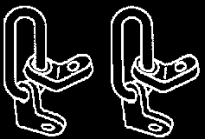
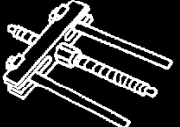
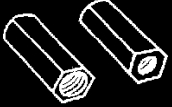


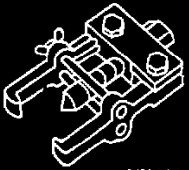


Engine: Service and Repair

Engine

Removal

 <p>ST1595-A</p>	<p>Engine Lifting Brackets 303-050 (T70P-6000)</p>
 <p>ST1516-A</p>	<p>Front Hub Tool 204-069 (T81P-1104-C)</p>
 <p>ST1518-A</p>	<p>Metric Hub Remover Set 204-085 (T83P-1104-BH)</p>

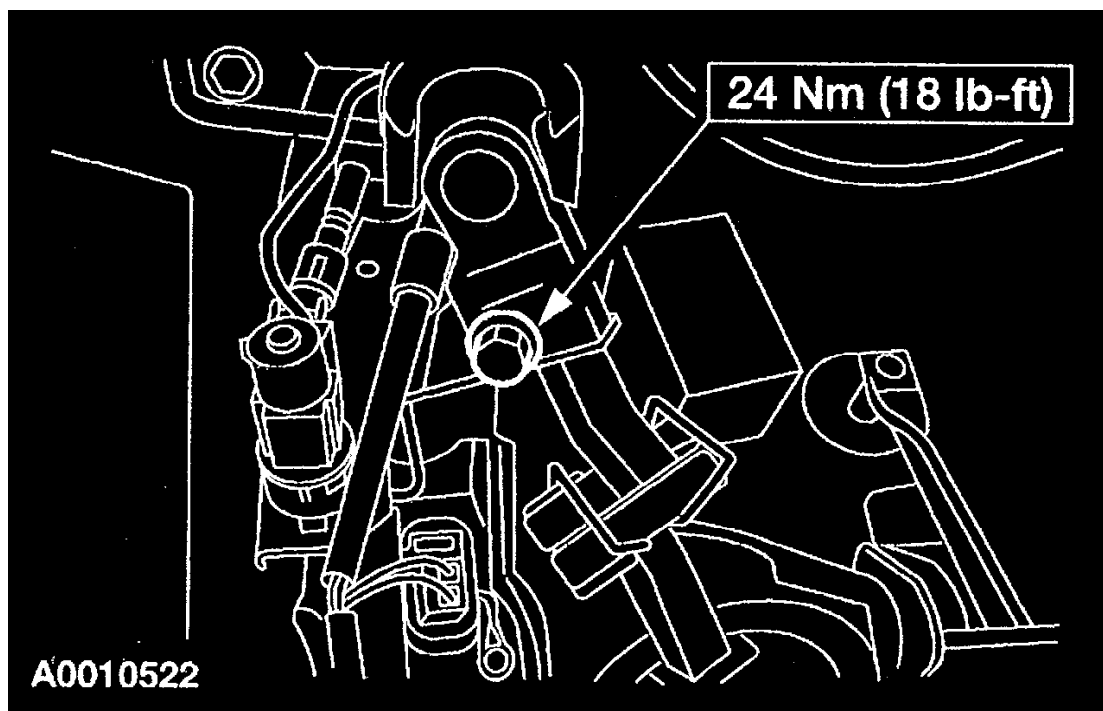
Special Tools

 <p>ST1263-A</p>	<p>Steering Arm Remover 211-003 (T64P-3590-F)</p>
 <p>ST1293-A</p>	<p>Powertrain Lift with Tilting Plate 014-00765</p>
 <p>ST1106-A</p>	<p>Tie Rod End Remover 211-001 (TOOL-3290-D)</p>

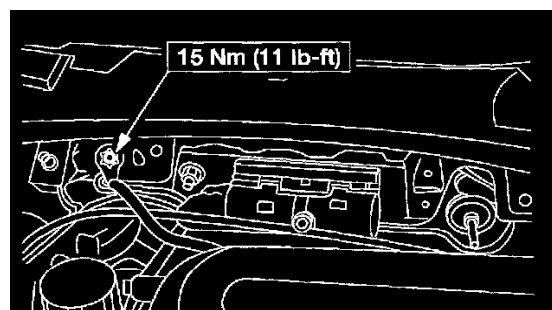
Special Tools

Removal

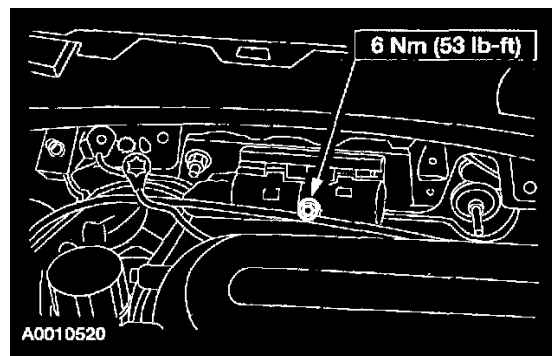
1. Disconnect the battery ground cable.



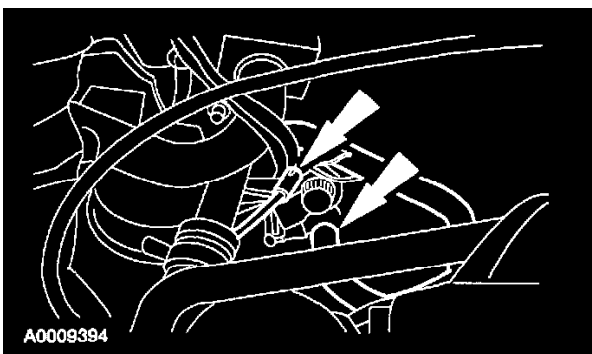
2. Remove the steering shaft pinch bolt.
3. Remove the cowl vent screen.



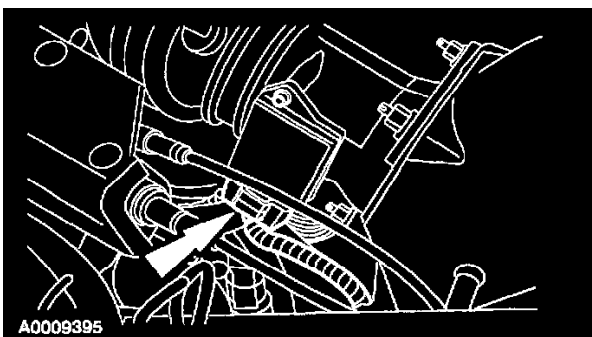
4. Remove the ground strap bolt.



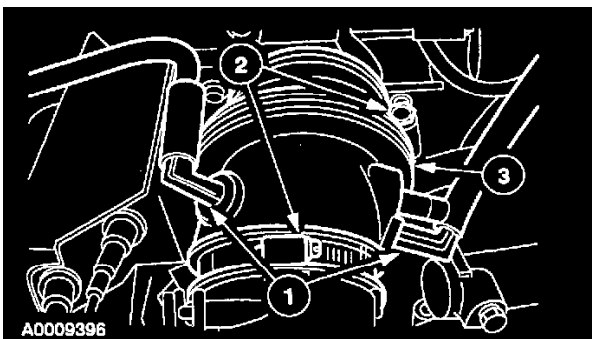
5. Loosen the bolt and disconnect the Powertrain Control Module (PCM) electrical connector.



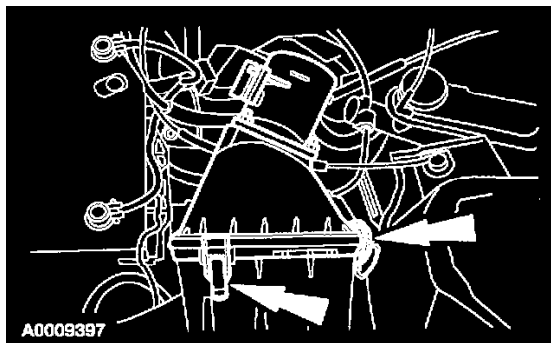
6. Disconnect the evaporative emission system hoses.



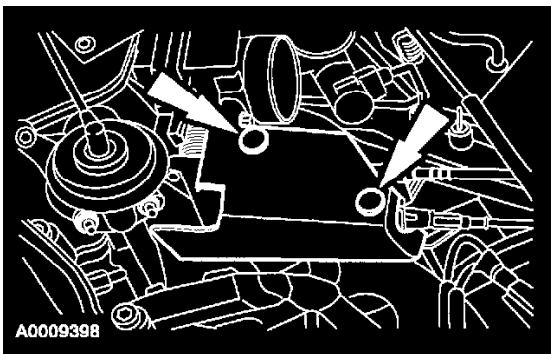
7. Disconnect the Mass Air Flow (MAF) sensor electrical connector.



8. Remove the air cleaner outlet tube.
 1. Disconnect the crankcase ventilation hoses.
 2. Loosen the clamps.
 3. Remove the tube.



9. Release the clamps and remove the air cleaner cover.



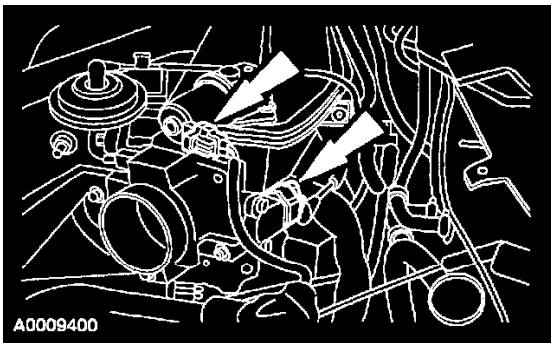
A0009398

10. Remove the pin-type retainers and the accelerator cable splash shield.



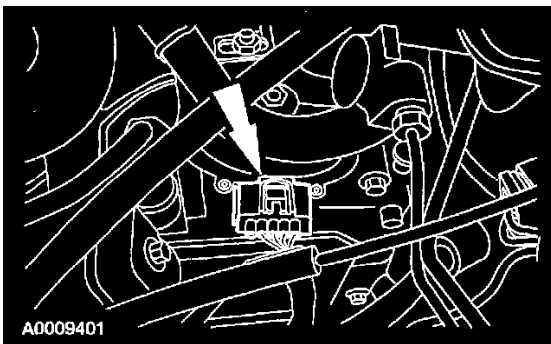
A0009399

11. Disconnect and unclip the accelerator and cruise control cables.



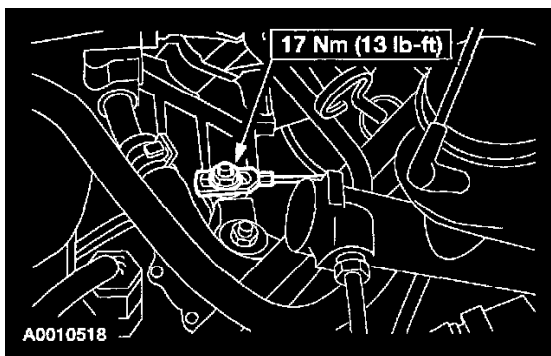
A0009400

12. Disconnect the Throttle Position (TP) sensor and Idle Air Control (IAC) valve electrical connectors.

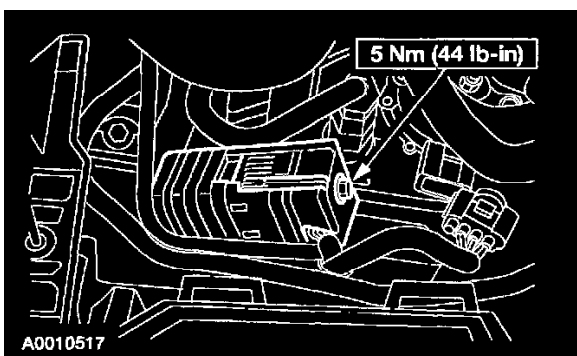


A0009401

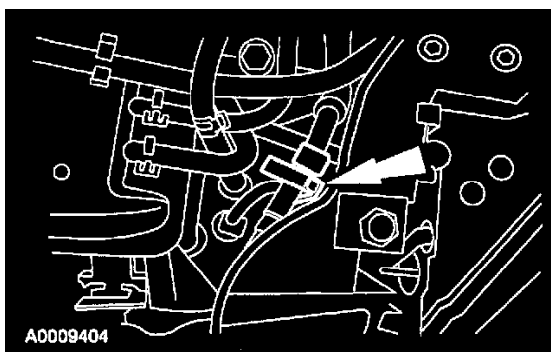
13. Disconnect the transaxle range sensor electrical connector.



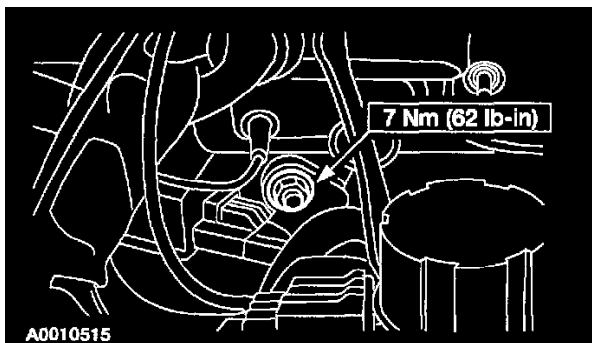
14. Remove the nut and unclip the shifter cable from the bracket.



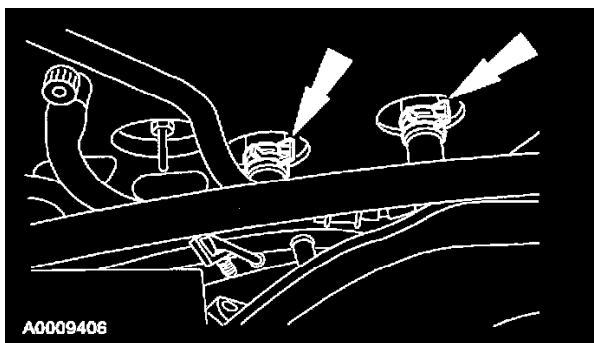
15. Loosen the bolt and disconnect the harness connector.
16. Drain the cooling system.
17. Recover the A/C system.
18. Relieve the fuel pressure.



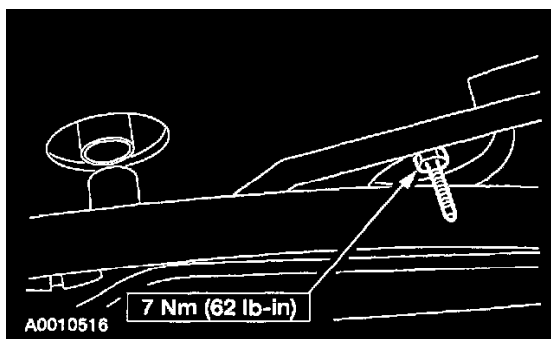
19. Disconnect the low pressure A/C line spring lock coupling at the accumulator/drier.



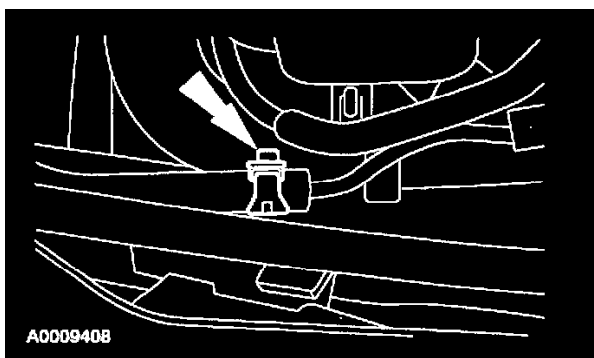
20. Remove the heater hose bracket nut.



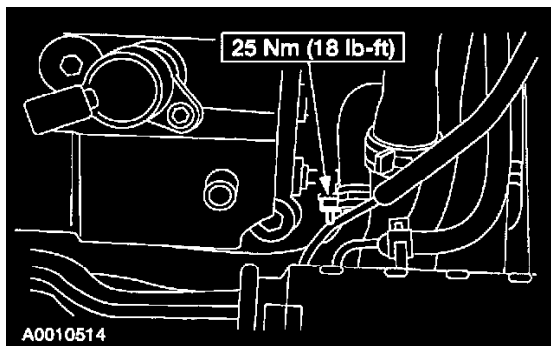
21. Disconnect the heater hoses.



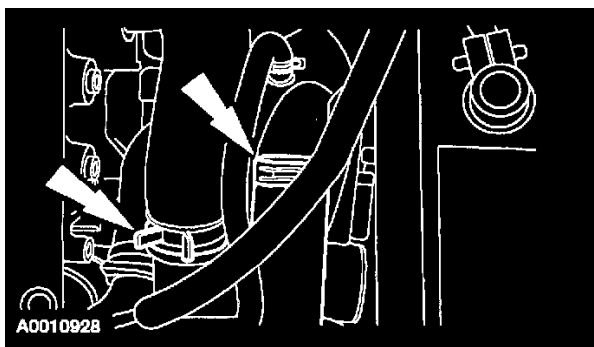
22. Remove the heater hose bracket nut.



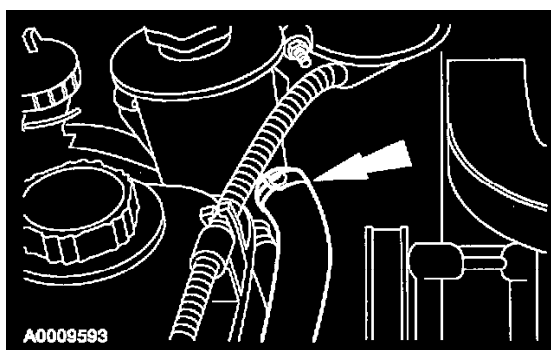
23. Disconnect the coolant recovery bottle hose.



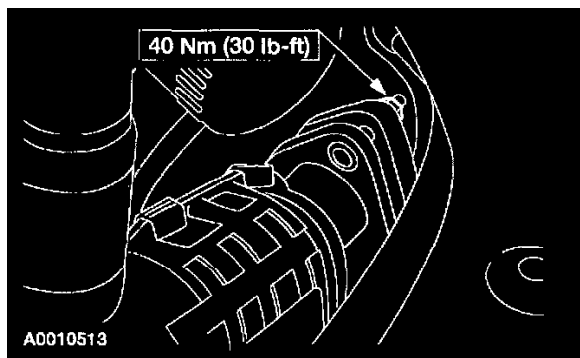
24. Remove the nut and disconnect the starter motor ground cable.



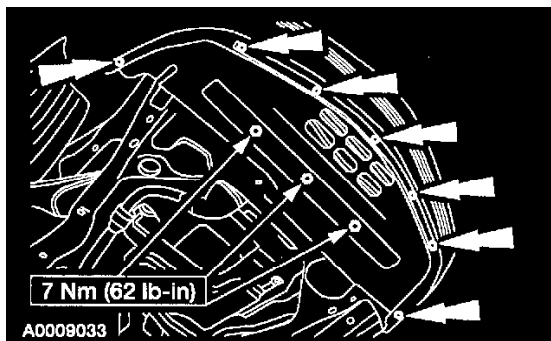
25. Disconnect the coolant hoses.



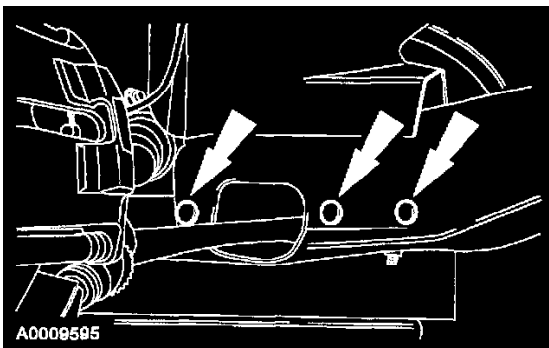
26. Disconnect the power steering fluid hose from the reservoir.



27. Remove the two LH exhaust manifold to pipe nuts.
28. Raise and support the vehicle.
29. Remove the LH and RH front wheels.

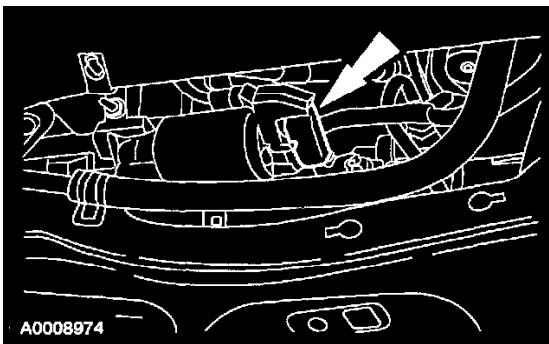


30. Remove the pin-type retainers, bolts, and the front splash shield.

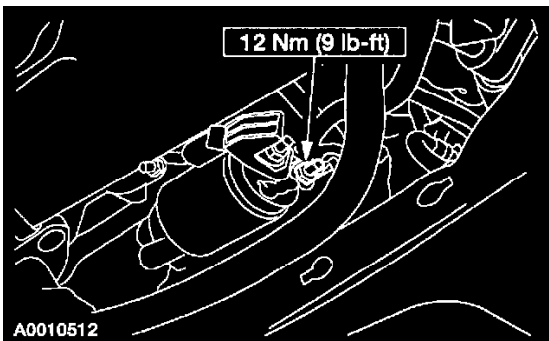


31. **Note:** RH shown, LH similar.

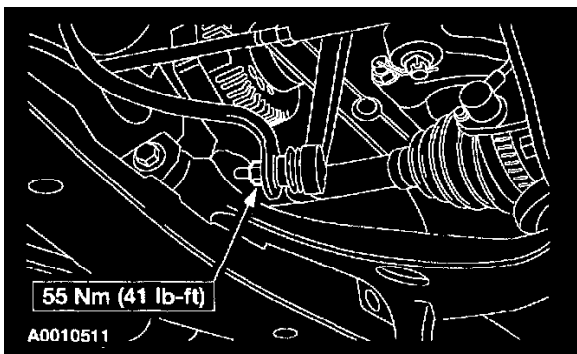
Remove the LH and RH inner fender splash shield pin-type retainers and remove the splash shield.



32. Remove the starter cable cover.

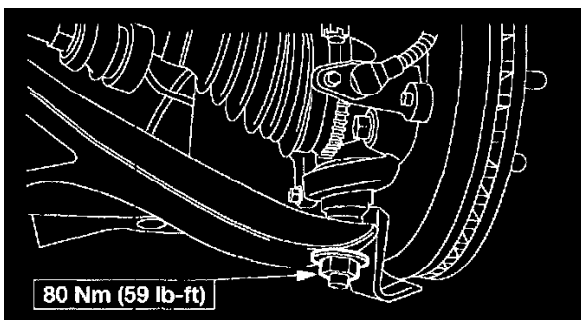


33. Remove the nut and disconnect the cable from the starter.



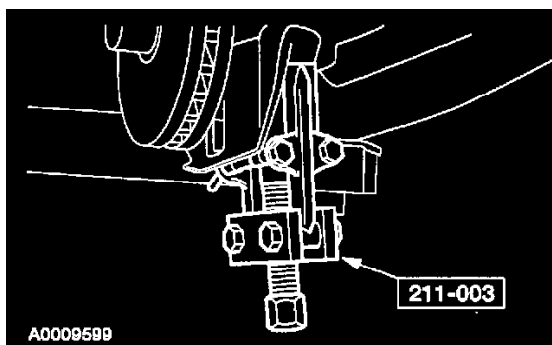
34. **Note:** RH shown, LH similar.

Remove the LH and RH sway bar end link nuts.

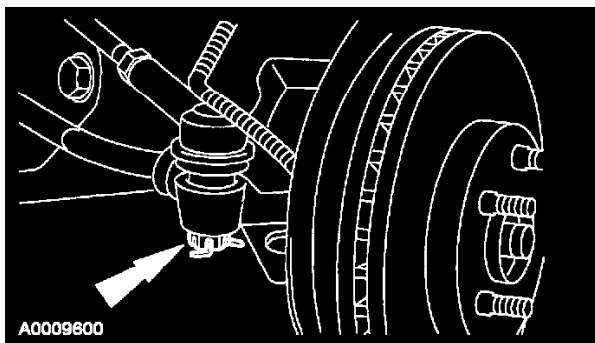


35. **Note:** RH shown, LH similar.

Remove the LH and RH ball joint nuts.

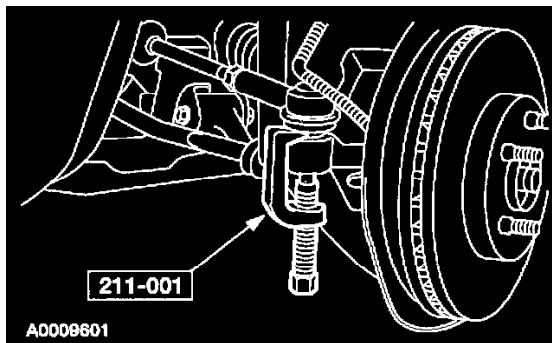


36. Using the special tool, separate the control arm from the ball joint.

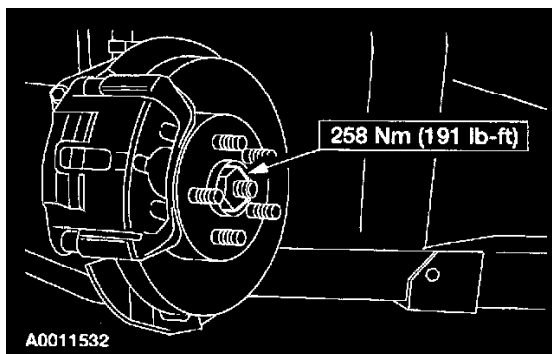


37. **Note:** RH shown, LH similar.

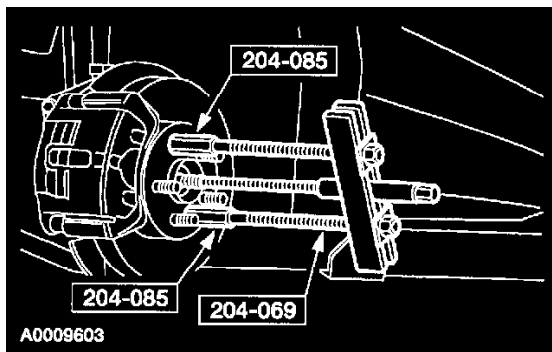
Remove the LH and RH tie rod end cotter pin and castle nut.



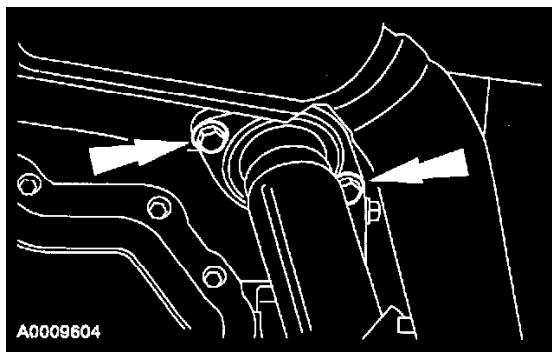
38. Using the special tool, separate the tie rod end from the knuckle.



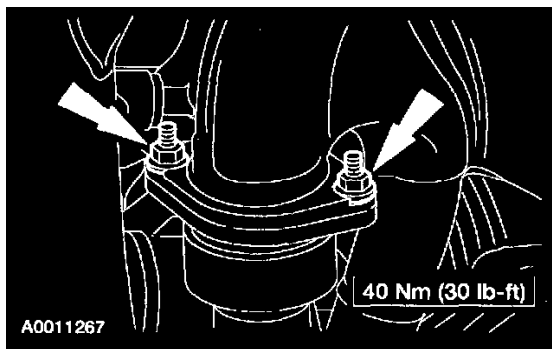
39. Remove the halfshaft nut and washer.
- Discard the nut.



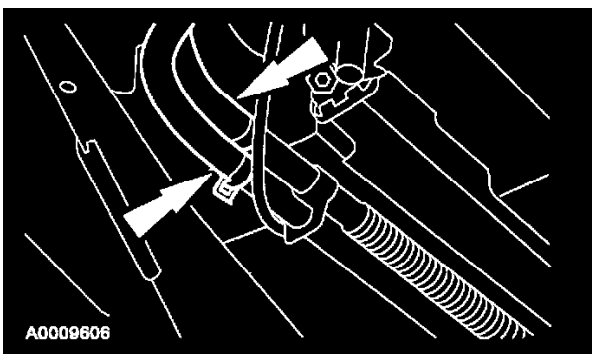
40. Using the special tools, push the halfshaft out of the hub.



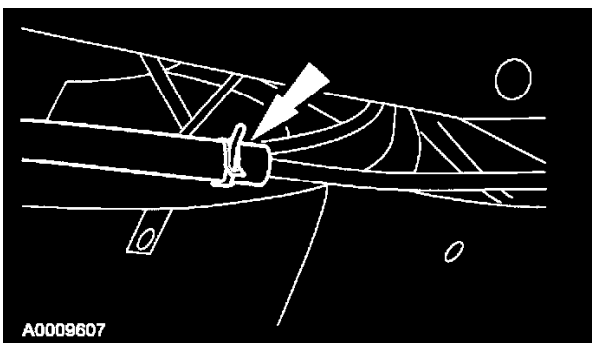
41. Remove the RH exhaust manifold to pipe bolts.



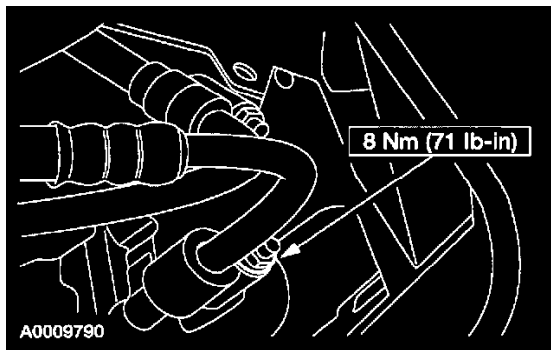
42. Remove the nuts and the dual converter Y-pipe.



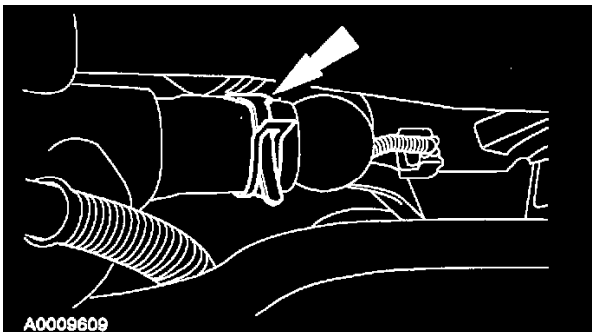
43. Disconnect the power steering and transaxle hoses from the cooler.



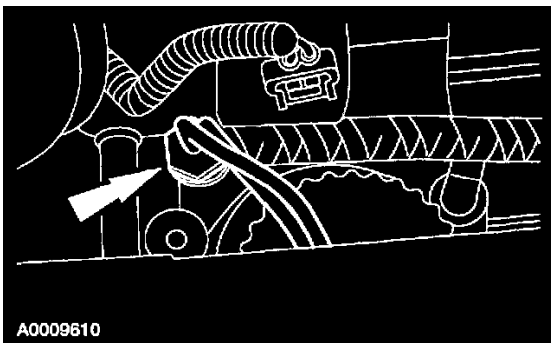
44. Disconnect the transaxle cooler line.



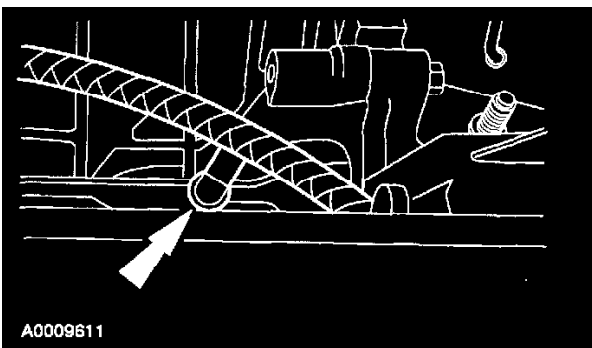
45. Remove the nut and disconnect the A/C high pressure line at the condenser.



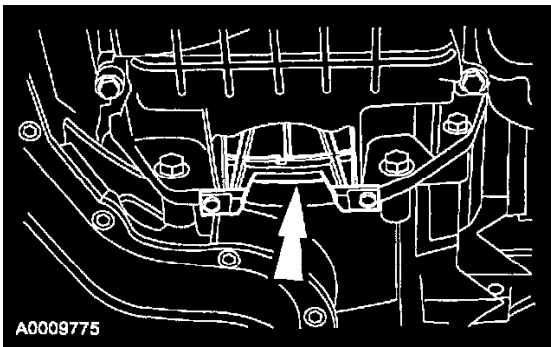
46. Disconnect the lower radiator hose.



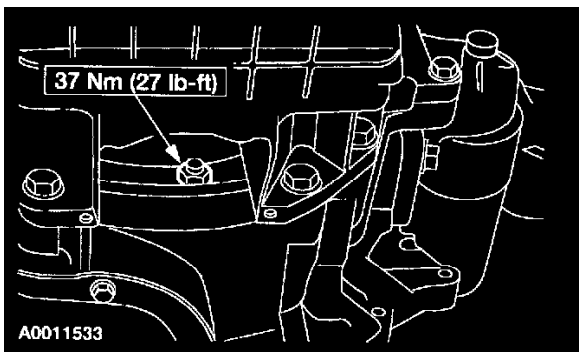
47. Disconnect the engine block heater electrical connector.



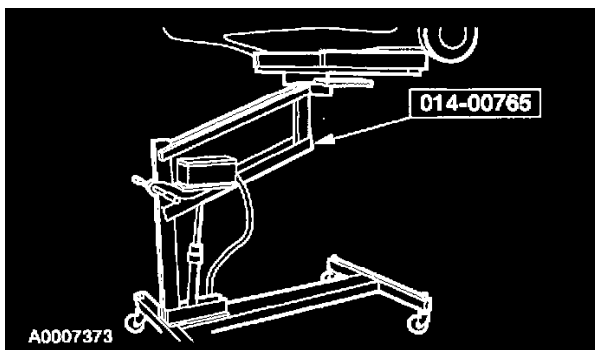
48. Unclip the engine block heater harness.



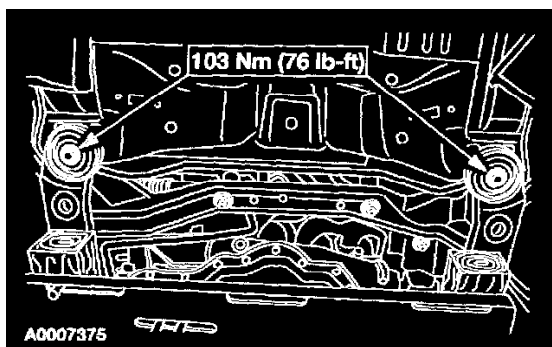
49. Remove the torque converter inspection cover.



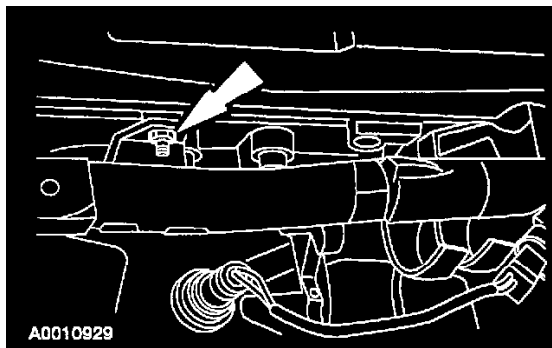
50. Remove the four torque converter to flex plate nuts.



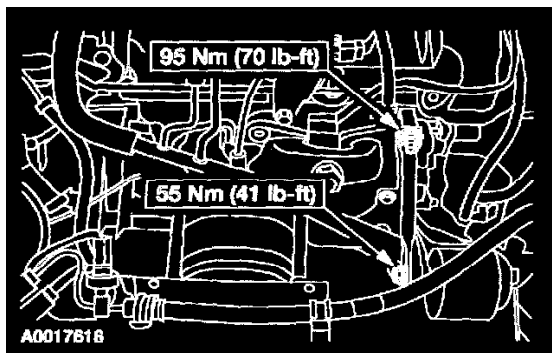
51. Using the special tool, support the subframe.



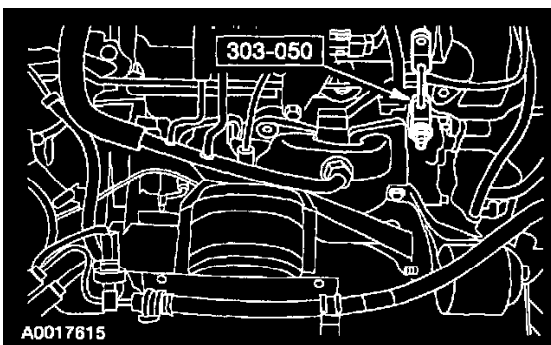
52. Remove the four subframe bolts and lower the subframe engine/transaxle assembly.



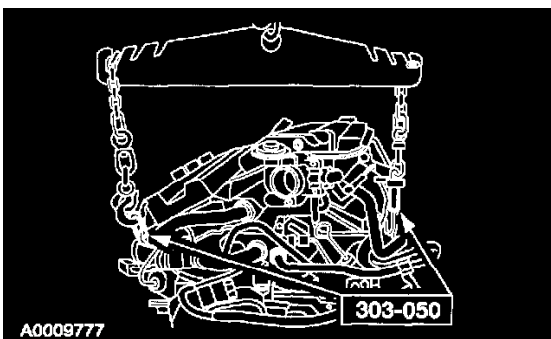
53. Remove the coolant tube mounting nut and position the tube away from the cylinder head.



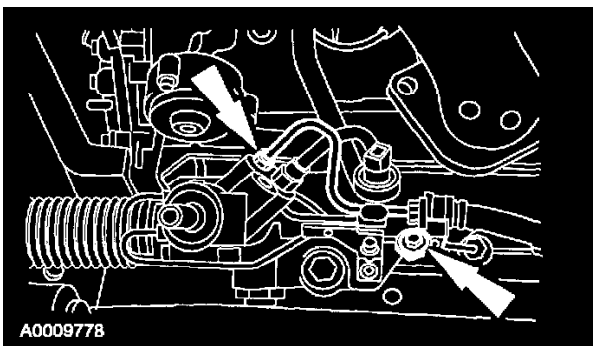
54. Remove the engine support brace.



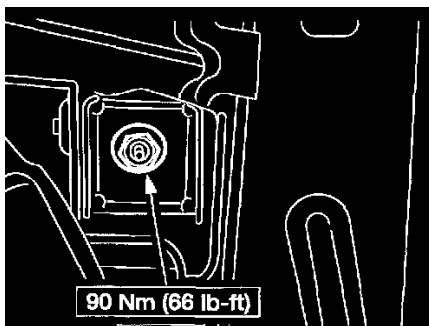
55. Install the special tool.



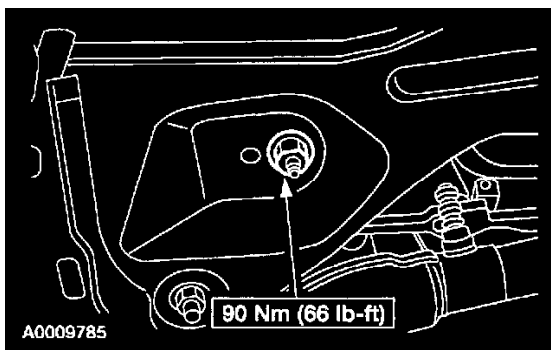
56. Using the special tools, support the engine and transaxle at the LH and RH cylinder heads.



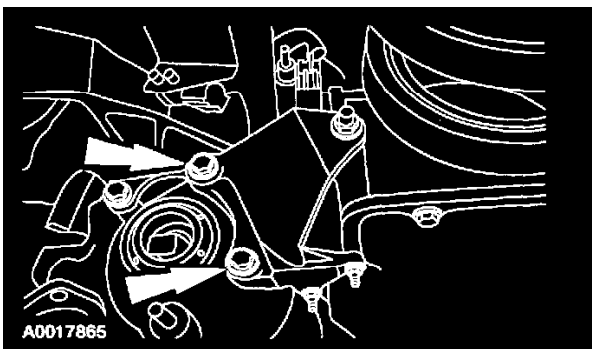
57. Disconnect the power steering pressure line and remove the clamp bolt.



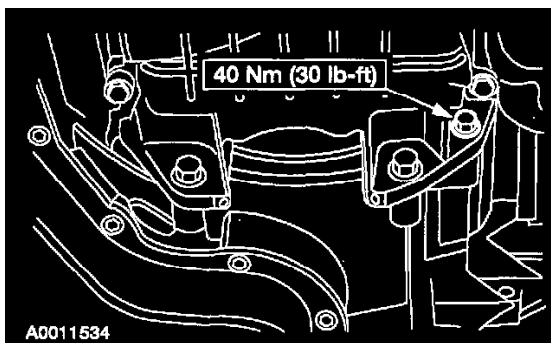
58. Remove the LH engine mount to frame nut.



59. Remove the RH engine mount to frame nut.

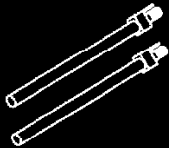
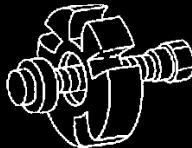


60. Remove the engine to transaxle bracket bolt.

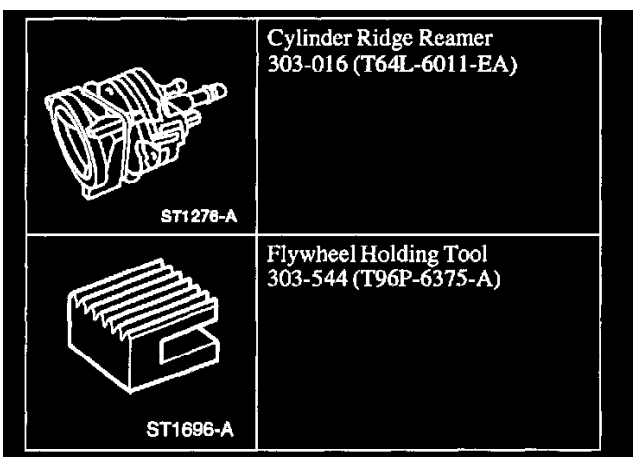


61. Remove the bolts and separate the engine from transaxle.

Steps 1 - 40

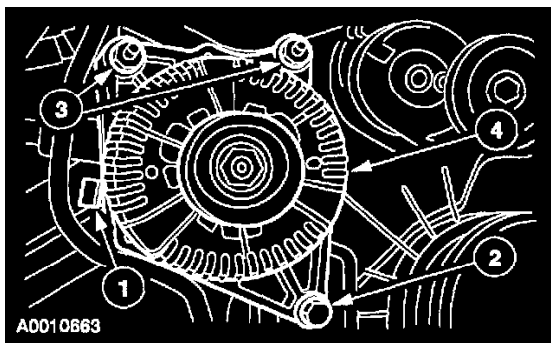
 <p>ST1982-A</p>	<p>Connecting Rod Guide Set 303-462 (T94P-6136-AH)</p>
 <p>ST1286-A</p>	<p>Crankshaft Damper Remover 303-009 (T58P-6316-D)</p>

Special Tools

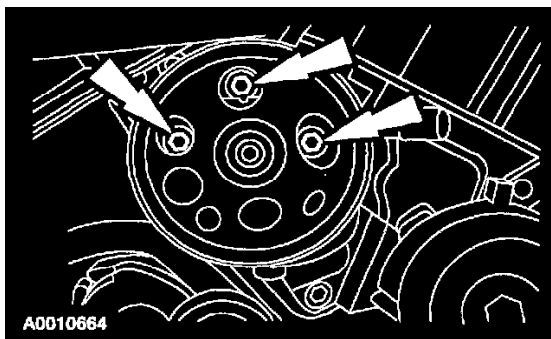


Special Tools

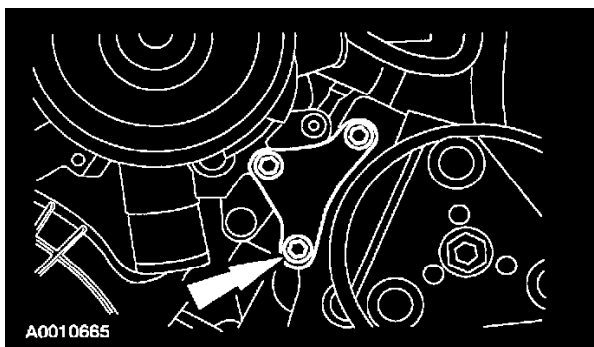
1. Remove the accessory drive belt.



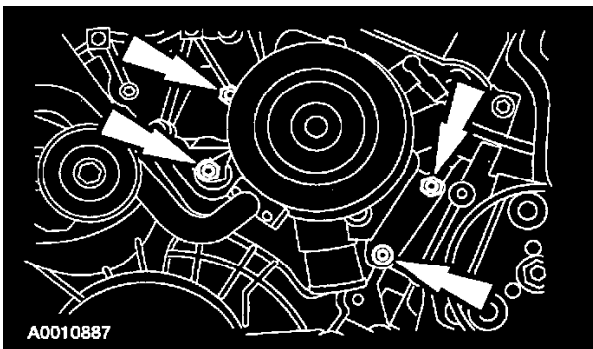
2. Remove the generator.
 1. Disconnect the electrical connector.
 2. Remove the bolt.
 3. Remove the studs.
 4. Remove the generator.



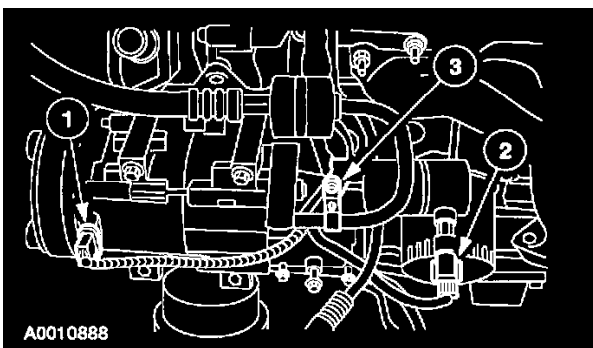
3. Remove the bolts and the power steering pump.



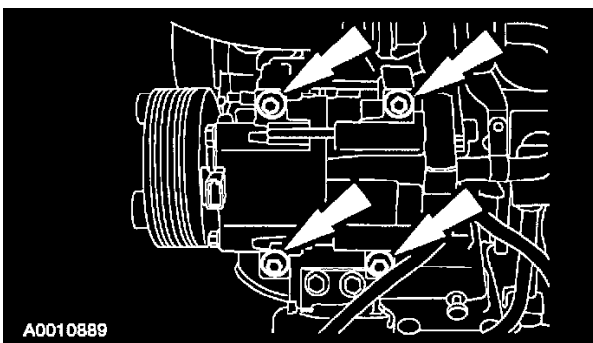
4. Remove the bolts and the water pump to A/C compressor bracket.



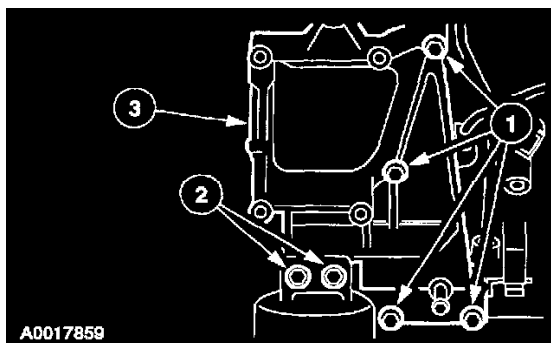
5. Remove the bolts and the water pump.



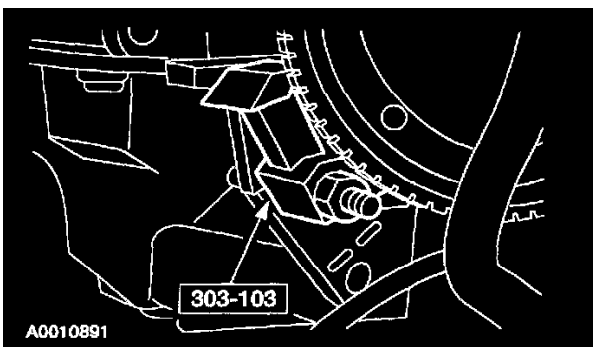
6. Disconnect the A/C compressor.
 1. Disconnect the compressor electrical connector.
 2. Disconnect the pressure sensor electrical connector.
 3. Disconnect the harness from the bracket.



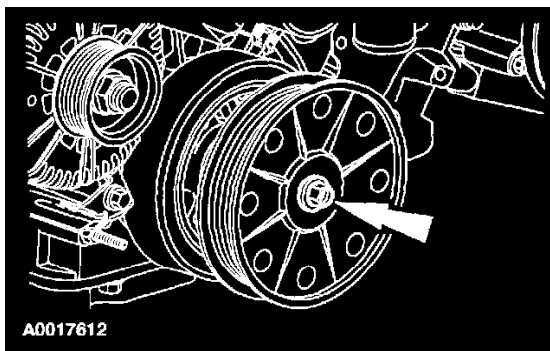
7. Remove the bolts and the A/C compressor.



8. Remove the bolts and the A/C compressor bracket.

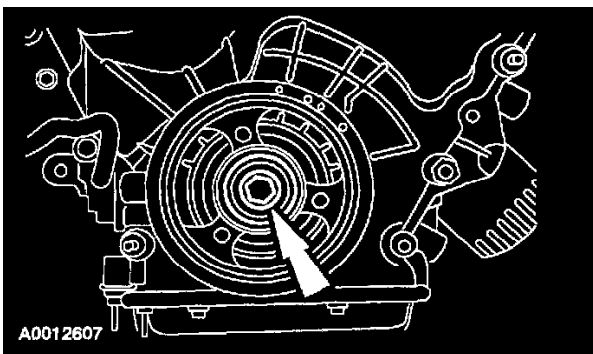


9. Install the special tool to hold the flywheel.

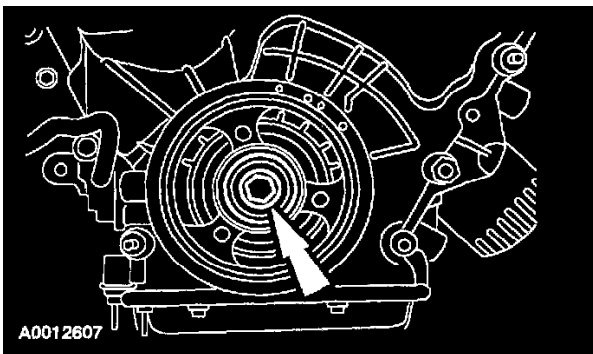


10. **Note:** The pulley has LH threads.

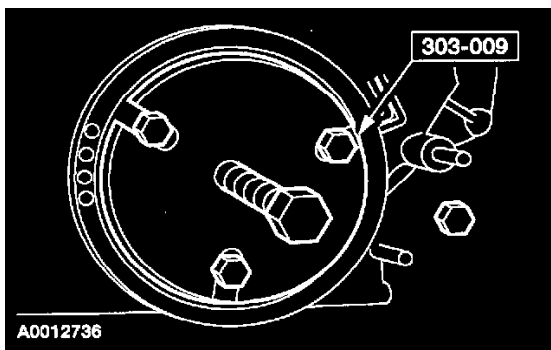
Remove the crankshaft pulley.



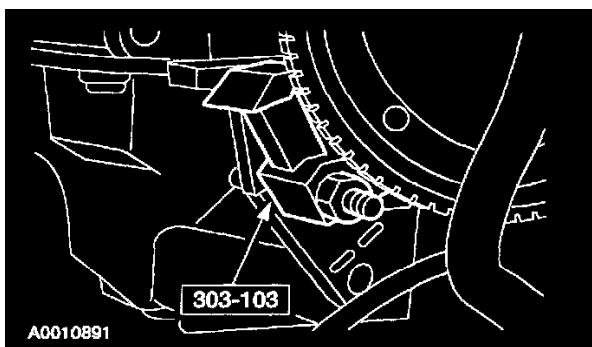
11. Remove the crankshaft damper bolt and washer.



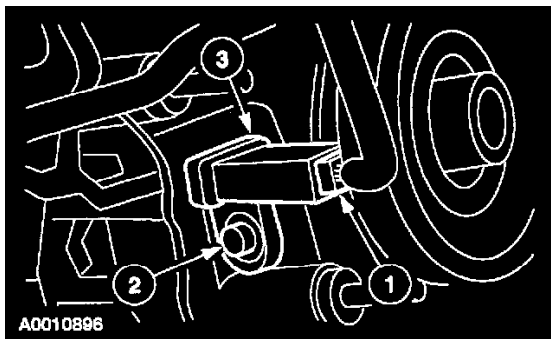
12. Install the crankshaft damper bolt.



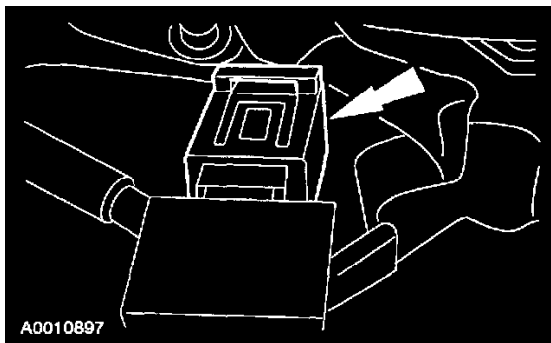
13. Using the special tool, remove the crankshaft vibration damper.



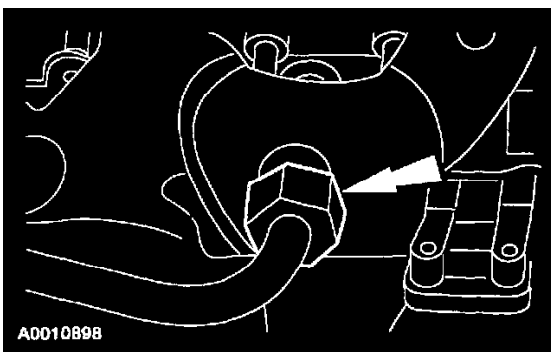
14. Remove the special tool.



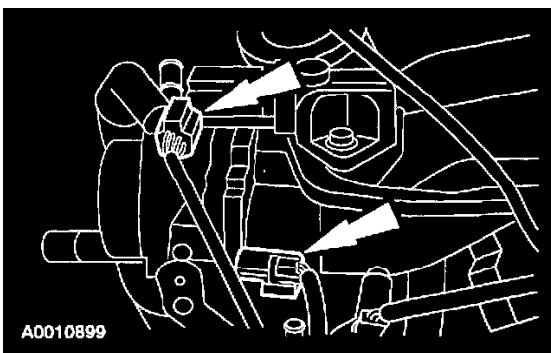
15. Remove the Crankshaft Position (CKP) sensor.
1. Disconnect and disconnect the electrical connector.
 2. Remove the bolt.
 3. Remove the sensor.



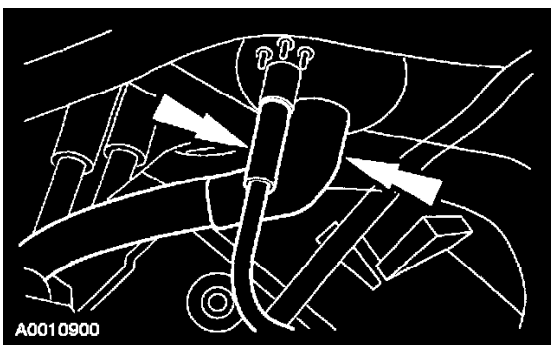
16. Disconnect the differential pressure feedback Exhaust Gas Recirculation (EGR) transducer electrical connector.



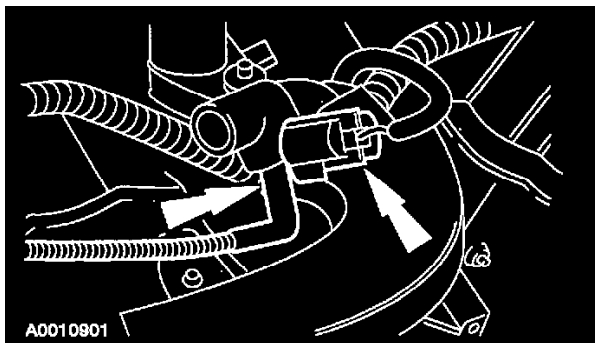
17. Loosen and disconnect the EGR tube from the manifold.



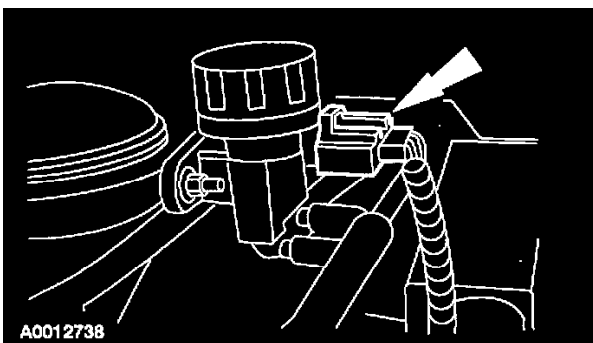
18. Disconnect the Throttle Position sensor (TPS) and Idle Air Control (IAC) valve electrical connectors.



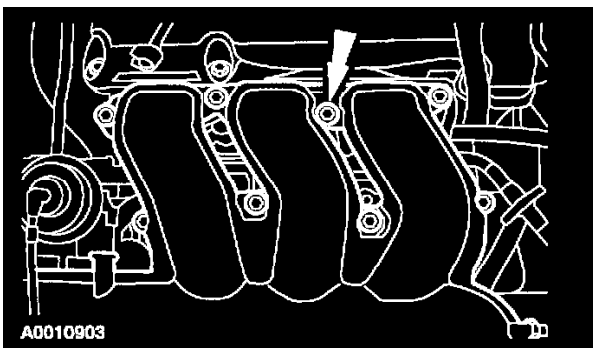
19. Disconnect the Positive Crankcase Ventilation (PCV) and Evaporative Emissions (EVAP) hose from the upper intake.



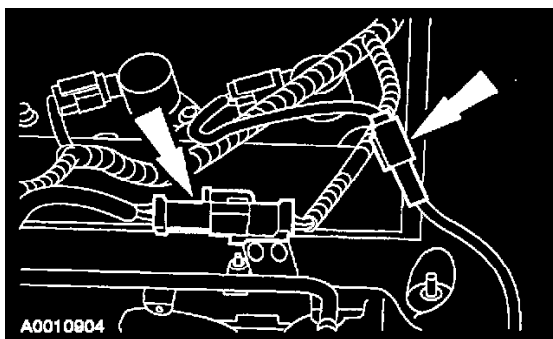
20. Disconnect the fuel pressure sensor vacuum hose and electrical connector.



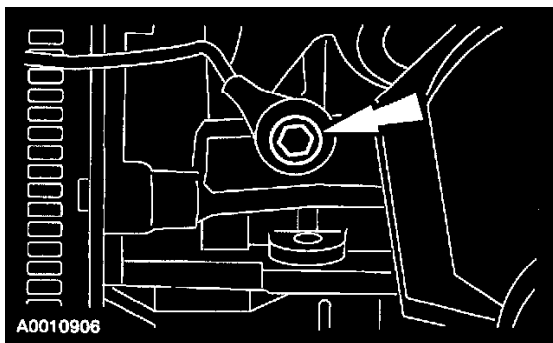
21. Disconnect the Exhaust Gas Recirculation (**EGR**) vacuum regulator solenoid electrical connector.



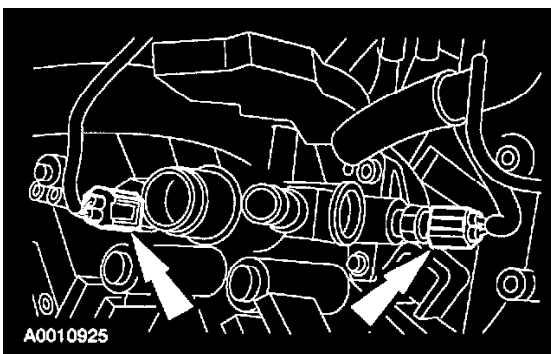
22. Remove the bolts and the upper intake manifold.
- Inspect the gaskets. Discard if damaged.



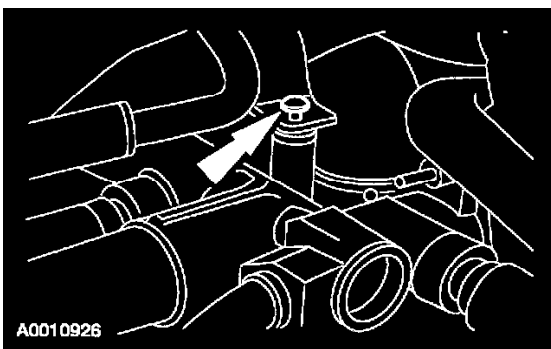
23. Disconnect the RH radio ignition interference capacitor and Heated Oxygen Sensor (**HO2S**) electrical connectors.



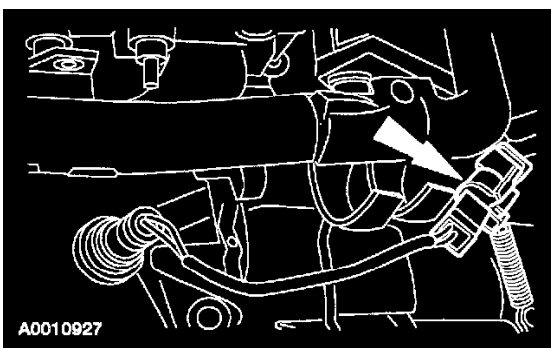
24. Remove the knock sensor bolt.



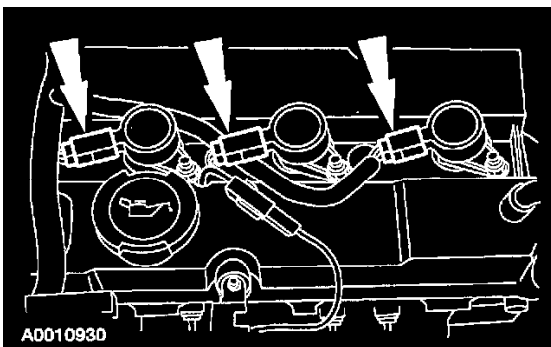
25. Disconnect the coolant temperature sensory electrical connectors.



26. Disconnect the harness from the coolant tube.

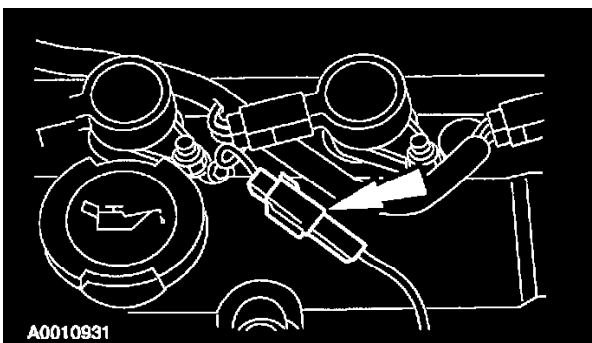


27. Disconnect and unclip the LH HO2S electrical connector from the coolant tube.

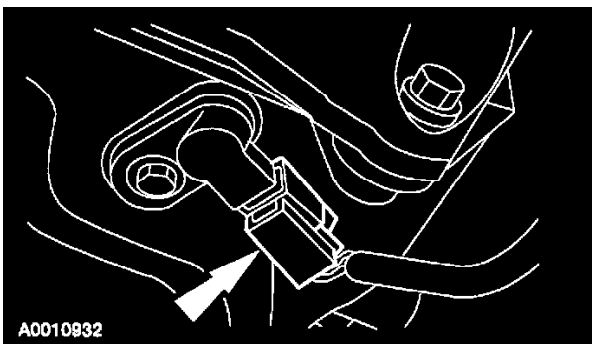


28. **Note:** LH shown, RH similar.

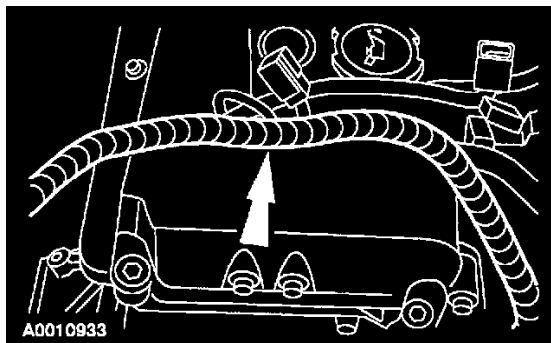
Disconnect the LH and RH coil-on-plug electrical connectors.



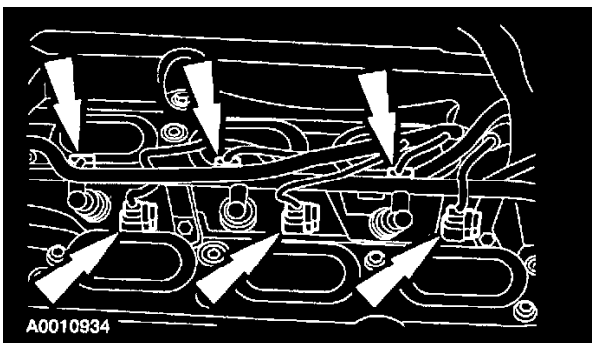
29. Disconnect and unclip the LH radio ignition interference capacitor.



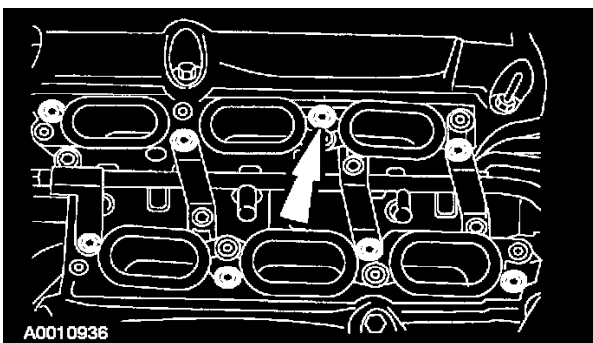
30. Disconnect the Camshaft Position (CMP) sensor electrical connector.



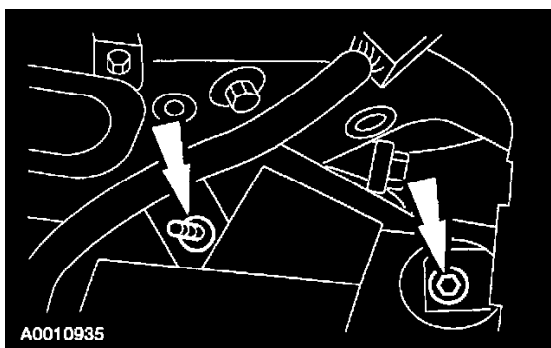
31. Disconnect the harness from the front LH valve cover studs.



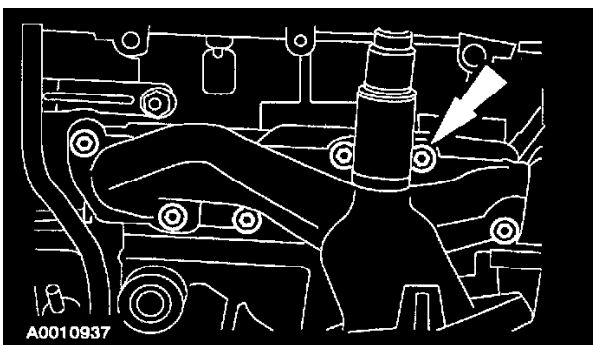
32. Disconnect the fuel injector electrical connectors.



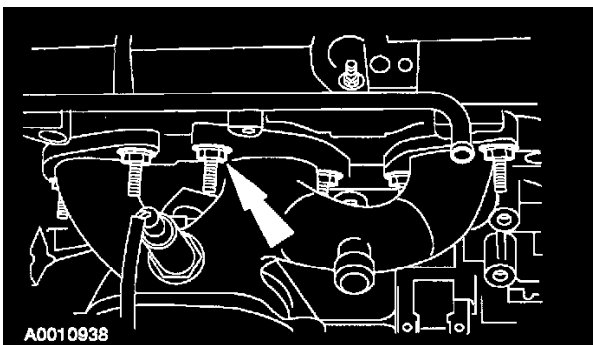
33. Remove the bolts and the lower intake manifold.



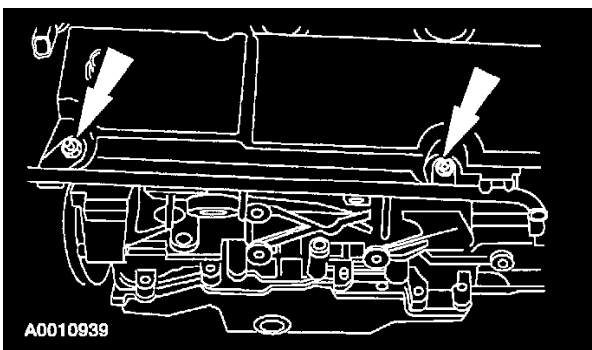
34. Remove the fuel charging harness.
- Disconnect the harness from the stud.
- Remove the harness nut.



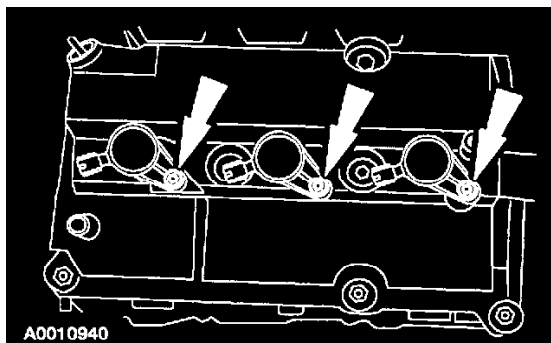
35. Remove the nuts and the LH exhaust manifold.
- Discard the gasket.



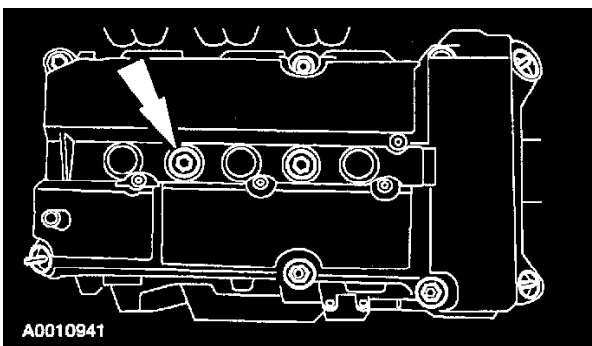
36. Remove the nuts and the RH exhaust manifold.
- Discard the gasket.



37. Remove the nuts and the EVAP tube from the RH valve cover.

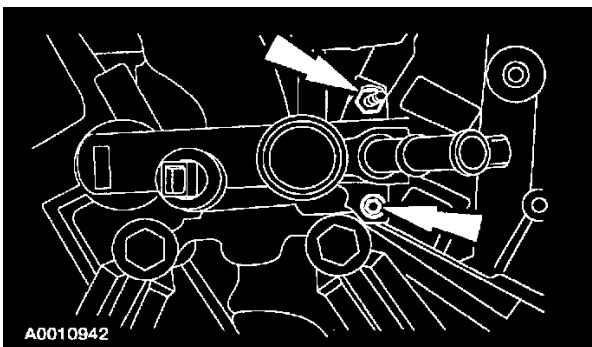


38. **Note:** RH shown, LH similar.
Remove the bolts and the RH and LH coil-on-plugs.



39. **Note:** RH shown, LH similar.

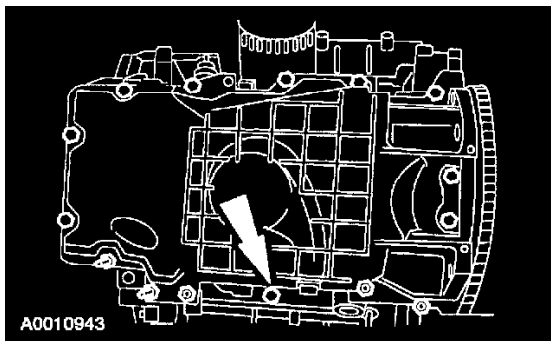
Remove the bolts and studs and the RH and LH valve cover.
- Remove and discard the gaskets.



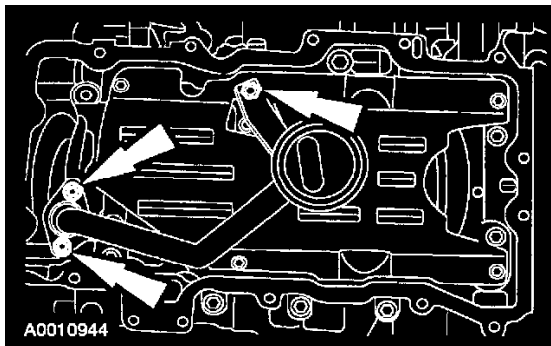
40. Remove the bolt and stud and the coolant tube.

Steps 41 - 79

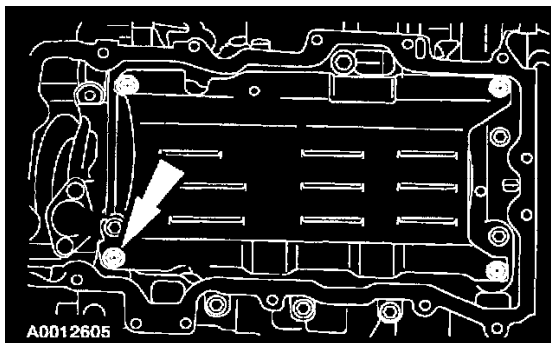
NOTE: Ford does not provide a TDC (Top Dead Center) mark or determination procedure for this engine in this vehicle. ALLDATA users have reported success using aftermarket tools to determine TDC on this engine.



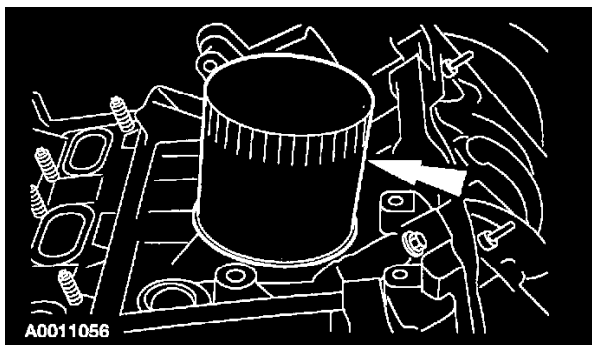
41. Remove the bolts and studs and the oil pan.
- Discard the gasket.



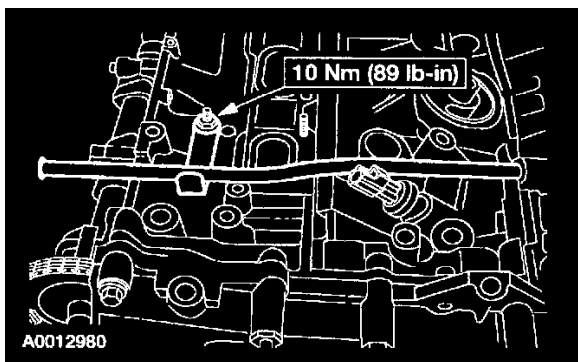
42. Remove the bolts, nut and the oil pick-up tube and screen.



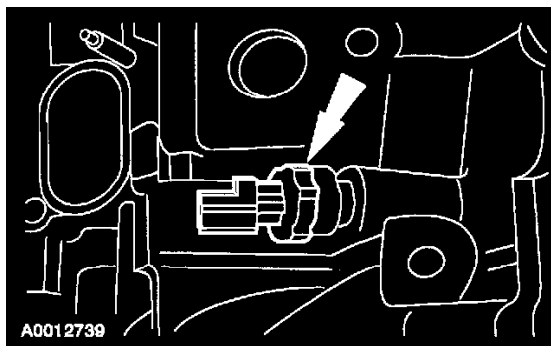
43. Remove the nuts and the oil pan baffle.



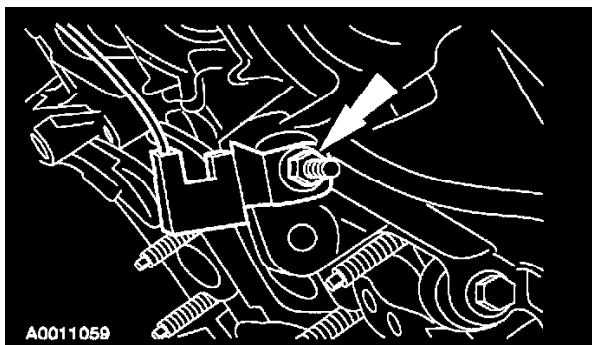
44. Remove the oil filter.



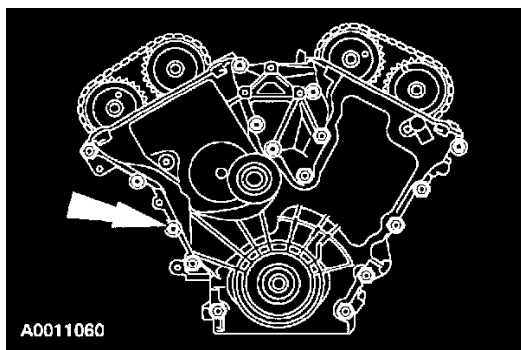
45. Remove the stud and the oil level indicator and tube.



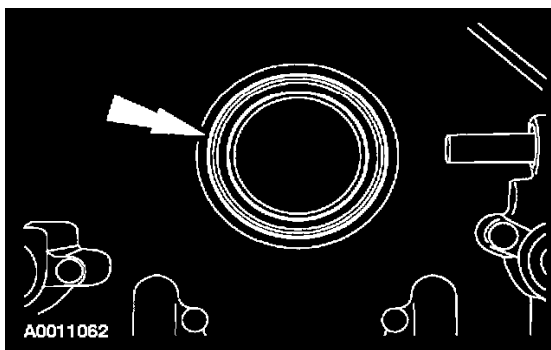
46. Remove the oil pressure sensor.



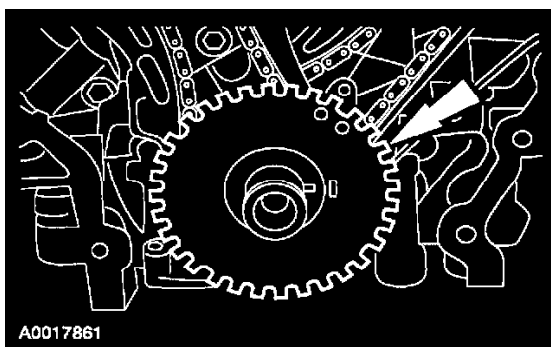
47. Remove the nut and the RH radio ignition interference capacitor.



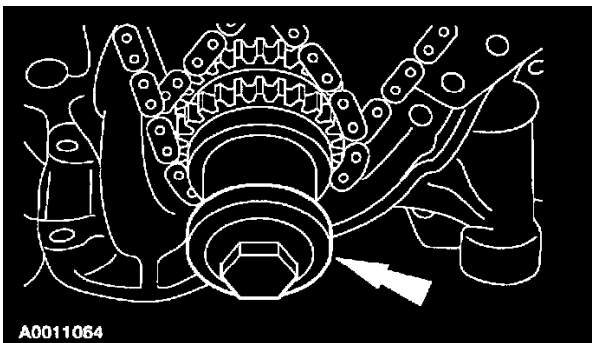
48. Remove the bolts, studs, and the front cover.



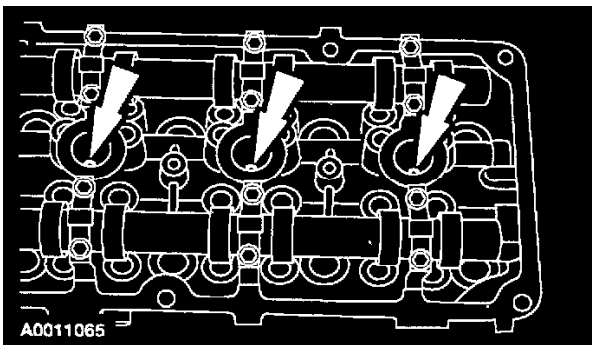
49. Remove the crankshaft front seal from the front cover.



50. Remove the ignition pulse wheel.

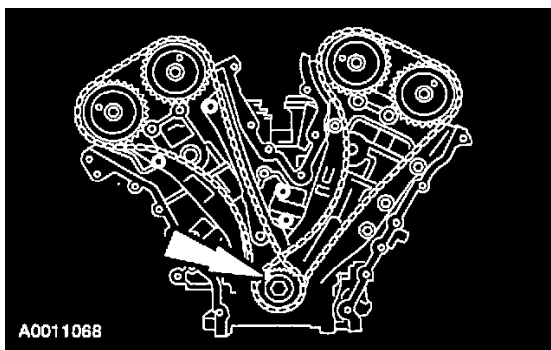


51. Install the damper bolt.

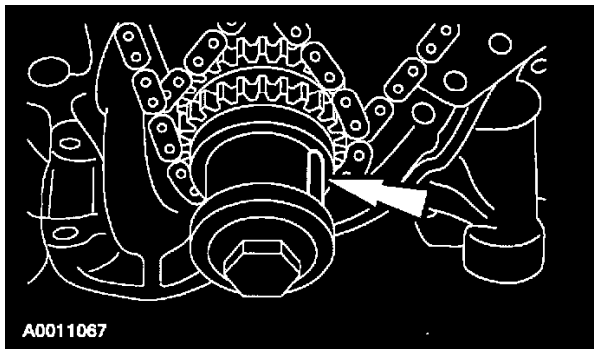


52. **Note:** LH shown, RH similar.

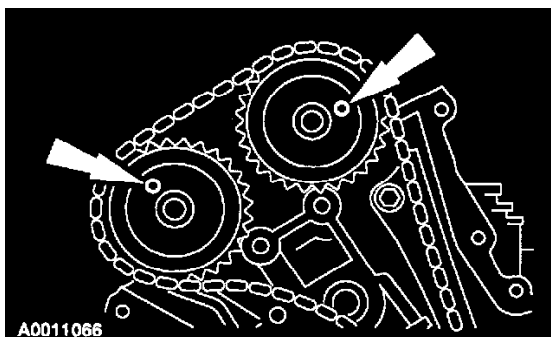
Remove the LH and RH spark plugs.



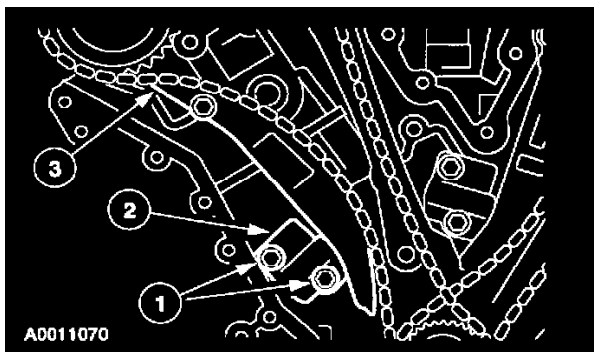
53. Rotate the crankshaft clockwise to position the crankshaft keyway in the 11 o'clock position and position the camshafts in the correct position. This will position the number one cylinder at Top Dead Center (TDC).
- Verify that the camshafts are correctly located. If not, rotate the crankshaft one additional turn and re-check.



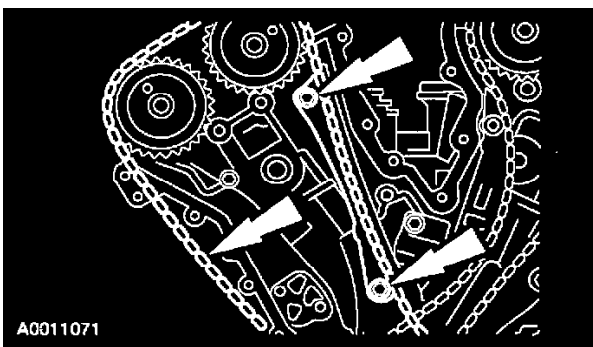
54. Rotate the crankshaft clockwise **120 degrees** to the **3 o'clock position** to locate the RH camshafts in the neutral position.



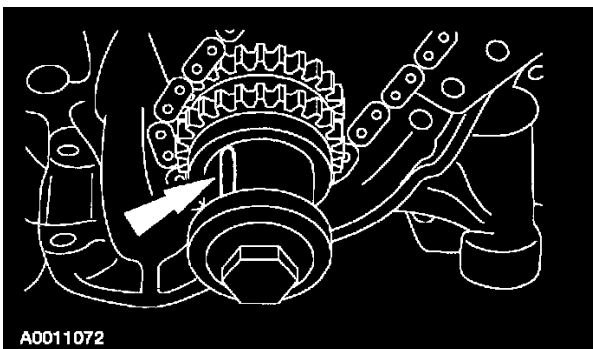
55. Verify that the RH camshafts are correctly positioned.



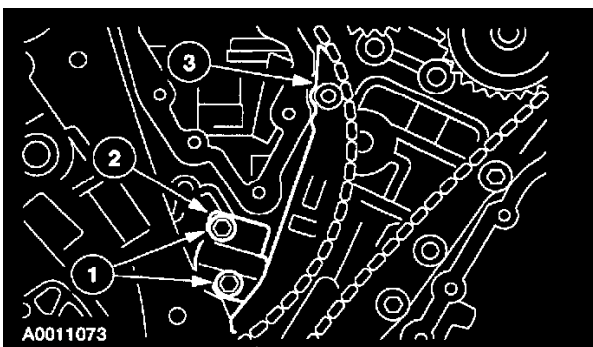
56. Remove the RH timing chain tensioner arm.
1. Remove the bolts.
 2. Remove the tensioner.
 3. Remove the tensioner arm.



57. Remove the bolts, RH timing chain guide and the timing chain.

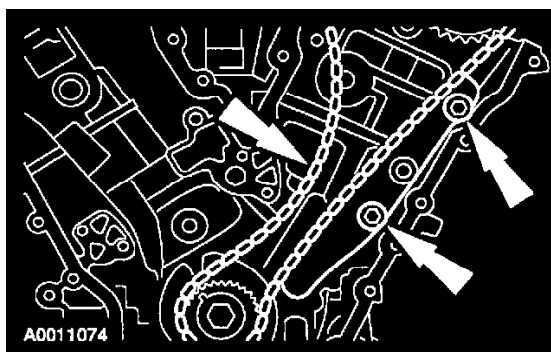


58. Rotate the crankshaft clockwise two times to position the crankshaft key way in the 11 o'clock position. This will position the LH camshafts in the neutral position.

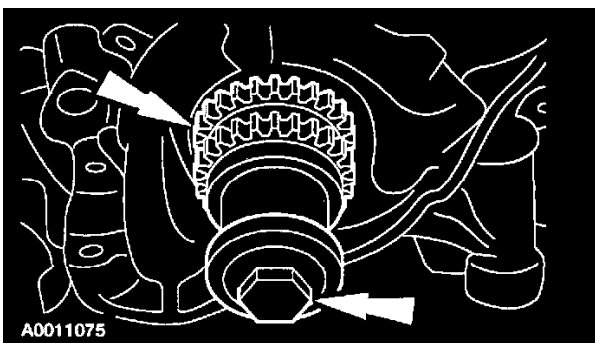


59. Remove the LH timing chain and tensioner arm.

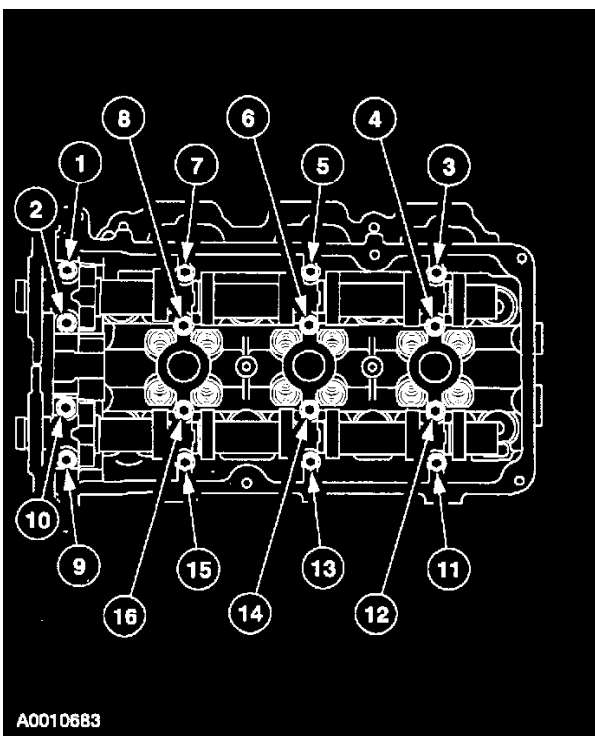
1. Remove the bolts.
2. Remove the tensioner.
3. Remove the tensioner arm.



60. Remove the LH timing chain and timing chain guide.



61. Remove the damper bolt and the crankshaft sprocket.



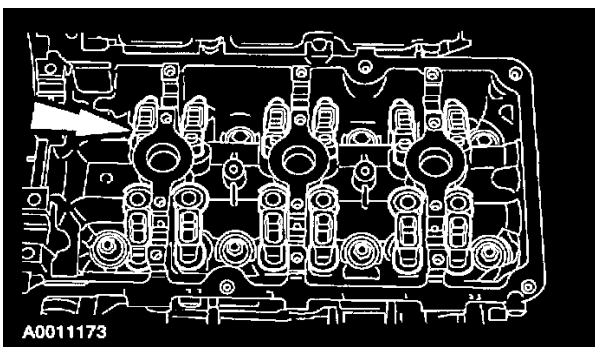
62. **Note:** LH shown, RH similar.

Note: The camshaft caps have alignment dowels.

Loosen the LH and RH camshaft cap bolts in the indicated sequence and remove the camshaft caps.

- Tap the caps lightly with a soft faced mallet to loosen the camshaft caps.

63. Remove the LH and RH camshafts.

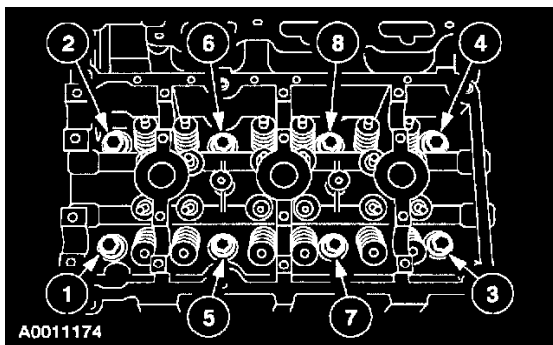


64. **CAUTION:** The camshaft followers must be installed in the original position.

Note: LH shown, RH similar.

Remove the LH and RH camshaft followers.

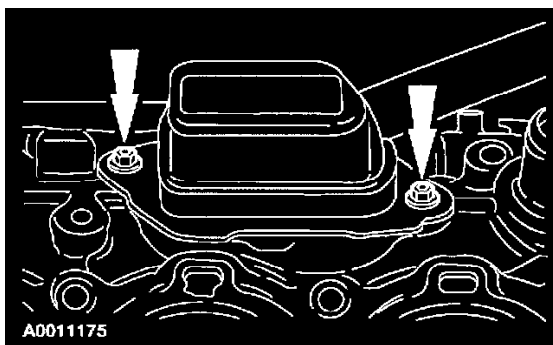
- Mark the location of the followers using a permanent-type marker.



65. **Note:** LH shown, RH similar.

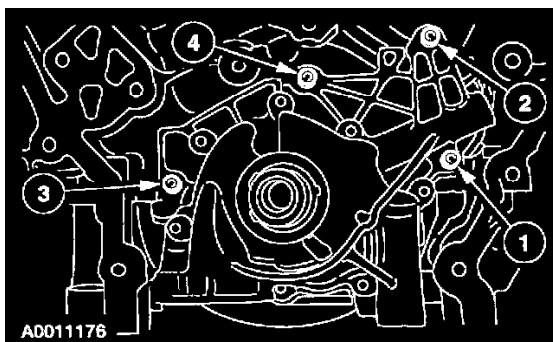
Loosen the bolts in the indicated sequence and remove the LH and RH cylinder heads.

- Discard the gaskets.

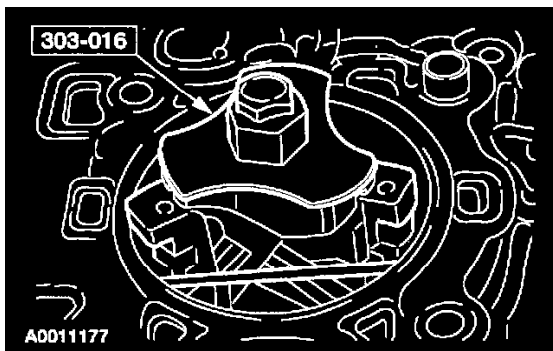


66. Remove the bolts and the oil separator.

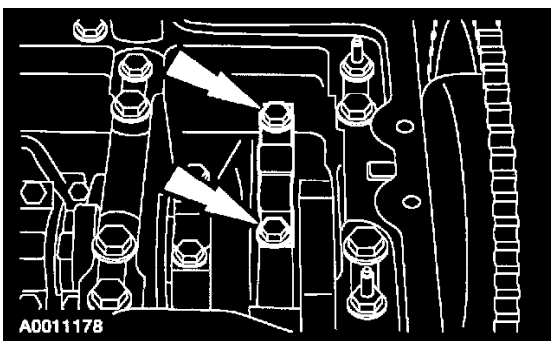
- Discard the gaskets.



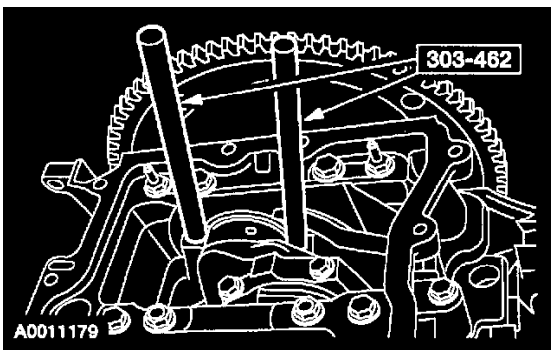
67. Remove the bolts in the indicated sequence and remove the oil pump.



68. Using the special tool, remove the cylinder ridge.

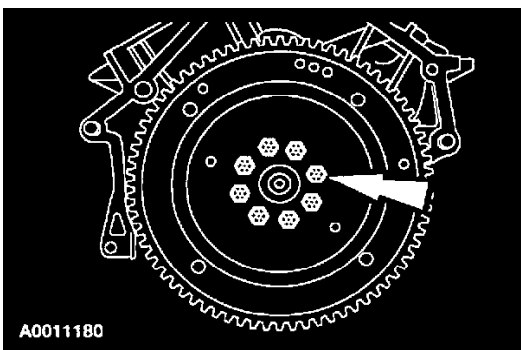


69. Remove the connecting rod cap bolts. Hold the piston/rod assembly to keep it from falling from the engine block.

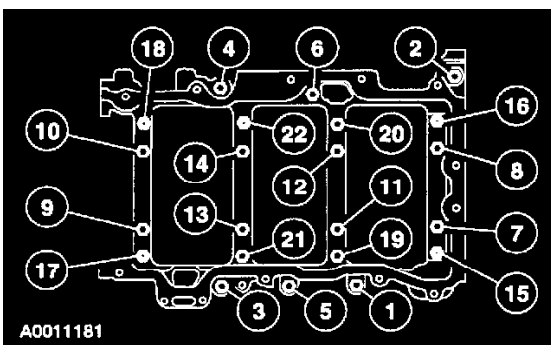


70. Using the special tool, remove the piston/rod assembly from the engine block.

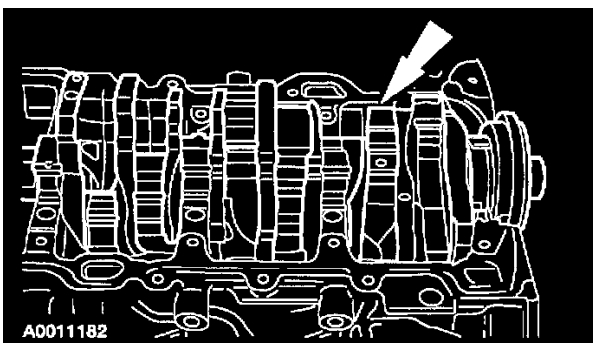
71. Remove the engine block from the stand and place on a workbench.



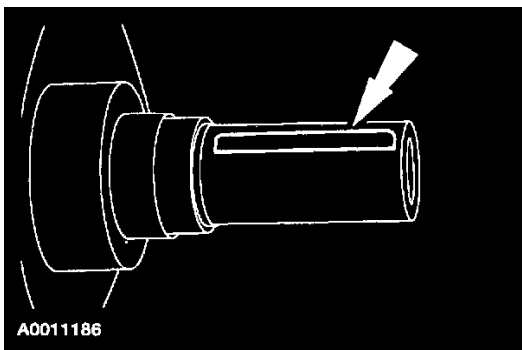
72. Remove the bolts and the flex plate.



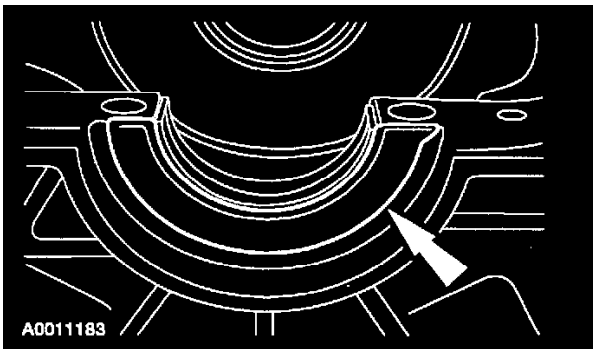
73. Remove the bolts and studs in the indicated sequence and remove the lower cylinder block.



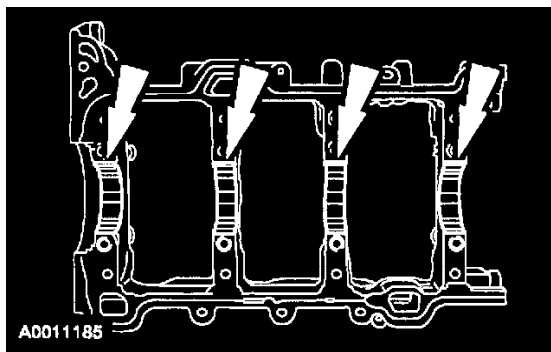
74. Remove the crankshaft rear main seal and remove the crankshaft.



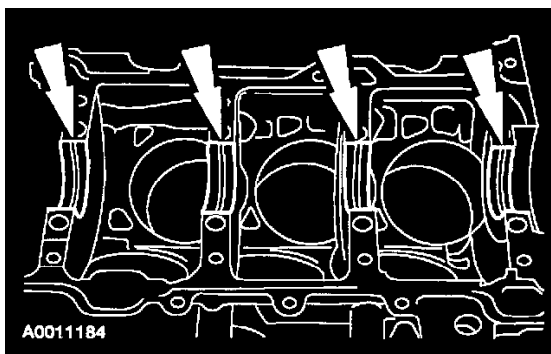
75. Remove the crankshaft key.



76. Remove the crankshaft thrust bearing from the cylinder block.



77. Remove the bearings from the lower cylinder block.



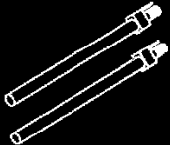
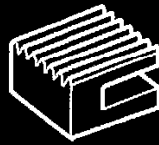



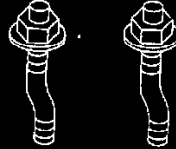
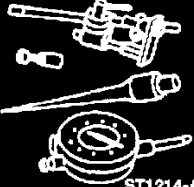
78. Remove the crankshaft main bearings from the cylinder block.

79. Inspect the cylinder block, lower cylinder block, cylinder heads, pistons and connecting rods.

Steps 1 - 51

NOTE: Ford does not provide a TDC (Top Dead Center) mark or determination procedure for this engine in this vehicle.

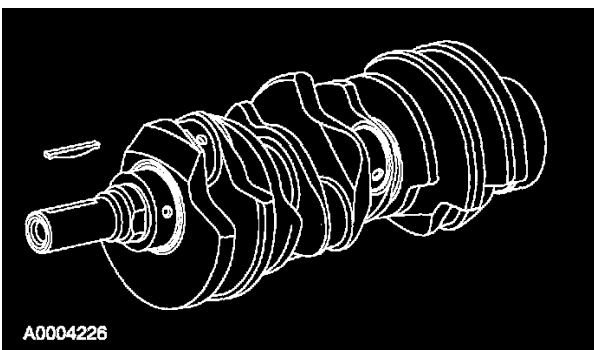
ALldata users have reported success using aftermarket tools to determine TDC on this engine.

 <p>ST1982-A</p>	<p>Connecting Rod Guide Set 303-462 (T94P-6136-AH)</p>	 <p>ST1696-A</p>	<p>Flywheel Holding Tool 303-544 (T96P-6375-A)</p>
 <p>ST1287-A</p>	<p>Crankshaft Damper Replacer 303-102 (T74P-6316-B)</p>	 <p>ST1327-A</p>	<p>Rear Main Seal Replacer 303-178 (T82L-6701-A)</p>
 <p>ST2296-A</p>	<p>Crankshaft Seal Installer/Aligner 303-335 (T88T-6701-A)</p>	 <p>ST1333-A</p>	<p>Rear Crankshaft Adapter Belts 303-384 (T91P-6701-A)</p>
 <p>ST1214-A</p>	<p>Dial Indicator with Bracketry 100-002 (TOOL-4201-C)</p>		

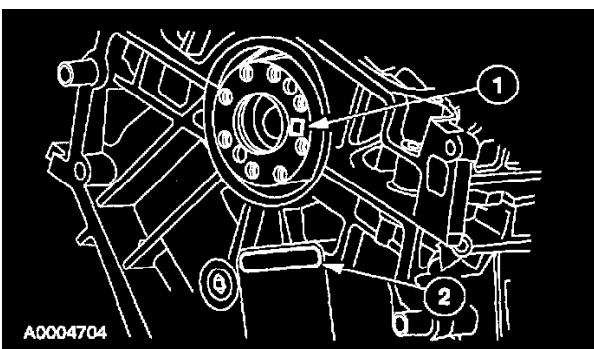
Special Tools

- WARNING:** Eye protection is required to be worn during the use of compressed air. Failure to wear eye protection could result in possible personal injury.

Clean gasket material, dirt and foreign material from the cylinder block. Wash the cylinder block with a suitable soap and water solution, and dry with compressed air.



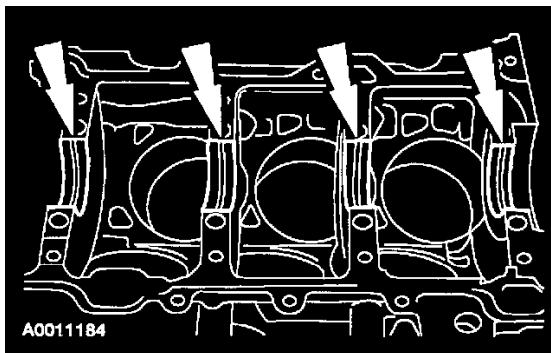
2. If removed, install the crankshaft key into the keyway on the crankshaft.



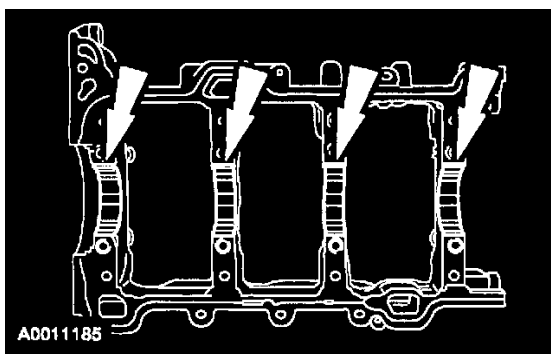
3. **Note:** This procedure is for selecting bearings using a new crankshaft.

		BLOCK CODE																							
		99	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
CRANKSHAFT CODE	91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	90	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	89	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	88	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	87	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	86	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
	85	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	84	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	83	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	82	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	81	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
	80	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
	79	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
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	77	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
	76	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3
	75	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
	74	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
	73	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
	72	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	71	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
70	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
69	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
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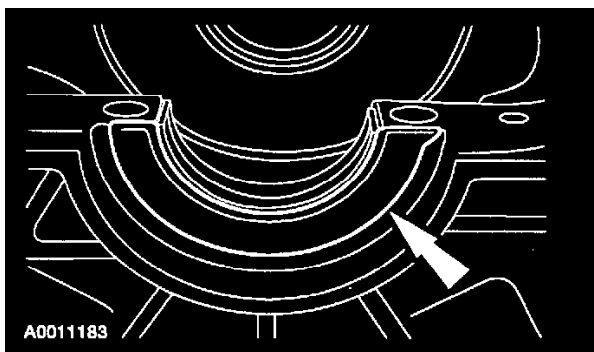
- Select the crankshaft main bearings for each crankshaft journal.
1. Read the code on the crankshaft flange.
 2. Read the code on the cylinder block rear face.
 - The first two numbers after the asterisk make up the code for main No.1 and the next two numbers for main No. 2.
 - The first two numbers after the second asterisk make up the code for main No.3 and the last two numbers for main No. 4.
 4. Using the chart, choose a bearing for each main. Match the block and crankshaft code with its corresponding column or row, by reading across the "crankshaft" row and down the "block" column.
 - For example: If the block code is *0609*0711* and the crankshaft code is *8480*8082*, main No.1 should use grade 1 bearings, as determined by the intersection of the 06 block column and the 84 crankshaft row. Mains 2,3 and 4 should all be grade 2.



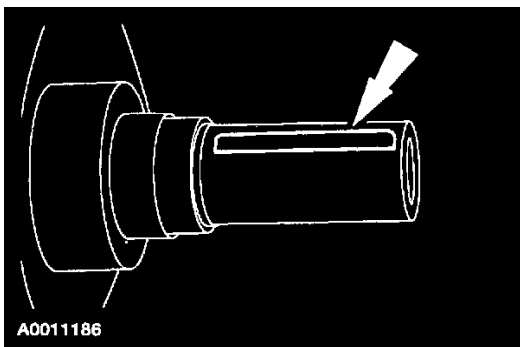
5. Install the main bearings into the cylinder block.



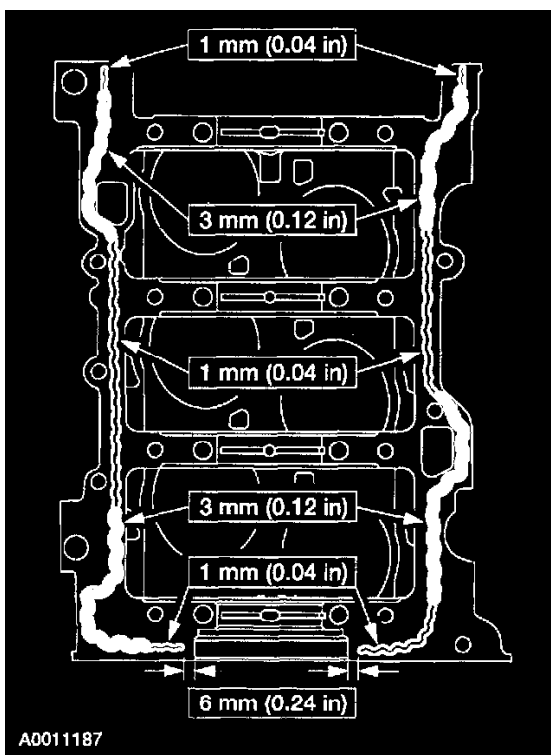
6. Install the main bearings into the lower cylinder block.



7. Install the crankshaft thrust bearing.



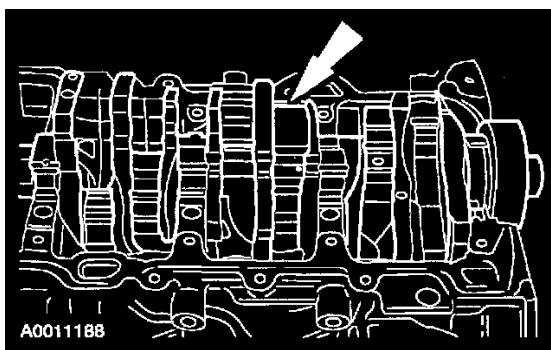
8. If removed, install the crankshaft key.



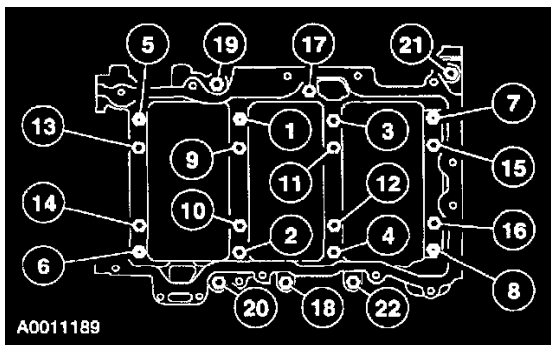
9. **CAUTION:** The lower cylinder block must be installed and the bolts tightened within four minutes of applying the sealant.

Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the cylinder block as shown.

10. Apply Super Premium SAE 5W-30 Motor Oil XO-5W-30-QSP meeting Ford specification WSS-M2C153-G to the crankshaft main and rod bearing journals.



11. Position the crankshaft in the cylinder block.

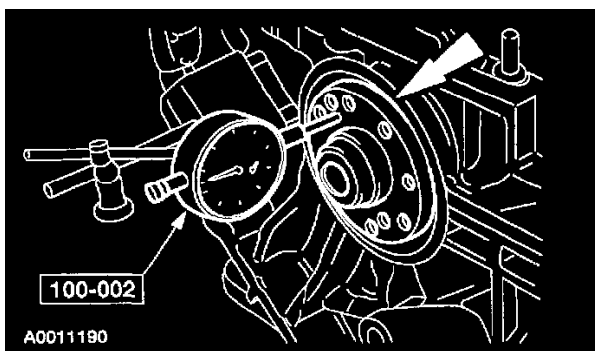


12. **CAUTION:** Fasteners No. 1, 5, 6, 7, 8 are studs. Fasteners No. 18-22 are M8 x 1.25 mm x 79.3 mm (0.05 inch x 3.12 inch) bolts. Fasteners No. 2-4, 17 are M8 x 1.25 mm x 95.3 mm (0.05 inch x 3.75 inch) bolts. Fasteners 9-16 are M10 x 1.5 mm x 106 mm (0.06 inch x 4.17 inch) bolts. The bolts and studs must be installed in the correct position or engine damage may result.

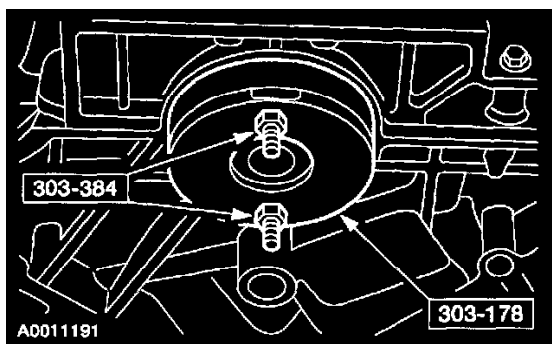
Position the lower cylinder block and install the bolts and studs.

- Tighten the bolts and studs in the sequence shown in four stages.
- Stage 1: Tighten fasteners 1-8 to 25 Nm (18 ft. lbs.).

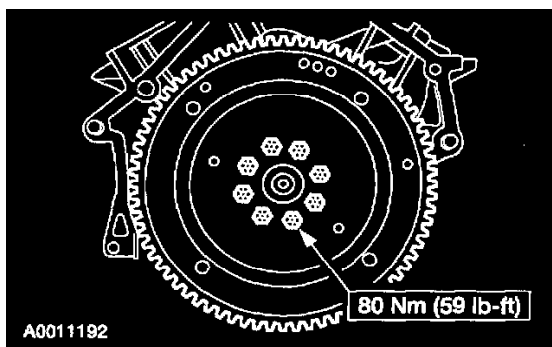
- Stage 2: Tighten fasteners 9-19 to **40 Nm (30 ft. lbs.)**.
- Stage 3: Tighten fasteners 1-16 **90 degrees**.
- Stage 4: Tighten fasteners 17-22 to **25 Nm (18 ft. lbs.)**.



13. Using the special tool, measure crankshaft end play.



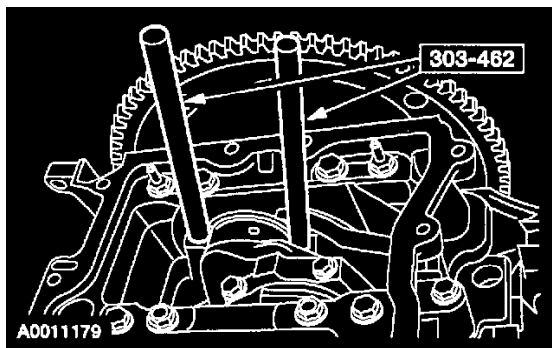
14. Using the special tools, install the crankshaft rear oil seal.



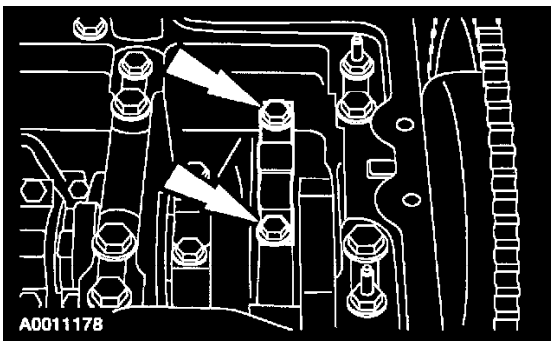
15. Position the flexplate and install the bolts.

16. Mount the engine on an engine stand.

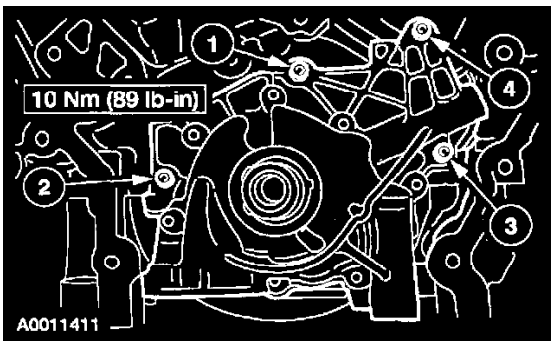
17. Apply Super Premium SAE 5W-30 Motor Oil XO-5W-30-QSP meeting Ford specification WSS-M2C153-G to the cylinder bores.



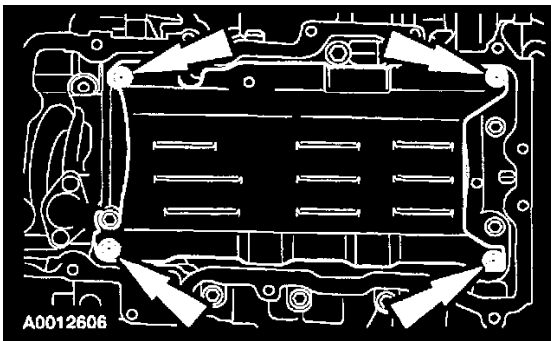
18. Using the special tool, install the piston and connecting rod assemblies.



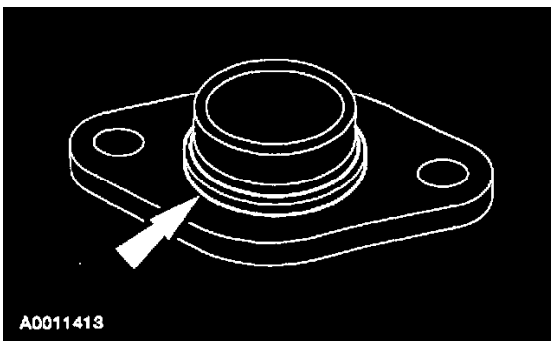
19. Install the connecting rod caps and bolts.
- Tighten the bolts in two stages.
 - Stage 1: Tighten to **23 Nm (17 ft. lbs.)**.
 - Stage 2: Tighten to **43 Nm (32 ft. lbs.)**.



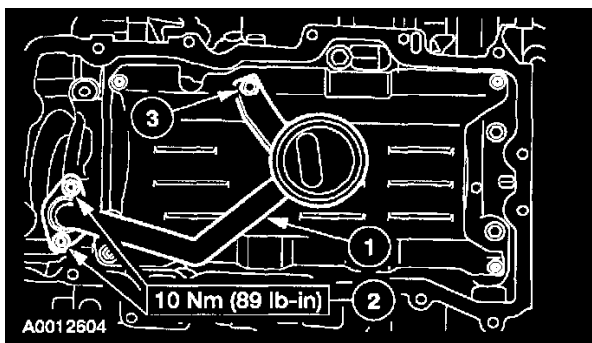
20. Position the oil pump and install the bolts in the indicated sequence.



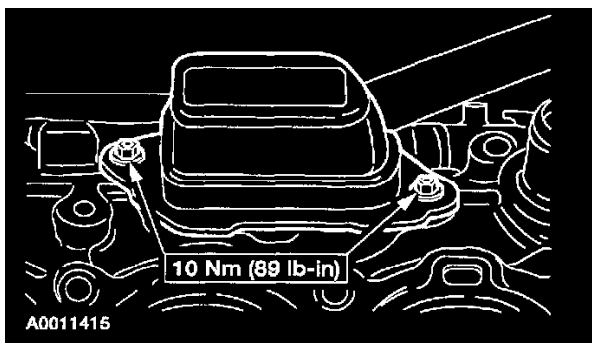
21. Position the oil pan baffle and install the nuts.
- Tighten the nuts in two stages.
 - Stage 1: Tighten to **5 Nm (44 inch lbs.)**.
 - Stage 2: Tighten **45 degrees**.



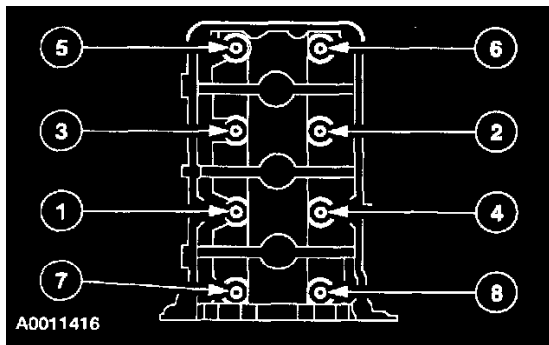
22. Install a new O-ring seal on the oil pump screen and pick-up tube.



23. Install the oil pump screen and pick up tube.
1. Position the oil pump screen and pick up tube.
 2. Install the bolts.
 3. Install the nut.
 - Tighten the nut in two stages.
 - Stage 1: Tighten to **5 Nm (44 inch lbs.)**.
 - Stage 2: Tighten **45 degrees**.



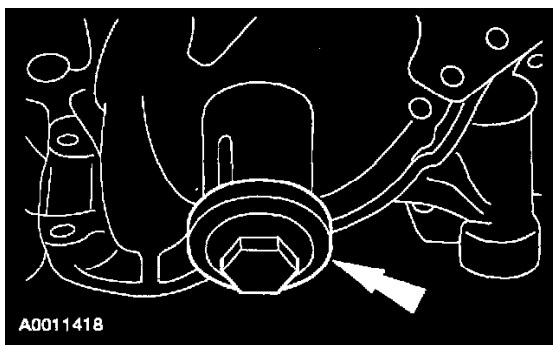
24. Position the oil separator, gasket, and install the bolts.



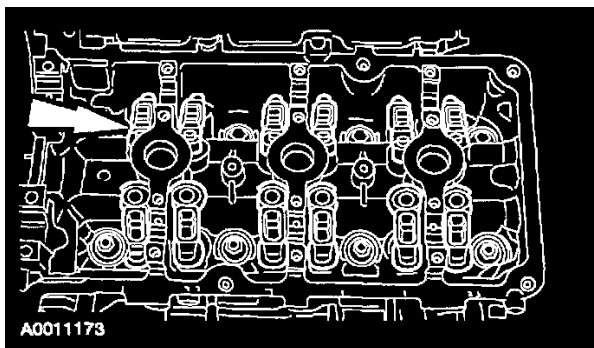
25. **Note:** LH shown, RH similar.

Position the LH and RH cylinder heads, gaskets, and install the bolts.

- Tighten the bolts in the sequence shown in six stages.
- Stage 1: Tighten to **40 Nm (30 ft. lbs.)**.
- Stage 2: Tighten to **90 Nm (66 ft. lbs.)**.
- Stage 3: Loosen **one full turn**.
- Stage 4: Tighten to **40 Nm (30 ft. lbs.)**.
- Stage 5: Tighten **90 degrees**.
- Stage 6: Tighten **90 degrees**.



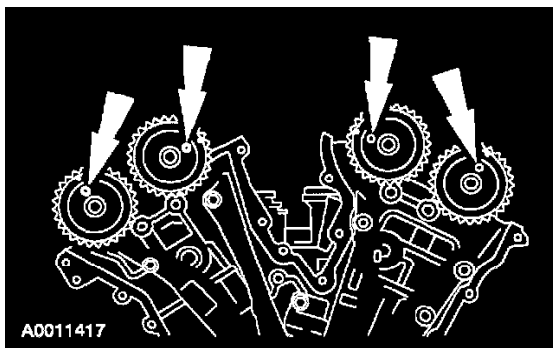
26. Install the crankshaft damper bolt and rotate the crankshaft key way to the 3 o'clock position to locate Top Dead Center (TDC).
27. Apply Super Premium SAE 5W-30 Motor Oil XO-5W-30-QSP meeting Ford specification WSS-M2C153-G to the LH and RH camshaft followers.



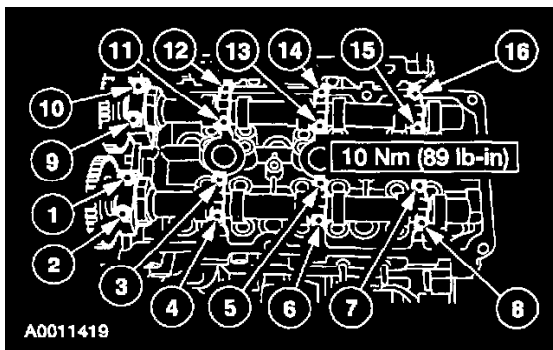
28. **Note:** LH shown, RH similar.

Install the LH and RH camshaft followers.

29. Apply Super Premium SAE 5W-30 Motor Oil XO-5W-30-QSP meeting Ford specification WSS-M2C153-G to the LH and RH camshafts.

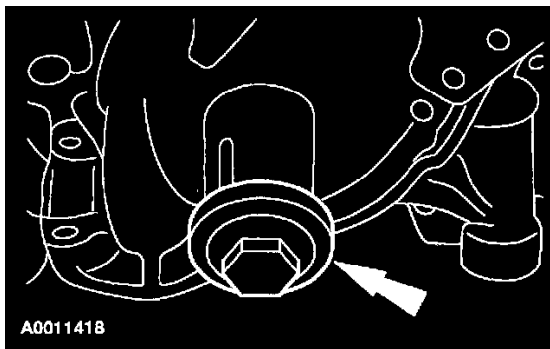


30. Install the LH and RH camshafts.
 - Locate the camshafts as shown.

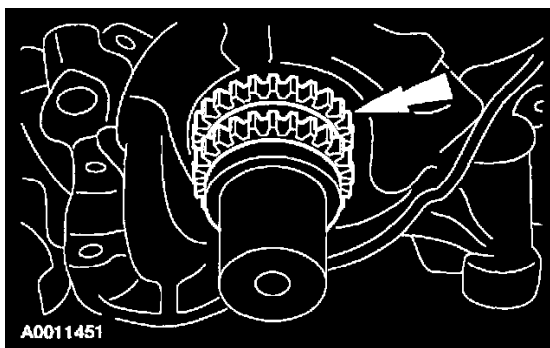


31. **Note:** LH shown, RH similar.

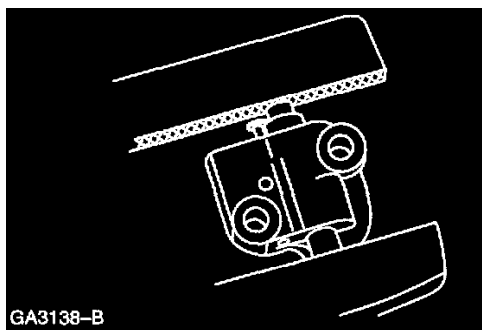
Position the LH and RH camshaft caps and install the bolts in the sequence shown.



32. Remove the crankshaft damper bolt.

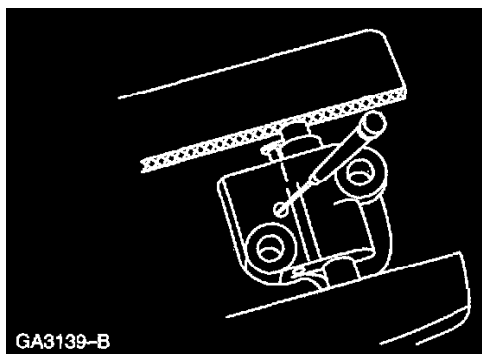


33. Install the crankshaft sprocket.



34. **Note:** LH shown, RH similar.

Position the chain tensioner in a soft-jawed vise.

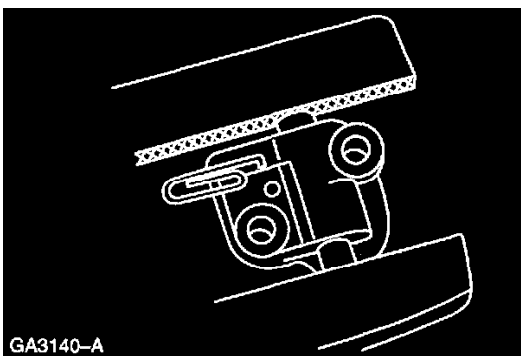


35. **Note:** LH shown, RH similar.

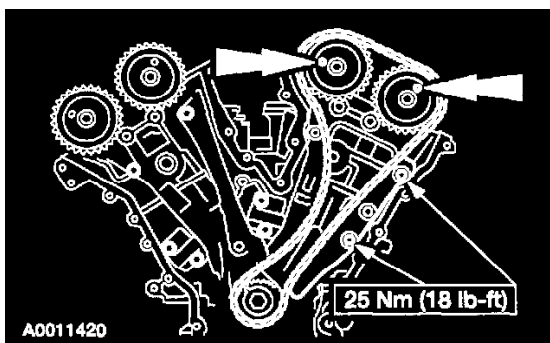
Hold the chain tensioner ratchet lock mechanism away from the ratchet stem with a small pick.

36. **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner piston is fully bottomed in its bore or damage to the ratchet stem will result.

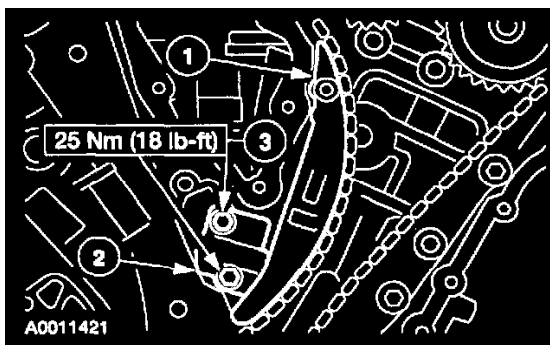
Slowly compress the timing chain tensioner.



37. Retain the tensioner piston with a 1.5 mm (0.06 inch) wire or paper clip.

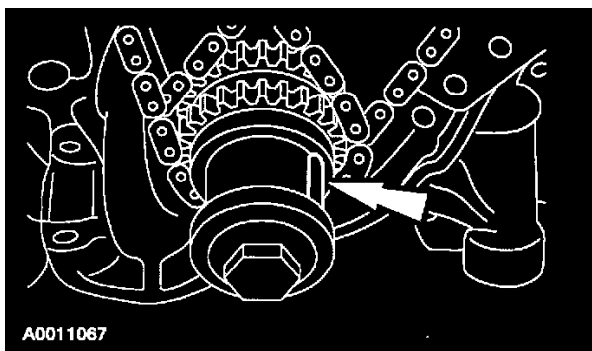


38. Position the LH timing chain and guide and install the bolts.
- Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.

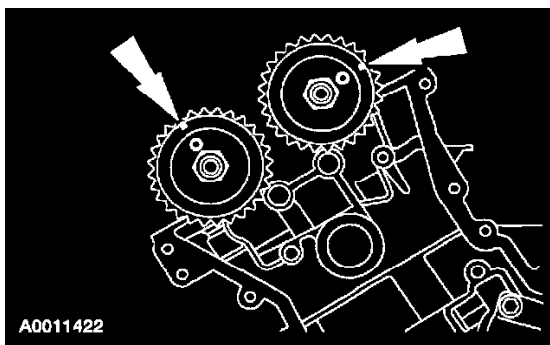


39. Install the LH timing chain tensioner and tensioner arm.

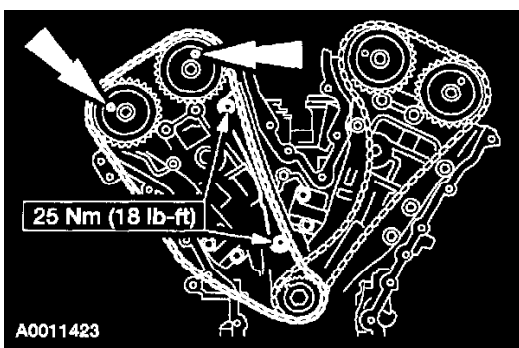
1. Install the tensioner arm.
2. Position the tensioner.
3. Install the bolts.



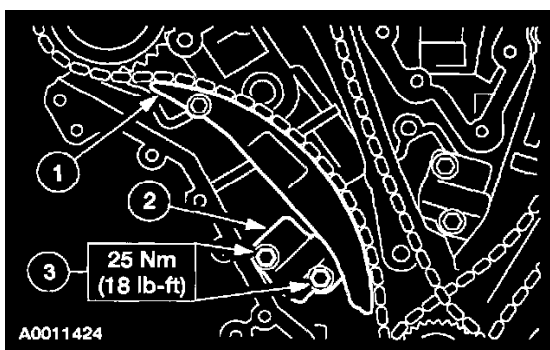
40. Install the crankshaft damper bolt and rotate the crankshaft keyway to the 3 o'clock position.



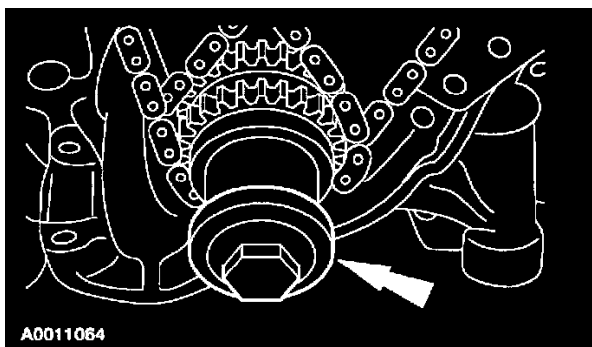
41. Verify that the RH camshafts are correctly positioned.



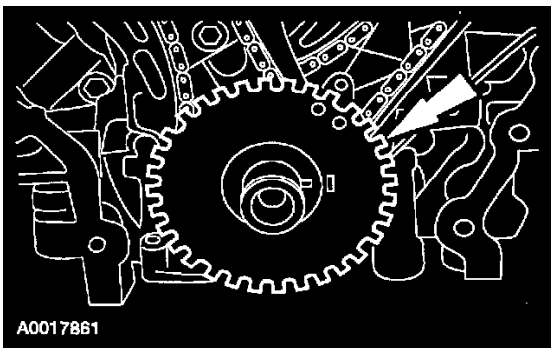
42. Position the RH timing chain and chain guide and install the bolts.
- Align the marks on the timing chain with the marks on the camshaft and crankshaft sprockets.



43. Install the RH timing chain tensioner and tensioner arm.
1. Install the tensioner arm.
2. Position the tensioner.
3. Install the bolts.
44. Remove the LH and RH timing chain tensioner piston retaining wires.

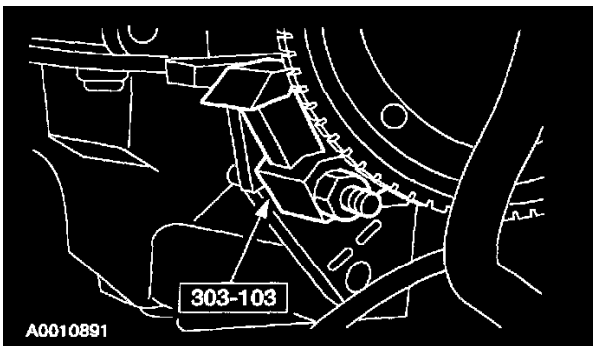


45. Remove the crankshaft damper bolt.



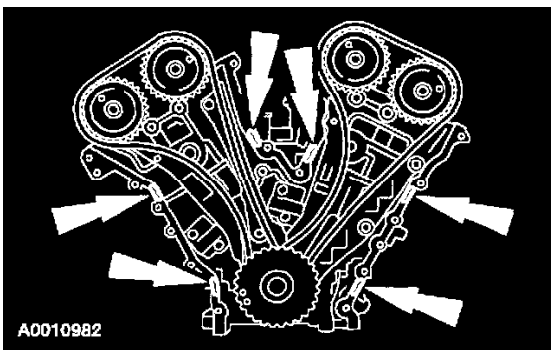
46. **Note:** Crank keyway must line up with line.

Install the ignition pulse wheel.



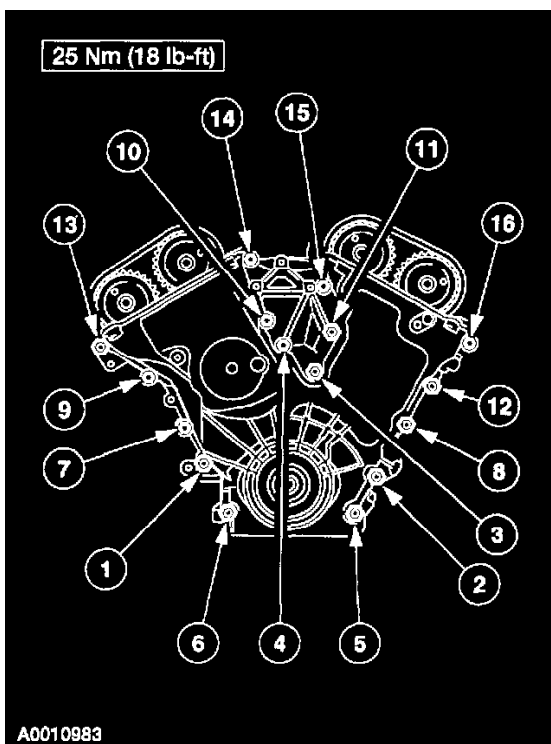
47. Install the special tool to hold the flex plate.

48. Install a new gasket in the front cover.



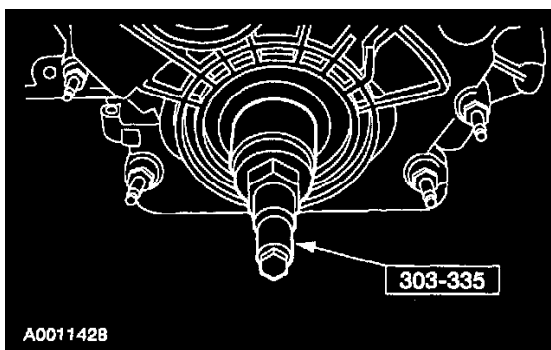
49. **Note:** The front cover must be installed and the bolts tightened within six minutes of sealant application.

Apply a 6 mm (0.24 inch) dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the cylinder block to lower cylinder block and cylinder head mating surfaces.



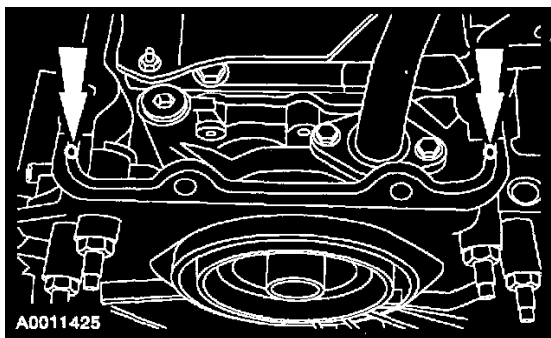
50. **Note:** Fasteners No. 1-3, 5, 6, 8, 11, 12, and 13 are studs.

Position the front cover and install the bolts and studs in the sequence shown.



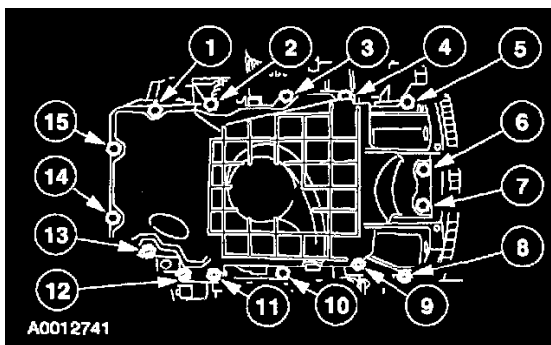
51. Using the special tool, install the crankshaft front oil seal.

Steps 52 - 103



52. **Note:** The oil pan must be installed and the bolts tightened within six minutes of sealant application.

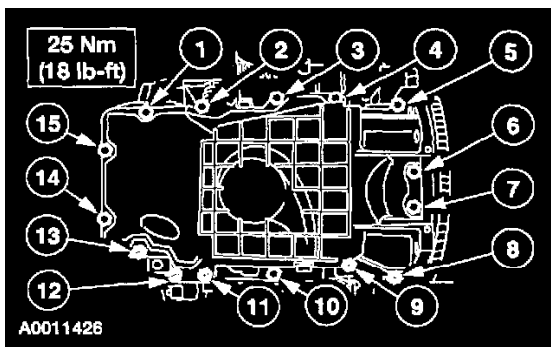
Apply a 10 mm (0.24 inch) dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A4 to the front cover to cylinder block mating surface.



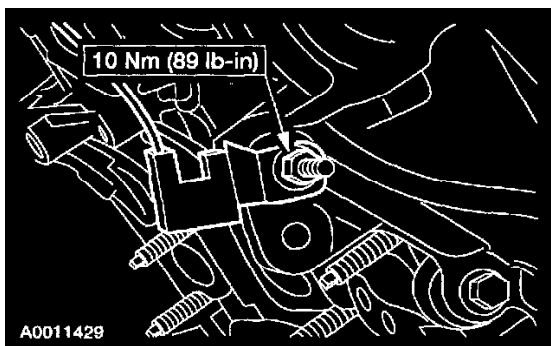
53. **Note:** Fasteners No. 12 and 13 are studs.

Position the oil pan and gasket and loosely install the bolts and studs in the indicated sequence.

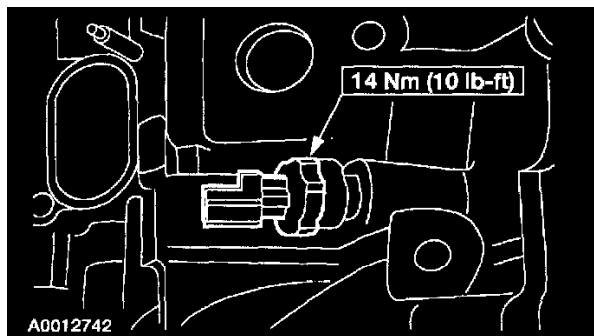
54. Align the transaxle face of the oil pan with the rear of the cylinder block. The pan should be **0.00 mm (0.0 inch)-0.25 mm (0.009 inch)** under flush. Assemblies that are between **0.26 (0.01 inch)-0.50 mm (0.019 inch)** should be shimmed using either one or two **0.25 mm (0.009 inch)** gold shims. Assemblies that are between **0.51 mm (0.020 inch)-0.75 mm (0.029 inch)** should be shimmed using either one or two **0.50 mm (0.019 inch)** silver shims. If the pan measures greater than **0.75 mm (0.029 inch)** or the pan is over flush of the cylinder block, the entire pan assembly must be removed and a new one installed.



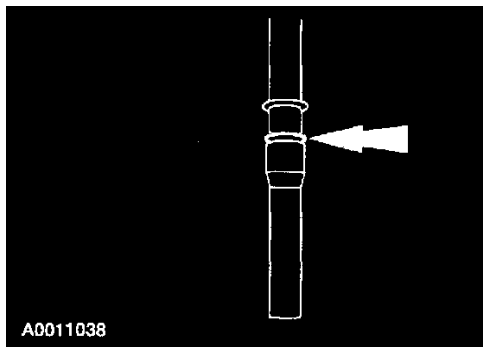
55. Tighten the oil pan bolts and studs in the sequence shown.



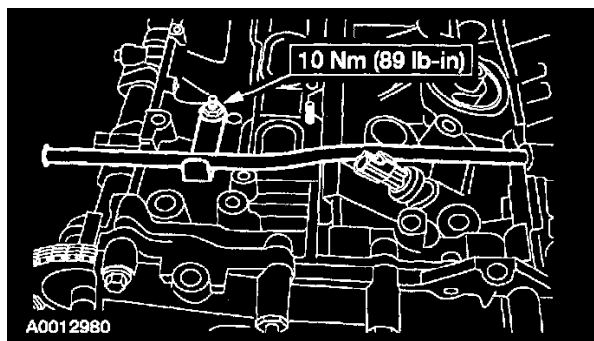
56. Position the RH radio ignition interference capacitor and install the nut.



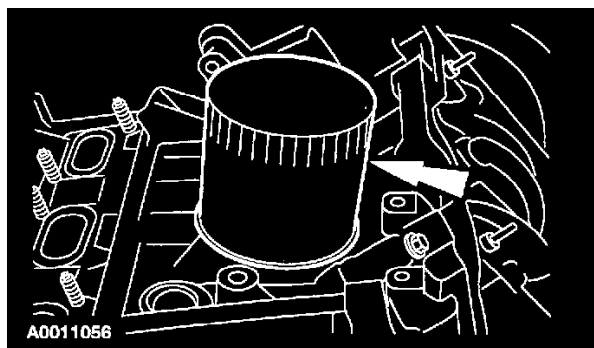
57. Install the oil pressure sensor.



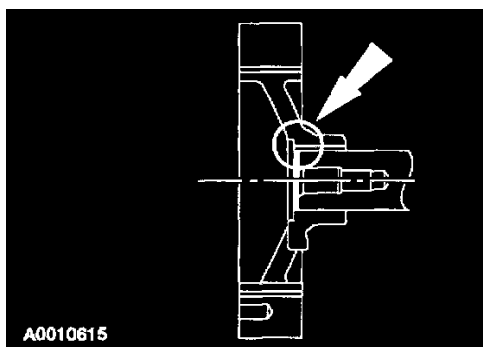
58. Install a new seal on the oil level indicator tube.



59. Install the oil level indicator tube and install the bolt.

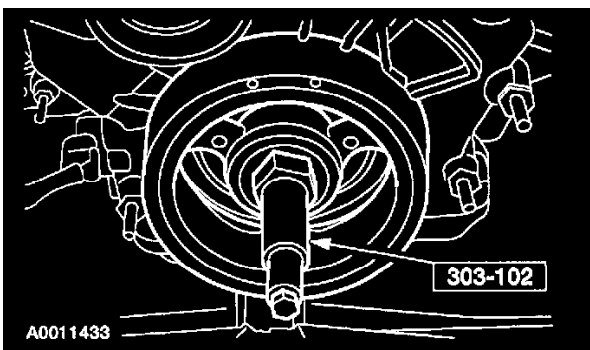


60. Install a new oil filter.

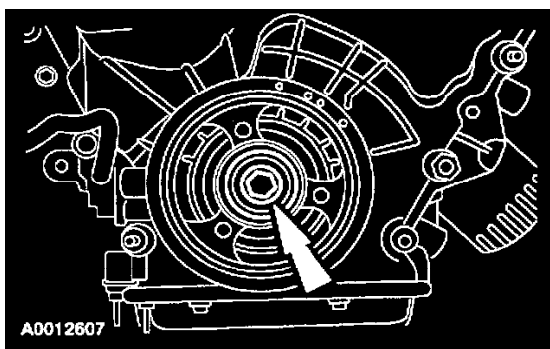


61. **Note:** The crankshaft damper must be installed and the bolt tightened with in six minutes of sealant application.

Apply Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A to the end of the crankshaft damper keyway slot.



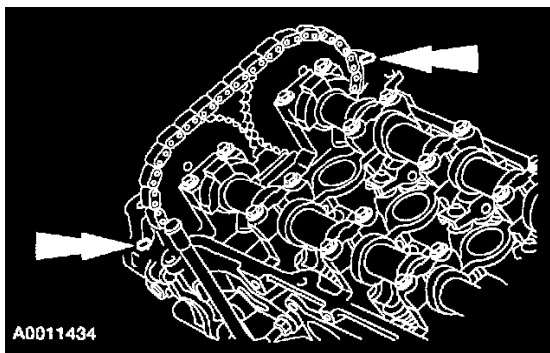
62. Using the special tool, install the crankshaft vibration damper.



63. Install the crankshaft vibration damper washer and bolt.

- Tighten the bolt in four stages.
- Stage 1: Tighten to **120 Nm (89 ft. lbs.)**.
- Stage 2: Loosen **one full turn (360 degrees)**.
- Stage 3: Tighten to **50 Nm (37 ft. lbs.)**.
- Stage 4: Tighten to **90 Nm (66 ft. lbs.)**.

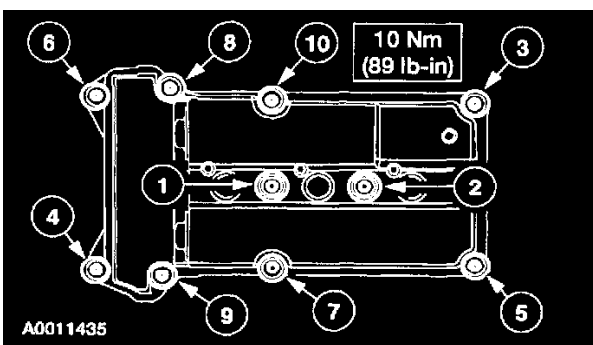
64. Install new gaskets in the valve covers.



65. **Note:** The valve cover must be installed and the bolts and studs tightened within six minutes of sealant application.

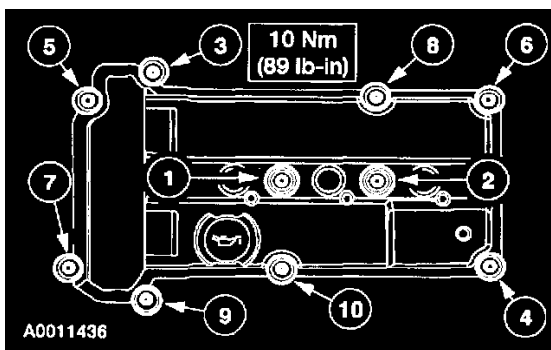
Note: LH shown, RH similar.

Apply a 8 mm (0.31 inch) dot of Silicone Gasket and Sealant F7AZ-19554-EA or equivalent meeting Ford specification WSE-M4G323-A at the cylinder block to front cover mating surface of the LH and RH valve covers.



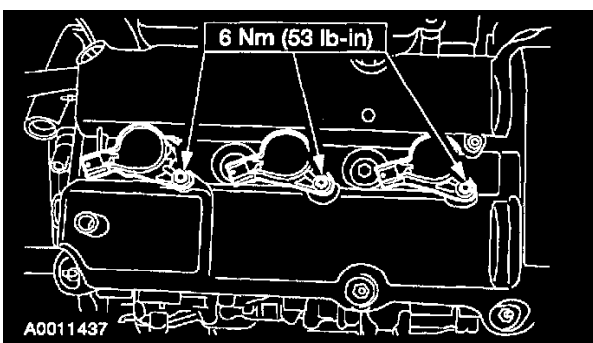
66. **Note:** Fasteners No. 3-6 and 8-10 are studs.

Position the RH valve cover and install the bolts and studs in the sequence shown.



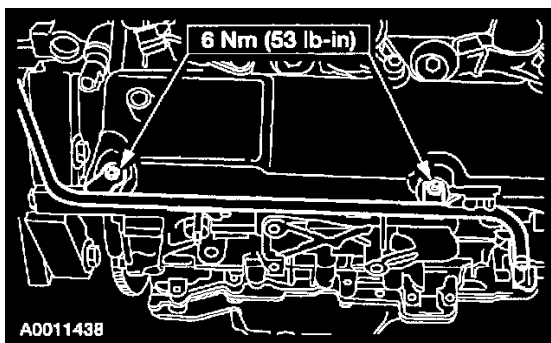
67. **Note:** Fasteners No. 3, 9, and 10 are studs.

Position the LH valve cover and install the bolts and studs in the sequence shown.

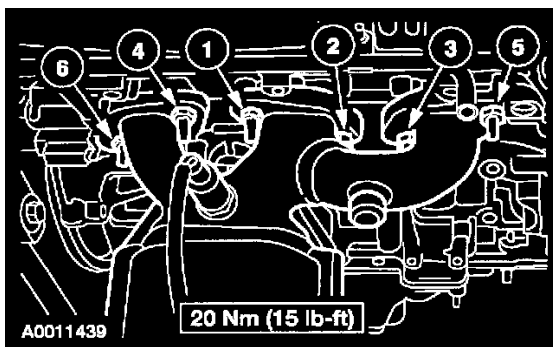


68. **Note:** RH shown, LH similar.

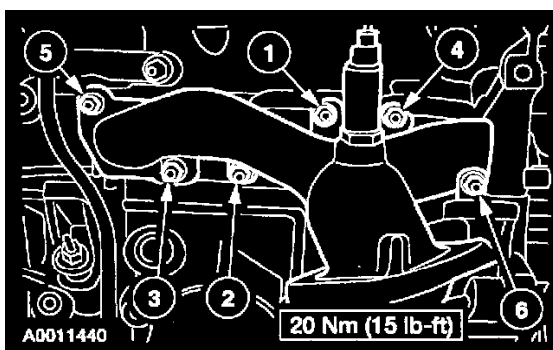
Install the LH and RH coil-on-plugs and install the bolts.



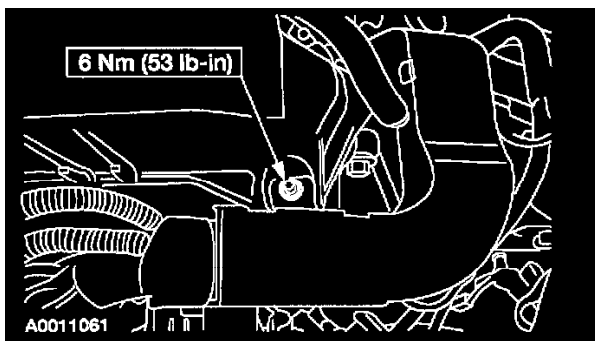
69. Position the Evaporative Emissions (EVAP) tube and install the nuts.



70. Position the RH exhaust manifold and gasket and install the nuts in the sequence shown.

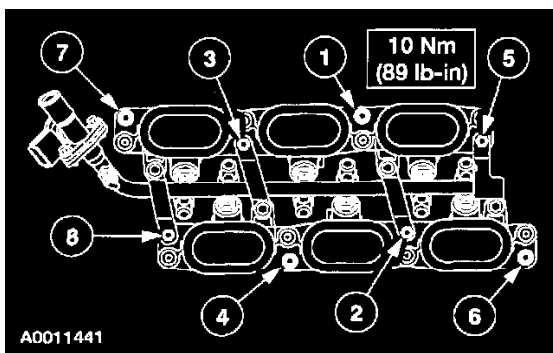


71. Position the LH exhaust manifold and gasket and install the nuts in the sequence shown.

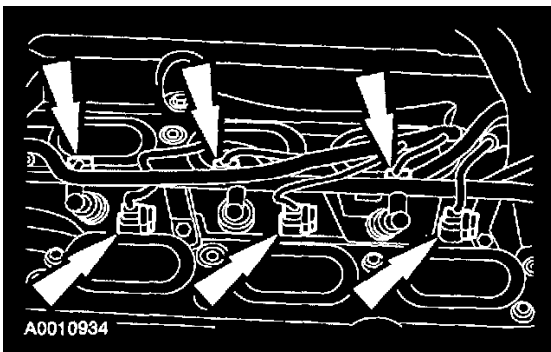


72. Position the fuel charging harness and install the nut.

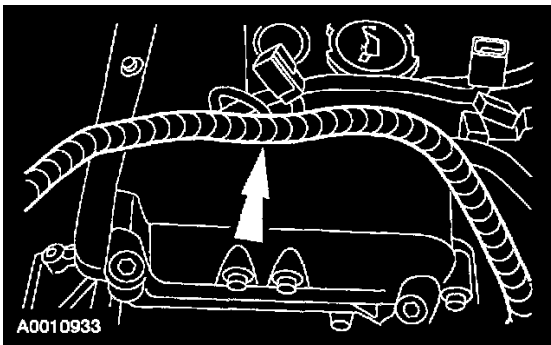
73. Install new gaskets in the lower intake manifold.



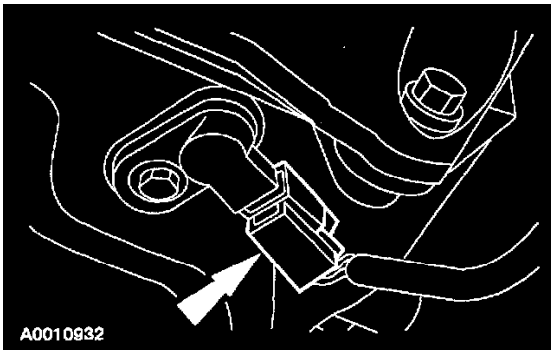
74. Position the lower intake manifold and install the bolts in the sequence shown.



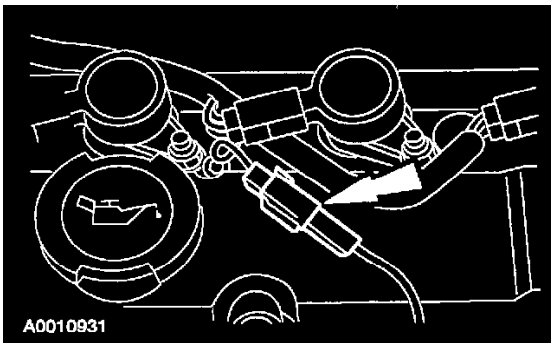
75. Connect the fuel injector electrical connectors.



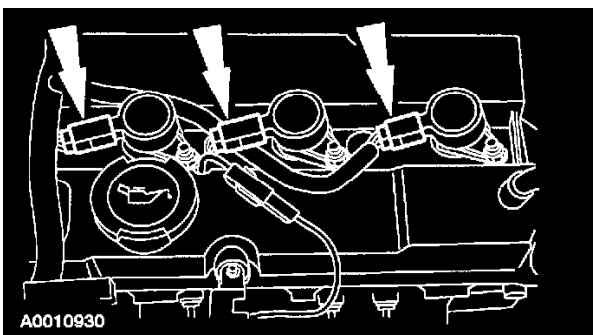
76. Connect the harness to the front LH valve cover studs.



77. Connect the Camshaft Position (CMP) sensor electrical connector.

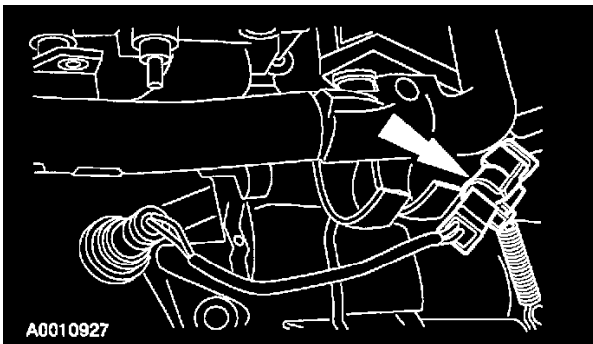


78. Connect the LH radio ignition interference capacitor electrical connector.

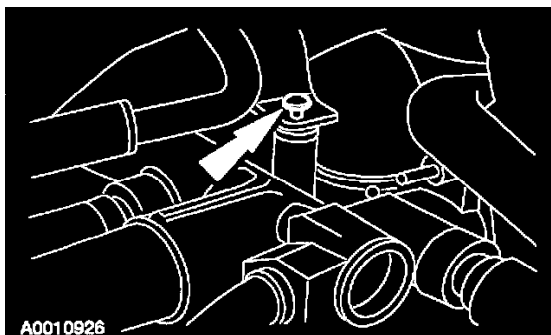


79. **Note:** LH shown, RH similar.

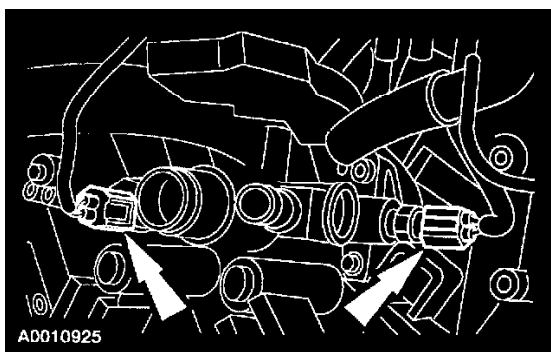
Connect the LH and RH coil-on-plug electrical connectors.



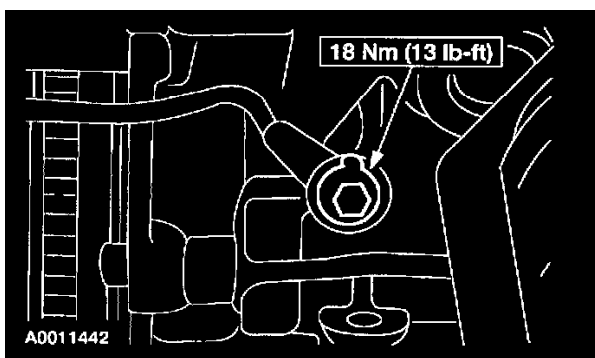
80. Connect the LH HO2S electrical connector.



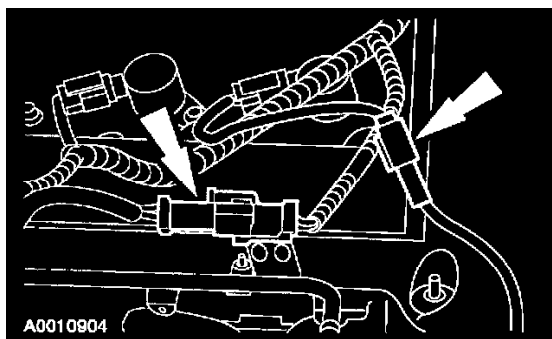
81. Clip the harness to the coolant tube.



82. Connect the coolant temperature sensor electrical connectors.

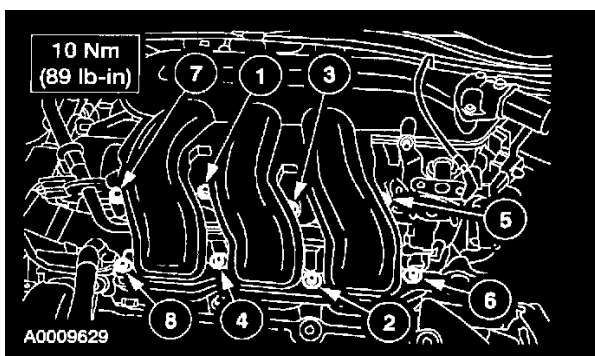


83. Position the knock sensor and install the bolt.

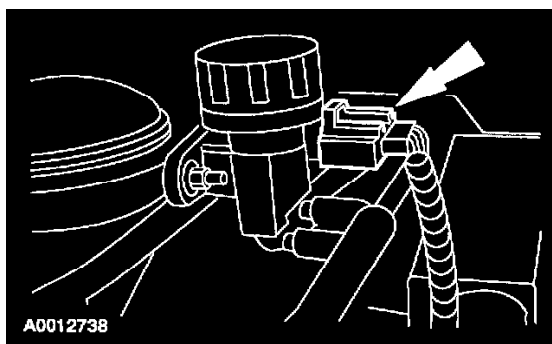


84. Connect the RH radio ignition interference capacitor and HO2S electrical connectors and clip into place.

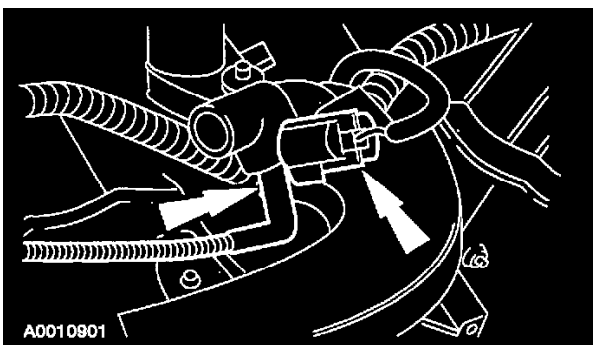
85. Install new gaskets in the upper intake manifold.



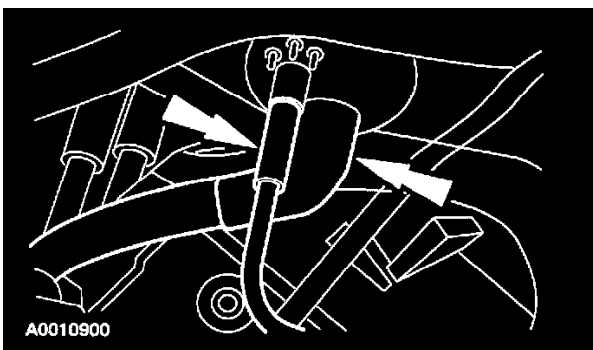
86. Position the upper intake manifold and install the bolts in the sequence shown.



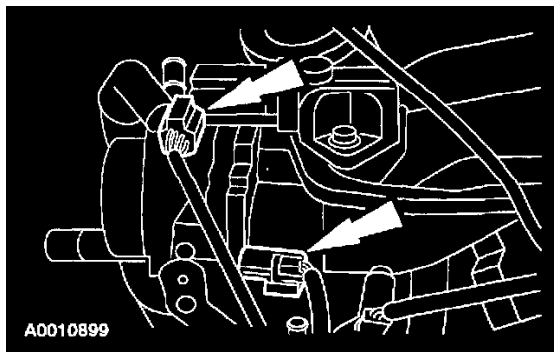
87. Connect the Exhaust Gas Recirculation (EGR) vacuum regulator solenoid electrical connector.



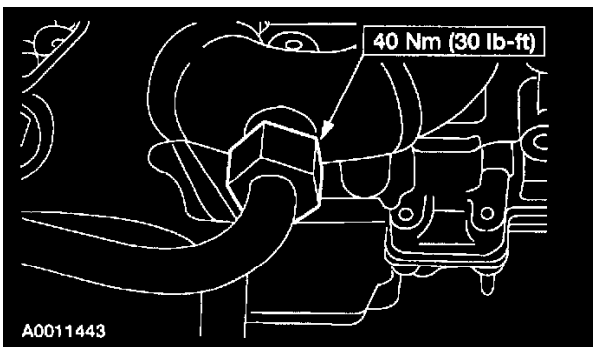
88. Connect the fuel pressure sensor vacuum hose and electrical connector.



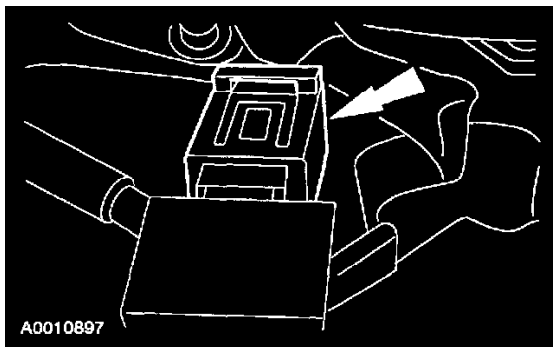
89. Connect the Positive Crankcase Ventilation (PCV) and evaporative (EVAP) emissions hose from the upper intake manifold.



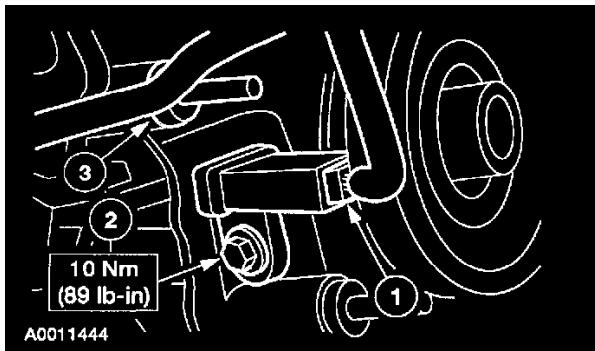
90. Connect the Throttle Position (TP) sensor and Idle Air Control (IAC) valve electrical connectors.



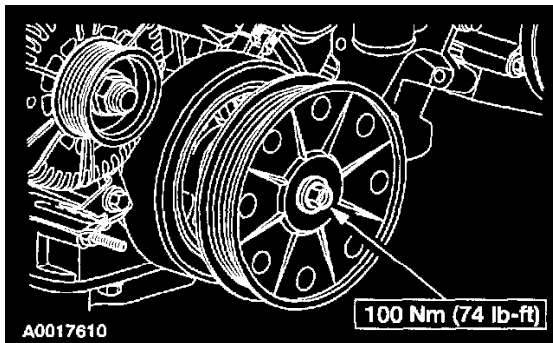
91. Connect the Exhaust Gas Recirculation (EGR) tube to the exhaust manifold.



92. Connect the differential pressure feedback exhaust gas recirculation (EGR) transducer electrical connector.

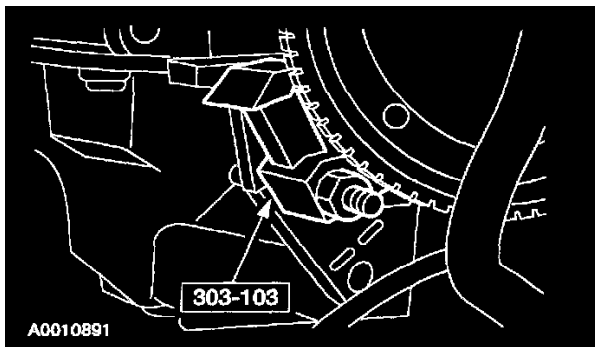


93. Install the Crankshaft Position (CKP) sensor.
1. Install the sensor.
 2. Install the bolt.
 3. Connect the electrical connector and clip into place.

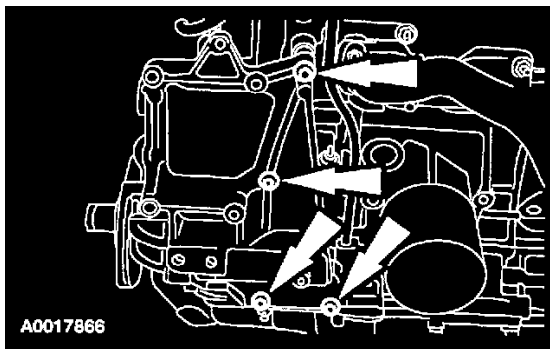


94. **Note:** The pulley has LH threads.

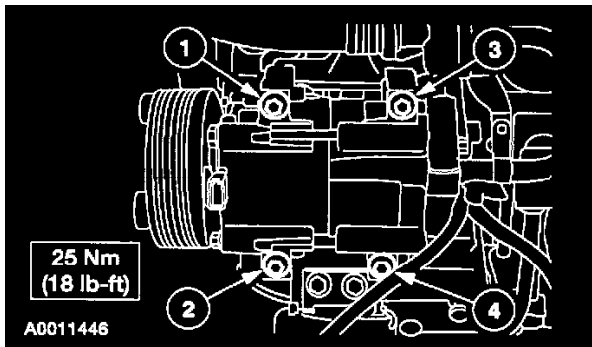
Install the crankshaft pulley.



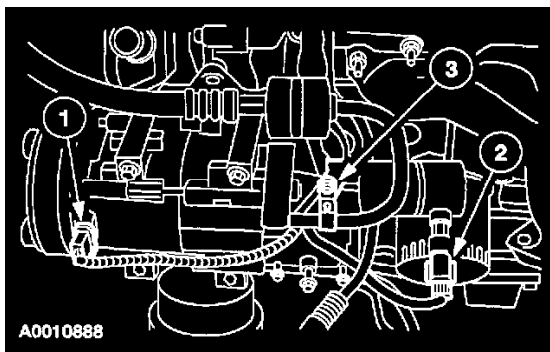
95. Remove the special tool.



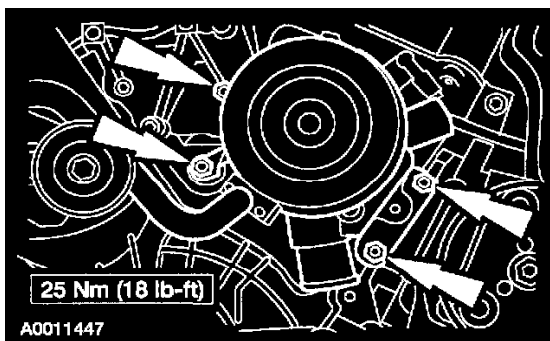
96. Position the A/C compressor bracket and install the bolts.
- Tighten the bolts in two stages.
 - Stage 1: Tighten to **25 Nm (18 ft. lbs.)**.
 - Stage 2: Tighten **90 degrees**.



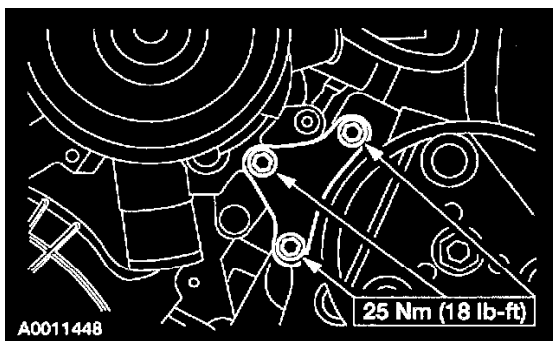
97. Position the A/C compressor and install the bolts.



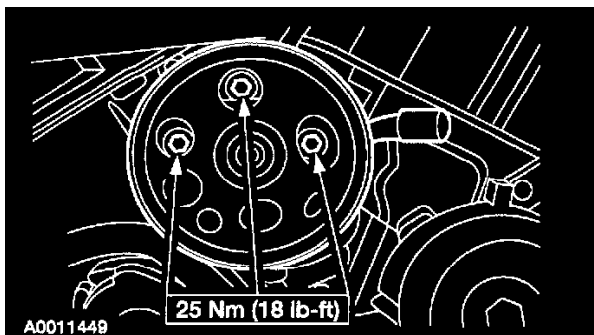
98. Connect the A/C compressor.
1. Connect the compressor electrical connector.
 2. Connect the pressure sensor electrical connector.
 3. Connect the harness to the bracket.



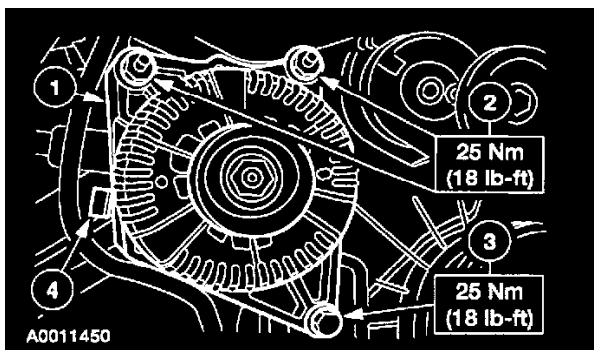
99. Position the water pump and install the bolts.



100. Position the A/C compressor to water pump bracket and install the bolts.



101. Position the power steering pump and install the bolts.

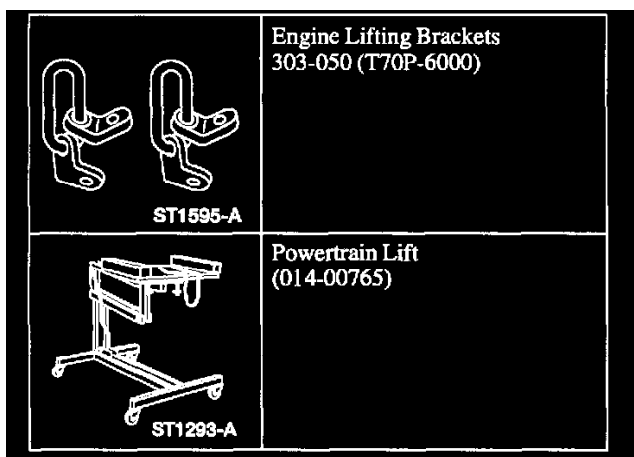


102. Install the generator.

1. Position the generator.
2. Install the studs.
3. Install the bolt.
4. Connect the electrical connector.

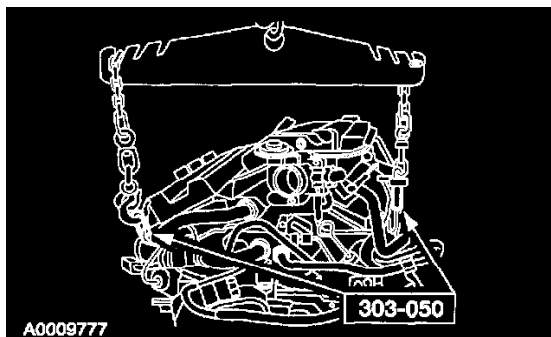
103. Install the accessory drive belt.

Installation



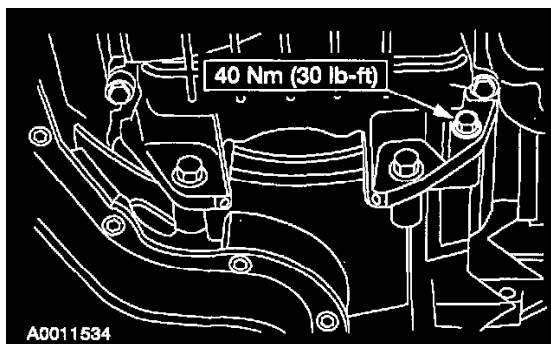
Special Tools

Installation

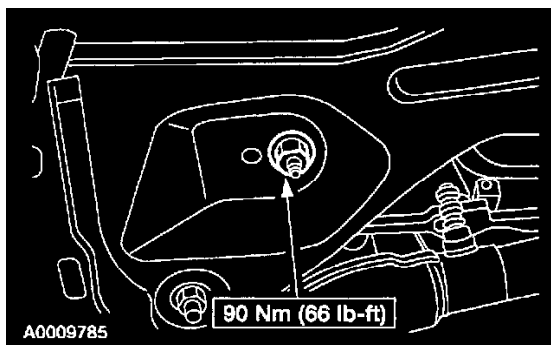


1. **Note:** The studs from the torque converter must align with the engine flex plate holes to assemble the engine/transaxle.

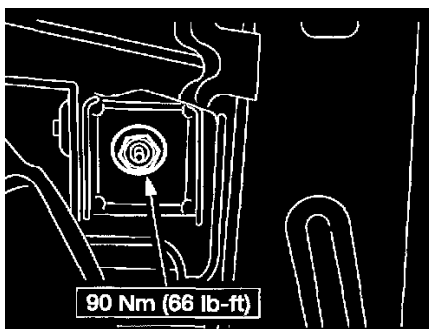
Using the special tools, support the engine and assemble with the transaxle.



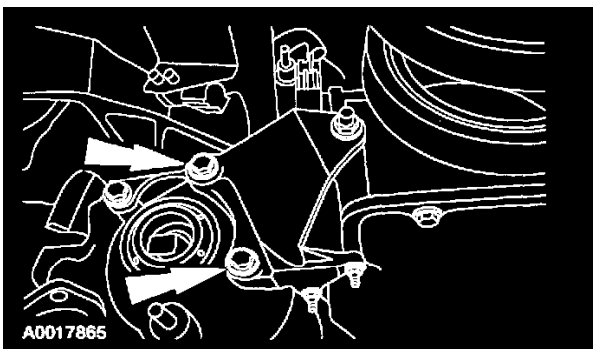
2. Install the engine to transaxle bolts.



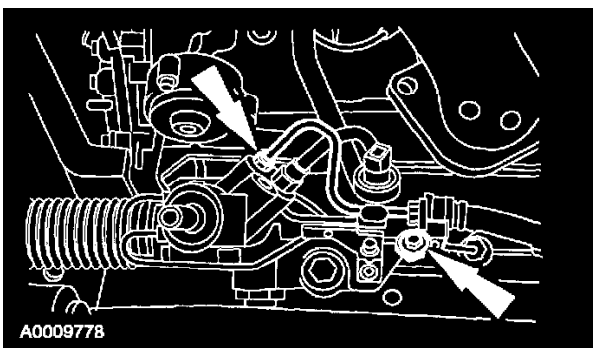
3. Install the LH engine mount nut.



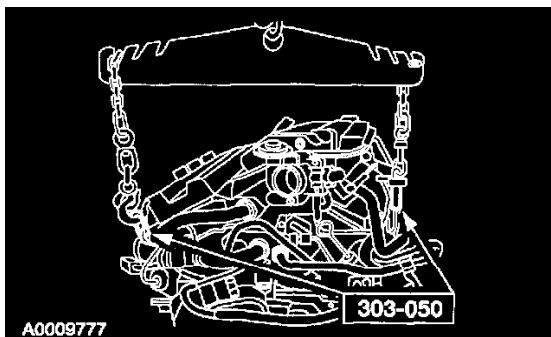
4. Install the RH engine mount nut.



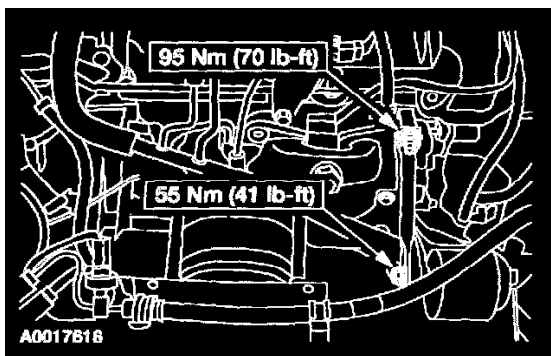
5. Install the engine to transaxle bracket bolt.



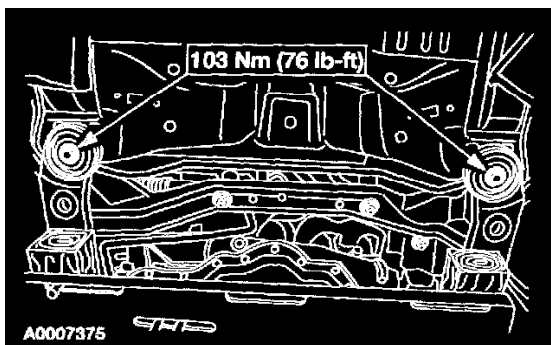
6. Connect the power steering pressure line and install the clamp bolt.



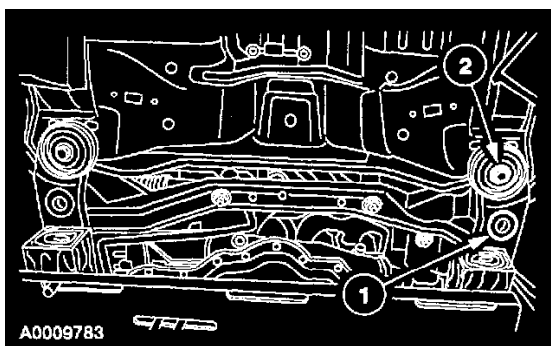
7. Remove the special tools from the engine.



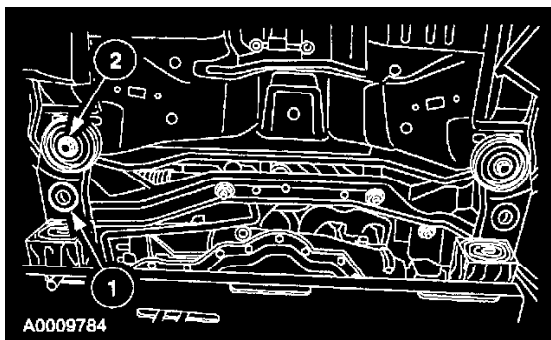
8. Install the engine support brace.



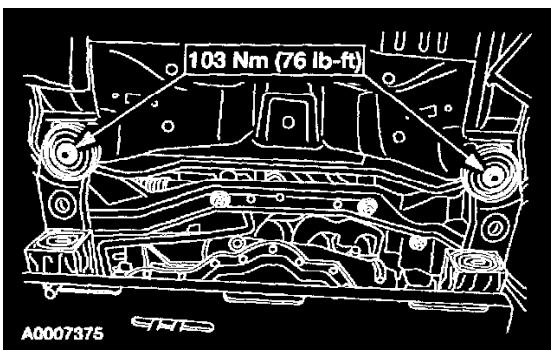
9. Using the special tool, raise the engine/transaxle assembly into the vehicle and loosely install the four subframe bolts.



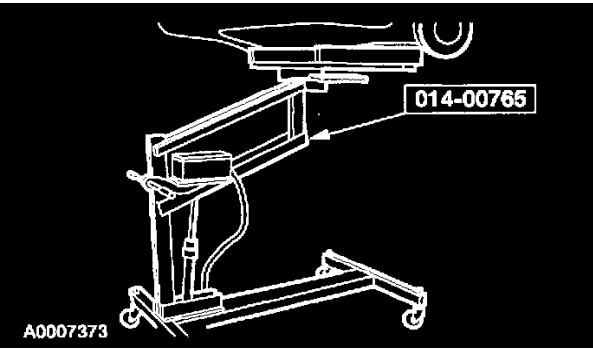
10. Align the subframe with the body.
 1. install a 19 mm (0.75 inch) rod into the front LH sub frame to body alignment hole.
 2. Hand tighten the bolt.



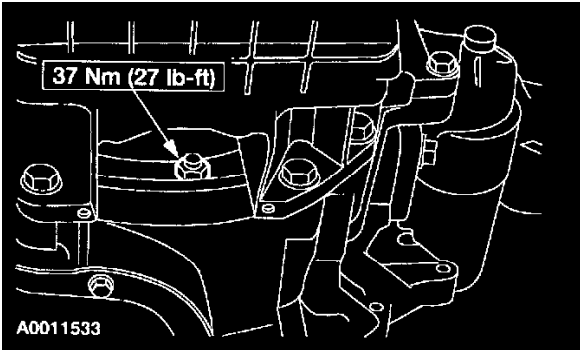
11. Align the subframe with the body.
 1. Install a 19 mm (0.75 inch) rod into the front RH sub frame to body alignment hole.
 2. Hand tighten the bolt.
12. Verify the subframe to body alignment at both of the alignment holes.



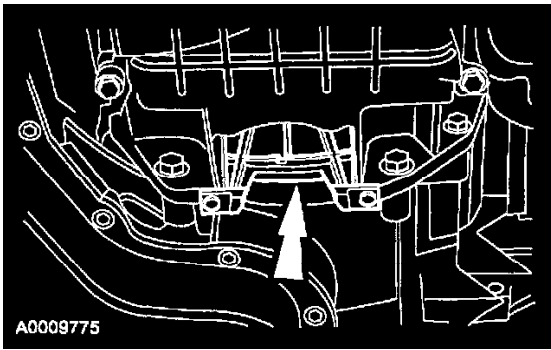
13. Tighten the four subframe bolts.



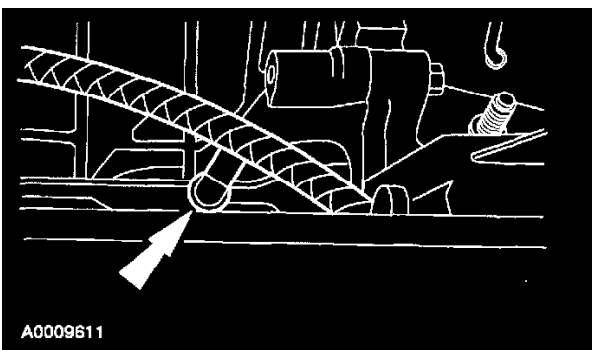
14. Remove the special tool.



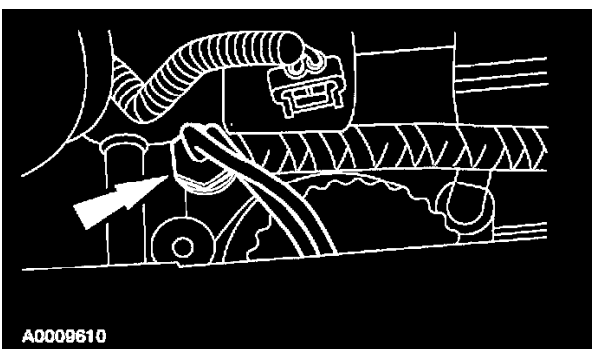
15. Install the four torque converter to flex plate nuts.



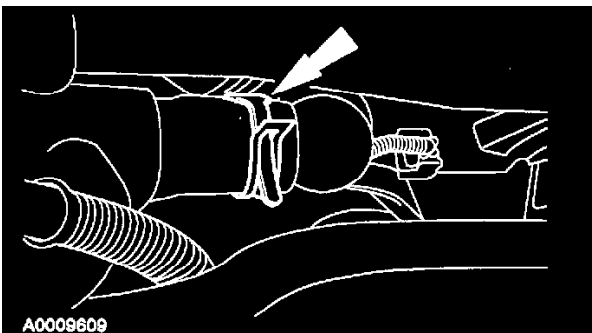
16. Install the torque converter inspection cover.



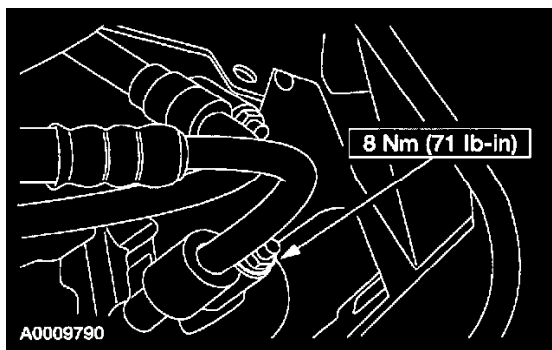
17. Clip the engine block heater harness to the engine block.



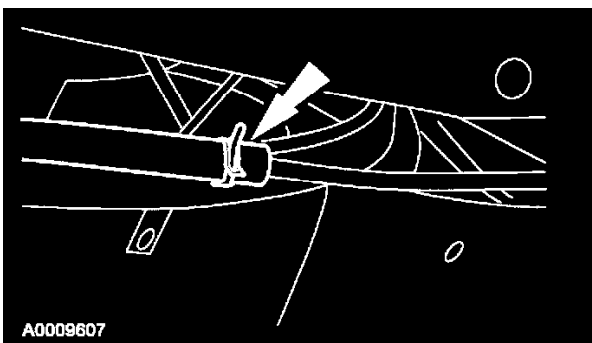
18. Connect the engine block heater electrical connector.



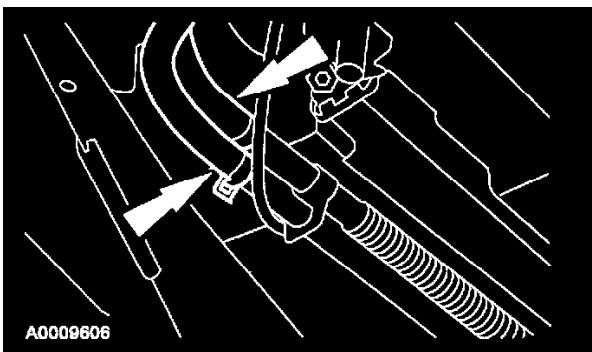
19. Connect the lower radiator hose.



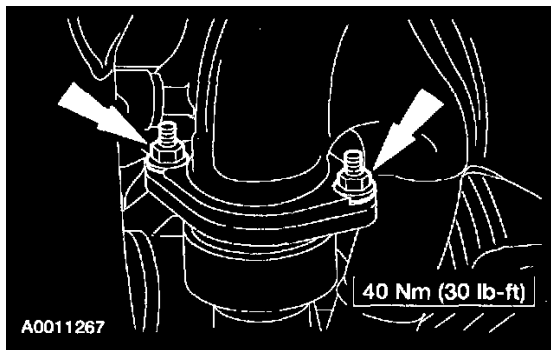
20. Connect the A/C high pressure line to the condenser and install the nut.



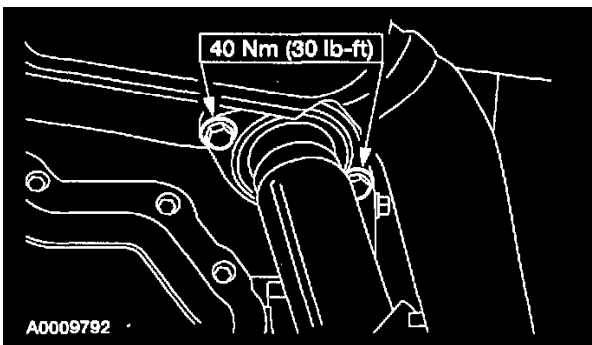
21. Connect the transaxle cooler line.



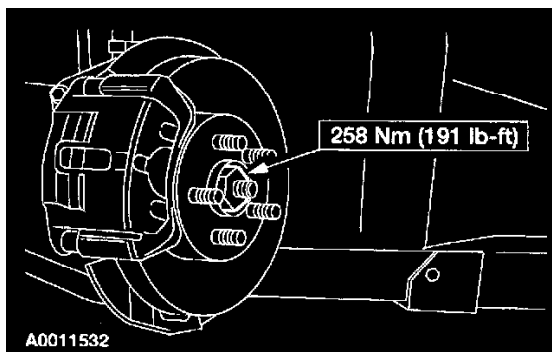
22. Connect the power steering and transaxle hoses to the cooler.



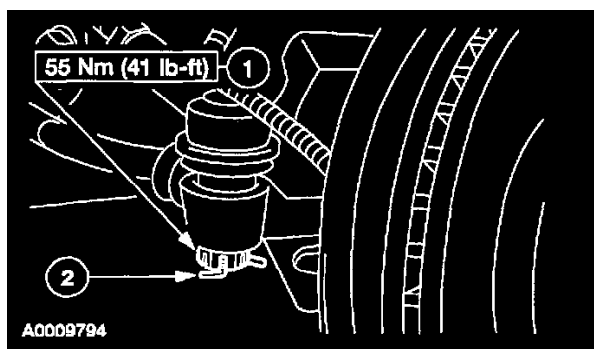
23. Position the dual converter Y-pipe and install the nuts.



24. Install the RH exhaust manifold to pipe bolts.



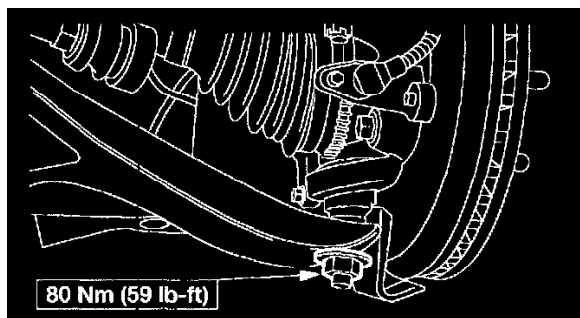
25. Position the halfshaft in the hub and install the washer and a new nut.



26. **Note:** RH shown, LH similar.

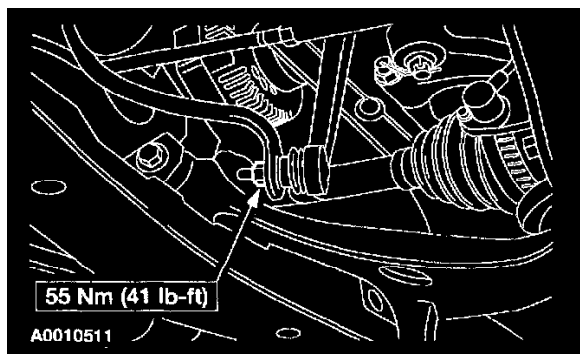
Connect the RH and LH tie rod ends.

1. Install the castle nut.
2. Install the cotter pin.



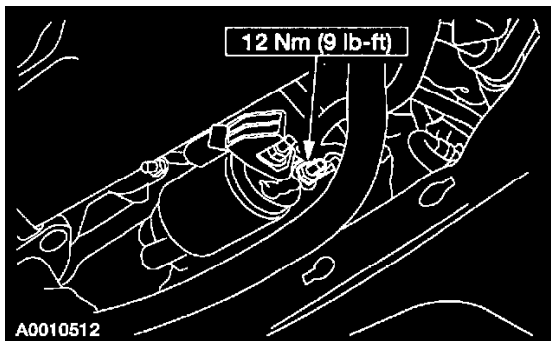
27. **Note:** RH shown, LH similar.

Install the RH and LH ball joint nuts.

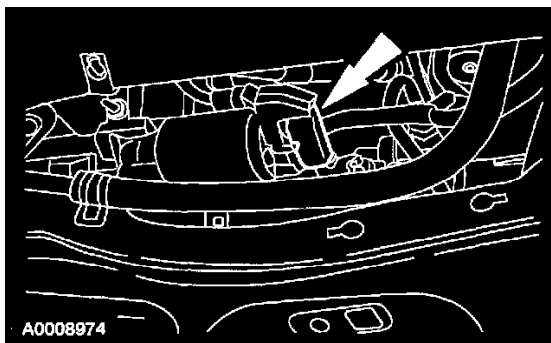


28. **Note:** RH shown, LH similar.

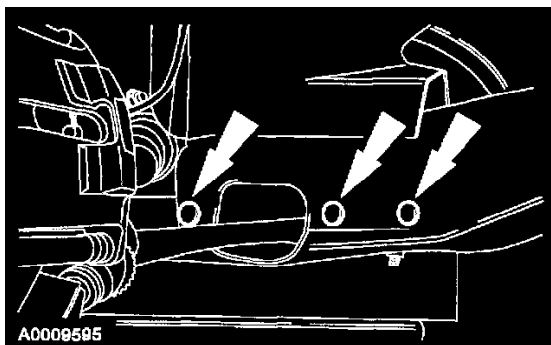
Install the RH and LH sway bar end link nuts.



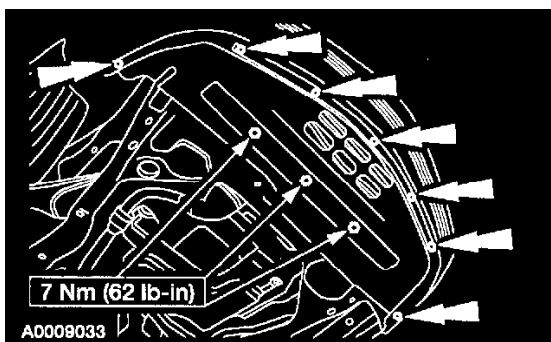
29. Position the starter cable and install the nut.



30. Install the starter cable cover.



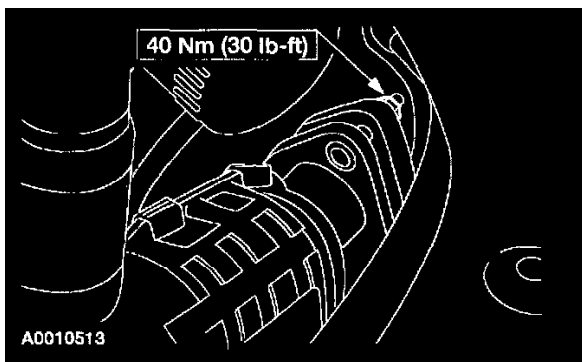
31. Position the inner fender splash shield and install the pin-type retainers.



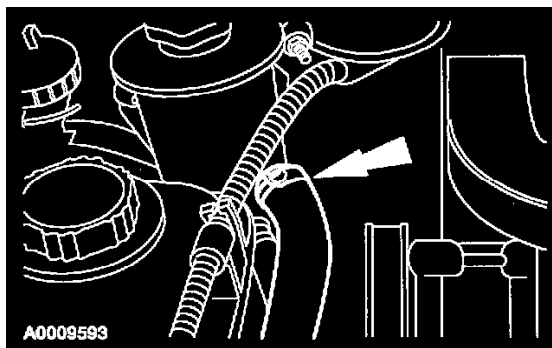
32. Position the front splash shield and install the bolts and pin-type retainers.

33. Install the LH and RH wheels.

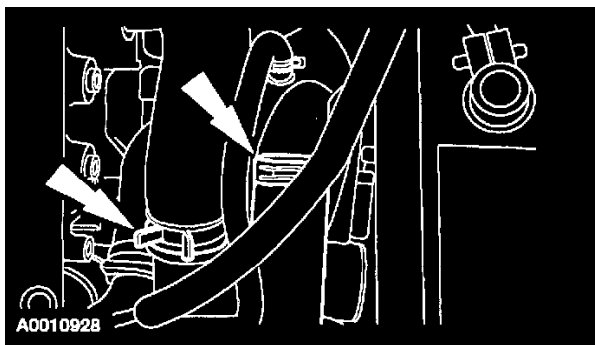
34. Lower the vehicle.



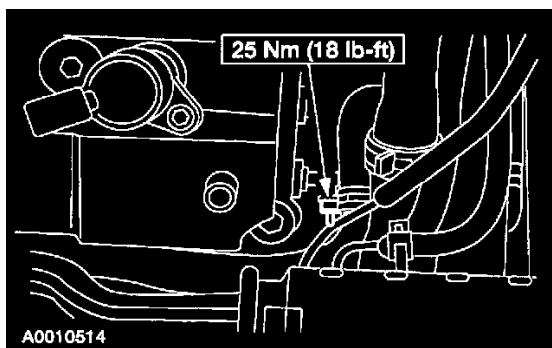
35. Install the two LH exhaust manifold to pipe nuts.



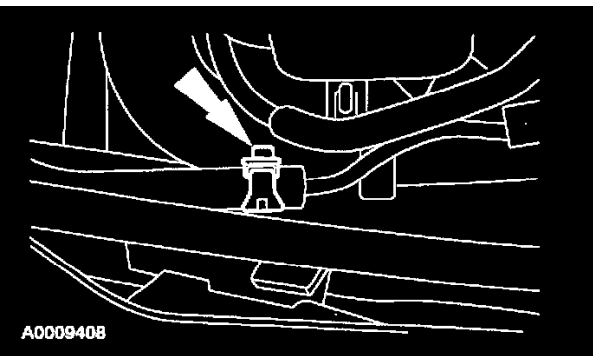
36. Connect the power steering fluid hose to the reservoir.



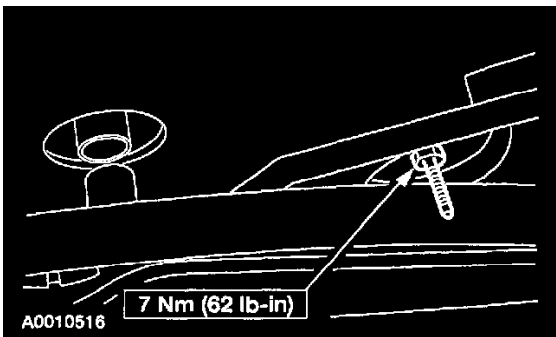
37. Connect the coolant hoses.



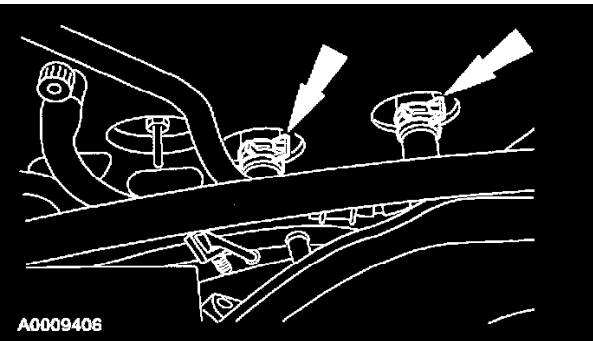
38. Position the starter motor ground cable and install the bolt.



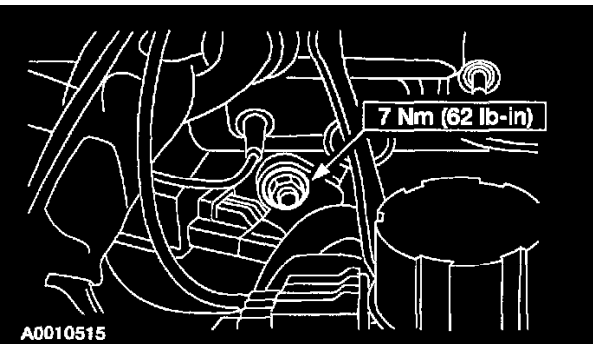
39. Connect the coolant recovery bottle hose.



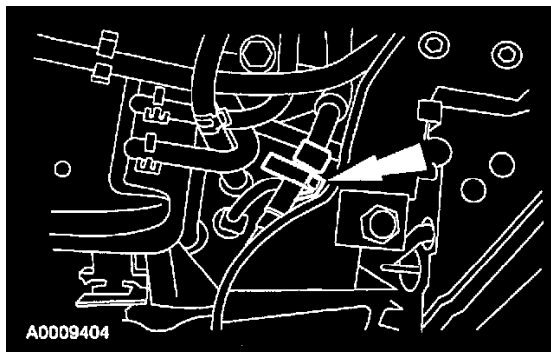
40. Install the heater hose bracket nut.



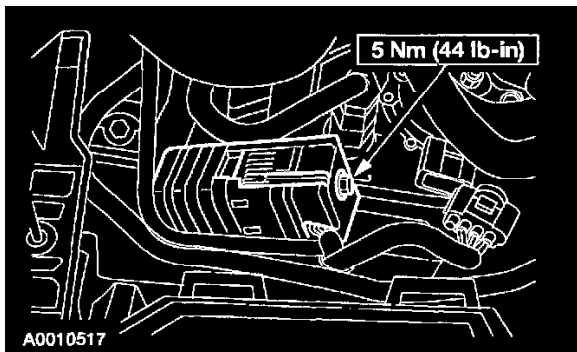
41. Connect the heater hoses.



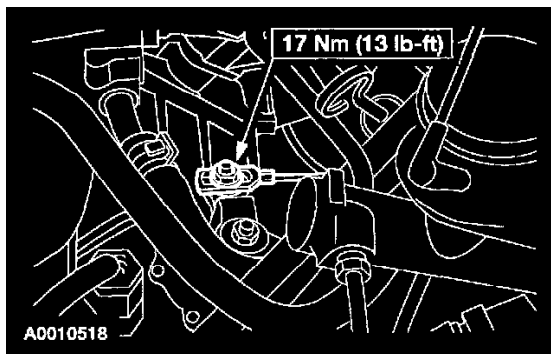
42. Install the heater hose bracket nut.



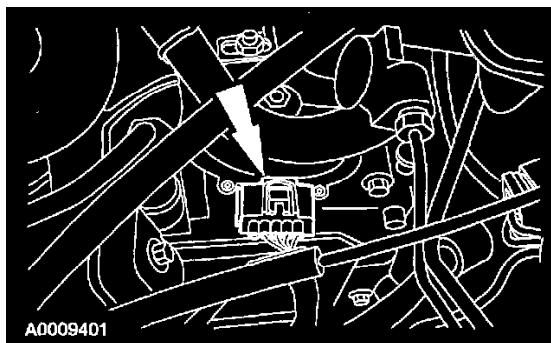
43. Connect the low pressure A/C line spring lock coupling at the accumulator/drier.
44. Recharge the A/C system.



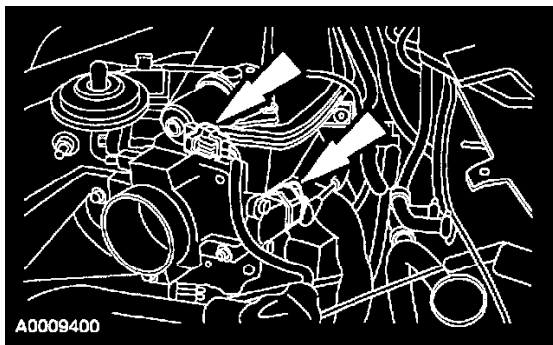
45. Connect the harness and tighten the bolt.



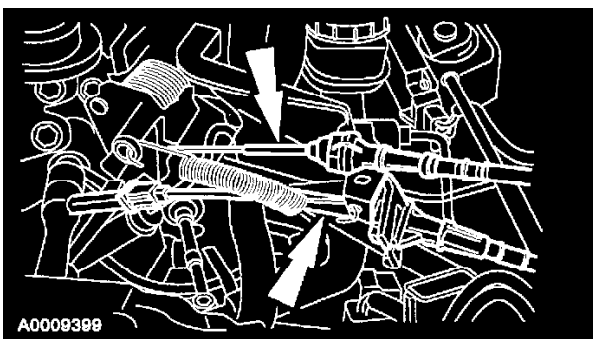
46. Clip the shifter cable to the bracket and install the nut.



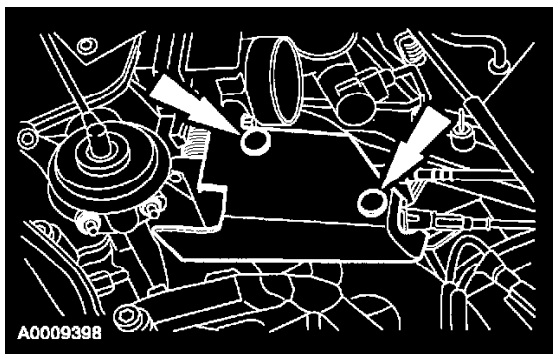
47. Connect the transaxle range sensor electrical connector.



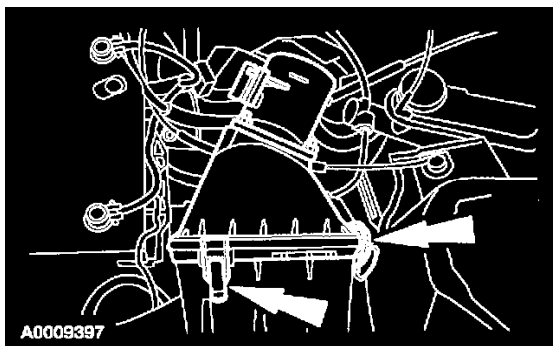
48. Connect the throttle position (TP) sensor and idle air control (IAC) valve electrical connectors.



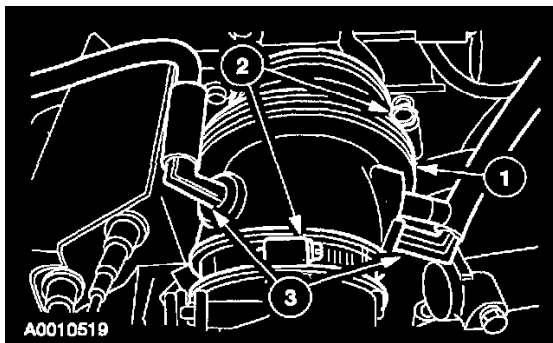
49. Connect the accelerator and cruise control cables.



50. Position the accelerator cable splash shield and install the pin-type retainers.

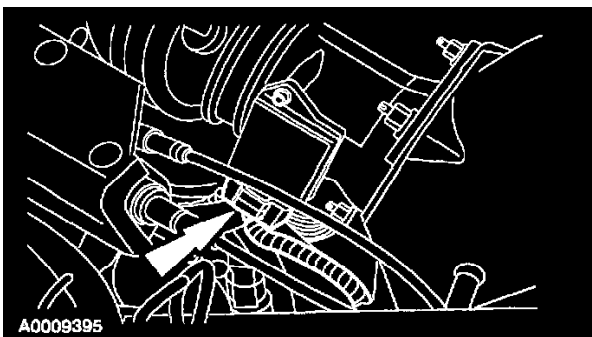


51. Position the air cleaner cover and clamp into place.

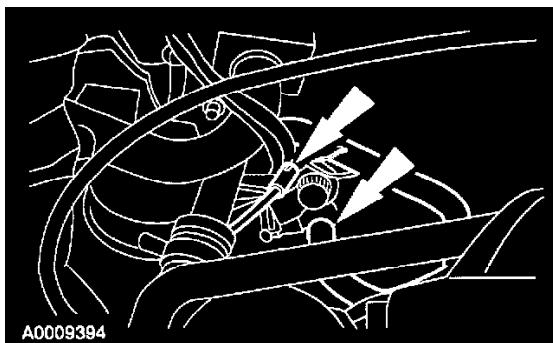


52. Install the air cleaner outlet tube.

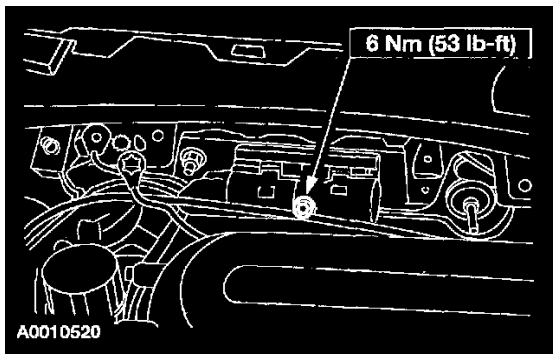
1. Install the tube.
2. Tighten the clamps.
3. Connect the crankcase ventilation hoses.



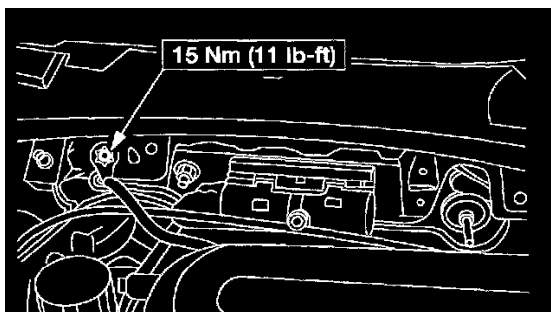
53. Connect the Mass Air Flow (MAF) sensor electrical connector.



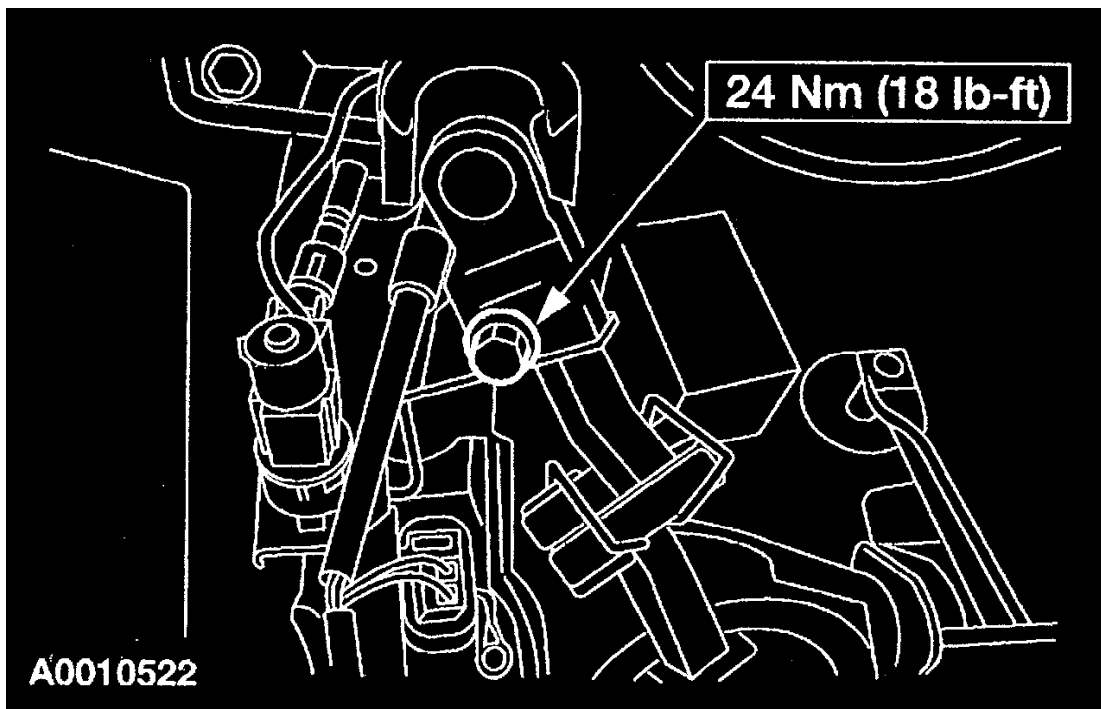
54. Connect the evaporative emission system hoses.



55. Connect the Powertrain Control Module (PCM) electrical connector and tighten the bolt.



56. Position the ground strap and install the bolt.
57. Install the cowl vent screen.



58. Install the steering shaft pinch bolt.
59. Connect the battery ground cable.
60. Fill the cooling system.