

SECTION 303-01D Engine — 6.0L Diesel

CONTENTS

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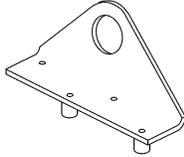
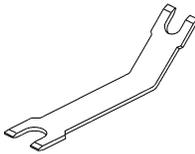
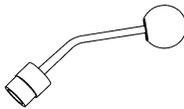
IN-VEHICLE REPAIR

Cylinder Head — LH	303-01D-2
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IN-VEHICLE REPAIR

Cylinder Head — LH

Special Tool(s)

 <p>ST2697-A</p>	<p>Lifting Bracket, Cylinder Head 303-759</p>
 <p>ST1341-A</p>	<p>Heavy Duty Floor Crane 014-00071</p>
 <p>ST2247-A</p>	<p>Quick Disconnect Tool 303-625</p>
 <p>ST2703-A</p>	<p>Disconnect Tool, Quick Release Coupling 303-755</p>
 <p>ST2862-A</p>	<p>Release Tool, Injector Connector 303-1115</p>

Material

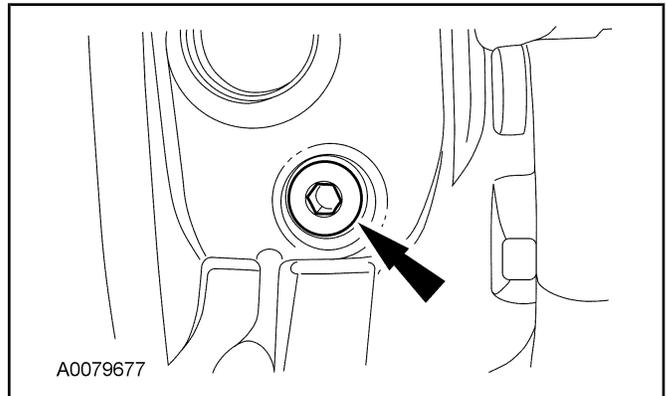
Item	Specification
<p>SAE 15W-40 Super Duty Engine Oil XO-15W40-QSD</p>	<p>WSS-M2C171-B</p>

Material(Continued)

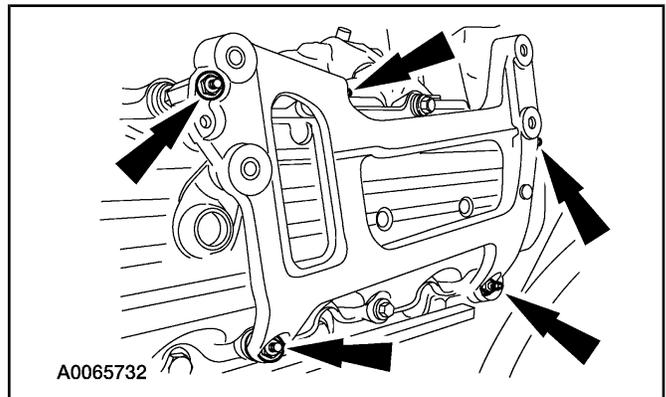
Item	Specification
<p>High Temperature Nickel Anti-Seize Lubricant F6AZ-9L494-AA</p>	<p>ESE-M12A4-A</p>

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.
2. Drain the engine oil.
3. Remove the intake manifold. For additional information, refer to Intake Manifold in this section.
4. Remove the LH cylinder block drain plug.

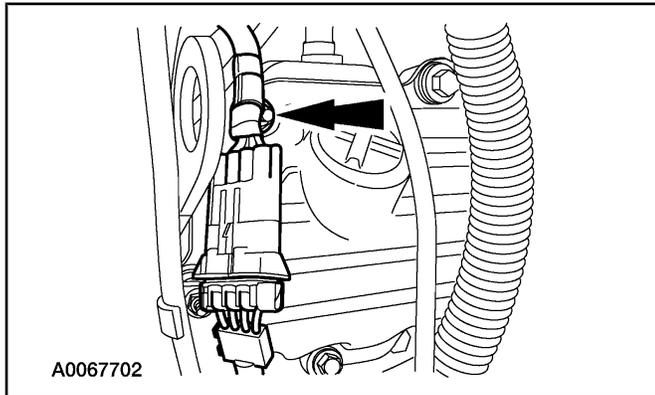


5. Remove the fuel injector control module mounting bracket.

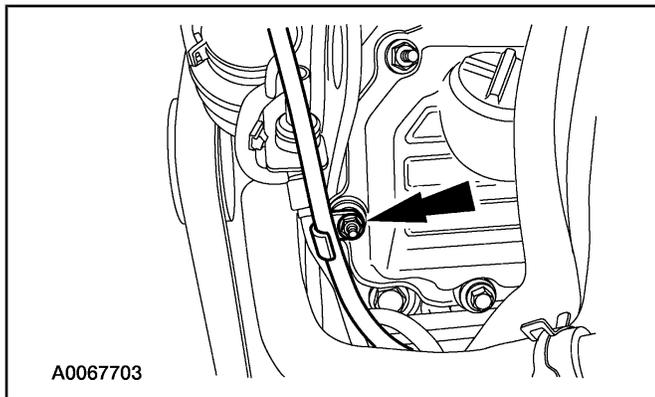


6. Disconnect the glow plug connector and position aside.

IN-VEHICLE REPAIR(Continued)

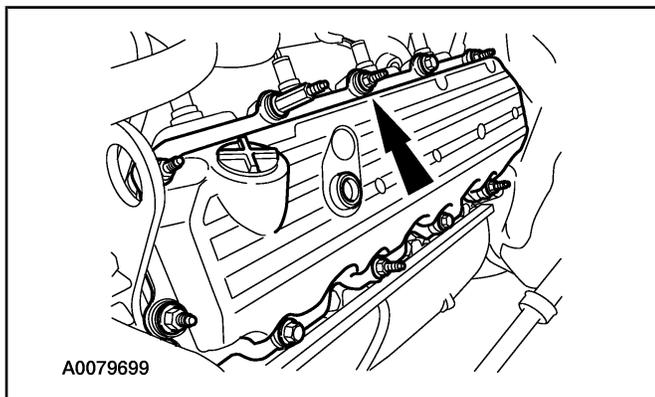


7. Remove the nut and position the oil level indicator and tube aside.

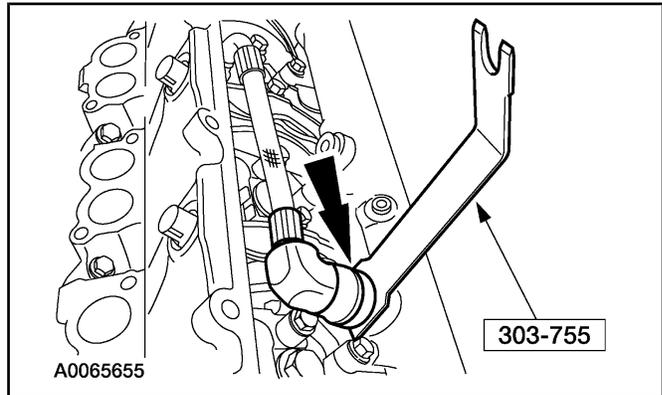


8. **NOTE:** Mark the position of the valve cover bolts for valve cover bolt installation.

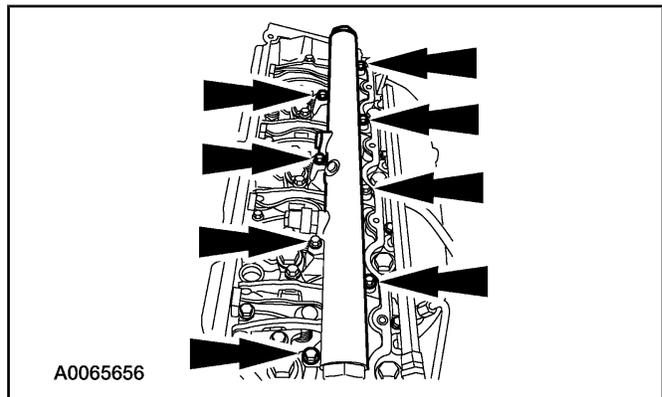
Remove the eleven bolts and the valve cover. Remove the valve cover gasket.



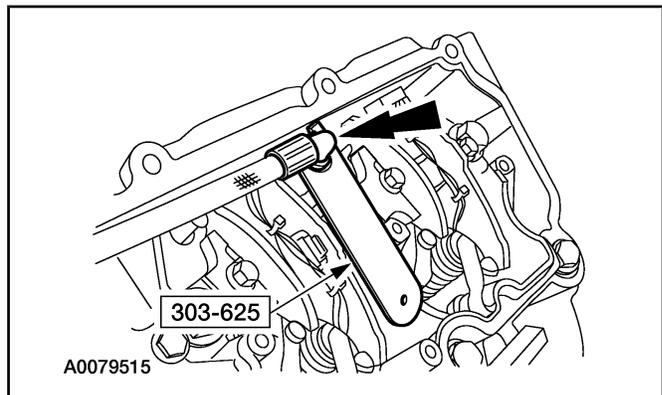
9. Disconnect the high-pressure oil rail supply line at the high-pressure oil rail.



10. Remove the bolts and the high-pressure oil rail.



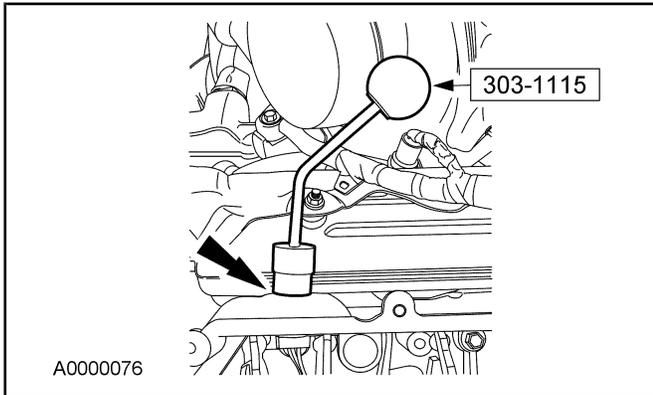
11. Disconnect and remove the high-pressure oil supply line.



12. **NOTICE:** Do not attempt to put battery voltage to the fuel injector or damage to the fuel injector will occur.

Using the special tool, push the fuel injector electrical connector out of the rocker arm carrier.

IN-VEHICLE REPAIR(Continued)



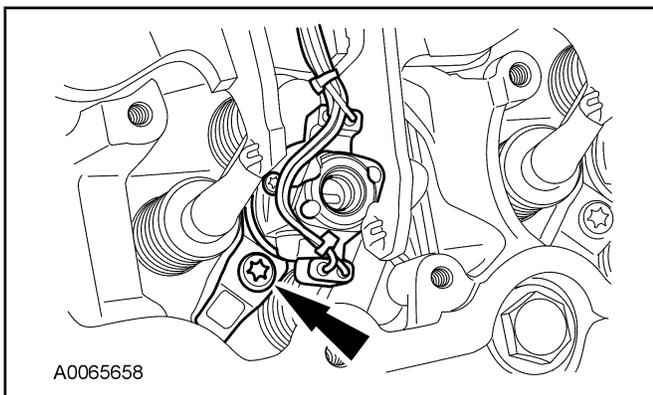
13. Prior to removing the injector assembly, insert clean shop towels in the oil drain holes adjacent to each glow plug.
14. **NOTICE:** To prevent engine damage, do not use air tools to remove the fuel injectors. The clip that extracts the injector can dislodge and fall into the oil drain hole.

NOTICE: Failure to account for all snap rings or pieces prior to placing the vehicle back in service can cause engine damage. A missing snap ring can be ingested into the lube oil system causing severe engine damage.

NOTE: There is no need to drain the fuel rail.

NOTE: If engine coolant is found in the combustion chambers, it may be necessary to install a new injector sleeve. For additional information, refer to Section 303-04D.

Remove the bolt, fuel injector hold-down and fuel injector.

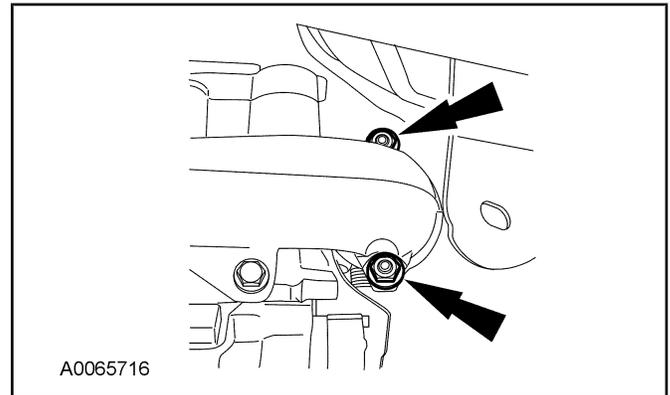


15. **NOTE:** If a snap ring or a piece of a snap ring is missing from the injector hold-down assembly, it must be located prior to removing the shop towels.

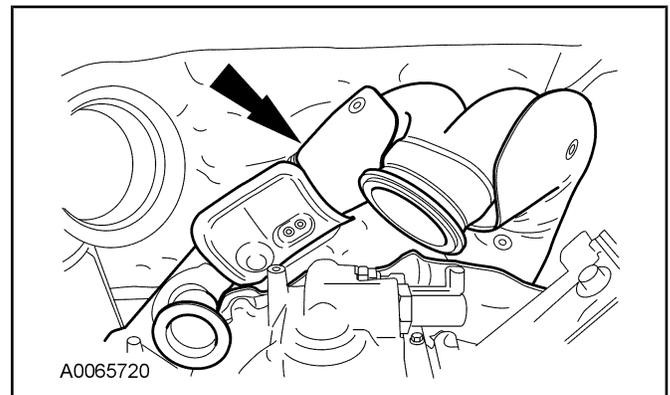
Remove the shop towels.

16. **NOTE:** LH shown, RH similar.

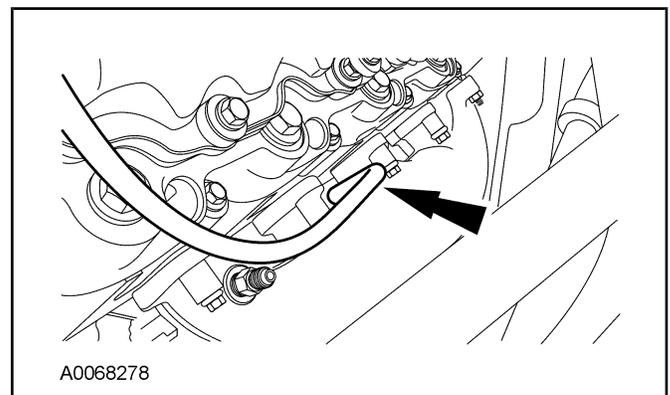
Remove the nuts and bolts from the turbocharger adapter pipe.



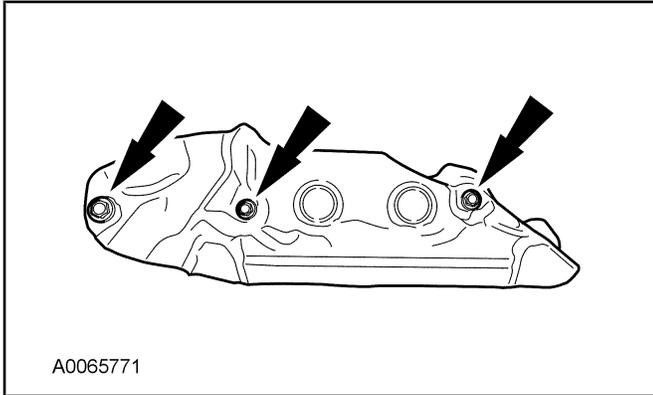
17. Remove the turbocharger adapter pipe.



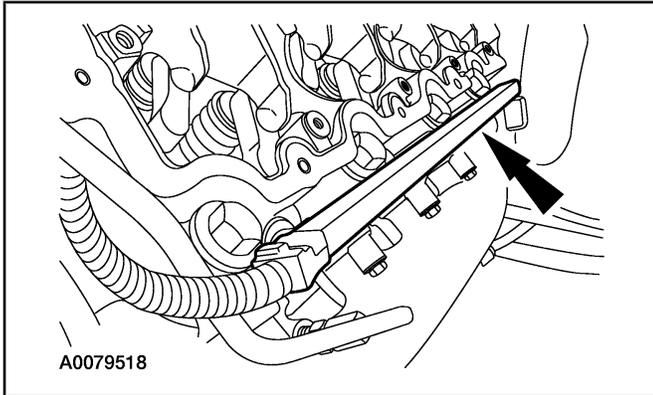
18. **NOTE:** Remove and discard the O-ring.
Remove the oil level indicator and tube.



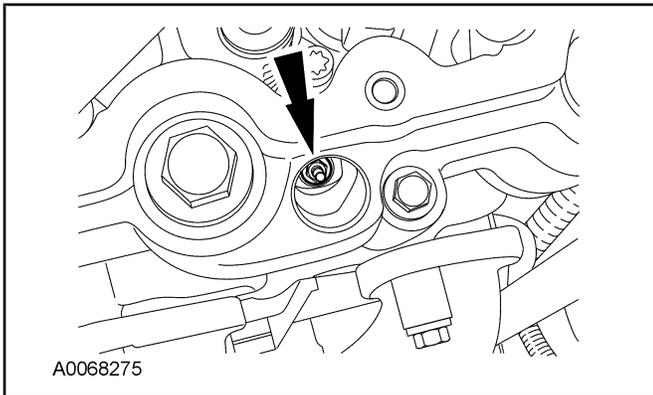
19. Remove the bolts and turbocharger heat shield.

IN-VEHICLE REPAIR(Continued)

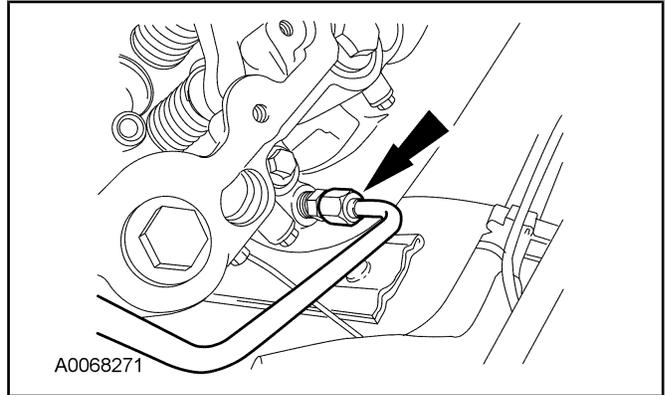
20. Remove the glow plug buss bar.



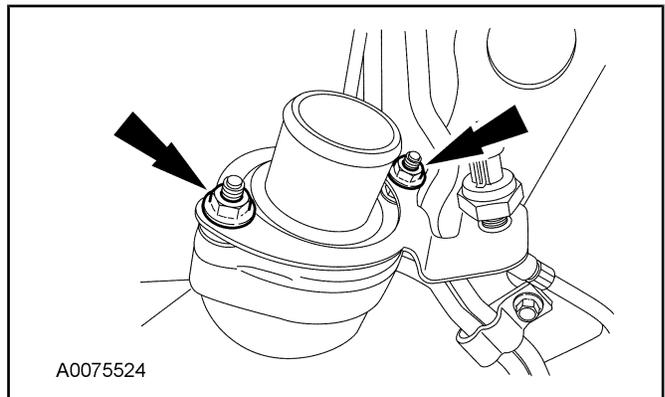
21. Remove the four glow plugs.



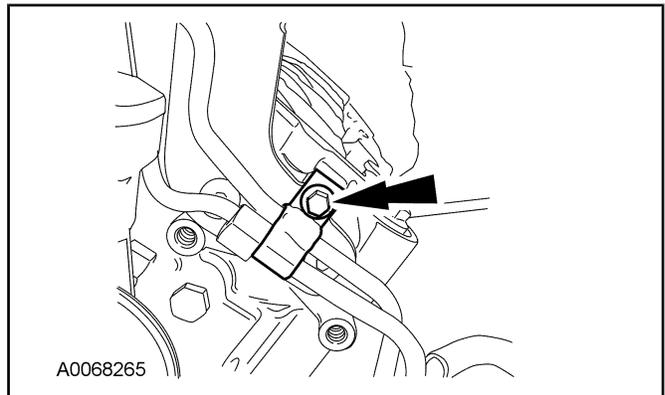
22. Disconnect the exhaust back pressure tube at the exhaust manifold.



23. Remove the retaining nuts. Remove the exhaust back pressure sensor and tube assembly.

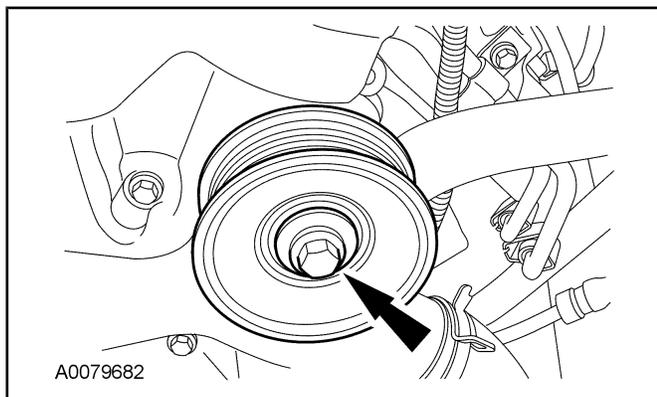


24. Remove the retaining nut from the fuel tube bracket and position the fuel tubes aside.

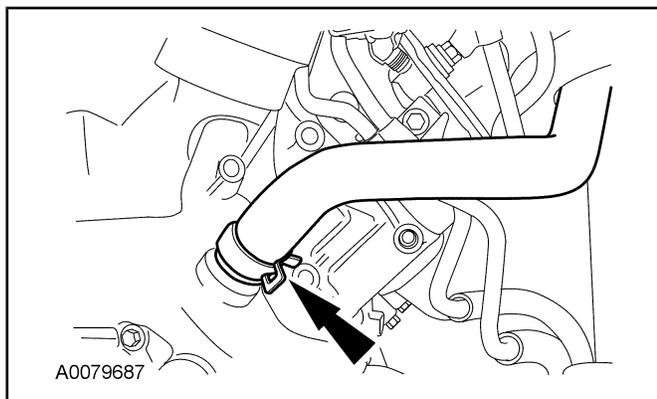


25. Remove the bolt and the idler pulley.

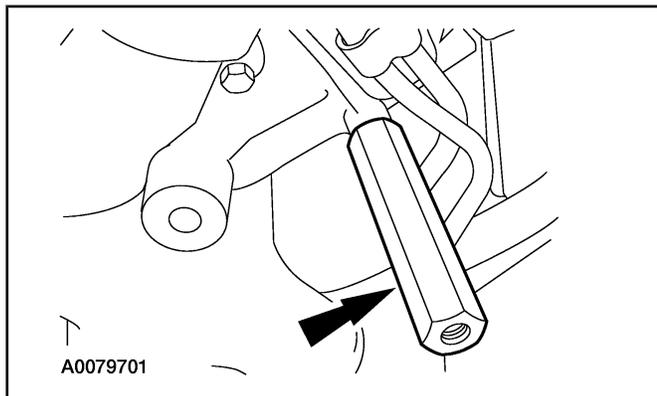
IN-VEHICLE REPAIR(Continued)



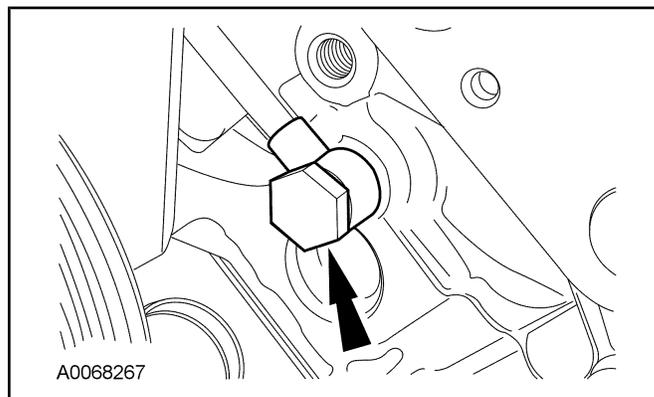
26. Disconnect the heater hose from the front cover and position aside.



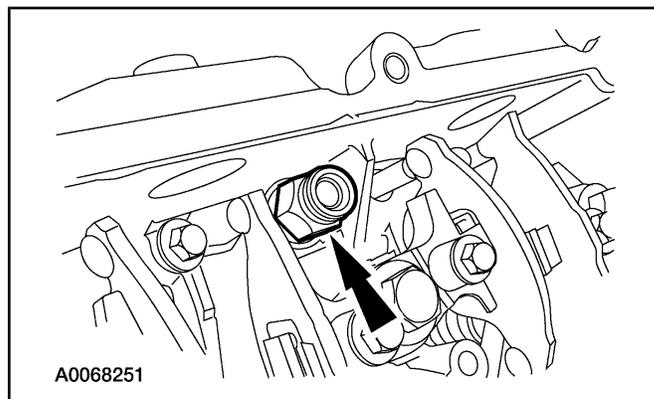
27. Remove the fan shroud mounting stud.



28. **NOTE:** Remove and discard the sealing washers.
Remove the banjo bolt and the fuel tube.



29. Remove and discard the crankcase-to-head tube assembly.



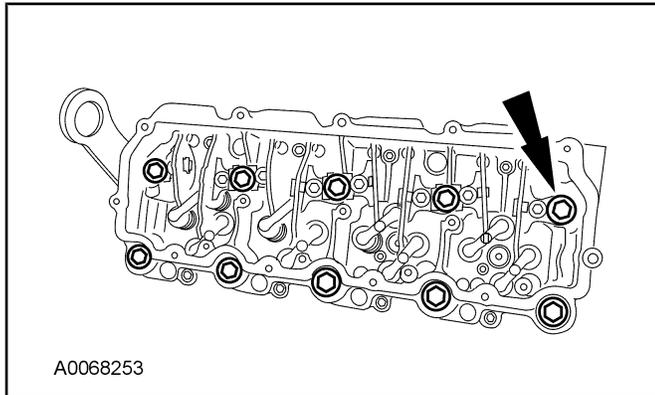
30. **NOTICE:** Make sure the insulation blanket is not damaged (torn, cracked or fabric separated from the metallic skin) when removing the lower rear cylinder head bolt. If the insulation blanket is damaged, the entire blanket must be replaced.

NOTE: It may be necessary to slightly compress or deform the insulation blanket to gain tool clearance to remove the lower rear cylinder head bolt.

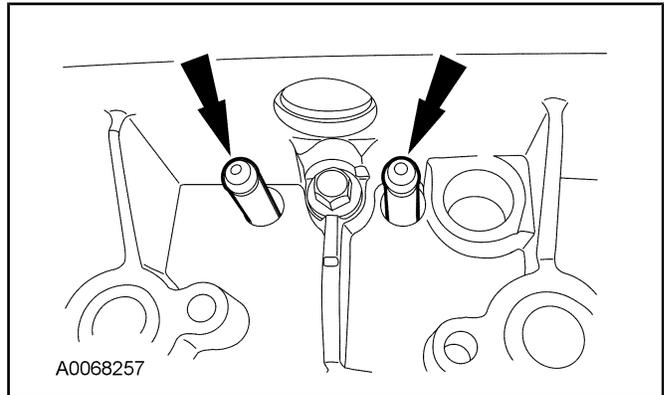
NOTE: The back two cylinder head bolts cannot be removed from the head in vehicle. Raise these bolts and secure them in position so they will clear the cylinder block deck as the head is removed.

Remove and discard the inner cylinder head bolts.

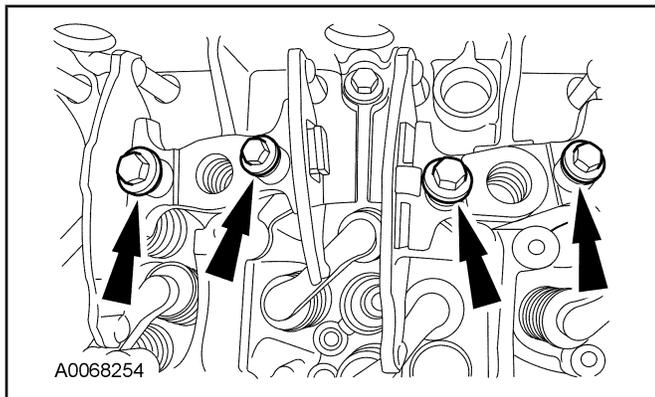
IN-VEHICLE REPAIR(Continued)



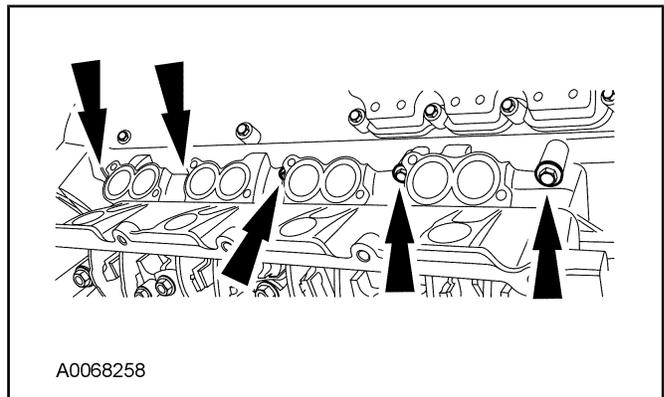
31. Remove the eight bolts and the rocker arm assemblies.



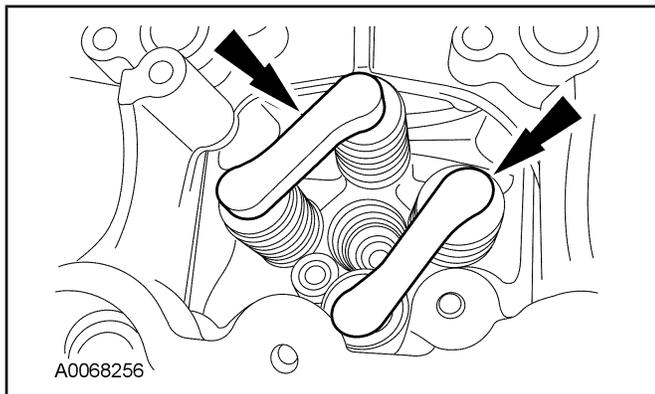
34. Remove the outer cylinder head bolts.



32. Mark the eight valve bridges with a permanent marker and remove.

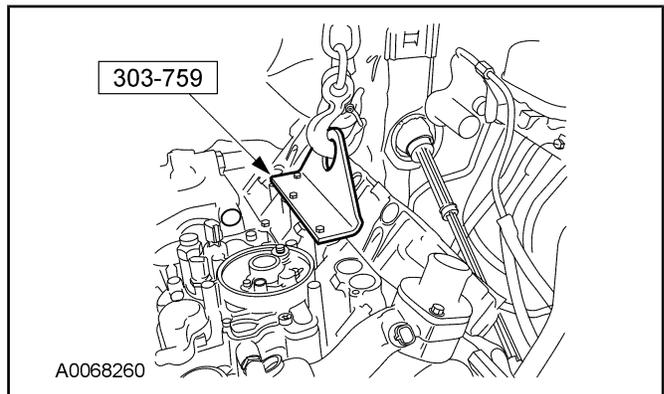


35. Install the special tool and the lifting crane. With the help of an assistant, remove the cylinder from the vehicle.



33. **NOTICE:** To prevent engine damage, keep the push rods in the order in which they were removed. Install all push rods back in their original positions.

Mark and remove the eight push rods.

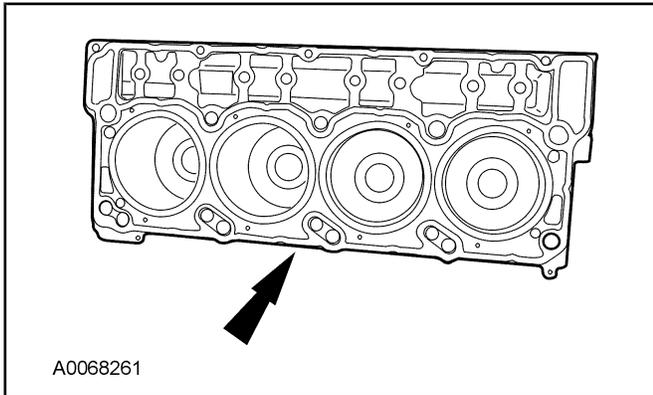


36. Check for cylinder head distortion. For additional information, refer to Cylinder Head Distortion in this section.

37. Remove the cylinder head gasket and dowels.

- Clean and inspect the gasket sealing surfaces.

IN-VEHICLE REPAIR(Continued)



Installation

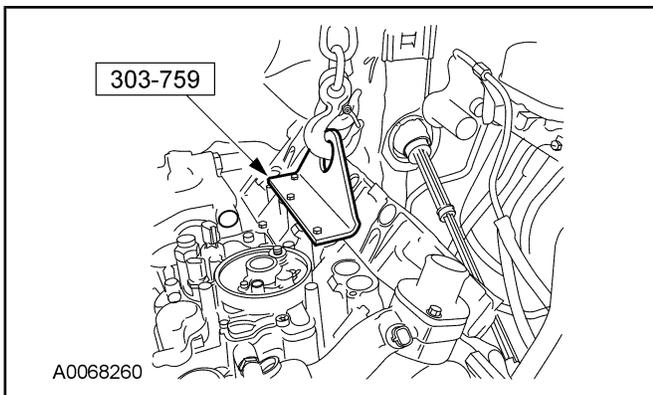
1. **NOTE:** Use care to avoid scratching the blue compound on the cylinder head gasket. Install the gasket with the part number facing upward.

Install the dowels and the cylinder head gasket.

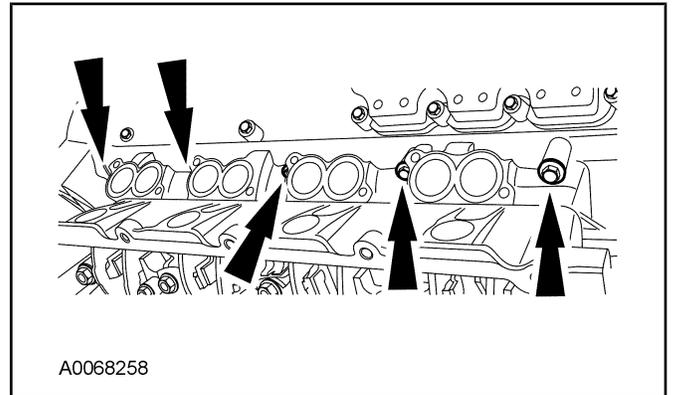
2. **NOTE:** Position the fuel lines in place before the cylinder head is installed.

NOTE: The back two cylinder head bolts cannot be installed into the head in vehicle. Lightly lubricate the threads of two new cylinder head bolts with clean engine oil. Position these bolts in the head and secure them in position so they will clear the cylinder block deck as the head is installed.

Using the special tools and with the help of an assistant, install the cylinder head on the engine. Remove the special tools.



3. Install the outer cylinder head bolts finger-tight.

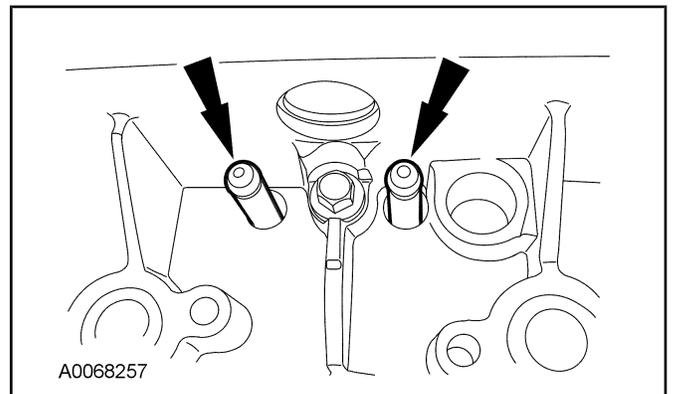


4. **NOTICE:** To prevent engine damage, keep the push rods in the order in which they were removed. Install all push rods back in their original positions.

NOTE: Higher mileage engines require push rods to be cleaned so the cooper-colored end of the push rod can be identified.

NOTE: If a push rod has been replaced, it may not have a copper-colored end and can be installed with either end up.

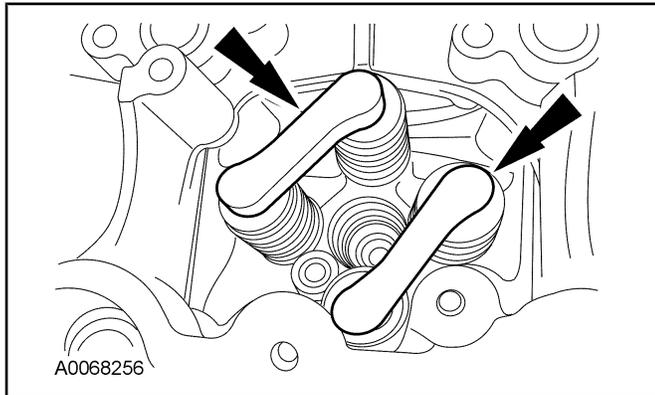
Apply clean engine oil to each end of the push rods. Insert them into their respective positions with the copper-colored end up.



5. **NOTE:** Coat the end of each valve stem with clean engine oil.

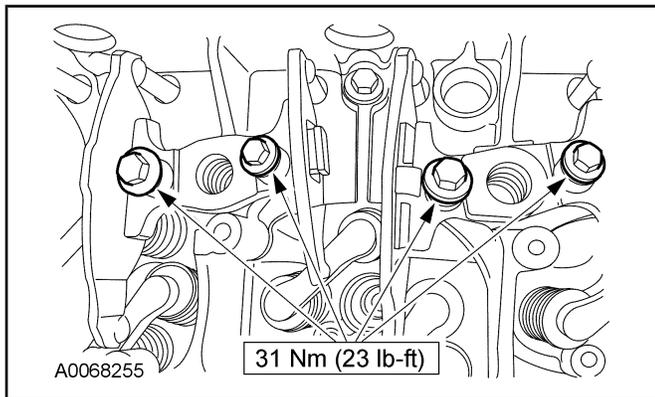
Install the eight valve bridges.

IN-VEHICLE REPAIR(Continued)



6. **NOTICE:** Rotate the crankshaft until the damper locating dowel notch is in the six o'clock position or engine damage can occur.

Install the rocker arm assemblies and eight bolts.



7. **NOTICE:** Using too much engine oil on the threads of the cylinder head bolts can cause damage to the threads and poor sealing. Using anti-seize compounds, grease or any other lubricants other than engine oil on the cylinder head bolt threads can affect the true torque value of the bolts.

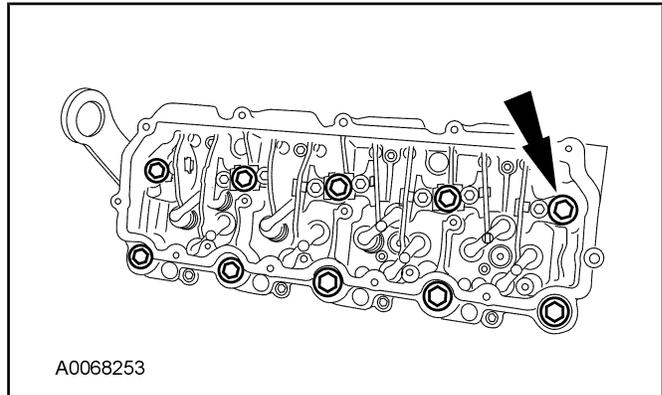
NOTICE: Make sure the insulation blanket is not damaged (torn, cracked or fabric separated from

the metallic skin) when installing the lower rear cylinder head bolt. If the insulation blanket is damaged, the entire blanket must be replaced.

NOTE: It may be necessary to slightly compress or deform the insulation blanket to gain tool clearance to install the lower rear cylinder head bolt.

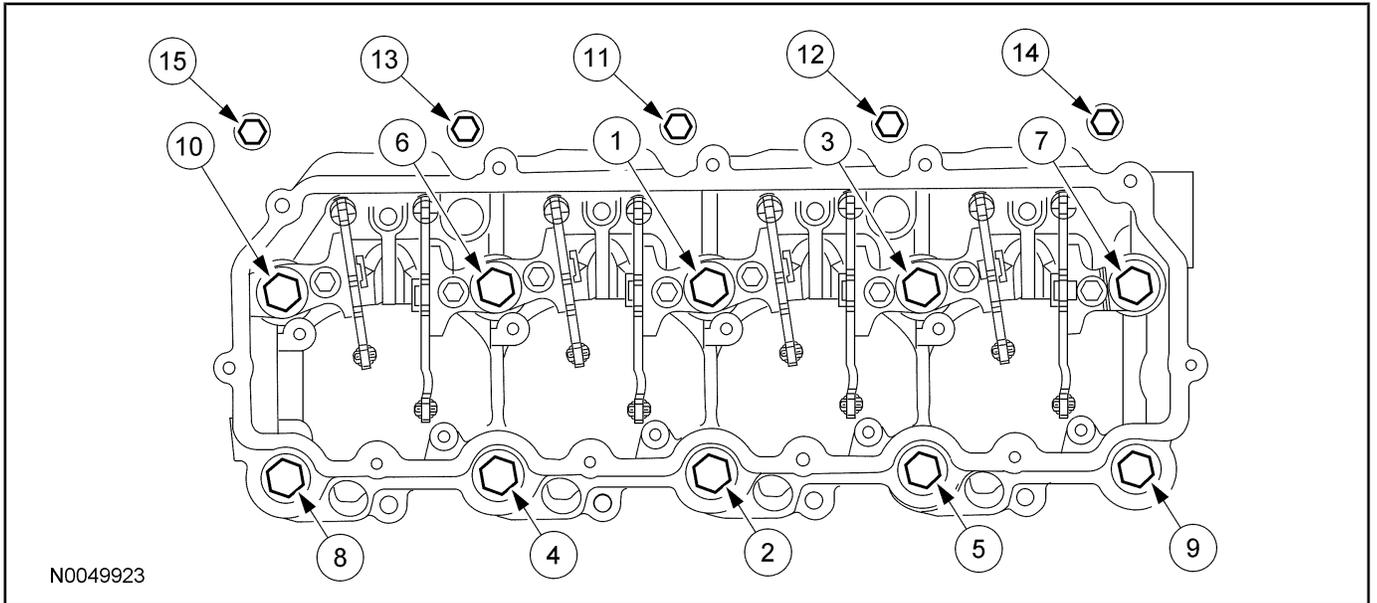
NOTE: Lightly lubricate the new cylinder head bolt threads with clean engine oil.

Install the new cylinder head retaining bolts finger-tight.



8. Tighten the head bolts in the following sequence.
- 1 Tighten bolts 1 through 10 to 88 Nm (65 lb-ft).
 - 2 Tighten bolts 1 through 10 to 115 Nm (85 lb-ft).
 - 3 Tighten bolts in sequence 1 through 10, clockwise 90 degrees.
 - 4 Tighten bolts in sequence 1 through 10, a second time, clockwise 90 degrees.
 - 5 Tighten bolts in sequence 1 through 10, a third time, clockwise 90 degrees.
 - 6 Tighten bolts 11 through 15 an to 24 Nm (18 lb-ft).
 - 7 Tighten bolts 11 through 15 to 31 Nm (23 lb-ft).

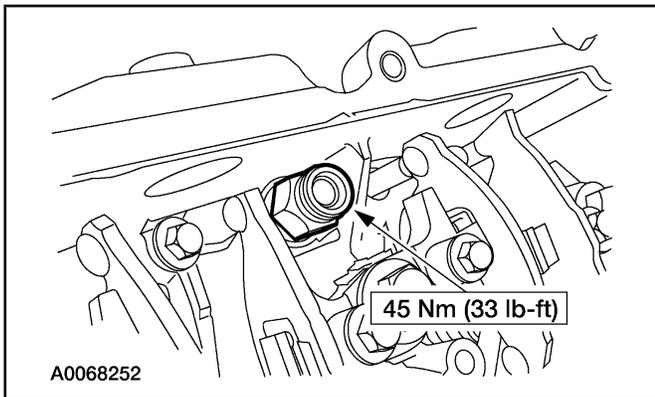
IN-VEHICLE REPAIR(Continued)



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9. **NOTE:** Install a new lower O-ring.

Install a new crankcase to head tube assembly.

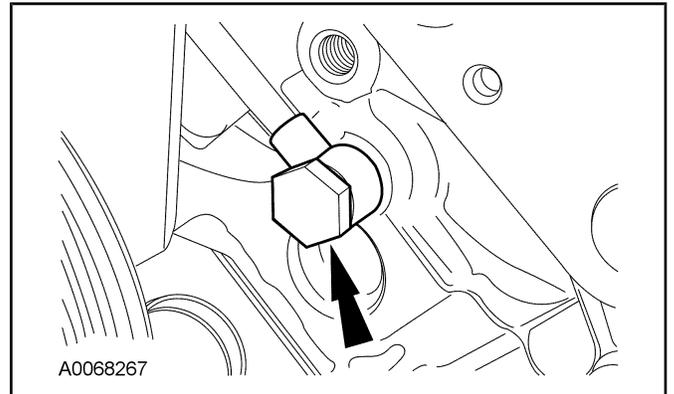


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10. **NOTE:** Install new sealing washers.

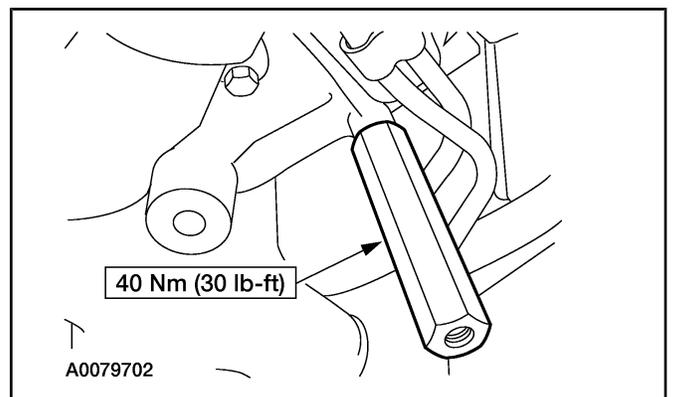
Install the fuel tube and the banjo bolt.

- For Viton® sealing washers, tighten to 25 Nm (18 lb-ft).
- For copper sealing washers, tighten to 38 Nm (28 lb-ft).



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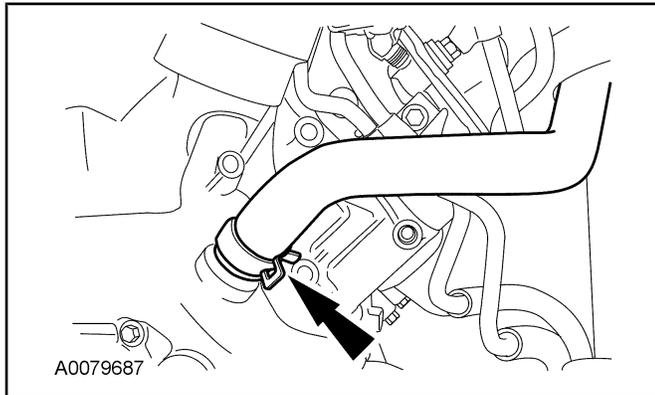
11. Install the fan shroud mounting stud.



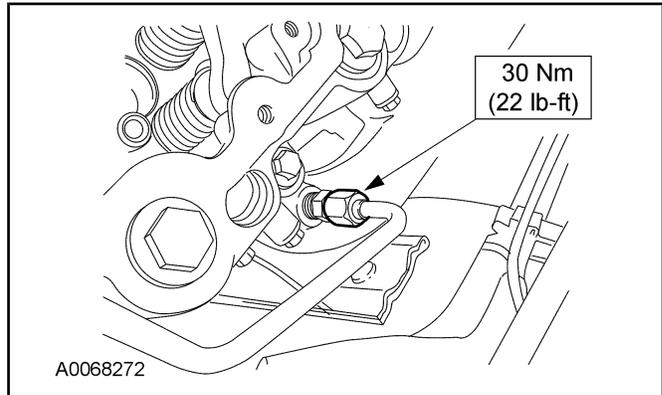
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12. Position back and connect the heater hose.

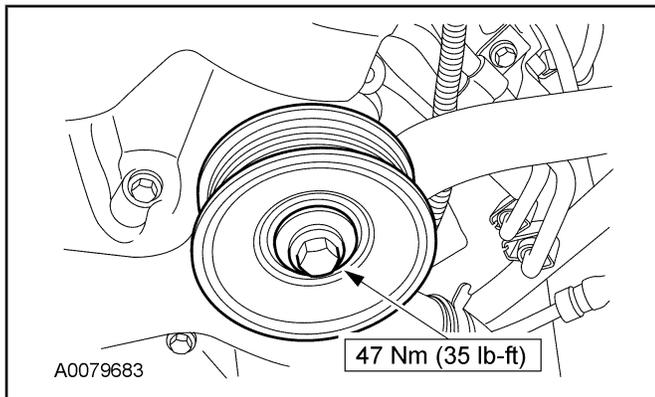
IN-VEHICLE REPAIR(Continued)



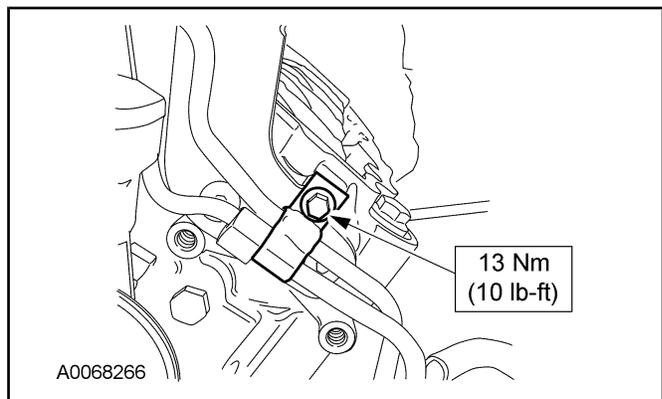
13. Install the idler pulley and bolt.



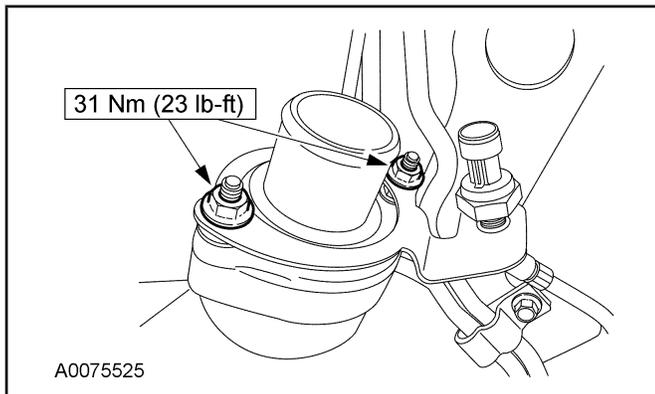
16. Position the fuel tubes and install the fuel tube bracket retaining bolt.



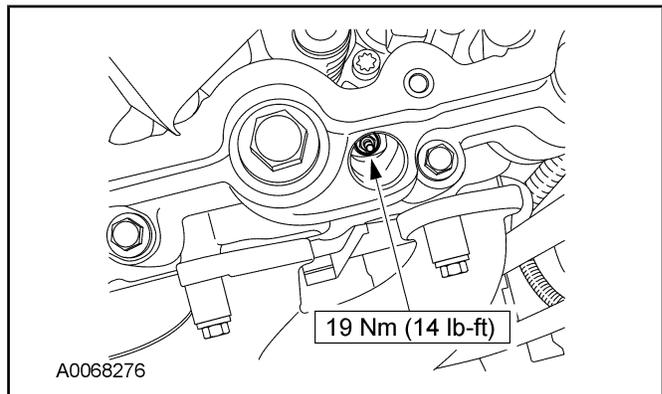
14. Position the exhaust backpressure sensor and tube assembly and install the retaining nuts.



17. Install the four glow plugs.



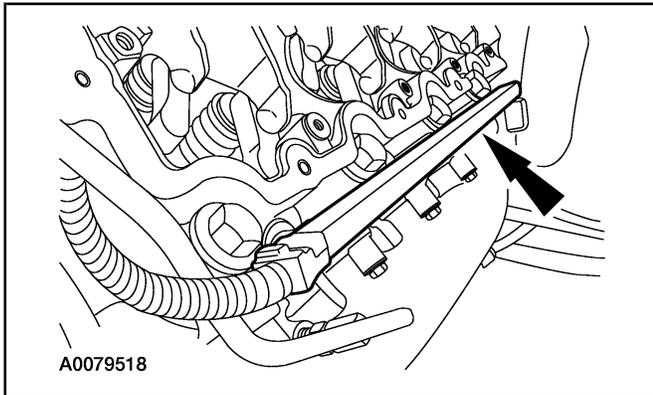
15. Tighten the exhaust backpressure tube fitting at the exhaust manifold.



18. **NOTE:** Clean and apply clean engine oil to the O-rings before installing.

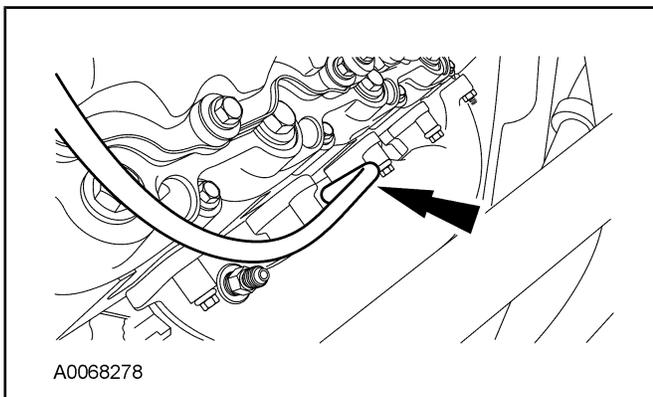
Install the glow plug buss bar.

IN-VEHICLE REPAIR(Continued)

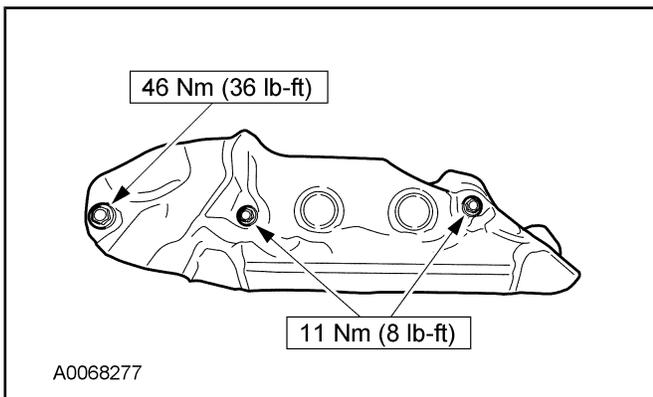


19. **NOTE:** Install a new O-ring.

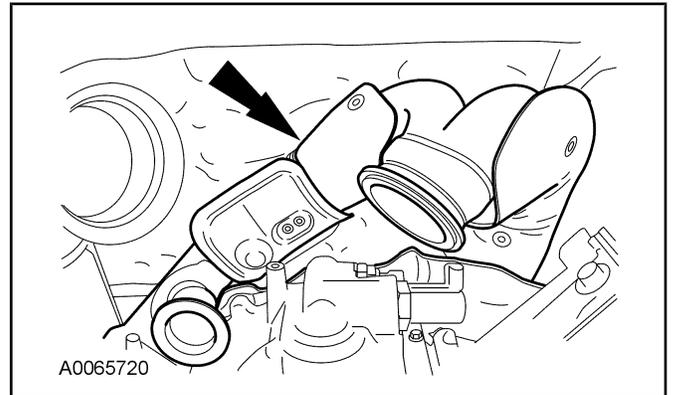
Install the oil level indicator and tube.



20. Install the turbocharger heat shield and bolts.

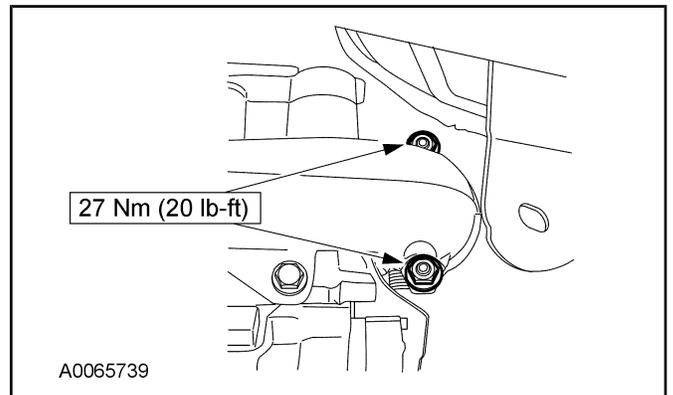


21. Position the turbocharger adapter pipe.



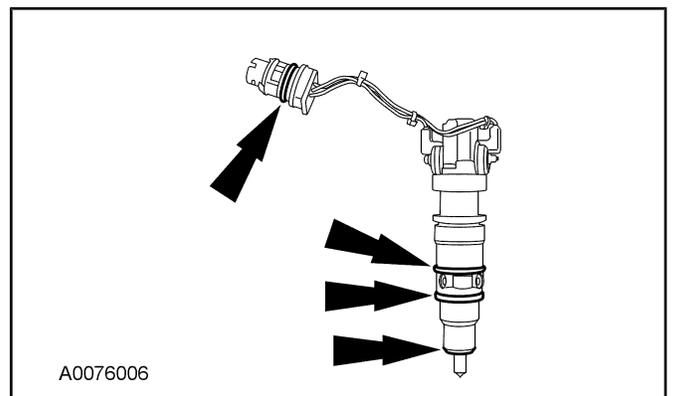
22. **NOTE:** Do not torque until after the turbocharger is installed.

Install the nuts and bolts in the adapter pipe.



23. **NOTICE:** If the fuel injector oil inlet D-ring is damaged, a new fuel injector must be installed.

Install new O-rings and copper washer on the fuel injector. Lubricate the fuel injector and O-rings liberally with clean engine oil.



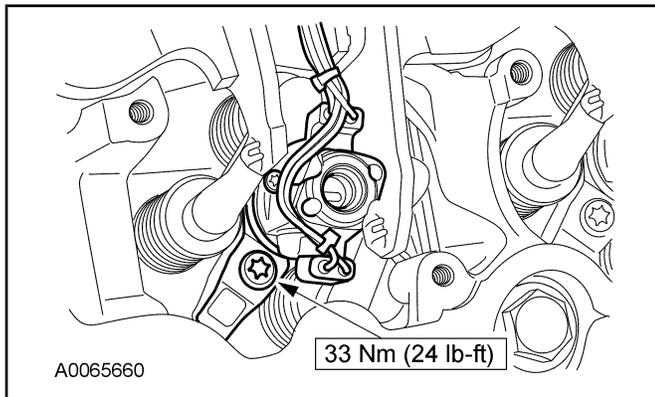
24. **NOTICE:** Failure to tighten the injector properly can lead to engine failure.

NOTICE: To prevent engine damage, do not use air tools to install the fuel injectors. The clip that

IN-VEHICLE REPAIR(Continued)

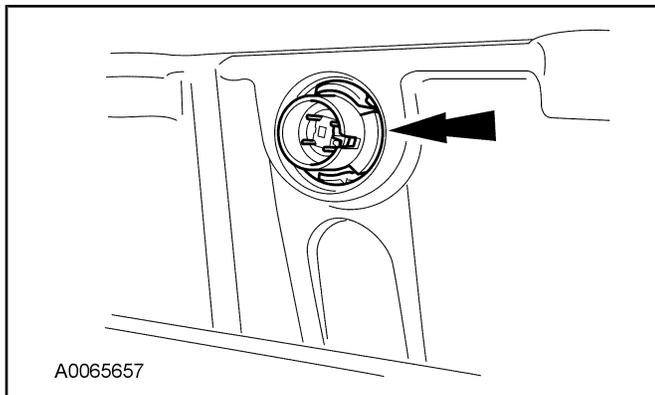
extracts the injector can dislodge and fall into the oil drain hole.

Install the fuel injector, fuel injector hold-down and bolt.

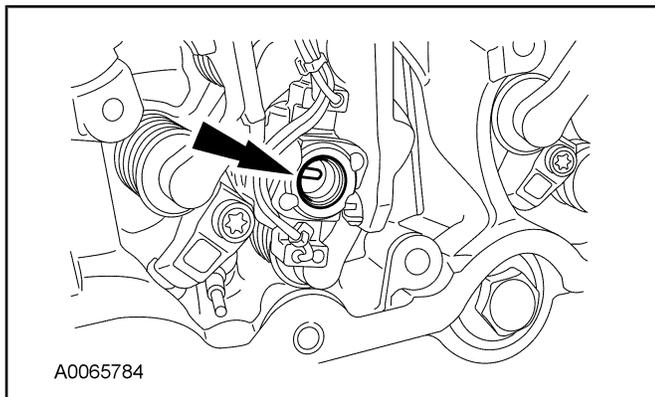


25. **NOTICE:** Make sure the injector wiring is clear of all moving parts or engine damage can occur.

Install the fuel injector electrical connector into the rocker carrier.

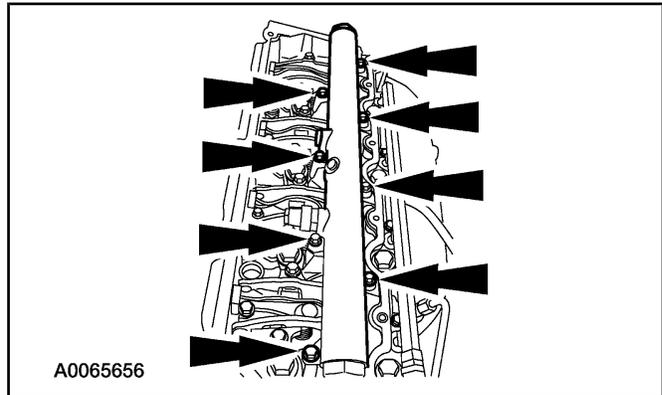


26. Apply engine oil to the top fuel injector O-rings.

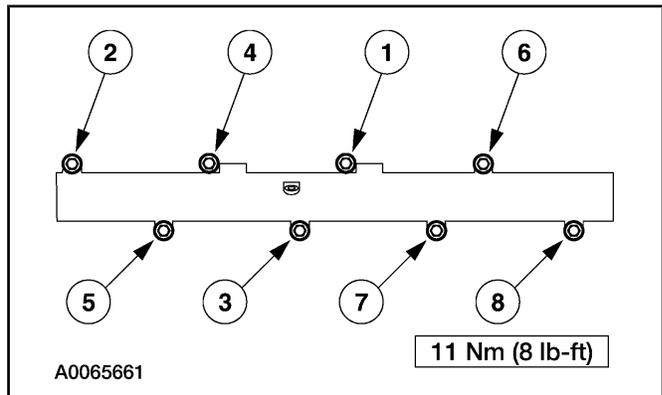


27. Install the high-pressure oil rail and bolts.

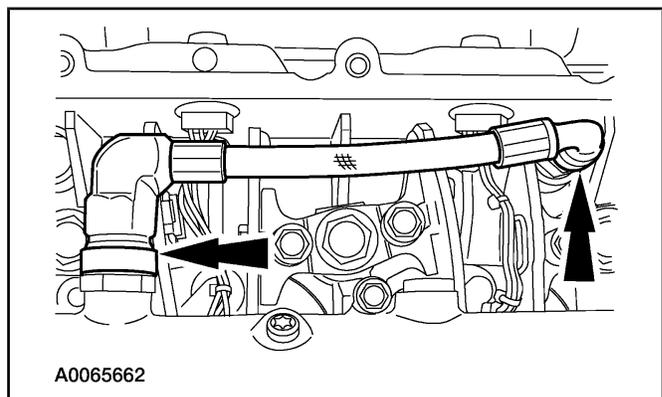
- Install the high-pressure oil rail.
- Install the bolts finger tight.



28. Tighten the bolts in the sequence shown.



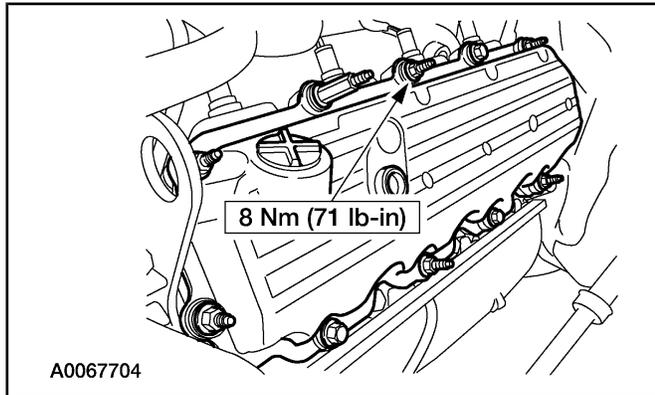
29. Install the high-pressure oil line.



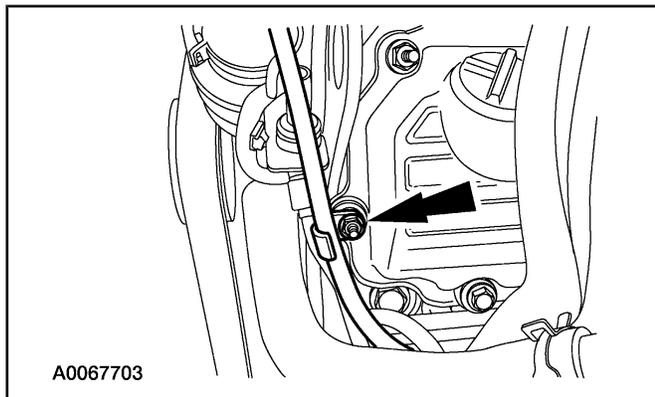
30. **NOTE:** Clean and inspect the valve cover gasket. Install a new gasket if necessary.

Position the valve cover gasket. Install the valve cover and 11 bolts.

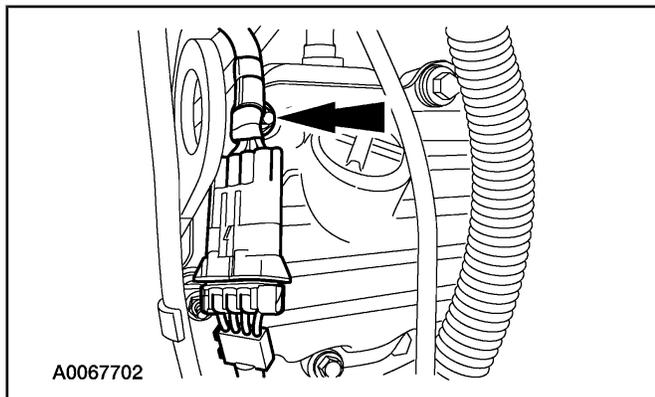
IN-VEHICLE REPAIR(Continued)



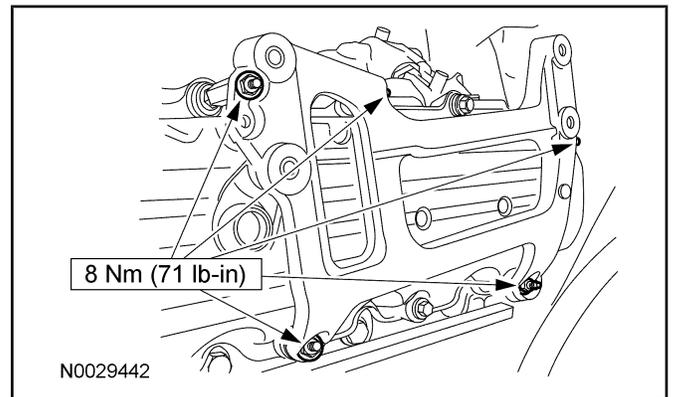
31. Position back the oil level indicator and install the nut.



32. Connect the glow plug connector.



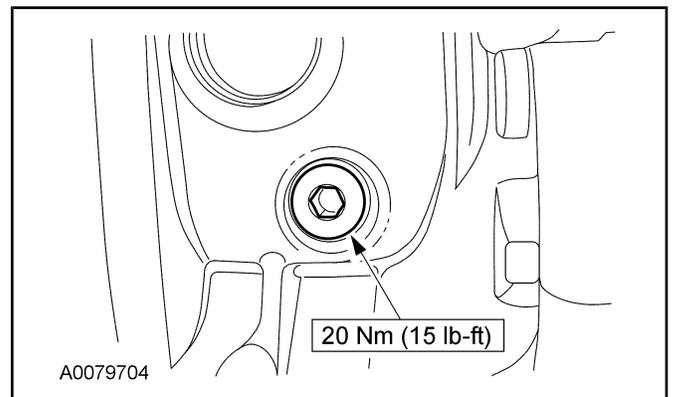
33. Install the fuel injection control module mounting bracket.



34. Fill the crankcase with clean engine oil.

35. **NOTE:** Lightly lubricate the O-ring with clean engine oil before installing.

Install the cylinder block drain plug.



36. **NOTE:** Install a new oil filter.

Install the intake manifold. For additional information, refer to Intake Manifold in this section.