

all vacuum lines to the vacuum tree, EGR valve, fuel pressure regulator and evaporative canister.

7. Disconnect the PCV hose from the fitting on the rear of the upper manifold and disconnect the PCV vent closure tube at the throttle body.

8. Remove the 2 EGR coolant lines from the fittings on the EGR spacer.

9. Remove the 6 upper intake manifold retaining bolts.

10. Remove the upper intake and throttle body as an assembly from the lower intake manifold.

11. Disconnect the fuel lines from the fuel rail.

12. Remove the 4 fuel rail assembly retaining bolts.

13. Detach the electrical connectors from the injectors.

14. Carefully disengage the fuel rail from the fuel injectors.

➔ **It may be easier to remove the injectors with the fuel rail as an assembly.**

15. Grasping the injector body, pull up while gently rocking the injector from side-to-side to remove the injector from the fuel rail or intake manifold.

16. Inspect the pintle protection cap and washer for signs of deterioration. Replace the complete injector, as required. If the cap is missing, look for it in the intake manifold.

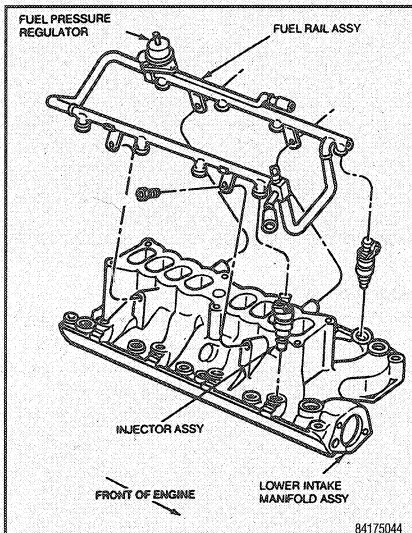


Fig. 38 Fuel rail (fuel supply manifold)—5.0L engine

➔ **The pintle protection cap is not available as a separate part.**

To install:

17. Lubricate new O-rings with light grade oil and install 2 on each injector.

➔ **Never use silicone grease as it will clog the injectors.**

18. Install the injectors using a light, twisting, pushing motion.

19. Install the fuel rail, pushing it down to ensure all the injector O-rings are fully seated in the fuel rail cups and intake manifold.

20. Install the retaining bolts while holding the fuel rail down and tighten to 71–106 inch lbs. (8–12 Nm).

21. Connect the fuel lines to the fuel rail.

22. With the injector wiring disconnected, connect the negative battery cable and turn the ignition switch to the **RUN** position to allow the fuel pump to pressurize the system.

23. Check for fuel leaks.

24. Disconnect the negative battery cable.

25. Connect the electrical connectors to the injectors.

26. Install the upper intake manifold and throttle body assembly by reversing the removal procedure. Use a new gasket and tighten the retaining bolts to 12–18 ft. lbs. (16–24 Nm).

27. Refill the cooling system and connect the negative battery cable.

28. Start the engine and let it idle for 2 minutes. Turn the engine **OFF** and check for leaks.

TESTING

The easiest way to test the operation of the fuel injectors is to listen for a clicking sound coming

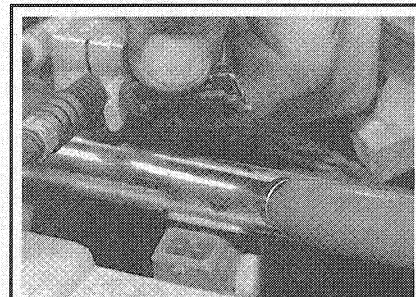


Fig. 39 Unplug the fuel injector connector

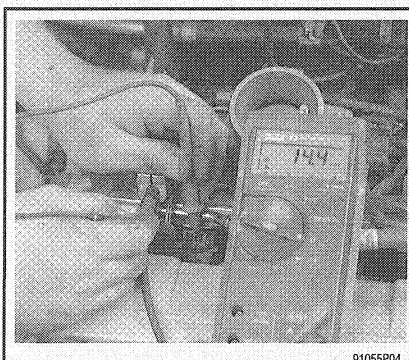


Fig. 40 Probe the two terminals of a fuel injector to check its resistance

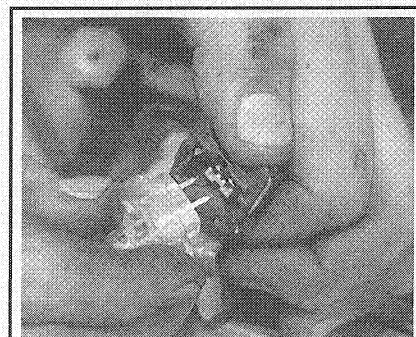


Fig. 41 Plug the correct "noid" light directly into the injector harness connector

from the injectors while the engine is running. This is accomplished using a mechanic's stethoscope, or a long screwdriver. Place the end of the stethoscope or the screwdriver (tip end, not handle) onto the body of the injector. Place the ear pieces of the stethoscope in your ears, or if using a screwdriver, place your ear on top of the handle. An audible clicking noise should be heard; this is the solenoid operating. If the injector makes this noise, the injector driver circuit and computer are operating as designed. Continue testing all the injectors this way.

CAUTION

Be extremely careful while working on an operating engine, make sure you have no dangling jewelry, loose clothing, power tool cords or other items that might get caught in a moving part of the engine.

All Injectors Clicking

If all the injectors are clicking, but you have determined that the fuel system is the cause of your driveability problem, continue diagnostics. Make sure that you have checked fuel pump pressure as outlined earlier in this section. An easy way to determine a weak or unproductive cylinder is a cylinder drop test. This is accomplished by removing one spark plug wire at a time, and seeing which cylinder causes the least difference in the idle. The one that causes the least change is the weak cylinder.

If the injectors were all clicking and the ignition system is functioning properly, remove the injector of the suspect cylinder and bench test it. This is accomplished by checking for a spray pattern from the injector itself. Install a fuel supply line to the injector (or rail if the injector is left attached to the rail) and momentarily apply 12 volts DC and a ground to the injector itself; a visible fuel spray should appear. If no spray is achieved, replace the injector and check the running condition of the engine.

One or More Injectors Are Not Clicking

➔ **See Figures 39, 40, 41 and 42**

If one or more injectors are found to be not operating, testing the injector driver circuit and computer can be accomplished using a "noid" light. First, with the engine not running and the ignition key in the **OFF** position, remove the connector from

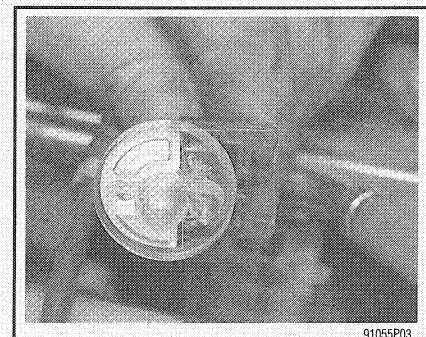


Fig. 42 If the correct "noid" light flashes while the engine is running, the injector driver circuit inside the PCM is working