G - TESTS W/CODES

1998 Pontiac Bonneville

1998 ENGINE PERFORMANCE
General Motors - Self-Diagnostics - 3.8L

Buick; LeSabre
Oldsmobile; LSS, Eighty Eight, Regency
Pontiac; Bonneville

INTRODUCTION

Most engine control problems are the result of mechanical breakdowns, poor electrical connections or damaged vacuum hoses. Before considering the computer system as a possible cause of problems, perform basic diagnostic procedures in the F - BASIC TESTING article. Failure to do so may result in lost diagnostic time.

If no faults were found while performing basic diagnostic procedures, proceed with DIAGNOSTIC PROCEDURE under SELF-DIAGNOSTIC SYSTEM. If no fault codes are present and driveability problems exist, proceed to H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.). If only intermittent codes are present, see INTERMITTENTS in H - TESTS W/O CODES article.

SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC SYSTEM

NOTE: Powertrain Control Module (PCM) may also be referred to as Vehicle Control Module (VCM) in some diagnostic text and illustrations. Terms may be used interchangeably.

PCM/VCM is equipped with a self-diagnostic system which detects system failures or abnormalities. When a malfunction occurs, PCM/VCM will store a Diagnostic Trouble Code (DTC) and, in most cases, illuminate the Malfunction Indicator Light (MIL) located on instrument cluster. Malfunctions are recorded as hard failures or as intermittent failures.

There are 4 types of DTC category:

* Type "A"
  Emissions related, turns on MIL the first time DTC sets.
* Type "B"
  Emissions related, turns on MIL if fault is active for 2 consecutive driving cycles.
* Type "C"
  Non-emissions related, does not turn on MIL, but will turn on SERVICE light.
* Type "D"
  Non-emissions related, does not turn on MIL or SERVICE light.

Hard Failures

Most hard failures cause MIL to illuminate and remain on until malfunction is repaired. If MIL comes on and remains on (light may flash) during vehicle operation, cause of malfunction must be determined. See DIAGNOSTIC PROCEDURE.

If a sensor fails, PCM/VCM will use a substitute value in its calculations to continue engine operation. In this condition, vehicle is functional, but it will most likely display degraded driveability.

Intermittent Failures

Intermittent failures cause MIL to flicker or glow and go out

about 10 seconds after intermittent fault goes away. Corresponding DTC, however, will be retained in PCM/VCM memory. If related fault does not reoccur within 50 engine starts, trouble code will be erased from control module memory. Intermittent failures may be caused by sensor, connector or wiring related problems. See INTERMITTENTS in H - TESTS W/O CODES article.

NOTE: OBD II vehicles have options available in the scan tool DTC mode to display enhanced information available. However, to fully utilize information and procedures requires the use of a Tech 1 or 2 scan tool. See scan tool operator's manual for additional information.

The following are Tech 1 or 2 scan tool sub-menus in the DTC INFO and SPECIFIC DTC modes:

DTC INFO MODE

Used to search for a specific type of stored DTC information. There are 7 choices in this mode. Technician may be instructed to test DTC(s) in a certain manner. Follow the affected DTC test procedures. To get complete description of any status, hit ENTER key before pressing the desired F-key.

DTC STATUS

This selection will display any DTC(s) that have not run during the current ignition cycle or have reported a test failure during this ignition up to a maximum of 33 DTCs. DTC test which run and passed will cause that affected DTC to be removed from scan tool screen.

FAIL THIS IGN.

This selection will display all DTCs that have failed during the present ignition cycle.

HISTORY

This selection will display only DTC(s) that are stored in the control module's history memory. It will not type "B" DTCs. It will display all type "A" and type "B" DTCs that have the MIL illuminated and have failed within the last 40 warm-up cycles. It will also display type "C" DTCs that have failed within the 40 warm-up cycles.

LAST TEST FAIL

This selection will display only DTCs that have failed the last time the test ran. The last test may have ran during the previous ignition cycle, if a type "A" or "B" DTC is displayed. For type "C" DTCs, the last failure must have occurred during the current ignition cycle to be displayed as LAST TEST FAIL.

MIL REQUEST

This selection will display only DTCs that are requesting the MIL. Type "C" DTCs cannot be displayed using this option. This selection will report type "B" DTCs only after the MIL has been requested.

NOT RUN SCC

Not Run Since Code Clear option will display up to 33 DTCs that have not run since DTCs were last cleared. Since any displayed DTCs have not run, their condition (passing or failing) is unknown.

TEST FAIL SCC

Test Fail Since Code Clear selection will display all active and history DTCs that have reported a test failure since the last time

DTCs were cleared. DTCs that last failed over 40 warm-up cycles before this option is selected will not be displayed.

FAILED SINCE CLEAR
This message indicates the DTC has failed at least once within the last 40 warm-up cycles since the last time DTCs were cleared.

NOT RUN SINCE CL.
Not Run Since Cleared message indicates that the selected diagnostic test has not run since the last time DTCs were cleared. Therefore, the diagnostic test status (passed or failed) is unknown. After DTCs are cleared, this message will continue to be displayed until the diagnostic test runs.

NOT RUN THIS IGN.
Not Run This Ignition message indicates the selected diagnostic test has not run this ignition cycle.

TEST RAN AND PASSED
This message indicates the selected diagnostic test has:

* Passed the last test.
* Ran and passed during this ignition cycle.
* Ran and passed since DTCs were last cleared.
* Test has not failed since DTCs were last cleared.

If this message is displayed, repair is done. If FAILED THIS IGN. message is displayed, repair is incomplete and further diagnosis is required.

DIAGNOSTIC PROCEDURE

Diagnosis of computerized engine control system should be performed in following order:

1) Ensure all engine systems not related to computer system are operating properly. DO NOT proceed with testing unless all other problems have been repaired. Powertrain On-Board Diagnostic (OBD) System Check must be performed before using specific DTC testing procedure. See POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

2) If DTC(s) were displayed, determine whether codes are hard or intermittent trouble codes. Hard codes will cause MIL to illuminate continuously while engine is running. See HARD OR INTERMITTENT TROUBLE CODE DETERMINATION. For diagnosing hard codes, proceed to appropriate DTC test. For diagnosing intermittent codes, proceed to INTERMITTENTS in H - TESTS W/O CODES article.

3) If no DTCs are present and a driveability problem exists, refer to SYMPTOMS in H - TESTS W/O CODES article. Doing so will help identify proper system or component to check in I - SYSTEM/COMPONENT TESTS article.

4) After necessary repairs are made, clear DTCs, verify vehicle will enter "closed loop" operation and ensure DTC does not reset.

POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK

NOTE: Tech 1 or 2 scan tool is required to perform OBD system check.

The OBD System Check determines:

* If Malfunction Indicator Light (MIL) operates.
* If PCM is operating and can recognize a fault.

* If any DTCs are stored.

After performing procedures in PRELIMINARY INSPECTION & ADJUSTMENTS, BASIC FUEL SYSTEM CHECKS and BASIC IGNITION SYSTEM CHECKS in F - BASIC TESTING article, this is the starting point for utilizing the self-diagnostic system for determining computer-related problems. After performing necessary tests as described in the diagnostic circuit check, if no codes are indicated and driveability problems still exist, see H - TESTS W/O CODES article and SCAN TOOL USAGE.

1) Turn ignition on with engine off. Observe Malfunction Indicator Light (MIL). If MIL illuminates, go to next step. If MIL does not illuminate, go to MIL INOPERATIVE.
2) Turn ignition off. Install scan tool and follow scan tool manufacturer's instructions to proceed with test. Turn ignition on. If scan tool displays PCM data, go to next step. If scan tool does not display PCM data, go to DLC DIAGNOSIS OR NO SCAN TOOL DATA.
3) Attempt to start engine. If engine start and runs, go to next step. If engine does not start, or starts and dies, see NO START DIAGNOSIS in F - BASIC TESTING article.
4) Using scan tool, observe DTC statuses: MIL REQUEST, FAIL THIS IGN, LAST TST FAIL and HISTORY. If any DTC is stored, save freeze frame and fail record information using scan tool CAPTURE INFO feature. If any DTC status is present, refer to affected DTC to diagnose problem. If DTCs are not present, go to next step.
5) Compare scan tool engine data with actual control system data values. If value is within limits, system is okay. If value is not within limits, go to I - SYSTEM/COMPONENT TESTS article.

MIL INOPERATIVE

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.
2) Attempt to start engine. If engine starts, go to next step. If engine does not start, go to step 6).
3) Check instrument cluster ignition feed fuse. If fuse is okay, go to next step. If fuses are blown, go to step 15).
4) Turn ignition on. Using a test light connected to ground, probe instrument cluster connector ignition feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).
5) Turn ignition off. Disconnect PCM connector. Turn ignition on. Using a jumper wire connected to ground, jumper PCM connector MIL driver circuit. See L - WIRING DIAGRAMS article. If MIL illuminates, go to step 10). If MIL does not illuminate, go to step 11).
6) Check PCM ignition feed and battery feed fuses. If fuses are okay, go to next step. If fuses are blown, go to step 14).
7) Turn ignition off. Disconnect PCM connector. Turn ignition on. Using a test light connected to ground, probe PCM connector ignition feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).
8) Using a test light connected to ground, probe PCM connector battery feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).
9) Check for poor PCM ground or PCM ground connection. Repair as necessary. After repairs, perform OBD system check. If ground and ground connection are okay, go to next step.
10) Check for poor PCM connection. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If connection is okay, go to step 16).
11) Check for open in MIL driver circuit. See L - WIRING

DIAGRAMS article. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If circuit is okay, go to step 17).

12) Repair open in instrument cluster ignition feed circuit. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

13) Locate and repair open in PCM battery feed circuit or PCM ignition feed circuit. Repair as necessary. After repairs, perform OBD system check.

14) Locate and repair short to ground in PCM battery feed circuit or PCM ignition feed circuit. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

15) Locate and repair short to ground in instrument cluster ignition feed circuit. Repair as necessary. After repairs, perform OBD system check.

16) Replace PCM. Perform PCM relearn procedures. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

17) Check for poor instrument cluster MIL driver circuit connection. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If connection is okay, diagnose instrument cluster.

DLC DIAGNOSIS OR NO SCAN TOOL DATA

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition on with engine off. Connect a test light between DLC battery feed circuit and ground circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 4). If test light does not illuminate, go to next step.

3) Using a test light connected to ground, probe DLC battery feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 9). If test light does not illuminate, go to step 10).

4) Turn ignition on with engine off. Using DVOM connected to ground, probe DLC class 2 serial data circuit. See L - WIRING DIAGRAMS article. DVOM should read zero volts. If voltage is as specified, go to next step. If voltage is not as specified, go to step 7).

5) Turn ignition off. Disconnect PCM connector. Turn ignition on with engine off. Using DVOM connected to battery voltage, probe DLC class 2 serial data circuit. See L - WIRING DIAGRAMS article. DVOM should read zero volts. If voltage is as specified, go to next step. If voltage is not as specified, go to step 8).

6) Check for open in class 2 serial data circuit between DLC and PCM. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If circuit is okay, go to step 11).

7) Check for short to voltage in class 2 serial data circuit. Repair as necessary. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If circuit is okay, go to step 11).

8) Locate and repair short to ground in class 2 serial data circuit. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

9) Locate and repair open in DLC ground circuits. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

10) Locate and repair open or short to ground in DLC battery feed circuit. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

11) Replace PCM. Perform PCM relearn procedures. After repairs, perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

READING TROUBLE CODES

NOTE: Use of Tech 1 or 2 scan tool is required to retrieve DTCs. Refer to user reference manual supplied with scan tool.

TROUBLE CODE DEFINITIONS

TROUBLE CODE DEFINITION TABLE

Code No.	Circuit Affected
P0101	MAF System Performance
P0102	MAF Sensor Circuit-Low Frequency
P0103	MAF Sensor Circuit-High Frequency
P0107	MAP Sensor Circuit-Low Voltage
P0108	MAP Sensor Circuit-High Voltage
P0112	IAT Sensor Circuit-Low Voltage
P0113	IAT Sensor Signal Voltage High
P0117	ECT Sensor Circuit Low Voltage
P0118	ECT Sensor Signal High Voltage
P0121	TP Sensor System Performance
P0122	TP Sensor Circuit-Low Voltage
P0123	TP Sensor Circuit-High Voltage
P0125	ECT Excessive Time To Closed Loop
P0131	HO2S Circuit Low Voltage-Sensor 1
P0132	HO2S Circuit High Voltage-Sensor 1
P0133	HO2S Slow Response-Sensor 1
P0134	HO2S Insufficient Activity-Sensor 1
P0135	HO2S Heater Circuit-Sensor 1
P0137	HO2S Circuit Voltage Low-Sensor 2
P0138	HO2S Circuit Voltage High-Sensor 2
P0140	HO2S Insufficient Activity-Sensor 2
P0141	HO2S Heater Circuit-Sensor 2
P0171	Fuel Trim System Lean
P0172	Fuel Trim System Rich
P0201	Injector No. 1 Control Circuit
P0202	Injector No. 2 Control Circuit
P0203	Injector No. 3 Control Circuit
P0204	Injector No. 4 Control Circuit
P0205	Injector No. 5 Control Circuit
P0206	Injector No. 6 Control Circuit
P0230	Fuel Pump Control Circuit
P0300	Engine Misfire Detected
P0325	Knock Sensor Module Circuit
P0327	Knock Sensor Circuit-Bank 1
P0332	Knock Sensor Circuit-Bank 2
P0336	18X Reference Signal Circuit
P0341	CMP Sensor Circuit Performance
P0403	EGR Solenoid Control Circuit
P0404	EGR Valve Pintle Stuck Open
P0405	EGR Pintle Position Sensor Circ. Low Voltage
P0420	TWC System Low Efficiency
P0440	EVAP System
P0442	EVAP System-Small Leak Detected
P0446	EVAP System Canister Vent Blocked
P0452	Tank Pressure Sensor Circuit Fault-Low Voltage
P0453	Tank Pressure Sensor Circuit Fault-High Voltage
P0506	IAC System RPM Low
P0507	IAC System RPM High
P0530	A/C Refrigerant Pressure Sensor Circuit
P0560	System Voltage
P0601	PCM Memory
P0602	PCM Not Programmed
P0705 (1)	Trans. Range Switch Circuit

P0706 (1) ..... Trans. Range Switch Performance
P1106 ..... MAP Sensor Circuit Intermittent High Voltage
P1107 ..... MAP Sensor Circuit Intermittent Low Voltage
P1111 ..... IAT Sensor Circuit Intermittent High Voltage
P1112 ..... IAT Sensor Circuit Intermittent Low Voltage
P1114 ..... ECT Sensor Circuit Intermittent Low Voltage
P1115 ..... ECT Sensor Circuit Intermittent High Voltage
P1121 ..... TP Sensor Intermittently High Voltage
P1133 ..... HO2S Insufficient Switching-Sensor 1
P1134 ..... HO2S Transition Time Ratio-Sensor 1
P1257 ..... Supercharger System Overboost
P1351 ..... IC Circuit Open
P1352 ..... By-Pass Line/Circuit Open
P1361 ..... IC Circuit Not Toggling
P1362 ..... By-Pass Circuit Shorted
P1374 ..... 3X Reference Circuit
P1380 ..... EBCM/EBTCM DTC Rough Road Data Unstable
P1381 ..... Misfire Detected, No EBCM/PCM/VCM Serial Data
P1404 ..... EGR Valve Pintle Stuck Open
P1441 ..... EVAP System Flow During Non-Purge
P1554 ..... Cruise Control Status Circuit
P1571 ..... TCS Desired Torque Circuit
P1573 ..... EBTCM/PCM Serial Data Circuit
P1619 ..... Engine Oil Life Monitor Reset Circuit
P1626 ..... Loss Of Serial Communication W/Theft Deterrent Or
Theft Deterrent System Fuel Enable Circuit
P1629 ..... Theft Deterrent Crank Signal Malfunction
P1635 ..... 5-Volt Reference "A" Circuit
P1639 ..... 5-Volt Reference "B" Circuit
P1641 ..... A/C Relay Control Circuit
P1646 ..... Boost Control Solenoid Control Circuit
P1651 ..... Fan No. 1 Relay Control Circuit
P1652 ..... Fan No. 2 Relay Control Circuit
P1662 ..... Cruise Control Inhibit Control Circuit
P1665 ..... EVAP Vent Solenoid Control Circuit
P1667 ..... Fuel Pump PWM Control Circuit
P1671 ..... MIL Control Circuit
P1673 ..... Engine Hot Light Control Circuit
P1676 ..... EVAP Vent Solenoid Control Circuit

(1) - Covered in entirety in AUTO TRANS DIAGNOSIS article in the AUTO TRANS DIAGNOSIS section.

HARD OR INTERMITTENT TROUBLE CODE DETERMINATION

During any diagnostic procedure, determine if DTC(s) are hard failure codes or intermittent failure codes. Diagnostic procedures will not always help analyze intermittent codes. To determine hard codes and intermittent codes:

1) Enter diagnostic mode. Read and record all stored DTCs. Exit diagnostic mode, and clear DTCs. See CLEARING DIAGNOSTIC TROUBLE CODES (DTC).

2) Apply parking brake, and place transmission in Neutral or Park. Block drive wheels, and start engine. MIL should go out. Operate warm engine at specified RPM for 2 minutes and note MIL.

3) If MIL illuminates, enter diagnostic mode. Read and record DTCs. This will reveal hard failure codes. Oxygen sensor related DTCs may require a road test to reset hard failure after DTCs were cleared.

4) If MIL does not illuminate, all stored DTCs were intermittent failures.

NOTE: DTCs will be recorded at various operating times. Some DTCs

require operation of that sensor or switch for 5 seconds; others require operation for 5 minutes or longer at normal operating temperature, vehicle speed and load. Therefore, some DTCs may not set in a service bay operational mode and may require road testing vehicle in order to duplicate conditions under which code will set.

CLEARING DIAGNOSTIC TROUBLE CODES (DTC)

To clear DTCs from memory, either to determine if malfunction will occur again or after making necessary repairs, disconnect power supply to ECM/PCM/VCM for at least 30 seconds or clear codes using a scan tool.

ECM/PCM/VCM LOCATION

On most models, ECM/PCM/VCM is located behind right or left side of dash, behind right or left kick panel, or on left or right side of engine compartment. For a more precise location, see COMPONENT LOCATIONS in I - SYSTEM/COMPONENT TESTS article.

DIAGNOSTIC MATERIALS

Diagnostic Aids

Diagnostic aids are additional tips used to help diagnose trouble codes when inspected circuit is okay. Diagnostic aids may help lead to a definitive solution to trouble code problem.

SPECIAL TOOLS (DIAGNOSTIC)

NOTE: For scan data values, refer to scan tool manufacturer owner’s manual or compare values with a known-good component or vehicle.

NOTE: A scan tool plugged into DLC is used to read DTCs and check voltages in system on serial data line. A scan tool is required to retrieve vehicle information.

Computerized engine control system is most easily diagnosed using scan tool; however, other tools may aid in diagnosing problems. These tools are a tachometer, test light, ohmmeter, digital voltmeter with a 10-megohm input impedance (minimum), vacuum pump, vacuum gauge, fuel injector test lights and 6 jumper wires 6" long (one wire with female connectors at both ends, one wire with male connectors at both ends and 4 wires with male and female connectors at opposite ends). A test light, rather than a voltmeter, must be used when indicated by a diagnostic test. In addition, special jumper harnesses or testers may be required by manufacturer to facilitate diagnosis.

SCAN TOOL USAGE

NOTE: Before connecting scan tool to vehicle, diagnostic system should be checked to determine if system is operating properly and if information received will be accurate. See POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. If vehicle does not pass OBD system check, information received may be invalid.

Scan tool is a specialized tester which, when plugged into DLC, can be used to diagnose on-board computer control systems by providing instant access to circuit voltage information without need to crawl under dash or hood to backprobe sensors and connectors.

Scan tool cuts down diagnostic time dramatically by furnishing input data (voltage signals) which can be compared to specification parameters. They may also furnish information on output device (solenoids and motors) status. However, status parameters only indicate output signals have been sent to devices by ECM/PCM/VCM; they do not indicate whether devices have responded properly to signal. Verify proper response at output device using a voltmeter or test light.

A problem may exist even if DTCs are not present. About 80 percent of driveability problems occur without setting DTCs. Sensors that are out of calibration will not set a DTC but will cause driveability problems.

Using a scan tool is the easiest method of checking sensor specifications and other data parameters. Scan tool is also useful in finding intermittent wiring problems by wiggling wiring harnesses and connections (key on, engine off) while observing data parameters. See SCAN DATA.

NOTE: If erroneous voltage signals are suspected, verify tester information using a digital voltmeter and wiring schematic. If non-existent codes are displayed, DO NOT use scan tool for diagnosis. Contact tester manufacturer for additional information.

SUMMARY

If no hard fault codes are present, driveability symptoms exist or intermittent DTC(s) exist, proceed to H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.

DIAGNOSTIC TROUBLE CODES

* PLEASE READ THIS FIRST *

NOTE: Before clearing DTCs, perform procedures under POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Record FREEZE FRAME and FAILURE RECORDS for reference during testing. Data will be erased when DTCs are cleared. If ECM/PCM/VCM is replaced, NEW ECM/PCM/VCM must be programmed using special manufacturer’s equipment.

DTC P0101 - MAF SENSOR SYSTEM PERFORMANCE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Mass Airflow (MAF) sensor measures amount of air entering engine during a given time. PCM uses MAF sensor information for fuel delivery calculations. MAF sensor readings during acceleration are much higher than those during deceleration or idle.

PCM calculates what MAF sensor reading should be from sensor under certain conditions using engine speed (RPM), throttle position, and barometric pressure parameters. When these test conditions are met, PCM will compare its calculated MAF value to actual value received from sensor.

Conditions required to set DTC are:

* Engine running.
* System voltage between 9-16 volts.
* Throttle is steady and TP angle is less than 50 percent.

* EGR duty cycle is less than 50 percent.
* EGR pintle position is less than 50 percent.
* MAF signal frequency indicates an airflow significantly higher or lower than a predicted value based on BARO pressure, throttle position and engine RPM.
* Conditions present for at least 12 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1635 is also set, go to DTC P1635. If DTC is not set, go to next step.

3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0101 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0101 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Turn ignition on. Observe MAP and BARO parameter on scan tool. If scan tool reads 65-105 kPa, go to next step. If scan tool does not read 65-105 kPa, go to step 8).

5) Start engine. Observe MAP sensor display on scan tool with engine idling. If scan tool reads 29-48 kPa, go to next step. If scan tool does not read 29-48 kPa, go to step 7).

6) Using scan tool, observe MAP sensor display while slowly increasing engine speed to 3000 RPM. If MAP sensor value increases with increase in RPM, go to step 9). If MAP sensor value does not increase with RPM, go to step 8).

7) Check for throttle body inlet screen blockage. Check for vacuum leaks at intake manifold, throttle body, or EGR valve flange and pipes. Check for PCV valve faulty, missing or incorrectly installed. Repair as necessary. After repairs, go to step 22). If no faulty conditions exist, go to step 9).

8) Replace MAP sensor. After replacing sensor, go to step 22).

9) Turn ignition on, throttle closed. Using scan tool, read THROTTLE AT IDLE. If scan tool displays YES, go to next step. If scan tool does not display YES, go to DTC P0121.

10) Turn ignition off. Disconnect MAF sensor harness connector. Turn ignition on, engine off. Using a DVOM, check voltage between MAF sensor harness connector signal circuit and chassis ground. If voltage is about 5 volts, go next step. If voltage is not about 5 volts, go to step 12).

11) Connect a test light between MAF sensor harness connector ignition feed and ground circuits. If test light illuminates, go to step 15). If test light does not illuminate, go to step 14).

12) If voltage is less than 4.5 volts, go to step 16). If voltage is not less than 4.5 volts, go to next step.

13) Turn ignition off. Disconnect PCM connectors. Turn ignition on, with engine off. Check voltage between PCM harness connector MAF signal circuit and chassis ground. If voltage reading is zero volts, go to step 21). If voltage is not zero volts, go to step 19),

14) Connect test light between MAF sensor harness connector ignition feed circuit and chassis ground. If test light illuminates, go to step 17). If test light does not illuminate, go to step 18).

15) Check for faulty connection at MAF sensor. Repair as necessary. After repairs, go to step 22). If MAF sensor connection is okay, go to step 20).

16) Check for open or short in MAF sensor signal circuit between PCM and MAF sensor. Repair signal circuit as necessary. After repairs, go to step 22). If signal circuit is okay, go to step 21).

17) Locate and repair open in MAF sensor ground circuit.

After repairs, go to step 22).

18) Locate and repair open MAF sensor ignition feed circuit. After repairs, go to step 22).

19) Locate and repair short to voltage in MAF sensor signal circuit. After repairs, go to step 22).

20) Replace MAF sensor. After replacing sensor, go to step 22).

21) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

22) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0101. If scan tool displays DTC P0101 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0101 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for skewed or stuck Throttle Position (TP) sensor. Using scan tool, read TP ANGLE value with throttle closed. If value is not zero percent, check for and repair the following condition(s):

* Throttle plate sticking or excessive deposits on throttle plate or throttle bore.
* TP sensor signal circuit shorted to voltage.
* Faulty connection or high resistance in TP sensor ground circuit.

If none of the listed conditions exist and TP ANGLE value is not zero percent, replace TP sensor.

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

Check for plugged intake air duct or dirty air filter. A wide-open throttle acceleration from a stop should cause MAF reading on scan tool to increase from about 4-7 grams per second at idle to 100 grams per second or greater at time of 1-2 shift. If MAF reading on scan tool does not increase, check for restriction.

Check for a skewed MAP sensor, which can cause Barometric (BARO) pressure reading to be incorrectly calculated. This condition may also cause high Idle Air Control (IAC) counts. If IAC counts are high, replace MAP sensor.

DTC P0102 - MAF SENSOR CIRCUIT LOW FREQUENCY

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Mass Airflow (MAF) sensor measures amount of air entering engine during a given time. PCM uses MAF sensor information for fuel delivery calculations. MAF sensor readings during acceleration are much higher than those during deceleration or idle.

PCM calculates what MAF sensor reading should be received from sensor under certain conditions using engine speed (RPM), throttle position, and altitude parameters. When these test conditions are met, PCM will compare its calculated MAF value to actual value received from sensor.

Conditions required to set DTC are:

* Engine running.
* TP sensor angle less than 50 percent.
* System voltage greater than 8 volts.

* MAF signal frequency less than 1200 Hz.
* Conditions present for at least 0.5 second, plus 400 3X reference periods (133 crankshaft revolutions).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start and operate engine at idle. Using scan tool, monitor MAF FREQUENCY. If frequency is less than 1200 Hz, go to step 4). If frequency is not less than 1200 Hz, go to next step.

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0102 FAILED THIS IGN, go to next step. If DTC P0102 FAILED THIS IGN is not displayed, see DIAGNOSTIC AIDS.

4) Check for MAF sensor inlet screen blockage. Check for vacuum leaks at intake manifold, throttle body or EGR valve flange and pipes. Check for PCV valve faulty, missing or incorrectly installed. Repair faulty conditions as necessary. After repairs, go to step 14). If no faulty conditions exist, go to next step.

5) Turn ignition off. Disconnect MAF sensor harness connector. Turn ignition on, engine off. Using a DVOM, check voltage between MAF sensor harness connector signal circuit and chassis ground. If voltage reading is about 5 volts, go next step. If voltage reading is not about 5 volts, go to step 9).

6) Connect a test light between MAF sensor harness connector ignition feed and ground circuits. If test light illuminates, go to step 8). If test light does not illuminate, go to next step.

7) Connect test light between MAF sensor harness connector ignition feed circuit and battery ground. If test light illuminates, go to step 10). If test light does not illuminate, go to step 11).

8) Check for faulty connection at MAF sensor. Repair connection as necessary. After repairs, go to step 14). If connection is okay, go to step 12).

9) Check MAF sensor signal circuit between PCM and MAF sensor for open or short. Repair signal circuit as necessary. After repairs, go to step 14). If signal circuit is okay, go to step 13).

10) Locate and repair open in the MAF sensor ground circuit. After repairs, go to step 14).

11) Locate and repair open MAF sensor ignition feed circuit. After repairs, go to step 14).

12) Replace MAF sensor. After replacing sensor, go to step 14).

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0102. If scan tool displays DTC P0102 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0102 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

Check for plugged intake air duct or filter element. Check minimum airflow rate as follows:

* Run engine and allow it to reach operating temperature.

* Disconnect IAC valve and install IAC Driver (J 37027-A).
* With engine idling, command IAC valve to fully extended position (zero counts).
* Using scan tool, observe MASS AIRFLOW VALUE.
* If MAF value is less than 2.27 grams per second on VIN K, or less than 2.95 grams per second on VIN 1, clean or replace throttle body as necessary.

DTC P0103 - MAF SENSOR CIRCUIT HIGH FREQUENCY

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Mass Airflow (MAF) sensor measures amount of air entering engine during a given time. PCM uses MAF sensor information for fuel delivery calculations. MAF sensor readings during acceleration are much higher than those during deceleration or idle.

PCM calculates what MAF sensor reading should be received from sensor under certain conditions using engine speed (RPM), throttle position, and altitude parameters. When these test conditions are met, PCM will compare its calculated MAF value to actual value received from sensor.

Conditions required to set DTC are:

* Engine is running.
* TP angle less than 50 percent.
* System voltage greater than 8 volts.
* On VIN K, MAF signal frequency greater than 10,500 Hz.
* On VIN 1, MAF signal frequency greater than 11,500 Hz.
* Conditions present greater than 0.5 second, plus 33 crankshaft revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine. With engine at idle, use scan tool to read MAF FREQUENCY. If frequency is greater than 10,500 Hz on VIN K, or greater than 11,500 Hz on VIN 1, go to step 4). If frequency is less than specified, go to next step.

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0103 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0103 FAILED THIS IGN, go to DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect MAF sensor harness connector. Turn engine on and allow it to idle. Using scan tool, read MAF FREQUENCY. If frequency is zero Hz, go to next step. If frequency is not as specified, go to step 7).

5) Check for faulty connection at MAF sensor. Repair connection as necessary. After repairs, go to step 10). If connection is okay, go to next step.

6) Replace MAF sensor. After replacing sensor, go to step 10).

7) Ensure MAF sensor harness is not routed too close to high-voltage wires, such as spark plug cables, ignition coils or other high voltage components. Reroute harness if necessary. After repairs, go to step 10). If harness routing is okay, go to next step.

8) Check MAF sensor signal circuit connection at PCM. Repair connection as necessary. After repairs, go to step 10). If connection is okay, go to next step.

9) Replace PCM. Program replacement PCM using required

equipment. After replacing PCM, go to next step.

10) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0103. If scan tool displays DTC P0103 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0103 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P0107 - MAP SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Manifold Absolute Pressure (MAP) sensor responds to changes in intake manifold pressure. PCM supplies 5-volt reference and ground for MAP sensor. MAP sensor provides a signal to the PCM relative to pressure changes in intake manifold pressure (vacuum). A low voltage signal, about 2 volts on VIN K or 1.5-2.5 volts on VIN 1, is sent to PCM on signal circuit at closed throttle (high vacuum) idle. A high voltage signal, about 4 volts or greater on both engines, is sent at wide open throttle (low vacuum).

Conditions for setting DTC:

* No TP sensor related DTCs present.
* Engine running.
* TP sensor angle greater than zero percent if engine speed is less than 1000 RPM.
* TP sensor angle greater than 6% percent with engine speed is greater than 1000 RPM.
* MAP sensor signal voltage less than 0.1 volt.
* Conditions present for greater than 67 crankshaft revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Turn ignition on, engine off. Using scan tool, read MAP sensor voltage. If voltage is about zero volts, go to step 5). If voltage is not about zero volts, go to step 4).

3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0107 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0107 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect MAP sensor harness connector. Connect a jumper wire between MAP sensor harness connector 5-volt reference circuit and signal circuit. If scan tool voltage is greater than 4.6 volts, go to step 10). If voltage is not greater 4.6 volts, go to next step.

5) Connect test light between MAP sensor harness connector battery voltage and signal circuit. If scan tool voltage reading is about 4.6 volts, go to next step. If scan tool voltage is not about 4.6 volts, go to step 8).

6) Turn ignition off. Disconnect PCM harness connector. Check PCM harness connector 5-volt reference circuit for open or short to ground. Repair as necessary. After repairs, go to step 12). If circuit

is okay, go to next step.

7) Check for faulty connection of 5-volt reference circuit at PCM. Repair as necessary. After repairs, go to step 12). If connection is okay, go to step 11).

8) Turn ignition off. Disconnect PCM connectors. Check PCM harness connector MAP signal circuit for open or short to ground. Repair as necessary. After repairs, go to step 12). If circuit is okay, go to next step.

9) Check for faulty connection of MAP signal circuit at PCM connector. Repair as necessary. After repairs are complete, go to step 12). If connection is okay, go to step 11).

10) Replace MAP sensor. After replacing sensor, go to step 12).

11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

12) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0107. If scan tool displays DTC P0107 FAILED THIS IGN, return to step 4). If scan tool does not display DTC P0107 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0108 - MAP SENSOR CIRCUIT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Manifold Absolute Pressure (MAP) sensor responds to changes in intake manifold pressure. PCM supplies 5-volt reference and ground for MAP sensor. MAP sensor provides a signal to the PCM relative to pressure changes in intake manifold pressure (vacuum). A low voltage signal, about 2 volts on VIN K or 1.5-2.5 volts on VIN 1, is sent to PCM on signal circuit at closed throttle (high vacuum) idle. A high voltage signal, about 4 volts or greater on both engines, is sent at wide open throttle (low vacuum).

Conditions required to set DTC are:

* No TP sensor related DTC present.
* Engine running for predetermined time depending on ECT at start-up. Predetermined time ranges from 0.5 second with ECT greater than 86°F (30°C) to 2 minutes with ECT -22°F (-30°C).
* TP less than 2 percent.
* Engine speed less than 900 RPM.
* MAP sensor voltage greater than 4.2 volts.
* Conditions present for greater than 200 crankshaft revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Correct any engine idle or vacuum problems before proceeding. Turn engine on and allow it to idle. Using scan tool, read MAP sensor voltage. If voltage is greater than 3.5 volts, go to step 4). If voltage is not greater than 3.5 volts, go to next step.

3) Turn ignition on, engine off. Using scan tool, read and

record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0108 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0108 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect MAP sensor harness connector. Turn ignition on. If scan tool reading is zero volts, go to next step. If scan tool reading is not zero volts, go to step 6).

5) Connect a test light between MAP sensor harness connector ground circuit and battery voltage. If test light illuminates, go to step 7). If test light does not illuminate, go to step 9).

6) Check MAP sensor harness connector signal circuit for short to voltage. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to step 11).

7) Check for faulty connection of ground circuit at MAP sensor. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

8) Check for plugged or leaking vacuum supply to MAP sensor. If vacuum supply is not okay, go to step 15). If vacuum supply is okay, go to step 12).

9) Check for faulty MAP sensor ground circuit connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

10) Check continuity of MAP sensor ground circuit. If resistance is 5 ohms or greater, repair circuit as necessary. After repairs, go to step 16). If resistance is not 5 ohms or greater, go to next step.

11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 16).

12) Turn ignition off. Disconnect PCM connectors. Turn ignition on, engine off. Check PCM harness connector 5-volt reference circuit for short to voltage. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

13) Check for faulty connection at MAP sensor. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

14) Replace MAP sensor. After replacing sensor, go to step 16).

15) Repair faulty vacuum source. After repairs, go to next step.

16) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0108. If scan tool displays DTC P0108 FAILED THIS IGN, return to step 3). If scan tool does not display DTC P0108 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

IAT TEMPERATURE-TO-RESISTANCE VALUES

IAT TEMPERATURE-TO-RESISTANCE VALUES TABLE

Temperature °F (°C)	Ohms
212 (100)	177
194 (90)	241
158 (70)	467
122 (50)	973

104 (40)	1459
86 (30)	2238
68 (20)	3520
50 (10)	5670

DTC P0112 - IAT SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Intake Air Temperature (IAT) sensor is a thermistor that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. High temperature will result in a low signal voltage. DTC will set when PCM sees an IAT sensor voltage of less than 0.82 volt for 10 seconds after engine runs for 100 seconds.

Conditions required to set DTC are:

* Vehicle driven at 25 MPH or greater.
* No VSS, ECT or MAF sensor DTCs are set.
* Engine running longer than 10 seconds.
* IAT is greater than 266°F (130°C).
* Conditions are present for at least 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on, engine off. Using scan tool, read INTAKE AIR TEMP. If temperature is greater than 266°F (130°C), go to step 4). If temperature is not greater than 266°F (130°C), go to next step.

3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0112 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0112 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect IAT sensor harness connector. Using scan tool, read INTAKE AIR TEMP. If IAT sensor temperature is less than -36°F (-39°C), go to step 6). If temperature is not less than -36°F (-39°C), go to next step.

5) Turn ignition off. Disconnect PCM connectors. Check IAT sensor signal circuit for short to ground. If short is found, go to step 7). If circuit is okay, go to step 8).

6) Replace IAT sensor. After replacing sensor, go to step 9).

7) Repair IAT sensor signal circuit. After repairs, go to step 9).

8) Replace PCM. Program replacement PCM using required equipment. After replacing and reprogramming PCM, go to next step.

9) Turn ignition on, with engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0112. If scan tool displays DTC P0112 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0112 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check for skewed IAT sensor. See IAT TEMPERATURE-TO-RESISTANCE VALUES table.

DTC P0113 - IAT SENSOR CIRCUIT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Intake Air Temperature (IAT) sensor is a thermistor that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. Low temperature will result in a high signal voltage. DTC will set when PCM sees an IAT sensor voltage of greater than 5 volts.

Conditions required to set DTC are:

* Engine running for greater than 3 minutes.
* Vehicle speed is less than 35 MPH.
* No ECT or MAF sensor DTCs are set.
* No VSS DTCs are set.
* MAF value is less than 12 grams per second.
* ECT is greater than 140°F (60°C).
* IAT less than -24°F (-31°C).
* Conditions present for at least 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on, engine off. Using scan tool, read INTAKE AIR TEMP. If temperature is less than -24°F (-31°C), go to step 4). If temperature is not less than -24°F (-31°C), go to next step.

3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0113 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0113 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect IAT sensor harness connector. Connect a jumper wire between IAT sensor harness connector signal and ground circuits. Using scan tool, read INTAKE AIR TEMP. If IAT is 284°F (140°C), go to step 6). If IAT is not 284°F (140°C), go to next step.

5) Connect jumper wire between chassis ground and IAT sensor harness connector signal circuit. Using scan tool, read INTAKE AIR TEMP. If scan tool temperature is 284°F (140°C), go to step 7). If scan tool temperature is not 284°F (140°C), go to step 8).

6) Check for faulty connection at IAT sensor. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 10).

7) Turn ignition off. Disconnect PCM connectors. Check IAT sensor ground circuit for an open. Repair as necessary. After repairs are complete, go to step 13). If circuit is okay, go to step 9).

8) Turn ignition off. Disconnect PCM connectors. Check IAT signal circuit for an open. Repair circuit as necessary. After repairs are complete, go to step 13). If circuit is okay, go to next step.

9) Check for faulty IAT signal or ground circuit connection at PCM. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 12).

10) Check for poor terminal connection at IAT sensor. Repair as necessary. After repairs, go to step 13). If connection is okay, go to next step.

11) Replace IAT sensor. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select

SPECIFIC DTC INFO for DTC P0113. If scan tool displays DTC P0113 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0113 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

If DTC cannot be duplicated, the information included in the Fail Records data can be used in determining vehicle mileage since DTC was last set.

ECT TEMPERATURE-TO-RESISTANCE VALUES

ECT TEMPERATURE-TO-RESISTANCE VALUES TABLE

Temperature °F (°C)	Ohms
212 (100)	177
194 (90)	241
158 (70)	467
122 (50)	973
104 (40)	1459
86 (30)	2238
68 (20)	3520
50 (10)	5670

DTC P0117 - ECT SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Engine Coolant Temperature (ECT) sensor is a thermistor that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. High temperature will result in a low signal voltage. DTC will set when PCM sees an excessively low ECT sensor voltage signal.

Conditions required to set DTC are:

* Engine running longer than 15 seconds.
* ECT greater than 282°F (139°C).
* Conditions present for at least 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, read ENG COOL TEMP. If temperature is 282°F (139°C) or greater, go to step 4). If temperature is not 282°F (139°C), go to next step.

3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0117 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0117 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect ECT sensor harness connector. Using scan tool, read ENG COOL TEMP. If temperature is -38°F (-39°C) or less, go to step 6). If temperature is not -38°F (-39°C), go to next step.

5) Turn ignition off. Disconnect PCM connectors. Check ECT sensor signal circuit for short to ground. Repair as necessary. After

repairs, go to step 8). If circuit is okay, go to step 7).
6) Replace ECT sensor. After replacing sensor, go to step 8).
7) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.
8) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0117. If scan tool displays DTC P0117 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0117 FAILED THIS IGN, repair is complete.

Diagnostic Aids
Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check for skewed ECT sensor.
If DTC cannot be duplicated, the information included in the Fail Records data can be used in determining vehicle mileage since DTC was last set.

DTC P0118 - ECT SENSOR CIRCUIT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description
Engine Coolant Temperature (ECT) sensor is a thermistor that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. Low temperature will result in a high signal voltage. DTC will set when PCM sees an excessively high ECT sensor voltage signal.
Conditions required to set DTC are:

* Engine running longer than 3 seconds.
* ECT less than -36°F (-38°C).
* Conditions present for at least 10 seconds.

Diagnostic Procedures
1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.
2) Turn ignition on. Using scan tool, read ENG COOL TEMP. If temperature is less than -36°F (-38°C), go to step 4). If temperature is not less than -36°F (-38°C), go to next step.
3) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0118 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0118 FAILED THIS IGN, go to DIAGNOSTIC AIDS.
4) Turn ignition off. Disconnect PCM and ECT harness connectors. Turn ignition on. Check ECT sensor signal circuit for short to ground. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to next step.
5) Turn ignition off. Reconnect PCM harness connector. Jumper ECT signal circuit and sensor ground circuit at ECT sensor harness connector. Turn ignition on. Observe ECT value displayed on scan tool. If ECT value is 284°F (140°C), go to step 7). If ECT value is not 284°F (140°C), go to next step.
6) Connect a jumper wire between ECT sensor harness connector signal and ground circuits. Using scan tool, read ECT value display. If ECT value is 284°F (140°C), go to step 8). If ECT value is not 284°F (140°C), go to step 9).
7) Check for faulty connection at ECT sensor. Repair as

necessary. After repairs are complete, go to step 13). If connection is okay, go to step 11).

8) Turn ignition off. Disconnect PCM harness connector. Check ECT sensor ground circuit for an open. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 10).

9) Turn ignition off. Disconnect PCM connectors. Check ECT signal circuit for an open. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to next step.

10) Check for faulty ECT signal or ground circuit connection at PCM. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 12).

11) Replace ECT sensor. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0118. If scan tool displays DTC P0118 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0118 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check for skewed ECT sensor.

If DTC cannot be duplicated, the information included in the Fail Records data can be used in determining vehicle mileage since DTC was last set.

DTC P0121 - TP SENSOR SYSTEM PERFORMANCE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Throttle Position (TP) sensor measures amount of throttle opening. PCM uses TP sensor information for fuel delivery calculations. TP sensor readings during acceleration are much higher than those during deceleration or idle.

Conditions required to set DTC are:

* Engine running and throttle steady.
* No MAP or TP sensor DTCs are set
* Throttle angle steady.
* Predicted throttle angle not close to actual throttle angle.
* Conditions present for at least 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P0403, P1404, P1374 or P1626 is also set, diagnose affected DTC(s). If these DTCs are not set, turn ignition on, engine off. Using scan tool, read MAP value. If value is less than 65 kPa, go to next step. If value is not less than 65 kPa, go to step 6).

3) Disconnect MAP sensor harness connector. Connect a test light between MAP sensor harness connector 5-volt reference and signal circuits. Using scan tool, read MAP value. If value is less than 65 kPa, go to step 5). If value is not less than 65 kPa, go to next step.

4) Check MAP sensor signal circuit for open or short between PCM and MAP sensor. Repair as necessary. After repairs, go to step

13). If circuit is okay, go to step 12).

5) Replace MAP sensor. After replacing sensor, go to step 13).

6) Observe scan tool TP ANGLE value while moving throttle from closed to wide open throttle. If value increases steadily and evenly from closed to open throttle, see DIAGNOSTIC AIDS. If value does not increase as specified, go to next step.

7) Disconnect TP sensor harness connector. If TP voltage is zero volts, go to next step. If TP voltage is not zero volts, go to step 9).

8) Connect a test light between TP sensor harness connector 5-volt reference and signal circuits. Using scan tool, read TP sensor voltage. If scan tool voltage is 5 volts, go to step 11). If scan tool voltage is not 5 volts, go to step 10).

9) Check TP sensor signal circuit for short to ground. Check ground circuit for high resistance or poor connection. Repair as necessary. After repairs, go to step 13). If circuits and connections are okay, go to step 12).

10) Check TP sensor 5-volt reference circuit for poor connection or high resistance in circuit between PCM and TP sensor. Repair as necessary. After repairs are complete, go to step 13). If connections and circuits are okay, go to step 12).

11) Replace TP sensor. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0117. If scan tool displays DTC P0117 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0117 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for and repair the following condition(s):

* Throttle plate sticking or excessive deposits on throttle plate or throttle bore.
* Check TP sensor harness connector terminals for damage.
* A steady throttle movement from a stop should cause TP ANGLE value reading on scan tool to increase smoothly as throttle is opened.

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check for skewed MAP signal or faulty MAP sensor.

DTC P0122 - TP SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Throttle Position (TP) sensor measures amount of throttle opening. PCM uses TP sensor information for fuel delivery calculations. TP sensor readings during acceleration are much higher than those during deceleration or idle.

Condition for setting DTC:

* Engine running.
* TP sensor signal voltage less than 0.16 volt.

* Conditions present for at least one second.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on, engine off. With throttle closed, use scan tool to read TP sensor voltage. If voltage is less than 0.16 volt, go to step 4). If voltage is not less than 0.16 volt, go to next step.

3) With ignition still on, engine off, use scan tool to read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0122 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0122 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect TP sensor harness connector. Connect a jumper wire between TP sensor harness connector 5-volt reference and signal circuits. If scan tool voltage reading is 5 volts, go to step 11). If scan tool voltage reading is not 5 volts, go to next step.

5) Turn ignition off. Connect a test light between TP sensor harness connector signal circuit and battery voltage. If scan tool voltage reading is 5 volts, go to next step. If scan tool reading is not 5 volts, go to step 8).

6) Turn ignition off. Disconnect PCM connectors. Check PCM harness connector 5-volt reference circuit for open or short to ground. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

7) Turn ignition off. Check for faulty connection of 5-volt reference circuit at PCM. Repair connection as necessary. After repairs, go to step 14). If connection is okay, go to step 13).

8) Turn ignition off. Disconnect PCM connectors. Check PCM harness connector TP signal circuit for open or short to ground. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

9) Check TP signal circuit for an open, short to ground, or short to sensor ground circuit. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

10) Check for faulty TP signal circuit connection at PCM. Repair as necessary. After repairs are complete, go to step 14). If connection is okay, go to step 13).

11) Check for faulty connection of TP signal circuit at TP sensor. Repair as necessary. After repairs, go to step 14). If connection is okay, go to next step.

12) Replace TP sensor. After replacing sensor, go to step 14).

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0122. If scan tool displays DTC P0122 FAILED THIS IGN, return to step 3). If scan tool does not display DTC P0122 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0123 - TP SENSOR CIRCUIT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Throttle Position (TP) sensor measures amount of throttle opening. PCM uses TP sensor information for fuel delivery calculations. TP sensor readings during acceleration are much higher than those during deceleration or idle.

Conditions required to set DTC are:

* Engine running.
* TP sensor signal voltage greater than 4.71 volts.
* Conditions present for at least one second.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on, engine off. Using scan tool, read TP sensor voltage. If voltage is greater than 4.70 volts, go to step 4). If voltage is not greater than 4.70 volts, go to next step.

3) Turn ignition on, with engine off. Use scan tool to read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0123 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0123 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect TP sensor harness connector. If voltage is about zero volts, go to next step. If voltage is not about zero volts, go to step 6).

5) Connect a test light between TP sensor harness connector ground circuit and battery voltage. If test light illuminates, go to step 7). If test light does not illuminate, go to step 10).

6) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Check TP sensor harness connector signal circuit for short to voltage. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to step 13).

7) Turn ignition on. While monitoring scan tool TP SENSOR display, disconnect each component (one at a time) that shares common 5-volt reference circuit. If display changes, replace component that causes change. After repairs, go to step 14). If display does not change, go to next step.

8) Turn ignition off. Disconnect PCM connectors. Turn ignition on, engine off. Check PCM harness connector 5-volt reference circuit for short to voltage. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

9) Check for faulty connection at TP sensor. Repair as necessary. After repairs, go to step 14). If connection is okay, go to next step.

10) Turn ignition off. Disconnect PCM connectors. Check for faulty TP sensor ground circuit connection at PCM. Repair as necessary. After repairs, go to step 14). If connection is okay, go to next step.

11) Check TP sensor ground circuit for poor connection at PCM. Repair as necessary. After repairs, go to step 14). If connection is okay, go to next step.

12) Replace TP sensor. After replacing sensor, go to step 14).

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0123. If scan tool displays DTC P0123 FAILED THIS IGN, return to step 4). If scan tool does not display DTC

P0123 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Ensure harness is not routed too close to high-voltage wires, such as spark plug cables. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

Turn ignition on, engine off. Using scan tool TP SENSOR display, slowly depress accelerator to wide open throttle. If voltage is greater than 4.71 volts at any time, replace TP sensor.

DTC P0125 - ECT SENSOR EXCESSIVE TIME TO REACH CLOSED LOOP

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

While engine is warming, PCM reads Engine Coolant Temperature (ECT) sensor to determine how long it takes coolant to reach temperature required for closed loop operation. PCM compares actual time required to a predetermined time.

Conditions required to set DTC are:

* No ECT or IAT DTCs are set.
* Vehicle speed greater than 5 MPH.
* IAT greater than 50°F (10°C).
* ECT greater than 32°F (0°C).
* Start-up ECT less than 70°F (21°C).
* Closed loop operation temperature of 68°F (20°C) not reached within 2 minutes of start-up.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Allow engine to cool completely. Turn engine on and allow it to idle. Using scan tool, monitor ENG COOL TEMP. If temperature increases to 70°F (21°C) within 2 minutes, see DIAGNOSTIC AIDS. If specified temperature is not reached within 2 minutes, go to next step.

3) If any ECT related DTCs are set, diagnose affected DTC before proceeding. If no ECT related DTCs are set, go to next step.

4) Allow engine to cool. Turn ignition on and observe cooling fans. If cooling fans are off, go to next step. If cooling fans are on, diagnose and repair cooling fan problem.

5) Check coolant level. If coolant level is low, go to step 9). If coolant level is okay, go to next step.

6) Check thermostat operation. If thermostat is operating correctly, go to next step. If thermostat is not operating correctly, go to step 9).

7) Compare actual coolant temperature with scan tool ECT value. If temperatures are within 5°F (3°C) of each other, go to step 9). If temperatures are not within 5°F (3°C) of each other, go to next step.

8) Check for high resistance in wiring related to ECT sensor and for poor connections at ECT sensor and PCM. Repair as necessary. After repairs, go to step 11). If no problem is found, go to step 10).

9) Repair cooling system as necessary. After repairs, go to step 11).

10) Replace ECT sensor. After replacing sensor, go to next step.

11) Allow engine to cool completely. Using scan tool, clear DTCs. Turn engine on and allow it to idle. Using scan tool, monitor ENG COOL TEMP. If temperature increases to 70°F (21°C) within 2

minutes, repair is complete. If specified temperature is not reached within 2 minutes, return to step 2).

Diagnostic Aids

Check coolant level. Ensure thermostat and cooling fans are operating properly. Check for high resistance in wiring related to ECT sensor. Check for skewed ECT sensor by comparing actual coolant temperature with scan tool display, and replace ECT sensor if temperatures are not close.

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0131 - HO2S 1 CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides about 0.35 volt reference to HO2S 1. HO2S 1 sensor signal voltage varies from about one volt when exhaust is rich to about 0.1 volt when exhaust is lean. PCM reads and stores sensor voltage information and evaluates the voltage samples to determine amount of time sensor voltage is out of range. If HO2S 1 voltage is out of predetermined range, DTC will set.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Closed loop commanded air/fuel ratio is 14.5-14.8:1.
* TP angle is 3-40 percent.
* HO2S 1 signal voltage stays less than 0.175 volt during closed loop operation.
* HO2S 1 signal voltage stays less than 0.6 volt during power enrichment mode of fuel control operation.
* Conditions present for 50 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine and allow it to reach operating temperature. Operate vehicle under conditions required to set DTC. Using scan tool, read HO2S 1 voltage. If voltage stays less than 0.3 volt, go to step 4). If voltage does not stay less than 0.3 volt, go to next step.

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0131 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0131 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect HO2S 1 connector. Connect jumper wire between HO2S 1 harness connector ground circuit and chassis ground. If voltage is about 0.45 volt, see DIAGNOSTIC AIDS. If voltage is not about 0.45 volt, go to next step.

5) Turn ignition off. Disconnect PCM connectors. Check HO2S sensor harness connector signal circuit for short to ground. Repair as necessary. After repairs, go to step 7). If circuit is okay, go to next step.

6) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

7) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0131. If scan tool displays DTC P0131 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0131 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Ensure HO2S 1 sensor harness is routed correctly and not contacting exhaust system. Check for faulty PCM grounds. Check fuel system. See F - BASIC TESTING article. Perform injector balance test. See I - SYSTEM/COMPONENT TESTS article.

Check for vacuum leaks at intake manifold, throttle body, EGR system and crankcase ventilation system. Check for exhaust leaks in front of HO2S 1. Disconnect MAF sensor connector and see if lean condition is corrected. If lean condition is corrected, replace MAF sensor. Check for fuel contamination. If no faults are found, replace HO2S 1.

DTC P0132 - HO2S 1 CIRCUIT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides about 0.45 volt reference to HO2S 1. HO2S 1 sensor signal voltage varies from about one volt when exhaust is rich to about 0.1 volt when exhaust is lean. PCM reads and stores sensor voltage information and evaluates the voltage samples to determine amount of time sensor voltage is out of range. If HO2S 1 voltage is out of predetermined range, DTC will set.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Closed loop commanded air/fuel ratio is 14.5-14.8:1.
* TP angle is 3-40 percent.
* HO2S 1 signal voltage stays greater than 0.8 volt during closed loop operation.
* HO2S 1 signal voltage stays greater than 0.11 volt during deceleration fuel mode operation.
* Conditions present for 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine and allow it to reach operating temperature. Operate vehicle under conditions required to set DTC. Using scan tool, read HO2S 1 voltage. If voltage stays greater than 0.8 volt, go to step 5). If voltage does not stay at greater than 0.8 volt, go to next step.

3) Operate vehicle in deceleration fuel mode (vehicle speed greater than 25 MPH and TP ANGLE less than 3 percent) while monitoring HO2S 1 voltage. If voltage stays greater than 0.11 volt, go to step 5). If voltage does not stay at greater than 0.11 volt, go to next step.

4) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0132 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0132 FAILED THIS IGN, see

DIAGNOSTIC AIDS.

5) Disconnect HO2S 1 harness connector. Connect a jumper wire between HO2S 1 harness connector ground circuit and chassis ground. If voltage is about 0.45 volt, see DIAGNOSTIC AIDS. If voltage is not about 0.45 volt, go to next step.

6) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between PCM harness connector HO2S 1 signal circuit and chassis ground. If voltage is greater than 0.6 volt, go to next step. If voltage is not greater than 0.6 volt, go to step 8).

7) Repair short to voltage in HO2S 1 signal circuit. After repairs, go to step 9).

8) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

9) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0132. If scan tool displays DTC P0132 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0132 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Ensure HO2S 1 sensor harness is routed correctly and not contacting exhaust system. Check for open or short in HO2S 1 signal or ground circuits. Check for internally shorted HO2S 1. Check HO2S 1 for silicon (powdery white deposit) contamination. Check for faulty PCM grounds. Check fuel system. See BASIC FUEL SYSTEM CHECKS in F - BASIC TESTING article. Perform injector balance test. See procedures in the I - SYSTEM/COMPONENT TESTS article.

Check EVAP canister for fuel saturation. Disconnect MAF sensor connector and see if rich condition is corrected. If rich condition is corrected, replace MAF sensor. Check for fuel in fuel pressure regulator vacuum line.

DTC P0133 - HO2S 1 CIRCUIT SLOW RESPONSE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides about 0.45 volt reference to HO2S 1. HO2S 1 sensor signal voltage varies from about one volt when exhaust is rich to about 0.1 volt when exhaust is lean. PCM counts number of times a rich-to-lean and lean-to-rich response is indicated and adds amount of time it takes to complete all transitions. PCM uses this information to determine average time for each transition. If average response time is slow, DTC P0133 will set.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Engine running in closed loop fuel control mode for at least 2 minutes.
* Engine speed 1000-3000 RPM.
* ECT greater than 122°F (50°C).
* MAF 15-30 grams per second.
* On VIN 1 engines, lean-to-rich or rich-to-lean average transition response time greater than 110 milliseconds, on VIN K, 115 milliseconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK.

Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If any other HO2S related DTCs (except P0153, P1133, P1134, P1135, P1136, P1153, P1155 or P1156) are set, diagnose affected DTCs. Start and warm engine to normal operating temperature. Operate vehicle within conditions required to set DTC. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0133 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0133 FAILED THIS IGN, see DIAGNOSTIC AIDS.

3) If scan tool also displays DTC P0153, P1133, P1134, P1135, P1136, P1153, P1154, P1155 and/or P1156 FAILED THIS IGN, go to step 8). If scan tool does not display these DTCs, go to next step.

4) Visually inspect exhaust system for leaks near HO2S 1. Repair as necessary. After repairs, return to step 2). If no leaks are found, go to next step.

5) Visually inspect HO2S 1 for secure installation or corrosion on terminals. Check terminal tension at HO2S 1 and PCM. Check for damaged wiring. If a problem is found, go to step 9). If no problem is found, go to next step.

6) Disconnect HO2S 1 connector. Connect a jumper wire betweenHO2S 1 harness connector ground circuit and chassis ground. Using scan tool, read HO2S 1 voltage. If voltage is about 0.45 volt, go to next step. If voltage is not about 0.45 volt, go to step 10).

7) Connect a jumper wire between HO2S 1 harness connector signal and ground circuits, and chassis ground. If voltage is less than 0.3 volt, go to step 12). If voltage is not less than 0.3 volt, go to step 11).

8) Repair condition causing fuel, sealant, oil or coolant contamination. Replace affected HO2S. After replacing sensor, go to step 13).

9) Repair condition as necessary. After repairs, go to step 13).

10) Repair open HO2S 1 ground circuit or HO2S 1 signal circuit shorted to ground. After repairs, go to step 13).

11) Repair open HO2S 1 signal circuit or faulty PCM connections as necessary. After repairs, go to step 13).

12) Replace HO2S 1. After replacing sensor, go to next step.

13) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0133. If scan tool displays DTC P0133 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0133 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0134 - HO2S 1 CIRCUIT INSUFFICIENT ACTIVITY

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides about 0.45 volt reference to HO2S 1. HO2S 1 sensor signal voltage varies from about one volt when exhaust is rich to about 0.1 volt when exhaust is lean. PCM reads and stores sensor voltage information and evaluates the voltage samples to determine amount of time sensor voltage is out of range. If HO2S 1 voltage is out of predetermined range, DTC will set.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.

* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Engine running for at least 4 minutes.
* HO2S 1 signal voltage signal voltage stays 0.4-0.5 volt for greater than 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine and allow it to reach operating temperature. Place gear selector in Park or Neutral, and apply parking brake. Increase engine speed to greater than 1200 RPM for 2 minutes. Using scan tool, read HO2S 1 voltage. If voltage is varying outside of 0.4-0.5 volt range, go to next step. If voltage is not varying out of 0.4-0.5 volt range, go to step 4),

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0134 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0134 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Connect a jumper wire between HO2S 1 harness connector signal and ground circuits, and chassis ground. If voltage is less than 0.15 volt, go to step 8). If voltage is not less than 0.15 volt, go to next step.

5) Remove jumper wire. Using DVOM, check voltage between HO2S 1 harness connector signal and heater ground circuits. If voltage is about 0.45 volt, go to next step. If voltage is not about 0.45 volt, go to step 7).

6) Turn ignition off. Disconnect PCM connectors. Check resistance of HO2S 1 harness connector ground circuit. If resistance is greater than 5 ohms, repair open or faulty connection and go to step 13). If resistance is not greater than 5 ohms, go to step 9).

7) Turn ignition off. Disconnect PCM connectors. Check resistance of HO2S 1 harness connector signal circuit. If resistance is greater than 5 ohms, repair open or faulty connection as necessary. After repairs, go to step 13). If resistance is not greater than 5 ohms, go to step 10).

8) Check for faulty connection at HO2S 1. Repair as necessary. After repairs, go to step 13). If no faulty connection is found, go to step 11).

9) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 13). If no faulty connection is found, go to step 12).

10) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 13). If no faulty connection is found, go to step 12).

11) Replace HO2S 1. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0134. If scan tool displays DTC P0134 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0134 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check HO2S 1 heater operation.

DTC P0135 - HO2S 1 HEATER CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides about 0.45 volt reference to HO2S 1. HO2S 1 sensor signal voltage varies from about one volt when exhaust is rich to about 0.1 volt when exhaust is lean. When ignition is turned on, battery voltage is supplied to HO2S 1 heater to provide for faster sensor warm-up, thus allowing sensor to become active in a shorter period of time. PCM reads amount of time necessary for sensor to become active after start-up.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* MAF less than 24 grams per second.
* ECT and IAT less than 95°F (35°C) at start-up.
* Difference between ECT and IAT not greater than 11°F (6°C).
* HO2S 1 voltage remains within 0.15 volt of bias voltage for longer amount of time than it should.
* Average mass airflow for sample period is less than 18 gm/s.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

NOTE: If engine has been operating, allow engine to cool down for about 30 minutes before proceeding with tests.

2) Turn ignition on, with engine off. Using scan tool, read HO2S 1 voltage. If voltage is greater than 0.6 volt or less than 0.3 volt, see DIAGNOSTIC AIDS. If voltage is not greater than 0.6 volt or not less than 0.3 volt, go to next step.

3) Inspect HO2S 1 ignition feed fuse. If fuse is open, go to step 15). If fuse is okay, go to next step.

4) Turn ignition off. Raise and support vehicle. Disconnect HO2S 1 harness connector. Connect a test light between ground and HO2S 1 ignition feed circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 7).

5) Connect test light between HO2S 1 harness connector ignition feed and heater ground circuits. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

6) Allow HO2S 1 to cool down for at least 10 minutes. Using DVOM, check resistance between ignition feed and heater ground circuits at HO2S 1. If resistance is 3-10 ohms, go to step 9). If resistance is not 3-10 ohms, go to step 14).

7) Repair open in HO2S 1 ignition feed circuit. After repairs, go to step 16).

8) Repair open in HO2S 1 heater ground circuit. After repairs, go to step 16).

9) Check for faulty connection at HO2S 1. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

10) Turn ignition off. Disconnect PCM connectors. Check resistance of HO2S 1 signal and ground circuits. If resistance on either circuit is greater than 5 ohms, repair open or faulty connection as necessary. After repairs, go to step 16). If resistance is 5 ohms or less, go to next step.

11) Check for faulty connection at HO2S 1 harness connector. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

12) Check for faulty ground circuit connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

13) Check for faulty HO2S 1 signal circuit connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

14) Replace HO2S 1. After replacing sensor, go to step 16).

15) Locate and repair short to ground in HO2S 1 ignition feed circuit, replace fuse. After repairs, go to next step.

16) Allow engine to cool completely. Using scan tool, clear DTCs. Turn ignition on, engine off. Read HO2S 1 voltage. If voltage is greater than 0.6 volt or less than 0.3 volt, repair is complete. If voltage is not greater than 0.6 volt or less than 0.3 volt, return to step 2).

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0137 - HO2S 2 CIRCUIT VOLTAGE LOW

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Three-Way Catalyst (TWC) system is used to control emissions. PCM uses signal from Heated Oxygen Sensor (HO2S) located behind TWC to read efficiency of TWC. PCM will set DTC P0137 if TWC oxygen storage capacity is less than a predetermined threshold.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Closed loop commanded air/fuel ratio is 14.5-14.8:1.
* TP angle is 3-40 percent.
* HO2S 2 signal voltage stays less than 0.075 volt during closed loop operation.
* HO2S 2 signal voltage stays less than 0.6 volt during power enrichment mode of fuel control operation.
* Conditions present for 50 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine and allow it to reach operating temperature. Operate vehicle under conditions required to set DTC. Using scan tool, read HO2S 2 voltage. If voltage stays less than 10 mV, go to step 4). If voltage does not stay less than 10 mV, go to next step.

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0137 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0137 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect HO2S 2 harness connector. Connect a jumper wire between HO2S 2 harness connector ground circuit and chassis ground. If

voltage is about 450 mV, see DIAGNOSTIC AIDS. If voltage is not about 450 mV, go to next step.

5) Turn ignition off. Disconnect PCM connectors. Check HO2S 2 sensor harness connector signal circuit for short to ground. Repair as necessary. After repairs, go to step 7). If circuit is okay, go to next step.

6) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

7) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0137. If scan tool displays DTC P0137 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0137 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Ensure HO2S 2 sensor harness is routed correctly and not contacting exhaust system. Check for faulty PCM grounds. Check fuel system. See BASIC FUEL SYSTEM CHECKS in F - BASIC TESTING article. Perform injector balance test. See I - SYSTEM/COMPONENT TESTS article.

Check for vacuum leaks at intake manifold, throttle body, EGR system and crankcase ventilation system. Check for exhaust leaks in front of HO2S 2. Disconnect MAF sensor connector and see if lean condition is corrected. If lean condition is corrected, replace MAF sensor. Check for fuel contamination.

DTC P0138 - HO2S 2 CIRCUIT VOLTAGE HIGH

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Three-Way Catalyst (TWC) system is used to control emissions. PCM uses signal from Heated Oxygen Sensor (HO2S) behind TWC to read efficiency of TWC. PCM will set DTC P0137 if TWC oxygen storage capacity is less than a predetermined threshold.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Closed loop commanded air/fuel ratio is 14.5-14.8:1.
* TP angle is 3-40 percent.
* HO2S 2 signal voltage stays greater than 999 mV during closed loop operation.
* HO2S 2 signal voltage stays greater than 0.2 volt during deceleration fuel mode operation.
* Conditions present for 100 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start engine and allow it to reach operating temperature. Operate vehicle under conditions required to set DTC. Using scan tool, read HO2S 2 voltage. If voltage stays greater than 999 mV, go to step 4). If voltage does not stay at greater than 999 mV, go to next step.

3) Turn ignition on. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0138. If scan tool displays DTC P0138 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0138 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect HO2S 2 harness connector. Connect a jumper wire

between HO2S 2 harness connector ground circuit and chassis ground. If voltage is about 450 mV, see DIAGNOSTIC AIDS. If voltage is not about 450 mV, go to next step.

5) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between PCM harness connector HO2S 2 signal circuit and chassis ground. If voltage is greater than 999 mV, go to next step. If voltage is not greater than 999 mV, go to step 7).

6) Repair short to voltage in HO2S 2 signal circuit. After repairs, go to step 8).

7) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

8) Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0138. If scan tool displays DTC P0138 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0138 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Ensure HO2S 2 sensor harness is routed correctly and not contacting exhaust system. Check for open or short in HO2S 2 signal or ground circuits. Check for internally shorted HO2S 2. Check HO2S 2 for silicone (powdery white deposit) contamination. Check for faulty PCM grounds. Check fuel system. See BASIC FUEL SYSTEM CHECKS in F - BASIC TESTING article. Perform injector balance test. See procedures in the I - SYSTEM/COMPONENT TESTS article.

Check EVAP canister for fuel saturation. Disconnect MAF sensor connector and see if rich condition is corrected. If rich condition is corrected, replace MAF sensor. Check for fuel in fuel pressure regulator vacuum line.

DTC P0140 - HO2S 2 INSUFFICIENT ACTIVITY

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Three-Way Catalyst (TWC) system is used to control emissions. PCM uses signal from Heated Oxygen Sensor (HO2S) behind TWC to read efficiency of TWC. PCM will set DTC P0140 if TWC oxygen storage capacity is less than a predetermined threshold.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* Closed loop commanded air/fuel ratio is 14.5-14.8:1.
* Engine run time greater than 200 seconds.
* HO2S 2 voltage stays 0.425-0.474 volt for 100 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Start and warm engine to normal operating temperature. Place transmission in Park or Neutral. Apply parking brake. Increase engine speed to greater than 1200 RPM for 2 minutes. Using scan tool, monitor HO2S 2 voltage. If displayed voltage is not switching from greater than 475 mV to less than 425 mV, go to next step. If voltage is switching as specified, go to step 4).

3) Turn engine off. Turn ignition on, engine off. Using scan tool, read and record FAIL RECORDS data. Operate vehicle within

conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0140 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0140 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect HO2S 2 harness connector. Connect a jumper wire between HO2S 2 harness connector signal and ground circuits, and chassis ground. If voltage is less than 150 mV, go to step 8). If voltage is not less than 150 mV, go to next step.

5) Remove jumper wire. Using DVOM, check voltage between HO2S 2 harness connector signal and heater ground circuits. If voltage is about 450 mV, go to next step. If voltage is not about 450 mV, go to step 7).

6) Turn ignition off. Disconnect PCM harness connectors. Check resistance of HO2S 2 harness connector ground circuit. If resistance is greater than 5 ohms, repair open or faulty connection. After repairs, go to step 13). If resistance is not greater than 5 ohms, go to step 9).

7) Turn ignition off. Disconnect PCM connectors. Check resistance of HO2S 2 harness connector signal circuit. If resistance is greater than 5 ohms, repair open or faulty connection as necessary. After repairs, go to step 13). If resistance is not greater than 5 ohms, go to step 10).

8) Check for faulty connection at HO2S 2. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 11).

9) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 12).

10) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 13). If connection is okay, go to step 12).

11) Replace HO2S No. 2. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0140. If scan tool displays DTC P0140 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0140 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location. Check HO2S 2 heater operation.

DTC P0141 - HO2S 2 HEATER CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

When ignition is turned on, battery voltage is supplied to HO2S 2 heater to provide for faster sensor warm-up, thus allowing sensor to become active in a shorter period of time. PCM reads amount of time necessary for sensor to become active after start-up.

Conditions required to set DTC are:

* No ECT, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP system DTC set.
* No fuel injector circuit, fuel trim, misfire or transaxle DTCs set.
* MAF less than 24 grams per second.
* ECT and IAT less than 95°F (35°C) at start-up.
* Difference between ECT and IAT no greater than 11°F (6°C).

* HO2S 2 voltage remains within 0.15 volt of bias voltage (about 0.45 volt) for longer amount of time than it should.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

NOTE: If engine has been operating, allow engine to cool for about 30 minutes before proceeding with tests.

2) Turn ignition on, engine off. Using scan tool, read HO2S 2 voltage. If voltage is greater than 0.6 volt or less than 0.3 volt, see DIAGNOSTIC AIDS. If voltage is not as specified, go to next step.

3) Inspect HO2S 2 ignition feed fuse. If fuse is open, go to step 15). If fuse is okay, go to next step.

4) Turn ignition off. Raise and support vehicle. Disconnect HO2S 2 harness connector. Connect a test light between ground and HO2S 2 ignition feed circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 7).

5) Connect test light between HO2S 2 harness connector ignition feed and heater ground circuits. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

6) Allow HO2S 2 to cool for at least 10 minutes. Using DVOM, check resistance between ignition feed and heater ground circuits at HO2S 2. If resistance is 3-10 ohms, go to step 9). If resistance is not 3-10 ohms, go to step 14).

7) Repair open HO2S 2 ignition feed circuit. After repairs, go to step 16).

8) Repair open HO2S 2 heater ground circuit. After repairs, go to step 16).

9) Check for faulty connection at HO2S 2. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

10) Turn ignition off. Disconnect PCM harness connectors. Check resistance of HO2S 2 signal and ground circuits. If resistance on either circuit is greater than 5 ohms, repair open or faulty connection as necessary. After repairs, go to step 16). If resistance is 5 ohms or less, go to next step.

11) Check for faulty connection at HO2S 2 harness connector. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

12) Check for faulty ground circuit connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

13) Check for faulty HO2S 2 signal circuit connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to next step.

14) Replace HO2S 2. After replacing sensor, go to step 16).

15) Locate and repair short to ground in HO2S 2 ignition feed circuit, replace fuse and go to next step.

16) Allow engine to cool completely. Using scan tool, clear DTCs. Turn ignition on, engine off. Read HO2S 2 voltage. If voltage is greater than 600 mV or less than 300 mV, repair is complete. If voltage is not as specified, return to step 2).

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0171 - FUEL TRIM SYSTEM LEAN

Circuit Description

PCM reads HO2S signal voltage and adjusts fuel delivery based on this voltage. A change made to fuel delivery is indicated by Long Term (LT) and Short Term (ST) FUEL TRIM values.

ST FUEL TRIM values change rapidly in response to HO2S signal voltages. These changes fine tune engine fueling. LT FUEL TRIM values change in response to trends in ST fuel trim. LT fuel trim makes coarse adjustments to fueling in order to re-center and restore control to ST fuel trim. LT and ST fuel trim can be read by using a scan tool.

Ideal FUEL TRIM value is about zero. Fuel trim value greater than zero indicates that PCM is adding fuel to compensate for a lean condition. Fuel trim less than zero indicates that PCM is reducing amount of fuel to compensate for rich condition. DTC will set if PCM detects an excessively rich or lean condition.

Conditions for setting DTC:

* No IAC DTCs set at idle.
* No ECT, EGR, HO2S, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP DTCs set.
* No misfire or injector circuit DTCs set.
* Engine speed 500-4000 RPM.
* ECT 68-230°F (20-110°C).
* IAT 0-104°F (-18 to 40°C).
* BARO greater than 10.7 psi (0.75 kg/cm²).
* MAP 2.6-12.8 psi (0.18-0.90 kg/cm²)
* TP angle less than 90 percent.
* MAF 9-180 grams per second.
* Long term fuel trim about maximum authority (16).
* Short term fuel trim about maximum authority (20).
* Vehicle speed less than 70 MPH.
* Conditions met in FUEL TRIM CELLS 0, 1, 2, 6, and/or 7.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If any other DTCs are set, diagnose affected DTCs before proceeding. If no other DTCs are set, go to next step.

3) Operate vehicle in closed loop mode while using scan tool to read LT and ST FUEL TRIM values. If LT FUEL TRIM value is about 16 and ST FUEL TRIM value is about 20, go to step 5). If values are not as specified, go to next step.

4) Using scan tool, read and record FAIL RECORDS data. Clear DTCs and operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC while operating vehicle. Continue operating vehicle until DTC P0171 test runs. If scan tool displays DTC P0171 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0171 FAILED THIS IGN, go to DIAGNOSTIC AIDS.

5) Check vacuum hoses for splits, kinks and proper routing. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

6) Check PCV valve for proper installation. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

7) Check throttle body inlet screen for blockage or foreign objects which may partially block airflow sample through MAF sensor. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

8) Start engine. If high or unsteady idle condition exists, go to next step. If Idle is okay, go to step 11).

9) Using scan tool, read IDLE AIR CONTROL (IAC) value. If

value is greater than 5 counts, go to step 11). If value is 5 counts or less, go to next step.

10) Check throttle body, intake manifold, and EGR valve for vacuum leaks. Repair as necessary. After repairs, go to step 22) If no problem is found, go to next step.

11) Check IAC valve for proper operation. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

12) Check for fuel contamination. If fuel is contaminated, repair condition causing contamination. After repairs, go to step 22). If fuel is okay, go to next step.

13) Check PCM injector, power and sensor grounds for clean and tight connection, and for proper location. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

14) Disconnect MAF sensor harness connector. Operate vehicle in closed loop mode while monitoring scan tool ST FUEL TRIM. If ST FUEL TRIM decreases to about zero, go to step 21). If ST FUEL TRIM does not decrease to about zero, go to next step.

15) Perform FUEL SYSTEM PRESSURE TEST under BASIC FUEL SYSTEM CHECKS in F - BASIC TESTING article. If a problem is found, repair as necessary and go to step 22). If no problem is found, go to next step.

16) Perform EVAP system check. See FUEL EVAPORATION CONTROL under EMISSION SYSTEMS & SUB-SYSTEMS in I - SYSTEM/COMPONENT TESTS article. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

17) Check intake manifold, injector "O" rings, EGR adapter, EGR valve, and EGR feed pipes for vacuum leaks. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

18) Check exhaust system for corrosion, loose or missing hardware. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

19) Perform INJECTOR BALANCE TEST under FUEL SYSTEM in I - SYSTEM/COMPONENT TESTS article. Repair as necessary. After repairs, go to step 22). If no problem is found, go to next step.

20) Ensure HO2S is installed securely, and connector and harness are not contacting exhaust manifold or ignition wires. Repair as necessary. After repairs, go to step 22). If no problem is found, see DIAGNOSTIC AIDS.

21) Replace MAF sensor. After replacing sensor, go to next step.

22) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0171. If scan tool displays DTC P0171 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0171 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Ensure HO2S wiring is routed correctly and not contacting exhaust system. Check for faulty PCM-to-engine ground connections. Check fuel pressure. Check fuel injector operation. Check for vacuum and exhaust leaks. Disconnect MAF sensor connector and see if lean condition is corrected. If lean condition is corrected, replace MAF sensor.

Check for fuel contamination. Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool HO2S 1 display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0172 - FUEL TRIM SYSTEM RICH

Circuit Description

PCM reads HO2S signal voltage and adjusts fuel delivery based on this voltage. A change made to fuel delivery is indicated by Long Term (LT) and Short Term (ST) FUEL TRIM values.

ST FUEL TRIM values change rapidly in response to HO2S signal voltages. These changes fine tune engine fueling. LT FUEL TRIM values change in response to trends in ST fuel trim. LT fuel trim makes coarse adjustments to fueling in order to re-center and restore control to ST fuel trim. LT and ST fuel trim can be read by using a scan tool.

Ideal FUEL TRIM value is about zero. Fuel trim value is greater than zero indicates that PCM is adding fuel to compensate for a lean condition. Fuel trim less than zero indicates that PCM is reducing amount of fuel to compensate for rich condition. DTC will set if PCM detects an excessively rich or lean condition.

Conditions required to set DTC are:

* No IAC DTCs set at idle.
* No ECT, EGR, HO2S, IAT, MAF, MAP or TP sensor DTCs set.
* No EVAP DTCs set.
* No misfire or injector circuit DTCs set.
* Engine speed 500-4000 RPM.
* ECT 68-230°F (20-110°C).
* IAT 0-104°F (-18 to 40°C).
* BARO greater than 10.7 psi (0.75 kg/cm²).
* MAP 2.6-12.8 psi (0.18-0.90 kg/cm²)
* TP angle less than 90 percent.
* MAF 9-180 grams per second.
* Long term fuel trim about maximum authority (-25).
* Short term fuel trim about maximum authority (-11).
* Vehicle speed less than 70 MPH.
* Conditions met in FUEL TRIM CELLS 0, 1, 2, 6, and/or 7.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If any other DTCs are set, diagnose affected DTCs before proceeding. If no other DTCs are set, go to next step.

3) Operate vehicle in closed loop mode while using scan tool to read LT and ST FUEL TRIM values. If LT FUEL TRIM and ST FUEL TRIM value is about -10, go to step 5). If values are not as specified, go to next step.

4) Using scan tool, read and record FAIL RECORDS data. Clear DTCs and operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC while operating vehicle. Continue operating vehicle until DTC P0172 test runs. If scan tool displays DTC P0172 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0172 FAILED THIS IGN, go to DIAGNOSTIC AIDS.

5) Check air filter element condition. Replace air filter element if necessary and go to step 21). If air filter element is okay, go to next step.

6) Check air intake duct for being collapsed or restricted. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

7) Check throttle body inlet screen for blockage or foreign objects which may partially block airflow sample through MAF sensor. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

8) Start engine. If high or unsteady idle condition exists, go to next step. If Idle is okay, go to step 11).

9) Using scan tool, read IDLE AIR CONTROL (IAC) value. If value is less than 100 counts, go to step 11). If value is not less than 100 counts, go to next step.

10) Turn ignition off. Check throttle body bore, throttle plate and IAC passages for coking and foreign objects. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

11) Check IAC valve for proper operation. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

12) Disconnect vacuum hose from fuel pressure regulator and check it for presence of fuel. If fuel is present, replace fuel pressure regulator and go to step 21). If no fuel is present, go to next step.

13) Turn ignition on, engine off. Using scan tool, read TP ANGLE while slowly depressing accelerator pedal. If TP ANGLE increases steadily from 0% at closed throttle to 100% at wide open throttle, go to next step. If TP ANGLE does not increase as specified, to step 19).

14) Disconnect MAF sensor harness connector. Operate vehicle in closed loop mode while monitoring scan tool LT and ST FUEL TRIM. If both FUEL TRIM values decrease to about 0, go to step 20). If FUEL TRIM values does not decrease to about 0, go to next step.

15) Perform FUEL SYSTEM PRESSURE TEST under BASIC FUEL SYSTEM CHECKS in F - BASIC TESTING article. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

16) Perform EVAP system check. See FUEL EVAPORATION CONTROL under EMISSION SYSTEMS & SUB-SYSTEMS in I - SYSTEM/COMPONENT TESTS article. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

17) Perform INJECTOR BALANCE TEST under FUEL SYSTEM in I - SYSTEM/COMPONENT TESTS article. Repair as necessary. After repairs, go to step 21). If no problem is found, go to next step.

18) Remove HO2S 1 and check it for silicone (powdery white deposit) contamination. If HO2S 1 is contaminated, replace HO2S 1 and go to step 21). If HO2S 1 is not contaminated, see DIAGNOSTIC AIDS.

19) Check and tighten TP sensor mounting screws. If mounting screws are tight, replace TP sensor. After replacing sensor, go to step 21).

20) Replace MAF sensor. After replacing sensor, go to next step.

21) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0172. If scan tool displays DTC P0172 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0172 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check fuel pressure. Check fuel injector operation. Disconnect MAF sensor connector and see if rich condition is corrected. If rich condition is corrected, replace MAF sensor.

Check for faulty TP sensor operation. Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool HO2S 1 display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0201 - INJECTOR NO. 1 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.

Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.

3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 1 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).

5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).

6) Turn ignition off. Disconnect cylinder No. 1 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 1 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).

7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 1. Check for intermittent open in injector No. 1 control circuit between PCM and injector. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 1 connector and injector No. 1 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 1 connector. Turn ignition on. Check voltage between ground and ignition feed circuit at injector No. 1 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 1 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 1 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 1 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 1 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 1 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 1 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 1

control circuit. After repairs, go to step 19).
16) Locate and repair short to voltage in injector No. 1 control circuit. After repairs, go to step 19).
17) Replace faulty injector. After replacing injector, go to step 19).
18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.
19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to step 2). If this DTC is not set, system is okay.

Diagnostic Aids
Monitor injector fault parameter on scan tool. Wiggle electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0202 - INJECTOR NO. 2 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description
PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.
Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures
1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.
2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.
3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.
4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 2 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).
5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).
6) Turn ignition off. Disconnect cylinder No. 2 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 2 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).
7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 2. Check for intermittent open in injector No. 2 control circuit between PCM and injector. Repair as

necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 2 connector and injector No. 2 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 2. Turn ignition on. Check voltage between ground and ignition feed circuit at injector No. 2 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 2 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 2 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 2 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 2 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 2 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 2 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 2 control circuit. After repairs, go to step 19).

16) Locate and repair short to voltage in injector No. 2 control circuit. After repairs, go to step 19).

17) Replace faulty injector. After replacing injector, go to step 19).

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to step 2). If this DTC is not set, system is okay.

Diagnostic Aids

Monitor injector fault parameter on scan tool. Wiggle electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0203 - INJECTOR NO. 3 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.

Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.

3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 3 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).

5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).

6) Turn ignition off. Disconnect cylinder No. 3 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 3 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).

7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 3. Check for intermittent open in injector No. 3 control circuit between PCM and injector. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 3 connector and injector No. 3 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 3. Turn ignition on. Check voltage between ground and ignition feed circuit at injector No. 3 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 3 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 3 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 3 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 3 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 3 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 3 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 3 control circuit. After repairs, go to step 19).

16) Locate and repair short to voltage in injector No. 3 control circuit. After repairs, go to step 19).

17) Replace faulty injector. After replacing injector, go to step 19).

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to step 2). If this DTC is not set, system is okay.

Diagnostic Aids

Monitor injector fault parameter on scan tool. Wiggle electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0204 - INJECTOR NO. 4 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.

Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.

3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 4 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).

5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).

6) Turn ignition off. Disconnect cylinder No. 4 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 4 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).

7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 4. Check for intermittent open in injector No. 4 control circuit between PCM and injector. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 4 connector and injector No. 4 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 4. Turn

ignition on. Check voltage between ground and ignition feed circuit at injector No. 4 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 4 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 4 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 4 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 4 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 4 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 4 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 4 control circuit. After repairs, go to step 19).

16) Locate and repair short to voltage in injector No. 4 control circuit. After repairs, go to step 19).

17) Replace faulty injector. After replacing injector, go to step 19).

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to repeat step 2). If this DTC is not set, system is okay.

Diagnostic Aids

Monitor injector fault parameter on scan tool. Wiggle electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0205 - INJECTOR NO. 5 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.

Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.

3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 5 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).

5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).

6) Turn ignition off. Disconnect cylinder No. 5 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 5 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).

7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 5. Check for intermittent open in injector No. 5 control circuit between PCM and injector. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 5 connector and injector No. 5 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 5 connector. Turn ignition on. Check voltage between ground and ignition feed circuit at injector No. 5 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 5 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 5 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 5 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 5 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 5 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 5 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 5 control circuit. After repairs, go to step 19).

16) Locate and repair short to voltage in injector No. 5 control circuit. After repairs, go to step 19).

17) Replace faulty injector. After replacing injector, go to step 19).

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to step 2). If this DTC is not set, system is okay.

Diagnostic Aids

Monitor injector fault parameter on scan tool. Wiggle

electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0206 - INJECTOR NO. 6 CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls fuel injector control circuit using an ignition feed driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in ignition feed or ground circuit. If an electrical malfunction occurs in fuel injector circuit for affected cylinder, ignition feed driver signals PCM to set DTC.

Conditions for setting DTC:

* Engine running.
* Incorrect voltage level being detected on an injector driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, monitor SPECIFIC DTC. If scan tool indicates that this DTC failed this ignition cycle, go to step 4). If scan does not indicate that this DTC failed this ignition cycle, go to next step.

3) Turn ignition on, engine off. Using scan tool, review and record FAIL RECORDS data. Operate vehicle in fail conditions parameter. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between cylinder No. 6 fuel injector control circuit and ground. If voltage reading is battery voltage, go to next step. If voltage reading is not battery voltage, go to step 9).

5) Check fuel injectors. See I - SYSTEM/COMPONENT TESTS article. If injectors are okay, go to next step. If injectors are not okay, go to step 17).

6) Turn ignition off. Disconnect cylinder No. 6 injector connector. Turn ignition on. Check voltage between ground and fuel injector No. 6 control circuit at PCM connector. If voltage reading is zero volts, go to next step. If voltage reading is not zero volts, go to step 16).

7) Check for intermittent open in ignition feed circuit in harness between fuse and injector No. 6. Check for intermittent open in injector No. 6 control circuit between PCM and injector. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

8) Check for poor terminal connections at fuel injector No. 6 connector and injector No. 6 connection at PCM connector. Repair as necessary. After repairs, go to step 19). If connections are okay, go to step 18).

9) Turn ignition off. Disconnect injector No. 6 connector. Turn ignition on. Check voltage between ground and ignition feed circuit at injector No. 6 connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 14).

10) Using a test light connected to battery voltage, probe test light to injector No. 6 control circuit. If test light illuminates, go to step 15). If test light does not illuminate, go to step 11).

11) Turn ignition off. Using a fused jumper wire, jumper injector No. 6 control circuit and ignition feed circuit at injector connector. Turn ignition on. Using test light connected to ground, probe injector No. 6 control circuit at PCM connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

12) Check for poor terminal contact at injector No. 6 connector. Repair as necessary. After repairs, go to step 19). If connection is okay, go to step 17).

13) Locate and repair open in injector No. 6 control circuit. After repairs, go to step 19).

14) Locate and repair open or short to ground in injector No. 6 ignition feed circuit. After repairs, go to step 19).

15) Locate and repair short to ground in injector No. 6 control circuit. After repairs, go to step 19).

16) Locate and repair short to voltage in injector No. 6 control circuit. After repairs, go to step 19).

17) Replace faulty injector. After replacing injector, go to step 19).

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, clear DTCs. Turn ignition off for 15 seconds. Start engine and operate vehicle with the FAIL RECORDS conditions. Check for DTCs. If this DTC is set, go to repeat step 2). If this DTC is not set, system is okay.

Diagnostic Aids

Monitor injector fault parameter on scan tool. Wiggle electrical harnesses for affected electrical circuit. If status changes on tool, an intermittent problem is present. Check for poor connections at PCM. Check for damaged harness.

DTC P0230 - FUEL PUMP CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM provides ignition voltage to control fuel pump. PCM has ability to detect an electrical malfunction on relay control circuit. When ignition is first turned on, PCM energizes fuel pump relay which applies power to fuel pump. Fuel pump relay will remain on as long engine is running or cranking and PCM is receiving reference pulses.

If no reference pulses are present, PCM de-energizes fuel pump relay within 2 seconds after ignition is turned on or engine is stopped. With engine off/stopped, fuel pump can be turned on by using scan tool output controls function. If electrical malfunction is detected, DTC will set.

Conditions for setting DTC:

* Ignition is on.
* PCM detects an electrical malfunction on fuel pump relay control circuit.
* Conditions met for .5 second.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Disconnect fuel pump relay. Connect a test light between fuel pump relay connector cavities for fuel pump relay control circuit and relay ground. Install scan tool. Turn ignition on, with engine off. Using scan tool, command fuel pump relay on and off. If test light illuminates when fuel pump is commanded on, go to step 7). If test light does not illuminate when fuel pump is commanded on, go to

next step.

3) Turn ignition off. Disconnect PCM harness connector. Using test light connected to battery voltage, probe fuel pump relay control circuit at PCM connector. If test light illuminates, go to step 9). If test light does not illuminate, go to next step.

4) Using test light connected to battery voltage, probe fuel pump relay ground circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

5) Check for open in fuel pump relay control circuit between PCM and fuel pump relay. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

6) Check fuel pump relay control circuit for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to step 12).

7) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, with engine off. Using test light connected to ground, probe fuel pump relay control circuit at PCM connector. If test light illuminates, go to step 13). If test light does not illuminate, go to next step.

8) Check for poor terminal connection at fuel pump relay connector. Repair as necessary. After repairs, go to step 14). If connections are okay, go to step 11).

9) Locate and repair short to ground in fuel pump relay ground circuit. After repairs, go to step 14).

10) Locate and repair open in fuel pump relay ground circuit. After repairs, go to step 14).

11) Replace fuel pump relay. After replacing relay, go to step 14).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 14).

13) Locate and repair short to voltage in fuel pump control circuit. After repairs, go to next step.

14) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter this DTC. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool does not indicate that this test ran and passed, repeat step 2).

Diagnostic Aids

Scan tool will appear not to run if diagnostic passes. Using FREEZE FRAME and/or FAILURE RECORDS may aid in locating an intermittent condition. An intermittent may be caused by a poor connection, rubbed-through wire insulation or a wire broken inside of insulation. Check for poor connections at PCM or fuel pump relay.

DTC P0300 - ENGINE MISFIRE DETECTED

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Misfire is detected using Camshaft Position (CMP) and Crankshaft Position (CKP) sensors. When PCM senses CKP deceleration not associated with normal engine speed reduction, CMP is used to determine misfiring cylinder. PCM determines misfires on each cylinder and evaluates a random misfire and set DTC.

Conditions for setting DTC:

* No transaxle or VSS DTCs set.
* No CKP, CMP, ECT, MAF or TP sensor DTCs set.
* Engine speed 450-5800 RPM.
* ECT 19-248°F (-7 to 120°C).
* Throttle steady.

* PCM detects crankshaft RPM variation, indicating a misfire which could cause catalytic convertor damage or high emissions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1200 is also set, go to DTC P1200. If DTC P1200 is not set, go to next step.

3) Start engine and allow it to idle. Using scan tool, read and record FREEZE FRAME data. Operate vehicle within conditions noted in FREEZE FRAME data. Using scan tool, read MISFIRE CUR # display for each cylinder. If MISFIRE CUR # is increasing (indicating a misfire currently occurring) for any cylinder, go to next step. If MISFIRE CUR # is not increasing, see DIAGNOSTIC AIDS.

4) If MISFIRE HIST # displays a very large number for more than one cylinder, go to next step. If MISFIRE HIST # does not display a very large number for more than one cylinder, go to step 14).

5) Check vacuum hoses for splits, kinks, or improper connections. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

6) Check PCV valve for improper installation or damaged "O" rings. If a problem is found, go to step 27). If no problem is found, go to next step.

7) Check throttle body inlet screen for blockage or foreign objects which may partially block airflow sample through MAF sensor. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

8) Perform injector balance test. See I - SYSTEM/COMPONENT TESTS article. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

9) Check for fuel contamination. If fuel is contaminated, repair condition causing contamination and go to step 27). If fuel is okay, go to next step.

10) Check PCM injector, power and sensor grounds for clean and tight connection, and for proper location. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

11) Disconnect MAF sensor harness connector. Operate vehicle within conditions noted in FREEZE FRAME data. Using scan tool, read MISFIRE CUR # display for each cylinder. If MISFIRE CUR # is increasing (indicating a misfire currently occurring) for any cylinder, go to next step. If MISFIRE CUR # is not increasing, go to step 25).

12) Check intake manifold, injector "O" rings, EGR adapter, EGR valve, and EGR feed pipes for vacuum leaks. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

13) Remove EGR valve and inspect valve, seat and passages for damage. Inspect valve pintle to ensure it is not sticking partially open. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

14) Perform injector circuit test. See F - BASIC TESTING article. Repair as necessary and go to step 27). If no problem is found, go to next step.

15) Check ignition wire(s) associated with cylinder(s) that is misfiring. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

16) Install a spark tester on spark plug wire at spark plug end for cylinder indicating most severe misfire. Connect a jumper wire between engine ground and companion cylinder spark plug wire at spark plug end. Companion cylinders are 1 and 4, 2 and 5, and 3 and 6. Crank

engine and check for crisp, Blue spark at tester. Repeat procedure for each affected cylinder. If spark is okay on all cylinders, go to step 21). If spark is not okay on any cylinder, go to next step.

17) Remove ignition coil(s) associated with misfiring cylinder(s). Check ignition coils for cracks or carbon tracking. If a problem is found, replace damaged coil(s) and go to step 27). If no problem is found, go to next step.

18) Check ignition coil secondary resistance. If resistance is not 7000 ohms on VIN 1 or 10,000 ohms on VIN K, replace ignition coil. After replacing coil, go to step 27). If resistance is as specified, go to next step.

19) Remove ignition wire(s) associated with misfiring cylinder(s). Check ignition wire(s) boot for carbon tracking or damaged insulation. If a problem is found, replace faulty ignition wire(s). After replacing ignition wire(s), go to step 27). If no problem is found, go to next step.

20) Check resistance of ignition wire(s) associated with misfiring cylinder(s). If resistance is not 5000-8000 ohms, replace ignition wire(s). After replacing ignition wire(s), go to step 27). If resistance is 5000-8000 ohms, go to step 26).

21) Remove spark plug(s) associated with misfiring cylinder(s). Check spark plugs for excessive fouling. If spark plugs are excessively fouled, diagnose and repair mechanical engine problem. If spark plugs are not excessively fouled, go to next step.

22) Check spark plug insulation for cracks, carbon tracking or other damage. If a problem is found, replace faulty spark plug(s). After replacing spark plug(s), go to step 27). If no problem is found, go to next step.

23) Diagnose mechanical engine problem. Repair as necessary. After repairs, go to step 27). If no problem is found, go to next step.

24) Check for transmission DTCs. See the AUTO TRANS DIAGNOSIS article in the AUTO TRANS DIAGNOSIS section. Repair as necessary. After repairs, go to step 27). If no problem is found, see DIAGNOSTIC AIDS.

25) Replace MAF sensor. After replacing sensor, go to step 27).

26) Replace ignition control module. After replacing module, go to next step.

27) Using scan tool, read and record FREEZE FRAME data. Clear DTCs. Start engine and allow it to idle. Operate vehicle within conditions noted in FREEZE FRAME data. Using scan tool, read MISFIRE CUR # display for each cylinder. If MISFIRE CUR # is increasing (indicating a misfire currently occurring) for any cylinder, return to step 2). If MISFIRE CUR # is not increasing, repair is complete.

Diagnostic Aids

Check secondary ignition wires. Check for damaged or faulty ignition coil. Substitute a known-good ignition coil. Check system grounds. Check MAF sensor, air induction system, fuel pressure, injectors, and EGR valve.

Extended idle periods or short trip driving could leave deposits on HO2S. Deposits could cause HO2S to respond slowly, affecting fuel control and causing misfire at idle.

DTC P0325 - KNOCK SENSOR MODULE CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Knock Sensor (KS) module is located in PCM and is replaceable. KS module reads KS to determine if excessive detonation (knock) is present. If excessive knock is present, PCM will retard

timing until knock goes away. When KS module is missing or malfunctioning, PCM will set DTC P0325.

Conditions for setting DTC:

* System voltage greater than 9 volts.
* PCM detects problem with KS module causing knock to be indicated continuously.
* Conditions present for up to 2.5 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If engine knock can be heard, repair engine mechanical problem before proceeding with test. Operate vehicle within conditions required to set DTC. Using scan tool, select DTC, SPECIFIC function and enter DTC P0325. If scan tool displays DTC P0325 FAILED THIS IGN, go to step 4). If scan tool does not display DTC P0325 FAILED THIS IGN, go to next step.

3) Turn engine off. Turn ignition on, engine off. Read and record FAIL RECORDS data for DTC P0325. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0325 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0325 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

5) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P0325. Monitor scan tool until DTC P0325 test runs. If scan tool displays DTC P0325 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0325 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connection at PCM. Check KS connector for damage. Ensure KS is installed properly.

DTC P0327 - KNOCK SENSOR CIRCUIT BANK 1

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Knock Sensor (KS) is used to detect engine detonation (knock). When KS module in PCM determines that an abnormally high noise channel voltage exists, PCM will set DTC P0327.

Conditions for setting DTC:

* No active CKP, ECT, MAF, TP or VSS sensor DTCs set.
* ECT greater than 167°F (75°C).
* Engine load is greater than 3 percent.
* TP angle greater than 3 percent.
* Engine speed is 1000-4000 RPM.
* Maximum system spark retard less than 15 percent.
* System voltage greater than 9 volts.
* PCM detect a KS 1 signal voltage within the calculated average voltage range.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If engine knock can be heard, repair mechanical problem

before proceeding with test. After repairs, operate vehicle within conditions required to set DTC. Using scan tool, select DTC, SPECIFIC function and enter DTC P0327. If scan tool displays DTC P0327 FAILED THIS IGN, go to step 4). If scan tool does not display DTC P0327 FAILED THIS IGN, go to next step.

3) Turn ignition on, engine off. Read and record FAIL RECORDS data for DTC P0327. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0327 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0327 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect KS No. 1 connector. Using a DVOM, check voltage between engine ground and terminal at each KS. If voltage is 5 volts, go to next step. If voltage is not 5 volts, go to step 8).

5) Connect DVOM to bank 1 KS terminal and ground. Select 2-volt AC scale on DVOM. Start and operate engine at idle. Observe DVOM. If voltage is indicated on DVOM, go to step 9). If voltage is not indicated, go to next step.

6) Turn ignition off. With DVOM still connected between KS terminal and engine ground, tap on engine while observing DVOM. If any signal is present, go to next step. If signal is not present, go to step 9).

7) Check KS harness connector for incorrect routing or faulty terminal connection at KS. Repair as necessary. After repairs, go to step 12). If no problem is found, go to step 10).

8) Turn ignition off. Disconnect PCM harness connectors. Turn ignition on and check KS signal circuit between PCM and KS harness connector for open, short to voltage or short to ground. Repair as necessary. After repairs, go to step 12). If no problem is found, go to step 10).

9) Replace KS. After replacing sensor, go to step 12).

10) Turn ignition off. Disconnect PCM connectors. Check KS signal circuit for proper terminal connection at PCM. Repair or replace terminal as necessary. After repairs, go to step 12). If terminal is okay, go to next step.

11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

12) Read and record FAIL RECORDS data for DTC P0327. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0327 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0327 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connection at PCM. Check KS and PCM connectors for damage. Ensure KS harness is not routed too close to high-voltage wires, such as spark plug cables, ignition coils or other high-voltage components. Insure KS is installed properly.

DTC P0332 - KNOCK SENSOR CIRCUIT BANK 2

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Knock Sensor (KS) is used to detect engine detonation (knock). When KS module in PCM determines that an abnormally high noise channel voltage exists, PCM will set DTC P0327.

Conditions required to set DTC are:

* No active CKP, ECT, MAF, TP or VSS sensor DTCs set.
* ECT greater than 167°F (75°C).
* Engine load is greater than 3 percent.
* TP angle greater than 3 percent.
* Engine speed is 1000-4000 RPM.

* Maximum system spark retard less than 15 percent.
* System voltage greater than 9 volts.
* PCM detect a KS 2 signal voltage within the calculated average voltage range.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If engine knock can be heard, repair mechanical problem before proceeding with test. After repairs, operate vehicle within conditions required to set DTC. Using scan tool, select DTC, SPECIFIC function and enter this DTC. If scan tool displays DTC FAILED THIS IGN, go to step 4). If scan tool does not display DTC FAILED THIS IGN, go to next step.

3) Turn ignition on, engine off. Read and record FAIL RECORDS data for DTC P0327. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays that this DTC FAILED THIS IGN, go to next step. If scan tool does not display that this DTC FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Disconnect KS No. 2 connector. Using a DVOM, check voltage between engine ground and terminal at KS. If voltage is 5 volts, go to next step. If voltage is not 5 volts, go to step 8).

5) Connect DVOM to bank 2 KS terminal and ground. Select 2-volt AC scale on DVOM. Start and operate engine at idle. Observe DVOM. If voltage is indicated on DVOM, go to step 9). If voltage is not indicated, go to next step.

6) Turn ignition off. With DVOM still connected between KS terminal and engine ground, tap on engine while observing DVOM. If any signal is present, go to next step. If signal is not present, go to step 9).

7) Check KS harness connector for incorrect routing or faulty terminal connection at KS. Repair as necessary. After repairs, go to step 12). If no problem is found, go to step 10).

8) Turn ignition off. Disconnect PCM harness connectors. Turn ignition on and check KS signal circuit between PCM and KS harness connector for open, short to voltage or short to ground. Repair as necessary. After repairs, go to step 12). If no problem is found, go to step 10).

9) Replace KS. After replacing sensor, go to step 12).

10) Turn ignition off. Disconnect PCM connectors. Check KS signal circuit for proper terminal connection at PCM. Repair or replace terminal as necessary. After repairs, go to step 12). If terminal is okay, go to next step.

11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

12) Read and record FAIL RECORDS data for DTC P0327. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0327 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0327 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connection at PCM. Check KS and PCM connectors for damage. Ensure KS harness is not routed too close to high-voltage wires, such as spark plug cables, ignition coils or other high-voltage components. Insure KS is installed properly.

DTC P0336 - 18X REFERENCE SIGNAL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Ignition Control Module (ICM) produces 18X reference signal. ICM calculates 18X reference signal by filtering Crankshaft Position (CKP) sensor 18X pulses when engine is running and CKP pulses are also being received. PCM uses this information to calculate engine speed and CKP at engine speeds less than 1200 RPM. PCM compares number of 18X reference pulses to 3X reference pulses and Camshaft Position (CMP) pulses. If PCM receives incorrect number of pulses, DTC P0336 will set.

Conditions required to set DTC are:

* Engine running and PCM receiving 3X reference pulses.
* Ratio of 18X reference pulses to 3X reference pulses received by PCM does not equal 6.
* Ratio of 3X reference pulses to CMP pulses received by PCM equals 6.
* Conditions present for 600 engine revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Attempt to start engine. If engine starts and runs, go to next step. If engine does not start and run, see NO START DIAGNOSIS in F - BASIC TESTING article.

3) Using scan tool, clear DTC P0336. Start and allow engine to idle for one minute. Read DTCs. If DTC P0336 resets, go to next step. If DTC does not reset, go to DIAGNOSTIC AIDS.

4) Disconnect ICM and PCM harness connectors. Check for open or short to ground in 18X reference circuit between ICM and PCM harness connectors. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

5) Reconnect ICM connector. Using DVOM, check voltage on 18X reference circuit at PCM harness connector while cranking engine. If voltage is about 3 volts, go to step 8). If voltage is not as specified, go to next step.

6) Check for faulty connections at ICM. Repair as necessary. After repairs, go to step 11). If connections are okay, go to next step.

7) Replace ICM. After replacing module, go to step 11).

8) Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

9) Check for faulty connections at PCM. Repair as necessary. After repairs, go to step 11). If connections are okay, go to next step.

10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

11) Read and record FAIL RECORDS data for DTC P0336. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0336 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P0336 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe a voltmeter connected to 18X reference circuit at PCM harness connector while moving all related harness and connectors. A change in voltage indicates fault location.

Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check

ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness.

DTC P0341 - CAMSHAFT POSITION SENSOR CIRCUIT PERFORMANCE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

DTC P0341 will set if Camshaft Position (CMP) sensor pulses are not in proper ratio to 18X and 3X pulses.

Conditions required to set DTC are:

* Engine running and PCM receiving 3X reference pulses.
* Ratio of 3X reference pulses to CMP pulses received by PCM does not equal 6.
* Ratio of 18X reference pulses to 3X reference pulses received by PCM does not equal 6.
* Conditions present for 600 engine revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, read and record FAIL RECORDS data for DTC P0341. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0341 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0341 FAILED THIS IGN, see DIAGNOSTIC AIDS.

3) Turn ignition off. Disconnect PCM connectors. Using DVOM, check voltage on CMP sensor signal circuit at PCM harness connector. Turn ignition on. If voltage is about 5 volts, go to next step. If voltage is not about 5 volts, go to step 5).

4) Remove CMP sensor, leaving harness connector connected. Place a magnet on sensor. If voltage is now about zero volts, go to step 16). If voltage is not about zero volts, go to step 8).

5) If voltage is greater than 5 volts, go to step 7). If voltage is not greater than 5 volts, go to next step.

6) Turn ignition off. Disconnect Ignition Control Module (ICM) connector. Leave PCM connector disconnected. Turn ignition on. Connect a test light between battery voltage and ICM harness connector CMP sensor signal and CMP sensor input circuits. If test light illuminates, locate and repair short to ground in CMP sensor signal or input circuit and go to step 24). If test light does not illuminate, go to step 13).

7) Turn ignition off. Disconnect Ignition Control Module (ICM) connector. Leave PCM connector disconnected. Turn ignition on. Connect a test light between engine ground and ICM harness connector CMP sensor input circuit. If test light illuminates, locate and repair short to voltage in CMP sensor input circuit. After repairs, go to step 24). If test light does not illuminate, go to step 18).

8) Disconnect CMP sensor. Check voltage between CMP sensor harness connector sensor feed and sensor ground circuit. If voltage is about battery voltage, go to next step. If voltage is not about battery voltage, go to step 12).

9) Check voltage CMP sensor harness connector sensor signal and sensor ground circuits. If voltage is 5-7 volts, go to next step. If voltage is not 5-7 volts, go to step 11).

10) Check voltage on PCM harness connector CMP sensor input signal circuit. Connect a test light to CMP sensor harness connector sensor signal circuit. Repeatedly touch other end of test light to engine ground. If voltage switches from zero to 5 volts, go to step 15). If voltage does not switch, go to step 14).

11) Turn ignition off. Disconnect Ignition Control Module

(ICM) connector. Leave CMP sensor connector disconnected. Turn ignition on. Check CMP sensor signal circuit for open or short to voltage. Check CMP sensor input signal circuit for short to voltage. Repair as necessary. After repairs, go to step 24). If no problem is found, go to step 14).

12) Turn ignition off. Disconnect ICM and CMP sensor connectors. Check sensor feed and sensor ground circuits for open between ICM and CMP sensor. Repair as necessary. After repairs, go to step 24). If no problem is found, go to step 14).

13) Check for open in CMP sensor input signal circuit between ICM and PCM. Repair as necessary. After repairs, go to step 24). If circuit is okay, go to next step.

14) Check for faulty connection at ICM. Repair as necessary. After repairs, go to step 24). If ICM connection is okay, go to step 17).

15) Check for faulty connection at CMP sensor. Repair as necessary. After repairs, go to step 24). If connection is okay, go to step 19).

16) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 24). If PCM connection is okay, go to step 20).

17) Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness. Repair as necessary. After repairs, go to step 24). If no problem is found, go to next step.

18) Replace ICM. After replacing module, go to step 24).

19) Replace CMP sensor. After replacing sensor, go to step 24).

20) Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness. Repair as necessary. After repairs, go to step 24). If no problem is found, go to next step.

21) Reinstall CMP sensor. Using DVOM, check voltage on CMP sensor input signal circuit while cranking engine. If voltage switches from zero to 4 volts, go to next step. If voltage does not switch, go to step 23).

22) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 24).

23) Replace faulty or missing CMP sensor. After repairs, go to next step.

24) Read and record FAIL RECORDS data for DTC P0341. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P0341 FAILED THIS IGN, repeat step 2). If scan tool does not display DTC P0341 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe a voltmeter connected to CMP sensor input circuit at PCM harness connector while moving all related harness and connectors. A change in voltage indicates fault location.

Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness.

DTC P0401 - EGR SYSTEM INSUFFICIENT FLOW

Circuit Description

PCM tests Exhaust Gas Recirculation (EGR) valve by momentarily commanding valve on while monitoring engine MAP. PCM will illuminate MIL and store DTC P0401 if expected increase is not seen under certain conditions during deceleration.

Conditions required to set DTC are:

* No ECT, IAT, MAP, or TP sensor DTCs set.
* No misfire, linear EGR (pintle position) or vehicle speed sensor DTCs set.
* BARO is greater than 10 psi (0.7 kg/cm²).
* ECT greater than 180°F (80°C).
* Vehicle speed greater than 25 MPH.
* Engine speed is 800-1400 RPM.
* IAC position steady.
* TP angle less than one percent.
* Commanded state of A/C relay is steady.
* MAP changes monitored during EGR flow test indicate insufficient EGR flow.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Inspect exhaust system for modifications or leaks. Repair as necessary. After repairs, go to step 5). If no problem is found, go to next step.

3) Remove EGR valve and check pintle, valve and passages and adapter for excessive deposits or restriction. Check EGR valve gasket and pipes for leaks. Repair as necessary. After repairs, go to step 5). If no problem is found, go to next step.

4) Remove EGR inlet and outlet pipes from exhaust and intake manifolds. Inspect manifold EGR ports and pipes for blockage or damage. Repair as necessary. After repairs, go to next step. If no problem is found, see DIAGNOSTIC AIDS.

5) Read and record FAIL RECORDS data for DTC P0401. Clear DTCs and monitor EGR TEST COUNT while operating vehicle within conditions noted in DIAGNOSTIC AIDS until 9-12 test counts have been taken. Read SPECIFIC DTC. If scan tool displays DTC P0401 TEST RAN AND PASSED, repair is complete. If scan tool does not display DTC P0401 TEST RAN AND PASSED, return to step 2).

Diagnostic Aids

PCM will only run EGR flow test during gradual deceleration, a closed throttle condition and with vehicle speed greater than 25 MPH. Accelerate vehicle to greater than 25 MPH, and gradually decelerate 9-12 times.

Check for faulty connections or damaged harness. Inspect PCM harness connector EGR control circuit for backed-out terminal. Observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

If EGR valve shows signs of excessive heat, check exhaust system for blockage or plugged catalytic converter.

DTC P0403 - EGR SOLENOID CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors EGR valve pintle position input to ensure that valve responds properly to commands from PCM. The EGR (linear) valve is controlled by using an ignition positive driver and ground circuit within the PCM. The driver has the ability to detect an electrical malfunction in the ignition positive or ground circuit, then signal

the PCM to set the DTC.

Conditions for setting this DTC:

* No CKP, ECT, IAT, MAF, MAP, TP, VSS sensors, misfire, idle speed or fuel injector related DTCs set.
* System voltage at 10-16 volts.
* EGR feedback is .4 volt greater than EGR closed valve pintle position when EGR is commanded to zero percent.
* Conditions present for longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Start and operate engine at idle. Using scan tool, observe actual EGR position. If actual EGR position is zero percent, go to next step. If actual EGR position is not zero percent, go to step 9).

3) Turn ignition on, engine off. Using scan tool select EGR VALVE OUTPUT CONTROL function. Increment EGR valve through all positions while comparing DESIRED EGR POSITION to ACTUAL EGR POSITION. If desired EGR position remains close to actual EGR position at all commanded positions, go to next step. If EGR position is not as specified, go to step 5).

4) Using scan tool, review FAIL RECORDS data. Operate vehicle within FAIL RECORDS conditions and monitor SPECIFIC DTC info. If scan tool indicates that DTC P0403 failed this ignition cycle, go to next step. If scan tool does not indicate that DTC P0403 failed in this ignition cycle, see DIAGNOSTIC AIDS.

5) Disconnect EGR valve harness connector. Using a test light, connect test light between EGR ground and control circuit at EGR harness connector. Using scan tool, command EGR valve to 100 percent. If test light illuminates, go to step 10). If test light does not illuminate, go to next step.

6) Using test light connected to battery voltage, probe EGR ground circuit at EGR harness connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 14).

7) Probe EGR control circuit at EGR harness connector. If test light illuminates, go to step 13). If test light does not illuminate, go to next step.

8) Turn ignition off. Disconnect PCM harness connector. Check for open in EGR control circuit at PCM connector. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 19).

9) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Using test light connected to ground, probe EGR control circuit at PCM connector. If test light illuminates, go to step 12). If test light does not illuminate, go to step 20).

10) Check for poor terminal contact at EGR valve. Repair as necessary. After repairs, go to step 21). If terminals are okay, go to next step.

11) Replace EGR valve. After replacing EGR valve, go to step 21).

12) Locate and repair short to voltage in EGR valve control circuit. After repairs, go to step 21).

13) Turn ignition off. Disconnect PCM harness connector. Using a test light connected to battery voltage, probe EGR control circuit at EGR harness connector. If test light illuminates, go to step 18). If test light does not illuminate, go to step 17).

14) Turn ignition off. Disconnect PCM harness connector. Using a test light connected to ground, probe EGR ground circuit at EGR harness connector. If test light illuminates, go to step 16). If test light does not illuminate, go to next step.

15) Check for open in EGR valve ground circuit. Repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

16) Locate and repair short to voltage in EGR valve ground circuit. After repairs, go to step 21).

17) Check EGR valve control circuit for short to EGR ground circuit. Check for short between EGR valve control circuit and EGR pintle position sensor. Repair as necessary. After repair, go to step 21). If circuits are okay, go to step 20).

18) Locate and repair short to ground in EGR valve control circuit. After repairs, go to step 21).

19) Check circuits related to EGR valve for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 21). If terminal connections are okay, go to next step.

20) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

21) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter DTC P0404. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool did not indicate that this test ran and passed, repeat step 2).

Diagnostic Aids

Check for poor connection at PCM or EGR valve harness connectors.

DTC P0404 - EGR VALVE PINTLE STUCK CLOSED

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors EGR valve pintle position input to ensure that valve responds properly to commands from PCM. PCM compares actual EGR position with desired EGR position when valve is commanded open. If actual EGR position is 15 percent less than desired EGR position when PCM is commanding EGR valve opened, DTC will set.

Conditions for setting DTC:

* No CKP, ECT, IAT, MAF, MAP, TP, VSS sensor, idle speed, fuel injector, misfire DTCs set.
* System voltage is 10-16 volts.
* Actual EGR position is 15 percent less than desired EGR position.
* Conditions present for longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition on. Using scan tool, check if DTC P0403 or P0405 is present. If any of this DTC is present, diagnose affected DTC first. If DTC P0403 or P0405 is not present, select EGR OUTPUT CONTROL function. Increment EGR valve through all positions while comparing desired to actual EGR position. If desired and actual EGR position remains close to each other at all commanded positions, go to next step. If desired and actual EGR position is not within range, go to step 4).

3) Using scan tool, review FAIL RECORDS data. Operate vehicle within FAIL RECORDS conditions and monitor SPECIFIC DTC info. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed in this ignition cycle, see DIAGNOSTIC AIDS.

4) Disconnect EGR valve harness connector. Check voltage between EGR pintle position sensor ground circuit and 5-volt reference circuit at EGR harness connector. If voltage reads 5 volts, go to next step. If voltage does not read 5-volts, go to step 10).

5) Using test light connected to battery voltage, probe EGR pintle position signal circuit at EGR harness connector. If test light illuminates, go to step 8). If test light does not illuminate, go to next step.

6) Using a fused jumper wire, jumper EGR 5-volt reference circuit and EGR pintle position signal circuit at EGR harness connector. Using scan tool, observe actual EGR position. If actual EGR position is 100 percent, go to step 9). If actual EGR position is not 100 percent, go to next step.

7) Turn ignition off. Disconnect PCM harness connector. Check for open in EGR pintle position signal circuit. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 15).

8) Turn ignition off. Disconnect PCM harness connector. Using a test light connected to battery voltage, probe EGR pintle position signal circuit. If test light illuminates, go to step 13). If test light does not illuminate, go to step 14).

9) Check for poor terminal connections at EGR valve. Repair as necessary. After repairs, go to step 17). If terminal connections are okay, go to step 12).

10) Check 5-volt reference circuit for open between EGR and PCM. Check 5-volt reference circuit for short to ground. Repair as necessary. After repairs, go to step 17). If circuits are okay, go to next step.

11) Check EGR pintle position ground sensor circuit for open or short to voltage. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 15).

12) Replace EGR valve. After replacing EGR valve, go to step 17).

13) Locate and repair short to ground in EGR pintle position signal circuit. After repairs, go to step 17).

14) Check for short in EGR pintle position signal circuit to sensor ground. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 16).

15) Check circuits related to EGR valve for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 17). If circuits are okay, go to next step.

16) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

17) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter DTC P0404. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool did not indicate that this test ran and passed, repeat step 2).

Diagnostic Aids

Check for excessive deposits on EGR valve pintle or seat. Check for poor connection at PCM or EGR valve harness connectors.

DTC P0405 - EGR PINTLE POSITION SENSOR CIRCUIT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors EGR valve pintle position input to ensure that valve responds properly to commands from PCM and to detect a fault if pintle position sensor circuit is open or shorted. If PCM detects an excessively low EGR feedback signal voltage, DTC will set.

Conditions for setting DTC:

* No ECT, HO2S, IAT, MAF or TP sensor DTCs set.
* Engine run time met. Time ranges from 45 seconds to 8.5 minutes depending upon ECT at start-up.

* TP angle greater than 2 percent.
* System voltage greater than 10 volts.
* EGR feedback is less than .14 volt at anytime.
* Conditions present for longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition on. Using scan tool, select EGR OUTPUT CONTROL function. Increment EGR valve through all positions while comparing desired to actual EGR position. If desired and actual EGR position remains close to each other at all commanded positions, go to next step. If desired and actual EGR position is not within range, go to step 4).

3) Using scan tool, review FAIL RECORDS data. Operate vehicle within FAIL RECORDS conditions and monitor SPECIFIC DTC info. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan tool does not indicate that this DTC failed in this ignition cycle, see DIAGNOSTIC AIDS.

4) Disconnect EGR valve harness connector. Check voltage between EGR pintle position sensor ground circuit and 5-volt reference circuit at EGR harness connector. If voltage reads 5 volts, go to next step. If voltage does not read 5-volts, go to step 9).

5) Using test light connected to battery voltage, probe EGR pintle position signal circuit at EGR harness connector. If test light illuminates, go to step 8). If test light does not illuminate, go to next step.

6) Using a fused jumper wire, jumper EGR 5-volt reference circuit and EGR pintle position signal circuit at EGR harness connector. Using scan tool, observe actual EGR position. If actual EGR position is 100 percent, go to step 13). If actual EGR position is not 100 percent, go to next step.

7) Turn ignition off. Disconnect PCM harness connector. Check for open in EGR pintle position signal circuit. Repair as necessary. After repairs, go to step 19). If circuit is okay, go to step 17).

8) Turn ignition off. Disconnect PCM harness connector. Using a test light connected to battery voltage, probe EGR pintle position signal circuit. If test light illuminates, go to step 12). If test light does not illuminate, go to step 15).

9) Using test light connected to battery voltage, probe EGR 5-volt reference circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 11).

10) Turn ignition off. Disconnect PCM harness connector. Using test light connected to battery voltage, probe EGR 5-volt reference circuit. If test light illuminates, go to step 16). If test light does not illuminate, go to step 18).

11) Check 5-volt reference circuit for open between EGR and PCM. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to step 17).

12) Locate and repair short to ground in EGR valve pintle position circuit. After repairs, go to step 19).

13) Check for poor terminal connections at EGR valve. Check for short in EGR pintle position signal circuit to control circuit. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

14) Replace EGR valve. After replacing EGR valve, go to step 19).

15) Check for short in EGR pintle position signal circuit to sensor ground. Repair as necessary. After repairs, go to step 19). If circuit is okay, go to step 18).

16) Locate and repair short to ground in 5-volt reference circuit. After repairs, go to step 19).

17) Check circuits related to EGR valve for poor terminal

connection at PCM. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to next step.

18) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

19) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter DTC P0404. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, system is okay. If scan tool does not indicate that this test ran and passed, repeat step 2).

Diagnostic Aids

Check for excessive deposits on EGR valve pintle or seat. Check for poor connection at PCM or EGR valve harness connectors.

DTC P0420 - TWC SYSTEM LOW EFFICIENCY

Circuit Description

Three-Way Catalyst (TWC) system is used to control emission. PCM uses signal from Heated Oxygen Sensors (HO2S) to read efficiency of TWC. PCM will set DTC P0420 if TWC oxygen storage capacity is less than a predetermined threshold.

Conditions required to set DTC are:

* IAT greater than 32°F (0°C).
* ECT greater than 167°F (75°C).
* MAF 15-32 gm/s.
* Engine load less than 63 percent and steady.
* Engine speed less than 4000 RPM.
* Conditions present for up to 4 minutes.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Diagnose any other DTCs present before proceeding. If no other DTCs are present, go to next step.

3) Using scan tool, clear DTCs. Ensure A/C is off. Start and warm engine to normal operating temperature. Operate vehicle within the conditions for setting this DTC. Test may need to be performed up to 6 times in order to pass or fail. If test has been performed or attempted for more than 6 times and DTC has not passed or failed this ignition cycle, test may be aborting. See DIAGNOSTIC AIDS. If scan tool indicates that DTC ran and passed in this ignition cycle, system is okay. If scan tool does not indicate that DTC ran and passed in this ignition cycle, go to next step.

4) Ensure TWC is an original equipment part. Check TWC for dents or discoloration caused by excessive heat. Ensure no internal damaged catalyst rattle exists. If a problem is found, repair as necessary. After repairs, go to step 9). If no problems are found, go to next step.

5) Check exhaust system for leaks, damage, loose or missing hardware. Repair as necessary. After repairs, go to step 7). If no problems are found, go to next step.

6) Ensure HO2S 2 is securely installed and that harness is not damaged or contacting exhaust. Repair as necessary. After repairs, go to step 8). If no problems are found, go to step 9).

7) Repair exhaust system. After repairs, go to step 10).

8) Repair HO2S sensor circuit. After repairs, go to step 10).

9) Replace TWC. Check for possible engine misfire DTC or engine mechanical problem. After repairs, go to next step.

10) Using scan tool, clear DTCs. Ensure A/C is off. Start and warm engine to normal operating temperature. Operate vehicle within

the conditions for setting this DTC. Test may need to be performed up to 6 times in order to pass or fail. If test has been performed or attempted for more than 6 times and DTC has not passed or failed this ignition cycle, test may be aborting. See DIAGNOSTIC AIDS. If scan tool indicates that DTC ran and passed in this ignition cycle, go to next step. If scan tool does not indicate that DTC ran and passed in this ignition cycle, repeat step 2).

11) If additional DTCs are present, diagnose affected DTCs. If no additional DTCs are present, system okay.

Diagnostic Aids

PCM will not enable the catalyst test if:

* Engine speed is plus or minus 100 RPM from desired idle speed.
* TP is zero percent.
* Short term integrator is between -20% and +20%.

The catalyst test will abort if vehicle falls out of following the conditions:

* Engine speed is plus or minus 125 RPM from desired idle speed.
* TP is zero percent.
* Short term integrator is between -20% and +20%.

The catalyst test may abort due to change in engine load (i. e., A/C or cooling fan on). If this problem occurs, use scan tool to force cooling fans to turn on, then repeat test.

Check for faulty connections or damaged harness. Inspect PCM harness connector EGR control circuit for backed-out terminal. Observe scan tool while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0440 - EVAP SYSTEM

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Evaporative (EVAP) emission system includes following components: fuel tank, EVAP vent solenoid, fuel tank pressure sensor, fuel pipes and hoses, vapor lines, fuel cap, EVAP emission canister, purge lines, and EVAP purge solenoid.

Conditions required to set DTC are:

* No IAT, MAP, ODM, or TP sensor DTCs set.
* Start-up ECT is 40-86°F (4-30C°).
* Start-up ECT is not greater than 14°F (8°C) greater than start-up IAT.
* Start-up IAT is 40-86°F (4-30°C).
* Start-up IAT is not greater than 4°F (2°C) greater than start-up ECT.
* Fuel tank level 15-85 full.
* BARO is greater than 10.7 psi (0.75 kg/cm²)
* System voltage 8-16 volts.
* EVAP system unable to achieve or maintain vacuum during diagnostic test.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1655 or P1675 is set, diagnose affected DTCs

before proceeding. If DTCs are not set, go to next step.

3) Turn ignition off. Remove fuel cap. Turn ignition on. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays zero in. H2O, go to next step. If scan tool does not display zero in. H2O, repair faulty fuel tank pressure sensor circuit.

4) Zero pressure and vacuum gauges on EVAP Pressure/Purge Diagnostic Station (J 41413). Reinstall fuel cap. Read and record FAIL RECORDS data for DTC P0440. Clear DTCs. Using scan tool, command EVAP vent solenoid ON (closed). Connect EVAP pressure/purge diagnostic station to EVAP service port. Using EVAP pressure/purge diagnostic station, attempt to pressurize EVAP system to 5 in. H2O. If specified pressure is achieved, go to next step. If specified pressure is not achieved, to step 6).

5) Maintain EVAP system pressure at 5 in. H2O. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays 5 in. H2O, go to step 8). If scan tool does not display 5 in. H2O, go to step 7).

6) Disconnect fuel tank vapor and EVAP purge lines from EVAP canister. Plug fuel tank vapor line fitting at EVAP canister. Connect a hand-held vacuum pump to EVAP purge line fitting at EVAP canister. Ensure EVAP vent solenoid is still commanded ON (closed). Attempt to apply 5 in. Hg vacuum to EVAP canister. If vacuum is maintained as specified, go to step 11). If vacuum cannot be maintained as specified, go to step 10).

7) Check fuel tank vapor line and EVAP purge line for restriction. If restriction is found, repair as necessary and go to step 16). If no restriction is found, repair faulty fuel tank sensor circuit.

8) Disconnect vacuum source line and plug vacuum source fitting at EVAP purge solenoid. Using scan tool, select and activate SYSTEM PERF. Using EVAP pressure/purge diagnostic station, pressurize EVAP system to 5 in. H2O. Observe pressure gauge on EVAP pressure/purge diagnostic station while removing plug from vacuum source fitting line at EVAP purge solenoid. If fuel tank vacuum decreases to zero in. H2O within 15 seconds, go to step 9). If vacuum does not decrease as specified, go to step 13).

9) Connect EVAP pressure/purge diagnostic station vacuum gauge to vacuum source line. Start engine. Run engine speed to greater than 2000 RPM while observing vacuum gauge. If vacuum is greater than 15 in. Hg, see DIAGNOSTIC AIDS. If vacuum is not greater than 15 in. Hg, go to step 14).

10) Check if vent hose is disconnected or damaged. Check EVAP canister for damage. Repair as necessary. After repairs, go to step 16). If no problem is found, go to step 15).

11) Check for missing or faulty fuel cap. Check for disconnected or leaking fuel tank vapor line. Check for disconnected or damaged EVAP purge line. Repair as necessary and go to step 16). If no problem is found, go to next step.

12) Using scan tool, command EVAP vent solenoid ON (closed). Connect EVAP pressure/purge diagnostic station to EVAP service port. Continuously attempt to pressurize EVAP system by leaving control knob in PRESSURIZE position. Using Ultrasonic Leak Detector (J 41413), locate and repair EVAP system leak. It may be necessary to lower fuel tank to check connections at top of fuel tank. After repairs are complete, go to step 16).

13) Replace EVAP purge solenoid. After replacing purge solenoid, go to step 16).

14) Locate and repair cause of no source vacuum to EVAP purge solenoid. After repairs, go to step 16).

15) Replace EVAP vent solenoid. After replacing solenoid, go to next step.

16) Turn ignition on, engine off. Using scan tool, command EVAP vent solenoid ON (closed). Using EVAP pressure/purge diagnostic station pressurize EVAP system to 15 in. H2O. Monitor EVAP

pressure/purge diagnostic station pressure gauge. Turn EVAP pressure/purge diagnostic station rotary switch to HOLD position. If pressure decreases to less than 10 in. H2O within 2 minutes, return to step 3). If pressure does not decrease as specified, repair is complete.

Diagnostic Aids
Check following items:

* For missing or damaged "O" rings at EVAP canister fuel vapor and purge line fittings.
* For cracks or punctures in EVAP canister.
* For damaged or disconnected source vacuum line, EVAP purge line, vent hose or fuel tank vapor line.
* For faulty connections at PCM. Inspect harness connectors for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal-to-wire connection.
* For damaged harness. Inspect wiring harness to EVAP vent solenoid, EVAP purge solenoid, and fuel tank pressure sensor for intermittent open or short.

DTC P0442 - EVAP SYSTEM (SMALL LEAK DETECTED)

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description
Evaporative (EVAP) emission system includes following components: fuel tank, EVAP vent solenoid, fuel tank pressure sensor, fuel pipes and hoses, vapor lines, fuel cap, EVAP emission canister, purge lines, and EVAP purge solenoid.
Conditions required to set DTC are:

* No IAT, MAP, ODM, or TP sensor DTCs set.
* DTC P0440 test passed.
* Vacuum decay condition indicating a small leak is detected during diagnostic test.

Diagnostic Procedures
1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.
2) If other DTCs are set, diagnose affected DTCs before proceeding. If DTCs are not set, go to next step.
3) Turn ignition off. Remove fuel cap. Turn ignition on. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays zero in. H2O go to next step. If scan tool does not display zero in. H2O, repair faulty fuel tank sensor circuit.
4) Zero pressure and vacuum gauges on EVAP Pressure/Purge Diagnostic Station (J 41413). Reinstall fuel cap. Read and record FAIL RECORDS data for DTC P0442. Clear DTCs. Connect EVAP pressure/purge diagnostic station to EVAP service port. Using scan tool, command EVAP vent solenoid ON (closed). Using EVAP pressure/purge diagnostic station, pressurize EVAP system to 5 in. H2O. If specified pressure is achieved, go to next step. If specified pressure is not achieved, repair faulty fuel tank sensor circuit.
5) Turn ignition on, engine off. Using scan tool, command EVAP vent solenoid ON (closed). Using EVAP pressure/purge diagnostic station pressurize EVAP system to 15 in. H2O. Monitor EVAP pressure/purge diagnostic station pressure gauge. Turn EVAP pressure/purge diagnostic station rotary switch to HOLD position. If pressure decreases to less than 10 in. H2O within 2 minutes, go to next step. If pressure does not decrease as specified, see DIAGNOSTIC

AIDS.

6) Disconnect fuel tank vapor and EVAP purge lines from EVAP canister. Plug fuel tank vapor line fitting at EVAP canister. Connect a hand-held vacuum pump to EVAP purge line fitting at EVAP canister. Ensure EVAP vent solenoid is still commanded ON (closed). Attempt to apply 5 in. Hg to EVAP canister. If vacuum is maintained as specified, go to step 9). If vacuum cannot be maintained as specified, go to next step.

7) Check if vent hose is disconnected or damaged. Check EVAP canister for damage. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

8) Replace EVAP vent solenoid. After replacing solenoid, go to step 11).

9) Check for missing or faulty fuel filler cap. Check for disconnected, leaking or damaged fuel tank vapor line or EVAP purge line. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

10) Using scan tool, command EVAP vent solenoid on (closed). With EVAP pressure/purge diagnostic station connected to EVAP service port, attempt to pressurize EVAP system by leaving diagnostic station control knob in PRESSURIZE position. Using Ultrasonic Leak Detector (J 41416), locate and repair EVAP system leak. It may be necessary to lower fuel tank to check connections at top of tank. After performing OBD system check, go to next step.

11) Turn ignition on, engine off. Using scan tool, command EVAP vent solenoid on (closed). Using EVAP pressure/purge diagnostic station pressurize EVAP system to 15 in. H2O. Monitor diagnostic station pressure gauge. Turn EVAP pressure/purge diagnostic station rotary switch to HOLD position. If pressure decreases to less than 10 in. H2O within 2 minutes, repeat step 3). If pressure does not decrease to less than 10 in. H2O within 2 minutes, repair is complete.

Diagnostic Aids

Check following items:

* For missing or damaged "O" rings at EVAP canister fuel vapor and purge line fittings.
* For cracks or punctures in EVAP canister.
* For damaged or disconnected source vacuum line, EVAP purge line, vent hose or fuel tank vapor line.
* For faulty connections at PCM. Inspect harness connectors for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
* For damaged harness. Inspect wiring harness to EVAP vent solenoid, EVAP purge solenoid, and fuel tank pressure sensor for intermittent open or short.

DTC P0446 - EVAP SYSTEM CANISTER VENT BLOCKED

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Evaporative (EVAP) emission system includes following components: fuel tank, EVAP vent solenoid, fuel tank pressure sensor, fuel pipes and hoses, vapor lines, fuel cap, EVAP emission canister, purge lines, and EVAP purge solenoid.

Conditions required to set DTC are:

* No IAT, MAP, ODM, or TP sensor DTCs set.
* Start-up ECT is 40-86°F (4-30°C).
* Start-up ECT is not greater than 14°F (8°C), but greater than start-up IAT.

* Start-up IAT is 40-86°F (4-30°C).
* Start-up IAT is not greater than 4°F (2°C), but greater than start-up ECT.
* Fuel tank level 15-85 percent.
* BARO greater than 75 kPa.
* Fuel tank pressure NOT -1.5 to 1.5 in. H2O when ignition is turned on.

Or

* No IAT, MAP, ODM, or TP sensor DTCs set.
* DTC P0442 test passed.
* Normal EVAP system operation is commanded (EVAP vent solenoid open, EVAP purge solenoid normal).
* Fuel tank pressure less than -10 in. H2O.
* Conditions present for 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1675 is also set, diagnose DTC P1675 before proceeding. If DTC is not set, go to next step.

3) Turn ignition on. Read and record FAIL RECORDS data for DTC P0446. Clear DTCs. Turn ignition off. Remove fuel cap. Turn ignition on. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays zero in. H2O go to next step. If scan tool does not display zero in. H2O, repair faulty fuel tank sensor circuit.

4) Zero pressure and vacuum gauges on EVAP Pressure/Purge Diagnostic Station (J 41413). Reinstall fuel cap. Using scan tool, command EVAP vent solenoid ON (closed). Connect EVAP pressure/purge diagnostic station to EVAP service port. Using EVAP pressure/purge diagnostic station, pressurize EVAP system to 5 in. H2O. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays 5 in. H2O, go to next step. If scan tool does not display 5 in. H2O, repair faulty fuel tank sensor circuit.

5) Maintain EVAP system pressure at 5 in. H2O. Using scan tool, command EVAP vent solenoid OFF (open). Monitor EVAP pressure/purge diagnostic station pressure gauge. If pressure decreases to zero in. H2O within 5 seconds, see DIAGNOSTIC AIDS. If pressure does not decrease as specified, go to next step.

6) Disconnect vent hose, marked "AIR", from EVAP canister. Switch EVAP pressure/purge diagnostic station rotary switch to PURGE. Start engine and allow it to reach operating temperature. Monitor vacuum gauge for 5 seconds while holding engine speed at 2500 RPM. If vacuum remains at less than 30 in. H2O, go to next step. If vacuum does not remain as specified, go to step 9).

7) Check if vent hose is between EVAP canister and EVAP solenoid is kinked, pinched or blocked. Repair as necessary. After repairs, go to step 10). If no problem is found, go to next step.

8) Replace EVAP vent solenoid. After replacing solenoid, go to step 10).

9) Replace EVAP canister. After replacing canister, go to next step.

10) Using scan tool, command EVAP vent solenoid ON (closed). With EVAP pressure/purge diagnostic station connected to EVAP service port, pressurize EVAP system to 5 in. H2O. Switch EVAP pressure/purge diagnostic station rotary switch to HOLD. Using scan tool, command EVAP vent solenoid OFF (open). If pressure decreases to zero in. H2O within 5 seconds, repair is complete. If pressure does not decrease as specified, return to step 3).

Diagnostic Aids

Check following items:

* For missing or damaged "O" rings at EVAP canister fuel vapor and purge line fittings. Check for kinked, pinched or plugged vent hose.
* For faulty connections at PCM. Inspect harness connectors for backed-out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal to wire connection.
* For damaged harness. Inspect wiring harness to EVAP vent solenoid, EVAP purge solenoid, and fuel tank pressure sensor for intermittent open or short.

DTC P0452 - FUEL TANK PRESSURE SENSOR LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors fuel tank pressure sensor signal to detect vacuum decay and excess vacuum during the enhanced EVAP diagnostic. Fuel tank pressure sensor measures the difference between air pressure (or vacuum) in the tank and the outside air pressure. PCM applies 5-volt reference and ground to the sensor. Sensor will return a signal voltage between 0.1-4.9 volts. If PCM detects a fuel tank pressure sensor signal that is excessively low, DTC will set.

Conditions for setting DTC:

* Ignition on.
* Fuel tank pressure sensor signal is less than 0.1 volt.
* Conditions present for 5 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition on, engine off. Monitor fuel tank pressure sensor voltage on scan tool. If scan tool reading is 0.30 volt or less, go to step 4). If scan tool reading is not 0.30 volt or less, go to next step.

3) Turn ignition on, engine off. Using scan tool, review FREEZE FRAME and/or FAILURE RECORDS data for this DTC and observe parameters. Turn ignition off for 15 seconds. Start and operate vehicle within conditions required for this DTC to run. Using scan tool, select DTC option, SPECIFIC DTC option, then enter this DTC. If scan tool indicates that this diagnostic failed this ignition cycle, go to next step. If scan tool does not indicate that this diagnostic failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Disconnect fuel tank pressure sensor connector. Jumper fuel tank pressure sensor 5-volt reference circuit and signal circuit at harness connector. Using scan tool observe fuel tank pressure sensor voltage. If scan tool display reads 5 volts, go to step 8). If scan tool display does not read 5 volts, go to next step.

5) Check voltage between 5-volt reference voltage circuit and sensor ground circuit at fuel tank pressure sensor harness connector. If voltage reading is 5 volts, go to step 9). If voltage reading is not 5 volts, go to next step.

6) Turn ignition off. Disconnect PCM harness connector. Check 5-volt reference circuit for poor connection at PCM connector. Repair as necessary. After repairs, go to step 13). If connection is okay, go to next step.

7) Check 5-volt reference circuit between fuel tank pressure sensor and PCM for open, short to ground, or short to sensor ground circuit. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 12).

8) Check for poor terminal connections at fuel tank pressure sensor connector. Repair as necessary. After repairs, go to step 13). If connections are okay, go to step 11).

9) Turn ignition off. Disconnect PCM harness connector. Check fuel tank pressure signal circuit for poor connection at PCM connector. Repair as necessary. After repairs, go to step 13). If connection is okay, go to next step.

10) Check fuel tank pressure signal circuit between the fuel tank pressure sensor connector and PCM for an open, short to ground, or short to sensor ground circuit. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 12).

11) Replace fuel tank pressure sensor. After replacing sensor, go to step 13).

12) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

13) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter DTC P0443. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool does not indicate that this test ran and passed, repeat step 2).

Diagnostic Aids

An intermittent open in the signal or 5-volt reference circuit or connectors will set DTC. Wiggle harnesses and connectors while monitoring tank pressure voltage. Review malfunction history data and attempt to reproduce the condition and fault.

DTC P0453 - FUEL TANK PRESSURE SENSOR HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors fuel tank pressure sensor signal to detect vacuum decay and excess vacuum during the enhanced EVAP diagnostic. Fuel tank pressure sensor measures the difference between air pressure (or vacuum) in the tank and the outside air pressure. PCM applies 5-volt reference and ground to the sensor. Sensor will return a signal voltage between 0.1-4.9 volts. If PCM detects a fuel tank pressure sensor signal that is excessively low, DTC will set.

Conditions for setting DTC:

* Ignition on.
* Fuel tank pressure sensor signal is greater than 4.8 volt.
* Conditions present for 5 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition on, engine off. Monitor fuel tank pressure sensor voltage on scan tool. If scan tool reading is greater than 4.7 volts, go to step 4). If scan tool reading is not greater 4.7 volts, go to next step.

3) Turn ignition on, engine off. Using scan tool, review FREEZE FRAME and/or FAILURE RECORDS data for this DTC and observe parameters. Turn ignition off for 15 seconds. Start and operate vehicle within conditions required for this DTC to run. Using scan tool, select DTC option, SPECIFIC DTC option, then enter this DTC. If scan tool indicates that this diagnostic failed this ignition cycle, go to next step. If scan tool does not indicate that this diagnostic failed this ignition cycle, see DIAGNOSTIC AIDS.

4) Disconnect fuel tank pressure sensor connector. Using scan tool observe fuel tank pressure sensor voltage. If scan tool display

reads about zero volts, go to step 6). If scan tool display is not about zero volts, go to next step.

5) Turn ignition off. Disconnect PCM harness connector. Check fuel tank pressure signal circuit for short to voltage or short to 5-volt reference circuit. Repair as necessary. After repairs, go to step 11). If connection is okay, go to step 10).

6) Turn ignition off. Disconnect PCM harness connector. Check fuel tank pressure ground circuit for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

7) Check for open in fuel tank pressure sensor ground circuit. Repair as necessary. After repairs, go to step 11). If circuit is okay, go to next step.

8) Check for poor terminal connections at fuel tank pressure sensor connector. Repair as necessary. After repairs, go to step 11). If connections are okay, go to next step.

9) Replace fuel tank pressure sensor. After replacing sensor, go to step 11).

10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

11) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter this DTC. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool does not indicate that this test ran and passed, repeat step 2).

12) Check for additional DTCs set. Diagnose affected DTCs. If no additional DTCs are set, system is okay.

Diagnostic Aids

Check for damaged harness or poor connection at PCM or fuel tank pressure sensor.

DTC P0506 - IAC SYSTEM RPM LOW

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls idle speed with an Idle Air Control (IAC) valve to a calculated RPM based on sensor inputs and actual engine RPM. PCM moves IAC valve in or out to vary amount of airflow into intake manifold and thus decrease or increase idle RPM.

PCM commands IAC in counts. A higher count, allows more air to by-pass throttle plate (higher idle).

Conditions required to set DTC are:

* No CKP, ECT, IAT, MAF, MAP, TP or VSS sensor DTCs set.
* No EVAP solenoid, EVAP system, fuel trim, fuel injector, EGR flow or EGR pintle position DTCs set.
* ECT greater than 158°F (70°C).
* Engine running greater than 5 seconds.
* Vehicle speed less than 3 MPH.
* IAT greater than -4°F (-20°C).
* Throttle closed.
* Engine speed greater than 175 RPM lower than desired idle.
* Conditions present for greater than 15 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, read DTCs. If any other DTCs are set, diagnose affected DTCs before proceeding. If no other DTCs are set, go

to next step.

3) Start engine. Turn all accessories off. Using scan tool, monitor ENGINE SPEED and command engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. If ENGINE SPEED remains within 100 RPM of desired RPM for each command, see DIAGNOSTIC AIDS. If ENGINE SPEED is not as specified, to next step.

4) Disconnect IAC harness connector. Install IAC Node Light (J 37027) in IAC harness connector. Monitor node lights while commanding engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. Both node lights should cycle Green and Red, but not off as RPM changes from 500-1500 RPM. If lights flash as specified, go to step 6). If lights do not flash as specified, go to next step.

5) Check IAC "A" high and low, and IAC "B" high and low circuits for open, short to voltage or short to ground. Repair as necessary. After repairs, go to step 11). If circuits are okay, go to step 9).

6) Ensure throttle stop screw has not been tampered with. Check for stuck IAC valve or throttle linkage. Check for restrictions, collapse or blockage in air intake system, air ducts or air filter. Check throttle body bore and IAC for excessive deposits. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

7) Check for faulty connection at IAC harness connector. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

8) Replace IAC valve. After replacing IAC valve, go to step 11).

9) Check for faulty connection at PCM harness connector. If faulty connection is found, repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

11) Start engine. Turn all accessories off. Using scan tool, monitor ENGINE SPEED and command engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. If ENGINE SPEED remains within 100 RPM of desired RPM for each command, repair is complete. If ENGINE SPEED is not as specified, return to step 2).

Diagnostic Aids

Check for faulty connection at IAC and PCM connectors. Check for damaged harness. Check for restrictions, collapse or blockage in air intake system, air ducts or air filter. Check throttle body bore and IAC for excessive deposits. Check for large vacuum leak, such as incorrectly installed PCV valve or disconnected brake booster hose. Check for restricted air intake system.

DTC P0507 - IAC SYSTEM RPM HIGH

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM controls idle speed with an Idle Air Control (IAC) valve to a calculated RPM based on sensor inputs and actual engine RPM. PCM moves IAC valve in or out to vary amount of airflow into intake manifold and thus decrease or increase idle RPM.

PCM commands IAC in counts. A higher count, allows more air to by-pass throttle plate (higher idle).

Conditions required to set DTC are:

* No CKP, ECT, IAT, MAF, MAP, TP or VSS sensor DTCs set.
* No EVAP solenoid, EVAP system, fuel trim, fuel injector, EGR flow or EGR pintle position DTCs set.
* ECT greater than 158°F (70°C).

* Engine running at least 5 seconds.
* BARO greater than 65 kPa.
* Vehicle speed less than 3 MPH.
* IAT greater than -4°F (-20°C).
* Throttle closed.
* Engine speed greater than 175 RPM, higher than desired idle.
* Conditions met for longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, read DTCs. If any other DTCs are set, diagnose affected DTCs before proceeding. If no other DTCs are set, go to next step.

3) Start engine. Turn all accessories off. Using scan tool, monitor ENGINE SPEED and command engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. If ENGINE SPEED remains within 100 RPM of desired RPM for each command, see DIAGNOSTIC AIDS. If ENGINE SPEED is not as specified, to next step.

4) Disconnect IAC harness connector. Install IAC Node Light (J 37027) in IAC harness connector. Monitor node lights while commanding engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. Both node lights should cycle Green and Red, but not OFF as RPM changes from 500-1500 RPM. If lights flash as specified, go to step 6). If lights do not flash as specified, go to next step.

5) Check IAC "A" high and low, and "B" high and low circuits for open, short to voltage or short to ground. Repair as necessary. After repairs, go to step 11). If circuits are okay, go to step 9).

6) Check for vacuum leaks. Ensure throttle stop screw has not been tampered with. Check for throttle plate or shaft binding. Check accelerator and speed control cables for misadjustment or binding. Check for faulty, missing or incorrectly installed PCV valve. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

7) Check for faulty connection at IAC harness connector. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

8) Replace IAC valve. After replacing IAC valve, go to step 11).

9) Check for faulty connection at PCM harness connector. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

11) Start engine. Turn all accessories off. Using scan tool, monitor ENGINE SPEED and command engine speed up to 1500 RPM, down to 500 RPM, and up to 1500 RPM. If ENGINE SPEED remains within 100 RPM of desired RPM for each command, repair is complete. If ENGINE SPEED is not as specified, return to step 2).

Diagnostic Aids

Check for faulty connection at IAC and PCM connectors. Check for damaged harness. Check for vacuum leaks. Check throttle body bore and IAC for excessive deposits. Check throttle plate for sticking.

DTC P0530 - A/C REFRIGERANT PRESSURE SENSOR CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM uses input signal from A/C refrigerant pressure sensor to determine if it should turn on engine coolant fans. When signal is out

of range, DTC P0530 sets and PCM will not allow A/C clutch to engage.

Conditions required to set DTC are:

* Engine running.
* A/C is requested.
* A/C refrigerant pressure sensor signal less than 0.1 volt.
* A/C refrigerant pressure sensor signal greater than 4.9 volts.
* Conditions present longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, read A/C refrigerant pressure sensor voltage. If voltage is less than 0.1 volt, go to step 5). If voltage is not less than 0.1 volt, go to next step.

3) If voltage is greater than 4.8 volts, go to next step. If voltage is not greater than 4.8 volts, go to DIAGNOSTIC AIDS.

4) While observing scan tool, disconnect A/C refrigerant pressure sensor connector. If voltage is about zero volts, go to step 12). If voltage is not as specified, go to step 11).

5) Disconnect A/C refrigerant pressure sensor connector. Connect a fused jumper wire between A/C refrigerant pressure sensor harness connector 5-volt reference and signal circuit. If voltage is about 5 volts, go to step 16). If voltage is not as specified, go to next step.

6) Using a DVOM, check voltage between A/C pressure sensor harness connector 5-volt reference and ground circuits. If voltage is about 5 volts, go to step 9). If voltage is not as specified, go to next step.

7) Check for faulty 5-volt reference circuit connection at PCM. If faulty connection is found, go to step 17). If connection is okay, go to next step.

8) Check for open or a faulty splice in 5-volt reference circuit. If problem is found, go to step 18). If no problem is found, go to step 13).

9) Check A/C refrigerant signal circuit for faulty connection at PCM. If faulty connection is found, go to step 17). If connection is okay, go to next step.

10) Check A/C refrigerant pressure signal circuit between A/C refrigerant pressure sensor connector and PCM for open or short to ground. If problem is found, go to step 18). If no problem is found, go to step 20).

11) Check A/C refrigerant pressure signal circuit between A/C refrigerant pressure sensor connector and PCM for short to voltage. If problem is found, go to step 18). If no problem is found, go to step 20).

12) Check 5-volt reference circuit for short to voltage. Repair as necessary. After repairs, go to step 18). If no problem is found, go to next step.

13) Check for faulty sensor ground circuit terminal connection at PCM. If faulty connection is found, go to step 17). If connection is okay, go to next step.

14) Check for faulty sensor ground circuit terminal connection at A/C refrigerant pressure sensor connector. If faulty connection is found, go to step 17). If connection is okay, go to next step.

15) Check for open or faulty splice in sensor ground circuit. If a problem is found, go to step 18). If no problem is found, go to step 19).

16) Check for faulty 5-volt reference or A/C refrigerant pressure signal circuit terminal connection at A/C refrigerant

pressure sensor. If faulty connection is found, go to next step. If connections are okay, go to step 19).

17) Replace faulty harness connector terminal. After repairs, go to step 21).

18) Locate and repair open/short circuit in wiring harness as necessary. After repairs, go to step 21).

19) Replace A/C refrigerant pressure sensor. After replacing sensor, go to step 21).

20) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

21) Using scan tool, clear DTCs. Read A/C refrigerant pressure sensor voltage. If voltage is 0.1-4.8 volts, repair is complete. If voltage is not as specified, return to step 2).

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool A/C refrigerant pressure sensor display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0560 - SYSTEM VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors system voltage on PCM ignition feed circuit. If system voltage is out of range, DTC P0560 will set.

Conditions required to set DTC are:

* Engine is running.
* System voltage monitored at PCM ignition feed circuit is less than 9 or greater than 16 volts.
* Conditions present for greater than 2 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1635 is also set, diagnose DTC P1635 before proceeding. If DTC is not set, go to next step.

3) Start and run engine at greater than 1000 RPM. Using scan tool, observe IGNITION 1 voltage on ENG. 2 DATA LIST. If voltage is 10-16 volts, go to step 5). If voltage is not 10-16 volts, go to next step.

4) Read and record FAIL RECORDS data for DTC P0560. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC while operating vehicle. Continue operating vehicle until DTC P0560 test runs. If scan tool displays DTC P0560 FAILED THIS IGN, go to next step. If scan tool does not display DTC P0560 FAILED THIS IGN, see DIAGNOSTIC AIDS.

5) Install DVOM between battery terminals. Monitor DVOM while running engine at greater than 1000 RPM. If voltage is 10-16 volts, go to next step. If voltage is not 10-16 volts, go to step 7).

6) Turn headlights on and place A/C switch on high. Monitor DVOM while running engine at greater than 2000 RPM. If voltage is 10-16 volts, go to step 8). If voltage is not 10-16 volts, go to next step.

7) Turn ignition off. Disconnect generator electrical connector. Turn ignition on. Connect DVOM between generator harness connector control circuit and engine ground. Using scan tool, command GEN L TERM on. If voltage is 10-16 volts, go to step 12). If voltage is not 10-16 volts, go to step 10).

8) Compare IGNITION 1 voltage display on scan tool with DVOM

voltage reading. If both values are close, see DIAGNOSTIC AIDS. If both values are not close, go to next step.

9) Check PCM ignition feed circuit for poor connection between ignition switch and PCM. Repair as necessary. After repairs, go to step 14). If no problem is found, go to step 13).

10) Check generator control circuit for open or short to ground between generator and PCM. Repair as necessary. After repairs, go to step 14). If no problem is found, go to next step.

11) Check generator control circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 14). If no problem is found, go to step 13).

12) Check generator control circuit for faulty connection at generator. Repair as necessary. After repairs, go to step 14). If no problem is found, see DIAGNOSTIC AIDS.

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Clear DTCs. Start and run engine at greater than 1000 RPM. Using scan tool, observe IGNITION 1 voltage on ENG. 2 DATA LIST. If voltage is 10-16 volts, repair is complete. If voltage is not 10-16 volts, return to step 2).

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool IGNITION 1 voltage display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0601 - PCM MEMORY

Circuit Description

PCM uses an Electrically Erasable Programmable Read Only Memory (EEPROM). EEPROM contains program information and calibrations required for engine, transaxle, and powertrain diagnostics operation.

Condition required to set DTC is:

* PCM detects an internal program fault (check sum error).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, repeat OBD system check.

Diagnostic Aids

Only possible repair is replacement and programming of PCM.

DTC P0602 - PCM NOT PROGRAMMED

Circuit Description

PCM uses an Electrically Erasable Programmable Read Only Memory (EEPROM). EEPROM contains program information and calibrations required for engine, transaxle, and powertrain diagnostics operation.

Condition required to set DTC is:

* PCM does not contain correct program(s) required to operate vehicle.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using special equipment, program PCM with correct software. Using scan tool, retest for DTC P0602. If DTC P0602 sets, go

to next step. If DTC does not set, repair is complete.

3) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, repeat OBD system check.

DTC P0705 - TRANSAXLE RANGE SWITCH CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Transaxle Range Switch (TRS) is part of Park/Neutral Position (PNP) switch. Inputs from TRS indicate to PCM which position is selected by gear selector lever. PCM uses this information for ignition timing, EVAP canister purge, EGR and IAC valve operation.

Combination of 4 TRS input states determine PCM commanded shift pattern. Input voltage level at PCM is high when TRS is open, and low when TRS is closed. A problem which causes PCM to detect an invalid transaxle range input combination will set DTC P0705.

Condition for setting DTC:

* TRS inputs indicate an invalid combination for more than 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on, engine off. Place gear selector in Park. Using scan tool, read TR PABC display. If scan tool displays P=O A=O B=X C=X, go to next step. If display is not as specified, go to step 4).

3) Observe scan tool display while placing gear selector in each gear position. Record TR PABC status for each gear position. Compare scan tool display for each gear position with TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS table. If scan tool display matches table entries for each gear selected, see DIAGNOSTIC AIDS. If scan tool display does not match table entries, go to step 10).

TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS TABLE

Gear Selector Position	Scan Tool TR PABC Display
Park	P=O A=O B=X C=X
Reverse	P=X A=O B=O C=X
Neutral	P=O A=X B=O C=X
Drive 4	P=X A=X B=O C=O
Drive 3	P=O A=O B=O C=O
Drive 2	P=X A=O B=X C=O
Drive 1	P=O A=X B=X C=O

4) If scan tool displays P=X A=X B=X C=X, go to next step. If display is not as specified, go to step 7).

5) Check if TRS 4-pin harness connector is disconnected or damaged. Repair as necessary. After repairs, go to step 17). If no problem is found, go to next step.

6) Check for open in TRS 7-pin harness connector ground circuit. Repair as necessary. After repairs, go to step 17). If circuit is okay, go to step 13).

7) If scan tool displays P=O A=O B=O C=O, go to next step. If display is not as specified, return to step 3).

8) Disconnect TRS 4-pin harness connector. If scan tool displays P=O A=O B=O C=O, go to next step. If display is not as

specified, go to step 14).

9) Turn ignition off. Disconnect PCM. Check TRS input circuit for being pinched or shorted to ground. Repair as necessary. After repairs, go to step 17). If no problem is found, go to step 16).

10) Ensure wires in TRS 4-pin harness connector are not crossed. Repair as necessary. After repairs, go to step 17). If no problem is found, go to next step.

11) Turn ignition off. Disconnect PCM and TRS. Turn ignition on. Check for open, short to ground or short to voltage in circuit which caused incorrect TRS input combination. Repair as necessary. After repairs, go to step 17). If no problem is found, go to next step.

12) Reconnect TRS. Connect a test light between battery voltage and TRS circuit which caused incorrect TRS input combination at PCM. Observe and record state of test light while selecting each gear position. Compare state of test light in each gear position with TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS table. If test light illuminates when input state should be "O" and off when input state should equal "X", go to step 15). If test light illuminates as specified, go to next step.

13) Check for faulty connection at TRS 4-pin and 7-pin connectors. Repair as necessary. After repairs, go to step 17). If no problem is found, go to next step.

14) Replace TRS. After replacing switch, go to step 17).

15) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 17). If no problem is found, go to next step.

16) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

17) Clear DTCs. Observe scan tool display while placing gear selector in each gear position. Record TR PABC status for each gear position. Compare scan tool display for each gear position with TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS table. If scan tool display matches table entries for each gear selected, repair is complete. If scan tool display does not match table entries, return to step 2).

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool TR PABC display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P0706 - TRANSAXLE RANGE SYSTEM PERFORMANCE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Transaxle Range Switch (TRS) is part of Park/Neutral Position (PNP) switch. Inputs from TRS indicate to PCM which position is selected by gear selector lever. PCM uses this information for ignition timing, EVAP canister purge, EGR and IAC valve operation.

Combination of 4 TRS input states determine PCM commanded shift pattern. Input voltage level at PCM is high when TRS is open, and low when TRS is closed. If PCM detects engine start-up in any gear other than Park or Neutral, DTC P0706 is set.

Conditions for setting DTC:

* System voltage greater than 9 volts.
* TRS inputs indicate a gear position other than Park or Neutral during start-up.
* Conditions present longer than 3 consecutive start-ups.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P0705 is also set, diagnose DTC P0705 before proceeding. If DTC is not set, go to next step.

3) Turn ignition on. Place gear selector in Park. Using scan tool, read TRANS RANGE display. If scan tool displays P-N, go to next step. If scan tool does not display P-N, go to step 5).

4) Place gear selector in Neutral. Read scan tool TRANS RANGE display. If scan tool displays P-N, see DIAGNOSTIC AIDS. If scan tool does not display P-N, go to next step.

5) Read scan tool TR PABC display. If scan tool displays P=O A=O B=O C=O, go to next step. If display is not as specified, go to step 10).

6) Disconnect TRS 4-pin harness connector. If scan tool displays P=O A=O B=O C=O, go to next step. If display is not as specified, go to step 8).

7) Turn ignition off. Disconnect PCM harness connector. Check TRS input circuit for being pinched or shorted to ground. Repair as necessary. After repairs, go to step 12). If no problem is found, go to step 11).

8) Attempt to adjust PNP/TRS switch. Read scan tool TRANS RANGE display with Park and Neutral selected. If scan tool displays P-N, go to step 12). If scan tool does not display P-N, go to next step.

9) Ensure wires in TRS 4-pin harness connector are not crossed. Repair as necessary. After repairs, go to step 12). If no problem is found, go to next step.

10) Replace TRS. After replacing switch, go to step 12).

11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

12) Clear DTCs. Observe scan tool display while placing gear selector in each gear position. Record TR PABC status for each gear position. Compare scan tool display for each gear position with TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS table. If scan tool display matches table entries for each gear selected, repair is complete. If scan tool display does not match table entries, return to step 3).

TRANSAXLE RANGE SWITCH VALID INPUT COMBINATIONS TABLE

Gear Selector Position	Scan Tool TR PABC Display
Park	P=O A=O B=X C=X
Reverse	P=X A=O B=O C=X
Neutral	P=O A=X B=O C=X
Drive 4	P=X A=X B=O C=O
Drive 3	P=O A=O B=O C=O
Drive 2	P=X A=O B=X C=O
Drive 1	P=O A=X B=X C=O

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool TR PABC display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P1106 - MAP SENSOR CIRCUIT INTERMITTENT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Manifold Absolute Pressure (MAP) sensor responds to changes

in intake manifold pressure. PCM supplies 5-volt reference and ground for MAP sensor. MAP sensor provides a signal to the PCM relative to pressure changes in intake manifold pressure (vacuum). A low voltage signal, about 2 volts on VIN K or 1.5-2.5 volts on VIN 1, is sent to PCM on signal circuit at closed throttle (high vacuum) idle. A high voltage signal, about 4 volts or greater on both engines, is sent at wide open throttle (low vacuum).

Conditions for setting DTC:

* No TP sensor DTCs set.
* Ignition on.
* TP ANGLE steady and less than 5 percent with engine speed less than 1000 RPM, or steady and less than 10 percent with engine speed greater than 1000 RPM.
* MAP sensor intermittently indicates MAP greater than 12.8 psi (0.90 kg/cm²).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0108 is also set, diagnose DTC P0108 before proceeding. If DTC is not set, go to next step.

3) If DTC P1111, P1115, and/or P1121 is also set, go to step 6). If none of these DTCs are set, go to next step.

4) Check for faulty sensor ground circuit terminal at MAP sensor. If problem is found, go to step 9). If no problem is found, go to next step.

5) Check MAP signal circuit between MAP sensor harness connector and PCM for intermittent short to voltage. If a problem is found, go to step 10). If no problem is found, go to step 8).

6) Check for intermittent short to voltage on 5-volt reference circuit between PCM and MAP, EGR and TP sensors. If a problem is found, go to step 10). If no problem is found, go to next step.

7) Check for faulty ground circuit terminal connection at PCM. If problem is found, go to step 9). If no problem is found, go to next step.

8) Check for intermittent open or faulty splice in sensor ground circuit. If a problem is found, go to step 10). If no problem is found, see DIAGNOSTIC AIDS.

9) Replace faulty connector terminal. After repairs, go to step 11).

10) Locate and repair intermittent open/short circuit. After repairs, go to next step.

11) Read and record FAIL RECORDS data for DTC P1106. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool MAP display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P1107 - MAP SENSOR CIRCUIT INTERMITTENT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Manifold Absolute Pressure (MAP) sensor responds to changes

in intake manifold pressure. PCM supplies 5-volt reference and ground for MAP sensor. MAP sensor provides a signal to the PCM relative to pressure changes in intake manifold pressure (vacuum). A low voltage signal, (about 2 volts on VIN K, or 1.5-2.5 volts on VIN 1) is sent to PCM on signal circuit at closed throttle (high vacuum) idle. A high voltage signal, about 4 volts or greater on both engines, is sent at wide open throttle (low vacuum).

Conditions required to set DTC are:

* No TP sensor DTCs set.
* Ignition on.
* TP angle steady and greater than 6 percent with engine speed greater than 1000 RPM.
* MAP sensor intermittently indicates MAP at less than 2.8 psi (0.20 kg/cm²).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0107 is also set, diagnose DTC P0107 before proceeding. If DTC is not set, go to next step.

3) If DTC P1122 is also set, go to step 6). If DTC is not set, go to next step.

4) Check for faulty 5-volt reference or signal circuit connection at MAP sensor. If a problem is found, go to step 9). If no problem is found, go to next step.

5) Check signal circuit between MAP sensor and PCM for intermittent open or short to ground. If problem is found, go to step 10). If no problem is found, go to step 8).

6) Check for intermittent short to ground on 5-volt reference circuit between PCM and EGR valve, MAP and TP sensors. If a problem is found, go to step 10). If no problem is found, go to next step.

7) Check for faulty 5-volt reference circuit connection at PCM. If faulty connection is found, go to step 9). If connection is okay, go to next step.

8) Check for intermittent open or faulty splice in 5-volt reference circuit. If a problem is found, go to step 10). If no problem is found, see DIAGNOSTIC AIDS.

9) Replace faulty connector terminal(s). After replacing terminals, go to step 11).

10) Repair circuit as necessary. After repairs, go to next step.

11) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1107. If scan tool displays DTC P1107 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1107 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool MAP display while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1111 - IAT SENSOR CIRCUIT INTERMITTENT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Intake Air Temperature (IAT) sensor is a thermistor. PCM applies and reads a 5-volt reference signal to sensor. When air is cold, sensor resistance is high and PCM will measure a high signal

voltage. If air is warm, sensor resistance is low causing PCM to measure low voltage.

Conditions required to set DTC are:

* No ECT, MAF or VSS sensor DTCs set.
* Engine running longer than 3 minutes.
* ECT greater than 140°F (60°C).
* Vehicle speed less than 35 MPH.
* IAT intermittently less than -38°F (-39°C).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0113 is also set, diagnose DTC P0113 before proceeding. If DTC is not set, go to next step.

3) If DTC P1106, P1115, and/or P1121 is also set, go to step 6). If DTC P1106, P1115, and/or P1121 is not set, go to next step.

4) Check for faulty sensor ground circuit terminal at IAT sensor. Repair as necessary. After repairs, go to step 10). If no problem is found, go to next step.

5) Check for faulty signal circuit connection at IAT sensor. Repair as necessary. After repairs, go to step 10). If connection is okay, go to next step.

6) Check IAT signal circuit between IAT sensor connector and PCM for intermittent open. Repair as necessary. After repairs, go to step 10). If circuit is okay, go to next step.

7) Check IAT signal circuit between IAT sensor harness connector and PCM for intermittent short to voltage. Repair as necessary. After repairs, go to step 10). If no short to voltage is found, go to next step.

8) Check for faulty ground circuit terminal connection at PCM. Repair as necessary. After repairs, go to step 10). If no problem is found, go to next step.

9) Check for intermittent open or faulty splice in sensor ground circuit. Repair as necessary. After repairs, go to next step. If circuit is okay, see DIAGNOSTIC AIDS.

10) Read and record FAIL RECORDS data for DTC P1111. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1111 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1111 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool IAT display while moving all related harnesses and connectors. A change in scan tool display indicates fault location. Check for skewed IAT sensor. See IAT TEMPERATURE-TO-RESISTANCE VALUES table.

DTC P1112 - IAT SENSOR CIRCUIT INTERMITTENT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Intake Air Temperature (IAT) sensor is a thermistor. PCM applies and reads a 5-volt reference signal to sensor. When air is cold, sensor resistance is high and PCM will measure a high signal voltage. If air is warm, sensor resistance is low causing PCM to measure low voltage.

Conditions for setting DTC:

* No ECT, MAF, or VSS sensor DTCs set.

* Vehicle speed greater than 25 MPH.
* Engine running longer than 10 seconds.
* IAT sensor voltage intermittently less than 0.14 volt.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0112 is also set, diagnose DTC P0112 before proceeding. If DTC is not set, go to next step.

3) Check IAT signal circuit between IAT sensor harness connector and PCM for intermittent short to ground. Repair as necessary. After repairs, go to next step. If no short to ground is found, see DIAGNOSTIC AIDS.

4) Read and record FAIL RECORDS data for DTC P1112. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1112 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1112 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool IAT display while moving all related harnesses and connectors. A change in scan tool display indicates fault location. Check for skewed IAT sensor.

DTC P1114 - ECT SENSOR CIRCUIT INTERMITTENT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Engine Coolant Temperature (ECT) sensor is a thermistor that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. High temperature will result in a low signal voltage. DTC will set when PCM sees an ECT sensor voltage intermittently less than 0.14 volt.

Conditions for setting DTC:

* Engine running for 3 seconds.
* ECT voltage intermittently less than 0.74 volt.
* ECT sensor intermittently indicates ECT greater than 237°F (114°C).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0117 is also set, diagnose DTC P0117 before proceeding. If DTC is not set, go to next step.

3) Check ECT signal circuit between ECT sensor harness connector and PCM for intermittent short to ground. Repair as necessary. After repairs, go to next step. If no short to ground is found, see DIAGNOSTIC AIDS.

4) Read and record FAIL RECORDS data for DTC P1114. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1114 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1114 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan

tool IAT display while moving all related harnesses and connectors. A change in scan tool display indicates fault location. Check for skewed ECT sensor. See ECT TEMPERATURE-TO-RESISTANCE VALUES table.

DTC P1115 - ECT SENSOR CIRCUIT INTERMITTENT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Engine Coolant Temperature (ECT) sensor is a thermistor, that varies resistance based on temperature. As temperature of sensor increases, resistance decreases. High temperature will result in a low signal voltage. DTC will set when PCM sees an ECT sensor voltage intermittently greater than 4.8 volts.

Conditions required to set DTC are:

* Engine running for 3 seconds.
* ECT voltage intermittently greater than 4.8 volts.
* ECT sensor intermittently indicates ECT at less than -29°F (-34°C).

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0118 is also set, diagnose DTC P0118 before proceeding. If DTC is not set, go to next step.

3) If DTC P1106, P1111, and/or P1121 is also set, go to step 8). If these DTCs are not set, go to next step.

4) Check for faulty sensor ground circuit terminal at ECT sensor. Repair as necessary. After repairs, go to step 10). If no problem is found, go to next step.

5) Check for faulty signal circuit connection at ECT sensor. Repair as necessary. After repairs, go to step 10). If connection is okay, go to next step.

6) Check ECT signal circuit between ECT sensor and PCM connector for intermittent open. Repair as necessary. After repairs are complete, go to step 10). If circuit is okay, go to next step.

7) Check ECT signal circuit between ECT sensor and PCM for intermittent short to voltage. Repair as necessary. After repairs, go to step 10). If no short to voltage is found, go to next step.

8) Check for faulty ground circuit terminal connection at PCM. Repair as necessary. After repairs, go to step 10). If no problem is found, go to next step.

9) Check for intermittent open or faulty splice in sensor ground circuit. Repair as necessary. After repairs, go to next step. If no problem is found, see DIAGNOSTIC AIDS.

10) Read and record FAIL RECORDS data for DTC P1115. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1115 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1115 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool ECT display while moving all related harnesses and connectors. A change in scan tool display indicates fault location. Check for skewed ECT sensor. See ECT TEMPERATURE-TO-RESISTANCE VALUES table.

DTC P1121 - TP SENSOR CIRCUIT INTERMITTENT HIGH VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Throttle Position (TP) sensor measures amount of throttle opening. PCM uses TP sensor information for fuel delivery calculations. TP sensor readings during acceleration are much higher than those during deceleration or idle. DTC P1121 sets if PCM senses TP sensor voltage intermittently greater than 4.7 volts.

Conditions for setting DTC:

* Ignition is on.
* TP signal voltage is intermittently greater than 4.7 volts.
* Conditions present longer than 5 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0123 is also set, diagnose DTC P0123 before proceeding. If DTC is not set, go to next step.

3) If DTC P1106, P1111, and/or P1115 is also set, go to step 6). If these DTCs are set, go to next step.

4) Check for faulty sensor ground circuit terminal at TP sensor. If problem is found, go to step 9). If no problem is found, go to next step.

5) Check TP signal circuit between TP sensor harness connector and PCM for intermittent short to voltage. If a problem is found, go to step 10). If no problem is found, go to step 8).

6) Check for intermittent short to voltage on 5-volt reference circuit between PCM and MAP, EGR and TP sensors. If a problem is found, go to step 10). If no problem is found, go to next step.

7) Check for faulty ground circuit terminal connection at PCM. If problem is found, go to step 9). If no problem is found, go to next step.

8) Check for intermittent open or faulty splice in sensor ground circuit. If a problem is found, go to step 10). If no problem is found, see DIAGNOSTIC AIDS.

9) Replace faulty connector terminal. After repairs, go to step 11).

10) Locate and repair intermittent open/short circuit and go to next step.

11) Read and record FAIL RECORDS data for DTC P1121. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1121 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1121 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool TP display while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1122 - TP SENSOR CIRCUIT INTERMITTENT LOW VOLTAGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Throttle Position (TP) sensor measures amount of throttle opening. PCM uses TP sensor information for fuel delivery calculations. TP sensor readings during acceleration are much higher than those during deceleration or idle. DTC P1121 sets if PCM senses TP sensor voltage intermittently less than 0.15 volt.

Conditions required to set DTC are:

* Ignition on.
* TP signal voltage is intermittently less than 0.16 volt.
* Conditions present longer than 5 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If DTC P0122 is also set, diagnose DTC P0122 before proceeding. If DTC is not set, go to next step.

3) If DTC P1107 is also set, go to step 6). If DTC is not set, go to next step.

4) Check for faulty 5-volt reference or signal circuit connection at TP sensor. If a problem is found, go to step 9). If no problem is found, go to next step.

5) Check signal circuit between TP sensor and PCM for intermittent open or short to ground. If problem is found, go to step 10). If no problem is found, go to step 8).

6) Check for intermittent short to ground on 5-volt reference circuit between PCM and EGR valve, MAP and TP sensors. If a problem is found, go to step 10). If no problem is found, go to next step.

7) Check for faulty 5-volt reference circuit connection at PCM. If faulty connection is found, go to step 9). If connection is okay, go to next step.

8) Check for intermittent open or faulty splice in 5-volt reference circuit. If a problem is found, go to step 10). If no problem is found, see DIAGNOSTIC AIDS.

9) Replace faulty connector terminal(s). After repairs, go to step 11).

10) Repair circuit as necessary. After repairs, go to next step.

11) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1122. If scan tool displays DTC P1122 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1122 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool TP display while moving all related harness and connectors. A change in scan tool display indicates fault location.

DTC P1133 - HO2S INSUFFICIENT SWITCHING SENSOR 1

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors Heated Oxygen Sensor (HO2S) activity for 100 seconds. PCM determines if HO2S 1 is functioning properly by counting number of HO2S 1 Lean/Rich (L/R) and Rich/Lean (R/L) switches. If PCM determines that HO2S 1 did not switch enough times, DTC 1133 is set.

Conditions required to set DTC are:

* No fuel trim, injector or HO2S 1 heater circuit DTCs set.
* No ECT, IAT, MAF, MAP, or TP sensor DTCs set.
* No EGR or EVAP DTCs set.
* Engine operating in closed loop mode.
* Conditions present during 100 second monitoring period.
* TP angle value 10-20 percent.
* L/R and R/L switches less than 50 on VIN 1.

* L/R and R/L switches less than 40 on VIN K.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If any DTC other than P1133 or P1134 sets, diagnose affected DTC before proceeding. If no other DTC sets, start engine and allow it to idle. Operate vehicle within conditions required to set DTC. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1133 FAILED THIS IGN, go to next step. If scan tool does not display DTC P1133 FAILED THIS IGN, go to DIAGNOSTIC AIDS.

3) Check exhaust system for leaks. Repair as necessary. After repairs, go to step 11). If no exhaust leak is found, go to next step.

4) Visually inspect HO2S 1 for secure installation or corrosion on terminals. Check terminal tension at HO2S 1 and PCM. Check for damaged wiring. If a problem is found, go to step 8). If no problem is found, go to next step.

5) Disconnect HO2S 1 harness connector. Connect a jumper wire between HO2S 1 harness connector ground circuit and chassis ground. Using scan tool, read HO2S 1 voltage. If voltage is about 0.45 volt, go to next step. If voltage is not as specified, go to step 9).

6) Connect a jumper wire between HO2S 1 harness connector signal and ground circuits, and chassis ground. If voltage is less than 0.3 volt, go to next step. If voltage is not less than 0.3 volt, go to step 10).

7) Repair condition causing fuel, sealant, oil or coolant contamination. Replace affected HO2S. After repairs, go to step 11).

8) Repair condition as necessary. After repairs, go to step 11).

9) Repair open HO2S 1 ground circuit or HO2S 1 signal circuit shorted to ground. After repairs, go to step 11).

10) Repair open HO2S 1 signal circuit or faulty PCM connections as necessary. After repairs, go to next step.

11) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1133. If scan tool displays DTC P1133 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1133 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check HO2S 1 heater operation. If HO2S 1 heater operation is okay, replace HO2S 1.

DTC P1134 - HO2S TRANSITION TIME RATIO SENSOR 1

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM reads Heated Oxygen Sensor (HO2S) activity for 100 seconds. During this period, PCM counts the number of Lean/Rich (L/R) and Rich/Lean (R/L) switches.

With this information, an average time for all transitions can be determined. PCM then divides R/L average by L/R rich average to obtain a ratio. If HO2S ratio is not within range, DTC P1134 will set.

Conditions for setting DTC:

* No fuel trim, injector or HO2S 1 heater circuit DTCs set.
* No ECT, IAT, MAF, MAP, or TP sensor DTCs set.
* No EGR or EVAP DTCs set.
* Engine operating in closed loop mode.
* Conditions present during 100 second monitoring period.

* TP angle value 10-20 percent.
* Ratio of average response times not 3.00-0.75 on VIN 1.
* Ratio of average response times not 4.50-0.50 on VIN K.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If any DTC other than P1133 or P1134 sets, diagnose affected DTC before proceeding. If no other DTC sets, start engine and allow it to idle. Operate vehicle within conditions required to set DTC. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1133 FAILED THIS IGN, go to next step. If scan tool does not display DTC P1133 FAILED THIS IGN, go to DIAGNOSTIC AIDS.

3) Check if DTC P1153, P1154, P1155 and/or P1156 failed. If any of these DTCs are present, go to step 8). If DTCs are not present, go to next step.

4) Check exhaust system for leaks. Repair as necessary. After repairs, repeat step 2). If no exhaust leak is found, go to next step.

5) Visually inspect HO2S 1 for secure installation or corrosion on terminals. Check terminal tension at HO2S 1 and PCM. Check for damaged wiring. If a problem is found, go to step 9). If no problem is found, go to next step.

6) Disconnect HO2S 1 connector. Connect a jumper wire between HO2S 1 harness connector ground circuit and chassis ground. Using scan tool, read HO2S 1 voltage. If voltage is about 0.45 volt, go to next step. If voltage is not about 0.45 volt, go to step 10).

7) Connect a jumper wire between HO2S 1 harness connector signal and ground circuits, and chassis ground. If voltage is less than 0.3 volt, go to next step. If voltage is not less than 0.3 volt, go to step 11).

8) Repair condition causing fuel, sealant, oil or coolant contamination. Replace affected HO2S. After repairs, go to step 13).

9) Repair condition as necessary. After repairs, go to step 13).

10) Repair open HO2S 1 ground circuit or HO2S 1 signal circuit shorted to ground. After repairs, go to step 13).

11) Repair open HO2S 1 signal circuit or faulty PCM connections as necessary. After repairs, go to step 13).

12) Replace Bank 1 HO2S 1. After replacing sensor, go to next step.

13) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1133. If scan tool displays DTC P1133 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1133 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check HO2S 1 heater operation. If HO2S 1 heater operation is okay, replace HO2S 1.

DTC P1257 - SUPERCHARGER SYSTEM OVERBOOST

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Normally PCM commands Boost Control (BC) solenoid to operate at 100 percent (ON) Pulse Width Modulation (PWM) to allow for full intake boost upon demand. If Reverse is selected, PCM detects rapid deceleration, or engine is load is extremely high, PCM commands BC solenoid to operate at zero percent (OFF) PWM.

Conditions required to set DTC are:

* IAT greater than 14°F (-10°C).
* Engine torque exceeds maximum predetermined torque threshold value.
* Conditions are present for at least 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, select LAST TST FAIL. Record any other failed DTCs. If any other DTCs set, diagnose affected DTCs before proceeding. If no other DTCs set, go to next step.

3) Disconnect BC solenoid harness connector. Turn ignition on. Connect a test light across BC solenoid harness connector terminals. If test light illuminates, go to step 9). If test light does not illuminate, go to next step.

4) Disconnect inlet vacuum signal hose from by-pass valve actuator. Connect a vacuum gauge to by-pass valve actuator. Start and allow engine to idle in Park. If vacuum is greater than 12 in. Hg, go to next step. If vacuum is not greater than 12 in. Hg, go to step 12).

5) Reconnect BC solenoid harness connector and inlet vacuum signal hose. Disconnect boost signal hose between BC solenoid and by-pass valve actuator. Connect vacuum gauge to by-pass valve actuator. Using scan tool, turn BC solenoid off. If vacuum is greater than 12 in. Hg, go to next step. If vacuum is not greater than 12 in. Hg, go to step 12).

6) Check for restriction in boost signal hose between BC solenoid and supercharger by-pass valve actuator. Repair as necessary. After repairs, go to step 15). If no restriction is found, go to next step.

7) Check for binding by-pass valve, sticking or misadjusted by-pass valve actuator linkage. Repair as necessary. After repairs are complete, go to step 15). If no problem is found, go to next step.

8) Replace by-pass valve actuator. After replacing by-pass valve actuator, go to step 15).

9) Turn ignition off. Disconnect PCM. Turn ignition on. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

10) Locate and repair short to ground in BC solenoid driver circuit. After repairs, go to step 15).

11) Repair restriction in inlet vacuum signal hose, or blocked inlet vacuum source. After repairs, go to step 15).

12) Check for restriction in boost source hose to BC solenoid. Repair as necessary. After repairs, go to step 15). If no restriction is found, go to step 12).

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 15).

14) Replace BC solenoid. After replacing solenoid, go to next step.

15) Read and record FAIL RECORDS data for this DTC. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1257 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1257 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Connect a DVOM between BC solenoid driver circuit at PCM harness connector and engine ground. With ignition on, observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

Check BC solenoid driver circuit for short to ground. Check

for binding by-pass valve. Check for sticking or misadjusted by-pass valve actuator.

DTC P1351 - IGNITION CONTROL (IC) CIRCUIT OPEN

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Ignition Control Module (ICM) sends signals that PCM requires for fuel control and spark advance calculations. At start of engine crank, ICM controls spark advance (by-pass mode). When second 3X signal is recognized by PCM, it applies 5 volts to by-pass circuit, commanding ICM to switch Ignition Control (IC) of spark advance to PCM (IC mode). An open in IC circuit, or a short to voltage in by-pass circuit will set DTC 1350.

Condition required to set DTC is:

* Engine running.
* PCM detects open circuit in by-pass circuit.
* Condition present for 100 crankshaft revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Connect DVOM between IC and reference low circuits. Turn ignition on. Using test light connected to battery voltage, probe by-pass circuit. If resistance is greater than 500 ohms, go to step 4). If resistance is not greater than 500 ohms, go to next step.

3) Turn ignition off. Disconnect ICM connector. Check IC circuit for open circuit. Repair as necessary. After repairs, go to step 8). If circuit is open, go to step 5).

4) Check for faulty IC circuit connection at PCM. Repair as necessary. After repairs, go to step 8). If connection is okay, go to step 7).

5) Check for faulty IC circuit connection at ICM. Repair as necessary. After repairs, go to step 8). If connection is okay, go to next step.

6) Replace ICM. After replacing module, go to step 8).

7) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

8) Read and record FAIL RECORDS data for this DTC. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, system is okay.

Diagnostic Aids

Check for faulty connections or damaged harness to ICM and PCM. Disconnect ICM. Connect a DVOM between ICM harness connector IC circuit and battery voltage. With ignition on, observe DVOM while moving all related harnesses and connectors. A change in voltage display indicates fault location.

DTC P1352 - BY-PASS CIRCUIT OPEN

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

The Ignition Control Module (ICM) sends signals that PCM requires for fuel control and spark advance calculations. At start of engine crank, ICM controls spark advance (by-pass mode). When the

second 3X reference pulse is recognized by the PCM, PCM applies 5 volts to by-pass circuit, commanding ICM to switch spark advance to PCM control (IC mode). If PCM detects an open in the IC circuit, DTC will set. Engine will start and may run in by-pass mode timing.

Conditions for setting DTC:

* Engine running.
* PCM detects an open in by-pass circuit.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Connect DVOM between IC and reference low circuit. Connect test light between battery voltage and by-pass circuit. If resistance is greater than 5000 ohms, go to step 4). If resistance is not greater than 5000 ohms, go to next step.

3) Turn ignition off. Disconnect ICM harness connector. Check for open in by-pass circuit. Repair as necessary. After repairs, go to step 8). If circuit is okay, go to step 5).

4) Check for poor terminal connections at PCM. Repair as necessary. After repairs, go to step 8). If connections are okay, go to step 7).

5) Check for poor terminal connections at ICM. Repair as necessary. After repairs, go to step 8). If connections are okay, go to next step.

6) Replace ICM. After replacing module, go to step 8).

7) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

8) Read and record FAIL RECORDS data for this DTC. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC FAILED THIS IGN, return to step 2). If scan tool does not display DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1361 - IGNITION CONTROL (IC) CIRCUIT NOT TOGGLING

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Ignition Control Module (ICM) sends signals that PCM requires for fuel control and spark advance calculations. At start of engine crank, ICM controls spark advance (by-pass mode). When second 3X signal is recognized by PCM, it applies 5 volts to by-pass circuit, commanding ICM to switch Ignition Control (IC) of spark advance to PCM (IC mode). A short in IC circuit, or an open or short ground in by-pass circuit will set DTC 1361.

Condition required to set DTC is:

* PCM monitors IC pulses during crank while by-pass mode spark advance is commanded.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Using scan tool, clear DTCs. Start engine and allow it to

idle for 2 minutes. Read DTCs. If DTC P1362 is also present, go to step 6). If DTC P1362 is not present, go to next step.

3) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Connect a test light between ground and IC circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

4) Turn ignition on. Disconnect IC module connector. Turn ignition on. Using test light connected to ground, probe IC circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).

5) Locate and repair short to voltage in IC circuit. After repairs are complete, go to step 14).

6) Turn ignition off. Disconnect IC module and PCM harness connectors. Connect test light between battery voltage and IC circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

7) Locate and repair short to ground in IC circuit. After repairs are complete, go to step 14).

8) Turn ignition off. Leave IC module and PCM harness connectors disconnected. Connect test light between ground and IC by-pass circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

9) Locate and repair short to ground in IC by-pass circuit. After repairs, go to step 14).

10) Locate and repair short between IC and by-pass circuits. After repairs, go to step 14). If circuit is okay, go to next step.

11) Reconnect IC module connector. Leave PCM connector disconnected. Turn ignition on. Connect DVOM between IC and reference low circuits. Connect test light to battery voltage. If resistance switches from less than 500 ohms to 5000 ohms when test light is connected bypass circuit, go to step 13). If resistance is not as indicated, go to next step.

12) Replace ICM. After replacing module, go to step 14).

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Read and record FAIL RECORDS data for this DTC. Clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, system is okay.

Diagnostic Aids

Check for faulty connections or damaged harness to ICM or PCM. Disconnect ICM. Connect a DVOM between ICM harness connector IC circuit and battery voltage. With ignition on, observe DVOM while moving all related harnesses and connectors. A change in voltage display indicates fault location.

DTC P1362 - BY-PASS CIRCUIT SHORTED

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Ignition Control Module (ICM) sends signals that the PCM requires for fuel control and spark advance calculations. At the start of engine crank, the ICM control spark advance (by-ass mode). When the second 3X reference pulse is recognized by the PCM, PCM applies 5 volts to by-pass circuit, commanding ICM to switch spark advance to PCM control (IC mode).

If PCM detects a short to voltage in by-ass circuit, DTC will set. A short to ground in the IC circuit or by-pass circuit will cause both DTCs P1361 and P1362 to set. Engine will start and run in by-pass mode timing.

The following conditions will set DTC:

* Engine running.
* PCM detects a short to voltage in by-pass circuit.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Clear DTCs. If DTC P1361 is set, go to step 6). If DTC P1361 is not set, go to next step.

3) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Using a test light connected to ground, probe by-pass circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

4) Turn ignition off. Leave PCM disconnected. Disconnect ICM harness connector. Turn ignition on. Using test light connected to ground, probe by-pass circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).

5) Locate and repair short to voltage in by-pass circuit. After repairs, go to step 14).

6) Turn ignition off. Disconnect ICM and PCM harness connectors. Using test light connected to battery voltage, probe IC circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

7) Locate and repair short to ground in IC circuit. After repairs are complete, go to step 14).

8) Leave ignition off, ICM and PCM connectors disconnected. Using test light connected to ground, probe by-pass circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

9) Locate and repair short to ground in by-pass circuit. After repairs, go to step 14).

10) Leave ignition off, ICM and PCM connectors disconnected. Check for short between IC and by-pass circuits. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

11) Leave ignition off and PCM connector disconnected. Reconnect IC module connector. Using DVOM, check resistance between IC and reference low circuits while probing by-pass circuit using test light connected to battery voltage. If resistance switches from less than 500 ohms to greater than 5000 ohms, go to step 13). If resistance does not switch from less than 500 ohms to greater than 5000 ohms, go to next step.

12) Replace IC control module. After replacing module, go to step 14).

13) Replace PCM. Program replacement PCM using required equipment. After repair is completed, go to next step.

14) Using scan tool, select DTC, CLEAR INFO function. Start and warm engine to normal operating temperature. Select DTC, SPECIFIC, then enter this DTC. Operate vehicle within conditions for setting this DTC. If scan tool indicates that this test ran and passed, go to next step. If scan tool does not indicate that this test ran and passed, repeat step 2).

DTC P1374 - 3X REFERENCE CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

3X reference circuit is produced by Ignition Control Module (ICM). PCM uses 3X reference signal pulses to calculate engine speed (RPM) and crankshaft position at engine speed more than 1200 RPM. PCM uses pulses on this circuit to initiate injector pulses. If PCM receives incorrect number of pulses on 3X reference circuit, DTC P1374

will set.

Conditions required to set DTC are:

* Engine running and PCM is receiving 18X reference signal pulses.
* Ratio of 18X reference signal pulses to 3X reference signal pulses received by PCM do not equal 6.
* Ratio of 18X reference signal pulses to camshaft reference signal pulses received by PCM equals 36.
* Conditions present for up to 30 seconds or 100 crankshaft revolutions.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Attempt to start engine. If engine starts and runs, go to next step. If engine does not start and run, see F - BASIC TESTING article.

3) Using scan tool, read and record FAILS RECORD DATA. Operate vehicle within conditions noted in FAILED RECORDS DATA. Read SPECIFIC DTC. If scan tool displays DTC P1374 FAILED THIS IGN, go to next step. If scan tool does not display DTC P1374 FAILED THIS IGN, see DIAGNOSTIC AIDS.

4) Connect a test light to any injector harness connector. Turn ignition on. Connect repeatedly touch test light lead to 3X reference signal circuit while observing test light. If test light blinks, go to step 8). If test light does not flash, go to next step.

5) Turn ignition off. Disconnect PCM. Check 3X reference signal circuit for open or short to ground. If a problem is found, go to step 11). If no problem is found, go to next step.

6) Check for faulty 3X reference signal circuit connection at PCM. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.

7) Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness. Repair as necessary. After repairs, go to step 11). If no problem is found, go to step 10).

8) Check for faulty connections at ICM. Repair as necessary. After repairs, go to step 11). If connections are okay, go to next step.

9) Replace ICM. After replacing module, go to step 11).

10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

11) Read and record FAIL RECORDS data for this DTC. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, read SPECIFIC DTC. If scan tool displays DTC P1374 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1374 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe a voltmeter connected to 3X reference circuit at PCM harness connector while moving all related harnesses and connectors. A change in voltage indicates fault location.

Check for incorrect harness routing near secondary ignition components, ignition coil arcing to wiring harness or ICM. Check ignition coils for cracks, carbon tracking or other signs of damage. Check for secondary ignition wire(s) arcing to wiring harness.

DTC P1380 - EBTCM DTC DETECTED ROUGH ROAD DATA UNUSABLE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

This DTC is used to determine when the EBCM has lost the ability to provide rough road data to the PCM for misfire detection. When the PCM sees that this condition is present, through the serial data, DTC will set.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Using scan tool, select DTC INFO and note if this DTC has failed this ignition cycle. If DTC failed, diagnose ABS system. See ANTI-LOCK BRAKE SYSTEM article in BRAKES section. If DTC did fail this ignition, go to next step.

Diagnostic Aids

If this DTC is set, it indicates that the ABS system has detected a malfunction which will not allow the EBCM to transmit correct rough road data to PCM.

DTC P1381 - MISFIRE DETECTED NO EBCM/PCM SERIAL DATA

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM detects engine misfire by detecting variations in crankshaft deceleration between firing strokes. For accurate detection of engine misfire, PCM must be able to distinguish between crankshaft deceleration caused by actual misfire or deceleration caused by rough road conditions.

Electronic Brake Control Module (EBCM) transmits rough road information based on wheel acceleration/deceleration data supplied by the wheel speed sensors. If ABS system detects rough road above a predetermined threshold, information is sent to PCM through serial data circuit.

Conditions required to set DTC are:

* Engine load less than 87 percent.
* Engine speed less than 5000 RPM.
* Vehicle speed greater than 10 MPH.
* A misfire DTC is occurring and requesting MIL to be illuminated.
* PCM detects rough road data error for at least 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, select CHASSIS APPLICATION and attempt to display ABS DATA. If ABS DATA is displayed, go to next step. If ABS DATA is not displayed, go to step 4).

3) Check serial data circuit for open or faulty connection between EBCM and PCM. Repair as necessary. If circuit or connection is okay, see DIAGNOSTIC AIDS.

4) Turn ignition off. Disconnect EBCM harness connector. Turn ignition on. Using a DVOM, check voltage on EBCM harness connector serial data circuit. If voltage is 1-5 volts, go to next step. If measured voltage is not 1-5 volts, go to step 6).

5) Check for faulty connection at EBCM. Repair as necessary. After repairs, go to step 7). If connection is okay, go to next step.

6) Check for open serial data circuit to EBCM. Repair as

necessary. After repairs, go to next step. If circuit is okay, perform ABS system diagnosis. See ANTI-LOCK BRAKE SYSTEM article in BRAKES section.

7) Turn ignition on. Using scan tool, select CHASSIS APPLICATION and attempt to display ABS DATA. If ABS DATA is displayed, repair is complete. If ABS DATA is not displayed, return to step 4).

Diagnostic Aids

Check for faulty connections or damaged harness. If connections and harness appear okay, observe ABS DATA on scan tool while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1404 - EGR VALVE PINTLE STUCK OPEN

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM monitors EGR valve pintle position input to ensure that valve responds properly to commands from the PCM. When ignition is turned on, PCM learns the EGR closed valve pintle position. PCM compares the learned EGR closed valve pintle position to the actual position when EGR valve is commanded closed. If actual EGR position indicates that EGR valve is still open when PCM is commanding EGR closed, DTC will set.

Conditions for setting DTC:

* No CKP, ECT, IAT, MAF, MAP, TP or VSS DTC set.
* No misfire, idle speed, fuel injector related DTCs set.
* System voltage 10-16 volts.
* EGR feedback is .2 volt or greater than EGR closed valve pintle position when desired EGR position is commanded to zero percent.
* Conditions present for longer than 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

NOTE: If DTC P0403 is set, diagnose DTC P0403 first.

2) Start and operate engine at idle. Using scan tool, observe actual EGR position. If actual EGR position is zero percent, go to next step. If actual EGR position is not zero percent, go to step 5).

3) Turn ignition on, engine off. Using scan tool, select EGR VALVE OUTPUT CONTROL function. Increment EGR valve through all positions while comparing desired to actual EGR position. If desired EGR position remains close to actual EGR position at all commanded positions, go to next step. If desired EGR position does not remain close to actual EGR position, go to step 6).

4) Using scan tool, review and record FAIL RECORDS data. Operate vehicle within FAIL RECORDS conditions. Monitor SPECIFIC DTC INFO for this DTC until DTC P1404 test runs. If scan tool indicates that this DTC failed this ignition cycle, go to next step. If scan does not indicate that this DTC failed this ignition cycle, see DIAGNOSTIC AIDS.

5) Disconnect EGR harness connector. Observe actual EGR position on scan tool. If actual EGR position is at zero percent, go to next step. If actual EGR position is not at zero percent, go to step 7).

6) Using test light connected to battery voltage, probe test light to EGR pintle position sensor ground circuit. If test light illuminates, go to step 9). If test light does not illuminate, go to

step 8).

7) Turn ignition off. Disconnect PCM harness connector. Turn ignition on, engine off. Check voltage between ground and EGR pintle position signal circuit. If voltage reading is zero volts, go to step 12). If voltage reading is not zero volts, go to step 11).

8) Check EGR pintle position sensor ground circuit for an open between EGR and EGR valve. Repair as necessary. After repairs, go to step 15). If circuit is okay, go to step 13).

9) Check for poor terminal connections at EGR valve. Repair as necessary. After repairs, go to step 15). If connections are okay, go to next step.

10) Replace EGR valve. If EGR showed signs of excessive heat, check for restricted exhaust. Exhaust restriction may be caused by faulty injector, grounded injector circuit or faulty PCM. Repair as necessary. Also, check for contaminated oil. After replacing EGR valve, go to step 15).

11) Locate and repair short to voltage in EGR pintle position signal circuit. After repairs, go to step 15).

12) Check EGR position signal circuit for short to 5-volt reference circuit or short to control circuit. Repair as necessary. After repairs, go to step 15). If circuits are okay, go to step 14).

13) Check circuits related to EGR valve for poor terminal connections at PCM. Repair as necessary. After repairs, go to step 15). If connections are okay, go to next step.

14) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

15) Using scan tool, select CLEAR INFO or CLEAR DTCS function to clear DTCs. Start engine and allow it to idle. Ensure engine is at normal operating temperature. Operate vehicle within conditions required for setting this DTC. Select SPECIFIC DTC function then enter this DTC. If scan tool indicates TEST RAN AND PASSED, go to next step. If scan tool does not indicate TEST RAN AND PASSED, repeat step 2).

Diagnostic Aids

Check for excessive deposits on EGR valve pintle or seat, causing EGR valve to stick. Check for poor connections at EGR and PCM connector. Check for faulty terminal connections or damaged harness.

DTC P1441 - EVAP EMISSIONS SYSTEM FLOW DURING NON-PURGE

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Evaporative (EVAP) emission system includes following components: fuel tank, EVAP vent solenoid, fuel tank pressure sensor, fuel pipes and hoses, vapor lines, fuel cap, EVAP emission canister, purge lines, and EVAP purge solenoid.

A leaking purge solenoid, EVAP purge and engine vacuum lines switched at EVAP purge solenoid, or EVAP purge solenoid driver circuit shorted to ground, will set DTC P1441.

Conditions required to set DTC are:

* No IAT, MAP, ODM, or TP sensor DTCs set.
* BARO greater than 70 kPa.
* Engine speed 650-5000 RPM.
* IAT 50-158°F (10-70°C).
* Difference between ECT and IAT less than 18°F (10°C).
* EVAP canister Pulse Width Modulation (PWM) less than 3 percent.
* EVAP purge vacuum switch open.
* Conditions present for longer than 4 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) If DTC P1676 is also set, diagnose DTC P1676 first. If DTC P1676 is not set, go to next step.

3) Turn ignition off. Remove fuel cap. Turn ignition on. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays zero in. H2O go to next step. If scan tool does not display zero in. H2O, repair faulty fuel tank pressure sensor circuit.

4) Zero pressure and vacuum gauges on EVAP Pressure/Purge Diagnostic Station (J-41413). Reinstall fuel cap. Read and record FAIL RECORDS data for DTC P1441. Clear DTCs. Connect EVAP pressure/purge diagnostic station to EVAP service port. Using scan tool, command EVAP vent solenoid ON (closed). Using EVAP pressure/purge diagnostic station, attempt to pressurize EVAP system to 5 in. H2O. If specified pressure is achieved, go to next step. If specified pressure is not achieved, to step 6).

5) Maintain EVAP system pressure at 5 in. H2O. Using scan tool, read FUEL TANK PRESSURE. If scan tool displays 5 in. H2O, go to next step. If scan tool does not display 5 in. H2O, repair faulty fuel tank pressure sensor circuit.

6) Check EVAP purge vacuum and source line routing and connections at EVAP purge solenoid. If no problem is found, go to next step. If a problem is found, go to step 9).

7) Disconnect engine vacuum source line from EVAP purge solenoid. Connect a hand vacuum pump to engine vacuum side of EVAP purge solenoid. Attempt to apply 15 in. Hg vacuum to EVAP canister. If vacuum is maintained as specified, see DIAGNOSTIC AIDS. If vacuum cannot be maintained as specified, go to next step.

8) Replace EVAP purge solenoid. After replacing EVAP purge solenoid, go to step 10).

9) Correct line routing and connections as necessary. After repairs, go to next step.

10) Turn engine on. Remove fuel cap. Using scan tool OUTPUT TESTS function. Select and activate SEAL SYSTEM. Reinstall fuel cap. Run engine at 2500 RPM for 10 seconds while monitoring FUEL TANK PRESSURE on scan tool. If scan tool displays zero in. H2O, repair is complete. If scan tool does not display zero in. H2O, return to step 3).

Diagnostic Aids

Check for incorrect vacuum hose routing or damage. Check for faulty connections or damaged harness. If connections and harness appear okay, observe scan tool FUEL TANK PRESSURE display while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1554 - CRUISE CONTROL STATUS CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM can disable Cruise Control (C/C) if conditions are detected which make C/C operation undesirable. If C/C status signal indicates C/C is engaged when PCM is inhibiting C/C operation, DTC P1554 is set.

Conditions required to set DTC are:

* PCM is inhibiting C/C operation
* C/C status signal indicates C/C is engaged.
* Conditions present longer than one second.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, check DTCs. If DTC P1676 is set, diagnose DTC P1676 first. If DTC P1676 is not set, go to next step.

3) Turn ignition off. Disconnect cruise control module connector. Turn ignition on. Using a DVOM, check voltage between engine ground and cruise status circuit at cruise control module connector. If voltage is greater than 7 volts, go to next step. If voltage is not greater than 7 volts, go to step 5).

4) Turn ignition off. Reconnect cruise control module connector. Turn ignition on. Using test light connected to battery voltage, probe cruise control engaged status circuit at PCM connector. If test light illuminates, go to step 6). If test light does not illuminate, go to step 7).

5) Turn ignition off. Disconnect PCM harness connector. Connect test light between battery voltage and cruise engaged status circuit at PCM connector. If test light illuminates, go to step 8). If test light does not illuminate, go to step 7).

6) Replace cruise control module. After replacing module, go to step 9).

7) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 14).

8) Locate and repair short to ground in cruise engaged status circuit. After repairs, go to next step.

9) Clear DTCs. Start engine and read DTCs. If DTC P1554 resets, return to step 2). If DTC does not reset, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool CRUISE STATUS display while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1571 - TRACTION CONTROL SYSTEM DESIRED TORQUE CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Traction Control System (TCS) uses Anti-lock Brake System (ABS) in conjunction with PCM fuel and ignition controls to limit drive wheel slippage during acceleration.

Condition required to set DTC is:

* Desired torque signal Pulse Width Modulation (PWM) is less than 5 percent or greater than 95 percent.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, read DESIRED TORQUE. If PWM is about 100 percent, go to step 4). If PWM is not as specified, go to next step.

3) Turn ignition off. Disconnect Electronic Brake and Traction Control Module (EBTCM) connector. Turn ignition on. Using a DVOM, check voltage between engine ground and EBTCM harness connector desired torque PWM circuit. If voltage is 5 volts, go to next step. If voltage is not 5 volts, go to step 6).

4) Turn ignition off. Connect ABS/TCS Pinout Box and Adapter (J39700-25) between EBTCM and EBTCM connector. Using DVOM in Hertz (Hz) scale, check frequency between engine ground and desired torque PWM circuit. Turn ignition on. If frequency is 120-135 Hz, go to next

step. If frequency is not as specified, go to step 7).
5) Using DVOM in duty cycle scale, check duty cycle between engine ground and desired torque PWM circuit. Turn ignition on, engine off. If duty cycle is 5-95 percent, go to step 9). If measured duty cycle is not as specified, go to step 7).
6) Turn ignition off. Disconnect harness PCM. Turn ignition on. Check desired torque PWM circuit for open, short to ground or short to voltage. Repair as necessary . After repairs are complete, go to step 11). If circuit is okay, go to step 9).
7) Check for faulty connection at EBTCM. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.
8) Replace EBTCM. After replacing EBTCM, go to step 11).
9) Check for faulty connection at PCM. Repair as necessary. After repairs, go to step 11). If connection is okay, go to next step.
10) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.
11) Clear DTCs. Turn ignition on and observe DESIRED TORQUE PWM scan tool display. If scan tool displays about 100, repair is complete. If scan tool does not display about 100 percent, return to step 2)

Diagnostic Aids
Check for faulty connections or damaged harness. Observe scan tool DESIRED TORQUE display while moving all related harnesses and connectors. A change in scan tool display indicates fault location.

DTC P1573 - EBTCM/PCM SERIAL DATA CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description
Powertrain Control Module (PCM) uses serial data line to communicate with various components and systems within vehicle. If PCM does not receive data from Electronic Brake and Traction Control Module (EBTCM) DTC P1573 will set.
Conditions for setting DTC:

* PCM has detected a PCM/EBTCM communication error for 0.5 second.

Diagnostic Procedures
1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.
2) Using scan tool, attempt to select ABS data. If ABS data is displayed, go to next step. If ABS data cannot be displayed, go to step 4).
3) Turn ignition off. Disconnect PCM and EBTCM. Check for an open in serial data circuit between EBTCM and PCM. Repair as necessary. After repairs, go to step 8). If circuit is okay, go to step 5).
4) Turn ignition off. Disconnect EBTCM. Turn ignition on. Using DVOM, measure voltage between ground and serial data circuit terminal at EBTCM harness connector. If voltage constantly varies from 0-5 volts, go to next step. If voltage does not constantly vary from 0-5 volts, check for open or short in serial data circuit. Repair as necessary.
5) Check serial data circuit for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 8). If connection is okay, see DIAGNOSTIC AIDS.
6) Check serial data circuit for poor terminal connection at EBTCM. Repair as necessary. After repairs, go to step 8). If connection is okay, go to next step.
7) Replace EBTCM. After replacing EBTCM, go to next step.

8) Using scan tool, select CLEAR INFO or CLEAR DTCS function to clear DTCs. Turn ignition on, with engine off. Using scan tool, review FREEZE FRAME data and note parameters. Start engine and operate vehicle within conditions required for setting this DTC, and as close to conditions recorded in FREEZE FRAME as possible. Monitor SPECIFIC DTC info for DTC P1573 until DTC P1573 test runs. If scan tool indicates FAILED THIS IGN, repeat step 2). If scan tool does not indicate FAILED THIS IGN, repair is complete.

Diagnostic Aids

Disconnect and inspect PCM connector. Inspect for damaged pins, corrosion and loose wires. An intermittent problem can be caused by a poor connection, rubbed through wire insulation or broken wire inside insulation. If no problems are found, replace PCM. Reviewing FAIL RECORDS vehicle mileage since diagnostic test last failed may help determine how often condition that caused DTC to be set occurs.

DTC P1619 - ENGINE OIL LIFE MONITOR RESET CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

To determine engine oil life remaining, PCM monitors ECT, number of crankshaft revolutions, vehicle speed, and calculated oil temperature. When PCM determines oil is at end of useful life, it will send a signal through Serial Data Line (SDL) to illuminate CHANGE OIL SOON indicator.

Condition required to set DTC is:

* Oil Life Monitor (OLM) reset circuit is grounded for greater than 60 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, observe OIL LIFE SWITCH. If scan tool displays PRESSED, go to next step. If scan tool does not display PRESSED, see DIAGNOSTIC AIDS.

3) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Connect a test light between battery voltage and PCM harness connector OLM reset circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 6)

4) Disconnect OLM reset switch. Connect a test light between battery voltage and PCM harness connector OLM reset circuit. If test light illuminates, go to next step. If test light does not illuminate, go to step 7)

5) Locate and repair short to ground in OLM reset circuit. After repairs, go to step 8).

6) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 8).

7) Replace OLM reset switch. After replacing switch, go to next step.

8) Turn ignition on. Using scan tool, observe OIL LIFE SWITCH. If scan tool displays PRESSED, return to step 3). If scan tool does not display PRESSED, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Connect a DVOM between battery voltage PCM harness connector OLM reset circuit. Observe DVOM while moving all related harnesses and connectors. A change in voltage display indicates fault location.

DTC P1626 - THEFT DETERRENT SYSTEM FUEL ENABLE CIRCUIT

Circuit Description

Vehicle operation is disabled if incorrect key or starting procedure is used. Theft deterrent module enables crank circuit to starter and sends a signal to PCM if correct key is being used. If proper signal does not reach PCM fuel enable signal circuit, PCM will not pulse injectors on, disabling vehicle, even if crank circuit is by-passed. Signal should be 40-60 Hz and is measured using DVOM in Hertz scale.

Conditions required to set DTC are:

* Engine running.
* PCM detects incorrect signal on Theft Deterrent System (TDS) fuel enable circuit.
* Conditions are present for more than 2 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. Go to next step.

2) Ensure battery is fully charged. Crank engine. If engine cranks, go to next step. If engine does not crank, diagnose and repair TDS.

3) Turn ignition off. Disconnect Vehicle Theft Deterrent (VTD) module connector. Turn ignition on. Using a DVOM, check voltage between VTD module harness connector ground and VTD fuel enable circuits. If voltage is about 5 volts, go to next step. If voltage is not about 5 volts, go to step 6).

4) Turn ignition off. Reconnect VTD connector. Turn ignition on. Using DVOM in Hertz (Hz) scale, check frequency between engine ground and VTD fuel enable circuit. If frequency is 40-60 Hz, go to next step. If frequency is not 40-60 Hz, go to step 8).

5) Turn ignition off. Using scan tool, clear DTCs. Attempt to start engine. If engine starts and continues to run, see DIAGNOSTIC AIDS. If engine does not start, go to step 7).

6) Check TDS fuel enable circuit for open, short to ground or short to battery voltage. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

7) Check VTD fuel enable circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 11). If VTD fuel enable circuit connection at PCM is okay, go to step 9).

8) Check for faulty connection at TDS module. Repair as necessary. After repairs, go to step 11). If connection is okay, go to step 10).

9) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 11).

10) Replace VTD module. After replacing module, go to next step.

11) Clear DTCs. Turn ignition on and observe VTD FUEL DISABLE scan tool display. If scan tool displays INACTIVE, repair is complete. If scan tool does not display INACTIVE, return to step 2)

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect VTD module connector. Turn ignition on. Connect a DVOM between engine ground and VTD module harness connector fuel enable circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1629 - THEFT DETERRENT CRANK SIGNAL MALFUNCTION

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Vehicle operation is disabled if incorrect key or starting procedure is used. Vehicle Theft Deterrent (VTD) module enables crank circuit to starter and sends a signal to PCM if correct key is being used. If proper signal does not reach PCM fuel enable signal circuit, PCM will not pulse injectors on, disabling vehicle, even if crank circuit is by-passed. Signal should be between 40-60 Hz and is measured using DC scale on DVOM.

Conditions required to set DTC are:

* DTC P1626 is not set.
* An attempt is made to start engine.
* PCM detects incorrect signal on theft deterrent fuel enable circuit.
* Conditions present for longer than 2 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Ensure battery is fully charged. Crank engine. If engine cranks, go to next step. If engine does not crank, diagnose and repair VTD.

3) Turn ignition off. Disconnect VTD module connector. Turn ignition on. Using a DVOM, check voltage between TDS module harness connector ground and VTD fuel enable circuits. If voltage is about 5 volts, go to next step. If voltage is not about 5 volts, go to step 6).

4) Turn ignition off. Reconnect TDS module connector. Turn ignition on. Using DVOM in Hertz (Hz) scale, check frequency between engine ground and VTD fuel enable circuit. If frequency is 40-60 Hz, go to next step. If frequency is not 40-60 Hz, go to step 8).

5) Turn ignition off. Using scan tool, clear DTCs. Attempt to start engine. If engine starts and continues to run, see DIAGNOSTIC AIDS. If engine does not start, go to step 7).

6) Check TDS fuel enable circuit for open, short to ground or short to battery voltage. Repair as necessary. After repairs, go to step 11). If no problem is found, go to next step.

7) Check TDS fuel enable circuit for faulty connection at PCM connector. Repair as necessary. After repairs, go to step 11). If connection is okay, go to step 9).

8) Check for faulty connection at TDS module. Repair as necessary. After repairs, go to step 11). If connection is okay, go to step 10).

9) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 11).

10) Replace VTD module. After replacing module, go to next step.

11) Clear DTCs. Turn ignition on and observe VTD FUEL DISABLE scan tool display. If scan tool displays INACTIVE, repair is complete. If scan tool does not display INACTIVE, return to step 2)

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect TDS module connector. Turn ignition on. Connect a DVOM between engine ground and TDS module harness connector fuel enable circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1635 - 5 VOLT-REFERENCE "A" CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM uses 5-volt reference "A" circuit as a sensor feed for EGR valve pintle position, fuel tank pressure (VIN K), MAP, and TP sensors. PCM monitors voltage on this circuit. If PCM senses voltage out of tolerance, DTC P1635 sets.

Conditions required to set DTC are:

* PCM detects an out of tolerance condition on the 5-volt reference "A".
* Condition is present longer than 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Ensure PCM and engine grounds are secure and clean. If a problem is found, go to step 14). If no problem is found, go to next step.

3) Using scan tool, select DTC INFO, LAST TST FAIL. If DTC P0107, P0108, P0122, P0123, P1106, P1107, P1121, P1122 and/or P1406 also set, diagnose affected DTC before proceeding. If none of these DTCs are set, go to next step.

4) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between PCM harness connector ground and 5-volt reference "A" circuits. If voltage is greater than 5.5 volts, go to next step. If voltage is not greater than 5.5 volts, go to step 9).

5) Using DVOM, check voltage between PCM harness connector ground and 5-volt reference "A" circuits. Disconnect EGR valve. If voltage is greater than 5.5 volts, go to next step. If voltage is not greater than 5.5 volts, go to step 8).

6) Using DVOM, check voltage between PCM harness connector ground and 5-volt reference "A" circuits while sequentially disconnecting fuel tank pressure (VIN K), MAP and TP sensors. If voltage changes whenever any of these sensors is disconnected, locate and repair short to voltage in affected sensor signal circuit and go to step 14). If voltage does not change, go to next step.

7) Turn ignition off. Disconnect PCM harness connectors. Turn ignition on. Check 5-volt reference "A" circuit for short to voltage. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to step 13).

8) Replace EGR valve. After replacing EGR valve, go to step 14).

9) Turn ignition off. Reconnect PCM. Disconnect TP sensor, MAP sensor, EGR valve and fuel tank pressure sensor. Turn ignition on. Connect DVOM between TP sensor 5-volt reference circuit and TP sensor ground circuit. If voltage is less than 4.5 volts, go to step 12). If voltage is not less than 4.5 volts, go to next step.

10) With DVOM still connected to TP sensor 5-volt reference and ground circuits, reconnect (one at a time) MAP sensor, EGR valve and fuel tank pressure sensor. If voltage changes when one of the listed devices is reconnected, replace that component. After repairs, go to step 14). If voltage does not change, go to next step.

11) Disconnect EGR valve. Connect DVOM between EGR connector 5-volt reference circuit and ground circuit. Reconnect TP sensor. If voltage measured on EGR connector changes, replace TP sensor. After replacing sensor, go to step 14). If voltage measured on EGR connector does not change, go to step 13).

12) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Check 5-volt reference "A" circuit for short to ground. Repair as necessary. After repairs, go to step 14). If circuit is okay, go to next step.

13) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

14) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1635. If scan tool displays DTC P1635 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1635 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Observe scan tool MAP display while moving harness and connectors related to EGR valve, fuel tank pressure, MAP and TP sensors. A change in scan tool display indicates fault location.

DTC P1639 - 5-VOLT REFERENCE "B" CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

PCM uses 5-volt reference "B" circuit as a sensor feed for A/C refrigerant pressure sensor. PCM monitors voltage on this circuit. If PCM senses voltage out of tolerance, DTC P1639 sets.

Conditions required to set DTC are:

* PCM detects an out of tolerance condition on 5-volt reference "B"circuit.
* Condition present for longer than 10 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Ensure PCM and engine grounds are secure and clean. If a problem is found, go to step 11). If no problem is found, go to next step.

3) Ensure A/C is off. Observe A/C high side pressure on scan tool. If pressure displays a voltage of greater than 4.8 volts or less than 0.1 volt, go to DTC P0530 for diagnosis of pressure sensor circuit. If voltage displayed is not greater than 4.8 volts or less than 0.1 volt, go to next step.

4) Unplug A/C pressure sensor connector. Using DVOM, check voltage between sensor ground circuit and sensor 5-volt reference circuit. If voltage is greater than 5.5 volts, go to next step. If voltage is not greater than 5.5 volts, go to step 7).

5) Turn ignition off. Disconnect PCM harness connectors. Turn ignition on, engine off. Using DVOM, check voltage between PCM harness connector ground and 5-volt reference "B" circuits. If voltage is greater than 5.5 volts, go to next step. If voltage measurement is not greater than 5.5 volts, go to step 10).

6) Locate and repair short to voltage in 5-volt reference "B" circuit. After repairs, go to step 13).

7) If voltage is less than 4.5 volts, go to next step. If voltage is not less than 4.5 volts, go to step 9).

8) Check for short to voltage in A/C pressure sensor signal circuit. Repair as necessary. After repairs, go to step 13). If no repairs are required, go to step 10).

9) Ignition off. Disconnect PCM connectors. Turn ignition on. Check 5-volt reference "B" circuit for short to ground. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 11).

10) Turn ignition on. Ensure A/C pressure sensor is disconnected. Wait 10 seconds. Using scan tool, check if DTC P1635 is set. If DTC P1635 is set, go to next step. If DTC P1635 is not set, go

to step 12).
11) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 13).
12) Replace A/C pressure sensor. After replacing sensor, go to next step.
13) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1639. If scan tool displays DTC P1639 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1639 FAILED THIS IGN, repair is complete.

Diagnostic Aids
Check for faulty connections or damaged harness. Observe scan tool A/C PRESSURE display while moving harness and connectors related to A/C refrigerant pressure sensor. A change in scan tool display indicates fault location.

DTC P1641 - A/C RELAY CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description
Output Driver Modules (ODM) are used by the PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 output by supplying ground to the device PCM is commanding on. ODMs can diagnose each circuit individually. DTC will set when ODM detects an improper voltage level.
Conditions required to set DTC are:

* Ignition is on.
* An improper voltage level has been detected on output circuit controlling A/C compressor control relay.
* Condition is present longer than 30 seconds.

Diagnostic Procedures
1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.
2) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector A/C compressor control relay control circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).
3) Using DVOM in 10-amp scale, check current between engine ground and A/C compressor control relay control circuit for 2 minutes. If current remains at 0.05-0.50 amp, go to step 11). If current does not remain at 0.05-0.50 amp, go to next step.
4) Turn ignition off. Disconnect PCM harness connector and A/C compressor control relay connector. Turn ignition on. Using DVOM, check voltage between engine ground and A/C relay control driver circuit. If voltage is zero volts, go to step 10). If voltage is not zero volts, go to next step.
5) Locate and repair short to voltage in A/C compressor control relay control circuit. After repairs, go to step 16).
6) Check ignition feed fuse for A/C compressor control relay. If fuse is blown, go to next step. If fuse is okay, go to step 8).
7) Locate and repair short to ground in ignition feed circuit for A/C compressor control relay. Replace fuse. After repairs, go to step 16).
8) Disconnect A/C compressor control relay. Turn ignition on. Check voltage between engine ground and A/C compressor control relay ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check A/C compressor control relay circuit for open or short to ground. If a problem is found, repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check A/C compressor control relay circuits for faulty connection at PCM or faulty connection at relay connector. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect A/C compressor clutch and PCM connectors. Disconnect A/C compressor control relay connector. Turn ignition on. Connect a test light between A/C compressor control relay connector and ignition feed circuits at relay connector. Using scan tool, cycle A/C compressor control relay on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check A/C compressor control relay control circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open ignition feed circuit to A/C compressor control relay. After repairs, go to step 16).

14) Replace A/C compressor control relay. After replacing relay, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for DTC P1641. If scan tool displays DTC P1641 FAILED THIS IGN, return to step 2). If scan tool does not display DTC P1641 FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector MIL driver circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1646 - BOOST CONTROL SOLENOID CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Output Driver Modules (ODM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs, including boost control solenoid, by supplying ground to device PCM is commanding on. ODMs can diagnose each circuit individually. If ODM "A" output 5 (boost control solenoid driver circuit) detects an improper voltage level, DTC is set.

Conditions for setting DTC:

* Ignition is on.
* An improper voltage level has been detected on boost control solenoid driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector boost control solenoid driver circuit. If battery voltage is present, go to next step. If battery voltage is not

present, go to step 6).

3) Using DVOM in 10-amp scale, check current between engine ground and boost control solenoid driver circuit for 2 minutes. If current remains .05-.80 amp go to step 11). If current does not remain between .05-.80 amp, go to next step.

4) Turn ignition off. Leave PCM connector disconnected. Disconnect boost control solenoid connector. Turn ignition on. Using DVOM, check voltage between engine ground and boost control solenoid driver circuit. If voltage is zero volts, go to step 10). If voltage is greater than zero volts, go to next step.

5) Locate and repair short to voltage in boost control solenoid driver circuit. After repairs, go to step 16).

6) Check boost control solenoid ignition feed fuse. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in boost control solenoid ignition feed circuit. Replace fuse. After repairs, go to step 16).

8) Disconnect boost control solenoid connector. Turn ignition on. Check voltage between engine ground and boost control solenoid ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check boost control solenoid driver circuit for open or short to ground. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check boost control solenoid driver and boost control solenoid ignition feed circuits for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect PCM connector. Disconnect boost control solenoid connector. Turn ignition on. Connect a test light between boost control solenoid harness connector boost control solenoid driver and ignition feed circuits. Using scan tool, cycle boost control solenoid on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check boost control solenoid driver circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open boost control solenoid ignition feed circuit. After repairs, go to step 16).

14) Replace boost control solenoid. After replacing boost control solenoid, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector boost control solenoid driver circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1651 - FAN 1 RELAY CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Output Driver Modules (ODM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs, including fan 1 relay, by supplying ground to device PCM is commanding on. ODMs can diagnose each circuit individually.

Conditions required to set DTC are:

* Ignition is on.
* An improper voltage level has been detected on fan 1 relay driver circuit.
* Condition present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector fan 1 relay driver circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Disconnect cooling fans. Using DVOM in 10-amp scale, check current between engine ground and fan 1 relay driver circuit for 2 minutes. If current remains .05-.50 amp go to step 11). If current does not remain between .05-.50 amp, go to next step.

4) Turn ignition off. Reconnect cooling fans. With PCM connectors still disconnected, disconnect fan 1 relay connector. Turn ignition on. Using DVOM, check voltage between engine ground and fan 1 relay driver circuit. If voltage is zero volts, go to step 10). If voltage is not zero volts, go to next step.

5) Locate and repair short to voltage in fan 1 relay driver circuit. After repairs, go to step 16).

6) Check fan 1 relay ignition feed fuse. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in fan 1 relay ignition feed circuit. Replace fuse. After repairs, go to step 16).

8) Disconnect fan 1 relay connector. Turn ignition on. Check voltage between engine ground and fan 1 relay ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check fan 1 relay driver circuit for open or short to ground. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check fan 1 relay driver and fan 1 relay ignition feed circuits for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect PCM connectors. Disconnect fan 1 relay connector. Turn ignition on. Connect a test light between fan 1 relay harness connector fan 1 relay driver and ignition feed circuits. Using scan tool, cycle fan 1 relay on and off. If test light flashes on and off, go to DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check fan 1 relay driver circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open fan 1 relay ignition feed circuit. After repairs, and go to step 16).

14) Replace fan 1 relay. After replacing relay, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS

data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector fan 1 relay driver circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1652 - FAN 2 RELAY CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Output Driver Modules (ODM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs, including fan 2 relay, by supplying ground to device PCM is commanding on. ODMs can diagnose each circuit individually. If ODM "B" output 2 (fan 2 relay driver circuit) detects an improper voltage level, P1652 is set.

Conditions required to set DTC are:

* Ignition is on.
* An improper voltage level has been detected on fan 2 relay driver circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM connectors. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector fan 2 relay driver circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Disconnect cooling fan connectors. Using DVOM in 10-amp scale, check current between engine ground and fan 2 relay driver circuit for 2 minutes. If current remains .05-.50 amp go to step 11). If current does not remain between .05-.50 amp, go to next step.

4) Ignition off. With PCM connectors still disconnected, disconnect series/parallel and high speed fan relays. Turn ignition on. Using DVOM, check voltage between engine ground and fan 2 relay driver circuit. If voltage is zero volts, go to step 10). If voltage is not zero volts, go to next step.

5) Locate and repair short to voltage in fan 2 relay driver circuit. After repairs, go to step 16).

6) Check fan 2 relay ignition feed fuse. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in fan 2 relay ignition feed circuit. Replace fuse. After repairs, go to step 16).

8) Disconnect fan 2 (high speed) relay connector. Turn ignition on. Check voltage between engine ground and fan 2 relay ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check fan 2 relay driver circuit for open or short to ground. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check fan 2 relay driver and fan 2 relay ignition feed circuits for faulty connection at PCM. Repair as necessary. After

repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect PCM connector. Disconnect high speed cooling fan relay connector. Turn ignition on. Connect a test light between fan 2 relay harness connector fan 2 relay driver and ignition feed circuits. Using scan tool, cycle fan 2 relay on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check fan 2 relay driver circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open fan 2 relay ignition feed circuit. After repairs, go to step 16).

14) Replace high speed cooling fan relay. After replacing relay, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 16).

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector fan 2 relay driver circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1662 - CRUISE CONTROL INHIBIT CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Quad Driver Modules (QDM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs, including cruise inhibit driver circuit, by supplying ground to device PCM is commanding on. ODMs can diagnose each circuit individually. If ODM detects an improper voltage level in output circuit controlling the stepper motor cruise control inhibit circuit, DTC will set.

Conditions for setting this DTC:

* Ignition is on.
* An improper voltage level has been detected on output circuit controlling cruise control inhibit circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector cruise inhibit driver circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Using DVOM in 10-amp scale, check current between engine ground and cruise inhibit driver circuit for 2 minutes. If current remains between .001-.500 amp, go to step 11). If current does not remain between .001-.500 amp, go to next step.

4) Turn ignition off. With PCM connectors disconnected,

disconnect cruise inhibit connector. Turn ignition on. Using DVOM, check voltage between engine ground and Servo Motor Cruise Control (SMCC) module cruise inhibit driver circuit. If voltage reading is zero volts, go to step 10). If voltage reading is not zero volts, go to next step.

5) Locate and repair short to voltage in cruise inhibit driver circuit. After repairs, go to step 16).

6) Check SMCC module ignition feed fuse. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in SMCC module ignition feed circuit. Replace fuse. After repairs, go to step 16).

8) Disconnect SMCC module connector. Turn ignition on. Check voltage between engine ground and SMCC module ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check cruise inhibit driver circuit for open or short to ground. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check cruise inhibit driver and ignition feed circuits for faulty connection at SMCC module and PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect PCM connector. Disconnect SMCC module connector. Turn ignition on. Connect a test light between SMCC module harness connector cruise inhibit driver and ignition feed circuits. Using scan tool, cycle cruise inhibit output on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check cruise inhibit driver circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open SMCC module ignition feed circuit. After repairs, go to step 16).

14) Replace SMCC module. After replacing module, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector cruise inhibit driver circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1665 - EVAP VENT SOLENOID CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

The Output Driver Module (ODM) is used by the PCM to turn on many of the current-driven devices that are needed to control various engine and transaxle functions. Each ODM is capable of controlling up to 7 separate outputs by applying ground to the device which the PCM is commanding on. ODM have the capability of diagnosing each output circuit individually.

Conditions for setting DTC:

* Ignition is on.
* Improper voltage level detected on output circuit controlling EVAP canister vent valve.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition off. Disconnect PCM connector. Turn ignition on. Using DVOM, check voltage between ground and EVAP canister vent valve control circuit at PCM connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Set ammeter to 10-amp range. Check current between ground and EVAP canister vent valve control circuit at PCM connector. Monitor reading for a minimum of 2 minutes. If current is .1-.8 amp, go to step 11). If current is not .1-.8 amp, go to next step.

4) Disconnect EVAP canister vent valve connector. Using DVOM, check voltage between ground and EVAP vent valve solenoid control circuit at harness connector. If voltage reading is zero volts, go to step 14). If voltage reading is not zero volts, go to next step.

5) Locate and repair short to voltage in EVAP canister vent valve control circuit. After repairs, go to step 16).

6) Turn ignition off. Remove and inspect fuse for EVAP canister vent valve. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in ignition feed circuit for EVAP canister vent valve. Replace fuse. After repairs, go to step 16).

8) Disconnect EVAP canister vent valve. Turn ignition on. Check voltage between ground and ignition feed circuit for EVAP canister vent valve harness connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check for an open or short to ground in EVAP canister vent valve control circuit. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check EVAP canister control circuit and ignition feed circuit for poor terminal connection at EVAP canister vent and at PCM connector. Repair as necessary. After repairs, go to step 16). If connections are okay, go to step 14).

11) Turn ignition off. Reconnect PCM harness connector. Disconnect EVAP canister vent valve connector. Turn ignition on. Connect a test light between EVAP canister vent valve control circuit and ignition feed circuit terminals at EVAP canister vent valve connector. Using scan tool, select OUTPUTS TEST function and cycle EVAP vent solenoid on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash, go to next step.

12) Check EVAP canister vent valve control circuit for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open in ignition feed circuit to EVAP canister vent valve. After repairs, go to step 16).

14) Replace EVAP canister vent valve. After replacing vent valve, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, select CLEAR INFO or CLEAR DTCS function to clear DTCs. Turn ignition on, with engine off. Using scan tool, review FREEZE FRAME data and note parameters. Start engine and operate vehicle within conditions required for setting this DTC, and as close to conditions recorded in FREEZE FRAME as possible. Monitor SPECIFIC DTC info for this DTC until this DTC test runs. If scan tool indicates FAILED THIS IGN, repeat step 2). If scan tool does not indicate FAILED THIS IGN, repair is complete.

Diagnostic Aids

Disconnect and inspect PCM and EVAP canister vent valve harness connectors. Inspect for damaged pins, corrosion and loose wires. An intermittent problem can be caused by a poor connection, rubbed-through wire insulation or broken wire inside insulation. Reviewing FAIL RECORDS vehicle mileage since diagnostic test last failed may help determine how often condition that caused DTC to set.

DTC P1667 - FUEL PUMP PWM CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

The Output Driver Module (ODM) is used by the PCM to turn on many of the current-driven devices that are needed to control various engine and transaxle functions. Each ODM is capable of controlling up to 7 separate outputs by applying ground to the device which the PCM is commanding on. ODM have the capability of diagnosing each output circuit individually.

Conditions required to set DTC are:

* Ignition is on.
* Improper voltage level detected on fuel pump speed control Pulse Width Modulated (PWM) circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition off. Disconnect PCM harness connector and fuel pump relay. Using a fused jumper wire, jumper between fuel pump relay connector terminals No. 30 and 87. Turn ignition on. Using DVOM, check voltage between ground and fuel pump speed control PWM circuit at PCM harness connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Check current between ground and fuel pump speed control PWM circuit at PCM connector. Monitor reading for at least 2 minutes. If current remains between .001-.500 amp, go to step 11). If current reading does not remain between .001-.500 amp, go to next step.

4) Turn ignition off. Disconnect fuel pump control module connector. Leave PCM connector disconnected. Turn ignition on. Check voltage between fuel pump speed control PWM circuit and ground. If voltage reading is zero volts, go to step 10). If voltage reading is not zero volts, go to next step.

5) Locate and repair short to voltage in fuel pump speed control PWM circuit. After repairs, go to step 18).

6) Check ignition feed fuse fro fuel pump relay. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in ignition feed circuit for fuel pump relay. Replace fuse. After repairs, go to step 18).

8) Disconnect fuel pump control module. Turn ignition on. Check voltage between ground and ignition feed circuit for fuel pump control module. If voltage reading is about battery voltage, go to next step. If voltage reading is not about battery voltage, go to step 13).

9) Check fuel pump speed control PWM circuit for open or short to ground. Repair as necessary. After repairs, go to step 18). If circuit is okay, go to next step.

10) Check fuel pump speed control PWM circuit for poor connection to PCM or fuel pump control module. Check fuel pump control module ignition feed circuit for poor connection at fuel pump control module. Repair as necessary. After repairs, go to step 18). If

connections are okay, go to step 14).

11) Turn ignition off. Reconnect PCM harness connector. Disconnect fuel pump control module. Turn ignition on. Using test light, connect test light between fuel pump speed control PWM circuit and ignition feed circuit at fuel pump control module harness connector. Using scan tool, cycle fuel pump PWM output on and off. If test light flashes on and off, go to step 16). If test light does not flash on and off, go to next step.

12) Check fuel pump speed control PWM circuit for poor connection at PCM. Repair as necessary. After repairs, go to step 18). If connection is okay, go to step 15).

13) Locate and repair open in ignition feed circuit to fuel pump relay or between fuel pump relay and fuel pump control module. Repair as necessary. After repairs, go to step 18).

14) Replace fuel pump control module. After replacing control module, go to step 18).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to step 18).

16) Check for poor connection at fuel pump relay. Repair as necessary. After repairs, go to step 18). If connection is okay, go to next step.

17) Replace fuel pump relay. After replacing relay, go to next step.

18) Using scan tool, read and record FAIL RECORDS data, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and fuel pump speed control PWM circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1671 - MIL CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

The Output Driver Module (ODM) is used by the PCM to turn on many of the current-driven devices that are needed to control various engine and transaxle functions. Each ODM is capable of controlling up to 7 separate outputs by applying ground to the device which the PCM is commanding on. ODM have the capability of diagnosing each output circuit individually.

Conditions required to set DTC are:

* Ignition is on.
* Improper voltage level detected on output circuit controlling MIL.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK, then go to next step.

2) Turn ignition off. Disconnect PCM connector. Turn ignition on. Using DVOM, check voltage between ground and MIL control circuit at PCM connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Set ammeter to 10-amp range. Check current between ground

and MIL control circuit at PCM connector. Monitor reading for a minimum of 2 minutes. If current is .05-.50 amp, go to step 11). If current is not .05-.50 amp, go to next step.

4) Disconnect instrument panel cluster connector. Using DVOM, check voltage between ground and MIL control circuit at harness connector. If voltage reading is zero volts, go to step 10). If voltage reading is not zero volts, go to next step.

5) Locate and repair short to voltage in MIL control circuit. After repairs, go to step 15).

6) Check ignition feed fuse for instrument panel indicators. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in ignition feed circuit for instrument panel indicators. Replace fuse. After repairs, go to step 15).

8) Disconnect instrument cluster connector. Turn ignition on. Check voltage between ground and ignition feed circuit for instrument cluster indicators. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check for an open or short to ground in MIL control circuit. Repair as necessary. After repairs, go to step 15). If circuit is okay, go to next step.

10) Check MIL control circuit and ignition feed circuit for poor terminal connection at instrument cluster and at PCM connector. Repair as necessary. After repairs, go to step 15). If connections are okay, diagnose instrument cluster assembly.

11) Turn ignition off. Reconnect PCM harness connector. Disconnect instrument cluster connector. Turn ignition on. Connect a test light between MIL control circuit and ignition feed circuit terminals at instrument panel connector. Using scan tool, select OUTPUTS TEST function and cycle MIL on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash, go to next step.

12) Check MIL control circuit for poor terminal connection at PCM. Repair as necessary. After repairs, go to step 15). If connection is okay, go to step 15).

13) Locate and repair open in ignition feed circuit to instrument cluster indicators. After repairs, go to step 15).

14) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

15) Using scan tool, select CLEAR INFO or CLEAR DTCS function to clear DTCs. Turn ignition on, with engine off. Using scan tool, review FREEZE FRAME data and note parameters. Start engine and operate vehicle within conditions required for setting this DTC, and as close to conditions recorded in FREEZE FRAME as possible. Monitor SPECIFIC DTC info for this DTC until DTC test runs. If scan tool indicates FAILED THIS IGN, repeat step 2). If scan tool does not indicate FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect DVOM between engine ground and MIL control circuit at PCM harness connector. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1673 - ENGINE HOT LIGHT CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Output Driver Modules (ODM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs by supplying ground to

device PCM is commanding on. ODMs can diagnose each circuit individually. If ODM output (ENGINE HOT light indicator driver circuit) detects an improper voltage level, DTC will set.

Conditions required to set DTC are:

* Ignition is on.
* An improper voltage level has been detected on ENGINE HOT light indicator driver circuit.
* Conditions present for at least 20 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Check voltage between ground and ENGINE HOT light control circuit at PCM harness connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Check current between ground and ENGINE HOT light control circuit at PCM harness connector. Monitor reading for at least 2 minutes. If current reads between .05-.50 amp. go to step 11). If current does not read between .05-.50 amp, go to next step.

4) Turn ignition off. Disconnect instrument panel connector. Leave PCM connector disconnected. Turn ignition on. Check voltage between ground and ENGINE HOT control circuit. If DVOM reads zero volts, go to step 10). If DVOM does not read zero volts, go to next step.

5) Locate and repair short to voltage in ENGINE HOT light control circuit. After repairs, go to step 15).

6) Check ignition feed fuse for instrument panel indicators. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in ignition feed circuit for instrument panel indicators. Replace fuse. After repairs, go to step 15).

8) Turn ignition off. Disconnect instrument cluster. Turn ignition on. Check voltage between ground and ignition feed circuit for instrument cluster indicators. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check ENGINE HOT light control circuit for open or short to ground. Repair as necessary. After repairs, go to step 15). If circuit is okay, go to step 13).

10) Check ENGINE HOT light control circuit and instrument panel indicators ignition feed circuit for poor connection at instrument panel and PCM. Repair as necessary. After repairs, go to step 15). If connections are okay, diagnose or repair instrument panel. See INSTRUMENT PANEL article in ACCESSORIES/SAFETY EQUIPMENT section.

11) Turn ignition off. Reconnect PCM harness connector. Disconnect instrument cluster connector. Turn ignition on. Connect test light between ENGINE HOT light control circuit and ignition feed circuit at instrument panel harness connector. Using scan tool, cycle ENGINE HOT light on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check ENGINE HOT light control circuit for poor connection at PCM. Repair as necessary. After repairs, go to step 15). If connection is okay, go to step 14).

13) Locate and repair open in ignition feed control circuit to instrument panel indicators. After repairs, go to step 15).

14) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

15) Using scan tool, read and record FAIL RECORDS data, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS

data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector ENGINE HOT light control circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.

DTC P1676 - EVAP CANISTER PURGE SOLENOID VALVE CONTROL CIRCUIT

NOTE: For circuit reference, see L - WIRING DIAGRAMS article.

Circuit Description

Output Driver Modules (ODM) are used by PCM to turn on current-driven devices needed to control various engine and transaxle functions. Each ODM can control up to 7 outputs, including EVAP vent solenoid driver circuit, by supplying ground to device PCM is commanding on. ODMs can diagnose each circuit individually. If ODM output (EVAP vent solenoid driver circuit) detects an improper voltage level, DTC will set.

Conditions required to set DTC are:

* Ignition is on.
* An improper voltage level has been detected on EVAP purge solenoid control circuit.
* Conditions present for at least 30 seconds.

Diagnostic Procedures

1) Perform POWERTRAIN ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK. Read and record FREEZE FRAME and/or FAIL RECORDS data for each DTC set. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect PCM harness connector. Turn ignition on. Using a DVOM, check voltage between engine ground and PCM harness connector EVAP purge valve control circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 6).

3) Using DVOM in 10 amp scale, check current between engine ground and EVAP vent solenoid driver circuit for 2 minutes. If current remains between .05-0.50 amp, go to step 11). If current does not remain between .05-.50 amp, go to next step.

4) Turn ignition off. Leave PCM connector disconnected. Disconnect EVAP purge valve connector. Using DVOM, check voltage between engine ground and EVAP purge valve control circuit. If voltage reading is zero volts, go to step 10). If voltage is not zero volts, go to next step.

5) Locate and repair short to voltage in EVAP purge valve control circuit. After repairs, go to step 16).

6) Check ignition feed fuse to EVAP purge valve. If fuse is blown, go to next step. If fuse is okay, go to step 8).

7) Locate and repair short to ground in EVAP purge valve ignition feed circuit. Replace fuse. After repairs, go to step 16).

8) Disconnect EVAP purge valve connector. Turn ignition on. Check voltage between engine ground and EVAP purge valve ignition feed circuit. If battery voltage is present, go to next step. If battery voltage is not present, go to step 13).

9) Check EVAP purge valve control circuit for open or short to ground. Repair as necessary. After repairs, go to step 16). If circuit is okay, go to next step.

10) Check EVAP purge valve control circuit and ignition feed circuits for faulty connection at EVAP purge valve and PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 14).

11) Turn ignition off. Reconnect PCM connector. Disconnect EVAP purge valve connector. Turn ignition on. Connect a test light between EVAP purge valve control circuit and ignition feed circuit at EVAP purge valve harness connector. Using scan tool, cycle EVAP purge solenoid on and off. If test light flashes on and off, see DIAGNOSTIC AIDS. If test light does not flash on and off, go to next step.

12) Check EVAP purge valve control circuit for faulty connection at PCM. Repair as necessary. After repairs, go to step 16). If connection is okay, go to step 15).

13) Locate and repair open in EVAP purge valve ignition feed circuit. After repairs, go to step 16).

14) Replace EVAP purge valve. After replacing EVAP purge valve, go to step 16).

15) Replace PCM. Program replacement PCM using required equipment. After replacing PCM, go to next step.

16) Using scan tool, read and record FAIL RECORDS DATA, and clear DTCs. Operate vehicle within conditions noted in FAIL RECORDS data. Using scan tool, select SPECIFIC DTC INFO for this DTC. If scan tool displays that this DTC FAILED THIS IGN, return to step 2). If scan tool does not display that this DTC FAILED THIS IGN, repair is complete.

Diagnostic Aids

Check for faulty connections or damaged harness. Disconnect PCM connector. Turn ignition on. Connect a DVOM between engine ground and PCM harness connector EVAP purge valve control circuit. Observe DVOM while moving all related harness and connectors. A change in voltage display indicates fault location.