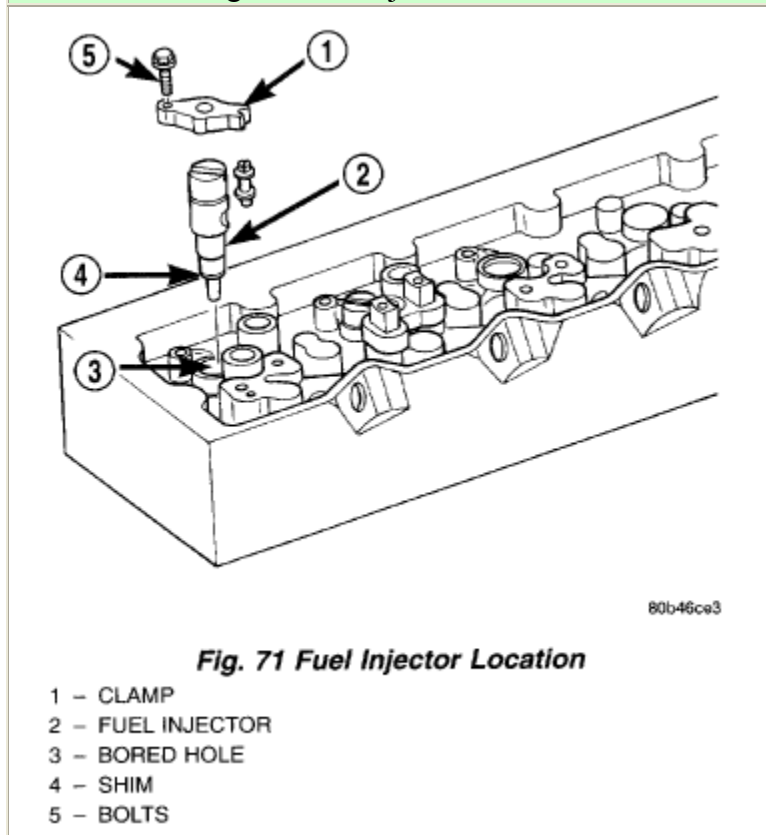




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## Fuel Injector Replacement

Fig. 71 Fuel Injector Location



The fuel injectors are located in the top of the cylinder head between the intake/exhaust valves (Fig. 71).

### REMOVAL

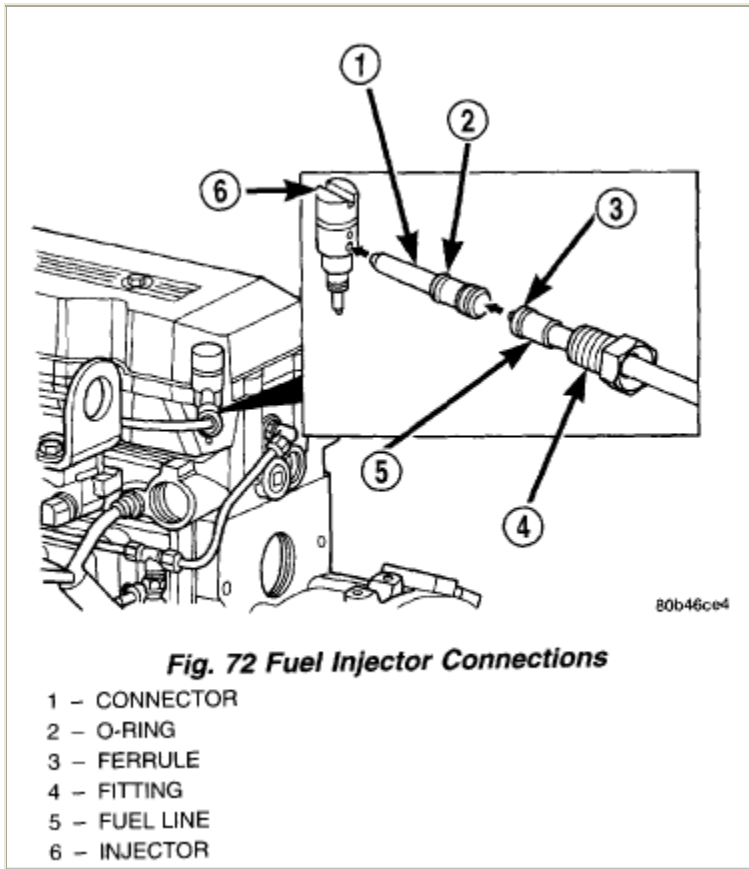
**CAUTION:** Refer to Cleaning Fuel System Parts.  
[See: Service and Repair\Cleaning Fuel System Parts](#)

1. Disconnect both negative battery cables from both batteries. Cover and isolate ends of cables.

Fig. 72 Fuel Injector Connections



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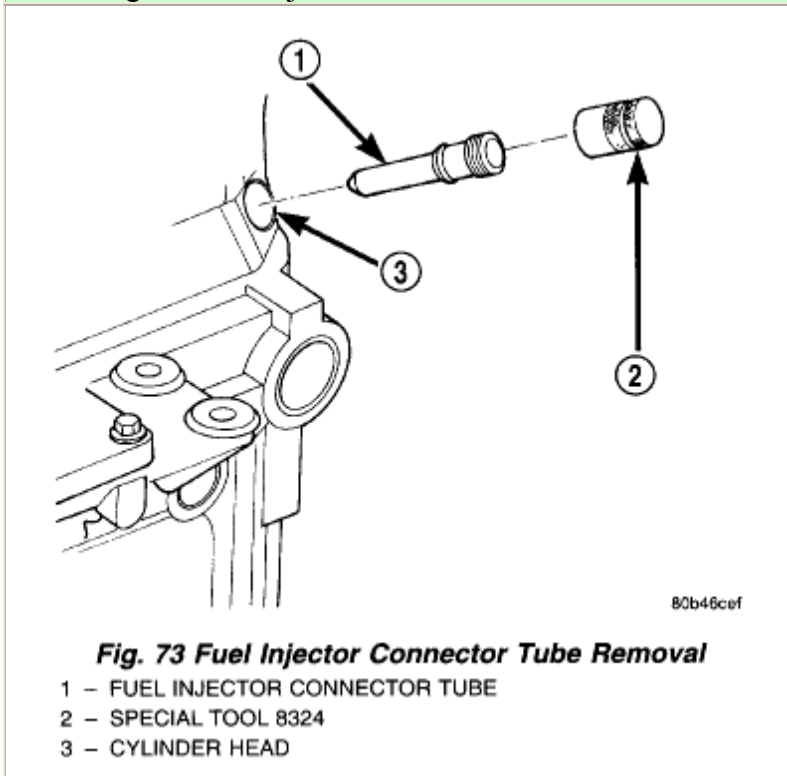
Each fuel injector is connected to each high-pressure fuel line with a steel connector tube (Fig. 72). This steel connector is positioned into cylinder head and sealed with an O-ring. The connectors are connected to high-pressure fuel lines with fittings (Fig. 72).

2. If injector at #1 or #2 cylinder is being removed, intake manifold air heater assembly must be removed. Refer to Intake Manifold Air Heater Removal/Installation.
3. If injector at #5 cylinder is being removed, remove engine lifting bracket (2 bolts).
4. Thoroughly clean area around injector and injector high-pressure lines before removal.
5. Remove necessary high-pressure fuel lines. Refer to High-Pressure Fuel Lines Removal/Installation. Do not bend any high-pressure fuel line to gain access to fuel injector. Cover or cap any open fuel connections.
6. Remove [valve cover](#).



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Fig. 73 Fuel Injector Connector Tube Removal

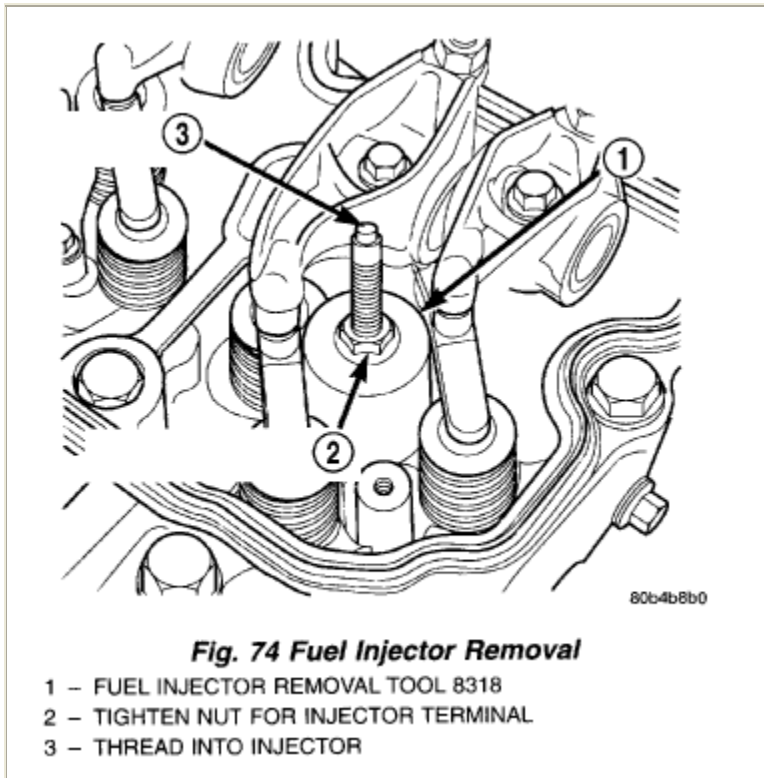


7. Thread Special Tool 8324 (Fuel Injector Connector Tube Remover) onto end of injector connector tube (Fig. 73).
8. Pull injector connector tube from cylinder head. The injector connector tube must be removed before attempting to remove fuel injector or serious damage to fuel injector and tube will result.
9. Remove and discard old O-ring (Fig. 72) from injector connector tube.
10. Remove fuel injector hold down clamp bolt at front end of clamp (Fig. 71). Do not loosen or remove special (2 shouldered) bolt at rear end of clamp. Remove injector clamp by sliding it from shoulders on rear clamp bolt.

Fig. 74 Fuel Injector Removal



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11. Thread rod from Special Tool number 8318 (Fuel Injector Remover) into top of fuel injector (Fig. 74).
12. Tighten nut on 8318 tool to pull (remove) fuel injector from cylinder head.
13. Remove and discard old O-ring from fuel injector.
14. Remove and discard copper sealing washer (shim) (Fig. 75) from bottom of injector. If copper sealing washer has remained in cylinder head, it must be removed.

## INSTALLATION

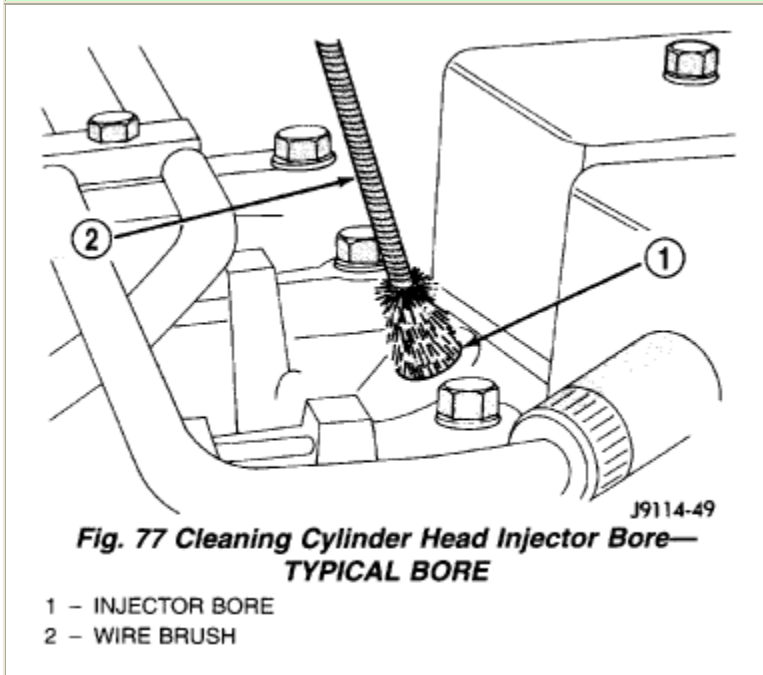
1. Inspect fuel injector.
  - a. If necessary, perform pressure test of injector. Refer to Fuel Injector Testing.
  - b. Look for burrs on injector inlet.
  - c. Check nozzle holes for hole erosion or plugging.
  - d. Inspect end of nozzle for burrs or rough machine marks.
  - e. Look for cracks at nozzle end.



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- f. Check nozzle color for signs of overheating. Overheating will cause nozzle to turn a dark yellow/tan or blue (depending on overheating temperature).
- g. If any of these conditions occur, replace injector.

Fig. 77 Cleaning Cylinder Head Injector Bore - TYPICAL BORE

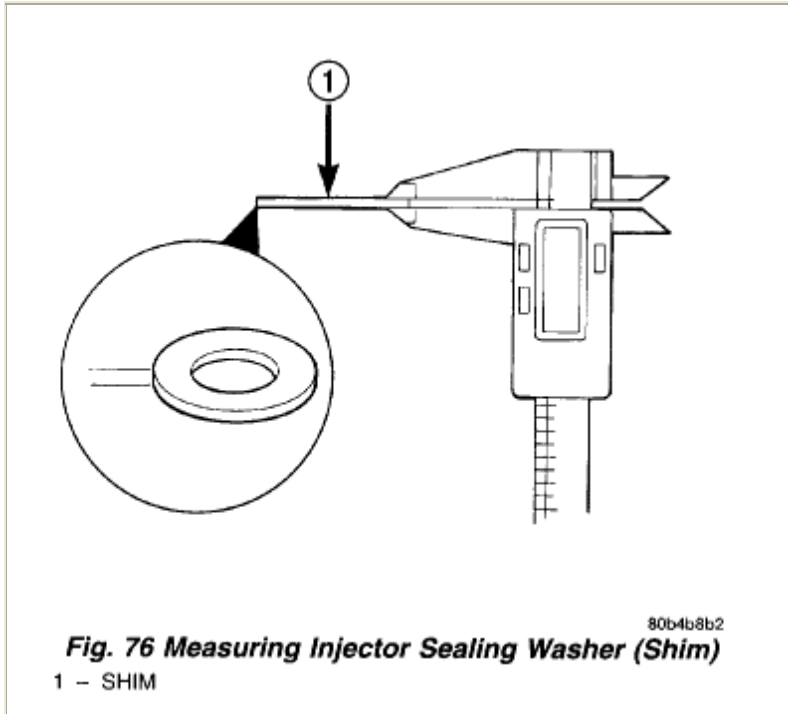


2. Thoroughly clean fuel injector cylinder head bore with special Cummins wire brush tool or equivalent (Fig. 77). Blow out bore hole with compressed air.

Fig. 76 Measuring Injector Sealing Washer (Shim)



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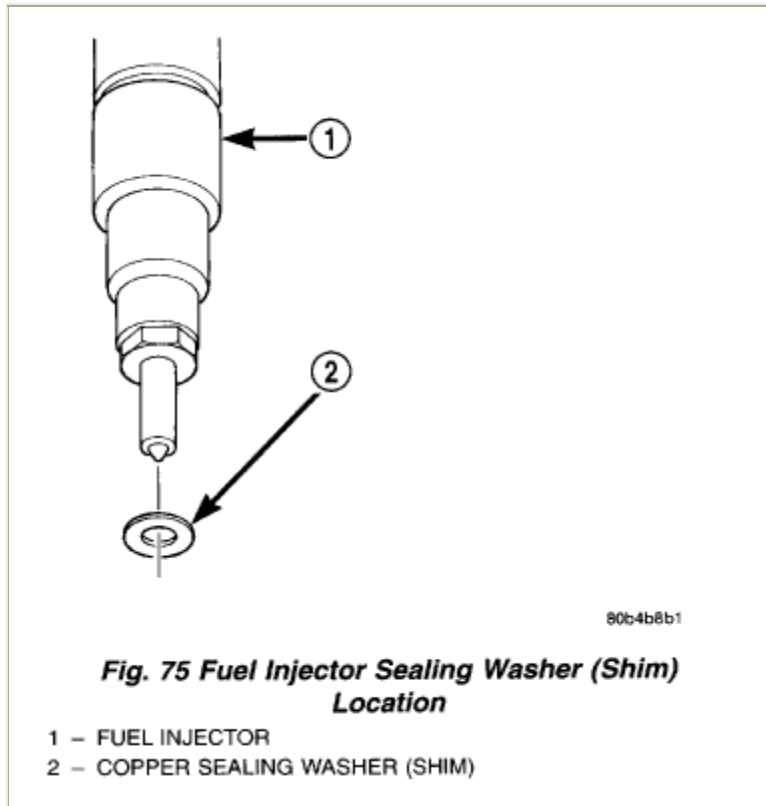


3. The bottom of fuel injector is sealed to cylinder head bore with a copper sealing washer (shim) of a certain thickness. A new shim with correct thickness must always be re-installed after removing injector. Measure thickness of injector shim (Fig. 76). Shim Thickness: **1.5 mm (.060")**

Fig. 75 Fuel Injector Sealing Washer (Shim) Location



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4. Install new shim (washer) to bottom of injector (Fig. 75). Apply light coating of clean engine oil to washer. This will keep washer in place during installation.
5. Install new O-ring to fuel injector. Apply small amount of clean engine oil to O-ring.
6. Note fuel inlet hole on side of fuel injector. This hole must be positioned towards injector connector tube. Position injector into cylinder head bore being extremely careful not to allow injector tip to touch sides of bore. Press fuel injector into cylinder head with finger pressure only. Do not use any tools to press fuel injector into position. Damage to machined surfaces may result.
7. Position fuel injector hold down clamp into shouldered bolt while aligning slot in top of injector into groove in bottom of clamp. Tighten opposite clamp bolt (Fig. 71) to **10 Nm (89 in. lbs.)** torque.
8. Install new O-ring to fuel injector connector tube. Apply small amount of clean engine oil to O-ring.
9. Press injector connector tube into cylinder head with finger pressure only. Do not use any tools to press tube into position. Damage to machined surfaces may result.



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10. Connect high-pressure fuel lines. Refer to High-Pressure Fuel Lines Removal/Installation. The fuel line fitting torque is very critical. If fitting is under torqued, the mating surfaces will not seal and a high-pressure fuel leak will result. If fitting is over torqued, the connector and injector will deform and also cause a high-pressure fuel leak. This leak will be inside cylinder head and will not be visible resulting in a possible fuel injector miss and low power.
11. Install [valve cover](#).
12. (If necessary) install intake manifold air heater assembly. Refer to Intake Manifold Air Heater Removal/Installation.
13. (If necessary) install engine lifting bracket. Tighten 2 bolts to **77 Nm (57 ft. lbs.)** torque.
14. Connect negative battery cables to both batteries.
15. Bleed air from high-pressure lines. Refer to Air Bleed Procedure.