

TECHNICAL SERVICE BULLETIN					No.46/2005 24 June 2005		
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Subject/Concern:		List of common concerns on the Delphi HPCR system					
Model:		All					
Markets:		All					
Section:		303-14					
Summary							
This bulletin covers a list of the common concerns on the Delphi HPCR system and fault analysis. Please take the time to read through and understand this bulletin. An understanding of the complex nature and special features of the Delphi Common Rail systems is an essential prerequisite for performing effective diagnosis and repairs. For additional information, refer to TSB 124/2003.							
Common concerns on the Delphi Common Rail System and fault analysis							
The customers' concerns often relate to the same fault symptoms (engine stalls, engine will not start, rough running/idling etc.). For this reason it is extremely important to start by reading out the diagnostic trouble codes (DTC's) with the aid of WDS and to then use this information to diagnose the actual cause of the concern. Never use the description of the problem or trouble symptoms alone to determine the possible cause.							
P0251 (Fuel metering valve (IMV) control error)							
Symptoms:							
• Extremely poor engine performance - glow plug warning lamp flashes. • Engine cuts out - glow plug warning lamp flashes. • Engine will not start.							
Cause:							
• The fuel rail pressure demanded by the system cannot be achieved without the IMV opening beyond the tolerance specified for that pressure.							
• NOTE: The fault descriptions listed below should be worked through in order.							
1. Restriction in the low-pressure fuel system, which could be caused by a blockage of a fuel line or the fuel filter, or a damaged fuel line. For additional information, refer to Workshop Manual Section 303-04, Diagnosis and Testing for a blocked filter.							
2. Air in the low-pressure system: Check using transparent hoses (see TSB 107/2003) or remote feed the fuel injection pump with a filtered proprietary fuel supply to eliminate the vehicle low-pressure fuel system entirely. Leaking fuel lines or connections can cause air in fuel.							
• NOTE: When using transparent hoses a small amount of air in the fuel system is normal due to a permanent bleed hole in the fuel filter. Recirculation of fuel will occur through the fuel filter until the temperature of the return fuel is over 40°C (hence any air in the system will re-circulate until the fuel is above 40°C and is being returned to the fuel tank).							
3. Faulty fuel injection pump, transfer pump part, or pressure control valve. Fuel injection pump internal transfer pressure needs to be at least 6 bar to achieve high pressure chamber filling (to generate the required fuel rail pressure). Check the following (if the engine does not start):							
• Remote feed the fuel injection pump with a filtered, proprietary fuel supply. If the engine will start when the fuel supply is pressurized or held above the fuel injection pump intake (gravity							

fed), but will not start when the fuel supply is not pressurized or held below the fuel injection pump intake then it is likely that there is a fault with the internal transfer pump (i.e. not able to draw fuel).

4. Faulty fuel injection pump - high-pressure part or inlet metering valve (IMV):

- Carry out a guided fuel pressure test diagnosis with the aid of WDS (symptom "No engine start" or "Poor driveability").



CAUTION: Do not crank the engine for more than 5 seconds. The fuel injection pump will be damaged with long or repeated cranking and no transfer pressure.

- Check the fuel pressure (with the ignition ON, engine OFF) (it should fluctuate between 4 and 10 bar maximum). If a default fuel pressure of 2000 bar is displayed then there is an electrical fault on the fuel pressure sensor (connector, wiring etc.).
- Check the fuel pressure at the moment the engine starts (target value = 300 bar $\pm$ 50 bar).
- Check the fuel pressure at idling (target value = 250 bar $\pm$ 40 bar).

5. Injectors:

- Perform a return quantity test using the WDS guided diagnostic. This test uses special tool 310-129 (see TSB 106/2003). If high return quantities are experienced, check a sample of fuel from the FIP return for black metallic swarf. Go to the next step.

6. Swarf in the system:

- Despite improved materials it is possible there may be swarf in the system, without the fuel injection pump being defective. A sample of fuel should be collected from the fuel injection pump return line. If this sample contains over 5mm diameter of black metallic swarf please refer to TSB 42/2003 for appropriate action. First run through all of the other system checks (as described above).

P1211 (Fuel pressure higher/lower than requested)

Symptoms:

- Malfunction indicator lamp (MIL) light on. Engine shut down.

Cause:

- Always occurs in conjunction with P0251 (follow on fault). If P0251 is present for a pre-determined number of engine cycles then P1211 is set and the engine is shut down.

P2291 (Pressure lower than expected)

Symptoms:

- This often arises in conjunction with P0251 and other trouble codes, but may also appear by itself.
- Poor engine performance (glow plug warning lamp flashes).
- Engine cuts out (glow plug warning lamp flashes).
- Engine will not start.

Causes:

- Fuel metering valve stuck. Use IMV cycle test if available on this vehicle.
- Fuel supply (see **P0251** in this bulletin).
- Fuel injection pump defective (see **P0251** in this bulletin).

P2288 (Pressure higher than expected)

Symptoms:

- This trouble code often occurs in conjunction with other trouble codes.
- Engine frequently undershoots to a stop.
- Engine will not start up.

Causes:

- Loose contacts (corrosion) on the wiring harness connector of the fuel metering valve, or the connector is not pushed together properly. Check wiring harness connector to ensure it is connected correctly and that the pins are not corroded. Use IMV cycle test (located in WDS toolbox) if available on this vehicle.
- Fault with IMV wiring harness. Use wiring pinpoint checks available on WDS.
- Fuel metering valve stuck. Use IMV cycle test if available on this vehicle.
- Loose contact on the fuel pressure sensor wiring harness connector (see TSB37/2003). This tends to happen more rarely.
- If DTC P0191 is also set, check RPM signal is present during cranking. If not check crank sensor.

P0200 (Shared injector actuation malfunction)

Symptoms:

- Engine cuts out while driving - glow plug warning lamp flashes.
- Engine judders (similar experience to misfiring) - glow plug warning lamp flashes.

Cause:

- Usually faults in the ground supply or the voltage supply to the injectors.

1. Check all ground connections.

2. Often the cause is the ground connection underneath the battery (corroded attachment) (for Mondeo 2001 (10/2001-) see TSB 44/2002).

P0201 / P0202 / P0203 / P0204 (Individual injector actuation malfunction)

Symptoms:

- DTC set.

Cause:

- Short circuit/open circuit on the wiring harness of the injector.
- Loose contact in the wiring harness connector of the injector.
- Faulty injector (interruption in the coil of the solenoid valve).
- Leaking wiring harness connector (diesel or water in the connector).

1. Clear fault codes and test vehicle. If fault codes return continue with the following checks.

2. Check all injector electrical connections are properly attached.

3. Carry out WDS pinpoint checks for wiring harness continuity.

P1664 (dual-module system - injector drive module (IDM) malfunction; single-module system - powertrain control module (PCM) malfunction)

• **NOTE:** Ignore this trouble code if it occurs in conjunction with other trouble codes. Diagnose the other fault codes first.

P1664 and P0251 - Ignore P1664 initially. See description of P0251 in this bulletin.

P1664 and P0180 - Ignore P1664 initially. See description of P0180 in this bulletin.

P1664 and P0191 - Ignore P1664 initially. Trouble code may have been provoked by the

customer, e.g. the engine was re-started too soon after engine undershooting to a stop. In this case there would not have been enough time to dissipate the pressure quickly enough, and P0191 would have been set. Ignore initially and delete them both.

Symptoms:

- P1664 and P0191 re-appear after deleting.
- Long startup times.
- Repeated startup attempts because the engine will not start.
- Engine finally starts after several attempts and after the ignition has been OFF for a longer period of time.

Cause:

- Powertrain control module (PCM)/injector drive module (IDM) malfunction.

1. First delete the fault memory.

2. Follow the service instructions in accordance with TSB 44/2002 (ground supply / voltage supply).

3. If P1664 is set again, initially install a new supply relay for the IDM (dual-module)/ PCM (single-module) and delete the fault memory.

4. If P1664 is set again, install a new IDM/PCM.

P1664 and P1665 - P1665 only occurs in addition to other trouble codes. Ignore initially and delete them.

Symptoms:

- P1664 and P1665 are still present after deleting them both.

Cause:

- A problem in the ground supply (Often between the battery and the body). Check all ground connections.
- IDM/PCM power supply and ground connection.
- CAN connection to the PCM.
- On Mondeo 2001 (10/2000-) vehicles with the dual-module system it is possible that the wiring harness may have been damaged in the area of the pollen filter after installing a new windshield.

P0180 (Fuel temperature sensor circuit)

Symptoms:

- P0180 usually occurs in conjunction with several other trouble codes (particularly P1664). Initially ignore any other trouble codes.
- Engine cuts out.
- Rough running engine.
- Irregular idling.
- Glow plug warning lamp usually flashes.

Cause:

- Loose contact on the wiring harness connector of the fuel temperature sensor.
- Fuel temperature sensor defective.

1. Read off the value of the fuel temperature sensor using the WDS data logger when the engine is

switched off. The value must be realistic (e.g. it must not show -20 °C when the ambient temperature is +18 °C).

2. If the displayed value is realistic, carefully move the sensor connection - if the value jumps to +39 °C (substitute value), then the problem lies with the connector.
3. If the displayed value is not realistic, carefully tap the sensor or perform a road test. If large temperature jumps are observed (e.g. +150/-230 °C or -110/+200 °C), then usually the fuel temperature sensor is defective (see TSB 38/2003).

P0191 (Fuel pressure sensor malfunction) - non-electrical fault

Symptoms:

- Engine will not start - glow plug warning lamp flashes.

Cause:

- In most cases this is a software fault. In the process, the system recognizes a fuel pressure which is implausible for the given conditions.

1. Turn the ignition key to ignition ON. At this moment, using WDS data logger, the fuel pressure should be below 90 bar.
2. If the fuel pressure is higher than 90 bar then this is a fault, as the pressure is dissipated after the ignition is switched off.
3. Upload the latest PCM calibration using WDS.

P0190 (Fuel pressure sensor malfunction) - electrical fault

Symptoms:

- Engine cuts out while driving.
- Engine will not start.

Cause:

- Wiring harness connector of the fuel pressure sensor.

1. Read off the fuel pressure with the ignition ON and the engine OFF using the WDS data logger.
2. If a default value of 2000 bar is displayed, repair the wiring harness connector. For additional information, refer to TSB 37/2003.

P0340 (Camshaft position (CMP) sensor)

The following possible concern may occur without a trouble code necessarily being set in the system.

Symptoms:

- Engine will not start.
- Engine cuts out while driving.
- Severe misfiring. If this occurs while idling then the engine may stop as a result.

Cause:

- Wiring harness to the CMP sensor (short circuit, open loop control).
- Loose contact in the wiring harness connector.
- CMP sensor defective.
- PCM fault (single-module vehicles) or IDM fault (dual-module vehicles) - exclude all other possibilities first.

1. An oscilloscope can be used to check that the CMP signal is present on start up.
2. Check the voltage supply to the CMP sensor (refer to the description below). For additional

information, refer to TSB 69/2003.

P0325 (Knock sensor fault)

It is extremely rare that the knock sensor itself is the problem, as this component is very reliable. This may also occur without a trouble code being set.

Symptoms:

- Extreme combustion noise (knocking).

Cause:

- Knock sensor wiring harness.
- IDM/PCM connector.

P0335 (Invalid crankshaft position (CKP) signal)

• **NOTE:** This trouble code is set when no concordance is detected between the CKP signal and the CMP signal.

Symptoms:

- Engine cuts out while driving.
- Engine will not start.

Cause:

- The CKP sensor wheel is damaged or loose on the flywheel.
- The CMP signal is not in order - no synchronization taking place.
- The CKP sensor and/or the CKP sensor bracket are loose.
- The CKP gap is incorrect.
- The CKP gap was set incorrectly and has damaged the sensor.

- 1.** Check the CKP sensor wheel to make sure it is securely attached, has no bent/damaged teeth and there is no corrosion on the teeth.
- 2.** Use WDS Datalogger to check the CKP signal, look for two clearly defined triggering teeth responses within a 720° captured event .
- 3.** Use an oscilloscope to check whether the CMP signal is present when the engine is started. If it is not present, refer to the description for P0340 in this bulletin.