

OREGON FUEL INJECTION, INC.

4036 W 1st Ave
Eugene, OR 97402
541-485-1434

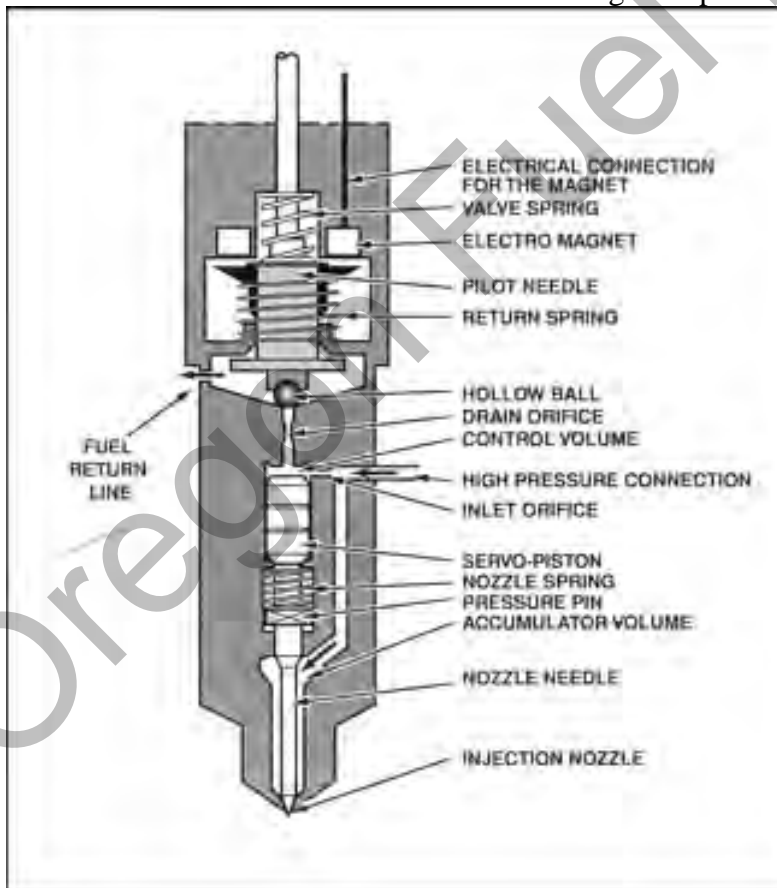
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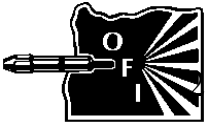
2005 – 2006 Jeep Liberty CRD Diagnostics

In order to do proper diagnostics you will need a scan tool and some special tools available from Mopar Special Tools <http://mopar.snapon.com>
If you don't have service information you can buy a subscription online at alldatadiy.com or eAutorepair.net.

High Pressure Common Rail Basic Information

The high pressure pump builds the high pressure and delivers it to the fuel rail manifold, which buffers out pressure fluctuations and distributes fuel to the individual injectors. The fuel quantity solenoid (fuel control actuator, M-Prop) in the high pressure pump controls pressure output from the pump. The fuel pressure solenoid (pressure control valve) in the fuel rail has final control of rail pressure and prevents over pressurizing of the system. The injectors have a hollow check ball that holds rail pressure until the fuel solenoid is actuated by the ECM, this allows the check ball to rise off its' seat and an injection to take place. If the check ball in the injector is leaking or the fuel pressure solenoid is defective then it will not build enough rail pressure to start the engine.





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CAUTION

The fuel system contains high pressure fuel up to 23,500 PSI. Do Not use your fingers to find leaks! High pressure fuel entering your bloodstream may result in amputation or loss of life.

Preliminary checks

1. Record and repair any active DTC, they may be related to complaint.
2. Ensure that you have a good clean fuel supply.

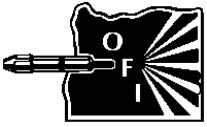
No Start or Hard Start

1. No or aerated fuel supply to the high pressure injection pump (CP3)
2. Monitor rail pressure and see if you have over 2,900 PSI during cranking, if not one or more injectors leaking internally can cause a hard start, see injector section for further diagnostics. No smoke from the tailpipe after about 10 seconds of cranking means no fuel is getting into the cylinders. [Buy Jeep 2.8 CRD Injectors](#)
3. Fuel filter head sucking air. Install a clear fuel line between filter and high pressure pump to check for air. The fuel heaters in the filter head are known to melt the electrical connector and suck air. Remove the connector from the filter head and inspect for melted plastic and/or heat damage. An update is available from Chrysler to fix this issue.
4. Leaking fuel pressure solenoid (in fuel rail). There should be no fuel coming out of the solenoid while cranking and it should hold 870-1450 psi when unplugged during cranking. If it doesn't, and the injectors are OK, then the fuel pressure solenoid is bad. [Buy Jeep CRD Fuel Pressure Solenoid](#)
5. If other work has just been performed be sure that the #4 injector connector and the fuel pressure solenoid connectors are not swapped. This will cause the fuel pressure solenoid to dump pressure and the engine will not start.

Black Smoke

1. If at idle, use the scan tool to cut out one cylinder at a time and see if the smoke disappears.
2. Dirty air filter
3. Exhaust leaks or Boost leaks, you can usually hear a boost leak as a high pitched squeal under load.
4. VGT turbo sticking and/or not operating properly.
5. EGR system fault. Usually this will set a code.
6. Dirty or damaged Mass Air Flow sensor
7. Worn or damaged engine camshafts and followers (see P0101)





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Miss

1. Perform the “Fuel Correction Test” with a scan tool. During the test the values should fluctuate slightly above or below 0 mg/stroke. If the values increase to +6 or -6 mg/stroke or more it would indicate a balance issue with that cylinder.
2. A bad or incorrect torque on an injector, missing or damaged chamber gasket, low compression, excessive valve lash, flat lobes on camshafts could all cause a miss.
3. There is a relative compression test available using the DRB3 or wiTECH scan tools. Acceptable values between two cylinders must be equal to or less than 15 rpm.

Knocks

1. Use scan tool to isolate one cylinder at a time

Surge at idle

1. Restricted or aerated fuel supply to the high pressure pump. Observe the fuel pressure set point vs. the actual fuel pressure, if the actual fuel pressure oscillates above and below the set point check for air intrusion in the fuel supply.
2. Actual versus desired too far apart; map the actual fuel pressure vs. the set point pressure, if erratic and there is no air in the system, it may be a bad Fuel Quantity Solenoid (fuel control actuator). If you have a fluctuation over 500 PSI this can cause a surge. Fuel contamination can cause the Fuel Quantity Solenoid to become sticky and erratic. [Buy Jeep Liberty 2.8 Fuel Pressure Regulator](#)

Slow Deceleration

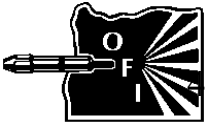
If the engine hangs at higher rpm or is slow to decelerate, injector wear is what normally causes this problem due to excessive return. Injectors will need to be replaced.

Blue-White smoke at idle when cold

If the smoke clears in less than 1 minute, this could be normal depending on temperature and altitude. Blue white smoke that burns your eyes is un-burnt fuel. Cold temperatures, high altitude and excessive idle time all mean incomplete combustion.

1. Possible bad injector, leaking at the nozzle tip. Use the scan tool to kill one injector at a time to isolate, or unplug one injector at a time. However, this does not reduce rail pressure in the injector and the tip can still leak fuel.
2. Perform the “Fuel Correction Test” with a scan tool. During the test the values should fluctuate slightly above or below 0 mg/stroke. If the values increase to +6 or -6 mg/stroke or more it would indicate a balance issue with that cylinder.
3. The intake air temperature, coolant temperature, inlet air temperature and battery temperature should all display normal ambient temperatures when cold. If not, repair as necessary.
4. Check glow plug system operation when cold.





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5. Check rail pressure when engine is off, it should be 0 PSI (+/- 500 PSI).
6. Aerated or restricted fuel supply.
7. Excessive idle time can cause white smoke when cold due to carbon build up on injector tips. More than 20% idle time is excessive.

Fuel Supply

1. Similar to the Duramax engines, these engines do not use a fuel supply pump. The CP3 pump pulls fuel through a fuel filter unit mounted on the fire wall. Because these systems are under vacuum, not pressure, they are more susceptible to air intrusion into the fuel system.
2. The fuel filter heads are a known problem on these engines, and there is an updated filter head assembly available through Chrysler. The biggest problem is the fuel heater connector tends to fail allowing air into the fuel supply. Use a clear fuel line to check for air in the fuel supply to the high pressure pump.
3. Worldwide, in other markets, these used a fuel supply pump in the tank. The ECM has a fuel pump driver built in and there is a relay and fuse in the fuse box, and wiring to the rear of the vehicle for a fuel supply pump. It is possible to install a different module in the tank with a fuel supply pump and the correct wiring harness to upgrade the fuel supply system. This is recommended if the engine is equipped with a tuner and/or other performance upgrades. It will also help the gear pump in the CP3 last longer and minimize the chance of other fuel supply issues.

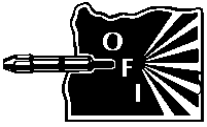
EGR System

1. The EGR system on this engine can set multiple codes, due to multiple issues some as simple as a turbocharger vacuum line problem. To properly diagnose you need to use your scan tool and follow the diagnostic procedures for any DTC codes that may set. See P0101 and P0401 in the DTC list below.

High Pressure Injection Pump (CP3 Pump) [Buy Jeep Liberty CRD High Pressure Fuel Pump](#)

1. Most starting problems due to low rail pressure are caused by bad (check ball seat) injectors or the fuel pressure solenoid in the fuel rail.
2. You can unplug the fuel quantity solenoid, on the CP3 pump, and the pressure should default to maximum (23,500 PSI), however during the first 30 seconds (during starting) the fuel quantity solenoid is inactive. If there is a leak in the injection system then the pump will not build enough pressure.
3. To attempt to look at volume out of the high pressure pump may be misleading, the 5.9 Dodge only puts out 70 ml (cc) in 30 seconds at cranking. There is no specification from Chrysler, but I would expect the volume to be half of the 5.9 Dodge. If there has been a major contamination issue with dirt and or water then it is very likely that the high pressure pump will need to be replaced. The injectors





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- are typically damaged first, but any contamination that got into the injectors also went through the CP3 pump.
4. If the cascade over flow valve is bad this can send fuel out the return line instead of to the charging circuit of the CP3 pump.
 5. If you have a surge, observe the fuel pressure set point vs. the actual fuel pressure, if the actual fuel pressure oscillates above and below the set point check for air intrusion in the fuel supply. If there is no air in the system a sticky fuel quantity solenoid can cause this problem.

Fuel Pressure Solenoid, In Fuel Rail [Buy Jeep Liberty 2.8 Fuel Pressure Solenoid](#)

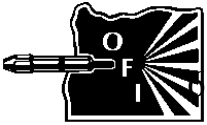
1. The fuel pressure solenoid is attached to the rear of the fuel rail. The tip of the fuel pressure solenoid uses a knife edge, for metal to metal sealing. The knife edge actually deforms the metal in the fuel rail in order to seal the surfaces. The solenoid must be replaced when ever it is removed from the rail. The solenoid controls and maintains the rail pressure as commanded by the ECM.
2. In a DE-energized state, the fuel pressure solenoid is closed. During starting the fuel pressure solenoid is held closed by magnetic force. When checking the fuel pressure solenoid there should be no fuel coming out the return during cranking, and it should hold 870-1450 psi when unplugged during cranking. If it doesn't, and the injectors are OK, then the fuel pressure solenoid is bad.
3. When driving, the fuel pressure solenoid is constantly open; the pressure of the fluid counteracts the magnetic force of the coil and the slight spring force to help maintain desired rail pressure.
4. If the actual fuel pressure, vs. the fuel pressure set point, gradually drops and then spikes well above the set point then the fuel pressure solenoid is sticking and usually needs replaced.
5. Low rail pressure under load, and a P0093 code, can be caused by a defective fuel pressure solenoid. Check for return with the engine running, and if possible, use a scan tool to run the high pressure set point test. There should be minimal to no return from the fuel pressure solenoid. If there is more than 15-20cc in 30 seconds, the valve is likely bad. A good solenoid will typically not leak any fuel while cranking or at idle.

Injectors [Buy Liberty 2.8 CRD Injectors](#)

It takes about 2,900 PSI rail pressure in order for the injectors to deliver fuel for starting.

1. Excessive leakage usually results in a starting issue, which could occur hot or cold, but usually occurs hot because the fuel is thinner when hot. Excess leakage is due to wear, which would be greatly accelerated due to fuel contamination. If the injector has excessive leakage that fuel goes out the return system it is not an external leak.
2. Per Chrysler, unplug the cam sensor and plumb the individual injector returns into graduated vials. In 10 seconds of cranking the highest return should be no more





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- than 3ml higher than any other injector. Any injector with 3ml more return would need to be replaced, per Chrysler.
3. If removed from the engine and sent in, we can test the injectors to be sure they meet factory specifications and provide replacements for any that do not meet specifications

Turbocharger [Buy New Replacement Liberty CRD Turbo](#)

The turbochargers on these engines are a VGT (Variable Geometry Turbocharger) type turbocharger. They use a vacuum actuator to vary vane position depending on load and throttle position. Vacuum to the actuator is controlled by the boost pressure solenoid, which is controlled by the ECM. Like any of the other VGT type turbochargers, these turbos are susceptible to carbon build up causing the vanes to stick resulting in several drivability problems. Most commonly these complaints would include poor response, low power, black smoke, and poor fuel economy, among others.

A turbocharger failure will usually be accompanied with diagnostic trouble codes pertaining to boost pressure (MAP), intake air volume (MAF), or EGR. Some common codes are P0299 Turbocharger under boost condition, P0101 Mass air flow sensor signal negative deviation, P0401 EGR solenoid circuit negative deviation.

Glow Plug System

These engines were originally equipped with ceramic glow plugs. As of 2011 the ceramic glow plugs are no longer available through Mopar. The ceramic glow plugs have been superseded with a metallic glow plug.

When replacing one or more ceramic glow plugs with metallic glow plugs it will be necessary to replace all four glow plugs, the glow plug control module, and reprogram the engine control module. All changes must be done at the same time, but only should need to be done once. After the update individual components can be replaced.

Ceramic glow plugs can be identified by using sand paper to scuff the oxidation off of the plug. Ceramic glow plugs are white in color. Metallic plugs are gray in color.

Timing Belt

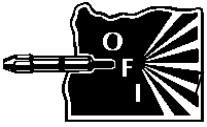
The timing belt, pulleys, and tensioner need to be replaced at 100,000 mile intervals.

Use the following information regarding diagnostic trouble codes in addition to the normal diagnostic procedures outlined in the service manual or technical service bulletins.

DTC P0087; Fuel rail pressure malfunction- pressure too low

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)





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2. Restricted or aerated fuel supply to CP3 pump. Observe the fuel pressure set point vs. the actual fuel pressure, if the actual fuel pressure oscillates above and below the set point check for air intrusion in the fuel supply.
3. Excessive leakage from fuel injectors
4. Fuel pressure solenoid in fuel rail not operating correctly

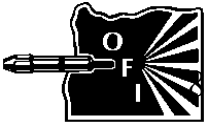
DTC P0093; Fuel rail pressure malfunction- maximum positive deviation

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)
2. Plugged fuel filter.
3. Aerated fuel supply to CP3 high pressure pump. Observe the fuel pressure set point vs. the actual fuel pressure, if the actual fuel pressure oscillates above and below the set point check for air intrusion in the fuel supply.
4. Malfunctioning fuel quantity solenoid (FCA) in CP3 pump.
5. Malfunctioning fuel pressure solenoid in fuel rail. If the actual fuel pressure, vs. the fuel pressure set point, gradually drops and then spikes well above the set point then the fuel pressure solenoid usually is bad and needs replaced.
6. Low rail pressure under load, and a P0093 code, can be caused by a defective fuel pressure solenoid in the rail. Check for return with the engine running, and if possible, use a scan tool to run the high pressure set point test. There should be minimal to no return from the fuel pressure solenoid. If there is more than 15-20cc in 30 seconds, the valve is likely bad. A good solenoid will typically not leak any fuel while cranking or at idle.

DTC P0101; MAF sensor signal negative deviation

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)
2. Plugged air filter
3. Dirty/damaged MAF sensor
4. Air leaks in turbo inlet ducting AFTER the MAF sensor
5. Faulty turbocharger
6. EGR system malfunction
7. Engine mechanical failure
8. Plugged catalytic converter
9. If the air intake, charge air cooler and hoses, turbocharger, intake manifold, EGR system, and exhaust system check ok, then it is possible there is an internal engine problem causing low air flow. Most commonly this is caused by worn or damaged camshafts and followers. MAF voltage should run around 4.5 volts under hard load on a good running engine with no other issues. Engines with bad camshafts, in our experience, have run in the 3.8-4.0 volt range with low power and heavy black smoke. MAF should read between 1.6-1.9 volts at idle with the EGR valve disabled. (Unplugged, or preferably blocked off to prevent any possibility of exhaust flowing into the intake. This can be accomplished by temporarily installing a thin metal plate under the EGR tube flange connection at the valve.).





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DTC P0105; Turbocharger inlet pressure signal plausibility

1. Most likely cause is a failed boost pressure sensor

DTC P0201 – P0204; Injector control circuit

1. Damaged injector wiring
2. Check injector resistance, should be less than 1 ohm and greater than zero ohms (zero ohm meter leads before test).

DTC P0299; Turbo under boost condition

Set Conditions-Actual boost pressure differs from the boost pressure set point by more than 1000hpa. The boost pressure set point is calculated from MAF sensor input. A dirty MAF sensor will skew the value and cause the P0299 code.

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)
2. Dirty/Damaged MAF sensor
3. Boost and/or exhaust leaks
4. Turbo and/or VGT system failure- VGT actuator stuck open
5. EGR system failure
6. Plugged air filter
7. Plugged catalytic converter

DTC P0300 – P0304; injector misfire, all and 1 through 4

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)
2. Restricted or aerated fuel supply.
3. Defective injector(s), perform Fuel Correction Test with scan tool to isolate cylinders
4. Damaged cams and/or lifters

DTC P0340; Camshaft position sensor circuit missing signal

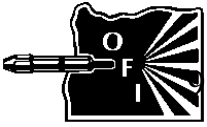
1. Monitor the CKP and CMP signals. There are cases where a bad CKP code will cause a CMP code and vice versa. If the pattern from the CKP is not correct, then replace the CKP.

DTC P0401; EGR solenoid circuit negative deviation

The EGR Solenoid circuit negative deviation code takes a delta measurement from the MAF sensor during EGR valve operation. A dirty MAF sensor can skew the reading and cause a P0401 code.

1. Perform re-flash per TSB 18-007-05 (2005 Model Year)
2. Defective EGR valve
3. Leaks around EGR cooler and/or cooler connecting hoses
4. Damaged/Dirty MAF sensor





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5. Plugged catalytic converter
6. Turbocharger and/or VGT system failure

DTC P1252; Vacuum reservoir solenoid short circuit

1. Internal failure in vacuum reservoir solenoid
2. Solenoid coil resistance should be 28-30 ohms

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