

# DISASSEMBLY

## Engine

### Special Tool(s)

<p>ST1784-A</p>	<p>Remover, Crankshaft Vibration Damper 303-101 (T74P-3616-A)</p>
<p>ST2897-A</p>	<p>Remover, Crankshaft Vibration Damper 303-773</p>
<p>ST1330-A</p>	<p>Compressor, Valve Spring 303-581 (T97T-6565-A)</p>
<p>ST1777-A</p>	<p>Holding Tool, Camshaft Sprocket 303-564 (T97T-6256-B)</p>
<p>ST1776-A</p>	<p>Adapter for 303-564 303-578 (T97T-6256-A)</p>
<p>ST1438-A</p>	<p>Strap Wrench 303-D055 (D85L-6000-A) or equivalent</p>

(Continued)

### Special Tool(s)

<p>ST2741A</p>	<p>Crankshaft Socket 303-674</p>
<p>ST1288-A</p>	<p>Remover, Crankshaft Front Oil Seal 303-107 (T74P-6700-A)</p>

### General Equipment

<p>8 mm x 1.25 x 100 mm bolts (2 required)</p>
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**⚠ CAUTION:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

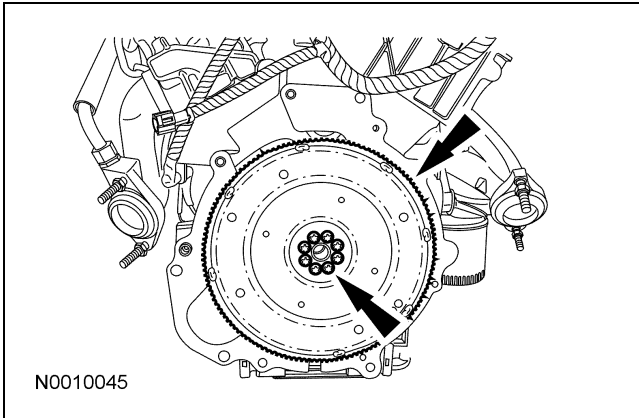
**⚠ CAUTION:** Remove the cylinder heads before removing the crankshaft. Failure to do so can result in engine damage.

**⚠ CAUTION:** If the fuel rail is used as a leverage device, damage may occur to the fuel rail. Care must be taken when working around the fuel rail.

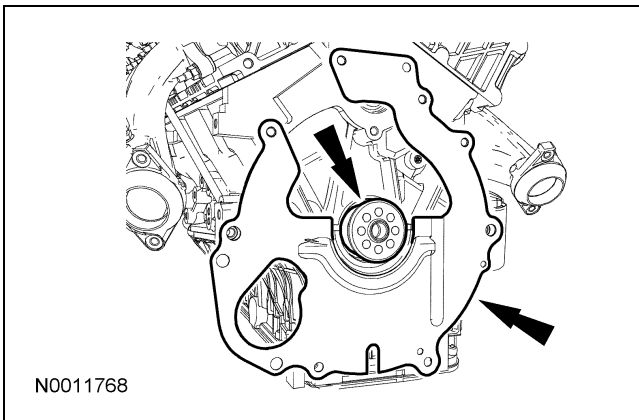
**NOTE:** For additional information, refer to the exploded views under Engine in the Assembly portion of this section.

**DISASSEMBLY (Continued)**

1. Remove the 8 bolts and the flexplate or flywheel.

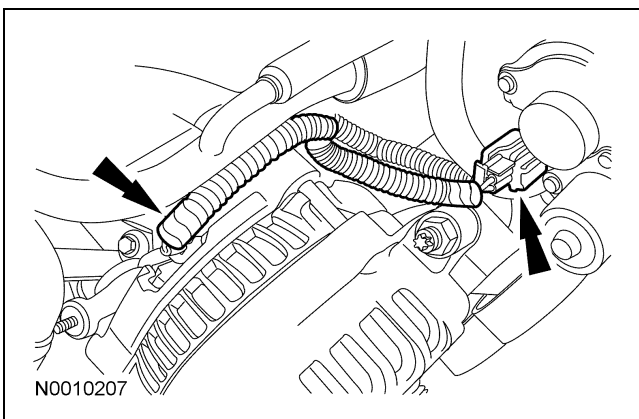


2. Remove the spacer plate and if equipped, the flexplate-to-crankshaft spacer.

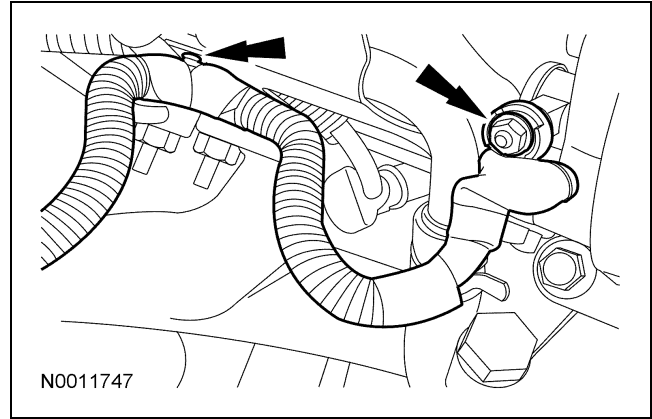


3. Mount the engine on a suitable engine stand.

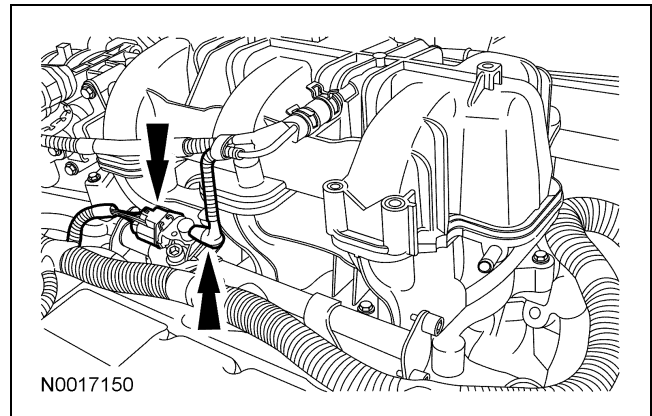
4. Disconnect the generator and throttle body (TB) electrical connectors.



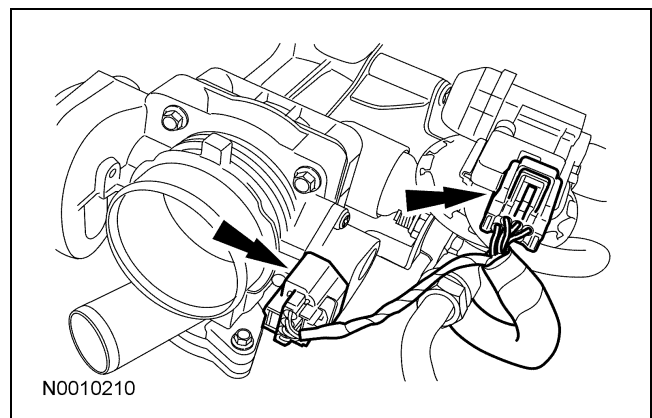
5. Remove the nut and detach the B+ terminal from the generator.
  - Detach the wiring retainer from the coolant tube bracket.



6. Disconnect the vacuum tube and the fuel rail pressure and temperature sensor electrical connector.

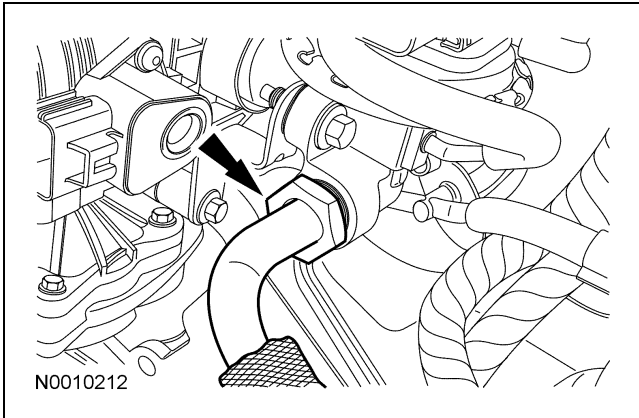


7. Disconnect the exhaust gas recirculation (EGR) system module and throttle position (TP) sensor electrical connectors.

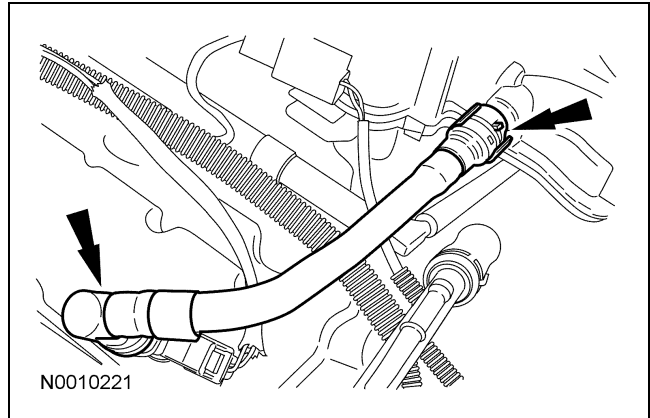


**DISASSEMBLY (Continued)**

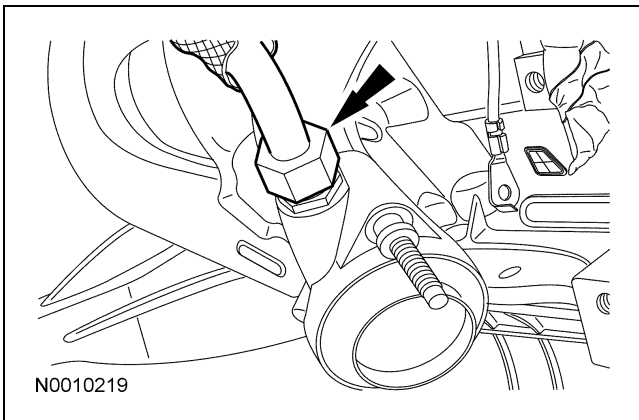
8. Disconnect the EGR tube fitting from the EGR system module.



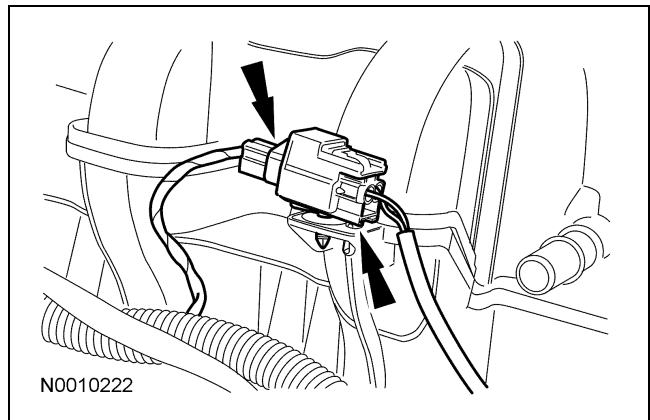
11. Disconnect the positive crankcase ventilation (PCV) tube fittings and remove the tube.



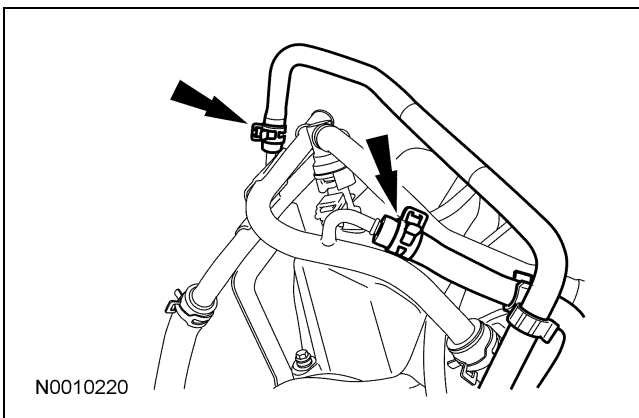
9. Disconnect the EGR tube fitting from the LH exhaust manifold and remove the tube.



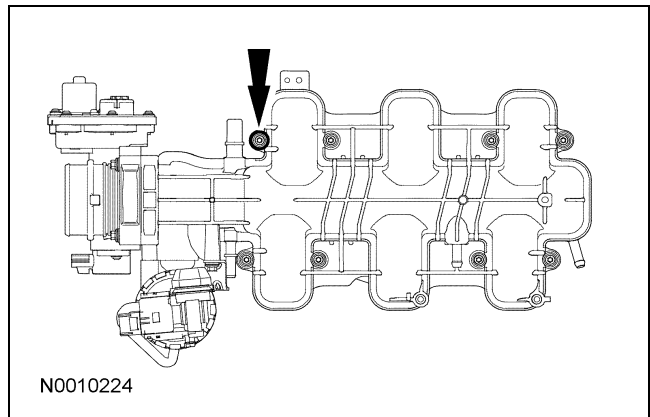
12. Disconnect the knock sensor (KS) electrical connector and detach the wiring retainer.



10. Disconnect the 2 (TB) coolant hoses from the coolant tube.

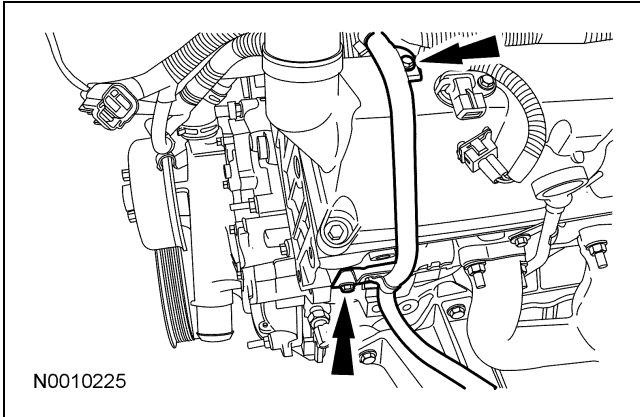


13. Remove the 8 bolts and the intake manifold.

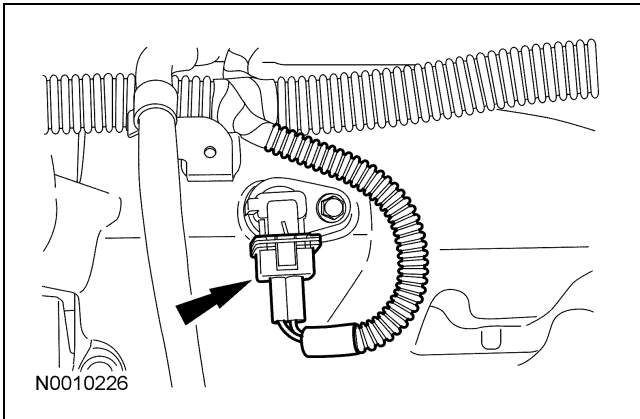


**DISASSEMBLY (Continued)**

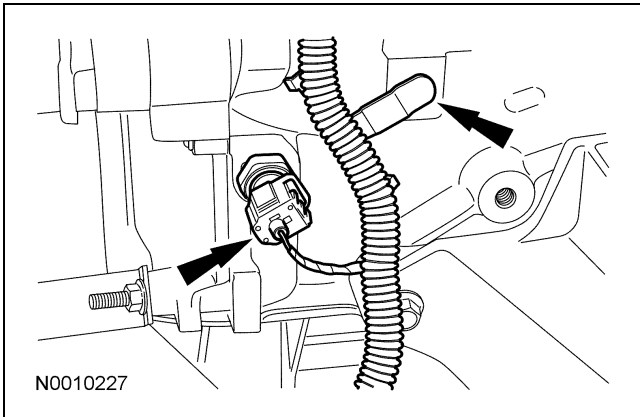
14. Remove the 2 fuel supply tube bracket bolts.



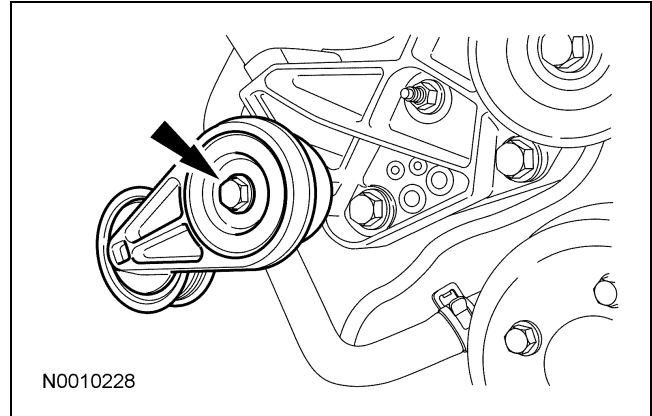
15. Disconnect the camshaft position (CMP) electrical connector.



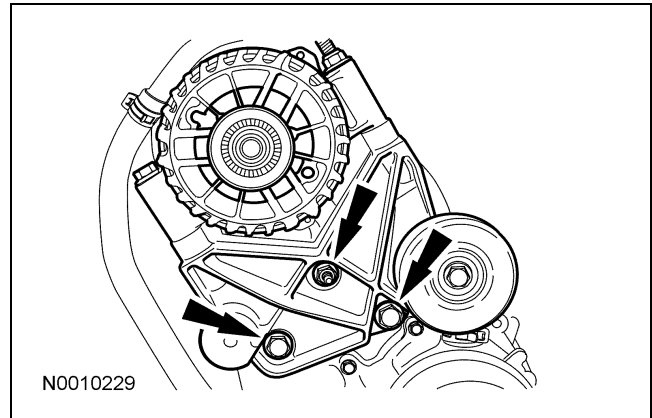
16. Disconnect the oil pressure sensor electrical connector and detach the wiring retainer.



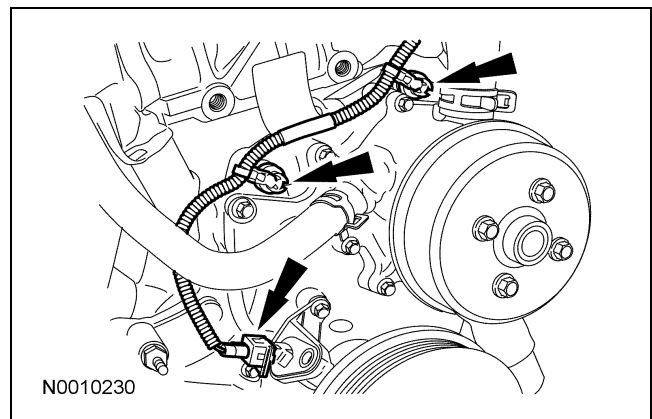
17. Remove the bolt and the belt tensioner.



18. Remove the 2 bolts, the nut and the generator and bracket.

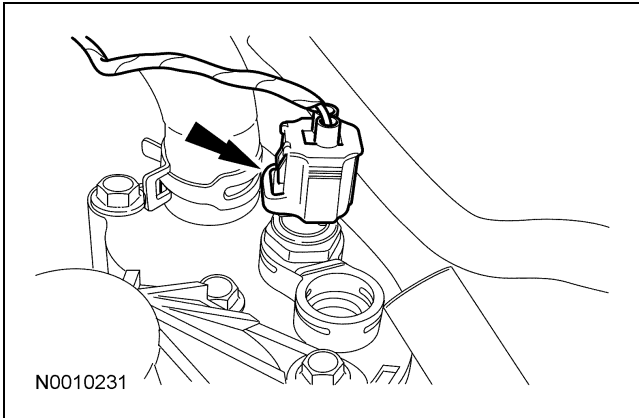


19. Disconnect the crankshaft position (CKP) sensor electrical connector and detach the 2 wiring retainers.

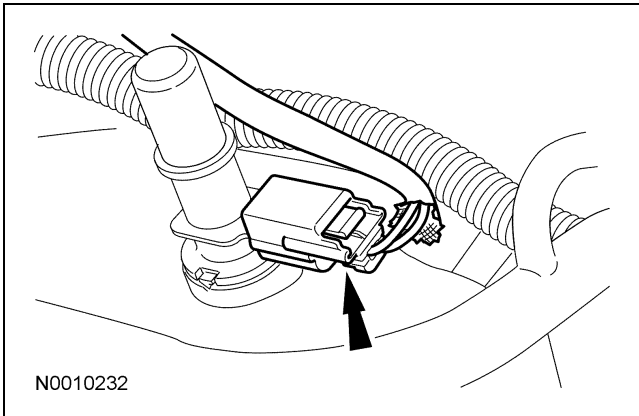


**DISASSEMBLY (Continued)**

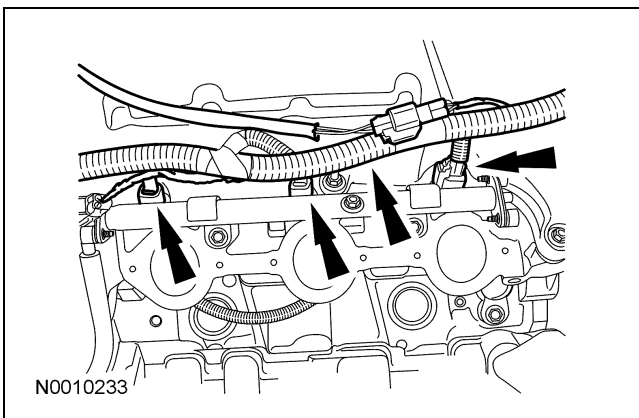
20. Disconnect the engine coolant temperature (ECT) sensor electrical connector.



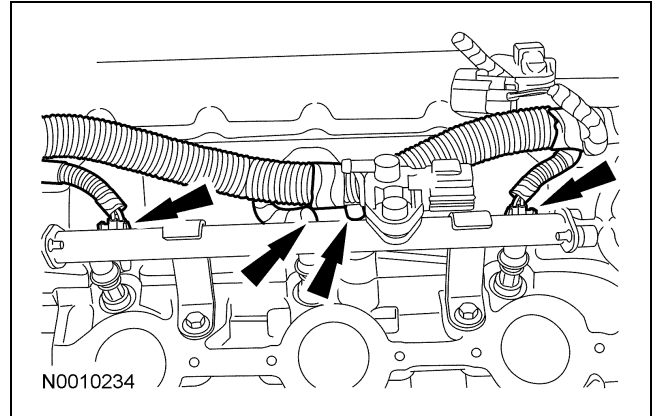
21. Disconnect the PCV valve electrical connector.



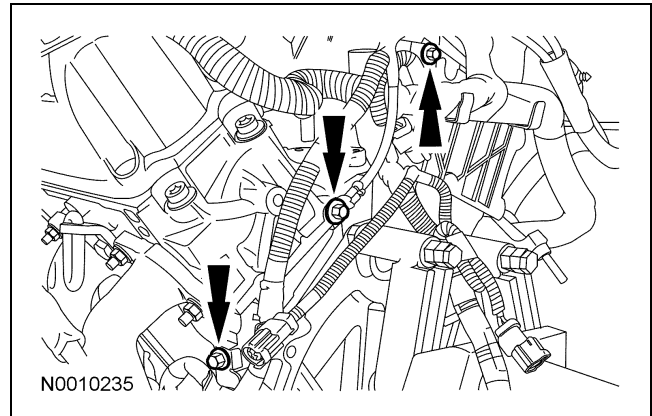
22. Disconnect the 3 LH fuel injector electrical connectors and detach the wiring retainer from the valve cover stud bolt.



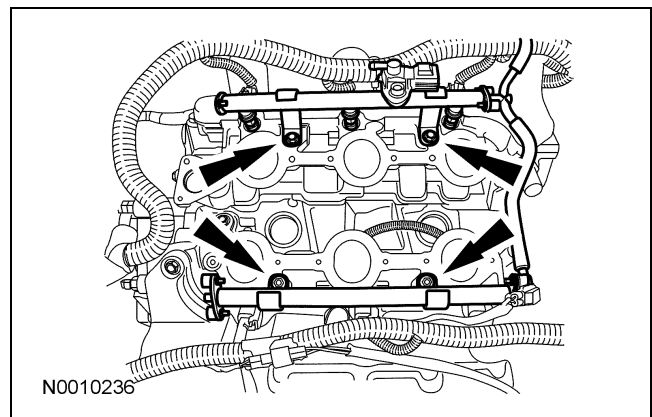
23. Disconnect the 3 RH fuel injector electrical connectors and detach the wiring retainer from the valve cover stud bolt.



24. Remove the 3 bolts, detach the wiring retainers and remove the main engine wiring harness.

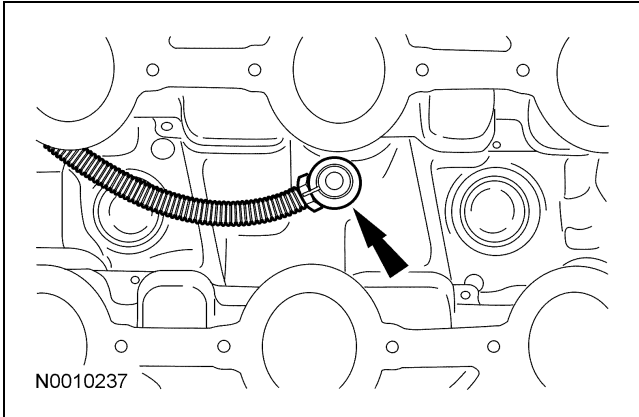


25. Remove the 4 bolts and then remove the fuel rail and injectors.

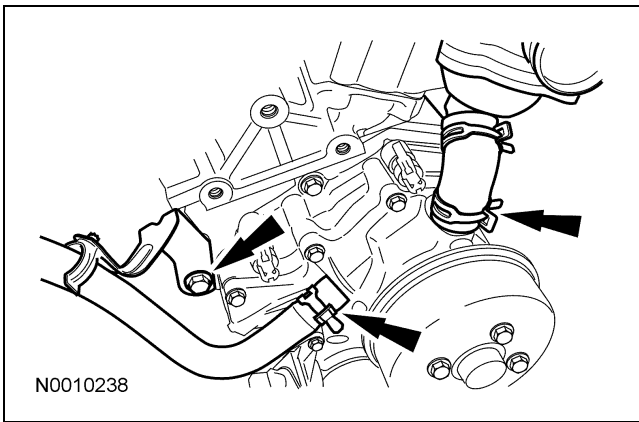


**DISASSEMBLY (Continued)**

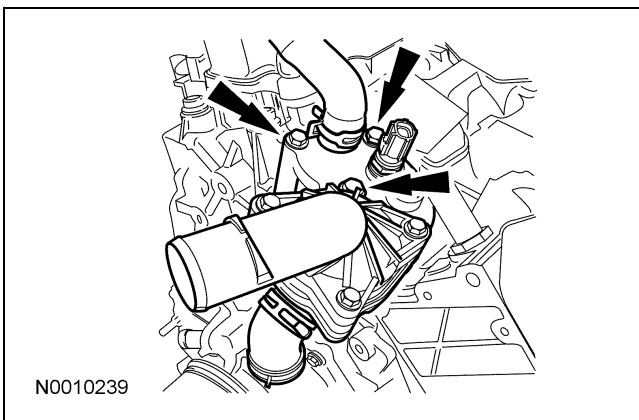
26. Remove the bolt and the KS.



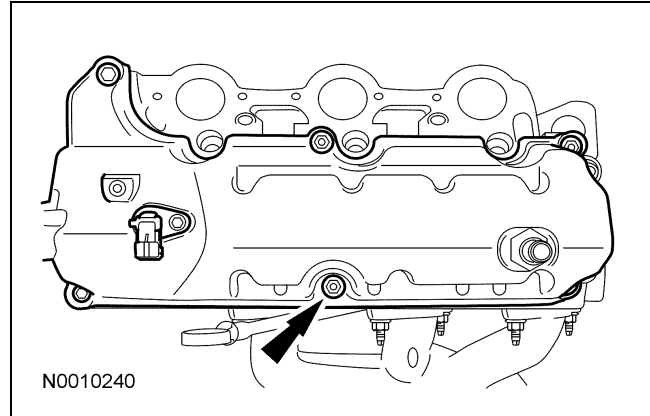
27. Remove the bolt and then disconnect the coolant bypass hose and the heater hose from the coolant pump.



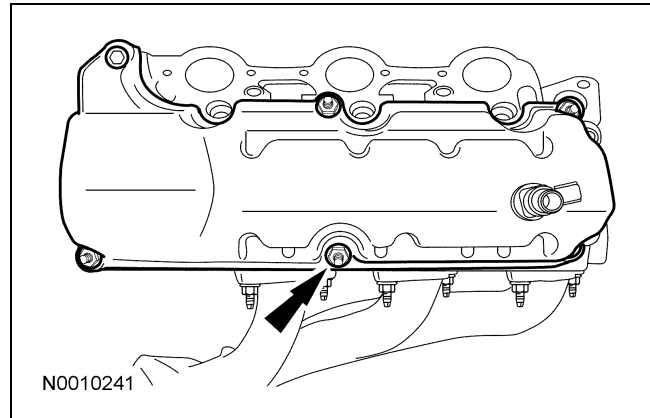
28. Remove the 3 bolts and then remove the thermostat housing, hoses and coolant tube.



29. Remove the 3 bolts, the 3 stud bolts and the LH valve cover.

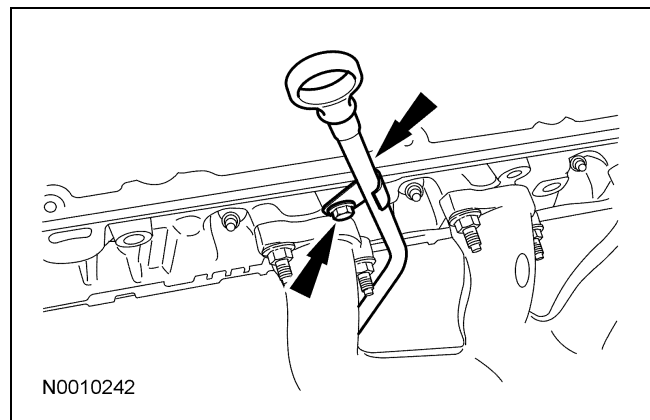


30. Remove the 2 bolts, the 4 stud bolts and the RH valve cover.



31. Remove the bolt and the oil level indicator tube.

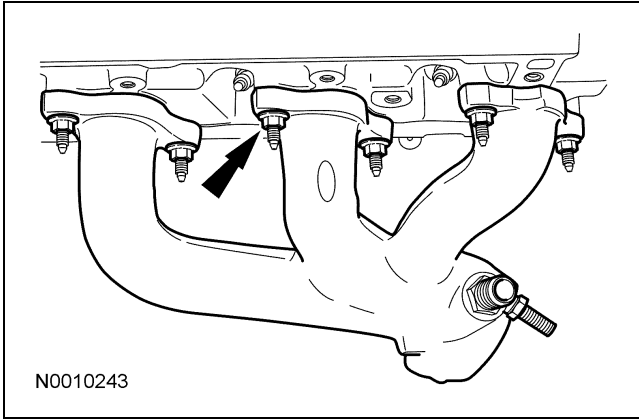
- Discard the oil level indicator tube O-ring seal.



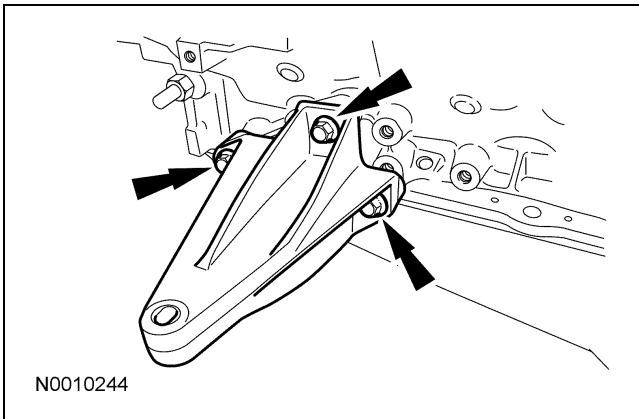
**DISASSEMBLY (Continued)**

32. Remove the 6 nuts and the LH exhaust manifold.

- Remove and discard the LH exhaust manifold gasket.

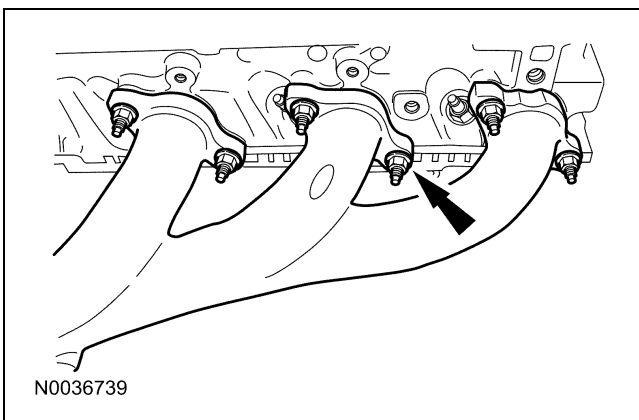


33. Remove the 3 bolts and the LH engine mount bracket.

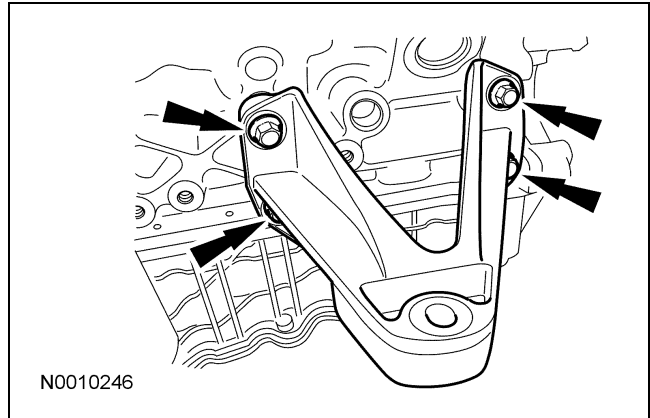


34. Remove the 6 nuts and the RH exhaust manifold.

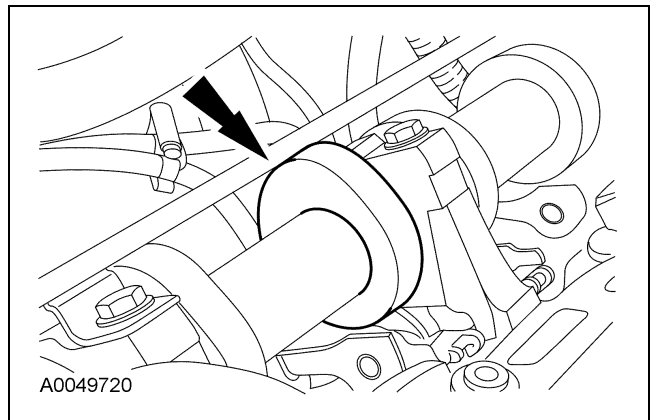
- Remove and discard the RH exhaust manifold gasket.



35. Remove the 4 bolts and the RH engine mount bracket.

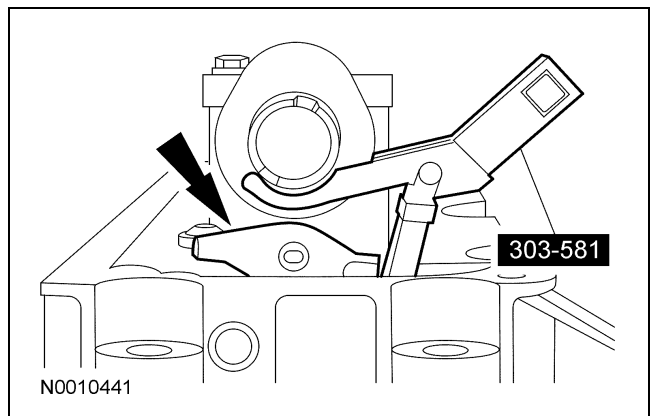


36. Rotate the crankshaft until the cam lobe is in the up position.



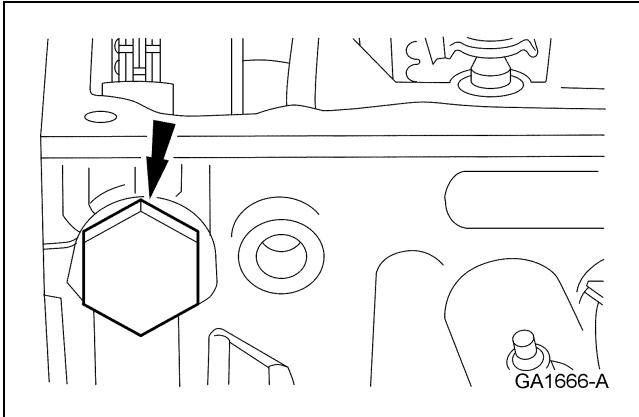
37. **NOTE:** Mark each camshaft roller follower to make sure it is installed in its original position during reassembly.

Using the special tool, remove the camshaft roller followers.

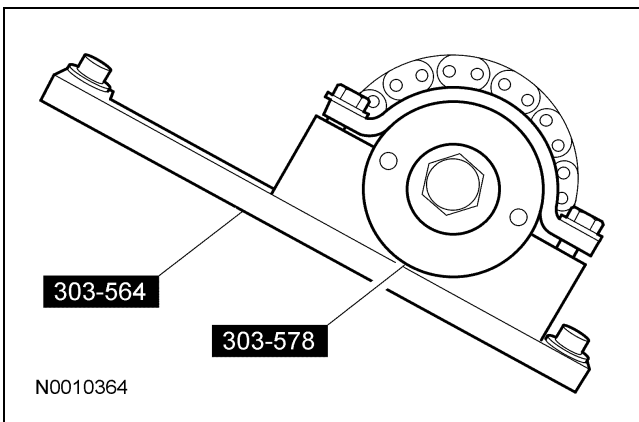


**DISASSEMBLY (Continued)**

38. Remove the RH hydraulic chain tensioner.

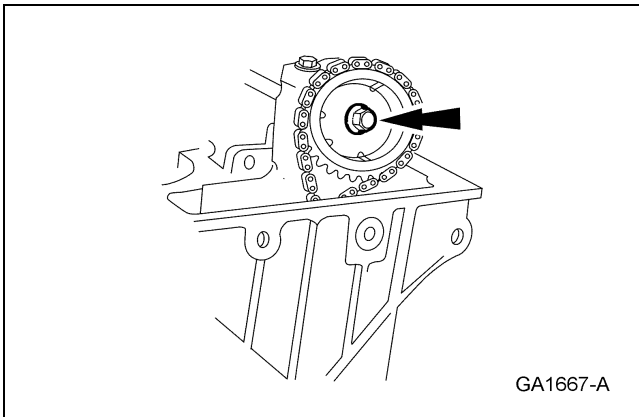


39. Install the special tools on the RH cylinder head and tighten the top 2 clamp bolts to 10 Nm (89 lb-in).

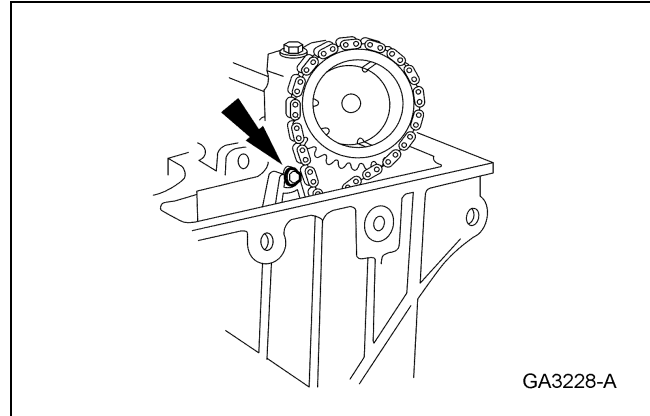


40. **⚠ CAUTION: The RH camshaft sprocket bolt is a LH-threaded bolt.**

Remove the RH camshaft sprocket bolt.



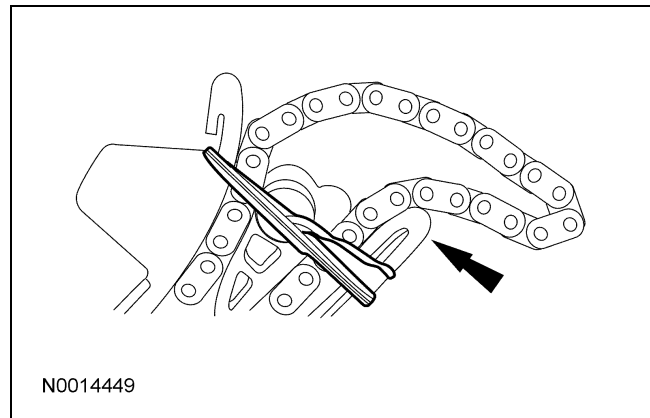
41. Remove the RH cassette bolt.



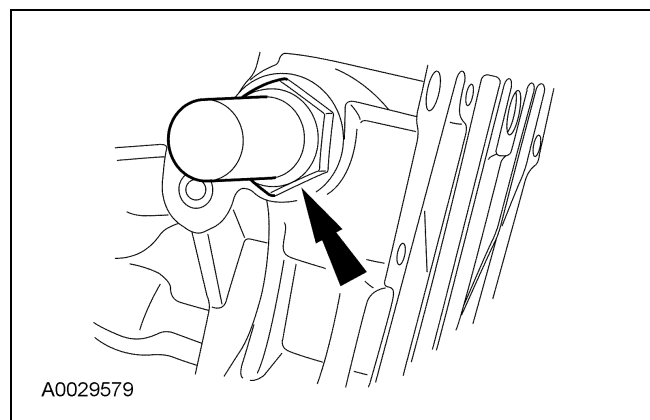
42. **⚠ CAUTION: Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.**

**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.

Remove the RH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.



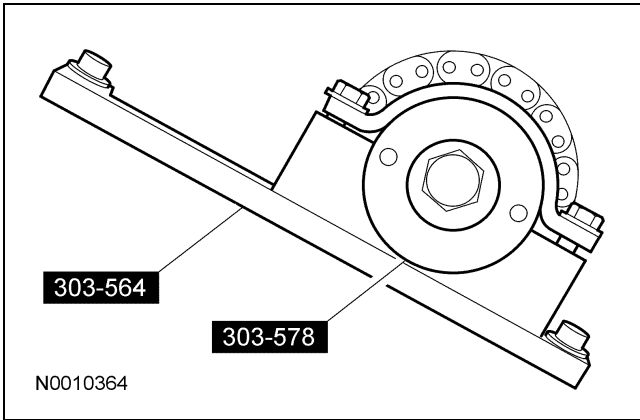
43. Remove the LH hydraulic chain tensioner.



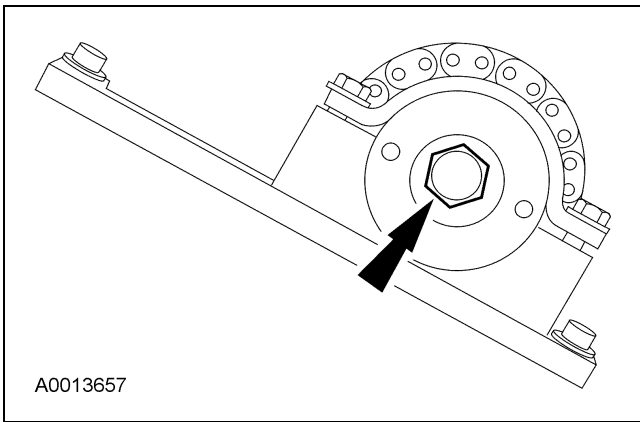


**DISASSEMBLY (Continued)**

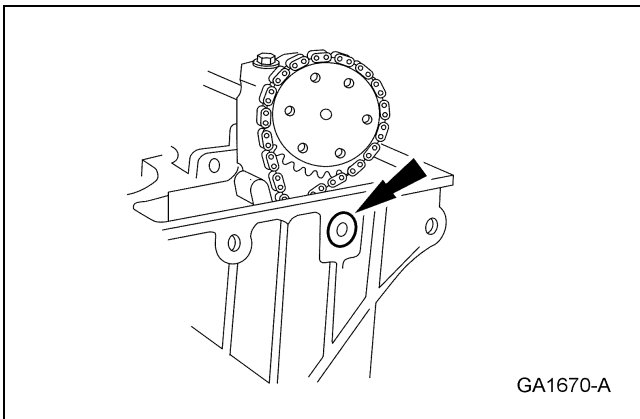
44. Install the special tools on the LH cylinder head and tighten the top 2 clamp bolts to 10 Nm (89 lb-in).



45. Remove the LH camshaft sprocket bolt.



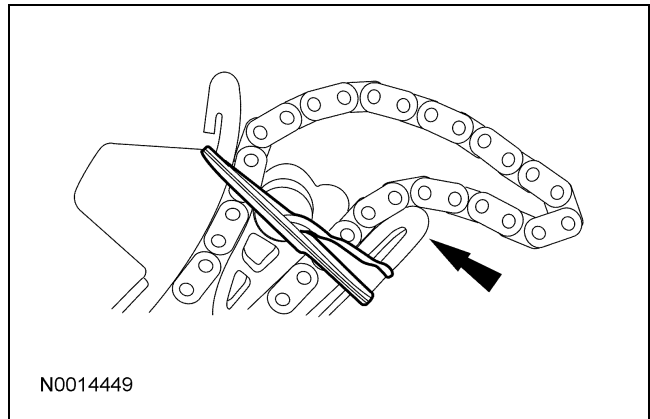
46. Remove the LH cassette bolt.



47. **⚠ CAUTION: Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.**

**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.

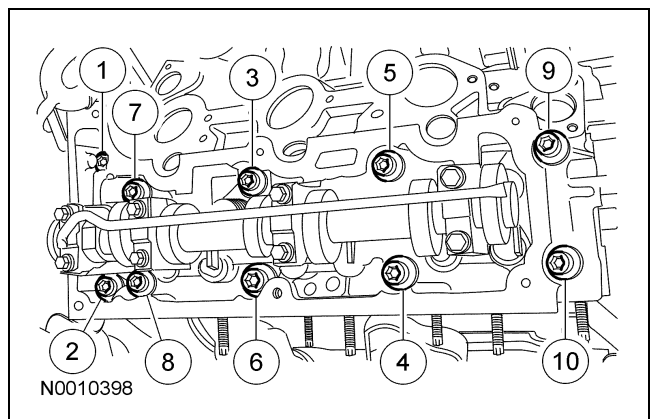
Remove the LH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.




48. **NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

Remove the bolts in the sequence shown and remove the cylinder heads.

- Discard the gaskets and the bolts.

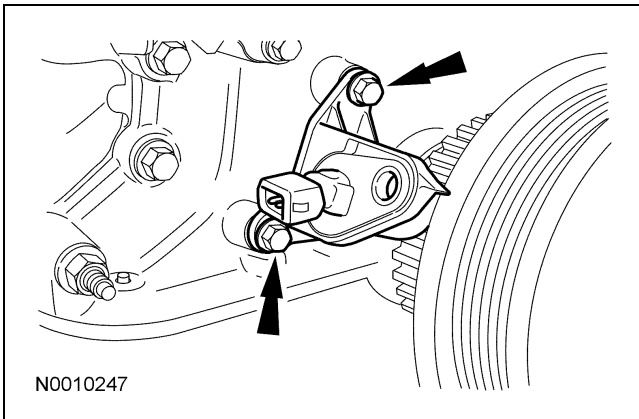


**DISASSEMBLY (Continued)**

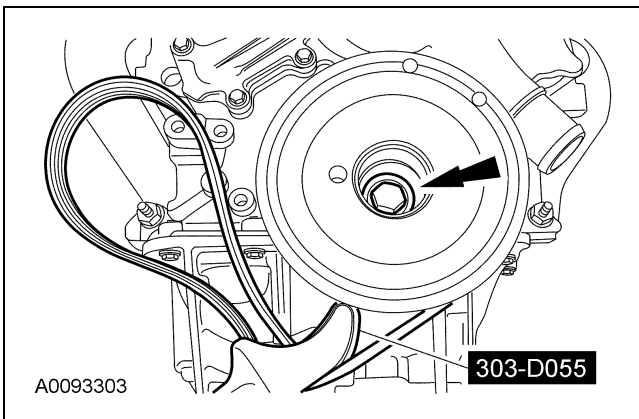
49.  **CAUTION:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

Clean and inspect the sealing surfaces. For additional information, refer to Section 303-00.

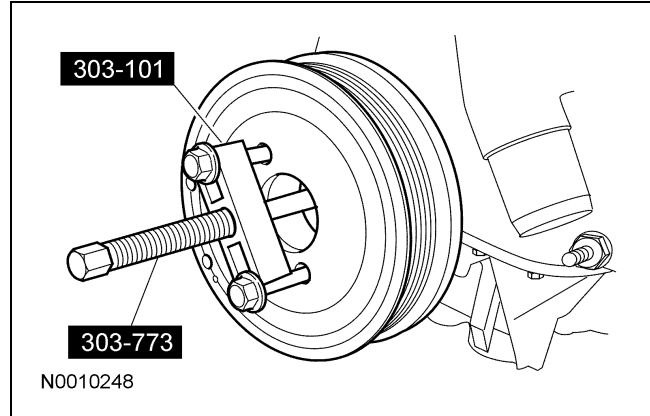
50. Remove the 2 bolts and the CKP.



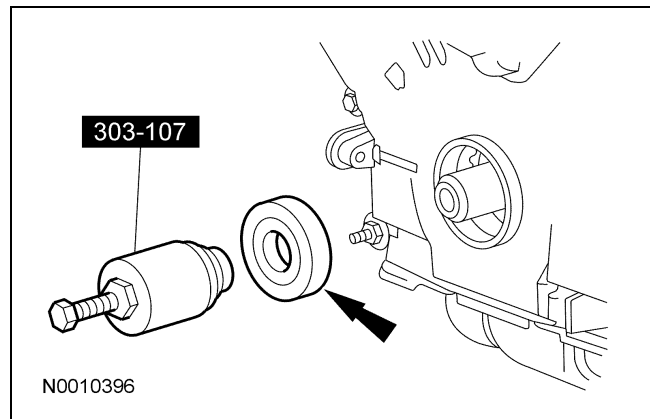
51. Using the special tool to hold the crankshaft pulley, remove the bolt and washer.



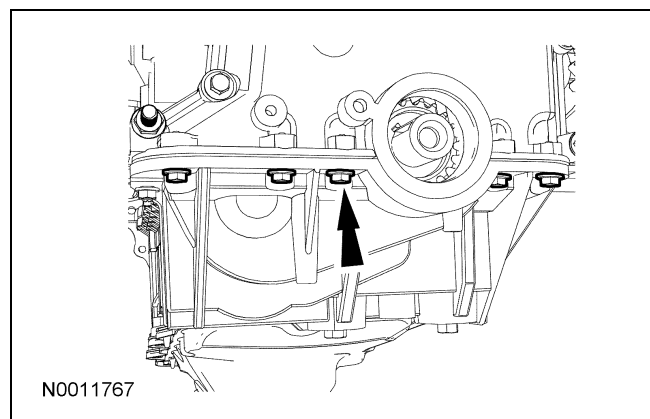
52. Using the special tool, remove the crankshaft pulley.



53. Using the special tool, remove the crankshaft front oil seal.

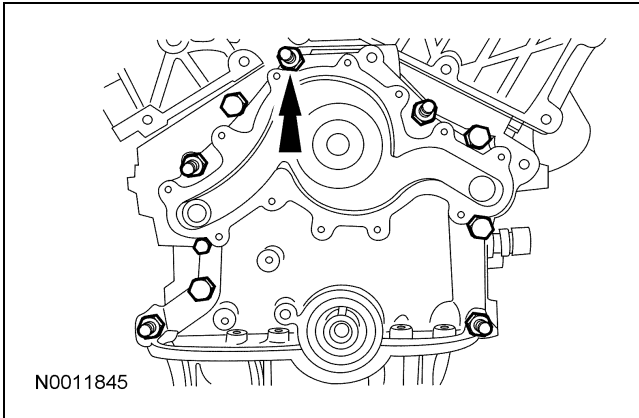


54. Remove the 5 cylinder block cradle-to-engine front cover bolts.

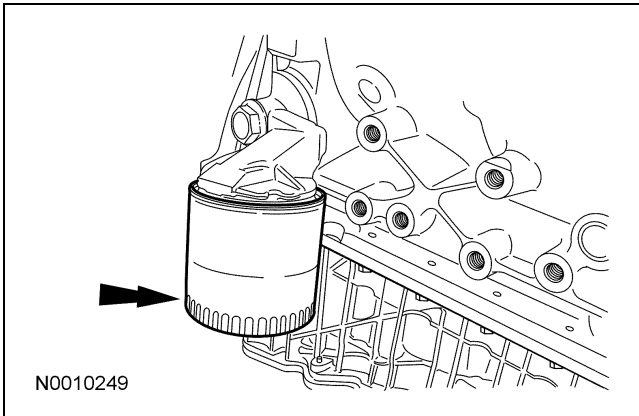


**DISASSEMBLY (Continued)**

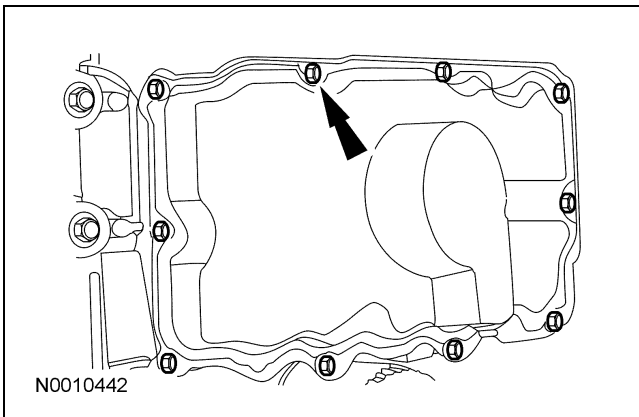
55. Remove the 5 bolts, the 5 stud bolts and the engine front cover.



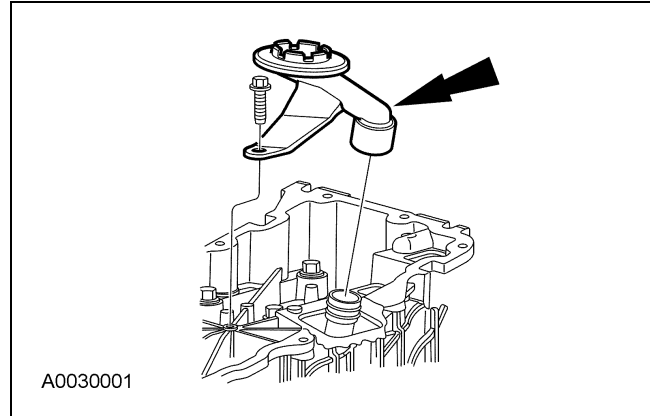
56. Remove and discard the engine oil filter.



57. Remove the bolts and the oil pan.

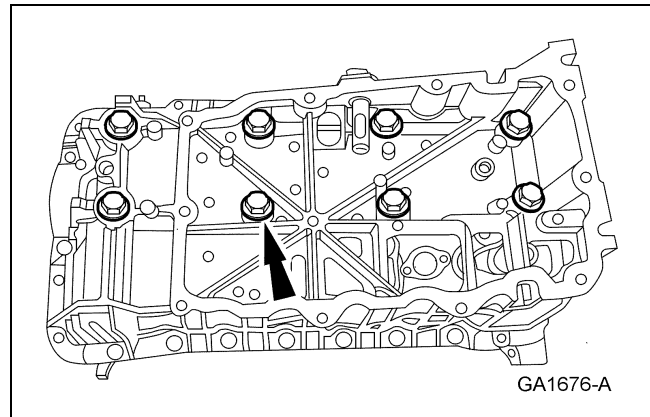


58. Remove the bolt and the oil pump screen cover and tube.

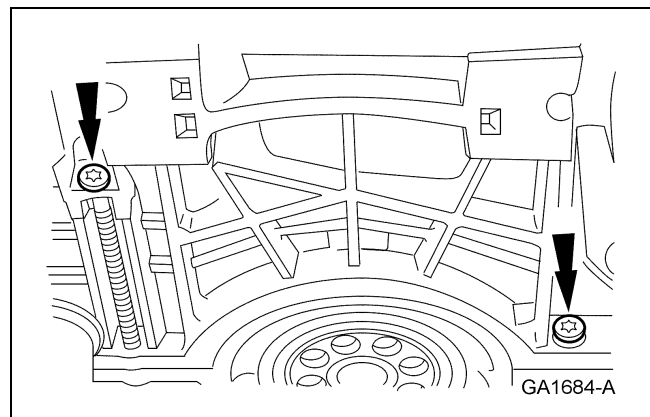


59. **NOTE:** Note the location of the 2 silver-colored bolts with the washer seals. These bolts must be installed in the same position from which they were removed with new washer seals.

Remove the cylinder block cradle inner bolts. Remove and discard the 2 washer seals.

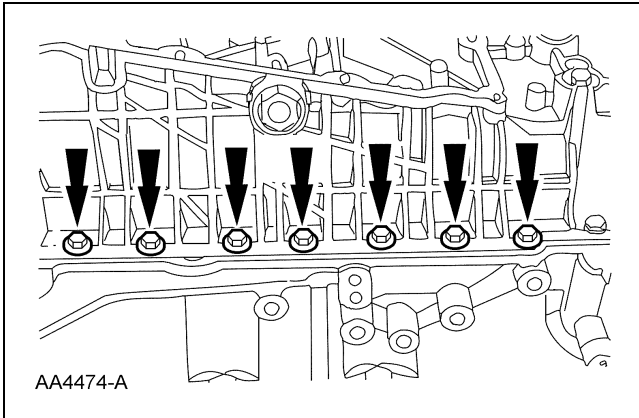


60. Remove the 2 cylinder block cradle Torx® bolts.

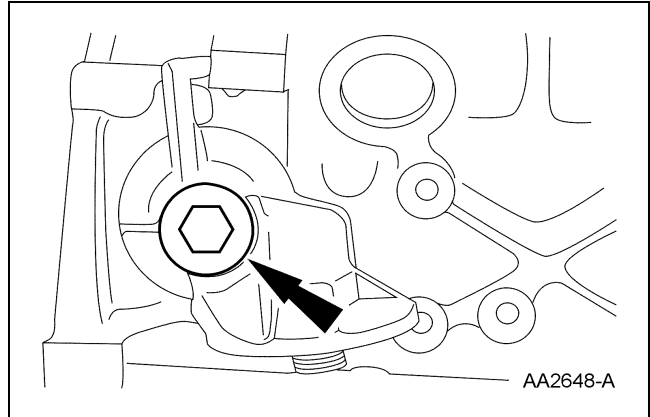


**DISASSEMBLY (Continued)**

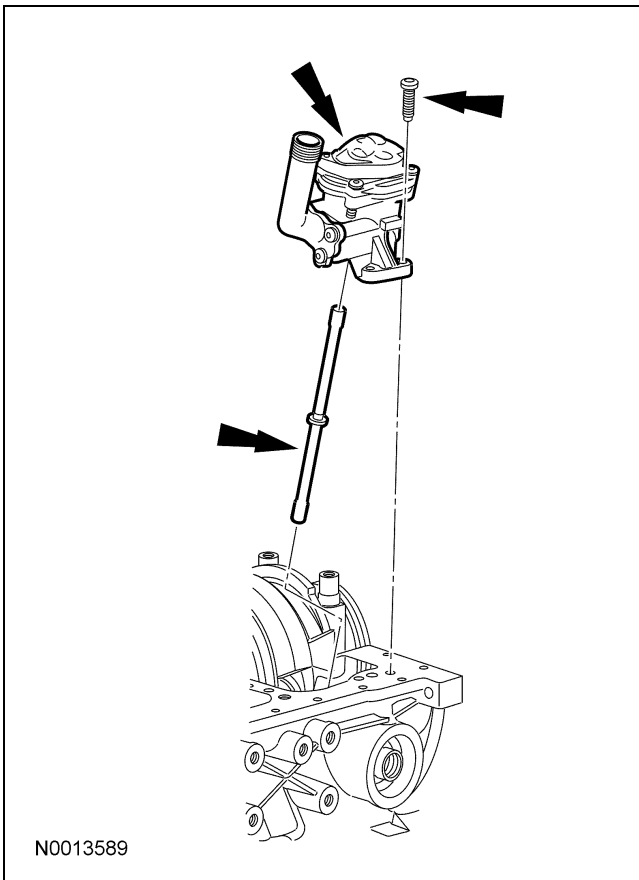
61. Remove the 15 bolts and the 2 nuts. Remove the cylinder block cradle.



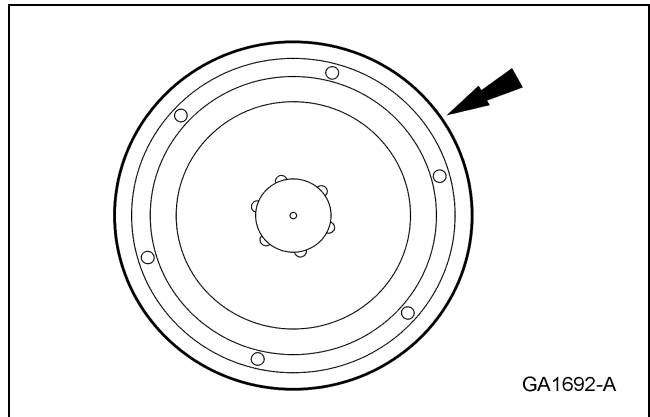
63. Remove the oil filter adapter.



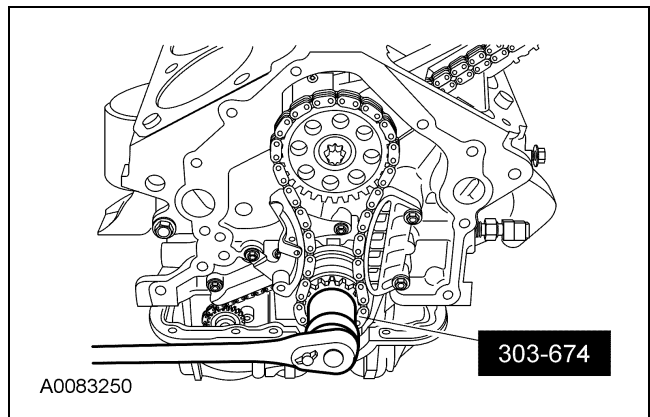
62. Remove the 2 bolts, the oil pump pickup tube and the oil pump intermediate shaft.



64. Remove the rear jackshaft plug.

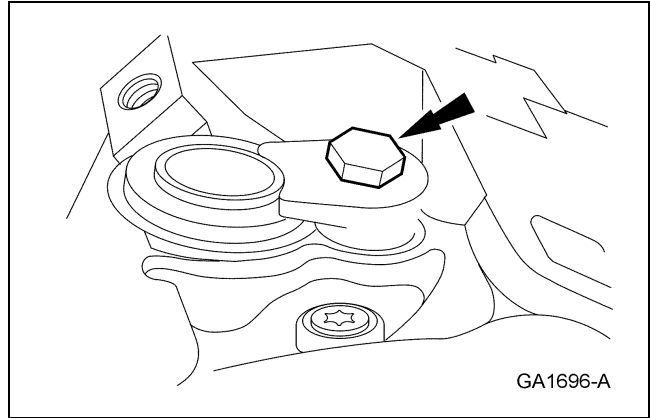
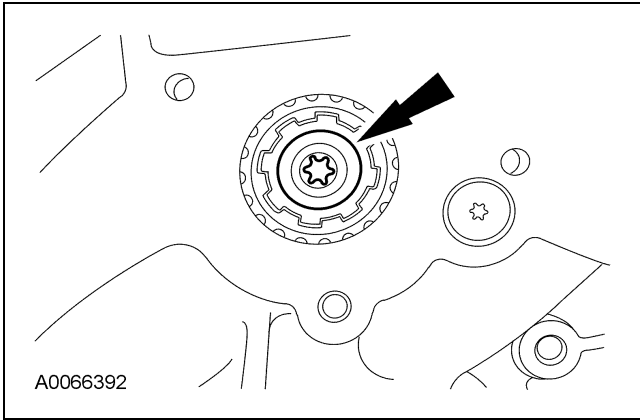


65. Using the special tool, hold the crankshaft.

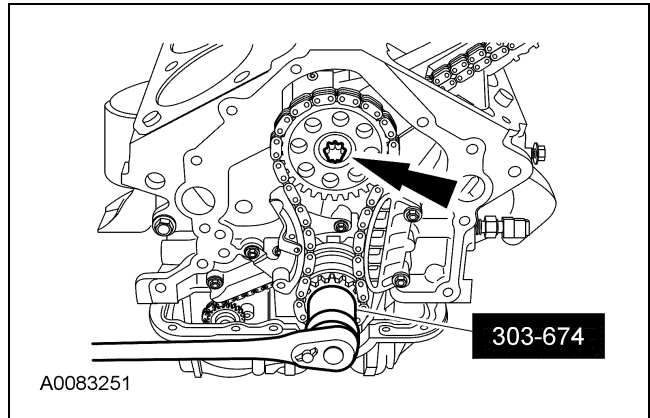


**DISASSEMBLY (Continued)**

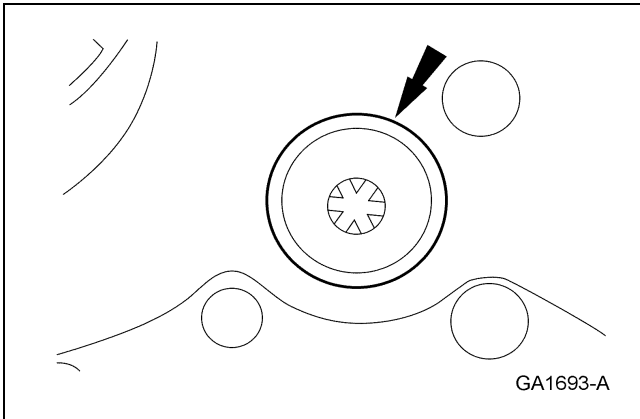
66. Remove the rear jackshaft sprocket-retaining bolt and the spacer.



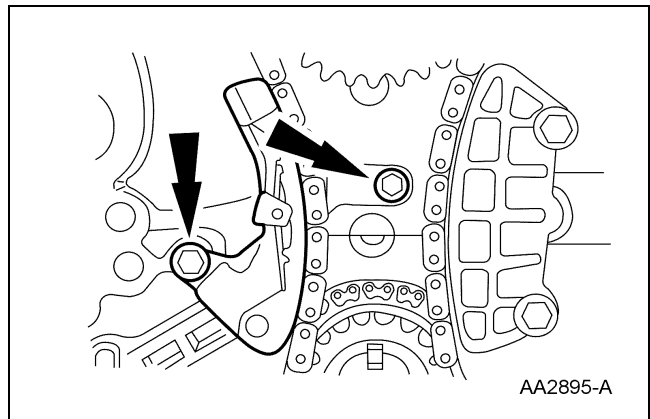
70. Using the special tool, loosen the front sprocket retaining bolt.



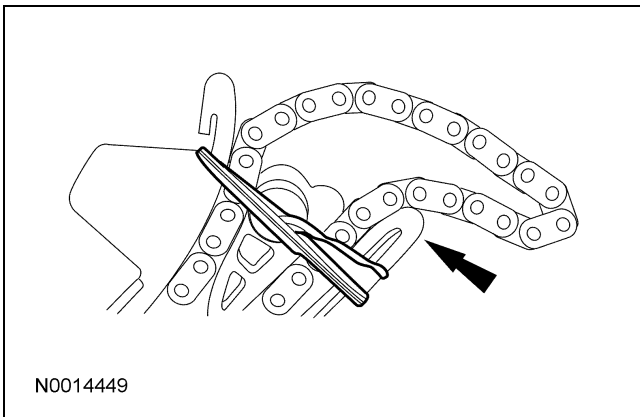
67. Remove the RH cassette bolt.



71. Remove the bolts and the chain tensioner.



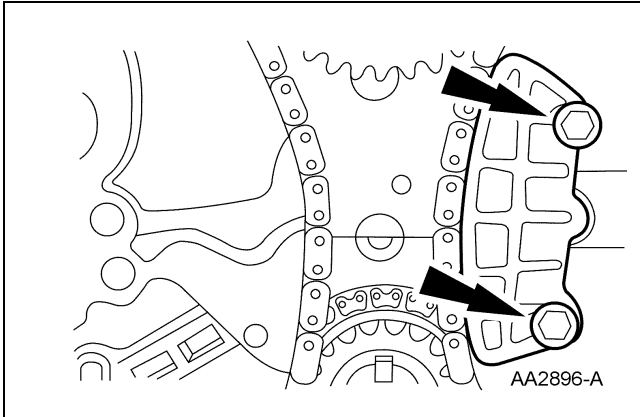
68. Remove the RH cassette.



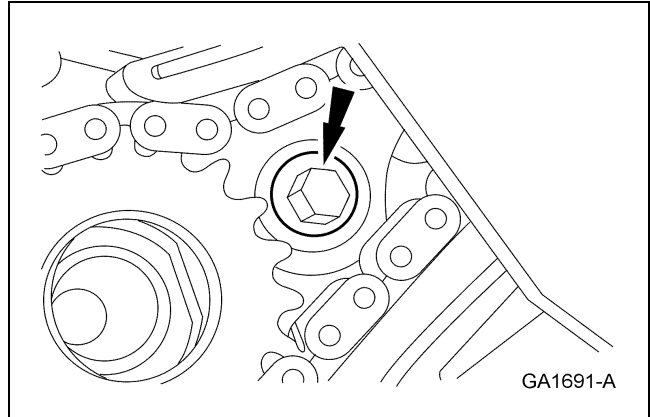
69. Remove the oil pump bolt and retainer and then remove the oil pump drive.

**DISASSEMBLY (Continued)**

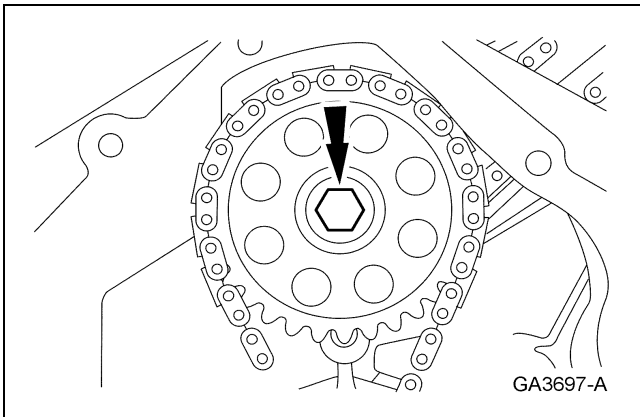
72. Remove the chain guide.



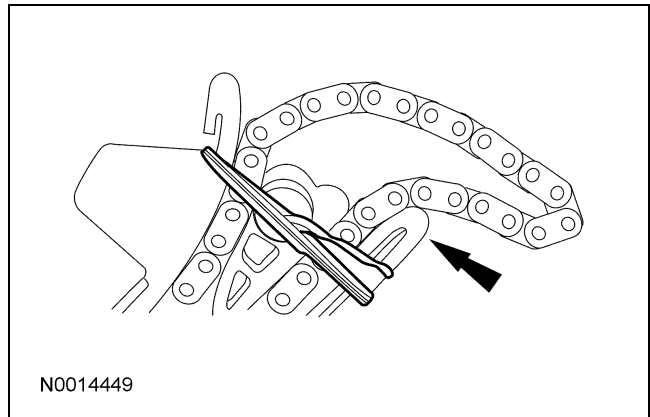
75. Remove the LH cassette bolt.



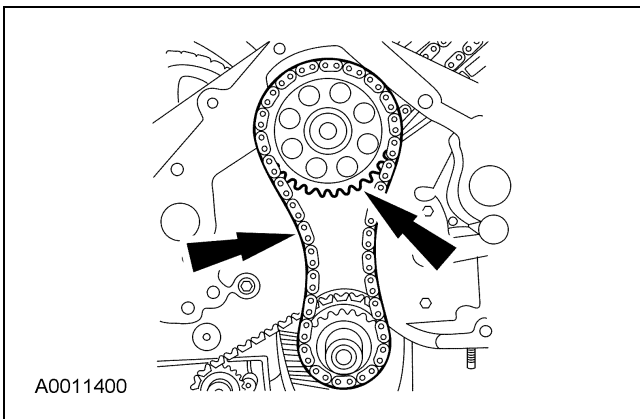
73. Remove the bolt.



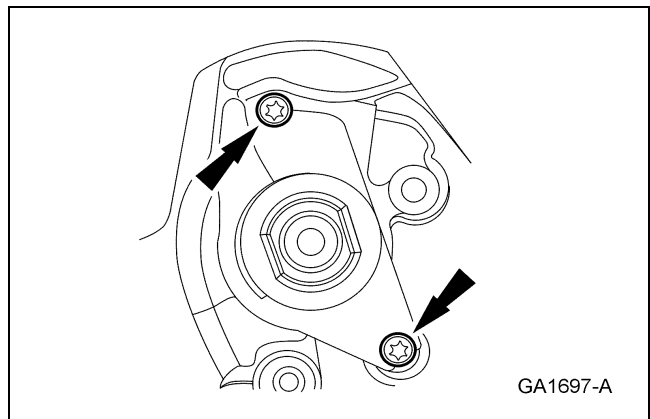
76. Remove the LH cassette.



74. Remove the jackshaft sprocket and chain.

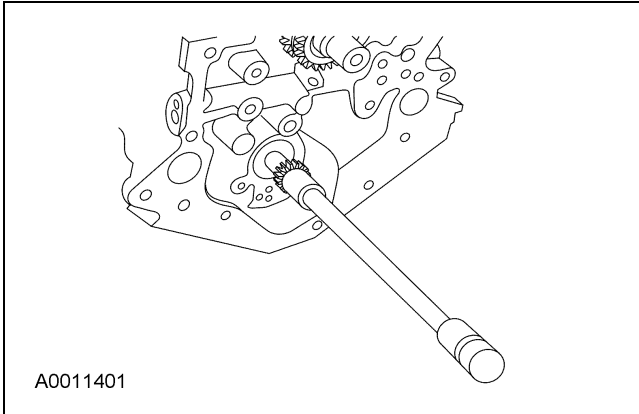


77. Remove the jackshaft thrust plate.



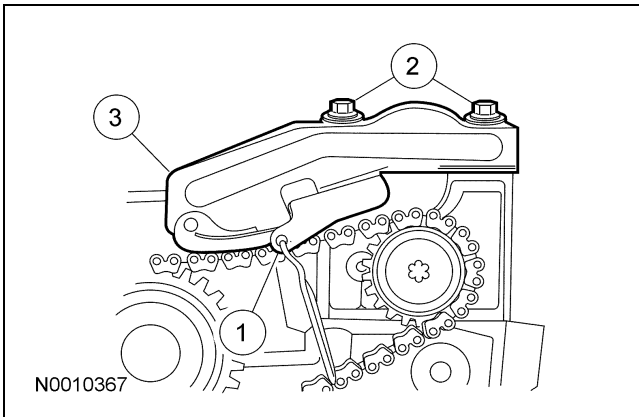
**DISASSEMBLY (Continued)**

78. Remove the jackshaft.



79. If equipped, remove the balance shaft tensioner.

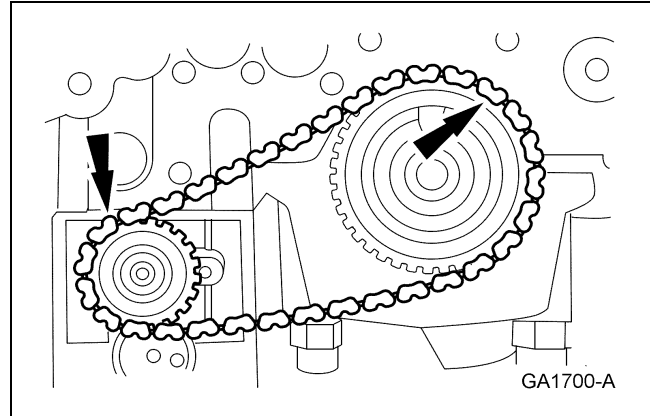
- 1 Install a pin in the balance shaft tensioner.
- 2 Remove the 2 bolts.
- 3 Remove the balance shaft tensioner.



80. If equipped, remove the 2 bolts and the balance shaft chain guide.

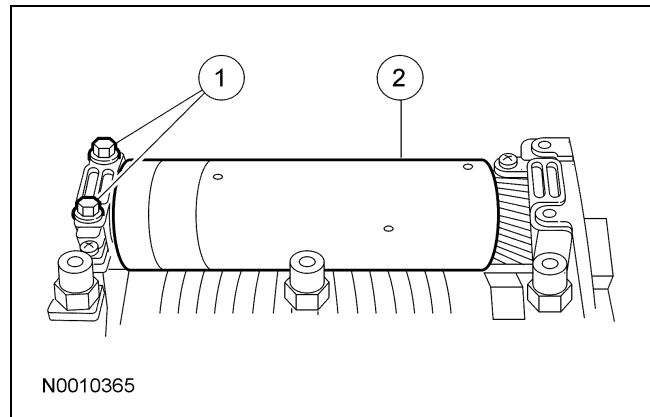
81. **NOTE:** DO NOT remove the balance shaft sprocket bolt.

If equipped, remove the balance shaft chain and crankshaft sprocket.



82. If equipped, remove the balance shaft.

- 1 Remove the 2 bolts.
- 2 Remove the balance shaft.



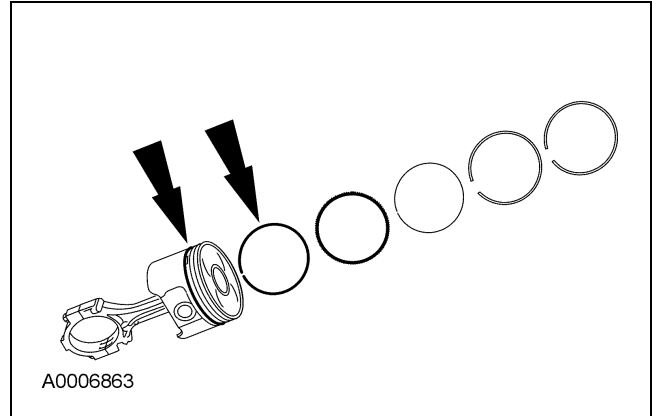
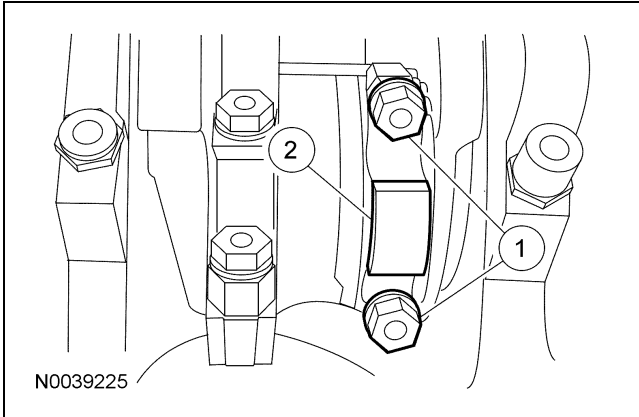
83. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad or equivalent, following the manufacturer's instructions.

**DISASSEMBLY (Continued)**

84. **NOTE:** Clearly mark the connecting rods and rod caps in numerical order for correct reassembly.

Remove the connecting rod caps.

- 1 Remove the connecting rod nuts.
- 2 Remove the connecting rod caps.



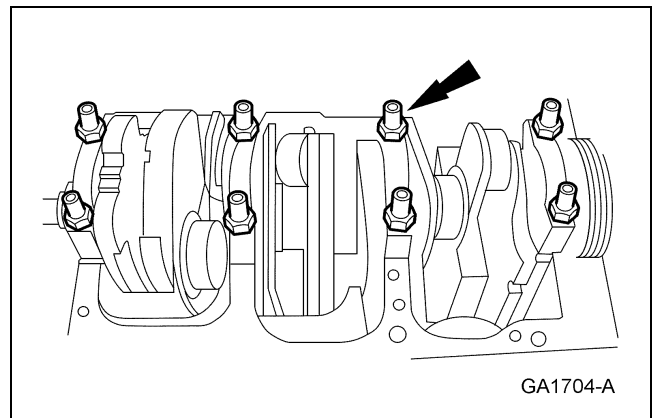
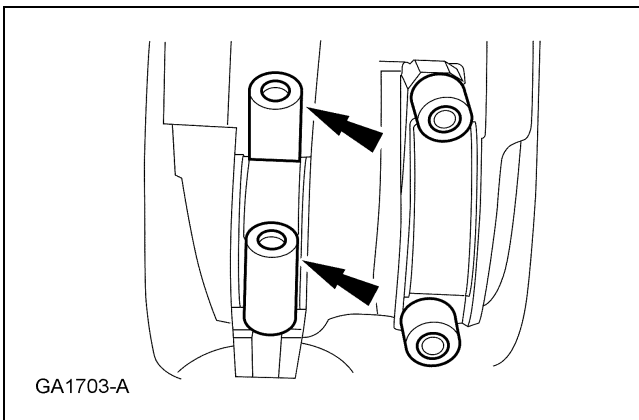
88. Clean and inspect the pistons. For additional information, refer to Section 303-00.

89. **⚠ CAUTION:** Remove the cylinder heads before removing the crankshaft. Failure to do so can result in engine damage.

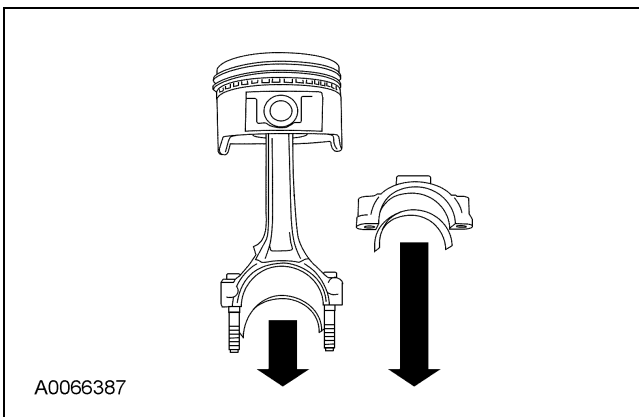
**NOTE:** Number (or mark) the crankshaft bearing caps before removing them.

Remove the bolts and the crankshaft main bearing caps.

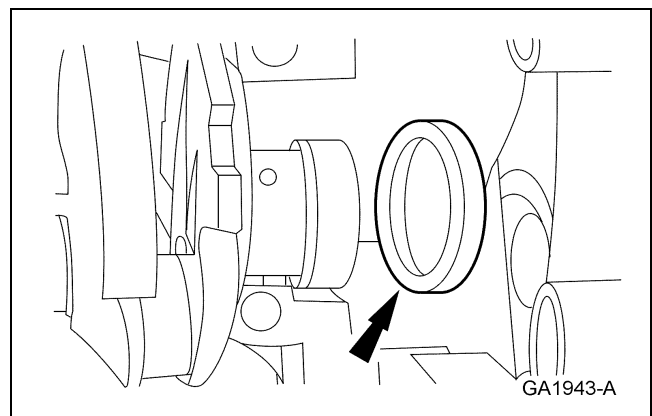
85. Install rubber hose pieces on the bolts to protect the crankshaft and remove the pistons.



86. Remove the connecting rod bearings.



90. Remove the crankshaft rear oil seal from the crankshaft.

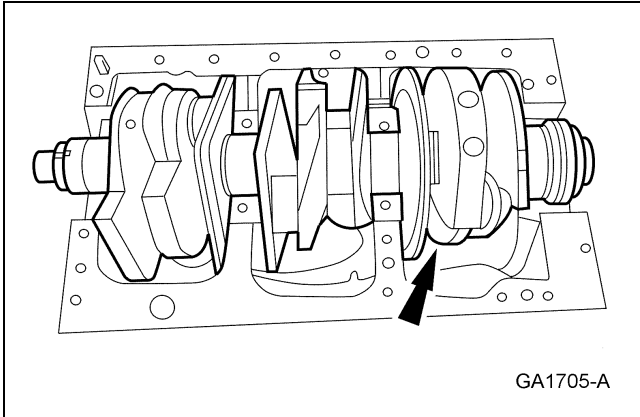


87. Remove the piston rings.



**DISASSEMBLY (Continued)**

91. Remove the crankshaft.



92. Remove the crankshaft main bearings and the thrust bearing.

