

Common Rail High-Pressure Pump Basics, Operation + Troubleshooting



An Employee Owned Company

12693 Old Virginia Road
Reno, NV 89521
800.648.4720

DIPACODTECH.com

Basic Operation

The high-pressure common rail fuel injection system (HPCR) used in the GM and Dodge heavy duty pickups since the early 2000's is quite different from the previously used pump-line-nozzle (PLN) systems.

In the PLN system a distributor or inline injection pump performs these critical functions: delivery of a pressurized and metered quantity of fuel to the injectors once for each power stroke, control of fuel injection timing, governor control of engine speeds and fuel delivery quantity related to the engine operating conditions.

In the HPCR system the rail pressure, fuel metering, injection timing and engine speed control is done by the engine or power train control module (ECM or PCM). The PCM controlled common rail injector receives high-pressure fuel via the rail and injects atomized fuel into the combustion chamber.

The basic function of the high-pressure (HP) pump is to provide a constant flow of fuel of sufficient volume and high-pressure to support the engine operating requirements. The primary parts of the Duramax and Dodge HP pumps are the low-pressure gear pump, inlet-metering valve and high-pressure pumping elements. The low-pressure gear pump draws fuel from the tank and pressurizes the fuel to around 6 bar. The PCM controlled inlet-metering valve commonly referred to as the fuel control actuator or fuel rail pressure regulator controls the amount of supply pressure to the high-pressure pumping elements, thereby regulating the volume and high-pressure output of the HP pump. The rail pressure is approximately 345 bar at idle and can reach 1,800 bar under full load conditions. From the HP pump the fuel flows to the rail where it is accumulated prior to flowing to the injectors. Later engine models include a pressure-control valve on the rail that works in conjunction with the inlet-metering valve to provide improved rail pressure control.

Troubleshooting

The HP pump is often mistaken as the cause of starting and low power conditions. Before replacing the HP pump, check for diagnostic trouble codes (DTC), check the fuel supply system, measure the return fuel from the injectors and rail pressure limiting valve and monitor the desired vs. actual rail pressure values.

If the fuel supply system is good, a quick test of the HP pump can be done. Remove the high-pressure discharge line from the pump, attach a hose to the line and crank the engine over until fuel is discharged from the hose. Now collect and measure the fuel discharge by cranking the engine for 10 seconds three times. If the cranking speed is around 150 RPM the collected amount should be 70 ml and at 200 RPM it should be around 90 ml. If the discharge volume is low suspect a bad HP pump.