler pulley. Tighten the retainer to 47-63 Nm (35-46 lb-ft).
30. Make sure the timing mark on the damper is aligned with the TDC mark on the front cover gauge.
31. Install the camshaft synchronizer assembly as follows:
 - Make sure Synchro Positioning Tool (T96T-12200-A) is properly installed on the synchronizer assembly.
 - Insert the camshaft synchronizer assembly in the front cover. Install the synchronizer assembly so that the arrow on the alignment tool is 54 degrees from the centerline of the engine. See Figure 11. This ensures that the CMP sensor electrical connector has proper clearance.

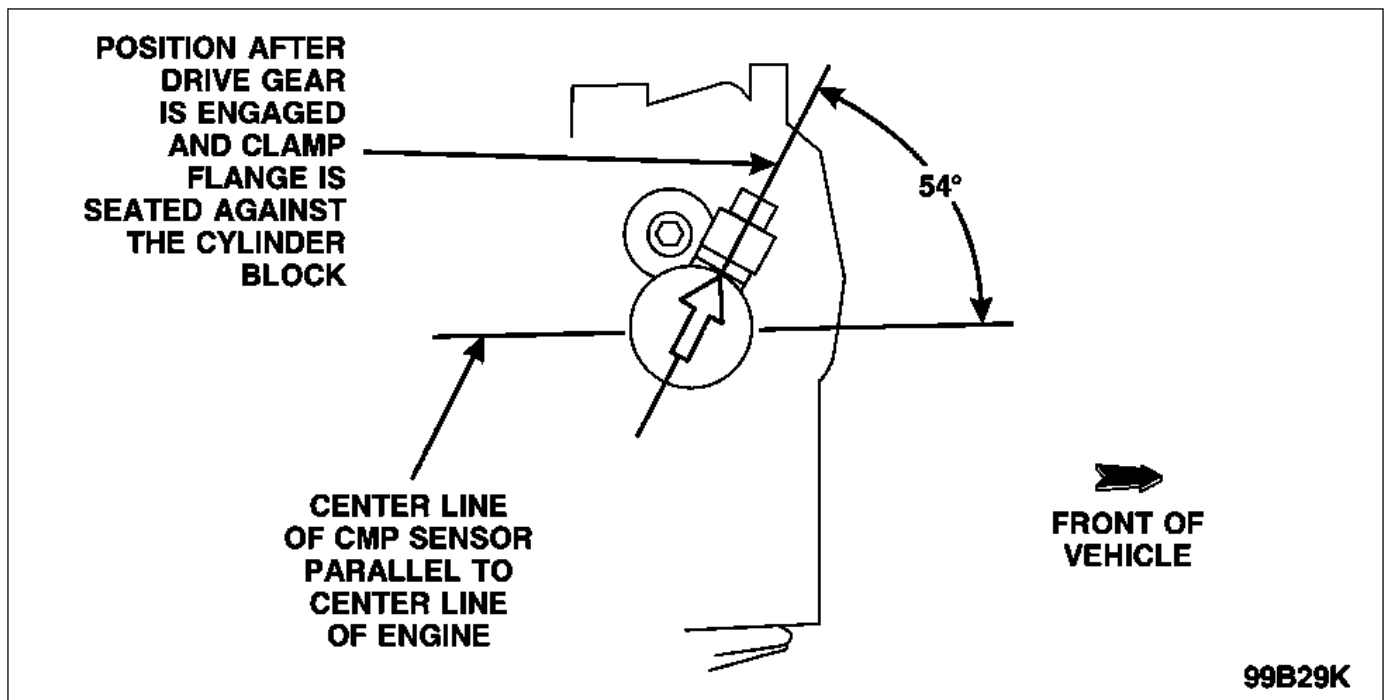


FIGURE 11

- Install and tighten the hold-down bolt to 20-30 Nm (15-22 lb-ft).
 - Remove Synchro Positioning Tool.
 - Install the camshaft sensor to the synchronizer assembly. Tighten the retaining screws to 5-8 Nm (45-70 lb-in).
32. Install the power steering pump bracket. Tighten the retainers to 40-55 Nm (30-41 lb-ft).
 33. Using Steering Pump Pulley Replacer (T91P-3A733-A), install the power steering pump pulley. The pulley face must be flush (within 0.25 mm [0.010 inch]) of the end of the power steering pump shaft.
 34. Connect the coolant hose (shown) to the water outlet tube. See Figure 12.

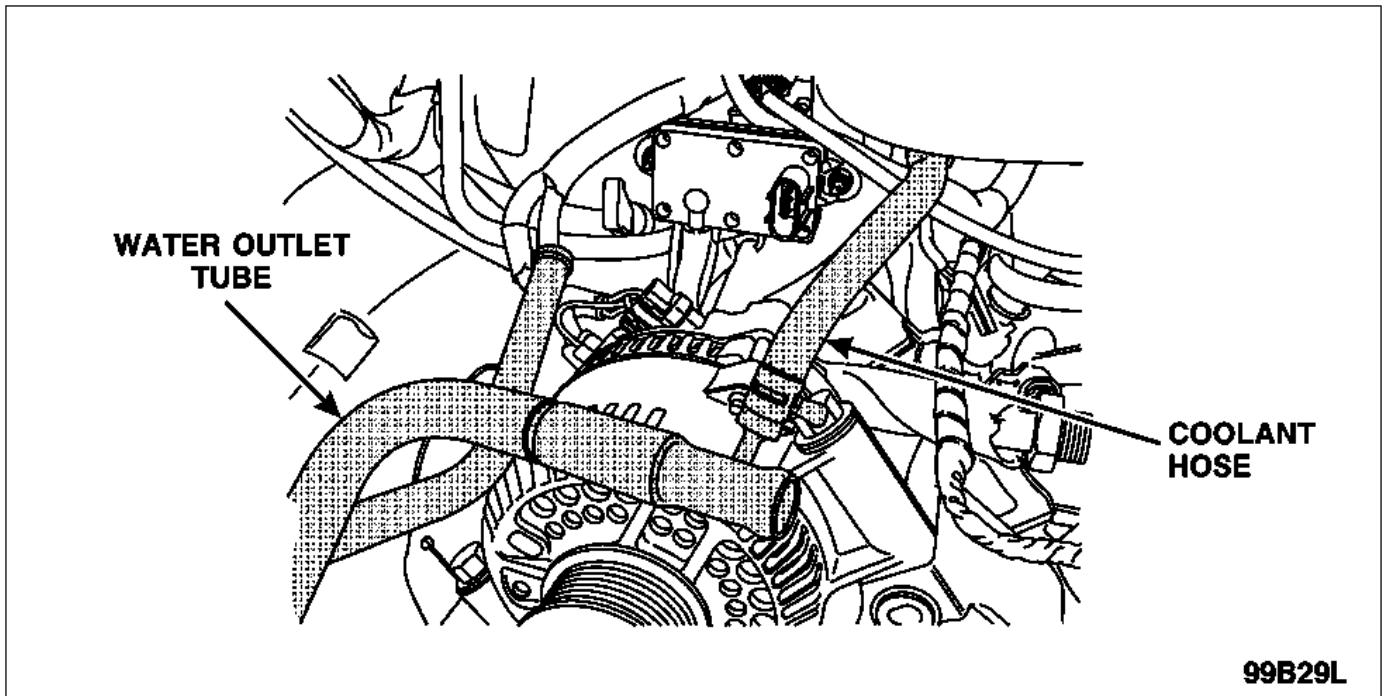


FIGURE 12

35. Lubricate the water outlet tube O-ring with antifreeze, then install it in the water pump. Tighten the retaining bolt to 8-11 Nm (71-97 lb-in).
36. Connect the remaining three (3) coolant hoses to the water outlet tube.
37. Connect the EGR tube to the EGR valve. Tighten the tube nut to 34-47 Nm (25-34 lb-ft).
38. Connect the heater hose to the fitting on the lower intake manifold.
39. Install the vacuum line to the EGR valve.
40. Connect the throttle position sensor electrical connector.
41. Route the engine wiring harness down the front of the engine. Secure the wiring anchor to the water pump stud.
42. Attach the engine wiring harness pushpin to the water outlet tube flange.
43. Connect the camshaft position sensor electrical connector.
44. Install the drive belt.
45. Install the engine cooling fan and the fan shroud. Tighten the cooling fan retainer to 47-63 Nm (35-46 lb-ft). Tighten the fan shroud retainers to 8-10 Nm (71-89 lb-in).
46. Install the upper radiator hose.
47. Install the front air deflector.
48. Install the jack handle.
49. Raise and support the vehicle.

50. Connect the oil pressure sender electrical connector.
51. Connect the crankshaft position sensor electrical connector.
52. Route the wiring harness to the knock sensor, setting the pushpin and the anchor, then connect the knock sensor electrical connector.
53. Lower the vehicle.
54. Connect the battery negative cable, then remove the memory saver.
55. Fill the cooling system.
56. Fill the engine with 5W-30 engine oil meeting Ford specification WSS-M2C153-G or equivalent.
57. Start the engine. Check the engine for leaks. Make sure the engine operates properly.

MUSTANG

FRONT COVER REMOVAL

1. Install the memory saver, then disconnect the battery negative cable.
2. Raise and support vehicle.
3. Completely drain the radiator of coolant.
4. Lower the vehicle.
5. Remove the drive belt.
6. Disconnect the clean air tube from the throttle body.
7. Remove the throttle return spring from the throttle body and the accelerator bracket.
8. Disconnect the accelerator and the speed control cables from the throttle body.
9. Position the accelerator bracket away from the upper intake manifold.
10. On vehicles without secondary air injection, proceed as follows:
 - Remove the ignition wire routing clip from the support bracket on the front of the upper intake manifold.
 - Remove the manifold support bracket from the front of the upper intake manifold.
11. On vehicles equipped with secondary air injection, proceed as follows:
 - Disconnect the exhaust tube from the air injection diverter valve. See Figure 13.
 - Disconnect the electrical and the vacuum connections from the air injection diverter valve solenoid. See Figure 13.
 - Remove the air injection diverter valve retainers, then position the valve/supply hose away from the work area. See Figure 13.

- Remove the ignition wire routing clip from the air injection diverter valve bracket.
- Remove the air injection diverter valve bracket from the engine. See Figure 13.

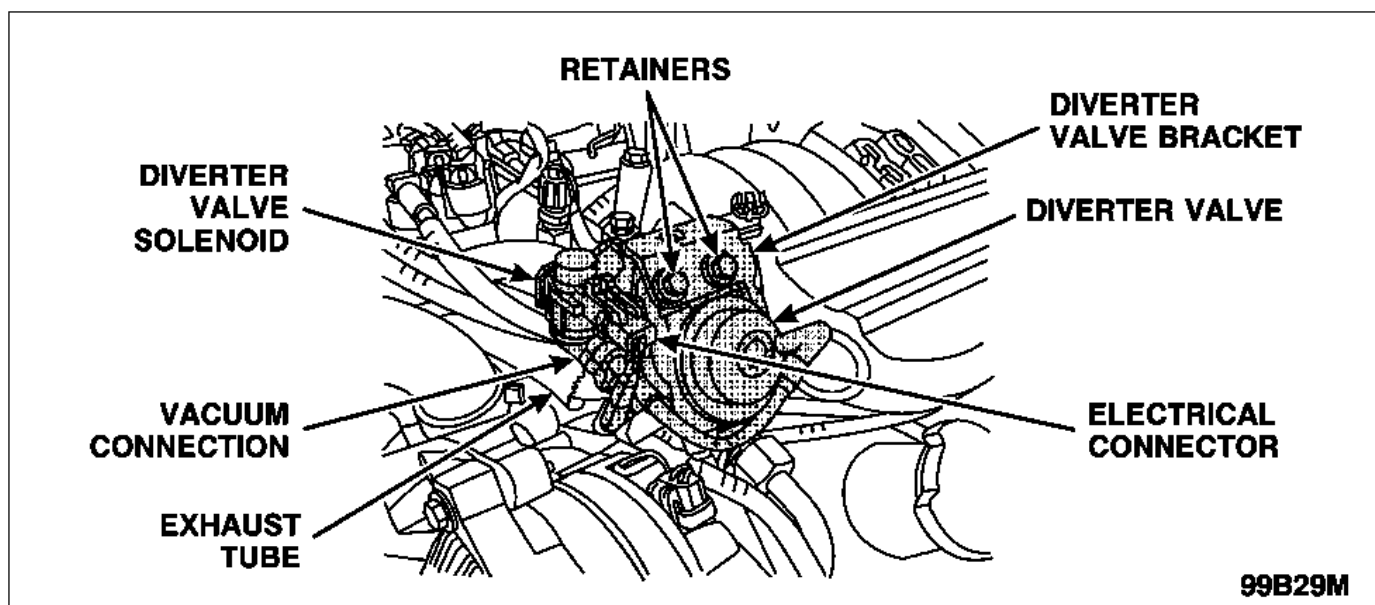


FIGURE 13

12. Disconnect the four (4) vacuum lines from the top of the upper intake manifold, next to the idle air control motor.
13. On vehicles without secondary air injection, disconnect the vacuum lines from the EGR valve and the EVR solenoid, then remove the vacuum harness from the vehicle.
14. On vehicles equipped with secondary air injection, disconnect the vacuum lines from the EGR valve and the EVR solenoid, then position the vacuum harness away from the upper intake manifold.
15. Disconnect the following electrical connectors:
 - Idle air control solenoid
 - Throttle position sensor
 - EVR solenoid
 - EGR transducer
16. Remove the EVR/EGR transducer bracket retaining nuts, then lift up the bracket.
17. Mark and disconnect the EGR transducer vacuum lines.
18. Remove the EVR/EGR transducer bracket assembly.
19. Disconnect the EGR tube from the EGR valve.
20. Remove the PCV valve from the valve cover. Leave the valve attached to the line.
21. Remove the upper intake manifold and gasket. Use care when removing the gasket as it will be reused.

22. Remove the PCV line from the clean air tube to the driver-side valve
23. Disconnect the coolant hose from the left coolant tower. See Figure 14.

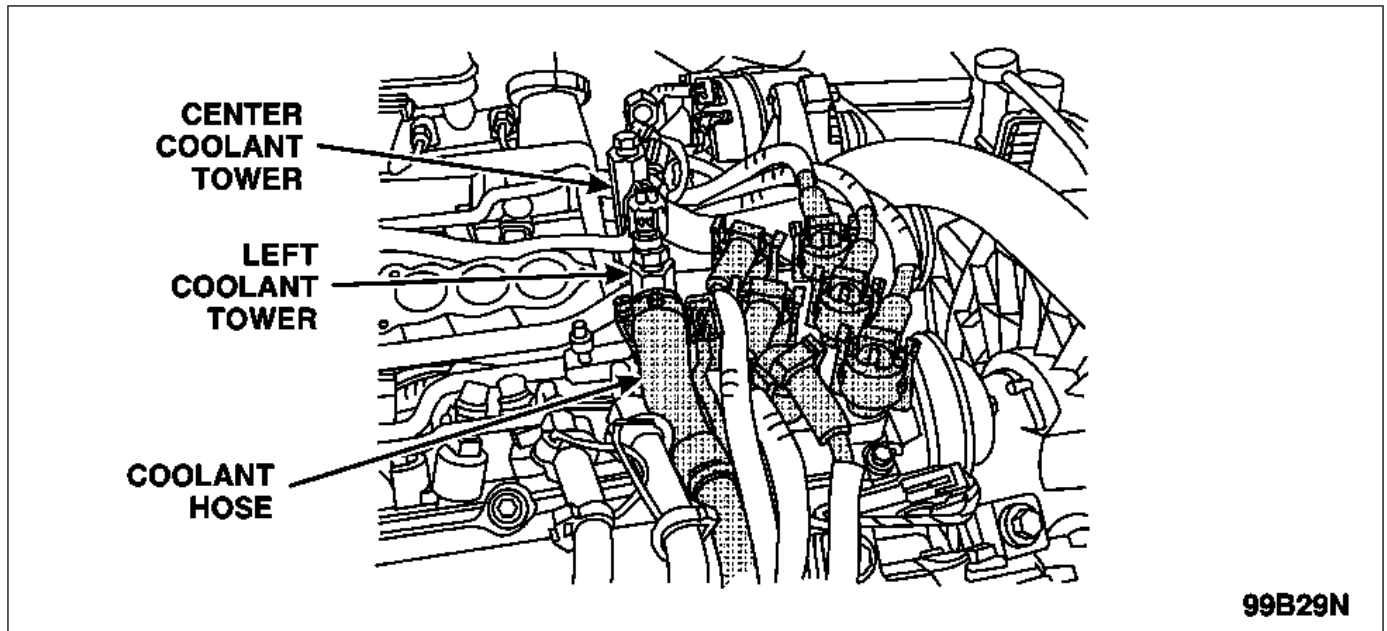


FIGURE 14

24. Disconnect all ignition wires from the coil pack.
25. Disconnect the coil pack and the radio suppressor electrical connectors.
26. Remove the coil pack bracket retainers, then remove the coil pack and the bracket as an assembly.
27. Disconnect the crankshaft sensor and the camshaft sensor electrical connectors. Route the wiring harness branch away from the engine front cover.
28. Disconnect the engine coolant temperature sensor electrical connector, located on the left coolant tower.
29. Detach the wiring harness pushpin from the water pump.
30. Disconnect the oil pressure sender electrical connector.
31. Disconnect connector C131, near the oil pressure sender. Route the wiring harness branch away from the engine front cover.
32. Disconnect the coolant hose from the center coolant tower. See Figure 15.
33. Disconnect the coolant hose from the bulkhead side of the coolant tube. See Figure 15.
34. Disconnect the coolant tube from the top of the water pump, then remove the coolant tube assembly from the vehicle. See Figure 15.

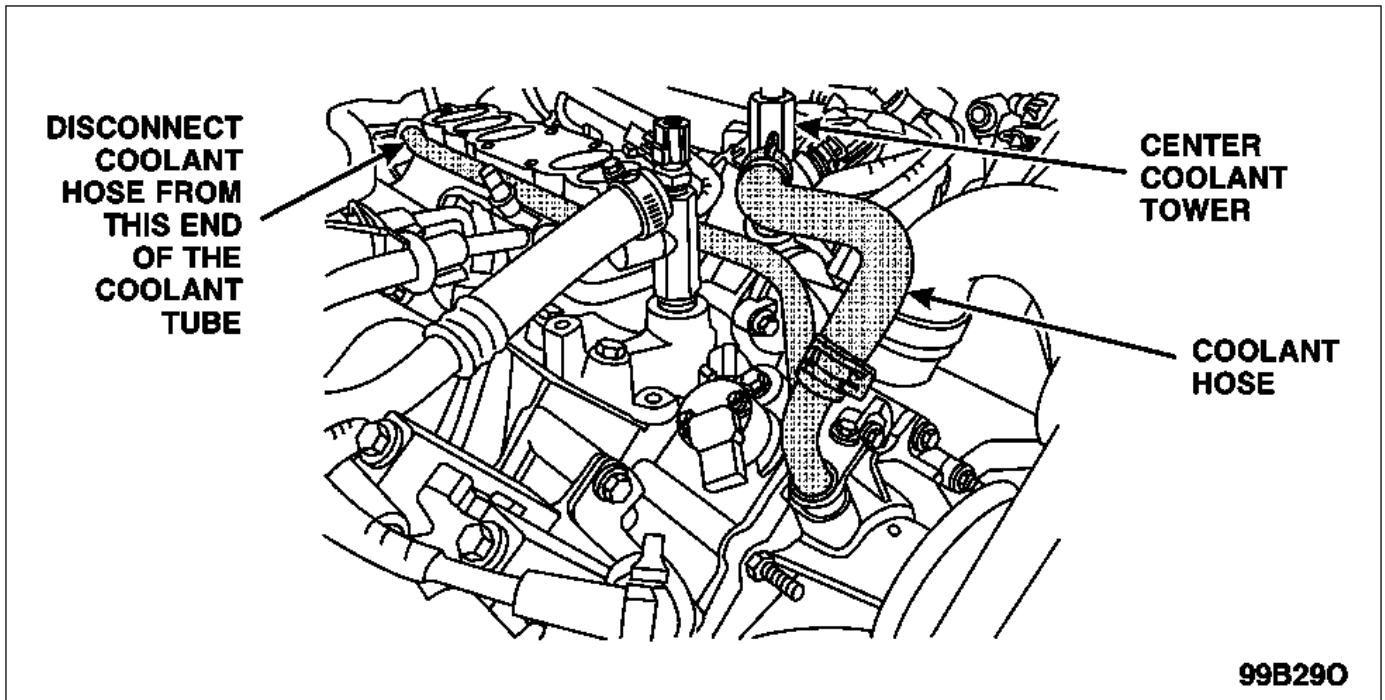
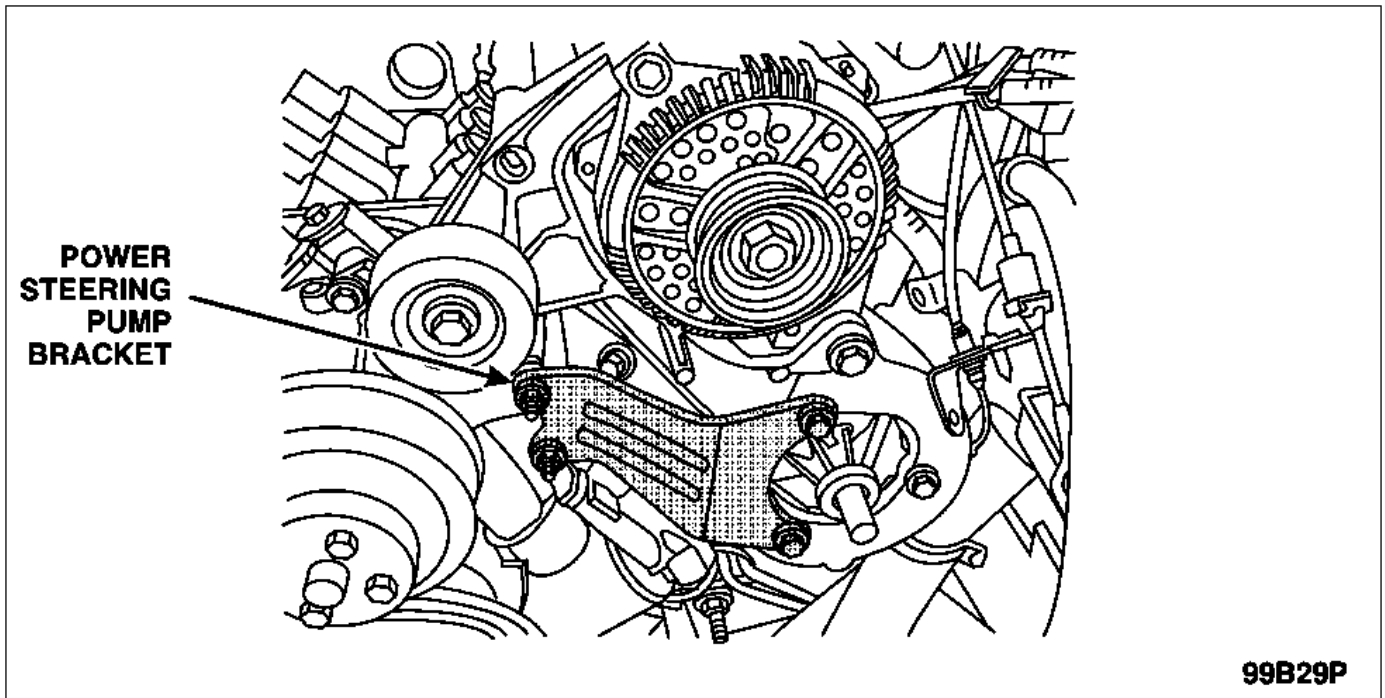


FIGURE 15

35. Disconnect the upper radiator hose from the thermostat housing.
36. Remove the sight shield from the upper radiator support.
37. Remove the coolant recovery bottle upper retaining bracket from the radiator support.
38. Disconnect the coolant overflow hose from the radiator.
39. Remove the coolant recovery bottle.
40. Disconnect the lower radiator hose from the water pump. Position the hose away from the engine front cover.
41. Using Power Steering Pump Pulley Remover (T69L-10300-B), remove the power steering pump pulley.
42. Remove the power steering pump bracket. See Figure 16.



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FIGURE 16

43. Disconnect and remove the camshaft position sensor.
44. Remove the camshaft synchronizer assembly.
45. Remove the water pump pulley, then the water pump.
46. Remove the crankshaft pulley.
47. Using Crankshaft Damper Remover (T58P-6316-D) and Vibration Damper Remover Adapter (T82L-6316-B), remove the crankshaft damper.

CAUTION

Do not damage the front cover or the crankshaft as possible engine oil leakage may occur.

48. Remove the crankshaft front seal from the engine front cover.
49. Install double nuts on the water pump studs, then remove the studs.
50. Remove the oil filter.
51. Remove the remaining front cover retainers.
52. Remove the front cover and the oil filter adapter as an assembly.
53. Remove the camshaft position sensor drive gear.
54. Reinstall the crankshaft damper bolt.
55. Rotate the crankshaft until the timing marks and the keyways are aligned. See Figure 17. This will position cylinder number 1 at TDC of the compression stroke, which is also required for camshaft synchronizer assembly installation.

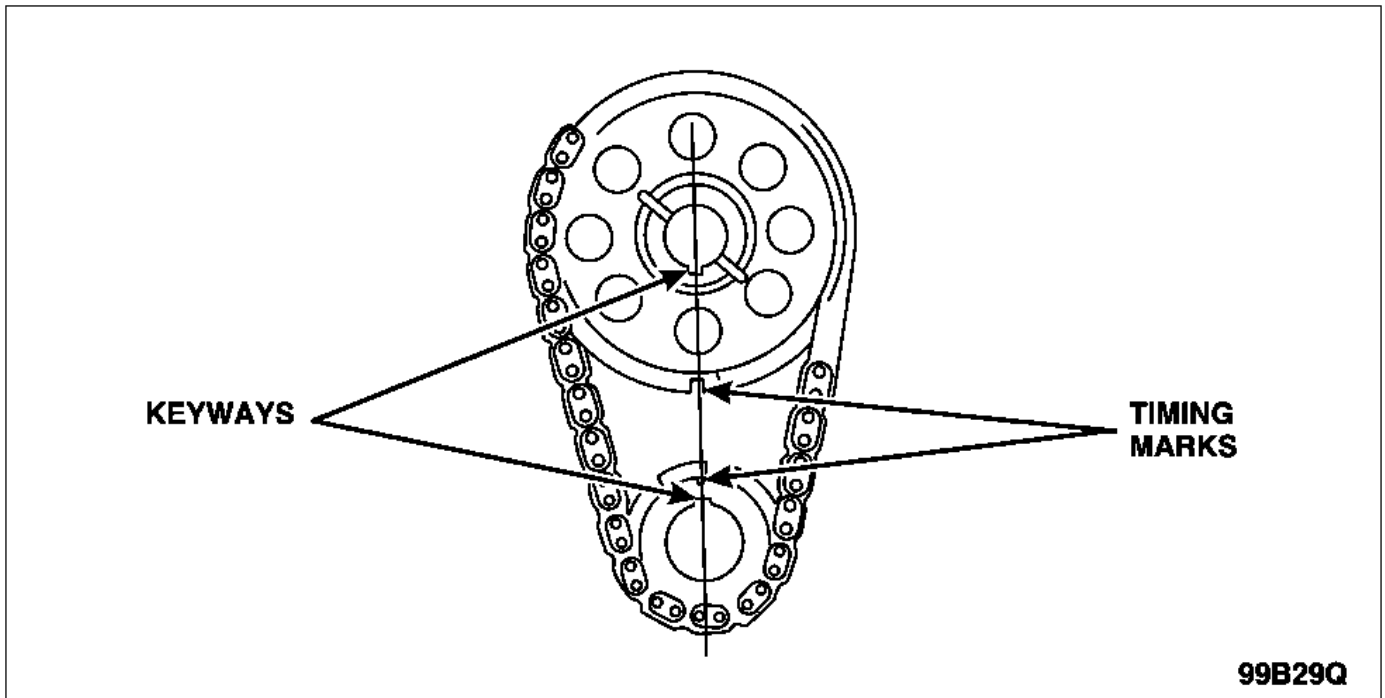


FIGURE 17

56. Release tension on the timing chain as follows:

- Using pliers, compress the timing chain tensioner. See Figure 18.
- Insert a pick through the tensioner housing and into the tensioner. See Figure 18.

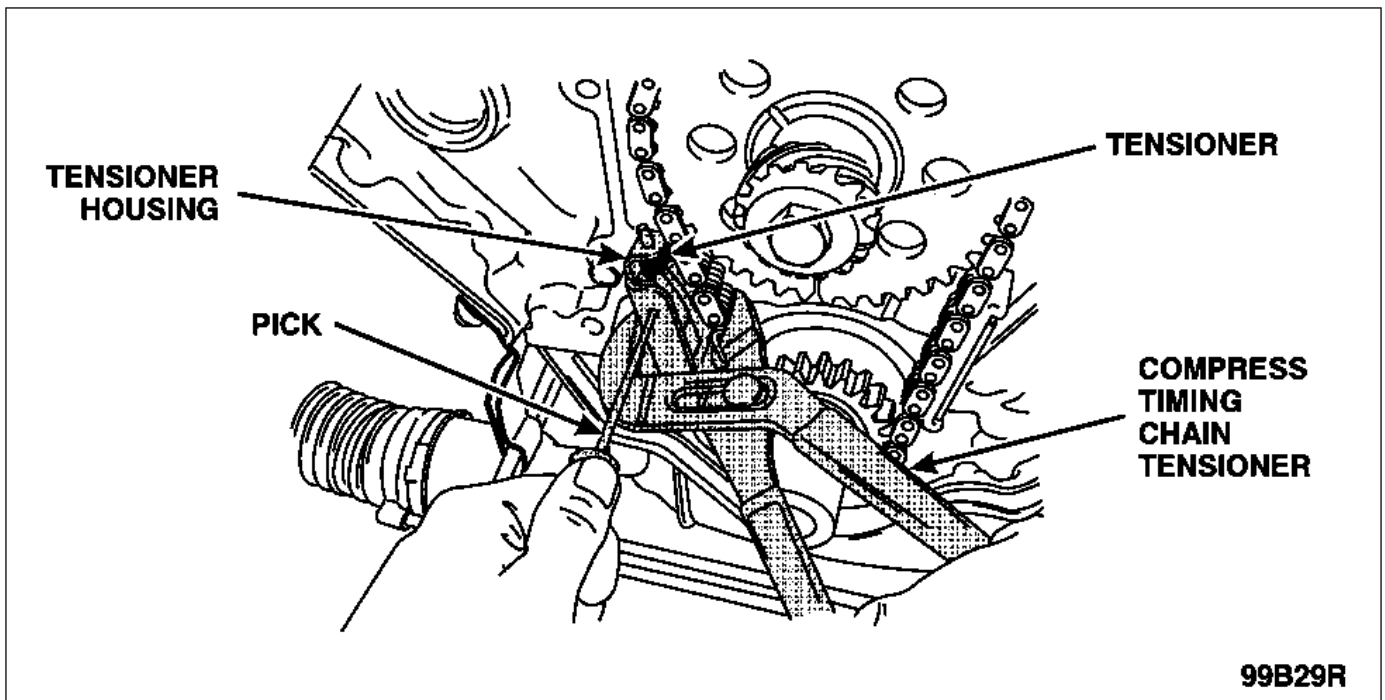


FIGURE 18

NOTE:

The timing chain and sprockets are being removed to keep debris from collecting on these parts, and to allow more room for cleaning the block front cover mating surface.

57. Remove the camshaft sprocket, crankshaft sprocket and the timing chain as an assembly.
58. Remove the timing chain tensioner.

CLEAN AND INSPECT

1. Clean the engine block and the oil pan portion of the front cover gasket surface as follows:
 - Pack the exposed portion of the oil pan with shop towel(s).

CAUTION

Do not use a Scotch-Brite® disk to clean this surface. Fibers from the disk could get into the oil pan and oil, and clog the oil by-pass valve.

- It is recommended that a Roloc® “Bristle Disk” be used to clean this gasket surface. The most appropriate disk for this surface is a Yellow, 2-inch disk, model #07525.
 - After the gasket surface is cleaned, blow out the oil galleys using compressed air.
2. Clean and inspect the gasket surface of the front cover.
 3. Clean all gasket surfaces that require RTV sealant with Metal Surface Cleaner F4AZ-19A536-RA.
 4. Clean and inspect the water pump gasket surface.
 5. Raise and support the vehicle.
 6. Drain the engine oil. Tighten the drain plug to 11-16 Nm (97-141 lb-in).
 7. Lower the vehicle.

FRONT COVER INSTALLATION

1. Install the timing chain tensioner. Tighten the retaining bolts to 8-14 Nm (6-10 lb-ft).
2. Install the timing chain, crankshaft sprocket and camshaft sprocket as an assembly.
3. Make sure the timing marks and keyways are aligned. See Figure 19.

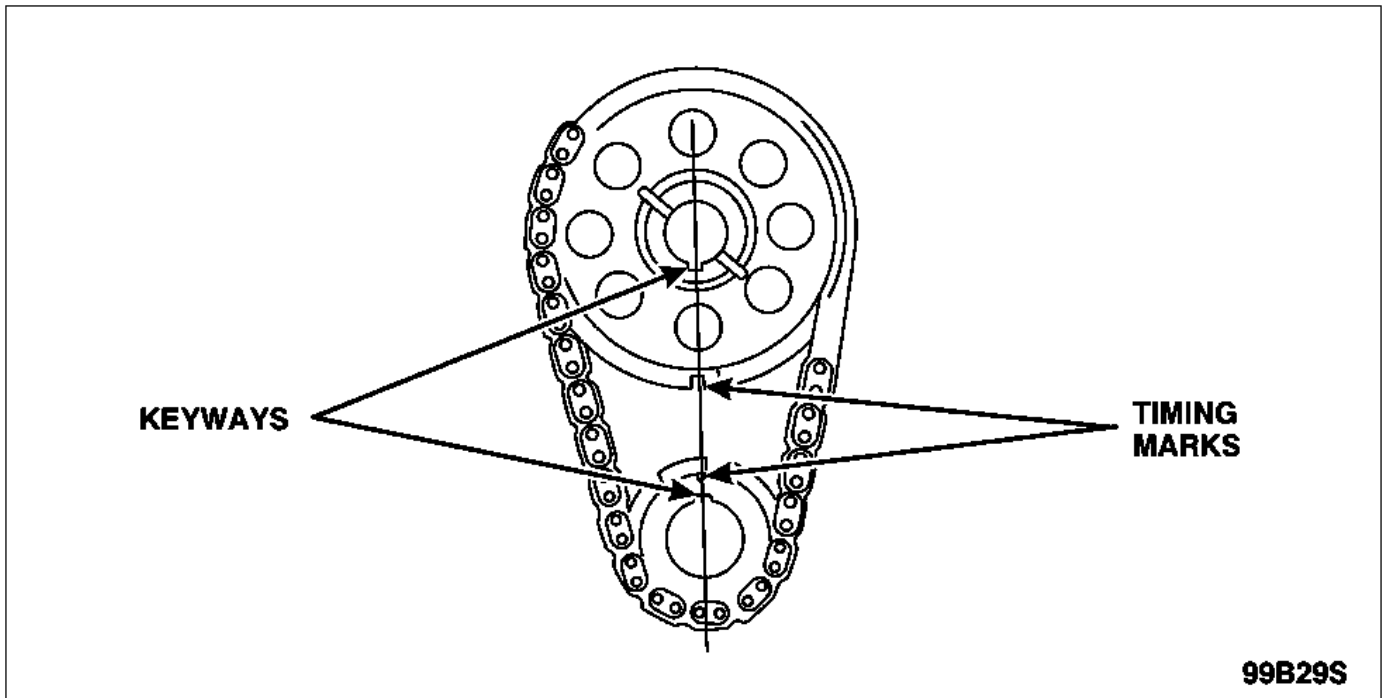


FIGURE 19

4. Apply tension to the timing chain by removing the pick from the tensioner housing.
5. Install the camshaft position sensor drive gear. Tighten the retaining bolt to 40-50 Nm (30-36 lb-ft).
6. Apply a light coat of engine oil to all front cover bolt and stud threads. Do not lubricate the capscrew threads or the two stud ends with sealant already applied.
7. Position the **new** front cover gasket on the engine block.
8. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the exposed portion of the oil pan.
9. Position the front cover assembly on the engine block.
10. Install four (4) water pump studs in the locations shown in Figure 20. The two (2) studs with thread sealer must be installed in the proper positions. Using double nuts, tighten the studs to 7 Nm (62 lb-in). Remove the double nuts after the studs have been tightened.

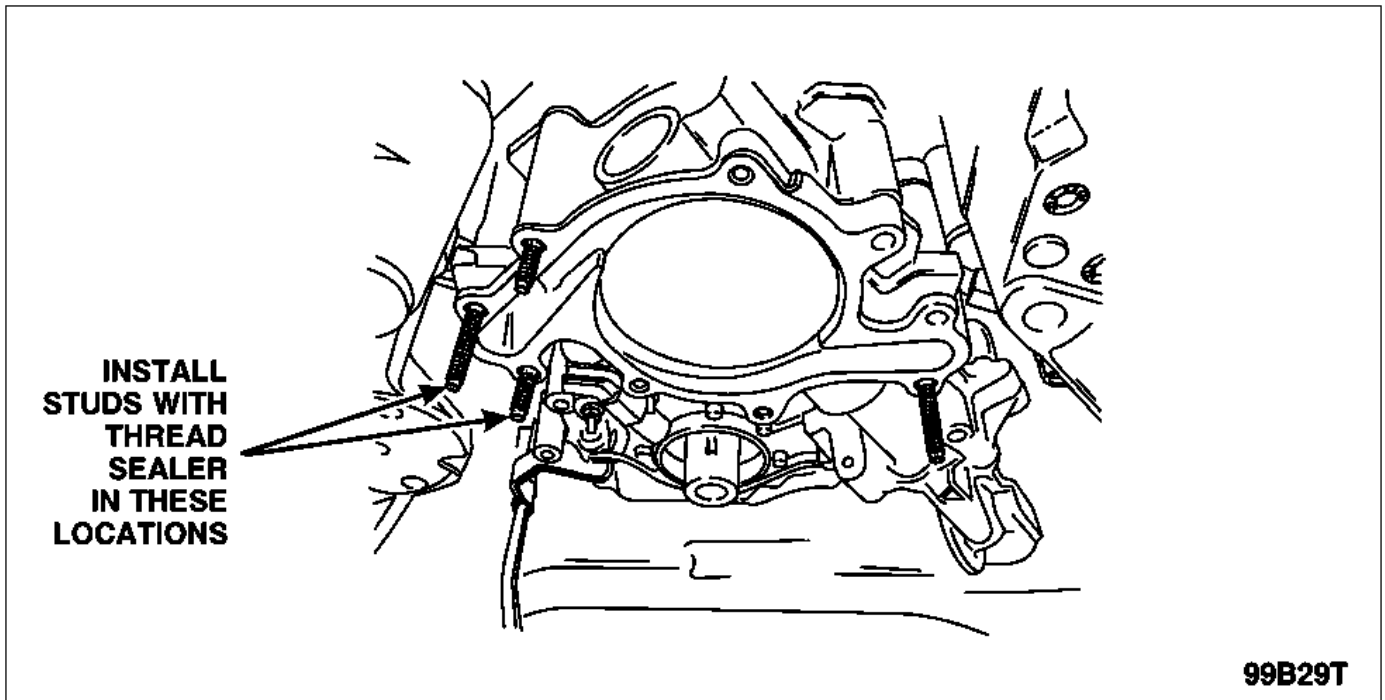


FIGURE 20

11. Install the remaining three (3) front cover retaining bolts.
12. Apply Loctite® to the Allen head capscrew, then install the capscrew into the lower part of the front cover.
13. Seat the front cover on the engine block by partially tightening all installed front cover bolts. Do not final tighten the bolts at this time.
14. Position the **new** water pump gasket on the front cover.
15. Position the water pump on the front cover.
16. Install the water pump retaining bolts.
17. Install stud nuts on all front cover/water pump studs.

NOTE:

The torque specifications in the following step have been revised and are different from the service manual.

18. Tighten the front cover/water pump retainers in the sequence shown in Figure 21, to 28 Nm (20 lb-ft). Tighten the Allen head capscrew 11 to 22 Nm (16 lb-ft).

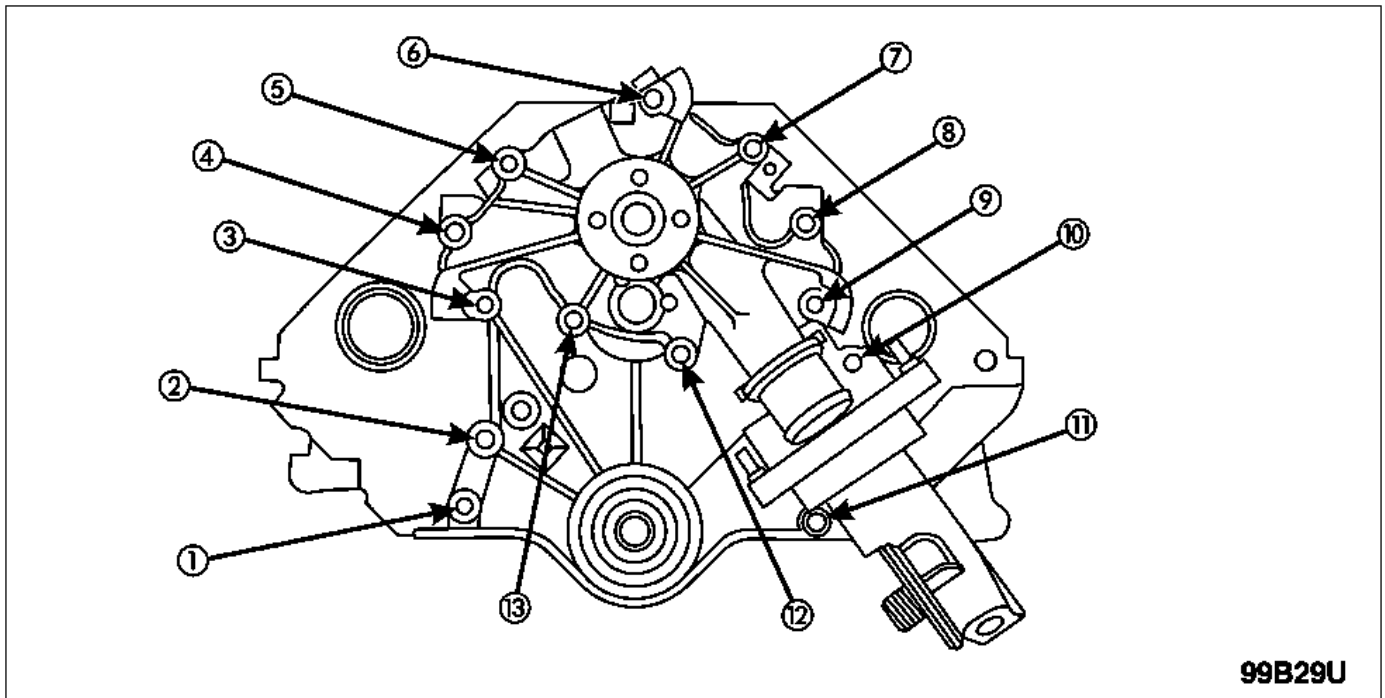


FIGURE 21

19. Install the crankshaft seal in the front cover as follows:
 - Lubricate the crankshaft front oil seal lip with clean engine oil.
 - Place Front Crankshaft Seal Replacer (T94P-6701-AH) and the crankshaft front seal on Front Crankshaft Seal Installer/Aligner (T88T-6701-A1).
 - Place above assembly over the crankshaft.
 - Insert the forcing screw from Damper/Front Cover Seal Replacer (T82L-6316-A), into Front Crankshaft Seal Installer/Aligner (T88T-6701-A2).
 - Thread the forcing screw into the crankshaft.
 - Hold the forcing screw with a wrench and tighten the draw nut until the flange of the aligner is flush with the front cover surface.
20. Lubricate the crankshaft front oil seal surface on the crankshaft vibration damper with clean engine oil.
21. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the crankshaft damper keyway.
22. Using Damper/Front Cover Seal Replacer (T82L-6316-A), install the crankshaft damper.
23. Install the crankshaft damper retaining bolt. Tighten the bolt to 140-180 Nm (103-132 lb-ft).
24. Install the crankshaft pulley. Tighten the retainers to 26-38 Nm (19-28 lb-ft).
25. Install the water pump pulley to the water pump. Tighten the retainers to 8-11 Nm (71-101 lb-in).
26. Lubricate and install the engine oil filter.
27. Make sure the timing mark on the damper is aligned with the TDC mark on the front cover gauge.

28. Install the camshaft sensor assembly as follows:

- Make sure the Synchro Positioning Tool (T96T-12200-A) is properly installed on the synchronizer assembly.
- Insert the camshaft synchronizer assembly in the front cover. Install the synchronizer assembly so that the arrow on the alignment tool is 54 degrees from the centerline of the engine. See Figure 22. This ensures that the CMP sensor electrical connector has proper clearance.

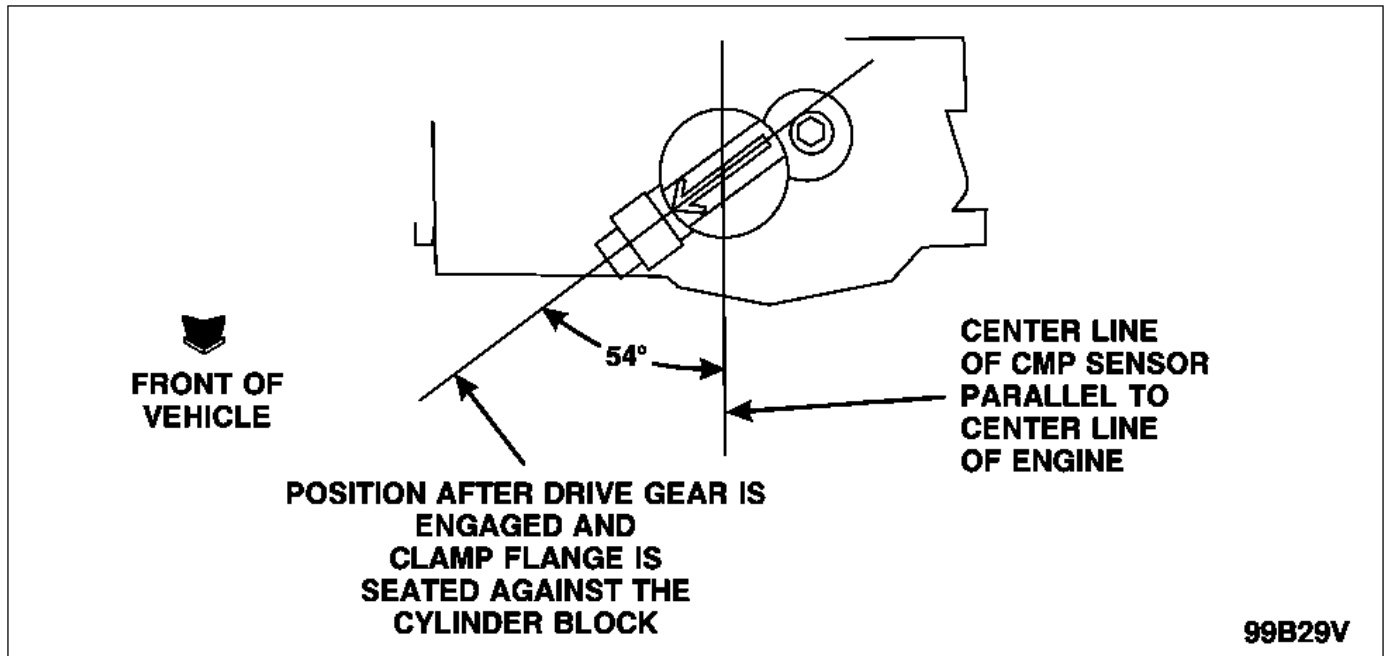


FIGURE 22

- Install and tighten the hold-down bolt to 20-30 Nm (15-22 lb-ft).
 - Remove Synchro Positioning Tool.
 - Install the camshaft sensor to the synchronizer assembly. Tighten the retaining screws to 5-8 Nm (45-70 lb-in).
29. Install the power steering pump bracket. Tighten the bolts to 51 Nm (38 lb-ft). Tighten the nuts to 25 Nm (18 lb-ft).
30. Using Steering Pump Pulley Replacer (T65P-3A733-C), install the power steering pump pulley. The pulley face must be flush (within 0.25 mm [0.010 inch]) of the end of the power steering pump shaft.
31. Connect the lower radiator hose to the water pump.
32. Install the coolant recovery bottle into the lower retaining bracket.
33. Install the coolant recovery bottle upper retaining bracket. Tighten all retainers to 9 Nm (80 lb-in).
34. Connect the coolant overflow hose to the radiator.
35. Install the sight shield to the upper radiator support.
36. Connect the upper radiator hose to the thermostat housing.

37. Lubricate the coolant tube O-ring with clean antifreeze.
38. Install the coolant tube to the water pump. Tighten the retaining bolt to 8-11 Nm (71-97 lb-in).
39. Connect the ends of the coolant tube to the coolant hoses on the bulkhead and the center coolant tower.
40. Route the engine wiring harness branches down the front of the engine.
41. Connect connector C131, near the oil pressure sender.
42. Connect the oil pressure sender electrical connector.
43. Attach the wiring harness pushpin to the water pump.
44. Connect the engine coolant temperature sensor electrical connector.
45. Connect the coil pack and the radio suppressor electrical connectors.
46. Install the coil pack and the bracket as an assembly. Tighten the retainers to 25 Nm (18 lb-ft).
47. Connect the coil pack and the radio suppressor electrical connectors.
48. Connect all ignition wires to the coil pack.
49. Connect the coolant hose to the left coolant tower.
50. Install the PCV line between the clean air tube and the driver-side valve cover.
51. Install the upper intake manifold gasket.
52. Apply a light coat of Pipe Sealant with Teflon® (D8AZ-19554-A) or equivalent to the upper intake manifold retaining bolts and the stud bolt threads.
53. Install the upper intake manifold. Tighten the retainers in the sequence shown in Figure 23, first to 10 Nm (88 lb-in), then to 20 Nm (15 lb-ft), finally to 32 Nm (23 lb-ft).

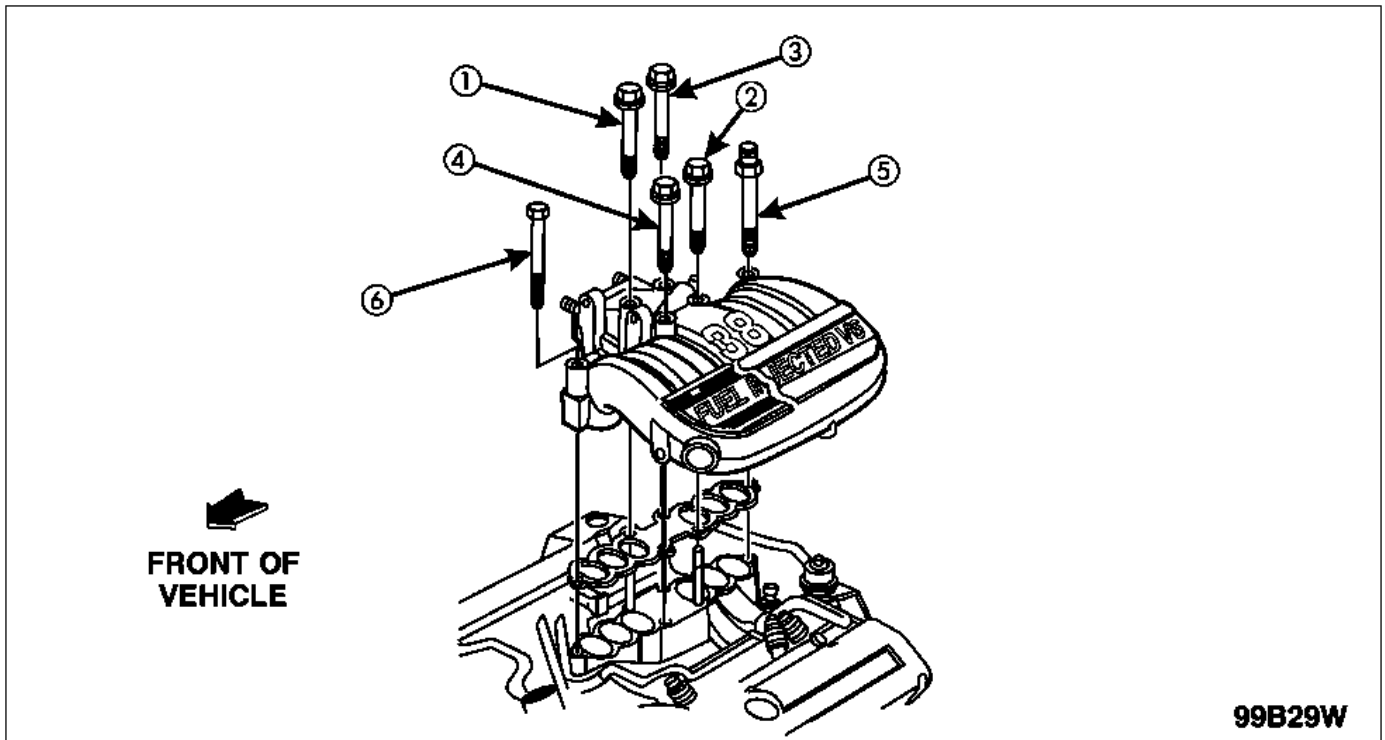


FIGURE 23

54. Install the PCV valve to the valve cover.
55. Connect the EGR tube to the EGR valve. Tighten the tube nut to 35-45 Nm (26-33 lb-ft).
56. Position the EVR/EGR transducer bracket assembly near the installed position, then connect the vacuum lines to the EGR transducer.
57. Install the EVR/EGR transducer bracket assembly. Tighten the retainers to 8-11 Nm (71-97 lb-in).
58. Connect the following electrical connectors:
 - EGR transducer
 - EVR solenoid
 - Throttle position sensor
 - Idle air control motor
59. On vehicles equipped with secondary air injection, route the vacuum harness across the engine.
60. On vehicles without secondary air injection, install the vacuum harness on top of the engine.
61. Connect the vacuum lines to the EGR valve and the EVR solenoid.
62. Connect the four (4) vacuum lines to the upper intake manifold.
63. On vehicles equipped with secondary air injection, proceed as follows:
 - Install the air injection diverter valve bracket to the engine. Tighten the retainers securely.
 - Install the ignition wire routing clip to the air injection diverter valve bracket.

- Position the air injection diverter valve in the installed position, then install the valve retainers. Tighten the retainers to 22-28 Nm (17-20 lb-ft).
 - Connect the vacuum and the electrical connections to the air injection diverter valve solenoid.
 - Install the exhaust tube to the air injection diverter valve. Tighten the tube to 26-34 Nm (20-25 lb-ft).
64. On vehicles without secondary air injection, proceed as follows:
- Install the manifold support bracket to the front of the upper intake manifold. Tighten the retainers securely.
 - Install the ignition wire routing clip to the support bracket.
65. Install the accelerator bracket to the upper intake manifold. Tighten the retainers to 10-14 Nm (91-122 lb-in).
66. Connect the accelerator and the speed control cables to the throttle body.
67. Install the throttle return spring.
68. Connect the clean air tube to the throttle body.
69. Install the drive belt.
70. Connect the battery negative cable, then remove the memory saver.
71. Fill the cooling system, noting the following:
- The vent plug must be removed from the center coolant tower before the radiator is filled or the engine may not fill completely. See Figure 24.

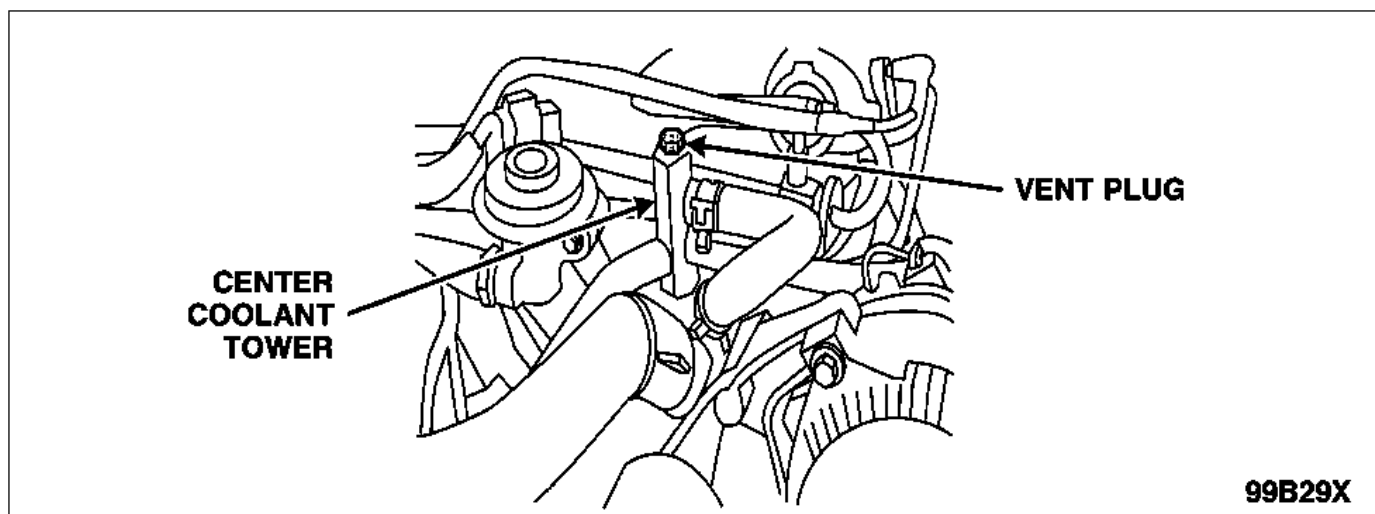


FIGURE 24

- After filling the engine cooling system, add coolant to the vent until full. Tighten the vent plug to 12 Nm (9 lb-ft).
72. Fill the engine with 5W-30 engine oil meeting Ford specification WSS-M2C153-G or equivalent.

73. Start the engine. Check the engine for leaks. Make sure the engine operates properly.

THUNDERBIRD/COUGAR

FRONT COVER REMOVAL

1. Install memory saver, then disconnect the battery negative cable.
2. Raise and support the vehicle.
3. Remove the lower air deflector.
4. Completely drain the radiator of coolant.
5. Lower the vehicle.
6. Disconnect the clean air tube from the throttle body.
7. Remove the throttle body splash shield.
8. Remove the throttle return spring from the throttle body and the accelerator bracket.
9. Disconnect the accelerator and the speed control cables from the throttle body.
10. Position the accelerator bracket away from the upper intake manifold.
11. Remove the ignition wire routing clip from the support bracket on the front of the upper intake manifold.
12. Remove the manifold support bracket from the front of the upper intake manifold.
13. Disconnect the four (4) vacuum lines from the top of the upper intake manifold, next to the idle air control solenoid.
14. Disconnect the vacuum lines from the EGR valve and the EVR solenoid, then remove the vacuum harness from the vehicle.
15. Disconnect the following electrical connectors:
 - Idle air control solenoid
 - Throttle position sensor
 - EVR solenoid
 - EGR transducer
16. Remove the EVR/EGR transducer bracket retaining nuts, then lift up the bracket.
17. Mark and disconnect the vacuum lines on the EGR transducer.
18. Remove the EVR/EGR transducer bracket assembly.
19. Disconnect the EGR tube from the EGR valve.

20. Remove the PCV valve from the valve cover. Leave the valve attached to the line.
21. Remove the upper intake manifold and gasket. Use care when removing the gasket as it will be reused.
22. Remove the PCV line from the clean air tube to the driver-side valve cover.
23. Disconnect the coolant hose from the left coolant tower. See Figure 25.

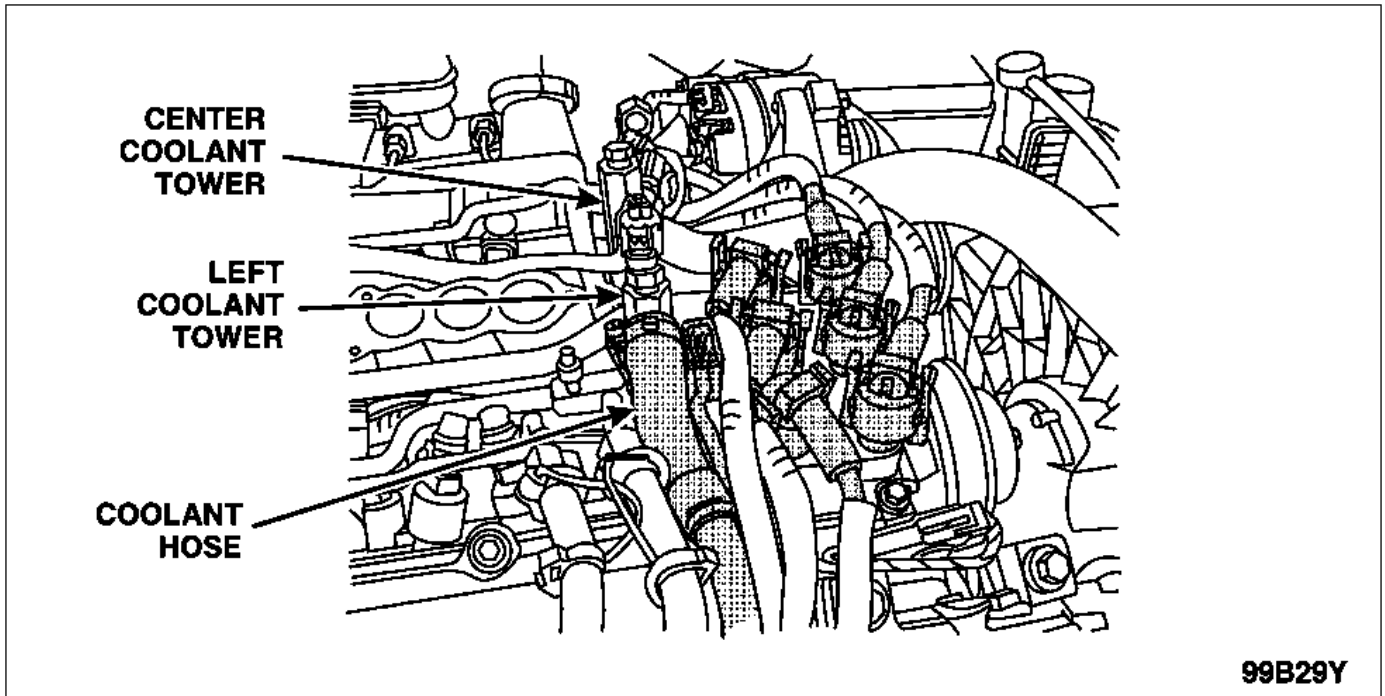


FIGURE 25

24. Disconnect all ignition wires from the coil pack.
25. Disconnect the coil pack and the radio suppressor electrical connectors.
26. Remove the coil pack bracket retainers, then remove the coil pack and the bracket as an assembly.
27. Disconnect the engine coolant temperature sensor electrical connector from the left coolant tower.
28. Detach the wiring harness pushpin from the water pump.
29. Disconnect the oil pressure sender electrical connector.
30. Route the wiring harness to the top of the engine.
31. Disconnect the coolant hose from the center coolant tower. See Figure 26.
32. Disconnect the coolant hose from the bulkhead side of the coolant tube. See Figure 26.
33. Disconnect the coolant tube from the top of the water pump, then remove the coolant tube assembly from the vehicle. See Figure 26.

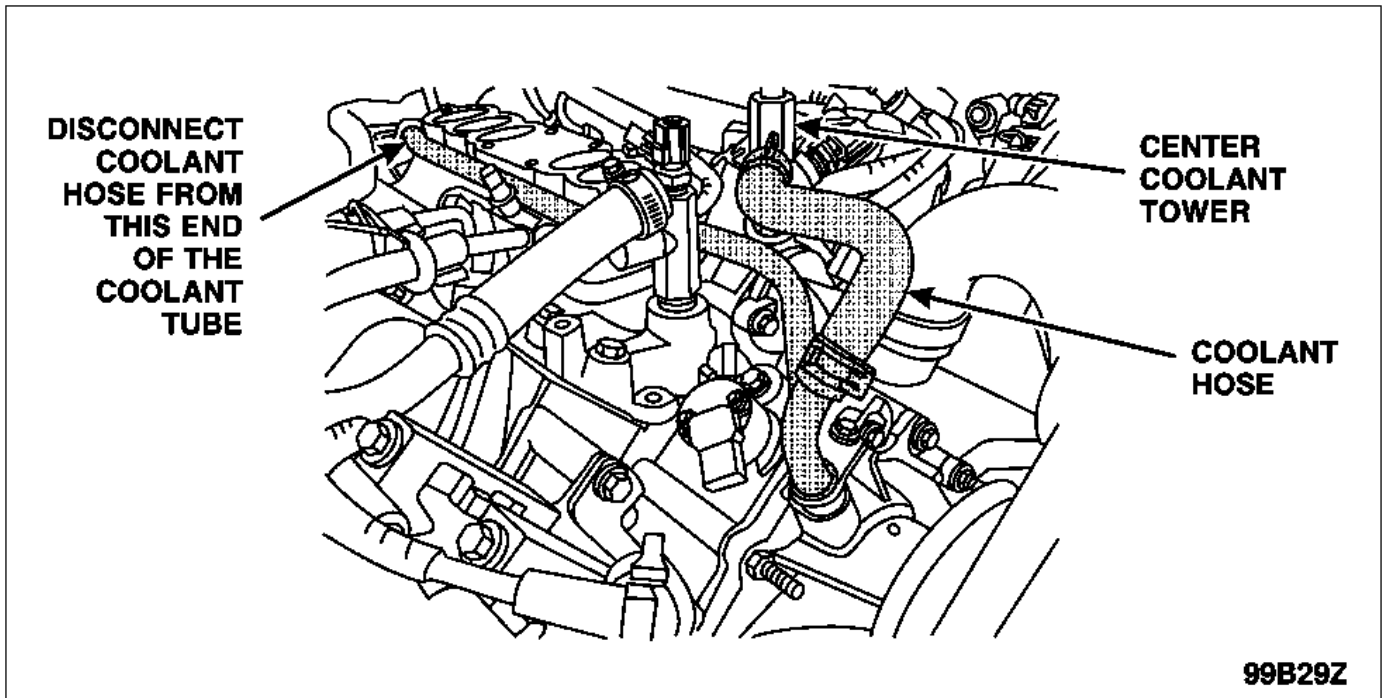


FIGURE 26

34. Disconnect the upper radiator hose from the thermostat housing.
35. Remove the drive belt.
36. Disconnect the lower radiator hose from the water pump. Position the hose away from the engine front cover.
37. Using Power Steering Pump Pulley Remover (T69L-10300-B), remove the power steering pump pulley.
38. Remove the power steering pump bracket. See Figure 27.

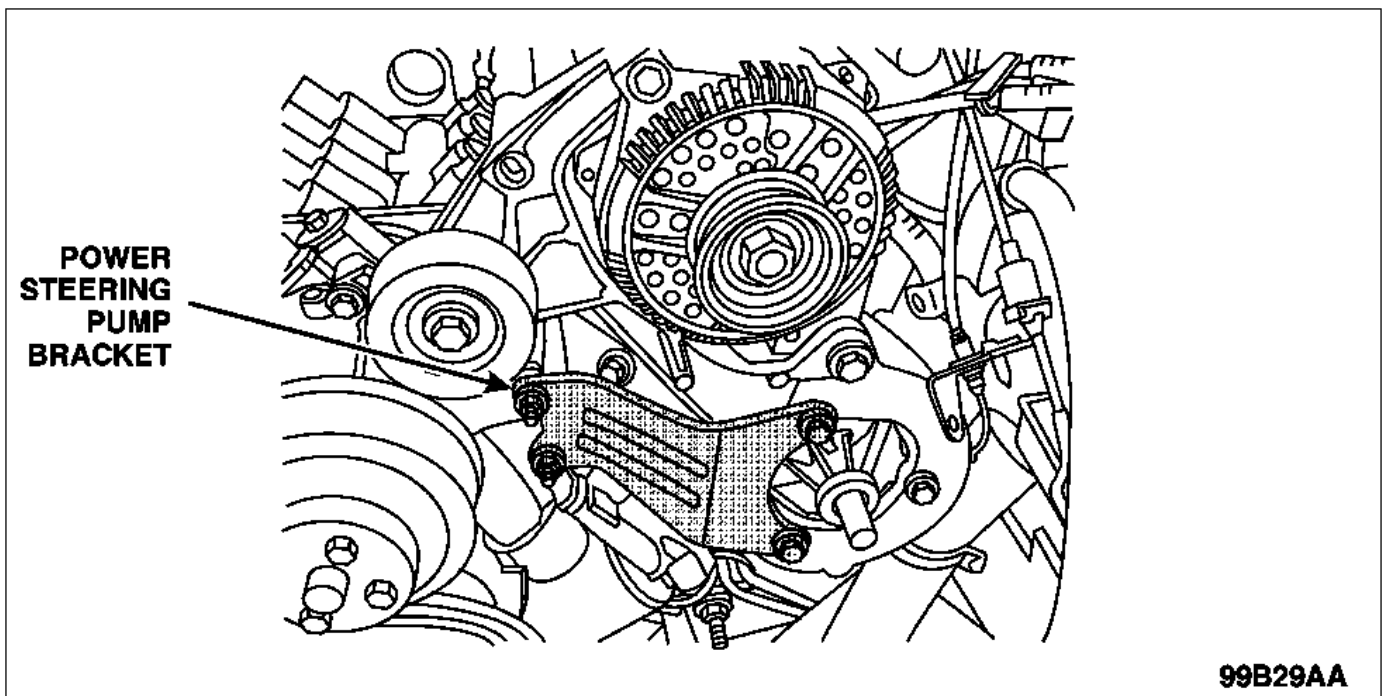


FIGURE 27

39. Disconnect and remove the camshaft position sensor.
40. Remove the camshaft synchronizer assembly.
41. Remove the water pump pulley, then the water pump.
42. Remove the crankshaft pulley.
43. Using Crankshaft Damper Remover (T58P-6316-D) and Vibration Damper Remover Adapter (T82L-6316-B), remove the crankshaft damper.

CAUTION

Do not damage the front cover or the crankshaft as possible engine oil leakage may occur.

44. Remove the crankshaft front seal from the engine front cover.
45. Install double nuts on the water pump studs, then remove the studs.
46. Remove the oil filter.
47. Remove the remaining front cover retainers.
48. Remove the front cover and the oil filter adapter as an assembly.
49. Remove the camshaft position sensor drive gear.
50. Reinstall the crankshaft damper bolt.
51. Rotate the crankshaft until the timing marks and the keyways are aligned. See Figure 28. This will position cylinder number 1 at TDC of the compression stroke, which is also required for camshaft synchronizer assembly installation.

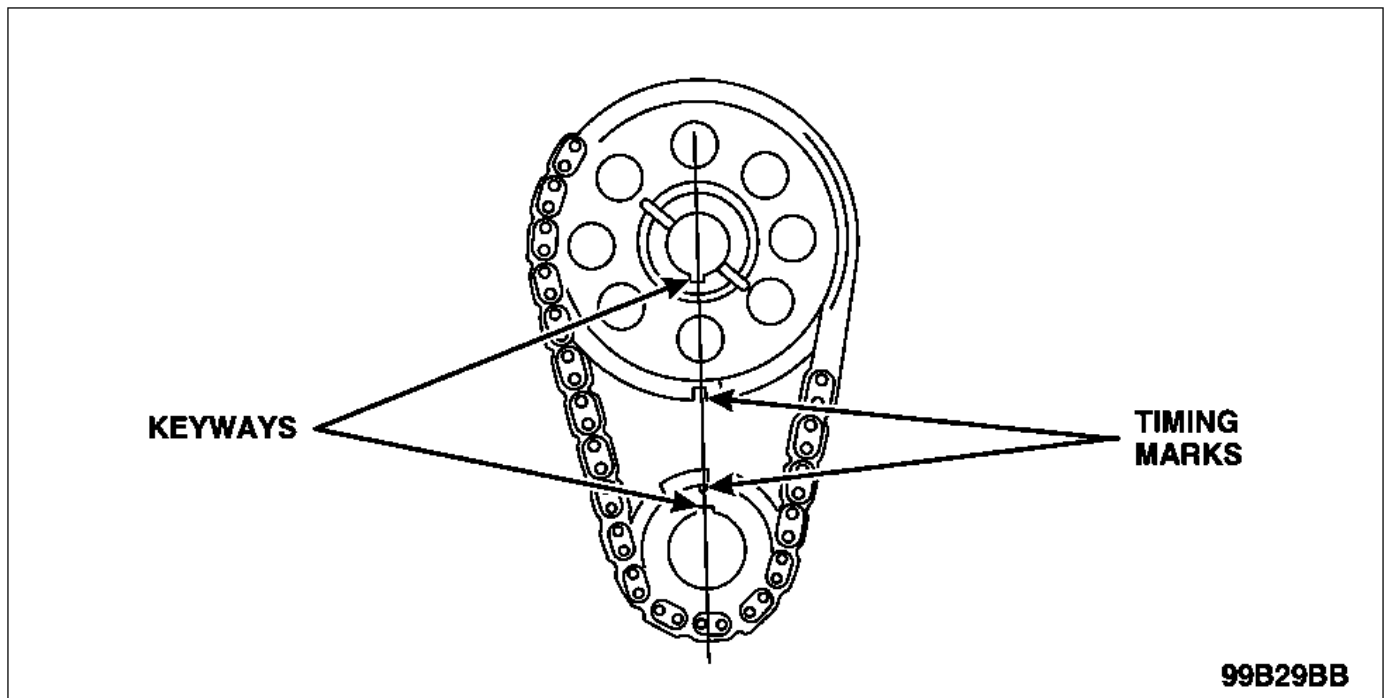


FIGURE 28

52. To release tension on the timing chain as follows:

- Using pliers, compress the timing chain tensioner. See Figure 29.
- Insert a pick through the tensioner housing and into the tensioner. See Figure 29.

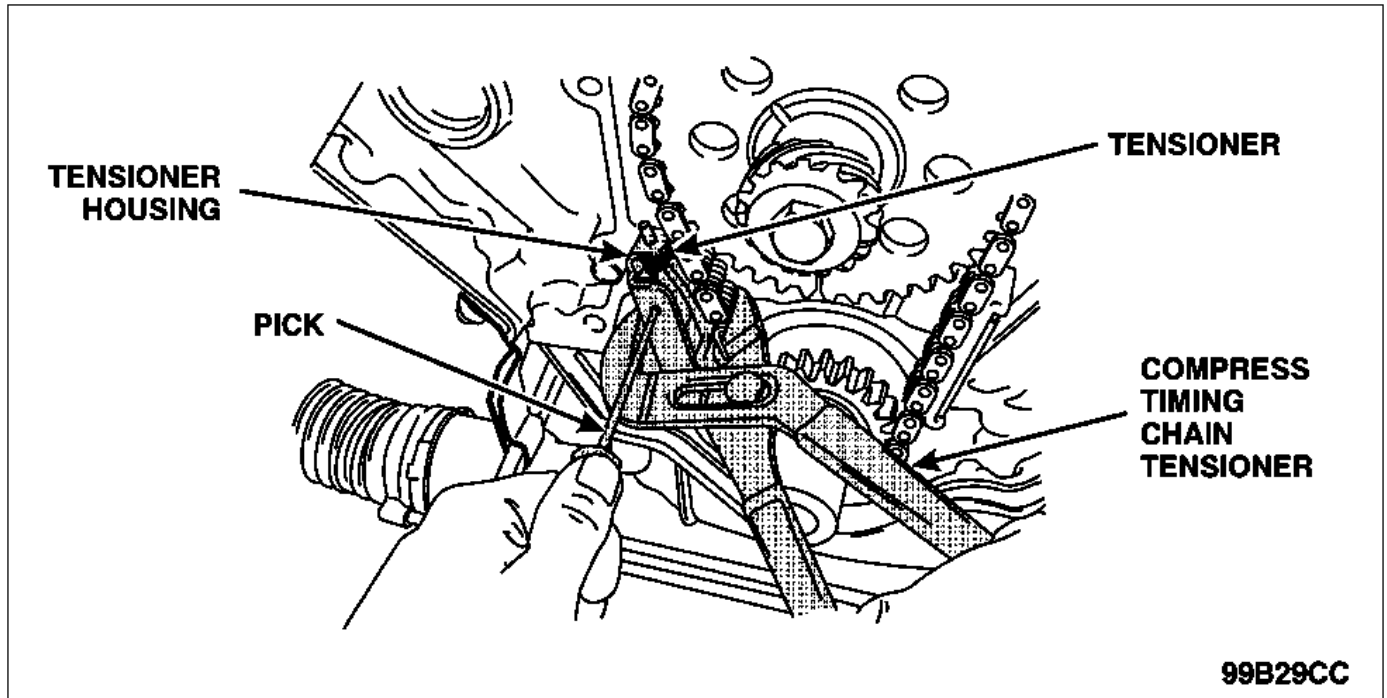


FIGURE 29

NOTE:

The timing chain and sprockets are being removed to keep debris from collecting on these parts, and to allow more room for cleaning the block front cover mating surface.

53. Remove the camshaft sprocket, crankshaft sprocket and the timing chain as an assembly.
54. Remove the timing chain tensioner.

CLEAN AND INSPECT

1. Clean the engine block and the oil pan portion of the front cover gasket surface as follows:
- Pack the exposed portion of the oil pan with shop towel(s).

CAUTION

Do not use a Scotch-Brite® disk to clean this surface. Fibers from the disk could get into the oil pan and oil, and clog the oil by-pass valve.

- It is recommended that a Roloc® “Bristle Disk” be used to clean this gasket surface. The most appropriate disk for this surface is a Yellow, 2-inch disk, model #07525.
 - After the gasket surface is cleaned, blow out the oil galleys using compressed air.
2. Clean and inspect the gasket surface of the front cover.
3. Clean all gasket surfaces that require RTV sealant with Metal Surface Cleaner F4AZ-19A536-RA.

4. Clean and inspect the water pump gasket surface.
5. Raise and support the vehicle.
6. Drain the engine oil. Tighten the drain plug to 11-16 Nm (97-141 lb-in).
7. Lower the vehicle.

FRONT COVER INSTALLATION

1. Install the timing chain tensioner. Tighten the retaining bolts to 8-14 Nm (6-10 lb-ft).
2. Install the timing chain, crankshaft sprocket and the camshaft sprocket as an assembly.
3. Make sure the timing marks and keyways are aligned. See Figure 30.

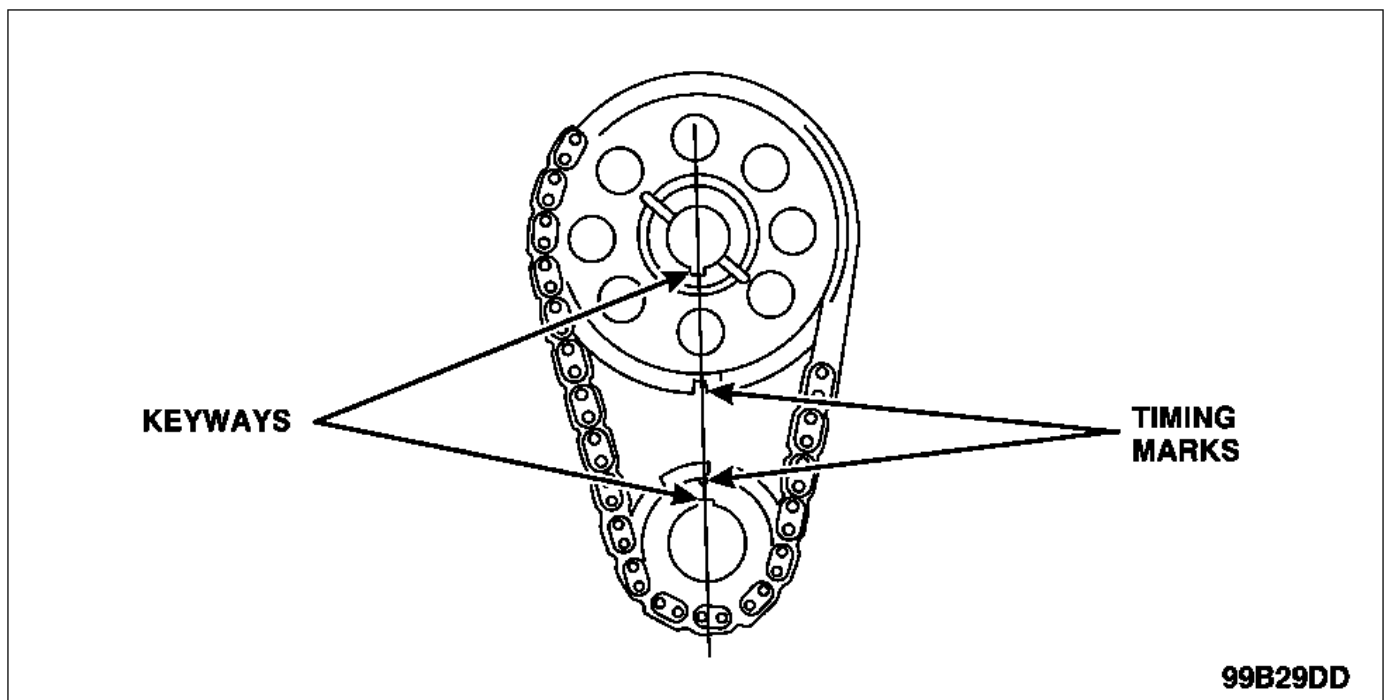


FIGURE 30

4. Apply tension to the timing chain by removing the pick from the tensioner housing.
5. Install the camshaft position sensor drive gear. Tighten the retaining bolt to 40-50 Nm (30-36 lb-ft).
6. Apply a light coat of engine oil to all front cover bolt and stud threads. Do not lubricate the capscrew threads or the two stud ends with sealant already applied.
7. Position the **new** front cover gasket on the engine block.
8. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the exposed portion of the oil pan.
9. Position the front cover assembly onto the engine block.
10. Install four (4) water pump studs in the locations shown in Figure 31. The two (2) studs with thread sealer must be installed in the proper positions. Using double nuts, tighten the studs to 7 Nm (62

lb-in). Remove the double nuts after the studs have been tightened.

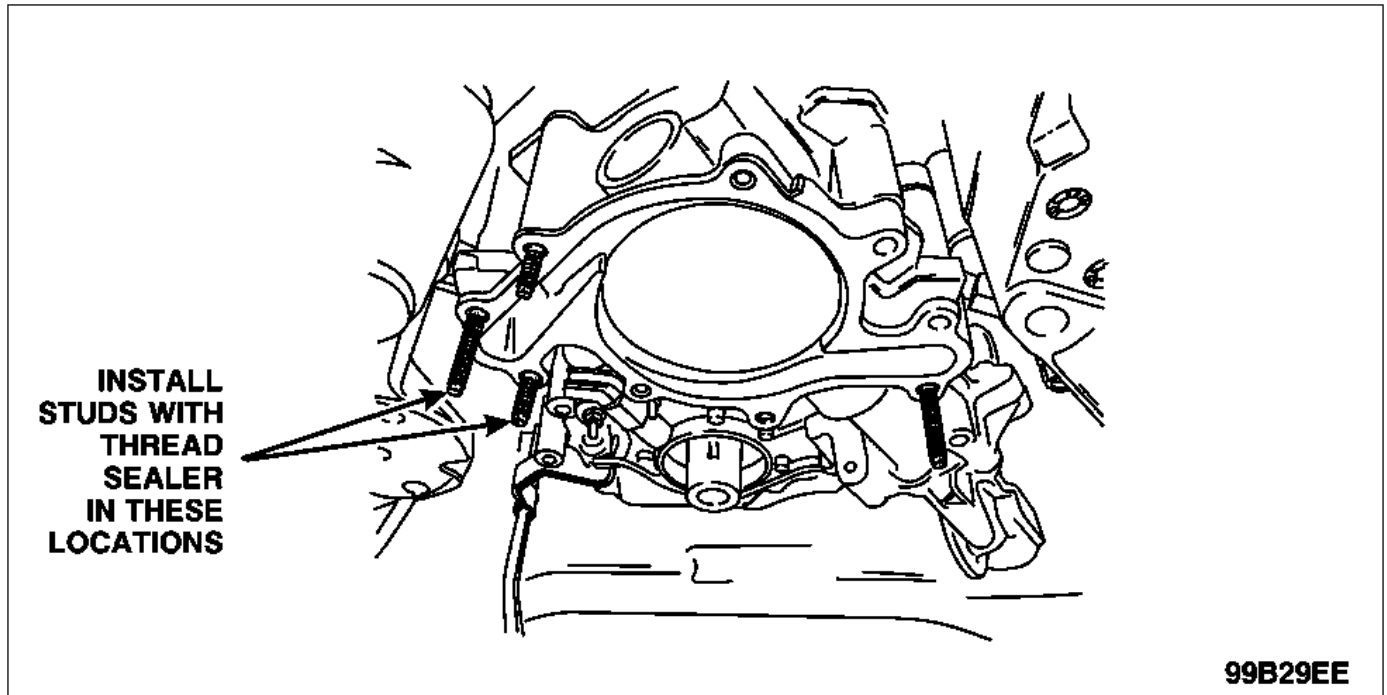


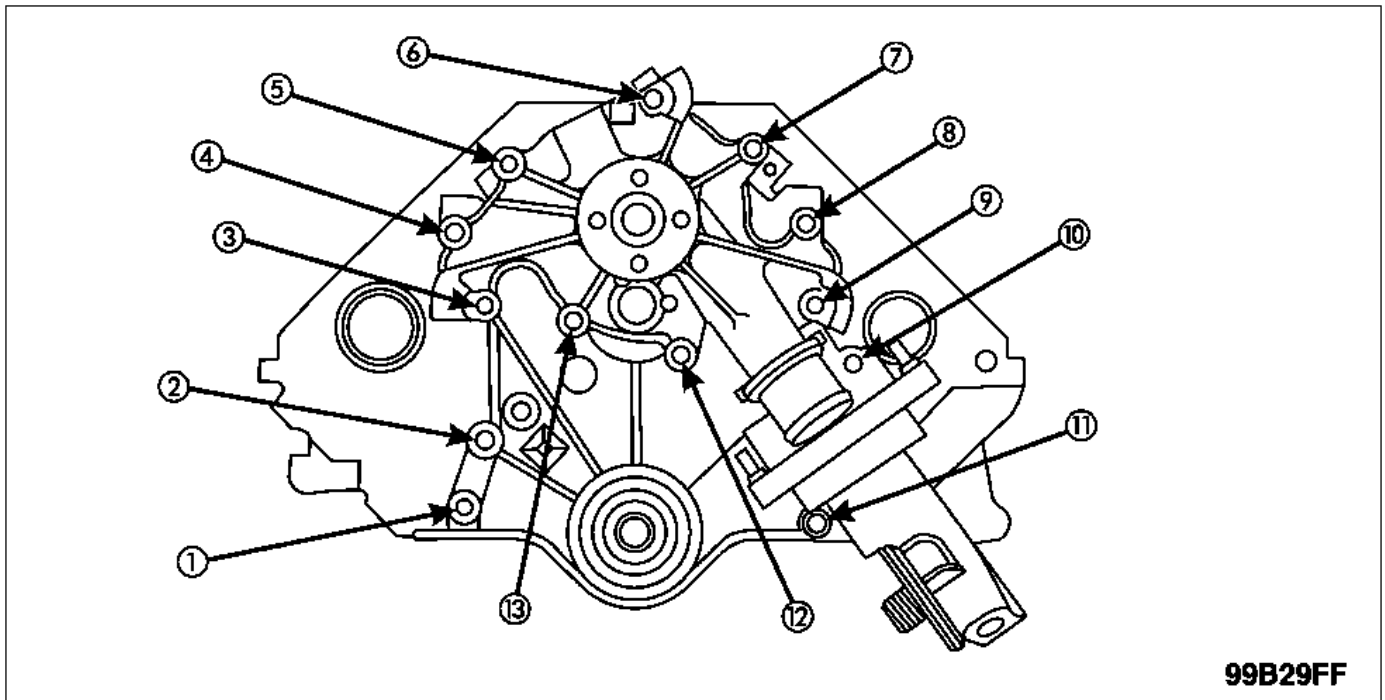
FIGURE 31

11. Install the remaining three (3) front cover retaining bolts.
12. Apply Loctite® to the Allen head capscrew, then install the capscrew into the lower part of the front cover.
13. Seat the front cover on the engine block by partially tightening all installed front cover bolts. Do not final tighten the bolts at this time.
14. Position the **new** water pump gasket on the front cover.
15. Position the water pump on the front cover.
16. Install the water pump retaining bolts.
17. Install the stud nuts on all front cover/water pump studs.

NOTE:

The torque specifications in the following step have been revised and are different from the service manual.

18. Tighten the front cover/water pump retainers in the sequence shown in Figure 32, to 28 Nm (20 lb-ft). Tighten the Allen head capscrew 11 to 22 Nm (16 lb-ft).



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FIGURE 32

19. Install the crankshaft seal in the front cover as follows:
 - Lubricate the crankshaft front oil seal lip with clean engine oil.
 - Place Front Crankshaft Seal Replacer (T94P-6701-AH) and crankshaft front seal on Front Crankshaft Seal Installer/Aligner (T88T-6701-A1).
 - Place above assembly over the crankshaft.
 - Insert the forcing screw from Damper/Front Cover Seal Replacer (T82L-6316-A), into Front Crankshaft Seal Installer/Aligner (T88T-6701-A2).
 - Thread the forcing screw into the crankshaft.
 - Hold the forcing screw with a wrench and tighten the draw nut until the flange of the aligner is flush with the front cover surface.
20. Lubricate the crankshaft front oil seal surface on the crankshaft vibration damper with clean engine oil.
21. Apply Silicone Gasket and Sealant (F6AZ-19562-A) or equivalent to the crankshaft damper keyway.
22. Using Damper/Front Cover Seal Replacer (T82L-6316-A), install the crankshaft vibration damper.
23. Install the crankshaft damper retaining bolt. Tighten the bolt to 140-180 Nm (103-132 lb-ft).
24. Install the crankshaft pulley. Tighten the retainers to 26-38 Nm (19-28 lb-ft).
25. Install the water pump pulley to the water pump. Tighten the retainers to 8-11 Nm (71-101 lb-in).
26. Lubricate and install the engine oil filter.
27. Make sure the timing mark on the damper is aligned with the TDC mark on the front cover gauge.

28. Install the camshaft sensor assembly as follows:

- Make sure the Synchro Positioning Tool (T96T-12200-A) is properly installed on the synchronizer assembly.
- Insert the camshaft synchronizer assembly in the front cover. Install the synchronizer assembly so that the arrow on the alignment tool is 54 degrees from the centerline of the engine. See Figure 33. This ensures that the CMP sensor electrical connector has proper clearance.

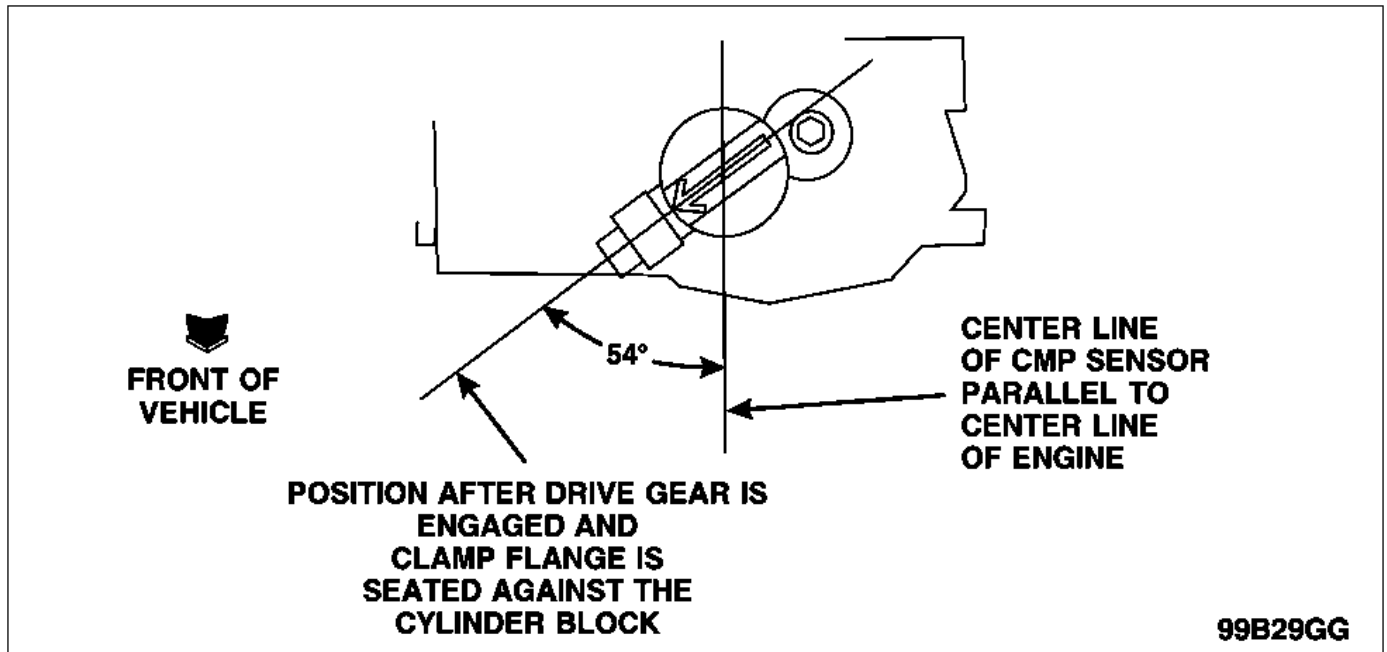


FIGURE 33

- Install and tighten the hold-down bolt to 20-30 Nm (15-22 lb-ft).
 - Remove the Synchro Positioning Tool.
 - Install the camshaft sensor to the synchronizer assembly. Tighten the retaining screws to 5-8 Nm (45-70 lb-in).
29. Install the power steering pump bracket. Tighten the bolts to 51 Nm (38 lb-ft). Tighten the nuts to 25 Nm (18 lb-ft).
30. Using Steering Pump Pulley Replacer (T65P-3A733-C), install the power steering pump pulley. The pulley face must be flush (within 0.25 mm [0.010 inch]) of the end of the power steering pump shaft.
31. Connect the lower radiator hose to the water pump.
32. Install the drive belt.
33. Lubricate the coolant tube O-ring with clean antifreeze.
34. Install the coolant tube to the water pump. Tighten the retaining bolt to 8-11 Nm (71-97 lb-in).
35. Connect the ends of the coolant tube to the coolant hoses on the bulkhead and the center coolant tower.

36. Connect the upper radiator hose to the thermostat housing.
37. Route the engine wiring harness down the front of the engine to the electrical components.
38. Connect the oil pressure sender electrical connector.
39. Attach the wiring harness pushpin to the water pump.
40. Connect the engine coolant temperature sensor electrical connector.
41. Connect the camshaft sensor and the crankshaft sensor electrical connectors.
42. Install the coil pack and the bracket as an assembly. Tighten the retainers to 25 Nm (18 lb-ft).
43. Connect the coil pack and the radio suppressor electrical connectors.
44. Connect all the ignition wires to the coil pack.
45. Connect the coolant hose to the left coolant tower.
46. Install the PCV line between the clean air tube and the driver-side valve cover.
47. Install the upper intake manifold gasket.
48. Apply a light coat of Pipe Sealant with Teflon® (D8AZ-19554-A) or equivalent to the upper intake manifold retaining bolts and the stud bolt threads.
49. Install the upper intake manifold. Tighten the retainers in the sequence shown in Figure 34, first to 10 Nm (88 lb-in), then to 20 Nm (15 lb-ft), finally to 32 Nm (23 lb-ft).

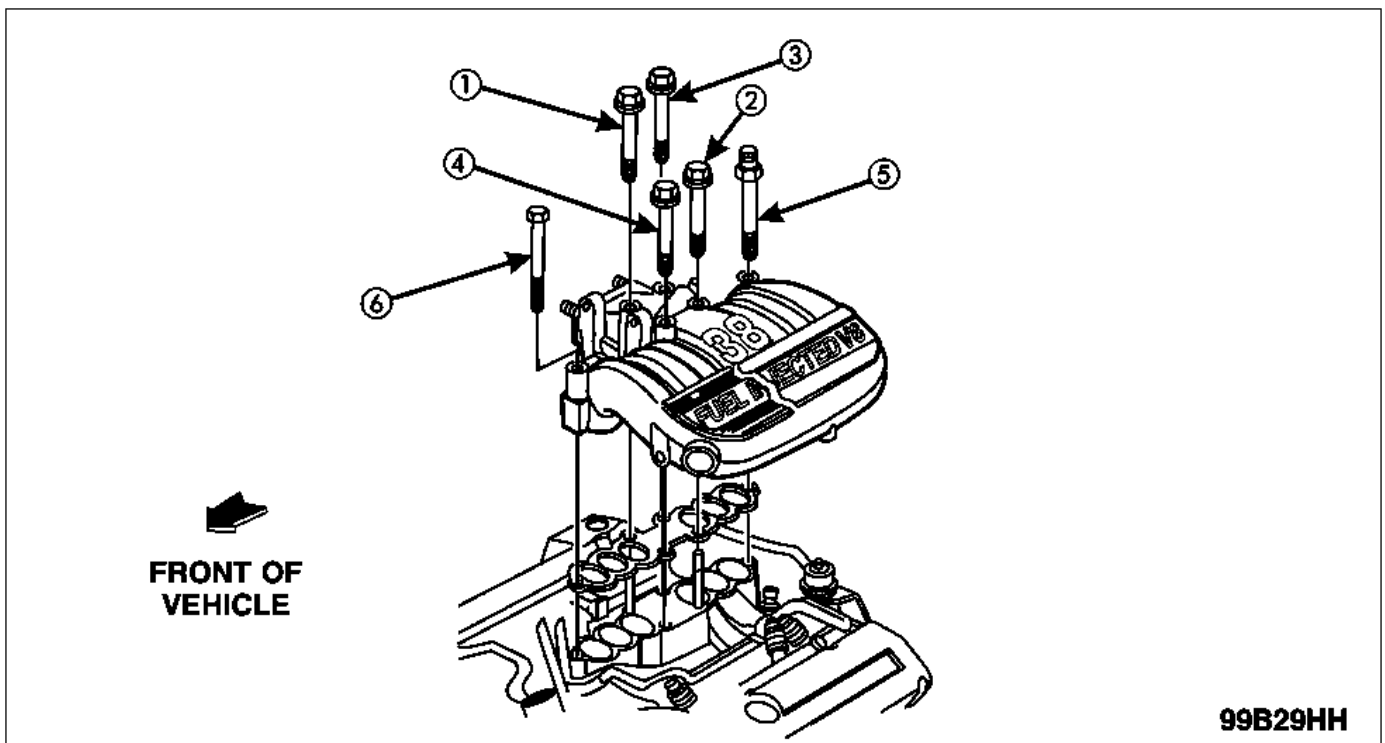


FIGURE 34

50. Install the PCV valve to the valve cover.

51. Connect the EGR tube to the EGR valve. Tighten the tube nut to 35-45 Nm (26-33 lb-ft).
 52. Position the EVR/EGR transducer bracket assembly near the installed position, then connect the vacuum lines to the EGR transducer.
 53. Install the EVR/EGR transducer bracket assembly. Tighten the retainers to 8-11 Nm (71-97 lb-in).
 54. Connect the following electrical connectors:
 - EGR transducer
 - EVR solenoid
 - Throttle position sensor
 - Idle air control solenoid
 55. Install the vacuum harness on top of the engine.
 56. Connect the vacuum lines to the EGR valve and the EVR solenoid.
 57. Connect the four (4) vacuum lines to the upper intake manifold.
 58. Install the manifold support bracket to the front of the upper intake manifold. Tighten the retainers securely.
 59. Install the ignition wire routing clip to the manifold support bracket.
 60. Install the accelerator bracket to the upper intake manifold. Tighten the retainers to 10-14 Nm (91-122 lb-in).
 61. Connect the accelerator and the speed control cables to the throttle body.
 62. Install the throttle return spring.
 63. Install the throttle body splash shield.
 64. Connect the clean air tube to the throttle body.
 65. Raise and support the vehicle.
 66. Install the lower air deflector.
 67. Lower the vehicle.
 68. Connect the battery negative cable, then remove the memory saver.
 69. Fill the cooling system.
 70. Fill the engine with 5W-30 engine oil meeting Ford specification WSS-M2C153-G or equivalent.
 71. Start the engine. Check the engine for leaks. Make sure the engine operates properly.
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