

## Fuel Injection Pump Replacement

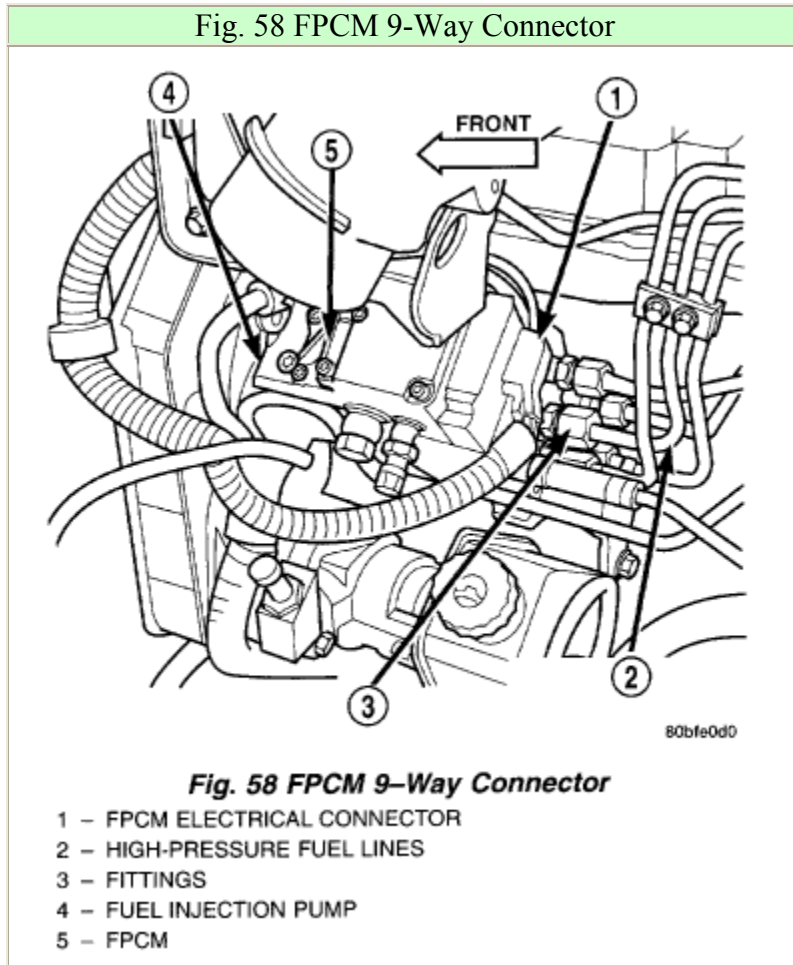
**CAUTION:** Whenever the fuel injection pump is removed from the engine, the pump drive gear is laying loose on the camshaft drive gear. Never attempt to crank or rotate the engine with the pump removed from the engine. Serious damage will occur.

### REMOVAL

**CAUTION:** Refer to Cleaning Fuel System Parts.

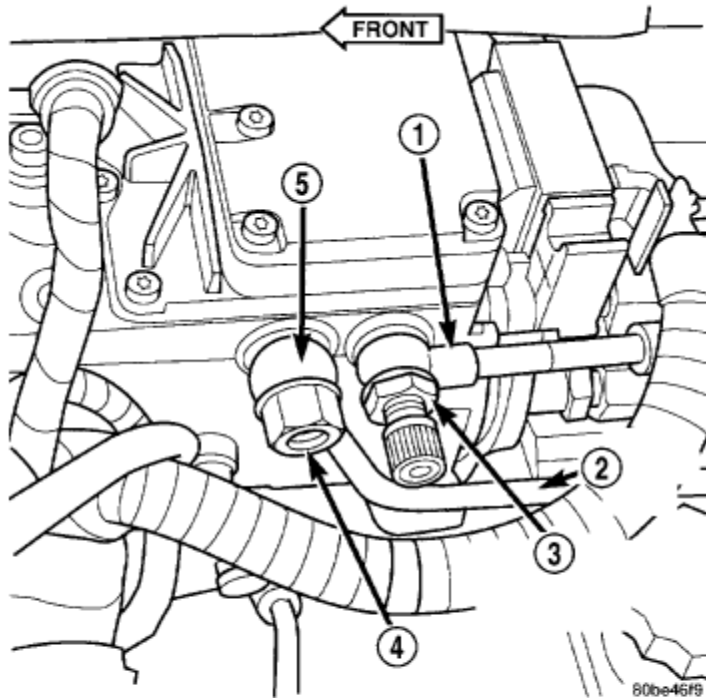
1. Disconnect both negative battery cables at both batteries. Cover and isolate ends of cables.
2. Thoroughly clean fuel lines at cylinder head and injection pump ends. Thoroughly clean fuel injection pump and supply/return lines at side of pump.

Fig. 58 FPCM 9-Way Connector



3. Disconnect 9-way electrical connector at Fuel Pump Control Module (**FPCM**) (Fig. 58).

Fig. 59 Fuel Supply And Return Lines At Pump

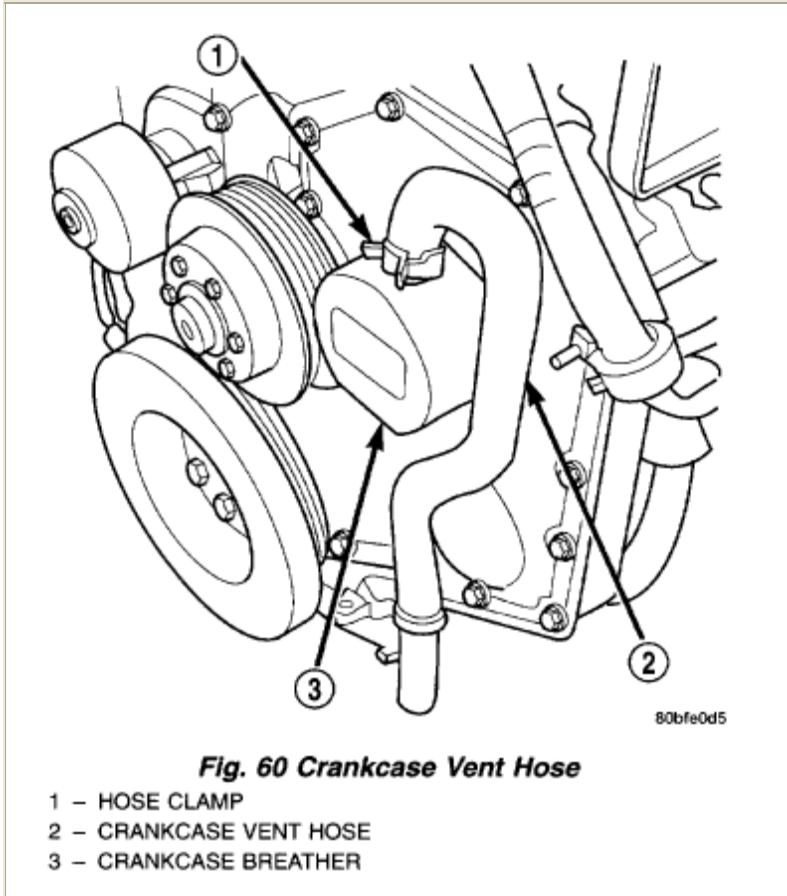


**Fig. 59 Fuel Supply and Return Lines at Pump**

- 1 - FUEL SUPPLY LINE
- 2 - FUEL RETURN-LINE
- 3 - BANJO BOLT (TEST PORT FITTING)
- 4 - OVERFLOW VALVE
- 5 - BANJO FITTING

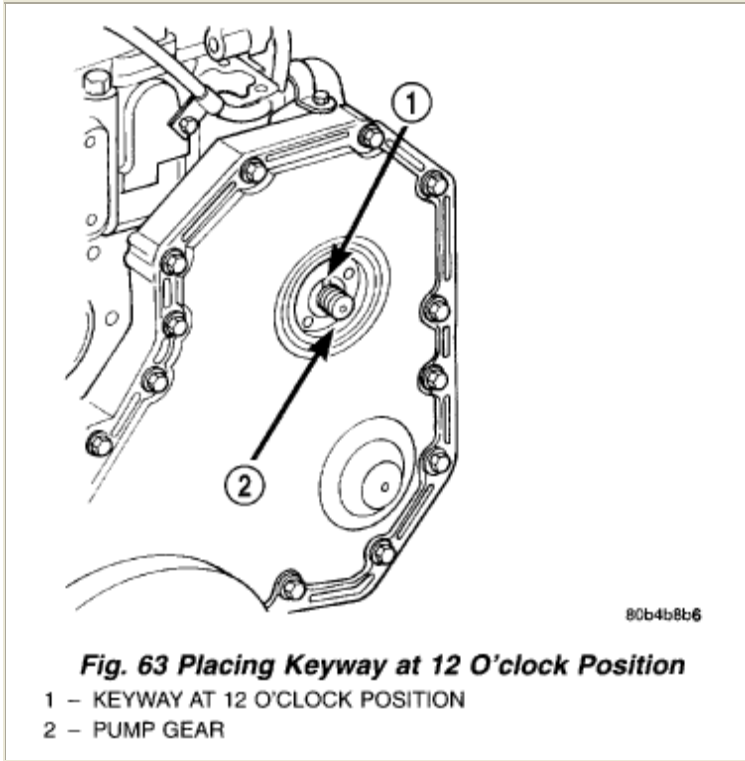
4. Remove [fuel return line](#) at side of injection pump by removing [overflow valve](#) (Fig. 59). Place rag beneath overflow valve to catch excess fuel.
5. Remove [fuel supply line](#) at side of injection pump by removing banjo bolt (Fig. 59). Also remove same line at top of [fuel filter](#) housing (banjo bolt).
6. Remove all high-pressure fuel lines, intake air tube, [accelerator pedal position sensor](#), air intake housing, engine oil dipstick tube, wiring clips, electrical cables at intake heaters and engine lifting bracket. Refer to High-Pressure Fuel Line Removal/Installation. All of these items are covered in this procedure.

Fig. 60 Crankcase Vent Hose



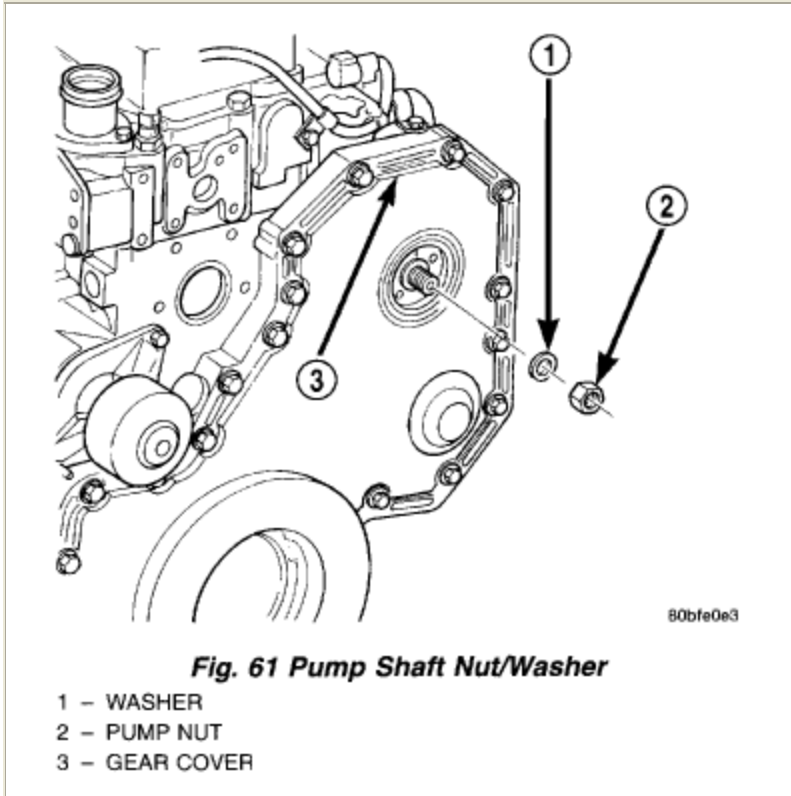
7. Remove hose clamp at crankcase vent hose (Fig. 60) and remove hose from canister.
8. Remove (unscrew) canister (Fig. 60) from gear cover.

Fig. 63 Placing Keyway At 12 O'clock Position



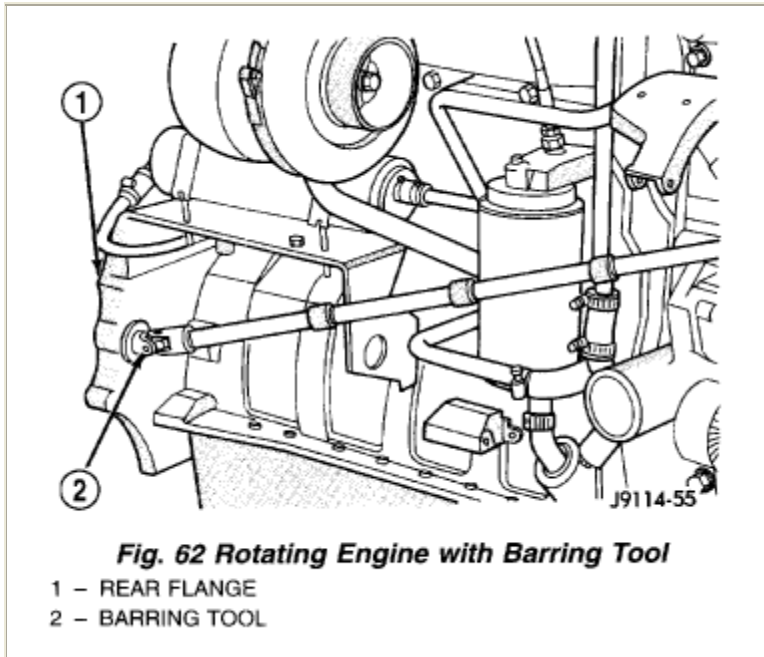
**CAUTION:** To prevent pump/gear keyway from falling into gear housing, engine must be rotated until keyway is at 12 o'clock position (Fig. 63). If gear retainer nut, washer or key drops into gear housing, cover may have to be removed to retrieve them before engine is started.

Fig. 61 Pump Shaft Nut/Washer



9. Remove nut and washer retaining injection pump gear to injection pump shaft (Fig. 61).

Fig. 62 Rotating Engine With Barring Tool

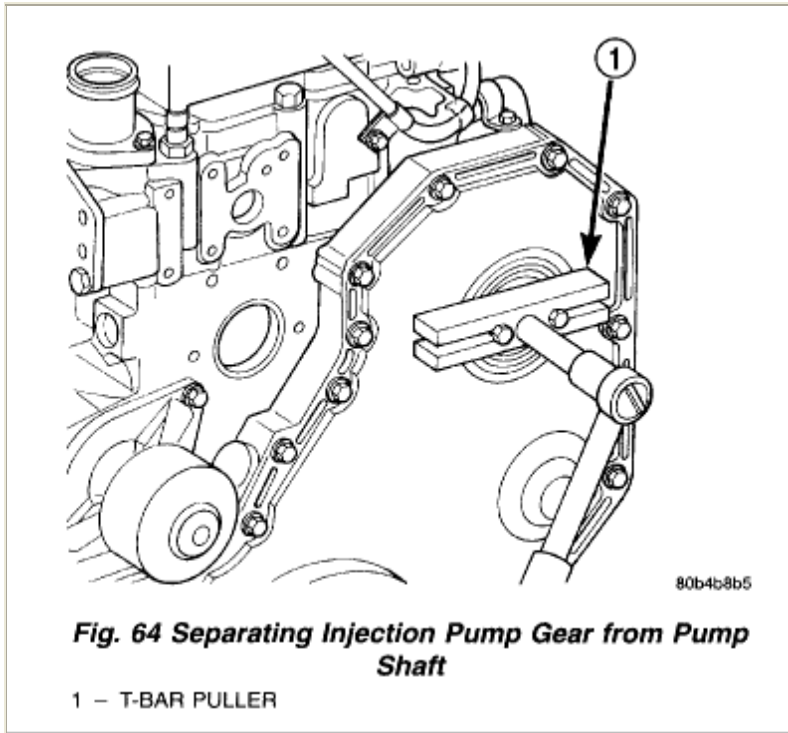


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10. The engine can be rotated with a barring tool such as Snap-On No. SP371, MTE No. 3377371 (Cummins Tool Division), or an equivalent. The opening for barring tool is located in rear flange of engine on exhaust manifold side (Fig. 62). Remove rubber access plug covering this opening.
11. Insert barring tool into flywheel housing opening (Fig. 62).
12. Rotate engine until keyway is at 12 o'clock position (Fig. 63).

Fig. 64 Separating Injection Pump Gear From Pump Shaft

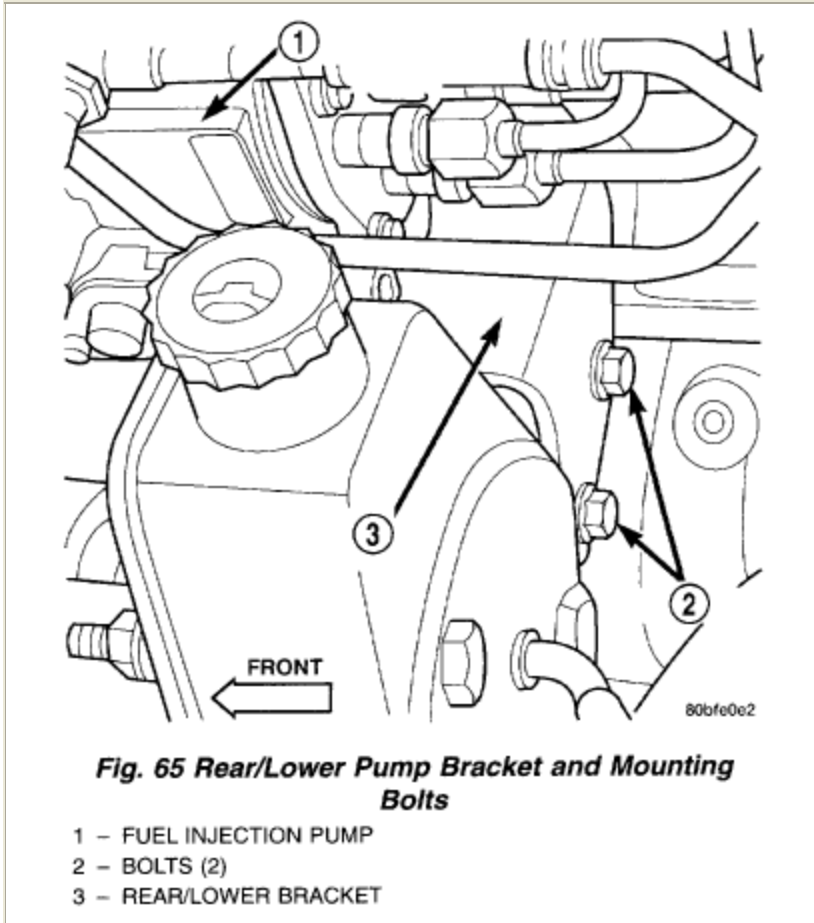


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13. Use T-bar type puller (Fig. 64) to separate injection pump gear from injection pump shaft. Attach two **M8 X 1.24 MM** (metric) screws through puller and into two threaded holes supplied in pump gear. Pull injection pump gear forward until it loosens from injection pump shaft. Pull on gear only enough to loosen it from injection pump shaft. Pulling gear too far may cause damage or breakage to gear cover.

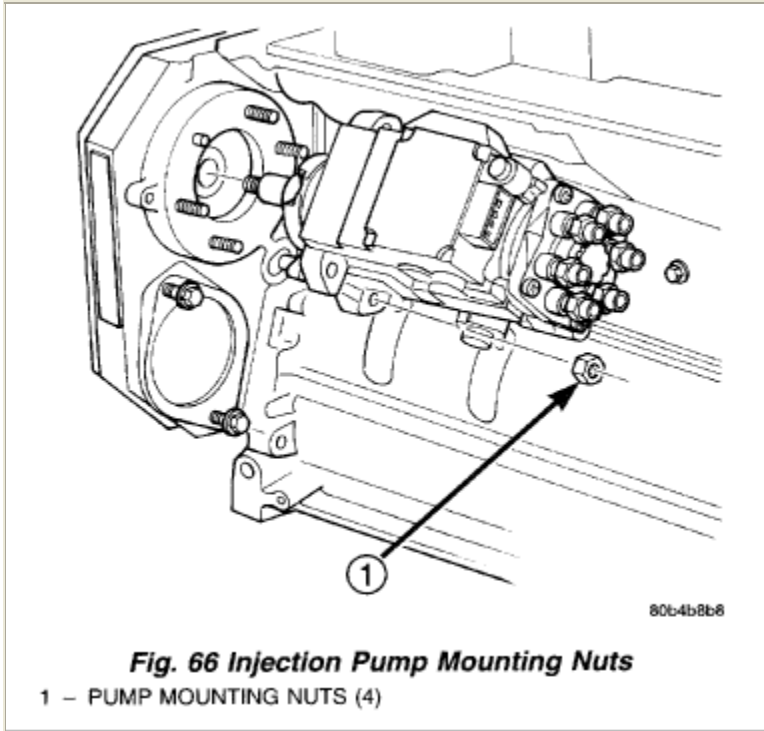
Fig. 65 Rear/Lower Pump Bracket And Mounting Bolts



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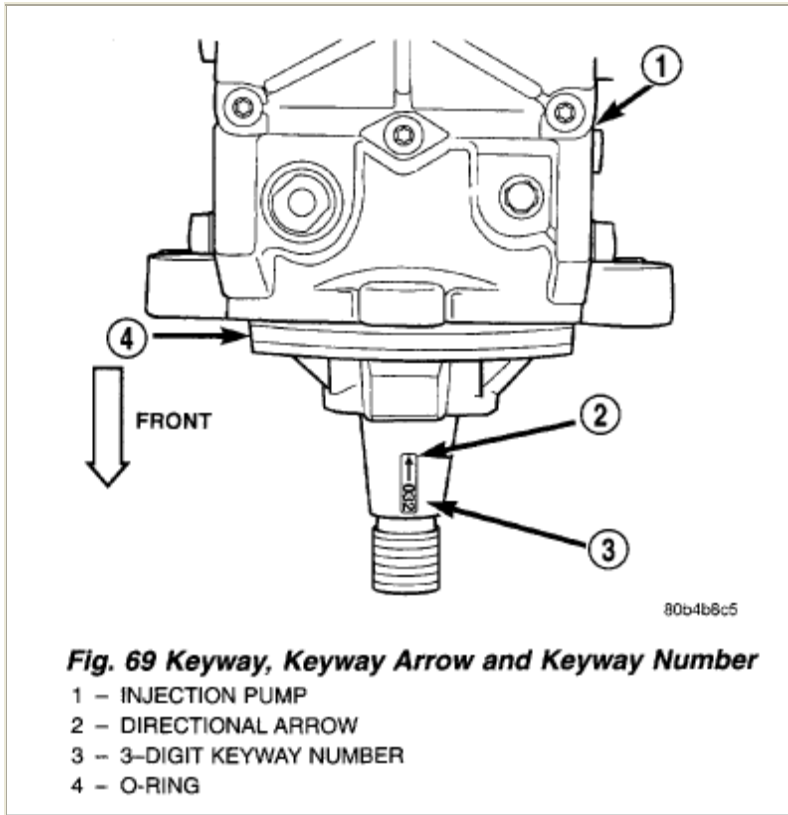
14. Remove 2 rear/lower pump bracket bolts (Fig. 65).

Fig. 66 Injection Pump Mounting Nuts



15. Remove 4 injection pump-to-gear housing mounting nuts (Fig. 66).

Fig. 69 Keyway, Keyway Arrow And Keyway Number



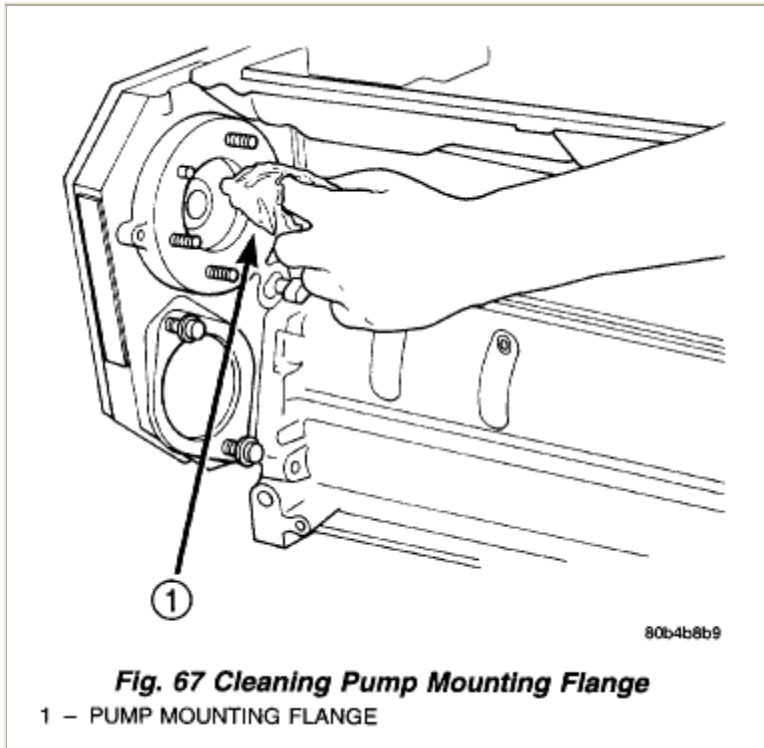
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16. Remove injection pump from gear housing. Take care not to nick injection pump shaft on aluminum gear housing when removing pump. Also be very careful not to drop pump keyway (Fig. 69) into gear housing. **CAUTION:** Whenever the fuel injection pump is removed from the engine, the pump drive gear is laying loose on the camshaft drive gear. Never attempt to crank or rotate the engine with the pump removed from the engine. Serious damage will occur.

## INSTALLATION

1. Inspect pump mounting surfaces at pump and mounting flange for nicks, cuts or damage. Inspect O-ring surfaces for nicks, cuts or damage.

Fig. 67 Cleaning Pump Mounting Flange

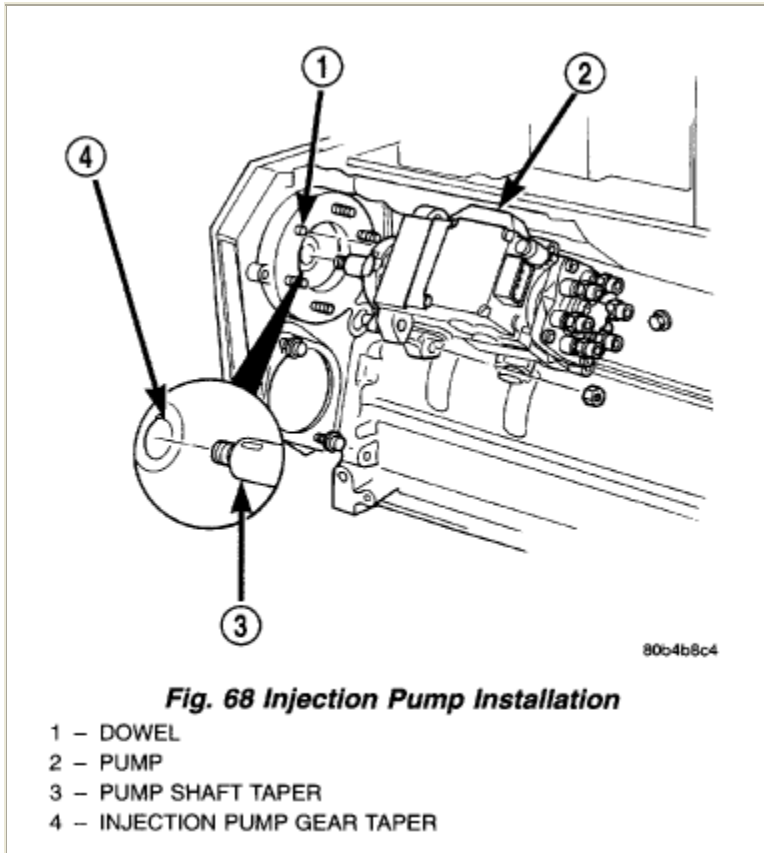


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2. Clean injection pump mounting flange (Fig. 67) at gear housing. Also clean front of injection pump.
3. Install new rubber O-ring (Fig. 69) at pump mounting area.
4. Apply clean engine oil to injection pump O-ring only.

**Fig. 68 Injection Pump Installation**

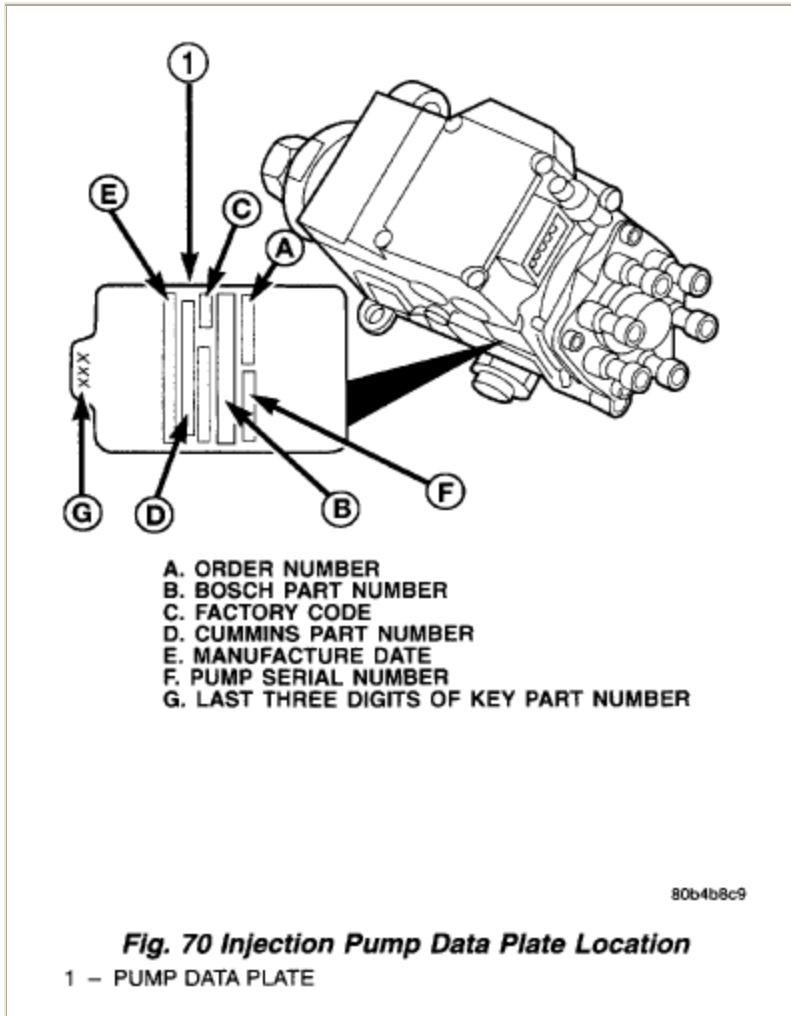


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The machined tapers on both injection pump shaft and injection pump gear (Fig. 68) must be absolutely dry, clean and free of any dirt or oil film. This will ensure proper gear-to-shaft tightening.

5. Clean pump gear and pump shaft at machined tapers (Fig. 68) with an evaporative type cleaner such as brake cleaner. Keyway Installation:

Fig. 70 Injection Pump Data Plate Location

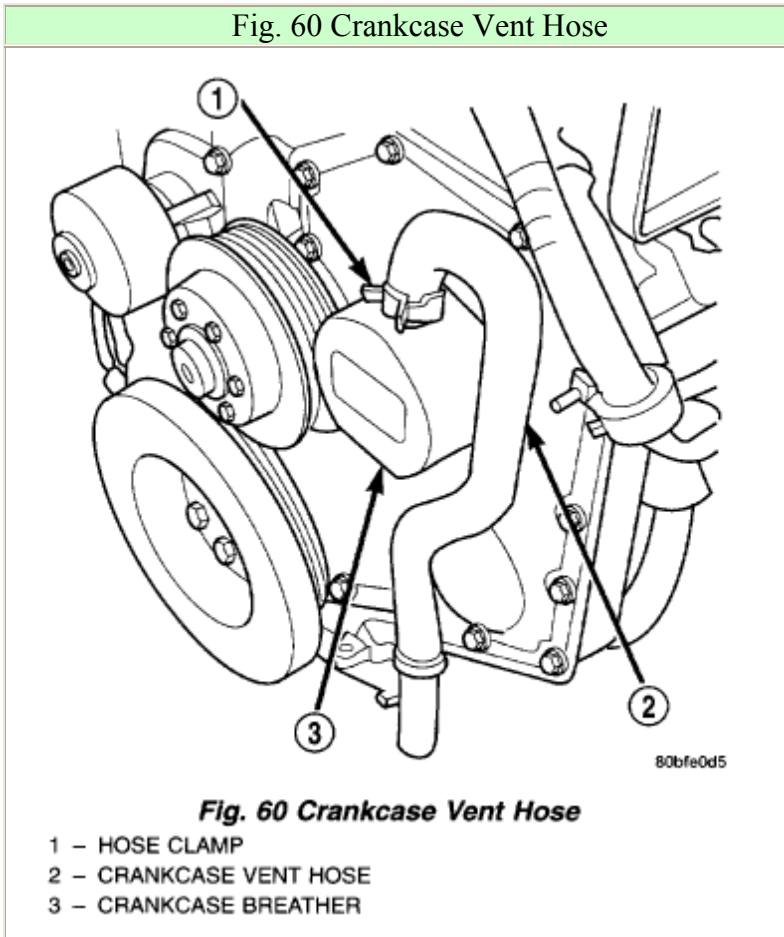


6. The pump/gear keyway has an arrow and a 3-digit number stamped at top edge (Fig. 69). Position keyway into pump shaft with arrow pointed to rear of pump. Also be sure 3-digit number stamped to top of keyway is same as 3-digit number stamped to injection pump data plate (Fig. 70). If wrong key-way is installed, a diagnostic trouble code may be set.
7. Position pump assembly to mounting flange on gear cover while aligning injection pump shaft through back of injection pump gear. When installing pump, dowel (Fig. 68) on mounting flange must align to hole in front of pump.
8. After pump is positioned flat to mounting flange, install four pump mounting nuts and tighten finger tight only. Do not attempt a final tightening at this time. Do not attempt to tighten (pull) pump to gear cover using mounting nuts. Damage to

pump or gear cover may occur. The pump must be positioned flat to its mounting flange before attempting to tighten mounting nuts.

9. To prevent damage or cracking of components, tighten nuts/bolts in the following sequence:
  - a. Install injection pump shaft washer and nut to pump shaft. Tighten nut finger tight only.
  - b. Install 2 rear/lower pump mounting bolts finger tight only.
  - c. Do preliminary tightening of injection pump shaft nut to **30 Nm (15-22 ft. lbs.)** torque. This is not the final torque.
  - d. Tighten 4 pump mounting nuts to **43 Nm (32 ft. lbs.)** torque.
  - e. Tighten 2 rear/lower pump bracket-to-pump bolts **24 Nm (18 ft. lbs.)** torque.
  - f. Do final tightening of injection pump shaft nut to **170 Nm (125 ft. lbs.)** torque. Use barring tool to prevent engine from rotating when tightening gear.

Fig. 60 Crankcase Vent Hose

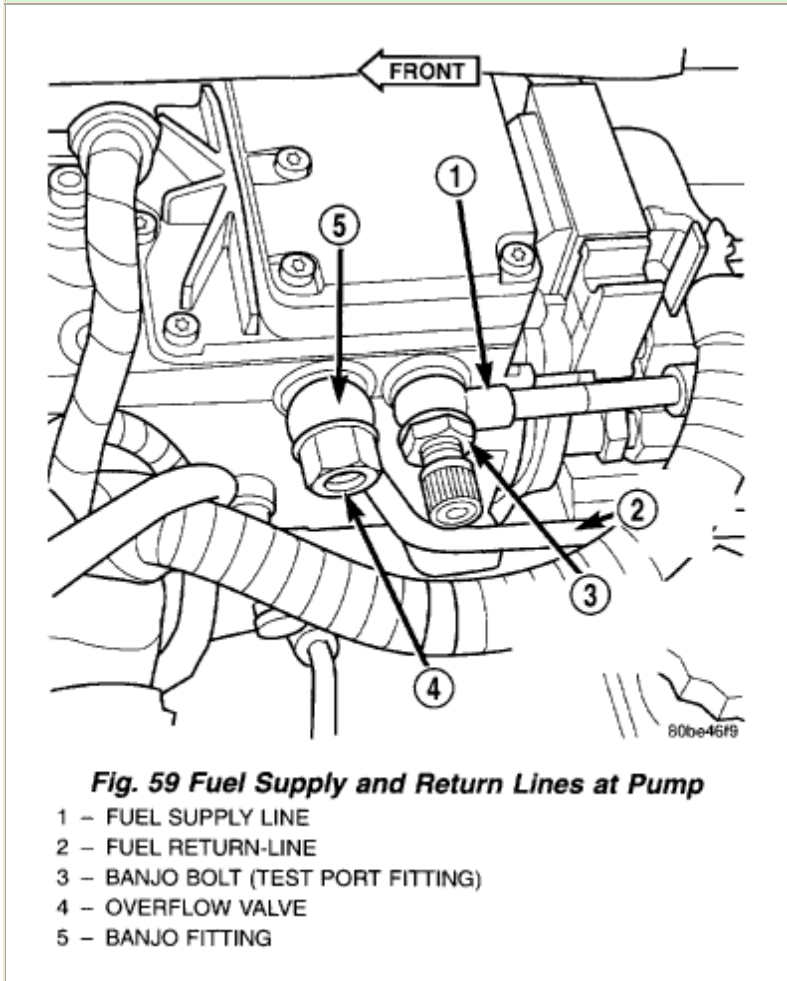


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10. Install canister (Fig. 60) to gear cover.
11. Install crankcase vent hose to canister and install hose (Fig. 60) clamp.

Fig. 59 Fuel Supply And Return Lines At Pump



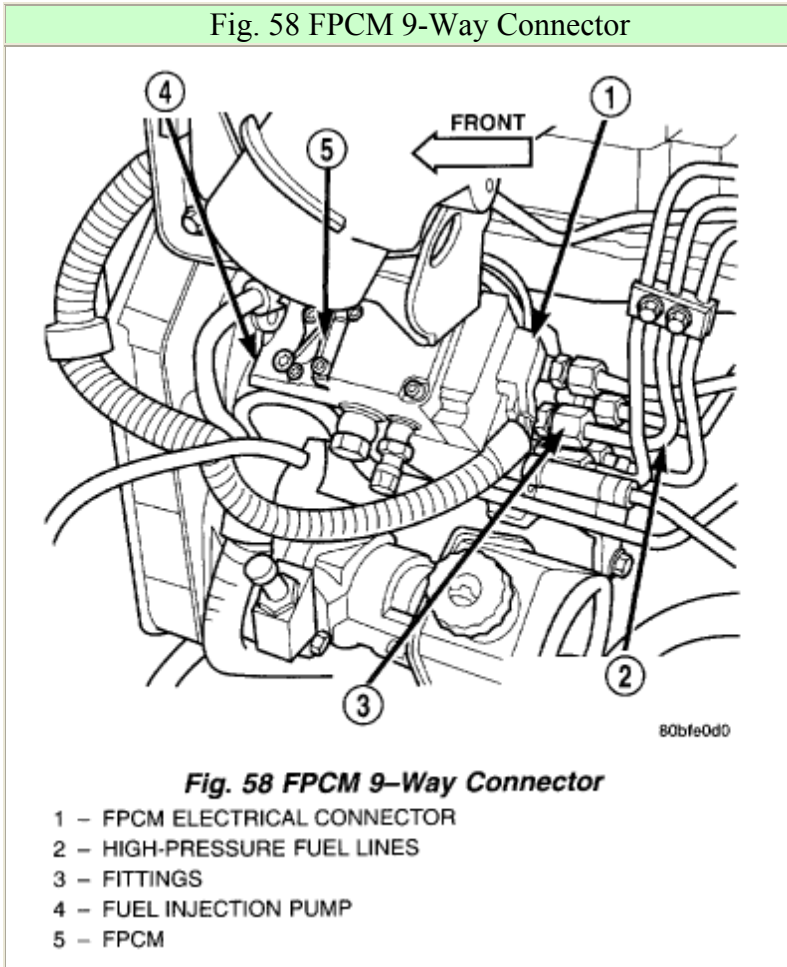
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12. Using new gaskets, install [fuel return line](#) and [overflow valve](#) to side of injection pump (Fig. 59). Tighten overflow valve to **24 Nm (18 ft. lbs.)** torque.
13. Using new gaskets, install [fuel supply line](#) to side of injection pump and top of [fuel filter](#) housing (Fig. 59). Tighten banjo bolts to **24 Nm (18 ft. lbs.)** torque.
14. Install all high-pressure fuel lines, intake air tube, [accelerator pedal position sensor](#), air intake housing, engine oil dipstick tube, wiring clips, electrical cables

at intake heaters and engine lifting bracket. Refer to High-Pressure Fuel Line Removal/Installation. All of these items are covered in this procedure.

Fig. 58 FPCM 9-Way Connector



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15. Connect 9-way electrical connector to Fuel Pump Control Module (**FPCM**) (Fig. 58).
16. Connect both negative battery cables to both batteries.
17. Bleed air from fuel system. Refer to Air Bleed Procedure.
18. Check system for fuel or engine oil leaks.