

EMISSION CONTROL SYSTEMS

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GENERAL INFORMATION

SYSTEM DESCRIPTION

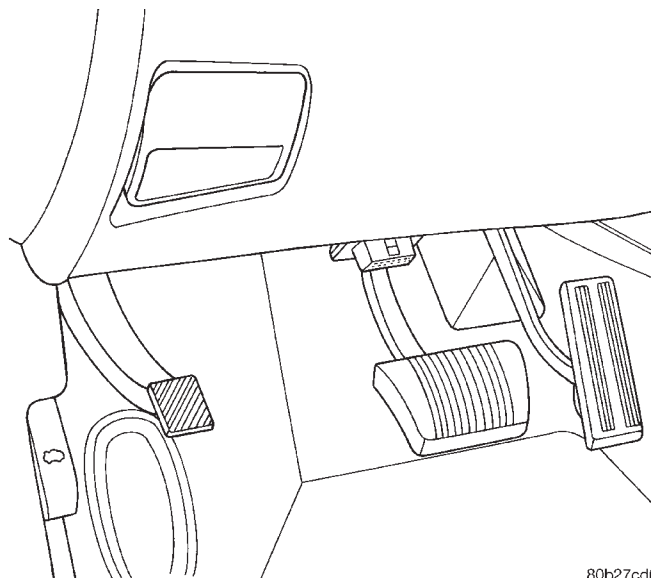
The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warmup cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator Lamp (MIL). Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example** , assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, disconnecting the TP Sensor with the ignition on may set the TP Sensor High code. When a repair is completed and verified, use the DRB scan tool to erase all DTC's and extinguish the MIL.

Technicians can display stored DTC's. Refer to Diagnostic Trouble Codes in this section. For DTC information, refer to charts in this section.



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Fig. 1 Data Link (Diagnostic) Connector

DESCRIPTION AND OPERATION

MALFUNCTION INDICATOR LAMP (MIL)

As a functional test, the Malfunction Indicator Lamp (MIL) illuminates at key-on before engine cranking. Whenever the Powertrain Control Module (PCM) sets a Diagnostic Trouble Code (DTC) that affects vehicle emissions, it illuminates the MIL. If a problem is detected, the PCM sends a message over the PCI Bus to the instrument cluster to illuminate the lamp. The PCM illuminates the MIL only for DTC's that affect vehicle emissions. The MIL stays on continuously when the PCM has entered a Limp-In mode or identified a failed emission component or system. The MIL remains on until the DTC is erased. Refer to the Diagnostic Trouble Code charts in this group for emission related codes.

Additionally, the PCM may reset (turn off) the MIL when one of the following occur:

- PCM does not detect the malfunction for 3 consecutive trips.
- PCM does not detect a malfunction while performing three successive engine misfire or fuel system tests. The PCM performs these tests while the engine is operating within ± 375 RPM of and within 10 % of the load of the operating condition at which the malfunction was first detected.

STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. From the state display screen, access either State Display Inputs and Outputs or State Display Sensors.

CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and

allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly.

DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

The preferred and most accurate method of retrieving a DTC is by using the DRB scan tool. The scan tool supplies detailed diagnostic information which can be used to more accurately diagnose causes for a DTC.

Remember that DTC's are the results of a system or circuit failure, but do not directly identify the failed component or components.

NOTE: For a list of DTC's, refer to the charts in this section.

BULB CHECK

Each time the ignition key is turned to the ON position, the malfunction indicator (Check Engine) lamp on the instrument panel should illuminate for approximately 2 seconds then go out. This is done for a bulb check.

OBTAINING DTC'S USING DRB SCAN TOOL

(1) Connect the DRB scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.

(2) Turn the ignition switch on and access the "Read Fault" screen.

(3) Record all the DTC's and "freeze frame" information shown on the DRB scan tool.

(4) To erase DTC's, use the "Erase Trouble Code" data screen on the DRB scan tool. **Do not erase any DTC's until problems have been investigated and repairs have been performed.**

DESCRIPTION AND OPERATION (Continued)

DIAGNOSTIC TROUBLE CODE DESCRIPTIONS

Hex Code	Generic Scan Tool Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
01	P0340	No Cam Signal at PCM	No camshaft signal detected during engine cranking.
02	P0601	Internal Controller Failure	PCM Internal fault condition detected.
05	P1682	Charging System Voltage Too Low	Battery voltage sense input below target charging during engine operation. Also, no significant change detected in battery voltage during active test of generator output circuit.
06	P1594	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
0A	P1388	Auto Shutdown Relay Control Circuit	An open or shorted condition detected in the auto shutdown relay circuit.
0B	P0622	Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
0F	P1595	Speed Control Solenoid Circuits	An open or shorted condition detected in the Speed Control vacuum or vent solenoid circuits.
10	P0645	A/C Clutch Relay Circuit	An open or shorted condition detected in the A/C clutch relay circuit.
11	P0403	EGR Solenoid Circuit	An open or shorted condition detected in the EGR transducer solenoid circuit.
12	P0443	EVAP Purge Solenoid Circuit	An open or shorted condition detected in the duty cycle purge solenoid circuit.
13	P0203	Injector #3 Control Circuit	Injector #3 output driver does not respond properly to the control signal.
14	P0202	Injector #2 Control Circuit	Injector #2 output driver does not respond properly to the control signal.
15	P0201	Injector #1 Control Circuit	Injector #1 output driver does not respond properly to the control signal.
19	P0505	Idle Air Control Motor Circuits	A shorted or open condition detected in one or more of the idle air control motor circuits.
1A	P0122	Throttle Position Sensor Voltage Low	Throttle position sensor input below the minimum acceptable voltage.
1B	P0123	Throttle Position Sensor Voltage High	Throttle position sensor input above the maximum acceptable voltage.
1E	P0117	ECT Sensor Voltage Too Low	Engine coolant temperature sensor input below minimum acceptable voltage.
1F	P0118	ECT Sensor Voltage Too High	Engine coolant temperature sensor input above maximum acceptable voltage.
20	P0134	1/1 O2S Stays At Center	Neither rich or lean condition detected from the oxygen sensor.
21	P1281	Engine Is Cold Too Long	Engine did not reach operating temperature within acceptable limits.
23	P0500	No Vehicle Speed Sensor Signal	No vehicle speed sensor signal detected during road load conditions.

DESCRIPTION AND OPERATION (Continued)

Hex Code	Generic Scan Tool Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
24	P0107	MAP Sensor Voltage Too Low	MAP sensor input below minimum acceptable voltage.
25	P0108	MAP Sensor Voltage Too High	MAP sensor input above maximum acceptable voltage.
27	P1297	No Change in MAP From Start to Run	No difference recognized between the engine MAP reading and the barometric (atmospheric) pressure reading from start-up.
28	P0320	No Crank Reference Signal at PCM	No crank reference signal detected during engine cranking.
29	P0353	Ignition Coil #3 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
2A	P0352	Ignition Coil #2 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
2B	P0351	Ignition Coil #1 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
2C	P1389	No ASD Relay Output Voltage at PCM	An Open condition Detected In The ASD Relay Output Circuit.
30	P1697	PCM Failure SRI Miles Not Stored	Unsuccessful attempt to update EMR mileage in the PCM EEPROM.
31	P1698	PCM Failure EEPROM Write Denied	Unsuccessful attempt to write to an EEPROM location by the PCM.
39	P0112	Intake Air Temp Sensor Voltage Low	Intake air temperature sensor input below the maximum acceptable voltage.
3A	P0113	Intake Air Temp Sensor Voltage High	Intake air temperature sensor input above the minimum acceptable voltage.
3B	P0325	Knock Sensor Circuit	Sensor is either shorted to ground or 12 volts. Will not detect open circuit.
3C	P0106	Baro Pressure Out of Range	Barometric pressure out of out of range.
3D	P0204	Injector #4 Control Circuit	Injector #4 output driver does not respond properly to the control signal.
3E	P0132	1/1 O2S Shorted To Voltage	Oxygen sensor input voltage maintained above the normal operating range.
41	P0154	Left Front O2S Stays at Center	Neither rich or lean condition detected from the oxygen sensor.
42	P0152	2/1 O2S Shorted To Voltage	Oxygen sensor input voltage maintained above the normal operating range.
44	P0600	PCM Failure SPI Communications	PCM Internal fault condition detected.
45	P0205	Injector #5 Control Circuit	Injector #5 output driver does not respond properly to the control signal.
46	P0206	Injector #6 Control Circuit	Injector #6 output driver does not respond properly to the control signal.
4C	P0354	Ignition coil #4 ckt	Peak primary circuit current not achieved with maximum dwell time.
4D	P0355	Ignition coil #5 ckt	Peak primary circuit current not achieved with maximum dwell time.

DESCRIPTION AND OPERATION (Continued)

Hex Code	Generic Scan Tool Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
52	P1683	SPD CTRL PWR RLY; or S/C 12v Driver CKT	Malfunction detected with power feed to speed control servo solenoids.
56	P1596	Speed Control Switch Always High	Speed control switch input above the maximum acceptable voltage.
57	P1597	Speed Control Switch Always Low	Speed control switch input below the minimum acceptable voltage.
58	P1289	Manifold Tune Valve Solenoid Circuit	An open or shorted condition detected in the MTV solenoid control circuit.
5A	P1598	A/C Pressure Sensor Volts Too High	Sensor input voltage is above 4.9 volts.
5B	P1599	A/C Pressure Sensor Volts Too Low	Sensor input voltage is below .098 volts.
5C	P1490	Low Speed Fan CTRL Relay Circuit	An open or shorted condition detected in the control circuit of the low speed radiator fan relay.
5D	P1489	Hi Speed Fan Relay Circuit	An open or shorted condition detected in the control circuit of the high speed radiator fan relay.
60**	P1698	No PCI Messages From TCM	No messages received from Transmission Control Module.
61	P1695	No PCI Message From Body Control Module	No messages received from Body Control Module.
65	P1282	Fuel Pump Relay Control Circuit	An open or shorted condition detected in the fuel pump relay control circuit.
67	P0135	1/1 O2S Heater Failure	Upstream oxygen sensor heating element circuit malfunction.
69	P0141	1/2 O2S Heater Failure	Oxygen sensor heating element circuit malfunction.
72	P1899	P/N Switch Stuck in Park or in Gear	Incorrect input state detected for the Park/Neutral switch, auto. trans. only.
73	P0551	Pwr steering sw perf	Incorrect input state detected for the power steering switch circuit.
76	P0172	1/1 Fuel System Lean	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
77	P0171	1/1 Fuel System Rich	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.
78	P0175	2/1 Fuel System Rich	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
79	P0174	2/1 Fuel System Lean	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.
7C	P0155	2/1 O2S Heater Failure	Oxygen sensor heater element malfunction.
7D	P0161	2/2 O2S Heater Failure	Oxygen sensor heater element malfunction.
7E	P0138	1/2 O2S Shorted to Voltage	Oxygen sensor input voltage maintained above the normal operating range.
7F	P0158	2/2 O2S Shorted to Voltage	Oxygen sensor input voltage maintained above the normal operating range.
81	P0140	1/2 O2S Stays at Center	Neither rich or lean condition detected from the downstream oxygen sensor.

DESCRIPTION AND OPERATION (Continued)

Hex Code	Generic Scan Tool Code	DRB Scan Tool Display	Description of Diagnostic Trouble Code
82	P0160	2/2 O2S Stays at Center	Neither rich or lean condition detected from the downstream oxygen sensor.
84	P0121	TPS Voltage Does Not Agree With MAP	TPS signal does not correlate to MAP sensor.
89	P0700	EATX Controller DTC Present	An automatic transmission input DTC has been set in the transmission controller. Refer to Group 21.
91	P1299	Vacuum Leak Found (IAC Fully Seated)	MAP sensor signal does correlate to TPS signal. Possible vacuum leak.
92	P1496	5 Volt Supply Output Too Low	5 volt output from regulator does not meet minimum requirement.
99	P1493	Ambient/Batt Temp Sen Volts Too Low	Battery temperature sensor input voltage below an acceptable range.
9A	P1492	Ambient/Batt Temp Sensor Volts Too High	Battery temperature sensor input voltage above an acceptable range.
9B	P0131	1/1 O2S Shorted to Ground	O2 sensor voltage too low, tested after cold start.
9C	P0137	1/2 O2S Shorted to Ground	O2 sensor voltage too low, tested after cold start.
9D	P1391	Intermittent Loss of CMP or CKP	Intermittent loss of either camshaft or crankshaft position sensor.
B5	P0151	2/1 O2S Shorted to Ground	O2 sensor voltage too low, tested after cold start.
B6	P0157	2/2 O2S Shorted to Ground	O2 sensor voltage too low, tested after cold start.
D8	P0356	Ignition coil #6 ckt	Peak primary circuit current not achieved with max. dwell time.
D9	P1288	Short run valve ckt	An open or shorted condition detected in the SRV tuning circuit.