











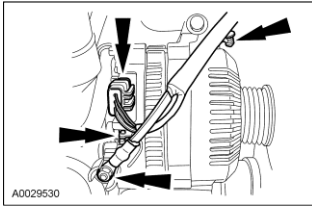
Cylinder Head**Special Tool(s)**

 ST1394-A	Spark Plug Wire Remover 303-106 (T74P-6666-A)
 ST1330-A	Valve Spring Compressor 303-581 (T97T-6565-A)
 ST1774-A	Timing Chain Tensioner 303-571 (T97T-6K254-A)
 ST1780-A	Camshaft Gear Removal Tool 303-575 (T97T-6256-F)
 ST1781-A	Camshaft Gear Torque Adapter 303-565 (T97T-6256-G)
 ST1777-A	Camshaft Gear Holding Tool 303-564 (T97T-6256-B)
 ST1776-A	Camshaft Gear Holding Tool Adapter 303-578 (T97T-6256-A)
 ST1778-A	Camshaft Holding Tool 303-577 (T97T-6256-C)
 ST1775-A	Crankshaft Holding Tool 303-573 (T97T-6303-A)
 ST1779-A	Camshaft Holding Tool Adapter 303-576 (T97T-6256-D)

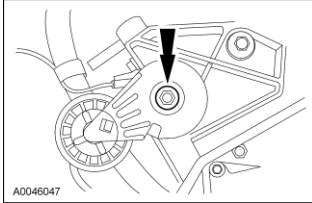
Removal**Both cylinder heads**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02](#).
2. Relieve the fuel system pressure. For additional information, refer to [Section 310-00](#).
3. Drain the cooling system. For additional information, refer to [Section 303-03](#).
4. Remove the intake manifold. For additional information, refer to [Intake Manifold](#) in this section.
5. Remove the cooling fan shroud. For additional information, refer to [Section 303-03](#).
6. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#).

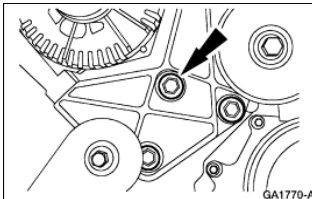
7. Remove the LH valve cover. For additional information, refer to [Valve Cover — LH](#) in this section.
8. Remove the RH valve cover. For additional information, refer to [Valve Cover — RH](#) in this section.
9. Disconnect the generator electrical connections.



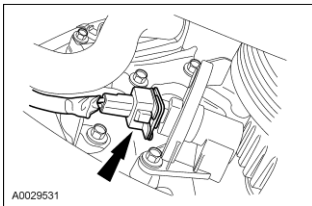
10. Remove the accessory drive belt tensioner.



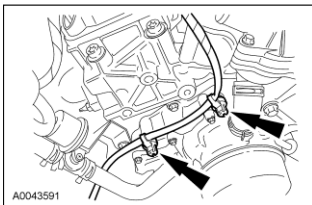
11. Remove the bolts and the generator and generator mounting bracket as an assembly.



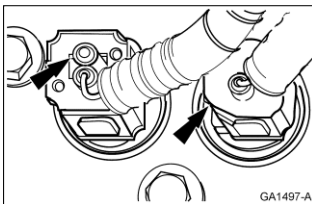
12. Disconnect the crankshaft position (CKP) sensor electrical connector.



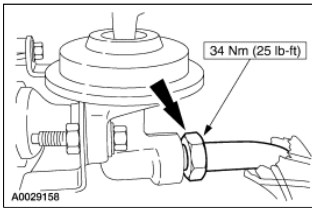
13. Disconnect the wiring harness retainers.



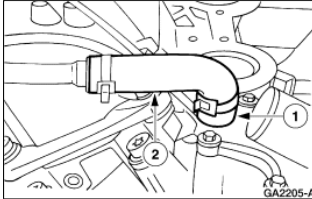
14. Disconnect the water temperature indicator sender unit and the engine coolant temperature (ECT) sensor electrical connectors.



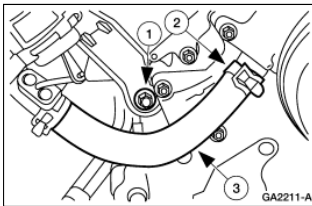
15. Disconnect the exhaust gas recirculation (EGR) tube fitting.



16. Remove the upper heater coolant hose.
 1. Squeeze the heater hose clamp.
 2. Remove the heater coolant hose.

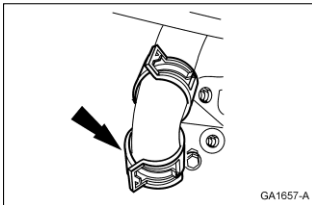


17. Remove the lower heater coolant hose and position aside.
 1. Remove the bolt.
 2. Squeeze the hose clamp.
 3. Remove the heater coolant hose and position aside.

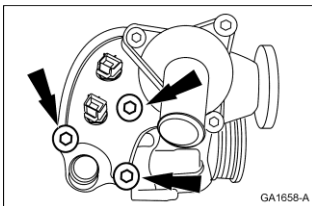


18. **NOTE:** The coolant hose will be removed with the thermostat housing.

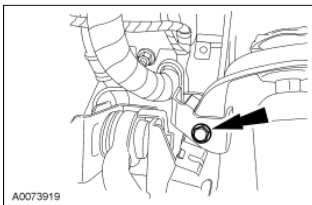
Move the coolant bypass hose clamp off the water pump outlet.



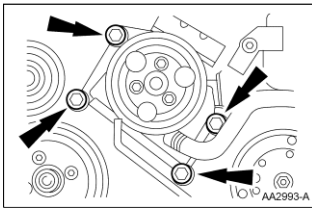
19. Remove the bolts, the thermostat housing and the bypass hose.



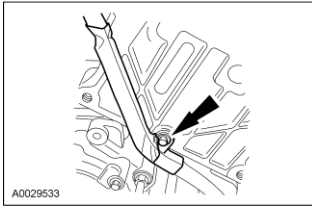
20. Remove the bolt and detach the wiring harness retainer.



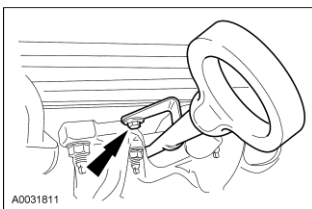
21. Remove the bolts and position the accessory drive bracket aside.



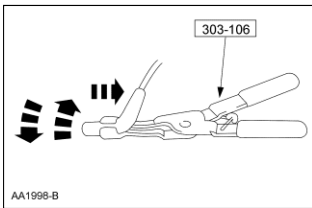
22. Detach the wiring harness retainer.



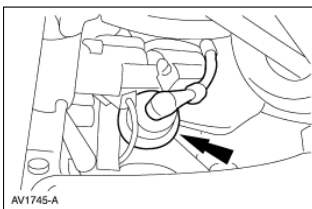
23. Remove the bolt and the oil level indicator tube.



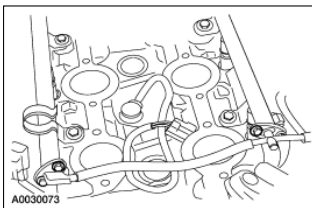
24. Using the special tool, disconnect the LH spark plug wires from the spark plugs.



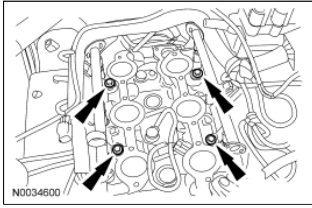
25. Disconnect the fuel pulse damper vacuum connector.



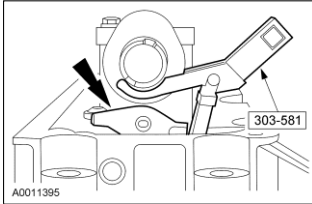
26. Remove the four bolts and position the fuel supply tube aside.



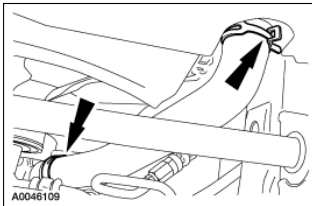
27. Remove the bolts and the fuel rail and injectors as an assembly.



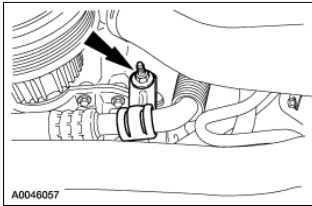
28. **NOTE:** Mark each of the roller followers to make sure it is installed in its original position during reassembly.
Use the special tool to remove the roller followers.



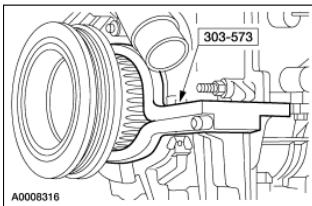
29. Remove the lower radiator hose.



30. Remove the nut and position the A/C tube bracket aside.

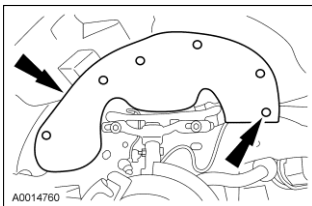


31. Using the special tool, set the No. 1 piston at top dead center (TDC).

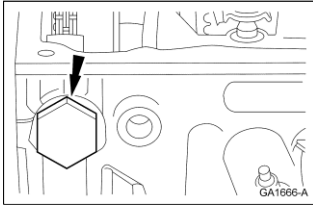


RH cylinder head

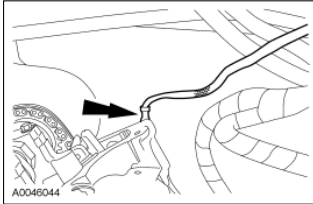
32. Remove the RH fenderwell splash shield.



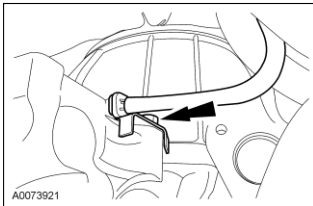
33. Remove the RH camshaft chain tensioner.



34. Remove the RH exhaust manifold. For additional information, refer to [Exhaust Manifold — RH](#) in this section.
35. Remove the bolt and detach the ground strap.



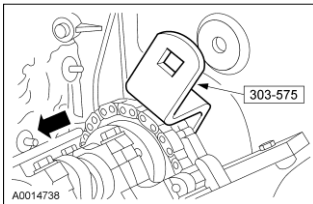
36. Remove the bolt and detach the bracket.



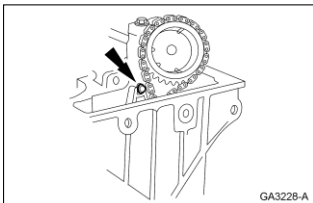
37. **⚠ CAUTION: The RH camshaft sprocket bolt is a left-hand threaded bolt.**

NOTE: Use the Camshaft Gear Torque Adapter (303-575) to remove the camshaft sprocket bolt.

Using the special tools, remove the RH camshaft sprocket bolt.



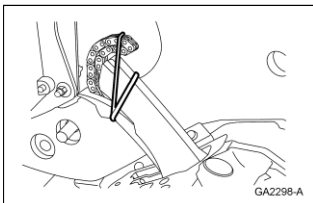
38. Remove the chain guide bolt.



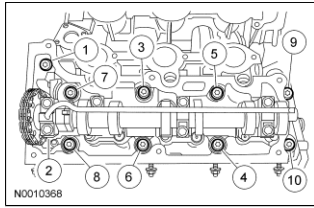
39. **⚠ CAUTION: Remove the camshaft sprocket to prevent breaking the cassette and to gain clearance to remove the cylinder head.**

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

Remove the RH camshaft sprocket from the cassette.



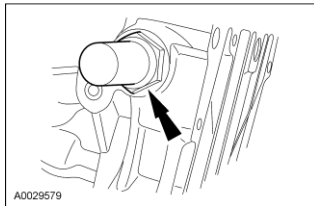
40. Remove the eight 12 mm (0.47 in) bolts and the two 8 mm (0.31 in) bolts in the sequence shown, and remove the RH cylinder head.
 - Discard the head gasket.
 - Discard the cylinder head bolts.



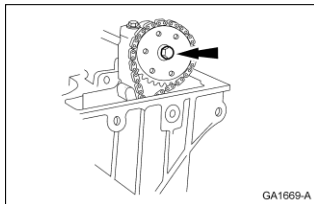
41. Clean the gasket mating surfaces.

LH cylinder head

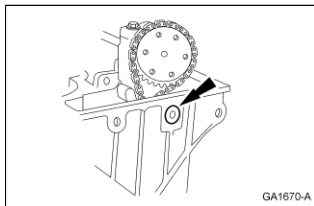
42. Remove the LH exhaust manifold. For additional information, refer to [Exhaust Manifold LH](#) in this section.
43. Remove the LH camshaft chain tensioner.



44. Remove the camshaft sprocket bolt.



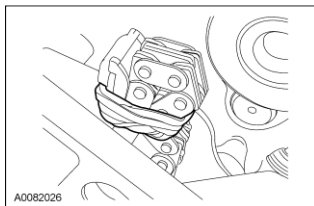
45. Remove the chain guide bolt.



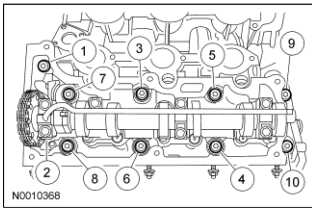
46. **⚠ CAUTION:** Remove the camshaft sprocket to prevent breaking the cassette and to gain clearance to remove the cylinder head.

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

Remove the LH camshaft sprocket from the cassette.



47. Remove the eight 12 mm (0.47 in) bolts and the two 8 mm (0.31 in) bolts in the sequence shown and remove the LH cylinder head.
 - Discard the head gasket.
 - Discard the cylinder head bolts.

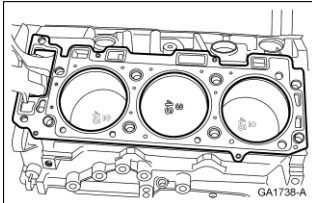


48. Clean the gasket mating surfaces.

Installation

LH cylinder head

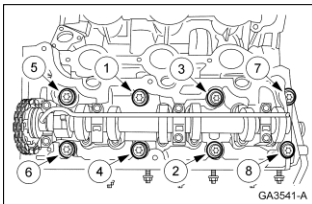
1. Position the cylinder head gasket and the cylinder head.



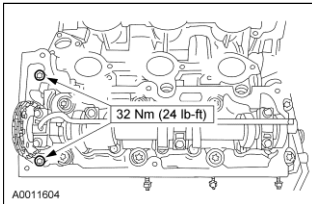
2. **NOTE:** Cylinder head bolts are a torque-to-yield design. New bolts must be installed.

Install the 12 mm (0.47 in) bolts and tighten in the sequence shown in two stages.

- Stage 1: Tighten to 12 Nm (9 lb-ft).
- Stage 2: Tighten to 25 Nm (18 lb-ft).

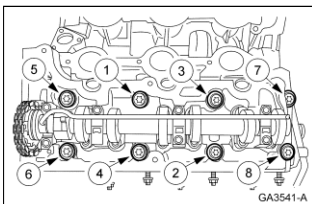


3. Install the two 8 mm (0.31 in) bolts.

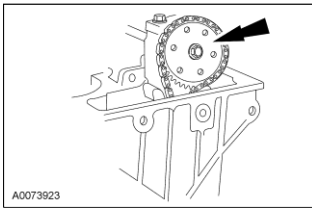


4. Tighten the eight 12 mm (0.47 in) bolts in two stages in the sequence shown.

- Stage 1: Tighten the bolts 90 degrees.
- Stage 2: Tighten the bolts an additional 90 degrees.

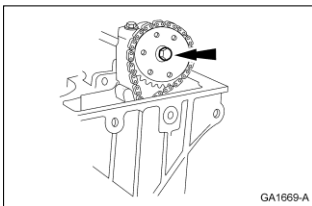


5. Install the LH camshaft sprocket in the cassette.

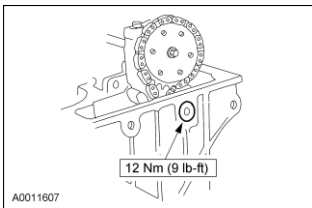


6. **CAUTION:** The camshaft sprocket must turn freely on the camshaft. DO NOT tighten the bolt.

Install the camshaft sprocket bolt.



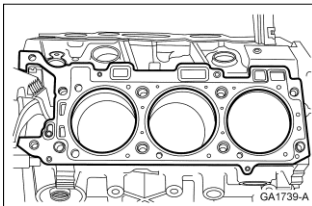
7. Install the chain guide bolt.



8. Install the LH exhaust manifold. For additional information, refer to [Exhaust Manifold LH](#) in this section.

RH cylinder head

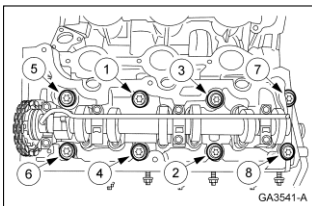
9. Position the cylinder head gasket and the cylinder head.



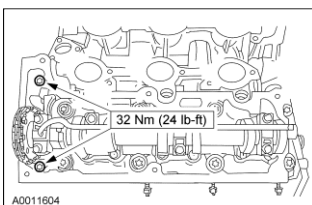
10. **NOTE:** Cylinder head bolts are a torque-to-yield design. New bolts must be installed.

Install the 12 mm (0.47 in) bolts and tighten in the sequence shown in two stages.

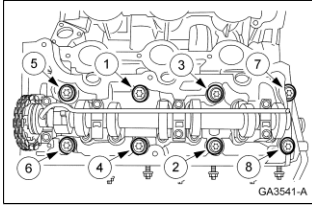
- Stage 1: Tighten to 12 Nm (9 lb-ft).
- Stage 2: Tighten to 25 Nm (18 lb-ft).



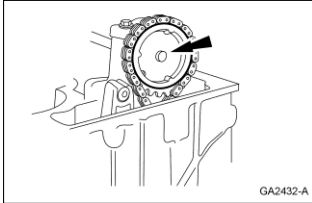
11. Tighten the two 8 mm (0.31 in) bolts.



12. Tighten the eight 12 mm (0.47 in) bolts in two stages in the sequence shown.
- Stage 1: Tighten the bolts 90 degrees.
 - Stage 2: Tighten the bolts an additional 90 degrees.

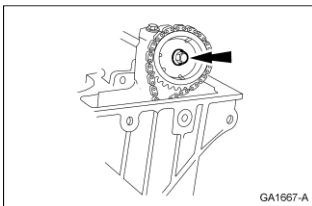


13. Install the RH camshaft sprocket in the cassette.

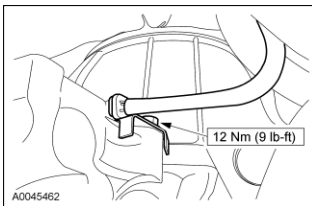


14. **CAUTION:** The camshaft sprocket must turn freely. **DO NOT** tighten the bolt.

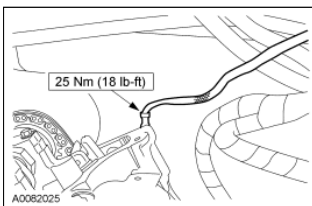
Install the RH camshaft sprocket bolt.



15. Position the bracket and install the bolt.



16. Position the ground strap and install the bolt.



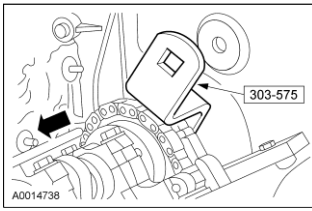
17. Install the RH exhaust manifold. For additional information, refer to [Exhaust Manifold — RH](#) in this section.

Both cylinder heads

18. **CAUTION:** The RH sprocket bolt in a left-hand threaded bolt.

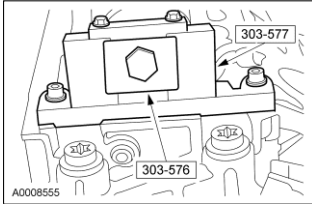
NOTE: Use the Camshaft Gear Torque Adapter (303-565) to loosen the camshaft sprocket bolt.

If necessary, loosen the RH camshaft sprocket bolt.

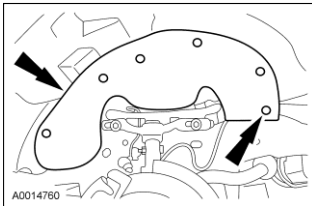


19. **NOTE:** The camshaft timing slots are off-center.

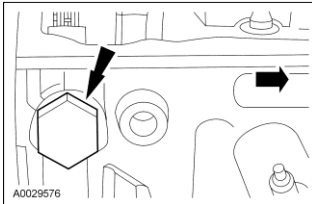
Position the camshaft timing slots below the centerline of the camshaft and install the special tools on the front of the RH cylinder head.



20. If necessary, remove the RH fenderwell splash shield.

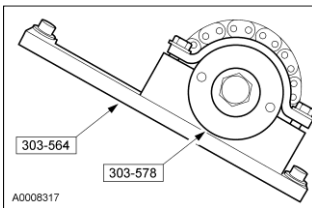


21. If necessary, remove the RH camshaft chain tensioner.

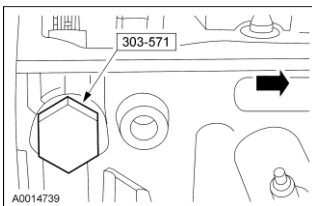


22. **NOTE:** Leave the top two special tool clamp bolts loose.

Install the special tools on the rear of the RH cylinder head.



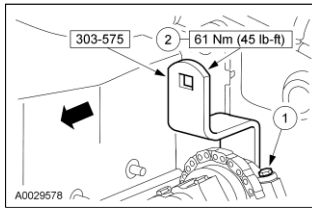
23. Install the special tool in the RH cylinder head.



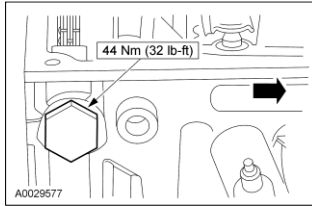
24. **CAUTION:** The right hand camshaft sprocket bolt is a left-hand thread bolt.

Tighten the bolts.

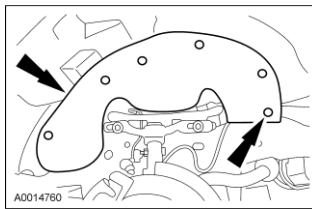
1. Tighten the special tool top two clamp bolts to 10 Nm (89 lb-in).
2. Tighten the camshaft sprocket bolt.



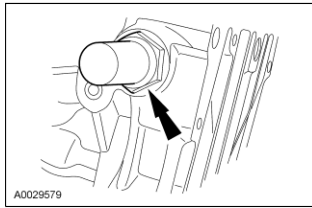
25. Install the RH camshaft chain tensioner.



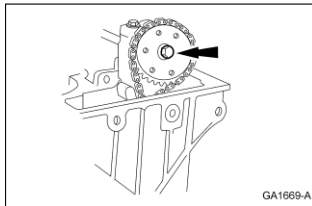
26. Install the RH fenderwell splash shield.



27. If necessary, remove the LH camshaft chain tensioner.

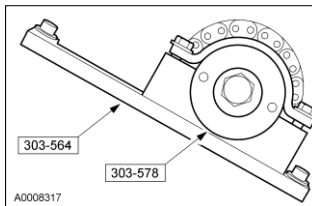


28. If necessary, loosen the LH camshaft sprocket bolt.



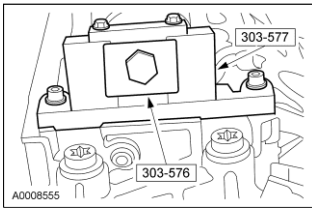
29. **NOTE:** Leave the top two special tool clamp bolts loose.

Install the special tools on the front of the LH cylinder head.

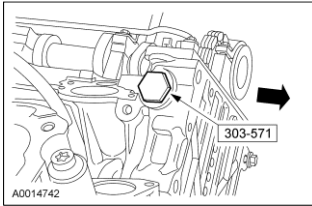


30. **NOTE:** The camshaft timing slots are off center.

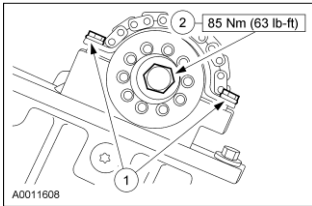
Position the camshaft timing slots below the centerline of the camshaft and install the special tools on the rear of the LH cylinder head.



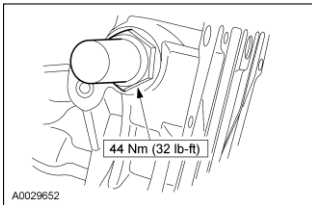
31. Install the special tool.



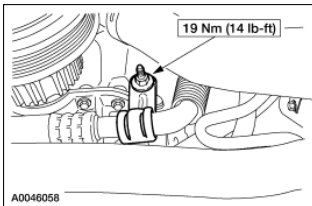
32. Tighten the bolts.
 1. Tighten the special tool top two clamp bolts to 10 Nm (89 lb-in).
 2. Tighten the camshaft bolt.



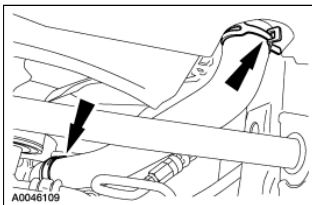
33. Install the LH camshaft chain tensioner.



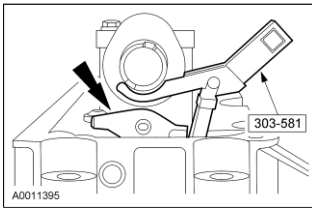
34. Position the A/C tube bracket and install the nut.



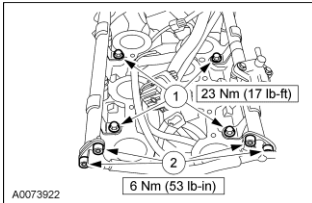
35. Install the lower radiator hose.



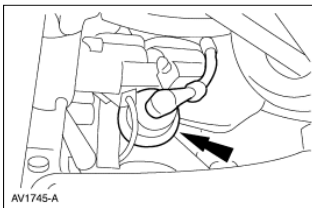
36. **NOTE:** Install each roller follower in its original position.
 Using the special tool, install the camshaft roller followers.



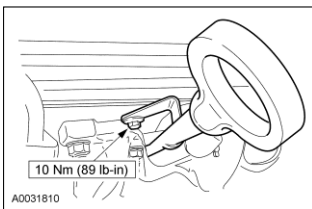
37. Install the fuel rail
1. Install the fuel rail and fuel injectors as an assembly.
 2. Install the fuel supply tube to the fuel rail.



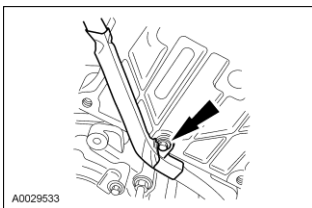
38. Connect the fuel pulse damper vacuum connector.



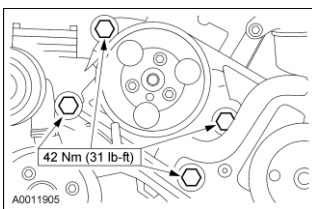
39. Connect the LH spark plug wires to the spark plugs.
40. Install the oil level indicator tube and the bolt.



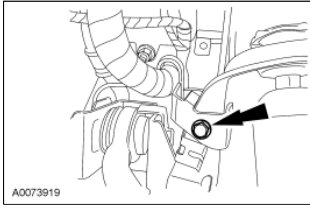
41. Attach the wiring harness retainer.



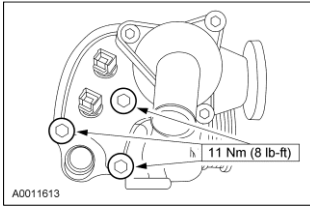
42. Position the accessory drive bracket and install the bolts.



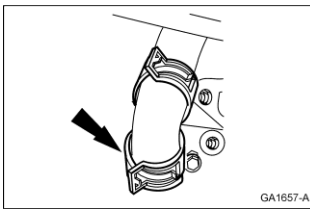
43. Position the wiring harness bracket and install the bolt.



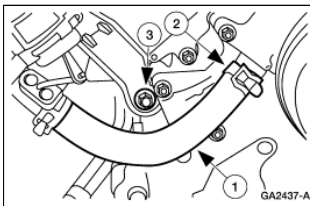
44. Position the thermostat housing and bypass hose and install the bolts.



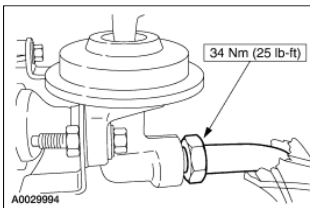
45. Position the bypass hose clamp.



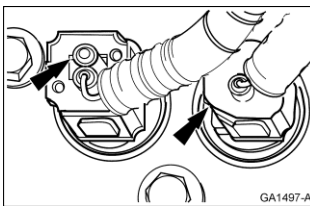
46. Install the lower heater coolant hose.
 1. Position the heater coolant hose.
 2. Squeeze the heater hose clamp and position.
 3. Install the bolt.



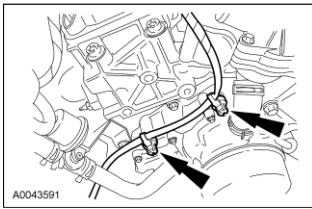
47. Connect the EGR tube fitting.



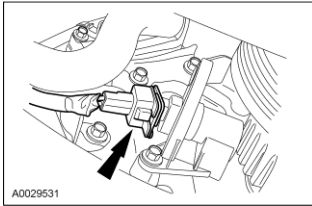
48. Connect the water temperature sender unit and the engine coolant temperature (ECT) sensor electrical connectors.



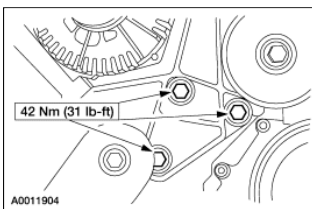
49. Connect the wiring harness retainers.



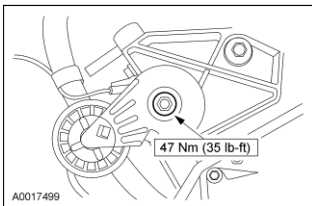
50. Connect the crankshaft position sensor electrical connector.



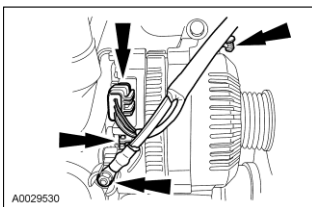
51. Position the generator and generator mounting bracket as an assembly and install the bolts.



52. Position the accessory drive belt tensioner and install the bolt.



53. Connect the generator electrical connections.



54. Install the RH valve cover. For additional information, refer to [Valve Cover — RH](#) in this section.
55. Install the LH valve cover. For additional information, refer to [Valve Cover — LH](#) in this section.
56. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).
57. Install the cooling fan shroud. For additional information, refer to [Section 303-03](#).
58. Install the intake manifold. For additional information, refer to [Intake Manifold](#).
59. Fill and bleed the cooling system. For additional information, refer to [Section 303-03](#).

