

Name \_\_\_\_\_

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

1) What can occur if dirt enters the air or fuel delivery system during service?

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2) What is the difference between a solenoid-controlled HPCR injector and a piezo-controlled HPCR injector?

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3) Why it is important to program the new calibration code into the powertrain control module when replacing an HPCR injector?

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4) What are the components in a typical high-pressure common rail injection system?

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5) What are the advantages and disadvantages of the high-pressure common rail injection systems over previous fuel injection systems?

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## Answer Key

Testname: LVDE1\_SHORT13

1) Dirt and debris that enters the fuel system and the air induction system are the root cause of many high-pressure fuel system failures. Many fuel and air management system manufacturers have kits that provide caps and covers for fuel and air management systems that are open due to testing by the service technician. Care should be used to ensure that dirt and debris do not enter the open components during testing as it may cause harm to the engine or the fuel system.

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2) The solenoid-controlled injector uses the electromagnetic field generated by the solenoid and the hydraulic pressure of the fuel to open and close the injector. The piezoelectric injectors require electrical current, high-pressure fuel, low-pressure fuel, and reversed electrical current to inject fuel, and then close the injector after injection. In a piezoelectric injector, the solenoid is replaced with a stack of piezo ceramic discs that changes shape when electrical current is introduced.

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3) High-pressure common rail injectors have an injector classification code assigned to them at the time of manufacturing. This code identifies any differences in fuel volume when the injector is energized during a bench test during manufacturing. The code, which is alpha-numeric, when programmed into the powertrain control module, allows for a fuel delivery strategy that accounts for the mechanical differences in the injector. Any time an injector is replaced, the classification code of the new injector has to be programmed into the controller for optimal performance.

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4) The high-pressure common rail or tube is the supply manifold used to store and distribute pressurized fuel to each injector supply line that will match the engine speed and load. An inline engine has a single fuel rail, while a v-type motor will have two rails connected via a transfer tube. Components that are mounted on the common rail tube are the pressure relief, or pressure control valve, the fuel pressure sensor, the injector supply lines, and the return line.

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5) Advantages:

- The design of the common rail components is very modular. This means the system can be easily modified and adapted to fit many different engines.
- The common rail systems are able to operate at higher operating pressures than previous systems.
- The common rail design allows an increase in the number of injection events per combustion cycle.

Disadvantages:

- Replacement injectors routinely exceed eight hundred dollars apiece and a replacement high-pressure pump can exceed twenty-five hundred dollars.
- The higher cylinder temperatures and pressures created with a high-pressure common rail injection system tend to create more oxides of nitrogen (NO<sub>x</sub>).

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