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**DRIVEABILITY - GAS**

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## NOTES

# 1.0 INTRODUCTION

The procedures contained in this manual include specifications, instructions, and graphics needed to diagnose the PCM Powertrain System. The diagnostics in this manual are based on the failure condition or symptom being present at the time of diagnosis.

Please follow the recommendations below when choosing your diagnostic path.

1. First make sure the DRBIII® is communicating with the appropriate modules; i.e., if the DRBIII® displays a "No Response" condition, you must diagnose this first before proceeding.
2. Read DTCs (diagnostic trouble codes) with the DRBIII®.
3. If no DTCs are present, identify the customer complaint.
4. Once the DTC or customer complaint is identified, locate the matching test in the Table of Contents and begin to diagnose the symptom.

All component location views are in Section 8.0. All connector pinouts are in Section 9.0. All system schematic diagrams are in Section 10.0. All charts and graphs are in Section 11.0.

An * placed before the symptom description indicates a customer complaint.

When repairs are required, refer to the appropriate service manual for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; current systems may be enhanced. READ THIS MANUAL BEFORE TRYING TO DIAGNOSE A VEHICLE DTC. It is recommended that you review the entire manual to become familiar with all new and enhanced diagnostic procedures.

After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

## 1.1 SYSTEM COVERAGE

This diagnostic procedure manual covers the 2003 Wrangler (TJ) with 2.4L and 4.0L Engines.

## 1.2 SIX-STEP TROUBLE SHOOTING PROCEDURE

Diagnosis of the Powertrain Control Module (PCM) is done in six basic steps:

- verification of complaint
- verification of any related symptoms
- symptom analysis
- problem isolation
- repair of isolated problem
- verification of proper operation

# 2.0 IDENTIFICATION OF SYSTEM

The Powertrain Control Module (PCM) monitors and controls:

- fuel system
- ignition system
- charging system
- speed control system
- automatic transmission ("42RLE" transmissions only)

# 3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

## 3.1 GENERAL DESCRIPTION

The on-board OBDII/EUROIII diagnostics incorporated with the PCM controller are intended to assist the field technician in repairing vehicle problems by the quickest means.

## 3.2 FUNCTION OPERATION

### 3.2.1 FUEL CONTROL (GAS)

The PCM controls the air/fuel ratio of the engine by varying fuel injector on time. Mass air flow is calculated by the speed density method using engine speed and manifold absolute pressure (IAT is a modifier in Speed Density).

Different fuel calculation strategies are used depending on the operational state of the engine. During crank mode, a prime shot fuel pulse is delivered followed by fuel pulses determined by a crank time strategy. Cold engine operation is determined via an open loop strategy until the O2 sensors have reached operating temperature. At this point, the strategy enters a closed loop mode where fuel requirements are based upon the state of the O2 sensors, engine speed, MAP, throttle position, air temperature, battery voltage, and coolant temperature.

## 3.2.2 ON-BOARD DIAGNOSTICS

The PCM has been programmed to monitor any circuit or system that has an effect on vehicle emissions, or is used by the PCM to determine the proper functionality of these systems. This monitoring is called "on-board diagnosis."

Certain criteria or, "arming conditions", must be met for a trouble code to be entered into the PCM memory. The criteria may be a range of: engine rpm, engine temperature, and/or input voltage to the PCM. If a problem is detected with a monitored circuit, and all of the criteria or arming conditions are met, a trouble code will be stored in the PCM.

It is possible that a trouble code for a monitored circuit may not be entered into the PCM memory even though a malfunction has occurred. This may happen because one of the trouble code criteria (arming conditions) has not been met.

The PCM compares input signal voltages from each input device with specifications (the established high and low limits of the range) that are preprogrammed for that device. If the input voltage is not within specifications and other trouble code criteria (arming conditions) are met, a trouble code will be stored in the PCM memory.

The On Board Diagnostics have evolved to the second Generation of Diagnostics referred to as OBDII/EUROIII. These OBDII/EUROIII Diagnostics control the functions necessary to meet the requirements of California OBDII/EUROIII and Federal OBD regulations. These requirements specify the inclusion of a Malfunction Indicator Light (MIL) located on the instrument panel for all 1994 and subsequent model-year passenger cars, light duty trucks, and medium-duty vehicles. The purpose of the MIL is to inform the vehicle operator in the event of the malfunction of any emission systems and components which can affect emissions and which provide input to, or receive output from, the PCM.

The following table summarizes the various OBDII EuroIII monitors operation.

**OBDII / EUROIII Monitor Operation**

| Comprehensive Components Monitor | Major Monitors Non Fuel Control & Non Misfire | Major Monitors Fuel Control & Misfire |
|---|---|---|
| Run constantly | Run Once Per Trip | Run constantly |
| Includes All Engine Hardware<br>• Sensors, Switches, Solenoids, etc. | Monitors Entire Emission System | Monitors Entire System |
| Most are One Trip Faults – Usually Turns On The MIL and Sets DTC After One Failure | Most are Two Trip Faults – Turns On The MIL and Sets DTC After Two Consecutive Failures | Two Trip Faults – Turns On The MIL and Sets DTC After Two Consecutive Failures |
| **Priority 3** | **Priority 1 or 3** | **Priority 2 or 4** |
| All Checked For Continuity<br>Open<br>Short To Ground<br>Short To Voltage | Done Stop Testing = Yes<br>Oxygen Sensor Heater<br>Oxygen Sensor Response | **Fuel Control Monitor**<br>Monitors Fuel Control System For:<br>Fuel System Lean<br>Fuel System Rich<br>Requires 3 Consecutive *Fuel System Good Trips* to Extinguish The MIL |
| Inputs Checked For Rationality<br>Outputs Checked For Functionality | Catalytic Converter Efficiency Except EWMA<br>• up to 6 tests per trip and a one trip fault (SBEC) and a two-trip fault on JTEC<br>EGR System<br>Evaporative Emission System (Purge and Leak)<br>Non-LDP or LDP | **Misfire Monitor**<br>Monitors For Engine Misfire at:<br>4 X 1000 RPM Counter (4000 Revs) (Type B)<br>**200 X 3 (600) RPM Counter (Type A)<br>Requires 3 Consecutive *Global Good Trips* To Extinguish the MIL<br>**Type A misfire is a one trip failure on pre-1999, 2 Trip failure on 1999 and later. The MIL will illuminate at the first or second failure, based on MY. |
| Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL* | Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL* | |

***40 Warm Up Cycles** are required to erase DTCs *after* the MIL has been extinguished.

## OBDII/EUROIII MONITOR RUN PROCESS, JTEC

The following procedure has been established to assist Chrysler Dealer Technicians in the field with enabling and running OBD II/EURO III Monitors. The order listed in the following procedure is intended to allow the technician to effectively complete each monitor and to set the CARB Readiness Status in the least time possible.

**NOTE:**

**A. Once the monitor run process has begun, do not turn off the ignition. By turning the ignition key off, monitor enabling conditions will be lost.**

**B. By performing a Battery Disconnect, or Selecting Erase DTCs, the CARB Readiness and all additional OBD information will be cleared.**

**Monitor Preliminary Checks:**

1. Plug a DRB III® into the vehicle's DLC.
2. Turn the ignition, KEY ON - ENGINE OFF. Watch for MIL lamp illumination during the bulb check. MIL lamp must have illuminated, if not, repair MIL lamp.
3. On the DRB III® Select #1 DRB III Standalone.
4. Select #1 1998-2002 Diagnostics
5. Select #1 Engine.
6. Select #2 DTCs and Related Functions
7. Select #1 Read DTCs

* Verify that No Emissions Related DTCs are Present.

* If an Emissions DTC is Present, the OBD II/EUROIII Monitors may not run and the CARB Readiness will not update.

*The Emissions related DTC, will need to be repaired, then cleared. By clearing DTCs, the OBD Monitors will need to be run and completed to set the CARB Readiness Status.

8. Return to Engine Select Function Menu and Select #9, OBD II/EUROIII Monitors.
9. Select #3 CARB Readiness Status.

Do all the CARB Readiness Status Locations read YES?

*YES, then all monitors have been completed and this vehicle is ready to be I/M or Emission Tested.

*NO, then the following procedure needs to be followed to run/complete all available monitors.

**NOTE:**

**A. Only the monitors, which are <u>not</u> YES in the CARB Readiness Status, need to be completed.**

**B. Specific criteria need to be met for each monitor. Each monitor has a Pre-Test screen to assist in running the monitor. For additional information, refer to the Chrysler Corporation Technical Training Workbook titled <u>On Board Diagnostics</u>, part number 81-699-97094.**

The most efficient order to run the monitors has been outlined below, including suggestions to aid the process. The first two monitors have very similar enable criteria; it is possible that the Evaporative Leak Detection Monitor will run during the O2 Sensor Heater Monitor.

1. **O2 Sensor Heater Monitor**
   This monitor requires a cold start, usually an overnight soak or parked for at least 8 hours without the engine running. The engine coolant temperature must be within 10 degrees of ambient/battery temperature, and the sensed Ambient (outside) Temperature must be between approximately 0° F and 100° F. For the monitor run conditions, select the O2S HEATER MON PRE-TEST in the DRB III®, OBD II/EUROIII Monitors Menu
2. **Evaporative Leak Detection Monitor (If the vehicle is equipped with an LDP system)**
   This monitor requires a cold start, usually an overnight soak or parked for at least 8 hours without the engine running. The engine coolant temperature must be within 10 degrees of ambient/battery temperature, and the sensed Ambient (outside) Temperature must be between approximately 40° F and 90° F. For the monitor run conditions select the EVAP LDP MON PRE-TEST in the DRB III®, OBD II/EUROIII Monitors Menu.
3. **Catalyst Monitor**
   The vehicle will need to be driven at highway speed for a few minutes. If the vehicle is equipped with a manual transmission, using 4th gear may assist in meeting the monitor running criteria. For the monitor run conditions, select the EWMA CAT MON PRE-TEST in the DRB III®, OBD II/EUROIII Monitors Menu.

4. **O2 Sensor Monitor**
   The vehicle will need to be driven for a period of time and brought to a stop for a short period of time with the Automatic Transmission left in Drive. The O2S Monitor will not run in Park or Neutral on an Automatic Transmission equipped vehicle. For the monitor run conditions, select the O2S MON PRE-TEST in the DRB III®, OBD II/EUROIII Monitors Menu.
5. **Purge Monitor**
   All the Purge Free (PF) cells must update on the ADAPTIVE MEMORY screen before the Purge Flow Monitor will run. For the monitor run conditions, select the PURGE FLOW MON PRE-TEST in the DRB III®, OBD II/EUROIII Monitors Menu. The Purge Flow Monitor will not run in Park or Neutral on an Automatic Transmission equipped vehicle. The Purge Flow Monitor will attempt to run every **other** throttle closure. If all of the parameters are met and it still does not run, with your foot firmly on the Service Brake, slightly (1/4) open the Throttle and quickly close the Throttle. This will allow the Purge Free update to happen, and then the Purge Flow Monitor will Run.

## 3.2.3 OTHER CONTROLS

### CHARGING SYSTEM

The charging system is turned on when the engine is started and ASD relay energized. When the ASD relay is on, ASD output voltage is supplied to the ASD sense circuit at the PCM. This voltage is connected in some cases, through the PCM and supplied to one of the generator field terminals (Generator Source +). All others, the Generator field is connected directly to the ASD output voltage. The amount of current produced by the generator is controlled by the Electronic Voltage Regulator (EVR) circuitry, in the PCM. Battery temperature is determined either by IAT, Ambient or Battery temperature sensor. This temperature along with sensed line voltage is used by the PCM to vary battery charging. This is accomplished by cycling the path to ground to the other generator field terminal (Generator field driver).

### SPEED CONTROL

The PCM controls vehicle speed by operation of the speed control servo vacuum and vent solenoids. Energizing the vacuum solenoid applies vacuum to the servo to increase throttle position. Operation of the vent solenoid slowly releases the vacuum allowing throttle position to decrease. A special dump solenoid allows immediate release of throttle position caused by braking, cruise control turn off, shifting into neutral, excessive RPM (tires spinning) or ignition key off.

### FUEL VAPOR RECOVERY SYSTEM (DUTY CYCLE PURGE CONTROL) GAS ENGINE

Duty Cycle Purge is a system that feeds fuel gases from the purge canister and gasoline tank into the throttle body for mixing with incoming air. Metering of the gases is performed by duty cycling the purge solenoid by the PCM.

The system is disabled during wide-open throttle conditions and while the engine is below a specified coolant temperature. When engine temperature becomes greater than a calibrated parameter, duty cycle purge is delayed for a calibrated time. Once purge delay is over, purge will be ramped in to soften the effect of dumping additional fuel into the engine.

The PCM provides a modulated 5 Hz signal (at closed throttle) or 10 Hz signal (at open throttle) to control this system. Modulation of the signal is based upon a calculated air flow (based upon known fuel flow through the injector at a given pulse width and RPM) and is adjusted to compensate for changes in flow due to varying engine vacuum.

### LEAK DETECTION PUMP

### LEAK DETECTION PUMP OPERATION

The evaporative emission system is designed to prevent the escape of fuel vapors from the fuel system. Leaks in the system, even small ones, can allow fuel vapors to escape into the atmosphere. Government regulations require onboard testing to make sure that the evaporative (EVAP) system is functioning properly. The leak detection system test for EVAP system leaks and blockage. It also performs self-diagnostics. During self-diagnostics, the Powertrain Control Module (PCM) first checks the Leak Detection Pump (LDP) for electrical and mechanical faults. If the first checks pass, the PCM then uses the LDP to seal the vent valve and pump air into the system to pressurize it. If a leak is present, the PCM will continue pumping the LDP to replace the air that leaks out. The PCM determines the size of the leak based on how fast/long it must pump the LDP as it tries to maintain pressure in the system.

### EVAP LEAK DETECTION SYSTEM COMPONENTS (FIGURE 1)

**Service Port:** Used with special tools like the Miller Evaporative Emissions Leak Detector (EELD) to test for leaks in the system.

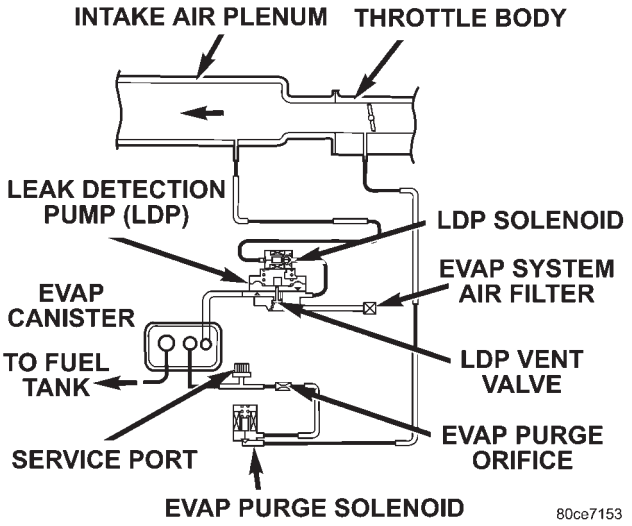
**EVAP Purge Solenoid:** The PCM uses the EVAP purge solenoid to control purging of excess fuel

vapors stored in the EVAP canister. It remains closed during leak testing to prevent loss of pressure.

**EVAP Canister:** The EVAP canister stores fuel vapors from the fuel tank for purging.

**EVAP Purge Orifice:** Limits purge volume.

**EVAP System Air Filter:** Provides air to the LDP for pressurizing the system. It filters out dirt while allowing a vent to atmosphere for the EVAP system.

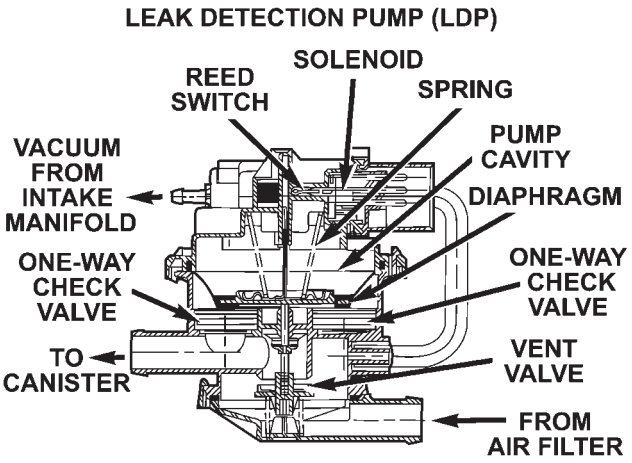



## LEAK DETECTION PUMP (LDP) COMPONENTS

The main purpose of the LDP is to pressurize the fuel system for leak checking. It closes the EVAP system vent to atmospheric pressure so the system can be pressurized for leak testing. The diaphragm is powered by engine vacuum. It pumps air into the EVAP system to develop a pressure of about 7.5″ HO (1/4) psi. A reed switch in the LDP allows the PCM to monitor the position of the LDP diaphragm. The PCM uses the reed switch input to monitor how fast the LDP is pumping air into the EVAP system. This allows detection of leaks and blockage.

The LDP assembly consists of several parts (Figure 2). The solenoid is controlled by the PCM, and it connects the upper pump cavity to either engine vacuum or atmospheric pressure. A vent valve closes the EVAP system to atmosphere, sealing the system during leak testing. The pump section of the LDP consists of a diaphragm that moves up and down to bring air in through the air filter and inlet check valve, and pump it out through an outlet check valve into the EVAP system.

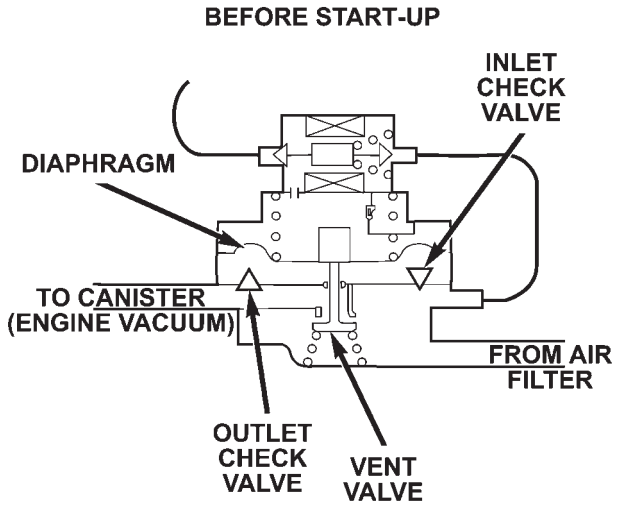
The diaphragm is pulled up by engine vacuum, and pushed down by spring pressure, as the LDP solenoid turns on and off. The LDP also has a magnetic reed switch to signal diaphragm position to the PCM. When the diaphragm is down, the switch is closed, which sends a 12 V (system voltage) signal to the PCM. When the diaphragm is up, the switch is open, and there is no voltage sent to




the PCM. This allows the PCM to monitor LDP pumping action as it turns the LDP solenoid on and off.

## LDP AT REST (NOT POWERED)

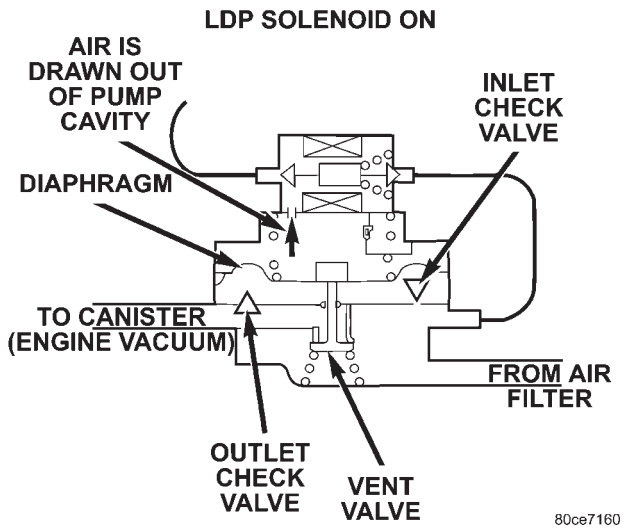
When the LDP is at rest (no electrical/vacuum) the diaphragm is allowed to drop down if the internal (EVAP system) pressure is not greater than the return spring. The LDP solenoid blocks the engine vacuum port and opens the atmospheric pressure port connected through the EVAP system air filter. The vent valve is held open by the diaphragm. This allows the canister to see atmospheric pressure (Figure 3).




## DIAPHRAGM UPWARD MOVEMENT

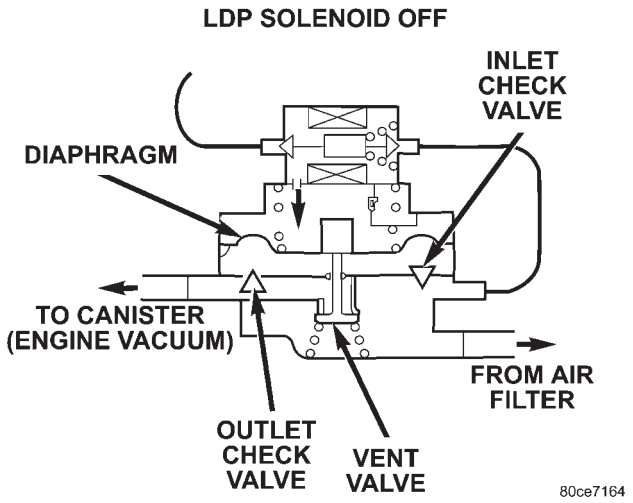
When the PCM energizes the LDP solenoid, the solenoid blocks the atmospheric port leading through the EVAP air filter and at the same time opens the engine vacuum port to the pump cavity above the diaphragm. The diaphragm moves upward when vacuum above the diaphragm exceeds spring force. This upward movement closes the vent valve. It also causes low pressure below the dia-

phragm, unseating the inlet check valve and allowing air in from the EVAP air filter. When the diaphragm completes its upward movement, the LDP reed switch turns from closed to open (Figure 4).




## DIAPHRAGM DOWNWARD MOVEMENT

Based on reed switch input, the PCM de-energizes the LDP solenoid, causing it to block the vacuum port, and open the atmospheric port. This connects the upper pump cavity to atmosphere through the EVAP air filter. The spring is now able to push the diaphragm down. The downward movement of the diaphragm closes the inlet check valve and opens the outlet check valve pumping air into the evaporative system. The LDP reed switch turns from open to closed, allowing the PCM to monitor LDP pumping (diaphragm up/down) activity (Figure 5. During the pumping mode, the diaphragm will not move down far enough to open the vent valve.




The pumping cycle is repeated as the solenoid is turned on and off. When the evaporative system begins to pressurize, the pressure on the bottom of the diaphragm will begin to oppose the spring pressure, slowing the pumping action. The PCM watches the time from when the solenoid is de-energized, until the diaphragm drops down far enough for the reed switch to change from opened to closed. If the reed switch changes too quickly, a leak may be indicated. The longer it takes the reed switch to change state, the tighter the evaporative system is sealed. If the system pressurizes too quickly, a restriction somwehere in the EVAP system may be indicated.

## PUMPING ACTION

During portions of this test, the PCM uses the reed switch to monitor diaphragm movement. The solenoid is only turned on by the PCM after the reed switch changes from open to closed, indicating that the diaphragm has moved down. At other times during the test, the PCM will rapidly cycle the LDP solenoid on and off to quickly pressurize the system. During rapid cycling, the diaphragm will not move enough to change the reed switch state. In the state of rapid cycling, the PCM will use a fixed time interval to cycle the solenoid.

If the system does not pass the EVAP Leak Detection Test, the following DTCs may be set:

- P0442 – EVAP LEAK MONITOR 0.040″ LEAK DETECTED
- P0455 – EVAP LEAK MONITOR LARGE LEAK DETECTED
- P0456 – EVAP LEAK MONITOR 0.020″ LEAK DETECTED
- P1486 – EVAP LEAK MON PINCHED HOSE FOUND
- P1494 – LEAK DETECTION PUMP SW OR MECH FAULT
- P1495 – LEAK DETECTION PUMP SOLENOID CIRCUIT

## ENABLING CONDITIONS TO RUN EVAP LEAK DETECTION TEST

1. Cold start: with ambient temperature (obtained from modeling the inlet air temperature sensor on passenger vehicles and the battery temperature sensor on Jeep & truck vehicles) between 4°C (40°F) and 32°C (90°F) for 0.040 leak. Between 4°C (40°F) and 29°C (85°F) for 0.020 leak.
2. Engine coolant temperature within: -12° to -8°C (10° to 18°F) of battery/ambient.
3. Battery voltage between 10 and 15 volts.

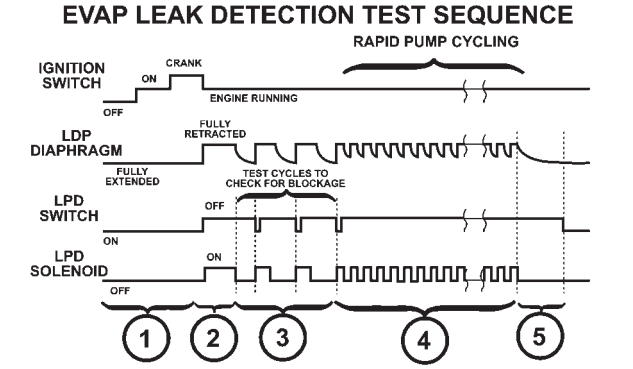
**NOTE: If battery voltage drops below 10 volts for more than 5 seconds during engine cranking, the EVAP leak detection test will not run.**

4. Low fuel warning light off (fuel level must be between 15% and 85%).
5. MAP sensor reading 22 in Hg or above (This is the manifold absolute pressure, not vacuum).
6. No engine stall during test.

**NOTE: The following values are approximate and vehicle specific. Use the values seen in pre test/monitor test screen on the DRBIII®. See TSB 25-002-98 for more detail.**

A DTC will not set if a one-trip fault is set or if the MIL is illuminated for any of the following:

- Purge Solenoid
- All engine Controller Self Test Faults
- All Cam and/or Crank Sensor Faults
- MAP Sensor Faults
- Ambient/Battery Temperature Sensor Electrical Faults
- All Coolant Sensor Faults
- All TPS Faults
- LDP Pressure Switch Faults
- EGR Solenoid Electrical Faults
- All Injector Faults
- Baro Out Of Range
- Vehicle Speed Faults
- LDP Solenoid Circuit




## FIGURE 6 SECTION 1

When the ignition key is turned to "ON", the LDP diaphragm should be in the down position and the LDP reed switch should be closed. If the EVAP system has residual pressure, the LDP diaphragm may be up. This could result in the LDP reed switch being open when the key is turned to "ON" and a P1494 fault could be set because the PCM is expecting the reed switch to be closed.

After the key is turned "ON", the PCM immediately tests the LDP solenoid circuit for electrical faults. If a fault is detected, DTC P1495 will set, the MIL will illuminate, and the remaining EVAP Leak Detection Test is cancelled.

**NOTE: If battery temperature is not within range, or if the engine coolant temperature is not within a specified range of the battery temperature, the PCM will not run tests for DTC P1494, P1486, P0442, P0455 and P04441. These temperature calibrations may be different between models.**

## FIGURE 6 SECTION 2

If DTCP1495 is not set, the PCM will check for DTC P1494. If the LDP reed switch was closed when the key was turned to "ON", the PCM energizes the LDP solenoid for up to 8 seconds and monitors the LDP switch. As the LDP diaphragm is pulled up by engine vacuum, the LDP reed switch should change from closed to open. If it does not, the PCM sets a temporary fault (P1494) in memory, and waits until the next time the Enabling Conditions are met to run the test again. If this is again detected, P1494 is stored and the MIL is illuminated. If the problem is not detected during the next enabling cycle, the temporary fault will be cleared.

However, if the PCM detects the reed switch open when the key is turned to "ON", the PCM must determine if this condition is due to residual pressure in the EVAP system, or an actual fault. The PCM stores information in memory on EVAP system purging from previous engine run or drive cycles.

If little or no purging took place, residual pressure could be holding the LDP diaphragm up, causing the LDP switch to be open. Since this is not a malfunction, the PCM cancels the EVAP Leak Detection Test without setting the temporary fault.

If there was sufficient purging during the previous sycle to eliminate EVAP system pressure, the PCM judges that this is a malfunction and sets a temporary fault in memory. The next time that the Enabling Conditions are met, the test will run again. If the fault is again detected, the MIL will illuminate and DTC 1494 will be stored. If the fault is not detected, the temporary fault will be cleared.

## FIGURE 6 SECTION 3

If no fault has been detected so far, the PCM begins testing for possible blockage in the EVAP system between the LDP and the fuel tank. This is done by monitoring the time required for the LDP to

pump air into the EVAP system during two to three pump cycles. If no blockage is present, the LDP diaphragm is able to quickly pump air out of the LDP each time the PCM turns off the LDP solenoid. If a blockage is present, the PCM detects that the LDP takes longer to complete each pump cycle. If the pump cycles take longer than expected (approximately 6 to 10 seconds) the PCM will suspect a blockage. On the next drive when Enabling Conditions are met, the test will run again. If blockage is again detected, P1486 is stored, and the MIL is illuminated.

### FIGURE 6 SECTION 4

After the LDP blockage tests are completed, the PCM then tests for EVAP system leakage. First, the PCM commands the LDP to rapidly pump for 20 to 50 seconds (depending on fuel level) to build pressure in the EVAP system. This evaluates the system to see if it can be sufficiently pressurized. This evaluation (rapid pump cycling) may occur several times prior to leak checking. The LDP reed switch does not close and open during rapid pumping because the diaphragm does not travel through its full range during this part of the test.

### FIGURE 6 SECTION 5

Next, the PCM performs one or more tests cycles by monitoring the time required for the LDP reed switch to close (diaphragm to drop) after the LDP solenoid is turned off.

If the switch does not close, or closes after a long delay, it means that the system does not have any significant leakage and the EVAP Leak Detection Test is complete.

However, if the LDP reed switch closes quickly, there may be a leak or the fuel level may be low enough that the LDP must pump more to finish pressurizing the EVAP system. In this case, the PCM will rapidly pump the LDP again to build pressure in the EVAP system, and follow that by monitoring the time needed for several LDP test cycles. This process of rapid pumping followed by several LDP test cycles may repeat several times before the PCM judges that a leak is present.

When leaks are present, the LDP test cycle time will be inversely proportional to the size of the leak. The larger the leak, the shorter the test cycle time. The smaller the leak, the longer the test cycle time. DTC's may be set when a leak as small as 0.5 mm (0.020″) diameter is present.

If the system detects a leak, a temporary fault will be stored in PCM memory. The time it takes to detect a .020, .040, or larger leak is based on calibrations that vary from model to model. The important point to remember is if a leak is again detected on the next EVAP Leak Detection Test, the MIL will illuminate and a DTC will be stored based on the size of leak detected. If no leak is detected during the next test, the temporary fault will be cleared.

### DIAGNOSTIC TIPS

During diagnosis, you can compare the LDP solenoid activity with the monitor sequence in Figure 6. If the PCM detects a problem that could set a DTC, the testing is halted and LDP solenoid activity will stop. As each section of the test begins, it indicates that the previous section passed successfully. By watching to see which tests complete, you can see if any conditions are present that the PCM considers abnormal.

For example, if the LDP solenoid is energized for the test cycles to test for blockage (P1486), it means that the LDP has already passed its test for P1494. Then, if the PCM detects a possible blockage, it will set a temporary fault without turning on the MIL and continue the leak portion of the test. However, the PCM will assume that the system is already pressurized and skip the rapid pump cycles.

Always diagnose leaks, if possible, before disconnecting connections. Disconnecting connections may mask a leak condition.

Keep in mind that if the purge solenoid seat is leaking, it could go undetected since the leak would end up in the intake manifold. Disconnect the purge solenoid at the manifold when leak checking. In addition, a pinched hose fault (P1486) could set if the purge solenoid does not purge the fuel system properly (blocked seat). The purge solenoid must vent the fuel system prior to the LDP system test. If the purge solenoid cannot properly vent the system the LDP cannot properly complete the test for P1486 and this fault can be set due to pressure being in the EVAP system during the test sequence.

Multiple actuation's of the DRBIII® Leak Detection Pump (LDP) Monitor Test can hide a 0.020 leak because of excess vapor generation. Additionally, any source for additional vapor generation can hide a small leak in the EVAP system. Excess vapor generation can delay the fall of the LDP diaphragm thus hiding the small leak. An example of this condition could be bringing a cold vehicle into a warm shop for testing for high ambient temperatures.

Fully plugged and partially plugged underhood vacuum lines have been known to set MIL conditions. P1494 and P0456 can be set for this reason. Always, thoroughly, check plumbing for pinches or blockage before condemning components.

### TEST EQUIPMENT

The Evaporative Emission Leak Detector (EELD) Miller Special Tool 8404 is capable of visually detecting leaks in the evaporative system and will take the place of the Evap System Diagnostic Kit.

The EELD utilizes shop air and a smoke generator to visually detect leaks down to 0.020 or smaller. The food grade oil used to make the smoke includes an UV trace dye that will leave telltale signs of the leak under a black light. This is helpful when components have to be removed to determine the exact leak location. For detailed test instructions, follow the operators manual packaged with the EELD.

**IMPORTANT**

Be sure that the PCM has the latest software update. Reprogram as indicated by any applicable Technical Service Bulletin. After LDP repairs are completed, verify the repair by running the DRBIII® Leak Detection Pump (LDP) Monitor Test as described in Technical Service Bulletin 18-12-99.

## 3.2.4 NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems, and conditions even though they could have malfunctions that result in driveability problems. A diagnostic code may not be displayed for the following conditions. However, problems with these systems may cause a diagnostic code to be displayed for other systems. For example, a fuel pressure problem will not register a diagnostic code directly, but could cause a rich or lean condition. This could cause an oxygen sensor, fuel system, or misfire monitor trouble code to be stored in the PCM.

**Engine Timing** − The PCM cannot detect an incorrectly indexed timing chain, camshaft sprocket, or crankshaft sprocket. The PCM also cannot detect an incorrectly indexed distributor or Cam Sensor.(*)

**Fuel Pressure** − Fuel pressure is controlled by the fuel pressure regulator. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line filter, or a pinched fuel supply.(*)

**Fuel Injectors** − The PCM cannot detect a clogged fuel injector, a sticking pintle, or that an incorrect injector is installed.(*)

**Fuel Requirements** − Poor quality gasoline can cause problems such as hard starting, stalling, and stumble. Use of methanol-gasoline blends may result in starting and driveability problems. (See individual symptoms and their definitions in Section 6.0 Glossary of Terms).

**PCM Grounds** − The PCM cannot detect a poor system ground. However, a diagnostic trouble code may be stored in the PCM as a result of this condition.

**Throttle Body Air Flow** − The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.(*)

**Exhaust System** − The PCM cannot detect a plugged, restricted, or leaking exhaust system.(*)

**Cylinder Compression** − The PCM cannot detect uneven, low, or high engine cylinder compression.(*)

**Excessive Oil Consumption** − Although the PCM monitors the exhaust oxygen content through the oxygen sensor when the system is in a closed loop, it cannot determine excessive oil consumption.

**NOTE: Any of these conditions could result in a rich or lean condition causing an oxygen sensor trouble code to be stored in the PCM, or the vehicle may exhibit one or moer of the driveability symptoms listed in the Table of Contents.**

## 3.2.5 SKIS OVERVIEW

The Sentry Key Immobilizer System (SKIS) is an immobilizer system designed to prevent unauthorized vehicle operation. The system consists of Sentry Key Immobilizer Module (SKIM) sends a PCI Bus message to the engine controller indicating ignition key status. Upon receiving this message the PCM will terminate engine operation or allow the engine to continue to operate.

## 3.2.6 SKIM ON-BOARD DIAGNOSTICS

The SKIM has been programmed to transmit and monitor many different coded messages as well as PCI Bus messages. This monitoring is called “On-Board Diagnosis”.

Certain criteria must be met for a diagnostic trouble code to be entered into the SKIM memory. The criteria may be a range of Input voltage, PCI Bus message, or coded messages to the SKIM. If all of the criteria for monitoring a circuit or function are met and a fault is sensed, a diagnostic trouble code will be stored in the SKIM memory.

## 3.2.7 SKIS OPERATION

When ignition power is supplied to the SKIM, the SKIM performs an internal self-test. After the self-test is completed, the SKIM energizes the antenna (this activates the transponder chip) and sends a challenge to the transponder chip. The transponder chip responds to the challenge by generating an encrypted response message using the following:

**Secret Key** - This is an electronically stored value (identification number) that is unique to each SKIS. The secret key is stored in the SKIM, PCM, and all ignition key transponders.

**Challenge** - This is a random number that is generated by the SKIM at each ignition key cycle. The secret key and challenge are the two variables used in the algorithm that produces the crypto algorithm to receive, decode and respond to the message sent by the SKIM. After responding to the coded message, the transponder sends a transpon-

der ID message to the SKIM. The SKIM compares the transponder ID to the available valid ignition key codes in the SKIM memory (8 key maximum). After validating the key, the SKIM sends a PCI Bus message called a "Seed Request" to the engine controller then waits for a PCM response. If the PCM does not respond, the SKIM will send the seed request again. After three failed attempts, the SKIM will stop sending the seed request and store a trouble code. If the PCM sends a seed response, the SKIM sends a valid/invalid key message to the PCM. This is an encrypted message that is generated using the following:

**VIN** - Vehicle Identification Number

**Seed** - This is a random number that is generated by the PCM at each ignition key cycle.

The VIN and seed are the two variables used in the rolling code algorithm that encrypts the "valid/invalid key" message. The PCM uses the rolling code algorithm to receive, decode and respond to the valid/invalid key message sent by the SKIM. After sending the valid/invalid key message the SKIM waits 3.5 seconds for a PCM status message from the PCM. If the PCM does not respond with a valid key message to the SKIM, a fault is detected and a trouble code is stored. The SKIS incorporates a warning lamp located in the instrument cluster. The lamp receives power and ground from the instrument cluster. The lamp is actuated when the SKIM sends a PCI Bus message to the instrument cluster requesting the lamp on. The SKIM will request warning lamp illumination for:

- bulb checks at ignition on
- to alert the vehicle operator to a SKIS malfunction
- customer key programming mode

For all faults except transponder faults and VIN mismatch, the lamp remains on steady. In the event of a transponder fault the light flashes at a rate of 1 Hz (once per second). If a fault is present the lamp will remain on or flashing for the complete ignition cycle. If a fault is stored in SKIM memory which prevents the system from operating properly, the PCM will allow the engine to start and run (for two seconds) up to six times. After the sixth attempt the PCM will not allow engine to start.

## 3.2.8 PROGRAMMING THE POWERTRAIN CONTROL MODULE

**Important Notice:** Before replacing the PCM for a failed driver, control circuit or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal failure to components (i.e. relay and solenoids) and short circuits (i.e. 12-volt pull-ups, drivers and ground sensors). These failures are difficult to detect when a double fault has occurred and only one DTC has set.

**NOTE: If the PCM and the SKIM are replaced at the same time, program the VIN into the PCM first. All vehicle keys will then need to be replaced and programmed to the new SKIM.**

The SKIS "Secret Key" is an ID code that is unique to each SKIS. This code is programmed and stored in the SKIM, PCM and transponder chip (ignition key). When replacing the PCM it is necessary to program the secret key into the PCM.

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRBIII® and select "THEFT ALARM", "SKIM" then "MISCELLANEOUS".
3. Select "PCM REPLACED".
4. Enter secured access mode by entering the vehicle four-digit PIN.

**NOTE: If three attempts are made to enter the secure access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit ths lockout mode, turn the ignition to the RUN position for one hour then enter the correct PIN. (Ensure all accessories are turned off. Also, monitor the battery state and connect a battery charger if necessary).**

5. Press "ENTER" to transfer the secret key (the SKIM will send the secret key to the PCM).

## 3.2.9 PROGRAMMING THE SENTRY KEY IMMOBILIZER MODULE

**NOTE: If the PCM and the SKIM are replaced at the same time, program the VIN into the PCM first. All vehicle keys will then need to be replaced and programmed to the new SKIM.**

1. Turn the ignition on (transmission in park/neutral).
2. Use the DRBIII® and select "THEFT ALARM", "SKIM", then "MISCELLANEOUS".
3. Select "SKIM MODULE REPLACEMENT (GASOLINE)".
4. Program the vehicle four-digit PIN into the SKIM.
5. Select "COUNTRY CODE" and enter the correct country.

**NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, the SKIM must be replaced.**

6. Select "UPDATE VIN" (the SKIM will learn the VIN from the PCM).
7. Press "ENTER" to transfer the VIN (the PCM will send the VIN to the SKIM).
8. The DRBIII® will ask if you want to transfer the secret key from the PCM. This will ensure the current vehicle ignition keys will still operate the SKIS system.

### 3.2.10 PROGRAMMING THE IGNITION KEYS TO THE SENTRY KEY IMMOBILIZER MODULE

1. Turn the igntion on (transmission in park/ neutral).
2. Use the DRBIII® and select "THEFT ALARM", "SKIM" then "MISCELLANEOUS".
3. Slect "PROGRAM IGNITION KEYS".
4. Enter secured access mode by entering the vehicle four-digit PIN.

**NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM, the key cannot be transferred to another vehicle.**

If ignition key programming is unsuccessful, the DRB III® will display one of the following messages:
**Program Not Attempted** - The DRBIII® attempts to read the programmed key status and there are no keys programmed in the SKIM memory.
**Programming Key Failed** - (Possible Used Key From Wrong Vehicle) - SKIM is unable to program key due to one of the following:

- faulty ignition key transponder
- ignition key is programmed to another vehicle.

**8 Keys Already Learned, Programming Not Done** - SKIM transponder ID memory is full.

- Obtain ignition keys to be programmed from customer (8 keys maximum).
- Using the DRBIII®, erase all ignition keys by selecting "MISCELLANEOUS" and "ERASE ALL CURRENT IGN. KEYS".
- Program all ignition keys.

**Learned Key In Ignition** - Ignition key transponder ID is currently programmed in SKIM memory.

## 3.3 DIAGNOSTIC TROUBLE CODES

Each diagnostic trouble code is diagnosed by following a specific testing procedure. The diagnostic test procedures contain step-by-step instructions for determining the cause of trouble codes as well as no trouble code problems. It is not necessary to perform all of the tests in this book to diagnose an individual code.

Always begin by reading the diagnostic trouble codes using the DRBIII®.

### 3.3.1 HARD CODE

A diagnostic trouble code that comes back within one cycle of the ignition key is a "hard" code. This means that the defect is present when the PCM checks that circuit or function. Procedures in this manual verify if the trouble code is a hard code at the beginning of each test. When it is not a hard code, an "intermittent" test must be performed.

Codes that are for OBDII/EUROIII monitors will not set with just the ignition key on. Comparing these to non-emission codes, they will seem like an intermittent. These codes require a set of parameters to be performed (The DRBIII® pre-test screens will help with this for MONITOR codes), this is called a "TRIP". All OBDII/EUROIII DTCs will set after two or in some cases one trip failures, and the MIL will be turned on. These codes require three successful, no failures, TRIPS to extinguish the MIL, followed by 40 warm-up cycles to erase the code. For further explanation of TRIPS, Pre-test screens, Warm-up cycles, and the use of the DRBIII®, refer to the On Board Diagnostic training booklet #81-699-97094.

### 3.3.2 INTERMITTENT CODE

A diagnostic trouble code that is not present every time the PCM checks the circuit is an "intermittent" code. Most intermittent codes are caused by wiring or connector problems. Intermittents that come and go like this are the most difficult to diagnose; they must be looked for under specific conditions that cause them. The following procedures may assist you in identifying a possible intermittent problem:

- Visually inspect related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Visually inspect the related harnesses. Look for chafed, pierced, or partially broken wire.
- Refer to any S.T.A.R. Hotline Newsletters or technical service bulletins that may apply.
- Use the DRBIII® data recorder or co-pilot.

### 3.3.3 STARTS SINCE SET COUNTER

This reset counter counts the number of times the vehicle has been started since codes were last set or erased. This counter will count up to 255 start counts.

The number of starts helps determine when the trouble code actually happened. This is recorded by the PCM and can be viewed on the DRBIII® as STARTS since set.

When there are no trouble codes stored in memory, the DRBIII® will display "NO TROUBLE CODES FOUND" and the reset counter will show "STARTS since set = XXX."

OBDII/EUROIII vehicles will also display a DTC Specific or Global "Good Trip" counter which will indicate the number of "Good Trips" since the DTC was set. After 3 consecutive "Good Trips," the MIL is extinguished and the good trip counter is replaced by a "Warm Up Cycle" counter. 40 Warm-up Cycles will erase the DTC and Freeze Frame information.

### 3.3.4 NO START INFORMATION

#### IMPORTANT NOTE:

If the Powertrain Control Module has been programmed, a DTC will set in the ABS and Air bag modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable starting.

#### FOR ABS AND AIR BAG SYSTEMS:

1. Enter correct VIN and Mileage in PCM.
2. Erase codes in ABS and Air Bag modules.

#### FOR SKIM THEFT ALARM:

1. Connect the DRBIII® to the data link connector.
2. Go to Theft Alarm, SKIM, Misc. and place the SKIM in *secured access* mode, by using the appropriate PIN code for this vehicle.
3. Select Update the Secret Key data, data will be transferred from the SKIM to the PCM (This is required to allow the vehicle to start with the new PCM).
4. If three attempts are made to enter *secured access* mode using the incorrect PIN, *secured access* mode will be locked out for one hour. To exit this lock out mode, leave the ignition key in the Run/Start position for one hour. Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary.

After reading Section 3.0 (System Description and Functional Operation), you should have a better understanding of the theory and operation of the on-board diagnostics, and how this relates to the diagnosis of a vehicle that may have a driveability-related symptom or complaint.

## 3.4 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading trouble codes, erasing trouble codes, and other DRBIII® functions.

## 3.5 DRBIII® ERROR MESSAGES AND BLANK SCREEN

Under normal operation, the DRBIII® will display one of only two error messages:

– User-Requested WARM Boot by pressing MORE and NO at the same time.

```
ver: 2.29
date: 1 Oct 93
file: key_itf.cc
date: Jan 12 1994
line: 544
err: 0x1
User-Requested WARM Boot

Press MORE to switch between this display
  and the application screen.
Press F4 when done noting information.
```

or

– User-Requested COLD Boot by pressing MORE and YES at the same time.

```
ver: 2.29
date: 1 Oct 99
file: key_hnd1.cc
date: Mar 8 2000
line: 1297
err: 0x1
User-Requested COLD Boot

Press MORE to switch between this display
  and the application screen.
Press F4 when done noting information.
```

If the DRBIII® should display any other error message, record the entire display and call the Star Center.

### 3.5.1 DRBIII® DOES NOT POWER UP

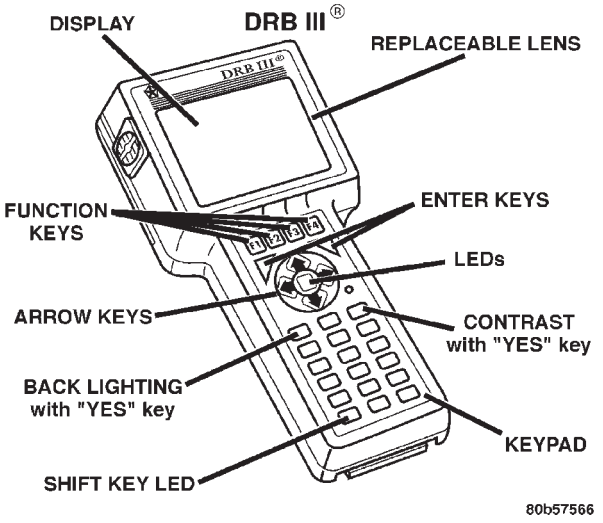
If the LED's do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage (data link connector cavity 16). Check for proper ground connection at DLC cavity. A minimum of 11 volts is required to adequately power the DRBIII®.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, and inoperative DRBIII®

may be the result of faulty cable or vehicle wiring. For a blank screen, refer to the appropriate body diagnostics manual.

### 3.5.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.




## 4.0 DISCLAIMERS, SAFETY, WARNINGS

### 4.1 DISCLAIMERS

All information, illustrations, and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

### 4.2 SAFETY

### 4.2.1 TECHNICIAN SAFETY INFORMATION

**WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME, AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREAS WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.**

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the parking brake does not hold the drive wheels.

When servicing a vehicle, always wear eye protection, and remove any metal jewelry such as watchbands or bracelets that might make an inadvertent electrical contact.

When diagnosing a powertrain system problem, it is important to follow approved procedures where applicable. These procedures can be found in service manual procedures. Following these procedures is very important to the safety of individuals performing diagnostic tests.

### 4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

### 4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the powertrain system are intended to be serviced as an assembly. Attempting to remove or repair certain system sub-components may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

### 4.2.4 DRBIII® SAFETY INFORMATION

**WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND THE SPECIFICATION LIMITS.**

Follow the vehicle manufacturer's service specifications at all times.

- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tips, or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

| FUNCTION | INPUT LIMIT |
|---|---|
| Volts | 0 - 500 peak volts AC<br>0 - 500 volts DC |
| Ohms (resistance)* | 0 - 1.12 megohms |
| Frequency Measured<br>Frequency Generated | 0 - 10 kHz |

| FUNCTION | INPUT LIMIT |
|---|---|
| Temperature | -50 - 600°C<br>-58 - 1100°F |

* Ohms cannot be measured if voltage is present. Ohms can be measured only in a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- A 10A fuse or circuit breaker must be used to protect the circuit being tested.
- Use the low current shunt to measure circuits up to 10A. Use the high current clamp to measure circuits exceeding 10A.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the meter function, keep the DRBIII® away from spark plug or coil wires to avoid measuring error from outside interference.

## 4.3 WARNINGS AND CAUTIONS

### 4.3.1 ROAD TEST WARNINGS

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

**CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not try to read the DRBIII® screen while in motion. Do not hang the DRBIII® from the rear view mirror or operate it yourself. Have an assistant available to operate the DRBIII®.**

### 4.3.2 VEHICLE DAMAGE CAUTIONS

Before disconnecting any control module, make sure the ignition is “off”. Failure to do so could damage the module.

When testing voltage or continuity at any control module, use the terminal side (not the wire end) of the connector. Do not probe a wire through the insulation; this will damage the insulation and wire and eventually cause it to fail because of corrosion.

Be careful when performing electrical tests so as to prevent accidental shorting of terminals. Such mistakes can damage fuses or components. Also, a second DTC could be set, making diagnosis of the original problem more difficult.

## 5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box) scan tool
Evaporative Emissions Leak Detector #8404
Fuel pressure kit #8978
fuel filler adapter #8382
fuel pressure adapter (C-6631) or #6539
fuel pressure kit (C-4799-B) or #5069
fuel release hose (C-4799-1)
Mirco 420 battery system tester
min air flow fitting #6714
jumper wires
ohmmeter
oscilloscope
vacuum gauge
voltmeter
12-volt test light minimum 25 ohms resistance with probe #6801

**CAUTION: A 12-volt test light should not be used for the following circuits, damage to the powertrain controller will occur.**

- 5-Volt Supply
- 8 Volt Supply
- J1850 PCI Bus
- CCD Bus
- CKP Sensor Signal
- CMP Sensor Signal
- Vehicle Speed Sensor Signal
- O2 Sensor Signal

## 6.0 ACRONYMS

| | |
|---|---|
| **A/C** | air conditioning |
| **ABS** | anti-lock brake system |
| **ASD Relay** | auto shutdown relay |
| **APPS** | accelerator pedal position sensor |
| **Baro** | barometric pressure |
| **BCM** | body control module |
| **BTS** | battery temperature sensor |
| **CAA** | clean air act |

| | |
|---|---|
| **CAB** | controller antilock brakes |
| **CARB** | California air resources board |
| **CCD Bus** | Chrysler collision detection bus |
| **CKP Sensor** | crank position sensor |
| **CMP Sensor** | camshaft position sensor |
| **CO** | carbon monoxide |
| **DCP Solenoid** | duty-cycle purge solenoid |
| **DLC** | data link connector |
| **DRBIII®** | diagnostic readout box – 3rd generation |
| **DTC** | diagnostic trouble code |
| **DVOM** | digital volt ohm meter |
| **EATX II** | electronic automatic transmission controller – 2nd Generation |
| **EC** | European community |
| **ECT Sensor** | engine coolant temperature sensor |
| **EE-PROM** | electrically erasable programmable read only memory |
| **EGR Valve** | exhaust gas recirculation valve |
| **EMCC** | electronic modulated converter clutch |
| **EMI** | electro-magnetic interference |
| **EOBD** | European OBD (based upon Euro Stage III) |
| **EPA** | Environmental Protection Agency |
| **EPP** | engine position pulse |
| **Eu** | European Union |
| **EVAP** | evaporative emission system |
| **EVR** | electronic voltage regulator |
| **EWMA** | exponentially weighted moving average |
| **FTP** | federal test procedure |
| **HC** | hydrocarbons |
| **HO2S** | heated oxygen sensor |
| **Generator** | previously called “alternator” |
| **IAC Motor** | idle air control motor |
| **IAT Sensor** | intake air temperature sensor |
| **I/M** | inspection and maintenance testing |
| **JTEC** | Jeep/Truck engine controller |
| **LDP** | leak detection pump |
| **LSIACV** | linear solenoid idle air control valve |
| **MAF** | mass air flow |
| **MAP Sensor** | manifold absolute pressure sensor |
| **$MDS_2$®** | Mopar diagnostic system – 2nd generation |
| **MIL** | malfunction indicator lamp |
| **MTV** | manifold tuning valve |
| **NGC** | next generation controller |
| **NTC** | negative temperature coefficient |
| **NVLD** | natural vacuum leak detection |
| **$O_2$Sensor** | oxygen sensor |
| **O2S** | oxygen sensor |
| **OBD I** | on board diagnostics – 1st generation |
| **OBD II** | on-board diagnostics – 2nd generation |
| **ORVR** | on-board refueling vapor recovery |
| **PCI Bus** | programmable communications interface bus (J1850) |
| **PCM** | powertrain control module |
| **PCV** | positive crankcase ventilation |
| **PDC** | power distribution center |
| **PEP** | peripheral expansion port |
| **P/N** | park/neutral |
| **PPS** | proportional purge solenoid |
| **PS** | power steering |
| **PSP** | power steering pressure (switch) |
| **PTC** | positive temperature coefficient |
| **PWM** | pulse-width modulation |
| **RAM** | random access memory |
| **RFI** | radio frequency interference |

| | |
|---|---|
| **RKE** | remote keyless entry |
| **RPM** | revolutions per minute |
| **SAE** | Society of Automotive Engineers |
| **SBEC** | single board engine controller |
| **SCW** | Similar Conditions Window |
| **SKIM** | sentry key immobilizer module |
| **SRV** | short runner valve |
| **TCC** | torque converter clutch |
| **TCM** | transmission control module |
| **TDC** | top dead center |
| **TPS** | throttle position sensor |
| **TRS** | transmission range sensor |
| **VSS** | vehicle speed sensor |
| **WOT** | wide open throttle |

## NOTES

# 7.0

# DIAGNOSTIC INFORMATION AND PROCEDURES

## Symptom:

## *NO RESPONSE FROM PCM (PCI BUS)

| POSSIBLE CAUSES |
|---|
| PCM PCI NO RESPONSE |
| PCI BUS CIRCUIT OPEN |
| POWERTRAIN CONTROL MODULE |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Turn the ignition on.<br>**NOTE: As soon as one or more module communicates with the DRB, answer the question.**<br>With the DRBIII®, enter Body then Electro/Mechanical Cluster (MIC).<br>With the DRBIII®, enter Passive Restraints then Airbag.<br>Were you able to establish communications with any of the modules?<br>Yes → Go To 2<br>No → Refer to symptom PCI Bus Communication Failure in the Communications category.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | With the DRBIII® read PCM Diagnostic Trouble Codes. This is to ensure power and grounds to the PCM are operational.<br>**NOTE: If the DRBIII® will not read PCM DTC's, follow the NO RESPONSE TO PCM (SCI only) symptom path.**<br>**NOTE: If the vehicle will not start and the DRBIII® displays a no response message, refer to the appropriate symptom in the powertrain diagnostic procedures.**<br>Turn the ignition off.<br>Disconnect the PCM C3 harness connector.<br>Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.<br>Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable.<br>With the DRBIII® select Pep Module Tools.<br>Select lab scope.<br>Select Live Data.<br>Select 12 volt square wave.<br>Press F2 for Scope.<br>Press F2 and use the down arrow to set voltage range to 20 volts. Set Probe to x10.<br>Press F2 again when complete.<br>Connect the Black lead to the PCM ground. Connect the Red lead to the PCI Bus circuit in the PCM connector.<br>Turn the ignition on.<br>Observe the voltage display on the DRBIII® Lab Scope.<br>Does the voltage pulse from 0 to approximately 7.5 volts?<br>Yes → Replace and program the Powertrain Control Module in accordance with the Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Repair the PCI Bus circuit for an open.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

**Symptom:**

***NO RESPONSE FROM PCM (SCI ONLY)**

| POSSIBLE CAUSES |
|---|
| CHECK PCM POWERS AND GROUNDS |
| CONTROLLER ANTILOCK BRAKE |
| SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE |
| TRANSMISSION CONTROL MODULE |
| SCI RECEIVE CIRCUIT SHORTED TO VOLTAGE |
| SCI CIRCUITS SHORTED TOGETHER |
| SCI TRANSMIT CIRCUIT SHORTED TO GROUND |
| SCI RECEIVE CIRCUIT SHORTED TO GROUND |
| SCI RECEIVE CIRCUIT OPEN |
| SCI TRANSMIT CIRCUIT OPEN |
| POWERTRAIN CONTROL MODULE |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Perform the symptom Checking PCM Power and Ground Circuits in the Driveability category.<br>**NOTE: With the DRBIII® in the generic scan tool mode, attempt to communicate with the PCM.**<br>**NOTE: If the DRBIII® can communicate with the PCM in the generic scan tool mode, it may not be necessary to perform this step.**<br>Did the vehicle pass this test?<br>Yes → Go To 2<br>No → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the DRB from the DLC.<br>Measure the resistance between ground and the SCI Transmit circuit.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 3<br>No → Go To 5 | All |
| 3 | Turn the ignition off.<br>Disconnect the CAB harness connector (if equipped).<br>**NOTE: If vehicle is not equipped with antilock brakes, answer yes to the question.**<br>Measure the resistance between ground and the SCI Transmit circuit.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 4<br>No → Replace the Controller Antilock Brake in accordance with the service information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## *NO RESPONSE FROM PCM (SCI ONLY) — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the TCM harness connector (if equipped).<br>**NOTE: If vehicle is not equipped with a TCM, answer yes to the question.**<br>Measure the resistance between ground and the SCI Transmit circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the SCI Transmit circuit for a short to ground.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Replace the Transmission Control Module in accordance with the service information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 5 | Turn the ignition off.<br>Disconnect the DRB from the DLC.<br>Disconnect the PCM harness connectors.<br>Disconnect the TCM harness connector (if equipped).<br>Disconnect the CAB harness connector (if equipped).<br>Turn the ignition on.<br>Measure the voltage of the SCI Transmit circuit at the DLC connector (cav 7).<br>Is the voltage above 1.0 volt?<br><br>Yes → Repair the SCI Transmit circuit for a short to voltage.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 6 | All |
| 6 | Turn the ignition off.<br>Disconnect the DRB from the DLC.<br>Disconnect the PCM harness connectors.<br>Turn the ignition on.<br>Measure the voltage of the SCI Receive circuit at the DLC connector (cav 6).<br>Is the voltage above 1.0 volt?<br><br>Yes → Repair the SCI Receive circuit for a short to voltage.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Disconnect the DRB from the DLC.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between the SCI Transmit circuit and the SCI Receive circuit at the PCM connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the short between the SCI Transmit and the SCI Receive circuits.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 8 | All |
| 8 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the DRB from the DLC.<br>Measure the resistance between ground and the SCI Receive circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the SCI Receive circuit for a short to ground.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 9 | All |

## *NO RESPONSE FROM PCM (SCI ONLY) — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the DRB from the DLC.<br>Measure the resistance of the SCI Receive circuit between the PCM connector and the DLC.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 10<br>No → Repair the SCI Receive circuit for an open.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 10 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the DRB from the DLC.<br>Measure the resistance of the SCI Transmit circuit between the PCM connector and the DLC.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 11<br>No → Repair the SCI Transmit circuit for an open.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 11 | If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module in accordance with the Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:
## *PCI BUS COMMUNICATION FAILURE

| POSSIBLE CAUSES |
|---|
| WIRING HARNESS INTERMITTENT |
| OPEN PCI BUS CIRCUIT AT THE DATA LINK CONNECTOR (DLC) |
| PCI BUS CIRCUIT SHORTED TO VOLTAGE |
| MODULE SHORT TO VOLTAGE |
| PCI BUS CIRCUIT SHORTED TO GROUND |
| MODULE SHORT TO GROUND |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **Note: Determine which modules this vehicle is equipped with before beginning.**<br>**Note: When attempting to communicate with any of the modules on this vehicle, the DRB will display 1 of 2 different communication errors: a NO RESPONSE message or a BUS +/- SIGNALS OPEN message.**<br>Turn the ignition on.<br>Using the DRB, attempt to communicate with the following control modules:<br>Airbag Control Module<br>SKIM (SENTRY KEY IMMOBILIZER)<br>MIC (INSTRUMENT CLUSTER)<br>Was the DRBIII® able to communicate with one or more Module(s)?<br>Yes → Go To 2<br>No → Go To 3 | All |
| 2 | Turn the ignition off.<br>**Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.**<br>**Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.**<br>**Note: If the DRB can not communicate with a single module, refer to the category list for the related symptom.**<br>Were any problems found?<br>Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1.<br>No → Test Complete. | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connector.<br>Disconnect the DRB from the Data Link Connector (DLC).<br>Disconnect the negative battery cable.<br>Measure the resistance of the PCI Bus circuit between the Data Link Connector (DLC) and the PCM connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 4<br>No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1. | All |

## *PCI BUS COMMUNICATION FAILURE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | **NOTE: Reconnect the PCM harness connector and the negative battery cable.**<br>Turn the ignition on.<br>Measure the voltage of the PCI Bus circuit at the Data Link Connector (DLC).<br>Is the voltage above 7.0 volts?<br>Yes → Go To 5<br>No → Go To 6 | All |
| 5 | Turn the ignition off.<br>Using a voltmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground.<br>**Note: When performing the next step turn the ignition off (wait one minute) before disconnecting any module. When the module is disconnected turn the ignition on to check for a short to voltage.**<br>Turn the ignition on.<br>While monitoring the voltmeter, disconnect each module the vehicle is equipped with one at a time.<br>Is the voltage steadily above 7.0 volts with all the modules disconnected?<br>Yes → Repair the PCI Bus circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1.<br>No → Replace the module that when disconnected the short to voltage was eliminated. Perform BODY VERIFICATION TEST - VER 1. | All |
| 6 | Turn the ignition off.<br>Disconnect the negative battery cable.<br>Using a ohmmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground.<br>While monitoring the ohmmeter, disconnect each module the vehicle is equipped with one at a time.<br>**NOTE: Total bus resistance to ground thru all of the modules is typically between 350 to 1000 ohms. The more modules on the bus, the lower the total bus resistance will be.**<br>Is the resistance below 150.0 ohms with all the modules disconnected?<br>Yes → Repair the PCI Bus circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1.<br>No → Replace the module that when disconnected the short to ground was eliminated. Perform BODY VERIFICATION TEST - VER 1. | All |

## Symptom:
## INTERMITTENT CONDITION

| POSSIBLE CAUSES |
|---|
| INTERMITTENT CONDITION |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.**<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Refer to any Technical Service Bulletins (TSBs) that may apply.<br>Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC set.<br>With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wire harness. Look for parameter values to change and/or a DTC to set.<br>Turn the ignition off.<br>Visually inspect the related wire harness. Disconnect all the related harness connectors. Look for any chafed, pierced, pinched, partially broken wires and broken, bent, pushed out, or corroded terminals.<br>Perform a voltage drop test on the related circuits between the suspected faulty component and the PCM.<br>Inspect and clean all PCM, engine, and chassis grounds.<br>If numerous trouble codes were set, use a wire schematic and look for any common ground or supply circuits<br>For any Relay DTCs, actuate the Relay with the DRBIII® and wiggle the related wire harness to try to interrupt the actuation.<br>For intermittent Evaporative Emission trouble codes perform a visual and physical inspection of the related parts including hoses and the Fuel Filler cap.<br>For intermittent Misfire DTC's check for restrictions in the Intake and Exhaust system, proper installation of Sensors, vacuum leaks, and binding components that are run by the accessory drive belt.<br>Use the DRBIII® to perform a System Test if one applies to failing component.<br>A co-pilot, data recorder, and/or lab scope should be used to help diagnose intermittent conditions.<br>Were any problems found during the above inspections?<br>Yes → Repair as necessary<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Test Complete. | All |

**Symptom List:**

**P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW**
**P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH**
**P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW**
**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH**
**P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW**
**P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW.**

**When Monitored and Set Condition:**

**P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.

Set Condition: Desired state does not match Actual state.

**P0032-O2 SENSOR 1/1 HEATER CIRCUIT HIGH**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.

Set Condition: Desired state does not equal Actual state.

**P0037-O2 SENSOR 1/2 HEATER CIRCUIT LOW**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.

Set Condition: Desired state does not equal Actual state.

**P0038-O2 SENSOR 1/2 HEATER CIRCUIT HIGH**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.

Set Condition: Desired state does not equal Actual state.

**P0051-O2 SENSOR 2/1 HEATER CIRCUIT LOW**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is on.

Set Condition: Desired state does not equal Actual state.

**P0052-O2 SENSOR 2/1 HEATER CIRCUIT HIGH**

When Monitored: Battery voltage above 10.6 volts, ASD is powered up, and O2 heater is off.

Set Condition: Desired state does not equal Actual state.

## P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW — Continued

| POSSIBLE CAUSES |
|---|
| O2 HEATER TEST |
| O2 SENSOR HEATER ELEMENT |
| (F142) FUSED ASD RELAY OUTPUT CIRCUIT |
| HEATER CONTROL CIRCUIT OPEN |
| HEATER CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, actuate the O2 Heater test.<br>Monitor the O2 Heater Voltage for 5 minutes.<br>Did the voltage drop below 0.5 of a volt during the Heater test?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 2<br>**NOTE: Stop the actuation before continuing.** | All |
| 2 | Turn the ignition off.<br>Disconnect the O2 Sensor harness connector.<br>Measure the resistance of the O2 Heater element at the O2 Sensor connector(component side).<br>**NOTE: The resistance value increases with higher temperatures.**<br>Is the resistance between 4.0 and 5.0 ohms at 70° F(21.1°C)?<br>Yes → Go To 3<br>No → Replace the O2 Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 3 | Ignition on, engine not running with the Sensor harness connector still disconnected.<br>With the DRBIII®, perform the O2 Heater Test.<br>Using a 12-volt test light connected to ground, probe the (F142) Fused ASD Relay Output at the O2 Sensor harness connector.<br>Did the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the open or short to ground in the (F142) Fused ASD Relay Output circuitt. Inspect the related fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the O2 Heater Control (PWM) circuit or the O2 Heater Relay Control circuit depending on the O2 Sensor being tested.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between ground and the O2 Heater Control (PWM) circuit at the Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the Heater Control (PWM) circuit or the Heater Relay Control circuit depending on the O2 Sensor being tested.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE

**When Monitored and Set Condition:**

**P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE**

When Monitored: With the ignition on and no Battery Temperature Sensor Open or Short Faults present.

Set Condition: After 5 warm cycles have occurred (coolant increases at least 22°C (40°F) to a minimum of 71°C (160°F) and the odometer mileage has increased 196.6 miles and the Battery Temperature has changed less than 4°C (7.2°F) change in temperature. One trip fault.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (K118) BATTERY TEMP SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| BATTERY TEMPERATURE SENSOR |
| RESISTANCE IN THE (K118) BATTERY TEMP SENSOR SIGNAL CIRCUIT |
| RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT |
| (K118) BATTERY TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Battery Temp Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K118) Battery Temp Signal circuit in the Sensor connector.<br>Is the voltage above 5.2 volts?<br>Yes → Repair the short to voltage on the (K118) Batt Temp Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |

## P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | With the DRBIII®, read the Battery Temp Sensor voltage with the Batt Temp Sensor still disconnected.<br>Is the voltage above 4.6 volts?<br>Yes → Go To 4<br>No → Go To 7 | All |
| 4 | Connect a jumper wire between the (K118) Battery Temp Signal circuit and the (K4) Sensor ground circuit at the Sensor harness connector.<br>With the DRBIII®, read the Battery Temp Sensor voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Replace the Battery Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Connect the Battery Temp Sensor harness connector.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Backprobe the (K118) Battery Temp Sensor Signal circuit at the Sensor harness connector and the PCM harness connector with both voltmeter leads.<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 6<br>No → Repair the excessive resistance in the (K118) BatteryTemp Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Turn the ignition off.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Backprobe the (K4) Sensor ground circuit at the Battery Temperature Sensor harness connector and the PCM harness connector using both volt meter leads.<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 8<br>No → Repair the excessive resistance in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | Turn the ignition off.<br>Disconnect the Battery Temp Sensor harness connector.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K118) Battery Temp Signal circuit.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K118) Battery Temp Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |

## P0071-AMBIENT/BATTERY TEMP SENSOR PERFORMANCE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 8 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0107-MAP SENSOR VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P0107-MAP SENSOR VOLTAGE TOO LOW**

When Monitored: With the engine RPM above 416 but less than 1500, the TPS voltage less than 1.13 volts, and battery voltage greater than 10.4 volts.

Set Condition: The MAP Sensor signal voltage is below 0.1 of a volt for 2.0 seconds with the engine running.

| POSSIBLE CAUSES |
|---|
| MAP SENSOR VOLTAGE BELOW 0.1 VOLT |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| MAP SENSOR |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO THE (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Start the engine.<br>With the DRBIII®, read the MAP Sensor voltage.<br>Is the voltage below 0.1 of a volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage of the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the voltage between 4.5 to 5.2 volts?<br>Yes → Go To 3<br>No → Go To 6 | All |

## P0107-MAP SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | With the DRBIII®, monitor the MAP Sensor voltage with the ignition on and Map Sensor still disconnected.<br>Is the voltage above 1.2 volts?<br>Yes → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K1) MAP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |
| 5 | Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to (K4) Sensor ground in the (K1) MAP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance in the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Go To 7<br>No → Repair the open in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | Measure the resistance between ground and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |
| 8 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0108-MAP SENSOR VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0108-MAP SENSOR VOLTAGE TOO HIGH**

When Monitored: With the engine RPM above 400, the TPS voltage less than 1.13 volts, and battery voltage greater than 10.4 volts

Set Condition: The MAP Sensor signal voltage is greater than 4.88 volts at start or with the engine running for 2.2 seconds.

| POSSIBLE CAUSES |
|---|
| MAP SENSOR VOLTAGE ABOVE 4.6 VOLTS |
| MAP SENSOR |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K1) MAP SENSOR SIGNAL CIRCUIT OPEN |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Start the engine.<br>With the DRBIII®, read the MAP Sensor voltage.<br>Is the voltage above 4.6 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>Connect a jumper wire between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit in the Sensor harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the MAP Sensor voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0108-MAP SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Go To 7<br><br>No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:
## P0111-INTAKE AIR TEMP PERFORMANCE

**When Monitored and Set Condition:**

**P0111-INTAKE AIR TEMP PERFORMANCE**

When Monitored: With the ignition on and no Intake Air Temperature Sensor open/ shorted faults present.

Set Condition: After 5 warm cycles have occurred (coolant increases at least 22°C (40°F) to a minimum of 71°C (160°F) and the odometer mileage has increased 196.6 miles and the Intake Air Temperature has had less than 5°C (9°F) change in temperature.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| IAT SENSOR VOLTAGE BELOW 1.0 VOLT |
| RESISTANCE IN THE (K21) IAT SENSOR SIGNAL CIRCUIT |
| RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Intake Air Temperature Sensor harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, read the IAT voltage.<br>Is the voltage above 4.6 volts?<br>Yes → Go To 3<br>No → Go To 4 | All |
| 3 | Connect a jumper wire across the IAT Sensor harness connector.<br>With the DRBIII®, read the IAT voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Replace the Intake Air Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4<br>**NOTE: Remove the jumper wire and connect the Sensor harness connector before continuing.** | All |

## P0111-INTAKE AIR TEMP PERFORMANCE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Perform a voltage drop test by back probing the (K21) IAT Sensor Signal circuit at the IAT Sensor harness connector and PCM harness connector.<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 5<br>No → Repair the excessive resistance in the (K21) IAT Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Turn the ignition off.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Perform a voltage drop test by back probing the (K4) Sensor ground circuit at the IAT Sensor harness connector and PCM harness connector.<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 6<br>No → Repair the excessive resistance in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>**NOTE: Turn the ignition off before continuing.** | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW**

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Intake Air Temperature (IAT) Sensor circuit voltage at the PCM goes below 0.8 of a volt.

| POSSIBLE CAUSES |
|---|
| IAT SENSOR VOLTAGE BELOW 1.0 VOLT |
| IAT SENSOR |
| (K21) IAT SENSOR SIGNAL SHORTED TO GROUND |
| (K21) IAT SENSOR SIGNAL SHORTED TO (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the IAT voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Intake Air Temp Sensor harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, read IAT Sensor voltage.<br>Is the voltage above 1.0 volt?<br>Yes → Replace the IAT Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K21) IAT Sensor Signal circuit in the IAT Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K21) IAT Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |

## P0112-INTAKE AIR TEMP SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the resistance between the (K21) IAT Sensor Signal circuit and the (K4) Sensor ground circuit at the IAT Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the (K4) Sensor ground and the (K21) IAT Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH**

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Intake Air Temperature (IAT) Sensor circuit voltage at the PCM goes above 4.9 volts.

| POSSIBLE CAUSES |
|---|
| IAT SENSOR VOLTAGE ABOVE 4.8 VOLTS |
| (K21) IAT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| IAT SENSOR |
| (K21) IAT SENSOR SIGNAL CIRCUIT OPEN |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the IAT voltage.<br>Is the voltage above 4.8 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the IAT Sensor harness connector.<br>Connect a jumper wire between the (K21) IAT Sensor Signal circuit and the (K4) Sensor ground circuit in the IAT harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, read the IAT voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Replace the IAT Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0113-INTAKE AIR TEMP SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K21) IAT Sensor Signal circuit in the Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (K21) IAT Sensor Signal circuit from the IAT Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K21) IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance of the (K4) Sensor ground circuit from the IAT Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW**

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Engine Coolant Temperature (ECT) Signal circuit voltage at the PCM goes below 0.8 of a volt for more than 3 seconds.

| POSSIBLE CAUSES |
|---|
| ECT VOLTAGE BELOW 1.0 VOLT |
| ECT SENSOR |
| (K2) ECT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| (K2) ECT SENSOR SIGNAL SHORTED TO (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the ECT Sensor voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the ECT harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, read ECT voltage.<br>Is the voltage above 1.0 volt?<br>Yes → Replace the ECT Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K2) ECT Sensor Signal circuit at the ECT Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K2) ECT Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |

## P0117-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the resistance between the (K2) ECT Sensor Signal circuit and the (K4) Sensor ground circuit at the ECT Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the between the (K4) Sensor ground and the (K2) ECT Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH**

When Monitored: With the ignition on and battery voltage greater than 10.4 volts.

Set Condition: The Engine Coolant Temperature (ECT) Sensor circuit voltage at the PCM goes above 4.94 volts for more than 3 seconds.

| POSSIBLE CAUSES |
|---|
| ECT VOLTAGE ABOVE 4.9 VOLTS |
| ECT SENSOR |
| (K2) ECT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K2) ECT SENSOR SIGNAL CIRCUIT OPEN |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read ECT voltage.<br>Is the voltage above 4.9 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the ECT harness connector.<br>Ignition on, engine not running.<br>Connect a jumper wire between the (K2) ECT Sensor Signal circuit and the (K4) Sensor ground circuit in the ECT harness connector.<br>With the DRBIII®, read the ECT voltage.<br>Is the voltage below 1.0 volt?<br>Yes → Replace the ECT Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0118-ENGINE COOLANT TEMP SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K2) ECT Sensor Signal circuit at the ECT Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (K2) ECT Sensor Signal circuit from the ECT Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K2) ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance of the (K4) Sensor ground circuit from the ECT Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom:**

**P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR**

**When Monitored and Set Condition:**

**P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR**

When Monitored: With the engine running and no MAP sensor or TPS DTC's set. Engine speed must be greater than 1600 RPM.

Set Condition: The PCM performs two separate tests. When the manifold vacuum is low, the TPS signal should be high. When the manifold vacuum is high, the TPS signal should be low. If the proper TPS voltage is not detected when the two conditions are met, a DTC will be set after 4 seconds.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| RESISTANCE IN (K7) MAP 5-VOLT SUPPLY CIRCUIT |
| (K7) MAP 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| MAP SENSOR |
| RESISTANCE IN THE (K1) MAP SENSOR SIGNAL CIRCUIT |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| RESISTANCE IN (K4) MAP SENSOR GROUND CIRCUIT |
| TP SENSOR OPERATION |
| RESISTANCE IN (K7) TP SENSOR 5-VOLT SUPPLY CIRCUIT |
| (K7) TP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| THROTTLE POSITION SENSOR |
| RESISTANCE IN (K22) TP SENSOR #1 SIGNAL CIRCUIT |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO GROUND |
| RESISTANCE IN (K4) SENSOR GROUND CIRCUIT |
| PCM |

## P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Diagnose any TP Sensor or MAP component DTCs first before continuing.**<br>**NOTE: If the P0500 - No Vehicle Speed Signal is set along with this DTC, refer to the P0500 diagnostics before continuing.**<br>**NOTE: The throttle plate and linkage should be free of binding and carbon build up.**<br>**NOTE: Ensure the throttle plate is at the idle position.**<br>Ignition on, engine not running.<br>**NOTE: Repair any vacuum leaks that are present before continuing.**<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Start the engine.<br>With the DRBIII®, monitor the MAP Sensor voltage.<br>Snap the throttle.<br>Does the DRBIII® display MAP voltage from below 2.0 volts at idle to above 3.5 volts at WOT?<br>Yes → Go To 3<br>No → Go To 10 | All |
| 3 | Ignition on, engine not running.<br>With the DRBIII®, monitor the TP Sensor voltage while slowly depressing the throttle pedal from the idle position to the wide open throttle position.<br>Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?<br>Yes → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Disconnect the TP Sensor harness connector.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the excessive resistance in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between ground and the (K7) 5-volt Supply circuit from the TP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 6 | All |

## P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 6 | Connect the PCM harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the TP Sensor voltage.<br>Connect a jumper wire between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit.<br>Does the DRBIII® display TP Sensor voltage from approximately 4.9 volts to below 0.5 of a volt?<br>Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 7<br>**NOTE: Remove the jumper wire before continuing.** | All |
| 7 | Turn the ignition off.<br>Disconnect the PCM harness connector.<br>Measure the resistance of the (K22) TP Sensor #1 Signal circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 8<br>No → Repair the excessive resistance in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 8 | Measure the resistance between ground and the (K22) TP Sensor #1 Signal circuit from the TP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Go To 9<br>No → Repair the short to ground in the (K22) TP Sensor #1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 9 | Measure the resistance of the (K4) Sensor ground circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 16<br>No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 10 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 11<br>No → Repair the excessive resistance in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 11 | Measure the resistance between ground and the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the resistance above 100k ohms?<br>Yes → Go To 12<br>No → Repair the short to ground in the (K7) MAP 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 12 | Connect the PCM harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the MAP Sensor voltage.<br>Connect a jumper wire between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit .<br>Cycle the ignition switch from off to on.<br>Does the DRBIII® display MAP voltage from approximately 4.9 volts to below 0.5 of a volt?<br>Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 13<br>**NOTE: Disconnect the jumper wire before continuing.** | All |
| 13 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 14<br>No → Repair the excessive resistance in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 14 | Measure the resistance between ground and the (K1) MAP Sensor Signal circuit from the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Go To 15<br>No → Repair the short to ground in the (K1) MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 15 | Measure the resistance of the (K4) Sensor ground circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 16<br>No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0121-TP SENSOR VOLTAGE DOES NOT AGREE WITH MAP SENSOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 16 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0122-THROTTLE POSITION SENSOR VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P0122-THROTTLE POSITION SENSOR VOLTAGE TOO LOW**

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: Throttle Position Sensor voltage at the PCM is lower than 0.1 of a volt for 1.3 seconds.

| POSSIBLE CAUSES |
|---|
| TP SENSOR SWEEP |
| INTERMITTENT CONDITION |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| TP SENSOR |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO GROUND |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT |
| TCM INTERNALLY SHORTED THROTTLE POSITION SIGNAL CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the Throttle Position Sensor voltage.<br>Is the voltage below 0.2 of a volt?<br>Yes → Go To 2<br>No → Go To 10 | All |
| 2 | Turn the ignition off.<br>Disconnect the Throttle Position Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the TP Sensor harness connector.<br>Is the voltage between 4.5 to 5.2 volts?<br>Yes → Go To 3<br>No → Go To 7 | All |
| 3 | With the DRBIII®, monitor the TP Sensor voltage with the Sensor disconnected.<br>Is the voltage above 4.5 volts?<br>Yes → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |

## P0122-THROTTLE POSITION SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K22) TP Sensor #1 Signal circuit at the TP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K22) TP Sensor #1 Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | Measure the resistance between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit at the TP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the (K4) Sensor ground and the (K22) TP Sensor #1 Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | **NOTE: If the vehicle is not equipped with a TCM, answer No to this test and continue.**<br>Connect the PCM harness connector.<br>Disconnect the TCM harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the Throttle Position Sensor voltage.<br>Is the voltage above 4.5 volts?<br><br>Yes → Replace the TCM in accordance with the Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 9 | All |
| 7 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 8<br><br>No → Repair the open in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 8 | Measure the resistance between ground and the (K7) 5-volt Supply circuit at the TP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 9 | All |

## P0122-THROTTLE POSITION SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Turn the ignition off.<br>**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 10 | Ignition on, engine not running.<br>With the DRBIII®, monitor the Throttle Position Sensor voltage.<br>Slowly open the throttle from the idle position to the wide open throttle position.<br>Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?<br><br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0123-THROTTLE POSITION SENSOR VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0123-THROTTLE POSITION SENSOR VOLTAGE TOO HIGH**

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: Throttle Position Sensor signal voltage at the PCM goes above 4.5 volts for 3.2 seconds.

| POSSIBLE CAUSES |
|---|
| TP SENSOR SWEEP |
| TP SENSOR |
| INTERMITTENT CONDITION |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT OPEN |
| (K22) TP SENSOR #1 SIGNAL CIRCUIT SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>**NOTE: Ensure the throttle is fully closed and free from binding or carbon build up.**<br>Start the engine.<br>With the DRBIII®, read the Throttle Position Sensor voltage.<br>Is the voltage above 4.5 volts?<br>Yes → Go To 2<br>No → Go To 8 | All |
| 2 | Turn the ignition off.<br>Disconnect the Throttle Position Sensor harness connector.<br>Connect a jumper wire between the (K22) TP Sensor #1 Signal circuit and the (K4) Sensor ground circuit in the Sensor harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the TP Sensor voltage.<br>Is the voltage below 0.5 of a volt?<br>Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0123-THROTTLE POSITION SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K22) TP Sensor #1 Signal circuit at the TP Sensor harness connector.<br>**NOTE: If the voltage reading is below 5.2 volts answer NO to this test and continue.**<br>If the voltage is above 5.2 volts, disconnect the Clock Spring harness connector per Service Information.<br>If the Clock Spring harness connector is disconnected and the TP Sensor voltage drops to 5.0 volts, replace the Clock Spring.<br>Is the voltage above 5.2 volts with the Clock Spring harness disconnected?<br>Yes → Repair the short to voltage in the (K22) TP Sensor #1 Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4<br>**NOTE: Turn the ignition off and connect the Clockspring harness connectors before continuing.** | All |
| 4 | Measure the resistance of the (K22) TP Sensor #1 Signal circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the open in the (K22) TP Sensor #1 Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between the (K22) TP Sensor #1 Signal circuit and the (K7) 5-volt Supply circuit at the TP Sensor harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K22) TP Sensor #1 Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 6 | All |
| 6 | Measure the resistance of the (K4) Sensor ground circuit from the TP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 7<br>No → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0123-THROTTLE POSITION SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 8 | Ignition on, engine not running.<br>With the DRBIII®, monitor the Throttle Position Sensor voltage.<br>Slowly open the throttle from the idle position to the wide open throttle position.<br>Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition?<br><br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:
## P0125-CLOSED LOOP TEMP NOT REACHED

**When Monitored and Set Condition:**

**P0125-CLOSED LOOP TEMP NOT REACHED**

When Monitored: With battery voltage greater than 10.4 volts, after engine is started, for ten minutes.

Set Condition: The engine temperature does not go above 18 deg. F after the engine has been running for 10 minutes. Two trips are required to set this DTC.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| LOW COOLANT LEVEL |
| THERMOSTAT OPERATION |
| ECT SENSOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | **NOTE: If a ECT DTC set along with this code, diagnose the ECT DTC first.**<br>**NOTE: Inspect the ECT terminals and related PCM terminals. Ensure the terminals are free from corrosion and damage.**<br>**NOTE: The best way to diagnose this DTC is to allow the vehicle to sit overnight outside in order to have a totally cold soaked engine.**<br>**Note: Extremely cold outside ambient temperatures may have caused this DTC to set.**<br>**WARNING: Never open the cooling system when the engine is hot. The system is under pressure. Extreme burns or scalding may result. Allow the engine to cool before opening the cooling system.**<br>Check the coolant system to make sure that the coolant is in good condition and at the proper level.<br>Is the coolant level and condition OK?<br>Yes → Go To 3<br>No → Inspect the vehicle for a coolant leak and add the necessary amount of coolant.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0125-CLOSED LOOP TEMP NOT REACHED — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | **Note: This test works best if performed on a cold engine (cold soak)**<br>Ignition on, engine not running.<br>With the DRBIII®, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.<br>**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**<br>Start the Engine.<br>During engine warm-up monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F) . Also monitor the actual coolant temperature with a thermometer.<br>**NOTE: As the engine warms up to operating temperature, the actual coolant temperature (thermometer reading) and the Eng Coolant Tmp Deg in the DRBIII® values should stay relatively close to each other.**<br>Using the appropriate service information, determine the proper opening temperature of the thermostat.<br>Did the thermostat open at the proper temperature?<br>Yes → Go To 4<br>No → Replace the thermostat.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | **Note: For this test to be valid, the thermostat must be operating correctly.**<br>**Note: This test works best if performed on a cold engine (cold soak)**<br>Ignition on, engine not running.<br>With the DRBIII® in sensors, read the Eng Coolant Tmp Deg value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the surrounding temperature (ambient temperature).<br>**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**<br>Start the engine.<br>During engine warm-up, monitor the Eng Coolant Tmp Deg value. The temp deg value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).<br>Was the Eng Coolant Tmp Deg value increase a smooth transition and did it reach at least 180°?<br>Yes → Test Complete.<br>No → Replace the Engine Coolant Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0131-O2 SENSOR 1/1 CIRCUIT VOLTAGE LOW**
**P0137-O2 SENSOR 1/2 CIRCUIT VOLTAGE LOW**
**P0151-O2 SENSOR 2/1 CIRCUIT VOLTAGE LOW**
**P0157-O2 SENSOR 2/2 CIRCUIT VOLTAGE LOW**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0131-O2 SENSOR 1/1 CIRCUIT VOLTAGE LOW.**

**When Monitored and Set Condition:**

**P0131-O2 SENSOR 1/1 CIRCUIT VOLTAGE LOW**

When Monitored: At a cold start, engine coolant below 98°F, Ambient/Battery Sensor reading within 27°F, and Engine Coolant Temperature above 170°F on the previous key off.

Set Condition: The Oxygen Sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

**P0137-O2 SENSOR 1/2 CIRCUIT VOLTAGE LOW**

When Monitored: At a cold start, engine coolant below 98°F, Ambient/Battery Sensor reading within 27°F, and Engine Coolant Temperature above 170°F on the previous key off.

Set Condition: The Oxygen Sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

**P0151-O2 SENSOR 2/1 CIRCUIT VOLTAGE LOW**

When Monitored: At a cold start, engine coolant below 98°F, Ambient/Battery Sensor reading within 27°F, and Engine Coolant Temperature above 170°F on the previous key off.

Set Condition: The Oxygen Sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

**P0157-O2 SENSOR 2/2 CIRCUIT VOLTAGE LOW**

When Monitored: At a cold start, engine coolant below 98°F, Ambient/Battery Sensor reading within 27°F, and Engine Coolant Temperature above 170°F on the previous key off.

Set Condition: The Oxygen Sensor signal voltage is below 0.156 of a volt for 28 seconds after starting engine.

| POSSIBLE CAUSES |
|---|
| O2 SENSOR BELOW 0.16 OF A VOLT |
| O2 SENSOR OPERATION |
| O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| O2 SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT |

## P0131-O2 SENSOR 1/1 CIRCUIT VOLTAGE LOW — Continued

| POSSIBLE CAUSES |
|---|
| O2 SENSOR SIGNAL SHORTED TO HEATER GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Start the engine.<br>Allow the engine to idle for 4 to 5 minutes.<br>With the DRBIII®, read the O2 Sensor voltage.<br>Is the voltage below 0.16 of a volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Disconnect the O2 Sensor harness connector.<br>Start the engine.<br>With the DRBIII®, monitor the O2 Sensor voltage.<br>Is the O2 Sensor voltage above 0.16 of a volt?<br>Yes → Replace the O2 Sensor<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the O2 Sensor Signal circuit at the O2 Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |
| 4 | Measure the resistance between the O2 Sensor Signal circuit and the (K4) Sensor ground circuit at the O2 Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short between the (K4) Sensor ground circuit and the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |

## P0131-O2 SENSOR 1/1 CIRCUIT VOLTAGE LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | **NOTE: There may be two types of O2 Sensor Heater ground circuits used on this vehicle. One type uses an engine ground and the other type uses the PCM as a ground through the Pulse Width Modulated circuit.**<br>* Measure the resistance between the PWM O2 Sensor Heater Control circuit and the O2 Sensor Signal circuit if it applies to the O2 Sensor being tested.<br>OR<br>* Measure the resistance between the O2 Sensor Signal circuit and the O2 Heater ground circuit if it applies to the O2 Sensor being tested.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the O2 Sensor Signal circuit and the Heater ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0132-O2 SENSOR 1/1 CIRCUIT VOLTAGE HIGH**
**P0138-O2 SENSOR 1/2 CIRCUIT VOLTAGE HIGH**
**P0152-O2 SENSOR 2/1 CIRCUIT VOLTAGE HIGH**
**P0158-O2 SENSOR 2/2 CIRCUIT VOLTAGE HIGH**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0132-O2 SENSOR 1/1 CIRCUIT VOLTAGE HIGH.**

**When Monitored and Set Condition:**

**P0132-O2 SENSOR 1/1 CIRCUIT VOLTAGE HIGH**

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

**P0138-O2 SENSOR 1/2 CIRCUIT VOLTAGE HIGH**

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

**P0152-O2 SENSOR 2/1 CIRCUIT VOLTAGE HIGH**

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

**P0158-O2 SENSOR 2/2 CIRCUIT VOLTAGE HIGH**

When Monitored: With battery voltage greater than 10.4 volts, engine running for more than 4 minutes and coolant temperature above 180°F.

Set Condition: The oxygen sensor voltage is above 1.5 volts.

| POSSIBLE CAUSES |
|---|
| O2 SENSOR ABOVE 1.5 VOLTS |
| O2 SENSOR OPERATION |
| O2 SENSOR SIGNAL CIRCUIT OPEN |
| O2 SENSOR SIGNAL CIRCUIT SHORTED TO O2 HEATER SUPPLY CIRCUIT |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| O2 SENSOR HEATER CONTROL CIRCUIT OPEN |
| O2 SENSOR HEATER SUPPLY CIRCUIT OPEN |

## P0132-O2 SENSOR 1/1 CIRCUIT VOLTAGE HIGH — Continued

| POSSIBLE CAUSES |
|---|
| O2 SENSOR SIGNAL SHORTED TO VOLTAGE |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Start the engine.<br>Allow the engine to idle for 4 to 5 minutes.<br>With the DRBIII®, read the O2 Sensor voltage.<br>Is the voltage above 1.5 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Turn the ignition off.<br>Disconnect the O2 Sensor harness connector.<br>Start the engine.<br>With the DRBIII®, monitor the O2 Sensor voltage.<br>Is the O2 Sensor voltage below 1.5 volts?<br>Yes → Replace the O2 Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the O2 Sensor Signal circuit from the O2 Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 4<br>No → Repair the open in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | **NOTE: Two relays may be used for the different types of Heated O2 Sensors. One uses the ASD Relay which is only used with PWM Heated O2 Sensors, while the other uses an O2 Heater Relay.**<br>Verify which relay is used to supply power for the O2 Sensor Heater being tested.<br>Measure the resistance between the O2 Sensor Signal circuit and the O2 Heater Supply circuit at the O2 Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short between the O2 Sensor Signal circuit and the ASD Relay Output or O2 Heater Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |

## P0132-O2 SENSOR 1/1 CIRCUIT VOLTAGE HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Measure the resistance of the (K4) Sensor ground circuit from the O2 Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **NOTE: The O2 Sensor Heater ground may be a Pulse Width Modulated circuit or an engine ground depending on the type of O2 Sensor being tested.**<br>* Measure the resistance of the PWM O2 Sensor Heater Control circuit from the O2 Sensor harness connector to the PCM harness connector if it applies to the O2 Sensor being tested<br>OR<br>* Measure the resistance between ground and the O2 Sensor Heater ground circuit at the O2 Sensor harness connector if it applies to the O2 Sensor being tested.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 7<br><br>No → Repair the open in the O2 Sensor (PWM) Heater Control or Heater ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | The PCM harness connectors and O2 Sensor harness connector still disconnected.<br>Ignition on engine not running.<br>Using a 12-volt test light connected to ground, probe the O2 Sensor Signal circuit at the O2 Sensor harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Repair the short to voltage in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 8 | All |
| 8 | Turn the ignition off.<br>Connect the PCM harness connectors.<br>Ignition on, engine not running.<br>With the DRBIII® actuate the O2 Heater Test.<br>Measure the voltage on the O2 Heater Supply circuit.<br>Is the voltage above 11.0 volts?<br><br>No → Repair the open in the Heater Supply circuit. The Heater Supply circuit can be an output from the ASD Relay or the O2 Heater Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>Yes → Go To 9 | All |
| 9 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0133-O2 SENSOR 1/1 SLOW RESPONSE**
**P0139-O2 SENSOR 1/2 SLOW RESPONSE**
**P0153-O2 SENSOR 2/1 SLOW RESPONSE**
**P0159-O2 SENSOR 2/2 SLOW RESPONSE**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0133-O2 SENSOR 1/1 SLOW RESPONSE.**

**When Monitored and Set Condition:**

**P0133-O2 SENSOR 1/1 SLOW RESPONSE**

When Monitored: With ECT greater than 147°F, after reaching a vehicle speed of 10 mph, and the throttle remaining open (off idle) for 2 minutes, bring the vehicle to a stop and allow the engine to idle with the transmission in DRIVE.

Set Condition: The oxygen sensor signal voltage is switching from below 0.27 of a volt to above 0.62 of a volt and back fewer times than required.

**P0139-O2 SENSOR 1/2 SLOW RESPONSE**

When Monitored: Start engine. Allow engine to idle. For 1st part of test, if limits are exceeded, test passes. If not, 2nd part of test runs. amb/batt temp >44°F, Baro >22.13″ H2O, battery >10.5 volts, MAP >11.79 & <18.15″ H2O, RPM >1350 & <2200 and vss >50 and <65.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.58 of a volt and back fewer times than required.

**P0153-O2 SENSOR 2/1 SLOW RESPONSE**

When Monitored: With ECT greater than 147°F, after reaching a vehicle speed of 10 mph, and the throttle remaining open (off idle) for 2 minutes, bring the vehicle to a stop and allow the engine to idle with the transmission in DRIVE.

Set Condition: The oxygen sensor signal voltage is switching from below 0.27 of a volt to above 0.62 of a volt and back fewer times than required.

**P0159-O2 SENSOR 2/2 SLOW RESPONSE**

When Monitored: Start engine. Allow engine to idle. For 1st part of test, if limits are exceeded, test passes. If not, 2nd part of test runs. amb/batt temp >44°F, Baro >22.13″ H2O, battery >10.5 volts, MAP >11.79 & <18.15″ H2O, RPM >1350 & <2200 and vss >50 and <65.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.58 of a volt and back fewer times than required.

## P0133-O2 SENSOR 1/1 SLOW RESPONSE — Continued

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| EXHAUST LEAK |
| RESISTANCE IN THE O2 SENSOR SIGNAL CIRCUIT |
| RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT |
| O2 SENSOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Start the engine.<br>Inspect the exhaust for leaks between the engine and the related O2 Sensor.<br>Are there any exhaust leaks?<br>Yes → Repair or replace the leaking exhaust parts as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Back probe the O2 Sensor Signal circuit at the O2 Sensor harness connector and PCM harness connector.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection and are connected for positive polarity.**<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 4<br>No → Repair the excessive resistance in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0133-O2 SENSOR 1/1 SLOW RESPONSE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Back probe the (K4) Sensor ground circuit at the O2 Sensor harness connector and PCM harness connector.<br>**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br>Yes → Go To 5<br>No → Repair the excessive resistance in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>**NOTE: Turn the ignition off before continuing.** | All |
| 5 | If there are no possible causes remaining, view repair.<br>Repair<br>Replace the O2 Sensor<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0135-O2 SENSOR 1/1 HEATER FAILURE**
**P0141-O2 SENSOR 1/2 HEATER FAILURE**
**P0155-O2 SENSOR 2/1 HEATER FAILURE**
**P0161-O2 SENSOR 2/2 HEATER FAILURE**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0135-O2 SENSOR 1/1 HEATER FAILURE.**

**When Monitored and Set Condition:**

**P0135-O2 SENSOR 1/1 HEATER FAILURE**

When Monitored: With battery voltage greater than 9 volts, at a cold start, ECT less than 147°F, battery temperature sensor equal to or less than 27°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 30 to 90 seconds.

**P0141-O2 SENSOR 1/2 HEATER FAILURE**

When Monitored: With battery voltage greater than 10.5 volts, at a cold start, ECT less than 147°F, battery temperature sensor equal to or less than 27°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 60 to 240 seconds.

**P0155-O2 SENSOR 2/1 HEATER FAILURE**

When Monitored: With battery voltage greater than 9 volts, at a cold start, ECT less than 147°F, battery temperature sensor equal to or less than 27°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 30 to 90 seconds.

**P0161-O2 SENSOR 2/2 HEATER FAILURE**

When Monitored: With battery voltage greater than 9 volts, at a cold start, ECT less than 147°F, battery temperature sensor equal to or less than 27°F, and engine at idle for at least 12 seconds.

Set Condition: O2 sensor voltage greater than 3 volts for 60 to 240 seconds.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| O2 SENSOR HEATER OPERATION |
| O2 HEATER ELEMENT |
| O2 HEATER SUPPLY CIRCUIT OPEN |

## P0135-O2 SENSOR 1/1 HEATER FAILURE — Continued

| POSSIBLE CAUSES |
|---|
| HEATER CONTROL CIRCUIT OPEN |
| HEATER CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>**NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test.**<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the O2 Heater Test.<br>With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes.<br>Does the voltage stabilize between 0.1 and 0.3 of a volt during the Heater test?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>**NOTE: Allow the O2 Sensor to cool to room temperature.**<br>Disconnect the O2 Sensor harness connector.<br>Measure the resistance across the O2 Sensor Heater element component side.<br>**NOTE: The resistance value increases with temperature.**<br>Is the resistance value between 4.0 and 5.0 ohms at 70°F (21.1°C)?<br>Yes → Go To 4<br>No → Replace the O2 Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | **NOTE: The O2 Heater Supply circuit may be a fused ASD Relay Output or an O2 Sensor Heater Relay Output, depending on the O2 Sensor being tested.**<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the O2 Heater Test.<br>Measure the voltage on the O2 Heater Supply circuit at the O2 Sensor harness connector.<br>Is the voltage above 10.0 volts?<br>Yes → Go To 5<br>No → Repair the open in the O2 Sensor Heater Supply cricuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0135-O2 SENSOR 1/1 HEATER FAILURE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Remove the O2 Heater Relay, if it applies to the O2 Sensor being tested.<br>* Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor to the PCM harness connector if it applies to the O2 Sensor being tested.<br>OR<br>* Measure the resistance of the (K512) O2 Heater Relay Control circuit from the O2 Heater Relay to the PCM harness connector, if it applies to the O2 Sensor being tested.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open/high resistance in the O2 Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **NOTE: Before beginning this test, verify what type of Heated O2 Sensor is being tested, either the PWM Heated O2 Sensor or the Heater Relay controlled Heated O2 Sensor.**<br>Remove the O2 Heater Relay if it applies to the type of Heated O2 Sensor being tested.<br>* Measure the resistance between ground and the PWM circuit at the O2 Sensor harness connector if it applies to the Heated O2 Sensor being tested.<br>OR<br>* Measure the resistance between ground and the (K512) O2 Heater Relay Control circuit if it applies to the Heated O2 Sensor being tested.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the O2 Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION

**When Monitored and Set Condition:**

**P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION**

When Monitored: Ignition ON, with battery voltage greater than 10.4 volts.

Set Condition: The state of the PCM relay control circuit, between the PCM and relay coil, does not match the desired state.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| O2 SENSOR HEATER RELAY |
| (F142) FUSED ASD RELAY OUTPUT CIRCUIT |
| (K512) O2 HEATER RELAY CONTROL CIRCUIT OPEN |
| (K512) O2 HEATER RELAY CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Remove the Heater Relay from the PDC.<br>Measurement is taken at the Heater Relay component.<br>Measure the resistance of the O2 Sensor Heater Relay Coil.<br>Is the resistance above 100 ohms?<br>Yes → Replace the O2 Sensor Heater Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Relay.<br>Using a 12-volt test light connected to ground, probe the (F142) Fused ASD Relay Output circuit of the O2 Heater Relay in the PDC.<br>Does the test light illuminate brightly when the relay actuates?<br>Yes → Go To 4<br>No → Repair the open or short to ground in the (F142) ASD Relay Output circuit. Inspect the related fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0136-O2 SENSOR 1/2 HEATER CIRCUIT MALFUNCTION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K512) O2 Heater Relay Control circuit from the PDC (Heater Relay) connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K512) O2 Heater Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between ground and the (K512) O2 Heater Relay Control circuit at the PDC connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K512) O2 Sensor Heater Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are not possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0171-1/1 FUEL SYSTEM LEAN**
**P0174-2/1 FUEL SYSTEM LEAN**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0171-1/1 FUEL SYSTEM LEAN.**

**When Monitored and Set Condition:**

**P0171-1/1 FUEL SYSTEM LEAN**

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

**P0174-2/1 FUEL SYSTEM LEAN**

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and a certain percentage is exceeded for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| FUEL PRESSURE OUT OF SPECS |
| RESTRICTED FUEL SUPPLY LINE |
| FUEL PUMP INLET STRAINER PLUGGED |
| FUEL PUMP MODULE |
| O2 SENSOR |
| O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| O2 SENSOR HEATER OPERATION |
| TP SENSOR VOLTAGE GREATER THAN 0.92 OF A VOLT WITH THROTTLE CLOSED |
| TP SENSOR SWEEP |
| MAP SENSOR OPERATION |
| ECT SENSOR OPERATION |
| ENGINE MECHANICAL PROBLEM |
| FUEL FILTER/PRESSURE REGULATOR |
| INTERMITTENT CONDITION |
| PCM |

## P0171-1/1 FUEL SYSTEM LEAN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br><br>Yes → Go To 2<br><br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install a fuel pressure gauge.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Turn the ignition off.<br>Choose a conclusion that best matches your fuel pressure reading.<br><br>Below Specification<br>Go To 3<br><br>Within Specification<br>Go To 6<br><br>Above Specification<br>Replace the fuel filter/pressure regulator.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>**CAUTION: Stop All Actuations.** | All |
| 3 | Turn the ignition off.<br>**Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.<br>Install special 5/16 fuel line adapter tool #6539 or #6631 between disconnected fuel line and the fuel pump module.<br>Attach a fuel pressure test gauge to the T fitting on tool #6539 or #6631.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Is the fuel pressure within specification?<br><br>Yes → Repair or replace fuel supply line as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4<br><br>**Caution: Stop All Actuations.** | All |

## P0171-1/1 FUEL SYSTEM LEAN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.<br>Is the Fuel Inlet Strainer plugged?<br>Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |
| 5 | If there are no possible causes remaining, view repair.<br>Repair<br>Replace the Fuel Pump Module.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Turn the ignition off.<br>**NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor and Exhaust System to cool down before continuing the test.**<br>Ignition on, engine not running.<br>With the DRBIII®, read the O2 Sensor voltage.<br>Is the voltage above 4.5 volts?<br>Yes → Go To 7<br>No → Go To 13 | All |
| 7 | Turn the ignition off.<br>**NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.**<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the O2 Heater Test.<br>With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes.<br>Does the voltage stay above 4.5 volts?<br>Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |
| 8 | Ignition on, engine not running.<br>With the DRBIII®, read TP Sensor voltage.<br>**NOTE: The throttle must be against the stop.**<br>Is the voltage 0.92 of a volt or less with the Throttle closed?<br>Yes → Go To 9<br>No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 9 | With the DRBIII®, read the TP Sensor voltage.<br>While monitoring the DRBIII®, slowly open and close the throttle.<br>Does the voltage increase and decrease smoothly?<br>Yes → Go To 10<br>No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0171-1/1 FUEL SYSTEM LEAN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 10 | Turn the ignition off.<br>Connect a Vacuum Gauge to a Manifold Vacuum source.<br>Start the engine.<br>Allow the engine to idle.<br>**Note: If engine will not idle, maintain a constant RPM above idle.**<br>With the DRBIII® in Sensors, read the MAP Sensor vacuum value.<br>Is the DRBIII® reading within 1″ of the Vacuum Gauge reading?<br>Yes → Go To 11<br>No → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>**NOTE: Remove the vacuum gauge before continuing.** | All |
| 11 | **Note: For this test to be valid, the thermostat must be operating correctly.**<br>**Note: This test works best if performed on a cold engine (cold soak)**<br>Ignition on, engine not running.<br>With the DRBIII®, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.<br>**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**<br>Start the Engine.<br>During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).<br>Did the Engine Coolant Temperature increase smoothly and did it reach at least 82°C (180°F)?<br>Yes → Go To 12<br>No → Replace the Engine Coolant Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 12 | Check for any of the following conditions/mechanical problems.<br>AIR INDUCTION SYSTEM - must be free from leaks.<br>ENGINE VACUUM - must be at least 13 inches in neutral<br>ENGINE VALVE TIMING - must be within specifications<br>ENGINE COMPRESSION - must be within specifications<br>ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.<br>ENGINE PCV SYSTEM - must flow freely<br>TORQUE CONVERTER STALL SPEED - must be within specifications<br>POWER BRAKE BOOSTER - no internal vacuum leaks<br>FUEL - must be free of contamination<br>FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector<br>Are there any engine mechanical problems?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0171-1/1 FUEL SYSTEM LEAN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 13 | **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.**<br>Ignition on, engine not running.<br>Disconnect the O2 Sensor harness connector.<br>With the DRBIII®, monitor the O2 Sensor voltage.<br>Is the O2 Sensor voltage above 4.5 volts?<br><br>Yes → Replace the O2 Sensor<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 14 | All |
| 14 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the O2 Sensor Signal circuit at the PCM harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 15 | All |
| 15 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0172-1/1 FUEL SYSTEM RICH**
**P0175-2/1 FUEL SYSTEM RICH**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0172-1/1 FUEL SYSTEM RICH.**

**When Monitored and Set Condition:**

**P0172-1/1 FUEL SYSTEM RICH**

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and the result is below a certain value for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

**P0175-2/1 FUEL SYSTEM RICH**

When Monitored: With the engine running in closed loop mode, the ambient/battery temperature above 20° F and altitude below 8000 ft.

Set Condition: If the PCM multiplies short term compensation by long term adaptive and the result is below a certain value for two trips, a freeze frame is stored, the MIL illuminates and a trouble code is stored.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| O2 SENSOR |
| O2 SENSOR SIGNAL CIRCUIT OPEN |
| O2 SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| O2 SENSOR HEATER OPERATION |
| EVAP SYSTEM OPERATION |
| TP SENSOR VOLTAGE GREATER THAN 0.92 OF A VOLT WITH THROTTLE CLOSED |
| TP SENSOR SWEEP |
| FUEL FILTER/PRESSURE REGULATOR |
| MAP SENSOR OPERATION |
| ECT SENSOR OPERATION |
| ENGINE MECHANICAL PROBLEM |
| INTERMITTENT CONDITION |
| PCM |

## P0172-1/1 FUEL SYSTEM RICH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>**NOTE: Any O2 Sensor, TPS, ECT, MAP, or EVAP DTCs must be repaired before continuing.**<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>**Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install a fuel pressure gauge.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Choose a conclusion that best matches your fuel pressure reading.<br>Within Specification<br>Go To 3<br>Above Specification<br>Replace the fuel filter/pressure regulator.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>**Caution: Stop All Actuations.** | All |
| 3 | Ignition on, engine not running.<br>With the DRBIII®, read the O2 Sensor voltage.<br>Is the O2 Sensor voltage above 4.5 volts?<br>Yes → Go To 4<br>No → Go To 11 | All |
| 4 | Turn the ignition off.<br>**NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test. Allow the O2 Sensor voltage to stabilize between 4 and 5 volts.**<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the O2 Heater Test.<br>With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes.<br>Does the voltage stay above 4.5 volts?<br>Yes → Replace the O2 Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |

## P0172-1/1 FUEL SYSTEM RICH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | **NOTE: The engine must be at operating temperature and in closed loop to perform this test.**<br>Start the engine.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Allow the engine to reach normal operating temperature.<br>With the DRBIII® select System Tests, perform the Purge Vapors Test.<br>Observe the Short Term Adaptive value and press 3 to flow.<br>**NOTE: Short Term Adaptive value change.**<br>Did the Short Term Adaptive value change?<br>Yes → Go To 6<br>No → Refer to the Driveability category and perform the appropriate symptom.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Ignition on, engine not running.<br>With the DRBIII®, read TP Sensor voltage.<br>**NOTE: The throttle must be against the stop.**<br>Is the voltage 0.92 of a volt or less with the Throttle closed?<br>Yes → Go To 7<br>No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | With the DRBIII®, read the TP Sensor voltage.<br>While monitoring the DRBIII®, slowly open and close the throttle.<br>Does the voltage increase and decrease smoothly?<br>Yes → Go To 8<br>No → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 8 | Turn the ignition off.<br>Connect a Vacuum Gauge to a Manifold Vacuum source.<br>Start the engine.<br>Allow the engine to idle.<br>**Note: If engine will not idle, maintain a constant RPM above idle.**<br>With the DRBIII® in Sensors, read the MAP Sensor vacuum value.<br>Is the DRBIII® reading within 1″ of the Vacuum Gauge reading?<br>Yes → Go To 9<br>No → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>**NOTE: Remove the vacuum gauge before continuing.** | All |

## P0172-1/1 FUEL SYSTEM RICH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | **Note: For this test to be valid, the thermostat must be operating correctly.**<br>**Note: This test works best if performed on a cold engine (cold soak)**<br>Ignition on, engine not running.<br>With the DRBIII®, read the Engine Coolant Temperature Sensor value. If the engine was allowed to sit overnight (cold soak), the temperature value should be a sensible value that is somewhere close to the ambient temperature.<br>**Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.**<br>Start the Engine.<br>During engine warm-up, monitor the Engine Coolant Temperature value. The temp value change should be a smooth transition from start up to normal operating temp 82°C (180°F). The value should reach at least 82°C (180°F).<br>Did the Engine Coolant Temperature value increase smoothly and reach at least 82°C?<br>Yes → Go To 10<br>No → Replace the Engine Coolant Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 10 | Check for any of the following conditions/mechanical problems.<br>AIR INDUCTION SYSTEM - must be free from restrictions.<br>ENGINE VACUUM - must be at least 13 inches in neutral<br>ENGINE VALVE TIMING - must be within specifications<br>ENGINE COMPRESSION - must be within specifications<br>ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.<br>ENGINE PCV SYSTEM - must flow freely<br>TORQUE CONVERTER STALL SPEED - must be within specifications<br>POWER BRAKE BOOSTER - no internal vacuum leaks<br>FUEL - must be free of contamination<br>FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector<br>Are there any engine mechanical problems?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 11 | Disconnect the O2 Sensor harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, monitor the O2 Sensor voltage.<br>Is the O2 Sensor voltage above 4.5 volts?<br>Yes → Replace the O2 Sensor<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 12 | All |
| 12 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the O2 Sensor Signal circuit from the PCM harness connector to the O2 Sensor harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 13<br>No → Repair the open in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0172-1/1 FUEL SYSTEM RICH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 13 | Leave the O2 Sensor and PCM harness connectors disconnected.<br>Ignition on, engine not running.<br>Measure the voltage on the O2 Sensor Signal circuit at the O2 Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 14<br><br>**NOTE: Turn the ignition off before continuing.** | All |
| 14 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0201-INJECTOR #1 CONTROL CIRCUIT**
**P0202-INJECTOR #2 CONTROL CIRCUIT**
**P0203-INJECTOR #3 CONTROL CIRCUIT**
**P0204-INJECTOR #4 CONTROL CIRCUIT**
**P0205-INJECTOR #5 CONTROL CIRCUIT**
**P0206-INJECTOR #6 CONTROL CIRCUIT**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0201-INJECTOR #1 CONTROL CIRCUIT.**

**When Monitored and Set Condition:**

**P0201-INJECTOR #1 CONTROL CIRCUIT**

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

**P0202-INJECTOR #2 CONTROL CIRCUIT**

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

**P0203-INJECTOR #3 CONTROL CIRCUIT**

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

**P0204-INJECTOR #4 CONTROL CIRCUIT**

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

**P0205-INJECTOR #5 CONTROL CIRCUIT**

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

## P0201-INJECTOR #1 CONTROL CIRCUIT — Continued

### P0206-INJECTOR #6 CONTROL CIRCUIT

When Monitored: With battery voltage greater than 10.4 volts, the auto shutdown relay energized, injector pulse width less than 10ms, and engine speed less than 3000 rpm.

Set Condition: This trouble code takes .64 to 10.0 seconds to set when no inductive kick is sensed .18ms after injector turn off, and with no other injectors on.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (F42) ASD RELAY OUTPUT CIRCUIT |
| FUEL INJECTOR |
| FUEL INJECTOR CONTROL CIRCUIT OPEN |
| FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>**NOTE: Diagnose any Misfire DTCs before continuing. If a Misfire is detected for a particular cylinder, the PCM will shut down that Injectors Control circuit.**<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Fuel Injector harness connector.<br>Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, backprobe the (F42) ASD Relay Output circuit at the Fuel Injector harness connector.<br>With the DRBIII®, actuate the ASD Relay.<br>Did the test light illuminate brightly when the ASD Relay was actuating?<br>Yes → Go To 3<br>No → Repair the open or short to ground in the (F42) ASD Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0201-INJECTOR #1 CONTROL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Using a 12-volt test light connected to 12-volts, backprobe the Fuel Injector Control circuit.<br>With the DRBIII®, actuate the Fuel Injector.<br>What is the state of the test light while actuating the Fuel Injector?<br><br>Brightly blinking.<br>Replace the Fuel Injector.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>ON constantly.<br>Go To 4<br><br>OFF constantly.<br>Go To 5 | All |
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the Fuel Injector Control circuit in the Fuel Injector harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the Fuel Injector Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the Fuel Injector Control circuit from the Fuel Injector harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the Fuel Injector Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair.<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0300-MULTIPLE CYLINDER MIS-FIRE**
**P0301-CYLINDER #1 MISFIRE**
**P0302-CYLINDER #2 MISFIRE**
**P0303-CYLINDER #3 MISFIRE**
**P0304-CYLINDER #4 MISFIRE**
**P0305-CYLINDER #5 MISFIRE**
**P0306-CYLINDER #6 MISFIRE**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0300-MULTIPLE CYLINDER MIS-FIRE.**

**When Monitored and Set Condition:**

**P0300-MULTIPLE CYLINDER MIS-FIRE**

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

**P0301-CYLINDER #1 MISFIRE**

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

**P0302-CYLINDER #2 MISFIRE**

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

**P0303-CYLINDER #3 MISFIRE**

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

**P0304-CYLINDER #4 MISFIRE**

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

### P0305-CYLINDER #5 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

### P0306-CYLINDER #6 MISFIRE

When Monitored: Any time the engine is running, and the adaptive numerator has been successfully updated.

Set Condition: When more than a 1% misfire rate is measured during two trips, or with a 6% to 30% misfire rate during one trip.

| POSSIBLE CAUSES |
|---|
| INTERMITTENT MISFIRE |
| VISUAL INSPECTION |
| IGNITION WIRE |
| (F42) ASD RELAY OUPUT CIRCUIT |
| ENGINE MECHANICAL PROBLEM |
| IGNITION COIL |
| COIL CONTROL CIRCUIT |
| SPARK PLUG |
| CHECKING FUEL PRESSURE |
| CHECKING FUEL LEAK DOWN |
| FUEL INJECTOR |
| INJECTOR CONTROL CIRCUIT |
| PCM |

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Check for any TSB's that apply to a Misfire condition. Review the vehicle repair history for any misfire condition repairs that have been performed.**<br>Read and record the FREEZE FRAME DATA. Select OBD II MONITORS. Read and record the MIS-FIRE SIMILAR CONDITIONS WINDOW DATA.<br>With these screens, attempt to duplicate the condition(s) that has set this DTC.<br>When the vehicle is operating in the SIMILAR CONDITIONS WINDOW, refer to the WHICH CYLINDER IS MISFIRING screen.<br>Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute.<br>Is there a misfire present?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | **NOTE: Anything that affects the speed of the crankshaft can cause a misfire DTC.**<br>**NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**<br>- Visually inspect the engine for any of the following conditions.<br>- Worn serpentine belt<br>- Binding Engine-Driven accessories: A/C Compressor, P/S Pump, Water pump.<br>- Misalignment Water pump, P/S Pump and A/C Compressor pulleys<br>- Corroded PCM power and ground circuits.<br>- Improper CKP, CMP, MAP, and TP Sensor mounting<br>- Poor connector/terminal to component connection. i.e., CKP sensor, Fuel Injector, Ign coil, etc.<br>- Vacuum leaks<br>- Restricted Air Induction system or Exhaust system.<br>Were any of the above conditions present?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the Ignition Coil harness connector.<br>Disconnect the Fuel Injector harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Relay.<br>Using a 12-volt test light connected to ground, probe the (F42) ASD Relay Output circuit at the Ignition Coil harness connector and Fuel Injector harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the excessive resistance or short to ground in the (F42) ASD Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the Ignition wire from the spark plug.<br>Disconnect the Fuel Injector harness connector of the cylinder being tested.<br>**NOTE: Before continuing inspect the ignition wire for damage or carbon tracking. Replace as necessary.**<br>Install a spark tester on the ignition wire.<br>While cranking the engine observe the spark coming from the spark tester.<br>**NOTE: A crisp blue spark that is able to jump the gap of the spark tester should be generated.**<br>Is good spark present?<br><br>Yes → Go To 5<br><br>No → Go To 12 | All |
| 5 | Turn the ignition off.<br>Remove the Spark Plug.<br>Inspect the Spark Plug for the following conditions.<br>- Cracks<br>- Carbon Tracking<br>- Foreign Material<br>- Gap size out of specifications<br>- Loose or broke electrode<br>**NOTE: Lightly tap the bottom of the spark plug on a solid surface. The electrode in the spark plug should not move.**<br>Were any of the above condition present?<br><br>Yes → Replace the Spark Plug.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install a fuel pressure gauge.<br>Start the engine and observe the fuel pressure reading.<br>**NOTE: Fuel pressure specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Choose a conclusion that best matches your fuel pressure reading.<br><br>Within Specification<br>Go To 7<br><br>Below Specification<br>Test Complete.<br><br>Above Specification<br>Replace the fuel filter/pressure regulator.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 7 | **NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.**<br>Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install special tool #6539 (5/16″) fuel line adapter.<br>Install the fuel pressure gauge.<br>Start the engine and allow the fuel system to reach maximum pressure.<br>Turn the ignition off.<br>**NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.<br>Monitor the fuel pressure gauge for a minimum of 5 minutes.<br>**NOTE: The pressure should not fall below 241 KPa (35 psi)**<br>Does the Upstream gauge fall below the above specification?<br>Yes → Replace the leaking Fuel Injector(s).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |
| 8 | **Warning: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>**CAUTION: After each Fuel Injector actuation, start the engine to clean the cylinder of fuel. Failure to do so could cause engine damage.**<br>Remove special tool #C4390.<br>Start the engine and allow the fuel pressure to reach maximum pressure.<br>Ignition on, engine not running.<br>Using the DRBIII®, actuate the Fuel Injector for the cylinder that indicated the misfire.<br>Monitor the fuel pressure gauge.<br>Does the fuel pressure gauge indicate a drop in fuel pressure?<br>Yes → Go To 9<br>No → Go To 10<br>**NOTE: Turn the ignition off, remove the fuel pressure gauge, and connect the fuel lines before continuing.** | All |
| 9 | Check for any of the following conditions/mechanical problems.<br>ENGINE VACUUM - must be at least 13 inches in neutral<br>ENGINE VALVE TIMING - must be within specifications<br>ENGINE COMPRESSION - must be within specifications<br>ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.<br>ENGINE PCV SYSTEM - must flow freely<br>TORQUE CONVERTER STALL SPEED - must be within specifications<br>POWER BRAKE BOOSTER - no internal vacuum leaks<br>FUEL - must be free of contamination<br>CAM LOBES - must not be worn excessively<br>CYLINDER LEAKAGE TEST - must be within specifications<br>VALVE SPRINGS - cannot be weak or broken<br>Are there any engine mechanical problems?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 15 | All |

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 10 | Turn the ignition off.<br>Disconnect the Fuel Injector harness connector.<br>Ignition on, engine not running.<br>**NOTE: When a Misfire is detected for a particular cylinder, the PCM will shut down that cylinders Injector Control circuit.**<br>With the DRBIII®, erase DTCs.<br>Using a 12-volt test light connected to 12-volts, probe the Injector Control circuit.<br>With the DRBIII®, actuate the Fuel Injector.<br>Does the test light blink/flicker?<br><br>Yes → Replace the Fuel Injector.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 11 | All |
| 11 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Check the Injector Control circuit for an open, short to ground, and short to voltage.<br>Was a problem found with the Injector Control circuit?<br><br>Yes → Repair the excessive resistance or short to ground in the Injector Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 15 | All |
| 12 | Turn the ignition off.<br>Remove the ignition wire.<br>Measure the resistance of the ignition wire.<br>Is the resistance below 10K ohms?<br><br>Yes → Go To 13<br><br>No → Replace the Ignition Wire.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 13 | Turn the ignition off.<br>Disconnect the Ignition Coil harness connector.<br>Remove the Fuel Pump Relay or ASD Relay.<br>Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Control circuit.<br>Crank the engine for 5 second while observing the test light.<br>**NOTE: The resistance of the primary Ignition Coil on a 2.4L is 0.51 to 0.61 of an ohm and the 4.0L Primary Coil Rail resistance is 0.53 to 0.63 of an ohm at 77°F (25°C).**<br>Does the test light brightly blink/flicker?<br><br>Yes → Replace the Ignition Coil.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 14 | All |
| 14 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Check the Coil Control circuit for an open, short to ground, and short to voltage.<br>Was a problem found with the Coil Control circuit?<br><br>Yes → Repair the Coil Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 15 | All |

## P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 15 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0320-NO CRANK REFERENCE SIGNAL AT PCM

**When Monitored and Set Condition:**

**P0320-NO CRANK REFERENCE SIGNAL AT PCM**

When Monitored: With the ignition on.

Set Condition: No signal from the Crankshaft Position Sensor is present during engine cranking, and at least 3 Camshaft Position Sensor signals have occurred.

| POSSIBLE CAUSES |
|---|
| INTERMITTENT CRANK POSITION SIGNAL |
| CAM POSITION SENSOR SIGNAL |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| (K24) CKP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K24) CKP SENSOR SIGNAL CIRCUIT OPEN |
| (K24) CKP SENSOR SIGNAL CIRCUIT SHORTED GROUND |
| (K24) CKP SENSOR SIGNAL SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| CRANKSHAFT POSITION SENSOR |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, erase DTCs.<br>Start the engine.<br>If the DTC does not set right away it may be necessary to take the vehicle on a test drive.<br>Does the DTC return?<br>Yes → Go To 2<br>No → Go To 14 | All |
| 2 | Turn the ignition off.<br>Disconnect the CKP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit in the CKP Sensor harness connector.<br>Is the voltage between 4.8 and 5.2 volts?<br>Yes → Go To 3<br>No → Go To 10 | All |

## P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Measure the voltage on the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector.<br>Is the voltage between 4.5 and 5.0 volts?<br>Yes → Go To 4<br>No → Go To 6 | All |
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K4) Sensor ground circuit from the CKP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | **NOTE: Inspect the slots on the flywheel for damage. If a problem is found repair as necessary.**<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace the Crankshaft Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector.<br>Did the voltage increase above 5.2 volts with the Ignition on?<br>Yes → Repair the short to voltage in the (K24) CKP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Measure the resistance of the (K24) CKP Sensor Signal circuit from the CKP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 8<br>No → Repair the open in the (K24) CKP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 8 | Measure the resistance between ground and the (K24) CKP Sensor Signal circuit in the CKP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K24) CKP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 9 | All |

## P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Measure the resistance between the (K24) CKP Sensor Signal circuit and the (K7) 5-volt Supply circuit in the CKP Sensor harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K24) CKP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 13 | All |
| 10 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the CKP Sensor harness connector.<br>Did the voltage increase above 5.2 volts with the Ignition on?<br><br>Yes → Repair the short to voltage in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 11<br><br>**NOTE: Turn the ignition off before continuing.** | All |
| 11 | Turn the ignition off.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the CKP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 12<br><br>No → Repair the open in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 12 | Measure the resistance between ground and the (K7) 5-volt Supply circuit at the CKP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 13 | All |
| 13 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 14 | **NOTE: The following tests may help in identifying a possible intermittent condition with the Crank Sensor or its related wire harness.**<br>Ignition on, engine not running.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crank Sensor connector and the PCM harness connector.<br>Wiggle the related wire harness and connections.<br>Monitor the lab scope screen.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and the related wire harness.<br>Observe the lab scope screen.<br>Look for any erratic pulses generated by the CKP Sensor.<br>Did the CKP Sensor generate any erratic pulses?<br>Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 15 | All |
| 15 | **NOTE: An intermittent failure with the Cam Position Sensor may cause the P0320 code to set.**<br>Turn the ignition off.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP Sensor connector and the PCM harness connector.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Ignition on, engine not running.<br>Wiggle the related wire harness and gently tap on the Cam Position Sensor.<br>Monitor the lab scope screen.<br>Start the engine.<br>Lightly tap on the CMP Sensor and wiggle the related wire harness.<br>Observe the lab scope screen, looking for any erratic pulses generated by the CMP Sensor.<br>Did the CMP Sensor generate any erratic pulses?<br>Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Test Complete. | All |

## Symptom:

## P0340-NO CAM REFERENCE SIGNAL AT PCM

**When Monitored and Set Condition:**

**P0340-NO CAM REFERENCE SIGNAL AT PCM**

When Monitored: Engine cranking/running.

Set Condition: At least 5 seconds have elapsed with Crankshaft Position Sensor signals present but no Camshaft Position Sensor signal.

| POSSIBLE CAUSES |
|---|
| CHECKING INTERMITTENT CMP SIGNAL WITH LAB SCOPE |
| CRANK POSITION SENSOR SIGNAL |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| (K44) CMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K44) CMP SENSOR SIGNAL CIRCUIT OPEN |
| (K44) CMP SENSOR SIGNAL CIRCUIT SHORTED GROUND |
| (K44) CMP SENSOR SIGNAL SHORTED TO (K7) 5-VOLT SUPPLY CIRCUIT |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| CAMSHAFT POSITION SENSOR |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, erase DTCs.<br>Start the engine.<br>If the DTC does not set right away it may be necessary to take the vehicle on a test drive.<br>Does the DTC return?<br>Yes → Go To 2<br>No → Go To 14 | All |
| 2 | Turn the ignition off.<br>Disconnect the CMP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the CMP Sensor harness connector.<br>Is the voltage between 4.8 and 5.2 volts?<br>Yes → Go To 3<br>No → Go To 10 | All |

## P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Measure the voltage on the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.<br>Is the voltage between 4.5 and 5.0 volts?<br>Yes → Go To 4<br>No → Go To 6 | All |
| 4 | Turn the Ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K4) Sensor ground circuit from the CMP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | **NOTE: Inspect the Camshaft sprocket for damage per the Service Information. If a problem is found repair as necessary.**<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace the Camshaft Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.<br>Is the voltage above 5.2 volts?<br>Yes → Repair the short to voltage in the (K44) CMP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Measure the resistance of the (K44) CMP Sensor Signal circuit from the CMP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 8<br>No → Repair the open in the (K44) CMP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 8 | Measure the resistance between ground and the (K44) CMP Sensor Signal circuit at the CMP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K44) CMP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 9 | All |

## P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Measure the resistance between the (K44) CMP Sensor Signal circuit and the (K7) 5-volt Supply circuit in the CMP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K44) CMP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 13 | All |
| 10 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the CMP Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 11 | All |
| 11 | Turn the ignition off.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the CMP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 12<br><br>No → Repair the open in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 12 | Measure the resistance between ground and the (K7) 5-volt Supply circuit at the CMP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 13 | All |
| 13 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 14 | **NOTE: The following tests may help in identifying a possible intermittent condition with the Cam Sensor or its related wire harness.**<br>Ignition on, engine not running.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the Cam Sensor connector and the PCM harness connector.<br>Wiggle the related wire harness and connections.<br>Monitor the lab scope screen.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Lightly tap on the Cam Sensor and wiggle the CMP Sensor connector and wire harness.<br>Observe the lab scope screen.<br>Look for any erratic pulses generated by the CMP Sensor.<br>Did the CMP Sensor generate any erratic pulses?<br>Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 15 | All |
| 15 | **NOTE: An intermittent Crank Position Sensor failure may cause the P0340 code to set.**<br>Ignition on, engine not running.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the Crank Sensor connector and the PCM harness connector.<br>Wiggle the related wire harness and connections.<br>Monitor the lab scope screen.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and wire harness.<br>Observe the lab scope screen.<br>Look for any erratic pulses generated by the CKP Sensor.<br>Did the CKP Sensor generate any erratic pulses?<br>Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Test Complete. | All |

**Symptom List:**

**P0351-IGNITION COIL # 1 PRIMARY CIRCUIT**
**P0352-IGNITION COIL # 2 PRIMARY CIRCUIT**
**P0353-IGNITION COIL # 3 PRIMARY CIRCUIT**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0351-IGNITION COIL # 1 PRIMARY CIRCUIT.**

**When Monitored and Set Condition:**

**P0351-IGNITION COIL # 1 PRIMARY CIRCUIT**

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

**P0352-IGNITION COIL # 2 PRIMARY CIRCUIT**

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

**P0353-IGNITION COIL # 3 PRIMARY CIRCUIT**

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with engine running, engine rpm less than 2016, and none of the coils in dwell when checked.

Set Condition: Peak current is not achieved with battery based dwell plus 1.5 msec of diagnostic offset. It takes less than 3 seconds during cranking or up to 6 seconds while running to set.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (F42) ASD RELAY OUTPUT CIRCUIT |
| IGNITION COIL RESISTANCE |
| IGNITION COIL |
| IGNITION COIL CONTROL CIRCUIT OPEN |

## P0351-IGNITION COIL # 1 PRIMARY CIRCUIT — Continued

| POSSIBLE CAUSES |
|---|
| IGNITION COIL CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br><br>Yes → Go To 2<br><br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Ignition Coil harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Relay.<br>Using a 12-volt test light connected to ground, probe the (F42) ASD Relay Output circuit at the coil rail harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 3<br><br>No → Repair the excessive resistance or short to ground in the (F42) ASD Relay Output circuit. Inspect the related fuses and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>**CAUTION: Stop All Actuations** | All |
| 3 | Turn the ignition off.<br>Disconnect the Ignition Coil harness connector.<br>**NOTE: The resistance of the 2.4L Primary Ignition Coil is 0.53 to 0.63 of an ohm and the resistance of a 4.0L Primary Coil Rail is 0.51 to 0.61 of an ohm at 70°F (21.1°C).**<br>Measure the resistance of the primary ignition coil.<br>Is the resistance value within the listed specifications?<br><br>Yes → Go To 4<br><br>No → Replace the ignition coil.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | Turn the ignition off.<br>Disconnect the Ignition Coil harness connector.<br>Using a 12-volt test light connected to 12-volts, probe the Ignition Coil Control circuit.<br>Crank the engine for 5 second while observing the test light.<br>What is the state of the test light while cranking the engine?<br><br>Brightly blinking.<br>Replace the Ignition Coil.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>ON constantly.<br>Go To 5<br><br>OFF constantly.<br>Go To 6 | All |

## P0351-IGNITION COIL # 1 PRIMARY CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between the Ignition Coil Control circuit and ground.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the Ignition Coil Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the Ignition Coil Control circuit from the Ignition Coil connector to the PCM connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 7<br><br>No → Repair the open in the Ignition Coil Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0420-1/1 CATALYTIC CONVERTER EFFICIENCY**
**P0432-2/1 CATALYTIC CONVERTER EFFICIENCY**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0420-1/1 CATALYTIC CONVERTER EFFICIENCY.**

**When Monitored and Set Condition:**

**P0420-1/1 CATALYTIC CONVERTER EFFICIENCY**

When Monitored: After engine warm up to 147° F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

Set Condition: As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one.

**P0432-2/1 CATALYTIC CONVERTER EFFICIENCY**

When Monitored: After engine warm up to 147° F, 180 seconds of open throttle operation, at a speed greater than 20 mph, with the engine at 1200-1700 rpm and MAP vacuum between 15.0 and 21.0 inches of mercury (Hg).

Set Condition: As catalyst efficiency deteriorates, the switch rate of the downstream O2 sensor approaches that of the upstream O2 sensor. If at any point during the test the switch ratio reaches a predetermined value a counter is incremented by one.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| VISUALLY INSPECT CATALYTIC CONVERTER |
| EXHAUST LEAK |
| ENGINE MECHANICAL PROBLEM |
| UPSTREAM O2 SENSOR OLDER THAN DOWNSTREAM O2 SENSOR |
| CATALYTIC CONVERTER |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0420-1/1 CATALYTIC CONVERTER EFFICIENCY — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 2 | Inspect the Catalytic Converter for the following damage.<br>Damage Catalytic Converter, dent and holes.<br>Severe discoloration caused by overheating the Catalytic Converter.<br>Catalytic Converter broke internally.<br>Leaking Catalytic Converter.<br>Were any problems found?<br><br>Yes → Replace the Catalytic Converter. Repair the condition that may have caused the failure.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 3 | All |
| 3 | Start Engine and let idle.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Check for exhaust leaks between the engine and the appropriate downstream O2 Sensor.<br>Is there any exhaust leaks?<br><br>Yes → Repair or replace leaking exhaust parts as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | **Check the exhaust for excessive smoke from internal oil or coolant leaks.**<br>Is there an oil or coolant consumption condition present?<br><br>Yes → Repair engine mechanical condition as necessary and replace Catalytic Converter.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | **NOTE: A new Downstream O2 Sensor along with an aging Upstream O2 Sensor may cause this trouble code to set.**<br>Review vehicle repair history.<br>Has the Downstream O2 Sensor been replaced without replacing the Upstream O2 Sensor?<br><br>Yes → Replace the appropriate Upstream Oxygen Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Catalytic Converter.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0441-EVAP PURGE FLOW MONITOR

**When Monitored and Set Condition:**

**P0441-EVAP PURGE FLOW MONITOR**

When Monitored: With engine temperature greater than 170° F, fuel control in closed loop, engine idling for 2 minutes, no low fuel, MAP less than 15.7 inches mercury and barometric altitude less than 8,000 feet.

Set Condition: After having passed the Leak Detection Pump (LDP) test, no air flow through the evaporative system is detected by the EVAP monitor.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| INTERMITTENT CONDITION |
| VISUAL INSPECTION |
| EVAP PURGE HOSE (SOLENOID TO CANISTER) |
| EVAP PURGE HOSE (CANISTER TO FUEL TANK) |
| EVAP PURGE SOLENOID VACUUM SUPPLY |
| EVAP PURGE SOLENOID (LEAKY/STUCK OPEN) |
| EVAP PURGE SOLENOID |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Visually inspect the Evap canister. Look for any physical damage or any signs of fuel that has entered the canister. Any signs of fuel may indicate a bad rollover valve.<br>Were any problems found?<br>Yes → Repair or Replace as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |

## P0441-EVAP PURGE FLOW MONITOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Visually inspect the Evap purge hose that goes from the Purge Solenoid to the Evap Canister. Look for any physical damage such as a pinched, plugged, ripped or dry rotted hose.<br>Were any problems found?<br>Yes → Repair or replace hose as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |
| 4 | Visually inspect the Evap Purge hose that goes between the Evap canister and the fuel tank. Look for any physical damage such as a pinched, plugged, ripped or dry rotted hose.<br>Were any problems found?<br>Yes → Repair or replace hose as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 5 | All |
| 5 | Carefully inspect the Evap Purge Solenoid vacuum supply hose for proper routing. Also check for a pinched or plugged hose from the throttle body to the Purge Solenoid. Inspect the vacuum nipple at the throttle body for any damage or plugging.<br>Make sure vacuum fitting at the purge solenoid is not over installed.<br>Is the vacuum supply hose and throttle body vacuum nipple free from defects?<br>Yes → Go To 6<br>No → Repair the vacuum supply hose/tube as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | **Note: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty rollover valve. Replace purge solenoid if contamination is found**<br>Disconnect the vacuum hoses at the EVAP Purge Solenoid.<br>Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port. (component side)<br>Does the Evap Purge Solenoid hold vacuum?<br>Yes → Go To 7<br>No → Replace the Evap Purge Solenoid and the Evap Canister and clean out Evap lines as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port. (component side)<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the EVAP Purge Solenoid and observe the vacuum gauge.<br>Does the vacuum drop when the solenoid is actuated?<br>Yes → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Replace the Evap Purge Solenoid.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0442-EVAP LEAK MONITOR MEDIUM (0.040) LEAK DETECTED**
**P0455-EVAP LEAK MONITOR LARGE LEAK DETECTED**
**P0456-EVAP LEAK MONITOR SMALL (.020) LEAK DETECTED**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0442-EVAP LEAK MONITOR MEDIUM (0.040) LEAK DETECTED.**

**When Monitored and Set Condition:**

**P0442-EVAP LEAK MONITOR MEDIUM (0.040) LEAK DETECTED**

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: If there is a leak larger than 0.040″ and smaller than 0.080″ in the evaporative system.

**P0455-EVAP LEAK MONITOR LARGE LEAK DETECTED**

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: There is a leak larger than 0.080″ in the evaporative system.

**P0456-EVAP LEAK MONITOR SMALL (.020) LEAK DETECTED**

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40° F and 90° F and coolant temperature within 10° F of battery/ambient.

Set Condition: There is a leak larger than 0.020″ and smaller than 0.040″ in the evaporative system.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| INTERMITTENT CONDITION |
| EVAPORATIVE EMISSION LEAK DETECTION |
| EVAP PURGE SOLENOID |

## P0442-EVAP LEAK MONITOR MEDIUM (0.040) LEAK DETECTED — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **Note: A loose gas cap could have caused this DTC to set. Make sure gas cap is tight and in good condition. Ensure the gas cap meets OEM specifications.**<br>**NOTE: Engine vacuum at must be present at the LDP vacuum port.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br><br>Yes → Go To 2<br><br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 2 | To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD).<br>**WARNING: Keep lit cigarettes, sparks, flames, and other ignition sources away from the test area to prevent the ignition of explosive gases. Keep the test area well ventilated.**<br>**NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity and the fuel must be cool to properly test the Evap system.**<br>Disconnect the vacuum supply hose at the Leak Detection Pump.<br>Connect and apply a continuous vacuum supply (i.e. 20″Hg) to the Leak Detection Pump. A vacuum pump such as an A/C recovery unit works well.<br>Using the DRBIII®, select Engine/System Tests and actuate the Leak Detect Pump Test (Option 3/Hold PSI).<br>**NOTE: The above energizes the LDP solenoid and allows the constant vacuum source to apply vacuum to the LDP pump diaphragm. This lifts the diaphragm up and seals the atmospheric canister vent valve at the bottom of the Leak Detection Pump.**<br>Connect the red power lead of Miller Tool #8404 to the battery positive terminal and the black ground lead to battery negative terminal.<br>**NOTE: See Charts and Graph support material EELD Calibration Setup for an example.**<br>Connect shop air to the #8404 EELD.<br>Set the smoke/air control switch to AIR.<br>Insert the tester's AIR supply tip (clear hose) into the appropriate calibration orifice on the tester's control panel (based on DTC leak size).<br>Press the remote smoke/air start button.<br>Position the red flag on the air flow meter so it is aligned with the indicator ball.<br>When the calibration is complete, release the remote button. The EELD is now calibrated the flow meter in liters per minute to the size leak indicated by the DTC set in the PCM.<br>Install the service port adapter #8404-14 on the vehicle's service port.<br>Connect the Air supply hose from the EELD to the service port.<br>Press the remote button to activate AIR flow.<br>**NOTE: Larger volume fuel tanks, and/or those with less fuel, may require 4 to 5 minutes to fill.**<br>Compare the flow meter indicator ball reading to the red flag.<br>ABOVE the red flag indicates a leak present.<br>BELOW the red flag indicates a sealed system.<br>Is the indicator ball above the red flag?<br><br>Yes → Go To 3<br><br>No → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## P0442-EVAP LEAK MONITOR MEDIUM (0.040) LEAK DETECTED — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | **NOTE: A thorough visual inspection of the Evap system hoses, tubes, and connections may save time in your diagnosis. Look for any physical damage or signs of wetness at connections. The strong smell of fuel vapors may aid diagnosis also.**<br>To continue testing, you will need Miller Tool #8404 Evaporative Emissions Leak Detector (EELD).<br>Remove the Air supply hose from the service port.<br>Connect the SMOKE supply tip (black hose) to the service port.<br>Set the smoke/air control switch to SMOKE.<br>**NOTE: The flow meter indicator ball will not move at this point.**<br>Press the remote smoke/air start button.<br>**NOTE: Ensure that smoke has filled the EVAP system by continuing to press the remote smoke/air start button, remove the vehicle fuel cap, and wait for the smoke to exit. Once smoke is indicated reinstall the fuel cap.**<br>**NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.**<br>While still holding the remote smoke/air start button, use the white light (#8404-CLL) to follow the EVAP system path, and look for the source of the leak indicated by exiting smoke.<br>If a leak is concealed from view (i.e., top of fuel tank), release the remote smoke/air start button, and use the ultraviolet (UV) black light #8404-UVL and the yellow goggles 8404-20 to look for residual traces of dye that is left behind by the smoke.<br>The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light.<br>Was a leak found?<br><br>Yes → Repair or replace the leaking component as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Go To 4 | All |
| 4 | **NOTE: After disconnecting the Evap Purge Solenoid vacuum connections, inspect the lines and solenoid for any signs of contamination from the EVAP Canister. This may indicate a faulty rollover valve. Replace/repair as necessary.**<br>Turn the ignition off.<br>Disconnect the vacuum hoses at the Evap Purge Solenoid.<br>Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side.<br>**NOTE: Monitor the vacuum gauge for at least 15 seconds.**<br>Does the Evap Purge Solenoid hold vacuum?<br><br>Yes → Refer to the INTERMITTENT CONDTION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Replace the Evap Purge Solenoid.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## Symptom:

## P0443-EVAP PURGE SOLENOID CIRCUIT

**When Monitored and Set Condition:**

**P0443-EVAP PURGE SOLENOID CIRCUIT**

When Monitored: Continuously after the ignition is turned on and the battery voltage is above 10.4 volts.

Set Condition: Not powering down, not in limp-in and time since last solenoid activation is greater than 72 micro seconds. The PCM will set a trouble code if the actual state of the solenoid does not match the intended state on two consecutive key cycles.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| EVAP PURGE SOLENOID |
| (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT OPEN |
| (K52) EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND |
| (F12) FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Evap Purge Solenoid connector.<br>Measure the resistance between the terminals of the Evap Purge Solenoid.<br>Is the resistance between 29.0 and 44.0 ohms?<br>Yes → Go To 3<br>No → Replace the Evap Purge Solenoid.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P0443-EVAP PURGE SOLENOID CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Ignition on, engine not running.<br>Measure the voltage on the (F12) Fused Ignition Switch Output circuit at the EVAP Purge Solenoid harness connector.<br>Is the voltage above 10.0 volts?<br><br>Yes → Go To 4<br><br>No → Repair the open or short to ground in the (F12) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | Disconnect the PCM harness connectors.<br>**NOTE: Check connectors - Clean/repair as necessary.**<br>Measure the resistance of the (K52) Evap Purge Solenoid Control circuit from the PCM harness connector to the Evap Purge Solenoid harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K52) Evap Purge Solenoid Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Measure the resistance between ground and the (K52) Evap Purge Solenoid Control circuit.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K52) Evap Purge Solenoid Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER-5.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom List:**

**P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES**
**P0461-FUEL LEVEL UNIT NO CHANGE OVER TIME**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES.**

**When Monitored and Set Condition:**

**P0460-FUEL LEVEL UNIT NO CHANGE OVER MILES**

When Monitored: Engine running and fuel level either below 15% or above 85% of capacity.

Set Condition: The PCM sees low fuel, less than 15%, for more than 120 miles or fuel level does not change by at least 4% for more than 250 miles.

**P0461-FUEL LEVEL UNIT NO CHANGE OVER TIME**

When Monitored: Engine running and fuel level either below 15% or above 85% of capacity.

Set Condition: The PCM sees low fuel, less than 15%, for more than 120 miles or fuel level does not change by at least 4% for more than 250 miles.

| POSSIBLE CAUSES |
|---|
| PHYSICALLY DAMAGED/DEFORMED/OBSTRUCTED FUEL TANK |
| FUEL LEVEL SENSOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure, even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Inspect the outside of the fuel tank for defects.<br>Remove the fuel tank.<br>Remove the fuel pump module from the fuel tank.<br>Inspect the inside of the fuel tank for any obstructions or deformities.<br>Is the fuel tank free from defects?<br>Yes → Go To 2<br>No → Repair or replace the fuel tank as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | If there are no possible causes remaining, view repair.<br>Repair<br>Replace the Fuel Level Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P0462-FUEL LEVEL SENDING UNIT VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P0462-FUEL LEVEL SENDING UNIT VOLTAGE TOO LOW**

When Monitored: Ignition on and battery voltage above 10.4 volts.

Set Condition: The Fuel Level Sensor signal voltage goes below 0.2 of a volt at the PCM for more than 5 seconds.

| POSSIBLE CAUSES |
|---|
| FUEL LEVEL SENSOR VOLTAGE BELOW 0.2 VOLT |
| FUEL LEVEL SENSOR |
| (K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| (K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the Fuel Level Sensor voltage.<br>Is the Fuel Level Sensor voltage below 0.2 of a volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Turn the ignition off.<br>Disconnect the Fuel Pump Module harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, read the Fuel Level Sensor voltage.<br>Did the Fuel Level Sensor voltage change from below 0.2 of a volt to above 4.0 volts?<br>Yes → Replace the Fuel Level Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K226) Fuel Level Sensor Signal circuit.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K226) Fuel Level Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 4 | All |

## P0462-FUEL LEVEL SENDING UNIT VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the resistance between the (K226) Fuel Level Sensor Signal circuit and the (K4) Sensor ground circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the short between the (K4) Sensor ground and the (K226) Fuel Level Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 5 | All |
| 5 | **NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P0463-FUEL LEVEL SENDING UNIT VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0463-FUEL LEVEL SENDING UNIT VOLTAGE TOO HIGH**

When Monitored: Ignition on and battery voltage above 10.4 volts.

Set Condition: The Fuel Level Sensor signal voltage at the PCM goes above 4.95 volts for more than 90 seconds.

| POSSIBLE CAUSES |
|---|
| FUEL LEVEL SENSOR VOLTAGE ABOVE 4.9 VOLTS |
| FUEL LEVEL SENSOR |
| (K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE |
| (K226) FUEL LEVEL SENSOR SIGNAL CIRCUIT OPEN |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the Fuel Level Sensor voltage.<br>Is the Fuel Level Sensor voltage above 4.9 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Turn the ignition off.<br>Disconnect the Fuel Pump Module electrical harness connector.<br>Ignition on, engine not running.<br>Connect a jumper wire between the (K226) Fuel Level Sensor Signal circuit and the (K4) Sensor ground circuit at the Fuel Pump Module harness connector.<br>With the DRBIII®, read the Fuel Level Sensor voltage.<br>Did the Fuel Level Sensor voltage change from above 4.9 volts to below 0.4 of a volt?<br>Yes → Replace the fuel level sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0463-FUEL LEVEL SENDING UNIT VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K226) Fuel Level Sensor Signal circuit at the Fuel Pump Module harness connector.<br>Is the voltage above 5.3 volts?<br><br>Yes → Repair the short to voltage in the (K226) Fuel Level Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (K226) Fuel Level Sensor Signal circuit from the PCM harness connector to the Fuel Pump Module harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair open in the (K226) Fuel Level Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the Fuel Pump Module harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P0500-NO VEHICLE SPEED SIGNAL CIRCUIT

**When Monitored and Set Condition:**

**P0500-NO VEHICLE SPEED SIGNAL CIRCUIT**

When Monitored: Engine Temperature greater than 104 deg F, MAP vacuum approximately 15″ to 16″ inches of mercury and Engine RPM between 1400 and 3000 rpm.

Set Condition: No Vehicle Speed Signal for more than 15 seconds on two consecutive trips.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (K6) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K6) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| VEHICLE SPEED SENSOR |
| (G7) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (G7) VEHICLE SPEED SIGNAL CIRCUIT OPEN |
| (G7) VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the Vehicle Speed Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K6) 5-volt Supply circuit at the VSS harness connector.<br>Is the voltage between 4.5 to 5.2 volts?<br>Yes → Go To 3<br>No → Go To 8 | All |

## P0500-NO VEHICLE SPEED SIGNAL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Ignition on, engine not running.<br>Connect a jumper wire between the (G7) Vehicle Speed Signal circuit and (K4) Sensor ground circuit in the VSS harness connector.<br>With the DRBIII® read the Vehicle Speed Signal voltage.<br>Does the voltage start at 5.0 volts and drop to approximately 0 volts?<br><br>Yes → Replace the Vehicle Speed Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4<br><br>**NOTE: Remove the jumper wire before continuing.** | All |
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (G7) Vehicle Speed Signal circuit at the PCM or Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (G7) Vehicle Speed Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Measure the resistance of the (G7) Vehicle Speed Signal circuit from the PCM harness connector to the VSS harness connector.<br>Is the resistance above 5.0 ohms?<br><br>Yes → Repair the open in the (G7) Vehicle Speed Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | Measure the resistance between ground and the (G7) Vehicle Speed Signal circuit at the Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (G7) Vehicle Speed Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 7 | Measure the resistance of the (K4) Sensor ground circuit from the Sensor harness connector to the PCM harness connector.<br>Is the resistance above 5.0 ohms?<br><br>Yes → Repair the open in the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 10 | All |

## P0500-NO VEHICLE SPEED SIGNAL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 8 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance in the (K6) 5-volt Supply circuit from the VSS harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 9<br><br>No → Repair the open in the (K6) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 9 | Measure the resistance between ground and the (K6) 5-volt Supply circuit at the VSS harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K6) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 10 | All |
| 10 | **NOTE: Before continuing, check the PCM harness connectors for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0505-IDLE AIR CONTROL MOTOR CIRCUITS

**When Monitored and Set Condition:**

**P0505-IDLE AIR CONTROL MOTOR CIRCUITS**

When Monitored: At power-up and battery voltage greater than 11.5 volts.

Set Condition: The PCM senses a short to ground or battery voltage on any of the four Idle Air Control (IAC) driver circuits for 100 msec while the IAC motor is active.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| IAC #1 CONTROL CIRCUIT SHORTED TO #2, #3, OR #4 |
| IAC #2 CONTROL CIRCUIT SHORTED TO #3 OR #4 |
| IAC #3 CONTROL CIRCUIT SHORTED TO #4 |
| IAC CONTROL CIRCUIT SHORTED TO VOLTAGE |
| IAC CONTROL CIRCUIT SHORTED TO GROUND |
| IAC MOTOR OPERATION |
| IAC MOTOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the IAC Motor harness connector.<br>Disconnect the PCM harness connectors.<br>**NOTE: The following steps are checking for a short between the IAC Control circuits.**<br>Measure the resistance between the IAC #1 Control circuit and #2, #3, #4 Control circuits.<br>Is the resistance below 5.0 ohms on any of the Drivers?<br>Yes → Repair the short between the appropriate IAC Control circuits.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |

## P0505-IDLE AIR CONTROL MOTOR CIRCUITS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Measure the resistance between the IAC #2 Control circuit and #3, #4 Control circuits.<br>Is the resistance below 5.0 ohms on any of the circuits?<br><br>Yes → Repair the short between the appropriate IAC Control circuits.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | Measure the resistance between the IAC #3 Control circuit and the #4 Control circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the short between the IAC Control circuits.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | Ignition on, engine not running.<br>Measure the voltage on each of the IAC Control circuits.<br>Is the voltage above 1.0 volt at any IAC Control circuit?<br><br>Yes → Repair the short to voltage in the appropriate IAC Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 6 | All |
| 6 | Turn the ignition off.<br>Repeat each measurement for each IAC Control circuit.<br>Measure the resistance between ground and each IAC Control circuit.<br>Is the resistance below 100 ohms at any IAC Control circuit?<br><br>Yes → Repair the short to ground in the appropriate IAC Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 7 | Connect the PCM harness connector.<br>Start and idle the engine.<br>Using a test light connected to ground, probe the IAC #1 Control circuit for 10 seconds.<br>Repeat the above test for the remaining IAC Motor Driver circuits.<br>Does the test light turn on and off while probing each IAC Motor Driver circuit?<br><br>Yes → Replace the Idle Air Control Motor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P0523-OIL PRESSURE VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P0523-OIL PRESSURE VOLTAGE TOO HIGH**

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: The oil pressure sensor signal at PCM goes above 4.9 volts.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| OIL PRESSURE SWITCH |
| (G60) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (G60) OIL PRESSURE SIGNAL CIRCUIT OPEN |
| (G60) OIL PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND |
| GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Turn the ignition off.<br>Disconnect the Oil Pressure Switch harness connector.<br>Ignition on, engine not running.<br>Connect a jumper wire to the (G60) Oil Pressure Signal circuit in the Sensor harness connector.<br>With the DRBIII® monitor the Oil Pressure Switch state.<br>Touch the other end of the jumper wire to the Ground circuit at the Oil Pressure Switch harness connector several times.<br>Did the Oil Pressure Switch state change from High to Low?<br>Yes → Replace the Oil Pressure Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3 | All |

## P0523-OIL PRESSURE VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (G60) Oil Pressure Signal circuit at the Switch harness connector.<br>Is the voltage above 5.3 volts?<br>Yes → Repair the short to voltage on the (G60) Oil Pressure Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (G60) Oil Pressure Signal circuit from the Oil Pressure Switch harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the open in the (G60) Oil Pressure Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Measure the resistance between (G60) Oil Pressure Signal circuit and ground at the Switch connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (G60) Oil Pressure Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 6 | All |
| 6 | Measure the resistance between Ground and the Ground circuit at the Oil Pressure Switch connector.<br>Is the resistance below 100 ohms?<br>Yes → Go To 7<br>No → Repair the open in the Ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P0551-POWER STEERING SWITCH FAILURE

**When Monitored and Set Condition:**

**P0551-POWER STEERING SWITCH FAILURE**

When Monitored: With the ignition key on and engine running.

Set Condition: With the vehicle above 40 mph for over 30 seconds, the power steering pressure switch remains open.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| POWER STEERING PRESSURE SWITCH |
| (K10) P/S PRESSURE SWITCH SIGNAL CIRCUIT OPEN |
| (K10) P/S PRESSURE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND |
| (Z1) P/S PRESSURE SWITCH GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Turn the ignition off.<br>Disconnect the Power Steering Pressure Switch harness connector.<br>Ignition on, engine not running.<br>Connect a jumper wire to the (K10) P/S Pressure Switch Signal circuit at harness connector.<br>Using the DRBIII®, while monitoring the Power Steering Pressure Switch.<br>Touch the jumper wire to the (Z1) Ground circuit at the Power Steering Pressure Switch harness connector several times.<br>Did the Power Steering Pressure Switch status change from Hi to Low?<br>Yes → Replace the Power Steering Pressure Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P0551-POWER STEERING SWITCH FAILURE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure resistance of (K10) P/S Pressure Switch Signal circuit from PCM harness connector to P/S Pressure Switch harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 4<br><br>No → Repair the open in the (K10) P/S Pressure Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 4 | Measure the resistance between ground and the (K10) P/S Pressure Switch Signal circuit at the Switch harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K10) P/S Pressure Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 5 | All |
| 5 | With a 12-volt test light connect to 12-volts, probe the (Z1) P/S Pressure Switch ground circuit at the Switch harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (Z1) P/S Pressure Switch ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:
## P0601-PCM INTERNAL CONTROLLER FAILURE

**When Monitored and Set Condition:**

**P0601-PCM INTERNAL CONTROLLER FAILURE**

When Monitored: Ignition key on.

Set Condition: Internal checksum for software failed, does not match calculated value.

| POSSIBLE CAUSES |
|---|
| PCM INTERNAL OR SPI |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | The Powertrain Control Module is reporting internal errors, view repair to continue.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:

## P0622-GENERATOR FIELD NOT SWITCHING PROPERLY

**When Monitored and Set Condition:**

**P0622-GENERATOR FIELD NOT SWITCHING PROPERLY**

When Monitored: With the ignition key on and the engine running.

Set Condition: When the PCM tries to regulate the generator field with no result during monitoring.

| POSSIBLE CAUSES |
|---|
| GENERATOR FIELD PERFORMANCE |
| (K125) GEN FIELD SOURCE CIRCUIT OPEN |
| (K20) GEN FIELD CONTROL CIRCUIT OPEN |
| (K20) GEN FIELD CONTROL CIRCUIT SHORTED TO GROUND |
| GENERATOR |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>Record all DTCs and the related Freeze Frame data.<br>Using a 12-volt test light connected to ground, backprobe the (K20) Gen Field Control circuit at the back of the Generator.<br>With the DRBIII®, actuate the Generator Field Driver.<br>Does the test light blink?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 2 | All |
| 2 | Backprobe the (K125) Generator Field Source circuit at back of Generator with a volt meter.<br>With the DRBIII® actuate the Generator Field Driver.<br>Is the voltage above 10.0 volts?<br>Yes → Go To 3<br>No → Repair the open in the (K125) Gen Field Source circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

## P0622-GENERATOR FIELD NOT SWITCHING PROPERLY — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the Generator Field harness connector.<br>Measure the resistance of the (K20) Generator Field Control circuit from the Generator Field harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 4<br><br>No → Repair the open in the (K20) Gen Field Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 4 | Measure the resistance between ground and the (K20) Generator Field Control circuit in the PCM harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K20) Gen Field Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 5 | All |
| 5 | Measure resistance across the Generator Field Terminals at the Generator.<br>Is the resistance between 0.5 of an ohm and 15 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the Generator as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

## Symptom:

## P0645-A/C CLUTCH RELAY CIRCUIT

**When Monitored and Set Condition:**

**P0645-A/C CLUTCH RELAY CIRCUIT**

When Monitored: With the ignition key in the run position and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the A/C clutch relay control circuit.

| POSSIBLE CAUSES |
|---|
| A/C CLUTCH RELAY OPERATION |
| A/C CLUTCH RELAY |
| (F12) FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| (C13) A/C CLUTCH RELAY CONTROL CIRCUIT OPEN |
| (C13) A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, actuate the A/C Clutch Relay.<br>Is the A/C Clutch Relay clicking?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Remove the A/C Clutch Relay from the PDC.<br>Measure the resistance between Terminals 1(85) and 2 (86) of the A/C Clutch Relay.<br>Is the resistance between 50.0 and 90.0 ohms?<br>Yes → Go To 3<br>No → Replace the A/C Clutch Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 3 | Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, probe the (F12) Fused Ignition Switch Output circuit in the A/C Clutch Relay connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the open or short to ground in the (F12) Fused Ignition Switch Output circuit. Inspect and replace the fuse as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## P0645-A/C CLUTCH RELAY CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (C13) A/C Clutch Relay Control circuit between the PDC terminal and the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (C13) A/C Clutch Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Measure the resistance between ground and the (C13) A/C Clutch Relay Control circuit at the PCM connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (C13) A/C Clutch Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P0700-EATX CONTROLLER DTC PRESENT

**When Monitored and Set Condition:**

**P0700-EATX CONTROLLER DTC PRESENT**

When Monitored: With the ignition key on.

Set Condition: This DTC is an indicator that a transmission DTC has previously been set.

| POSSIBLE CAUSES |
|---|
| TCM DTC PRESENT SET IN PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | This DTC is an indicator that a Trans DTC has previously been set. A code may not currently be present in the TCM if a Trans repair was made. If after reading transmission DTC's there are no codes in the TCM, this code can be erased from the PCM.<br>Trans DTC present?<br>Continue<br>A DTC was registered in the Transmission Control Module. With the DRB, go to the TCM and read codes. Refer to the appropriate symptom (DTC). | All |

**Symptom List:**

**P1195-1/1 O2 SENSOR SLOW DURING CATALYST MONITOR**
**P1196-2/1 O2 SENSOR SLOW DURING CATALYST MONITOR**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1195-1/1 O2 SENSOR SLOW DURING CATALYST MONITOR.**

**When Monitored and Set Condition:**

**P1195-1/1 O2 SENSOR SLOW DURING CATALYST MONITOR**

When Monitored: With the engine running, coolant greater than 170°F, open throttle, steady to slightly increasing vehicle speed greater than 18 mph but less than 55 mph, with a light load on the engine, for a period no less than 5 minutes.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.6 of a volt and back fewer times than required.

**P1196-2/1 O2 SENSOR SLOW DURING CATALYST MONITOR**

When Monitored: With the engine running, coolant greater than 170°F, open throttle, steady to slightly increasing vehicle speed greater than 18 mph but less than 55 mph, with a light load on the engine, for a period no less than 5 minutes.

Set Condition: The oxygen sensor signal voltage is switching from below 0.39 of a volt to above 0.6 of a volt and back fewer times than required.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| EXHAUST LEAK |
| RESISTANCE IN THE O2 SENSOR SIGNAL CIRCUIT |
| RESISTANCE IN THE (K4) SENSOR GROUND CIRCUIT |
| O2 SENSOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P1195-1/1 O2 SENSOR SLOW DURING CATALYST MONITOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 2 | Start the engine.<br>Inspect the exhaust for leaks between the engine and the appropriate O2 Sensor.<br>Are there any exhaust leaks?<br><br>Yes → Repair or replace the leaking exhaust parts as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Backprobe the O2 Sensor Signal circuit at the O2 Sensor harness connector and PCM harness connector.<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity, meet the terminals in the connector, and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br><br>Yes → Go To 4<br><br>No → Repair the excessive resistance on the O2 Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | Turn the ignition off.<br>Backprobe the (K4) Sensor ground circuit at the O2 Sensor harness connector and PCM harness connector.<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity, meet the terminals in the connector, and that there is good terminal to wire connection.**<br>**NOTE: Ensure the voltmeter leads are connected for positive polarity**<br>Start the engine.<br>Allow the engine to idle.<br>Is the voltage below 0.10 of a volt?<br><br>Yes → Go To 5<br><br>No → Repair the excessive resistance on the (K4) Sensor ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | Turn the ignition off.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the O2 Sensor<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P1281-ENGINE IS COLD TOO LONG

**When Monitored and Set Condition:**

**P1281-ENGINE IS COLD TOO LONG**

When Monitored: The ignition key on, engine running.

Set Condition: The engine does not warm to 176 deg. F while driving for 20 minutes after start.

| POSSIBLE CAUSES |
|---|
| ENGINE COLD TOO LONG |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **Note: The best way to diagnose this DTC is to allow the vehicle to remain outside overnight in order to have a completely cold soaked engine.**<br>**Note: Extremely cold outside ambient temperatures may cause this DTC to set.**<br>Verify that the coolant level is not low and correct as necessary.<br>Start the engine.<br>With the DRBIII®, set the engine RPM to 1500 and allow the engine to warm up for 10-15 minutes.<br>With the DRBIII®, monitor the ENG COOLANT TMP DEG value during the warm up cycle. Make sure the transition of temperature change is smooth.<br>Did the engine temperature reach a minimum of 80° C (176° F)?<br>Yes → Test Complete.<br>No → Refer to the Service Information for cooling system performance diagnosis. The most probable cause is a Thermostat problem. Also, refer to any related TSBs.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT

**When Monitored and Set Condition:**

**P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT**

When Monitored: With the ignition on and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the Fuel Pump Relay Control circuit.

| POSSIBLE CAUSES |
|---|
| FUEL PUMP RELAY OPERATION |
| FUEL PUMP RELAY |
| (F15) FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| (K31) FUEL PUMP RELAY CONTROL CIRCUIT OPEN |
| (K31) FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, actuate the Fuel Pump Relay.<br>Is the Fuel Pump Relay clicking?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Remove the Fuel Pump Relay.<br>**Note: Check connectors - Clean/repair as necessary.**<br>Measure the resistance between terminals 1 (85) and 2 (86) of the Fuel Pump Relay.<br>Is the resistance between 50 and 90 ohms?<br>Yes → Go To 3<br>No → Replace the Fuel Pump Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Ignition on, engine not running.<br>With a 12-volt test light connect to ground, probe the (F15) Fused Ignition Switch output circuit in the PDC.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 4<br><br>No → Repair the open or short to ground in the (F15) Fused Ignition Switch Output circuit. Inspect the related fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 4 | Turn ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K31) Fuel Pump Relay control circuit between the PDC and the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K31) Fuel Pump Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Measure the resistance between ground and the (K31) Fuel Pump Relay Control circuit at the PDC.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K31) Fuel Pump Relay control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:
## P1294-TARGET IDLE NOT REACHED

**When Monitored and Set Condition:**

**P1294-TARGET IDLE NOT REACHED**

When Monitored: With the engine idling and in drive, if automatic. There must not be a MAP sensor trouble code or a throttle position sensor trouble code.

Set Condition: Engine idle is not within 200 rpm above or 100 rpm below target idle for 14 seconds. Three separate failures are required to set a bad trip. Two bad trips are required to set the code.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| VACUUM LEAK |
| AIR INDUCTION SYSTEM |
| THROTTLE BODY AND THROTTLE LINKAGE |
| IAC DRIVER CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>**NOTE: All MAP Sensor, IAC, and/or TPS codes present must be diagnosed first before proceeding.**<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Inspect the Intake Manifold for vacuum leaks.<br>Inspect the Power Brake Booster for any vacuum leaks.<br>Inspect the PCV system for proper operation or any vacuum leaks.<br>Were any problems found?<br>Yes → Repair vacuum leak as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3 | All |

## P1294-TARGET IDLE NOT REACHED — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Inspect the Air Induction System for the following problems.<br>Restrictions: Dirty Air Cleaner, Foreign material in the air intake tube, etc.<br>Leaks: Air Intake tube connection, Air Cleaner housing, etc.<br>Were any problems found?<br><br>Yes → Repair or replace as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 4 | All |
| 4 | Inspect the throttle body plate for carbon build up or other restrictions.<br>Inspect the throttle linkage for binding and smooth operation.<br>Ensure the throttle plate is resting on the stop at idle.<br>Remove IAC, inspect the pintle and its seating surface inside the throttle body.<br>Were any problems found?<br><br>Yes → Repair the reason for the carbon build up and replace the Throttle Body as needed.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Disconnect IAC Motor harness connector.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of each of the IAC Driver circuit from the IAC Motor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the appropriate IAC Driver circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:
## P1296-NO 5-VOLTS TO MAP SENSOR

**When Monitored and Set Condition:**

**P1296-NO 5-VOLTS TO MAP SENSOR**

When Monitored: During power-down and battery voltage greater than 10.4 volts.

Set Condition: The MAP sensor signal voltage goes below 2.35 volts with the key off for 5 seconds.

| POSSIBLE CAUSES |
|---|
| MAP SENSOR VOLTS BELOW 2.3 VOLTS |
| SHORTED SENSOR |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| MAP SENSOR |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: If the P0107 - MAP Sensor Voltage Too Low is also set, diagnose it first before continuing with P1296 - No 5-volts To MAP Sensor.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII® in Sensors, read the MAP Sensor voltage.<br>Is the voltage below 2.35 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the voltage above 4.5 volts?<br>Yes → Go To 3<br>No → Go To 4 | All |
| 3 | With the DRBIII® in Sensors, read the MAP Sensor voltage with the Sensor harness connector disconnected.<br>Is the voltage above 4.5 volts?<br>Yes → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 7 | All |

## P1296-NO 5-VOLTS TO MAP SENSOR — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the voltage on the (K7) 5-volt Supply circuit in the MAP Sensor harness connector while disconnecting the remaining Sensors that share the (K7) 5-volt Supply circuit.<br>Does the voltage return to approximately 5.0 volts with any Sensor disconnected?<br><br>Yes → Replace the Sensor that pulled the (K7) 5-volt Supply circuit low.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connector.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open or excessive resistance in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Measure the resistance between ground and the (K7) 5-volt Supply circuit in the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P1297-NO CHANGE IN MAP FROM START TO RUN

**When Monitored and Set Condition:**

**P1297-NO CHANGE IN MAP FROM START TO RUN**

When Monitored: With engine RPM +/- 64 of target idle and the throttle blade at closed throttle.

Set Condition: Too small of a difference is seen between barometric pressure with ignition on (engine running) and manifold vacuum for 8.80 seconds.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| MAP SENSOR VACUUM PORT |
| MAP SENSOR VOLTAGE BELOW 3.19 VOLTS |
| (K7) 5-VOLT SUPPLY CIRCUIT OPEN |
| (K7) 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND |
| MAP SENSOR |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND |
| (K1) MAP SENSOR SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: If a MAP high or Low DTC set along with P1297, diagnose the High or Low DTC first before continuing.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>Remove the MAP Sensor.<br>Inspect the vacuum port, check for restrictions or any foreign materials.<br>Were any restriction found?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3<br>**NOTE: Reinstall the MAP Sensor before continuing.** | All |

## P1297-NO CHANGE IN MAP FROM START TO RUN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Ignition on, engine not running.<br>With the DRBIII®, read the MAP Sensor voltage.<br>**NOTE: If a MAP High or Low DTC was set along with P1297, diagnose the High or Low DTC first.**<br>Is the voltage below 3.19 volts?<br>Yes → Go To 4<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit at the MAP Sensor harness connector.<br>Is the voltage between 4.5 to 5.2 volts?<br>Yes → Go To 5<br>No → Go To 8 | All |
| 5 | With the DRBIII®, monitor the MAP Sensor voltage with the Sensor harness connector disconnected.<br>Is the voltage above 1.2 volts?<br>Yes → Replace the MAP Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 6 | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K1) MAP Sensor Signal circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K1) MAP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 7 | All |
| 7 | Measure the resistance between the (K1) MAP Sensor Signal circuit and the (K4) Sensor ground circuit at the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short between the (K4) Sensor ground and the (K1) MAP Sensor Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 10 | All |
| 8 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K7) 5-volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 9<br>No → Repair the open in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P1297-NO CHANGE IN MAP FROM START TO RUN — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Measure the resistance between ground and the (K7) 5-volt Supply circuit in the MAP Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 10 | All |
| 10 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:
## P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT

**When Monitored and Set Condition:**

**P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT**

When Monitored: With ignition key on and battery voltage above 10.4 volts.

Set Condition: An open or shorted condition is detected in the ASD Relay control circuit.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| ASD RELAY |
| (F15) FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| (K51) ASD RELAY CONTROL CIRCUIT OPEN |
| (K51) ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Turn the ignition off.<br>Remove the ASD Relay.<br>Measure the resistance between terminals 85 and 86 of the ASD Relay.<br>Is the resistance between 50 and 80 ohms?<br>Yes → Go To 3<br>No → Replace the ASD Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 3 | Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, probe the (F15) Fused Ignition Switch Output circuit at the ASD Relay connector in the PDC.<br>Does the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the open or short to ground in the (F15) Fused Ignition Output. Inspect the related fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K51) ASD Relay Control circuit from the ASD Relay cavity in the PDC to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K51) ASD Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Measure the resistance between ground and the (K51) ASD Relay Control circuit at the PDC.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K51) ASD Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM

**When Monitored and Set Condition:**

**P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM**

When Monitored: With ignition key on, battery voltage above 10.4 volts, and engine RPM greater than 400.

Set Condition: No voltage sensed at the PCM when the ASD Relay is energized.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (A142) ASD RELAY OUTPUT CIRCUIT OPEN |
| (A14) FUSED B+ CIRCUIT OPEN |
| (A142) ASD OUTPUT CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 2 | Attempt to start the engine.<br>Did the engine start?<br>Yes → Go To 3<br>No → Go To 4 | All |
| 3 | Turn the ignition off.<br>Remove the ASD Relay from the PDC.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (A142) ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 6<br>No → Repair the open in the (A142) ASD Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Remove the ASD Relay from the PDC.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (A142) ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 5<br>No → Repair the open in the (A142) ASD Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 5 | Turn the ignition off.<br>Remove the ASD Relay from the PDC.<br>Using a 12-volt test light, probe the (A14) Fused B+ circuit at the ASD Relay connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 6<br>No → Repair the open or short to ground in the (A14) Fused B+ circuit.<br>Inspect and replace fuses as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P1391-INTERMITTENT LOSS OF CMP OR CKP

**When Monitored and Set Condition:**

**P1391-INTERMITTENT LOSS OF CMP OR CKP**

When Monitored: Engine running or cranking.

Set Condition: When the failure counter reaches 20 for 2 consecutive trips.

| POSSIBLE CAUSES |
|---|
| INTERMITTENT CONDITION |
| CHECKING INTERMITTENT CMP SIGNAL WITH A LAB SCOPE |
| CMP WIRE HARNESS INSPECTION |
| TONE WHEEL/PULSE RING INSPECTION |
| CKP WIRE HARNESS INSPECTION |
| TONE WHEEL/PULSE RING INSPECTION |
| CHECKING INTERMITTENT CKP SIGNAL WITH A LAB SCOPE |
| CAMSHAFT POSITION SENSOR |
| CRANKSHAFT POSITION SENSOR |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, erase DTCs.<br>Start the engine and run until operating temp is reached. (Closed Loop)<br>If the DTC does not set right away it may be necessary to test drive the vehicle.<br>Does the DTC reset?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 2 | Turn the ignition off.<br>With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the CMP harness connector.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Observe the lab scope screen.<br>Are there any irregular or missing signals?<br>Yes → Go To 3<br>No → Go To 6 | All |

## P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.<br>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.<br>Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight.<br>Refer to any TSBs that may apply.<br>Were any of the above conditions present?<br><br>Yes → Repair as necessary<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Remove the Camshaft Position Sensor.<br>Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement.<br>Were any problems found?<br><br>Yes → Repair or replace the Tone Wheel/Pulse Ring as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 5 | All |
| 5 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Camshaft Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Turn the ignition off.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K44) CMP Signal circuit in the PCM harness connector and in the CMP harness connector.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Observe the lab scope screen.<br>Wiggle the related wire harness and gently tap on the Cam Position Sensor.<br>Look for any differences between the Channel 1 and Channel 2 patterns, generated by the CMP Sensor.<br>Does the DRBIII® screen display any missing or irregular patterns?<br><br>Yes → Replace the Camshaft Position Sensor or repair the wiring/ connection concern..<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |

## P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 7 | Turn the ignition off.<br>With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the CKP harness connector.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Observe the lab scope screen.<br>Are there any irregular or missing signals?<br>Yes → Go To 8<br>No → Go To 11 | All |
| 8 | Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.<br>Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.<br>Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight.<br>Refer to any TSBs that may apply.<br>Were any of the above conditions present?<br>Yes → Repair as necessary<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 9 | All |
| 9 | Turn the ignition off.<br>Remove the Crankshaft Position Sensor.<br>Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement.<br>Were any problems found?<br>Yes → Repair or replace the Tone Wheel/Flex Plate as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 10 | All |
| 10 | If there are no possible causes remaining, view repair.<br>Repair<br>Replace the Crankshaft Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 11 | **NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.**<br>Turn the ignition off.<br>With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the (K24) CKP Signal circuit in the PCM harness connector and CKP harness connector. Both of the graphs should be identical.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Monitor the DRBIII® lab scope screen, both patterns should be the same.<br>Wiggle the related wire harness and gently tap on the Crank Position Sensor.<br>Look for any differences between Channel 1 and Channel 2 patterns generated by the CKP Sensor.<br>Were any erratic or missing signals noticed?<br>Yes → Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Test Complete. | All |

## Symptom:
## P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT

**When Monitored and Set Condition:**

**P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT**

When Monitored: Under closed throttle decel and Fuel Pulse Width equal to zero for 30 seconds.

Set Condition: One of the CKP sensor target windows has more than 2.86% variance from the reference window.

| POSSIBLE CAUSES |
|---|
| ADAPTIVE NUMERATOR RELEARN |
| CMP SENSOR CONNECTOR/WIRING |
| CKP SENSOR CONNECTOR/WIRING |
| DAMAGED TONE WHEEL/FLEX PLATE (CRANKSHAFT) |
| CRANKSHAFT POSITION SENSOR |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **Note: Check for any TSB's that may apply to this symptom.**<br>Read and record the Freeze Frame Data. Use this information to help you duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.<br>Ignition on, engine not running.<br>With the DRBIII® in the miscellaneous menu, choose ″Clear PCM (battery disconnect)″ to reset the PCM.<br>With the DRBIII®, choose the ″Misfire Pretest screen.<br>Road test the vehicle and re-learn the adaptive numerator.<br>The adaptive numerator is learned when the ″Adaptive Numerator Done Learning″ line on the Mis-fire Pre-test screen changes to ″Yes″.<br>Did the adaptive numerator re-learn?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 2 | All |

## P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 2 | **Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.**<br>**NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.**<br>**NOTE: Verify the Camshaft Position Sensor is properly installed.**<br>**Note: Refer to any technical service bulletins that may apply.**<br>Were any problems found?<br>Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |
| 3 | **Note: Visually inspect the Crankshaft Position Sensor and related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.**<br>**NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.**<br>**NOTE: Verify the Crank Position Sensor is properly installed.**<br>Were any problems found?<br>Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 4 | All |
| 4 | Disconnect and remove the Crankshaft Position Sensor.<br>Inspect the tone wheel/flexplate slots for damage, foreign material, or excessive movement.<br>Is the tone wheel/flexplate free from defects?<br>Yes → Go To 5<br>No → Repair/replace tone wheel/flex plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | With the DRBIII® lab scope probe and the Miller special tool #6801, back probe the CKP Signal circuit in the PCM harness connector.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING..**<br>Start the engine and observe the lab scope screen for any erratic CKP Sensor pulses.<br>Were any erratic Crank Position signals detected?<br>Yes. Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No. Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:

## P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND

**When Monitored and Set Condition:**

**P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND**

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40 deg. F and 90 deg. F and coolant temperature within 10 deg. F of battery/ambient.

Set Condition: LDP test must pass first. If the PCM suspects a pinched hose it will not set a fault until it runs the evap purge flow monitor. If the purge monitor does not pass then the pinched hose fault will be set.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| EVAP CANISTER OBSTRUCTED |
| OBSTRUCTION IN HOSE/TUBE BETWEEN EVAP CANISTER AND PURGE SOLENOID |
| LDP PRESSURE HOSE OBSTRUCTED |
| LEAK DETECTION PUMP |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 2 | The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized.<br>Disconnect the LDP Pressure hose at the EVAP Canister. The LDP Pressure hose is the hose that connects the Evap Canister to the Leak Detection Pump.<br>Did the pressure drop when the hose was disconnected?<br>Yes → Go To 3<br>No → Replace the EVAP Canister.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## P1486-EVAP LEAK MONITOR PINCHED HOSE FOUND — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | **Note: All previously disconnected hose(s) reconnected.**<br>Re-pressurize the EVAP System. On Miller Tool #8404, set the Pressure/Hold switch to Open and set the Vent switch to Closed. Turn the pump timer On and watch the gauge.<br>The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized.<br>Disconnect the EVAP hoses at the Purge Solenoid.<br>Did the pressure drop when the hose was disconnected?<br><br>Yes → Go To 4<br><br>No → Repair or replace hose/tube as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 4 | Disconnect and remove the LDP pressure hose. The LDP pressure hose is the hose that connects the EVAP Canister to the Leak Detection Pump.<br>Inspect the LDP pressure hose for any obstructions or physical damage.<br>Is the LDP pressure hose free from defects?<br><br>Yes → Replace the Leak Detection Pump.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Repair/replace hose as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

**Symptom:**

## P1491-COOLING FAN RELAY CONTROL CIRCUIT

| POSSIBLE CAUSES |
|---|
| COOLING FAN RELAY OPERATION |
| FUSED B+ OUTPUT CIRCUIT |
| GROUND CIRCUIT |
| (K173) COOLING FAN RELAY CONTROL CIRCUIT OPEN |
| (K173) COOLING FAN RELAY CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, actuate the Cooling Fan Relay.<br>Is the Cooling Fan operating?<br>Yes → Refer to the INTERITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Remove the Cooling Fan Relay.<br>Using a 12-volt test light connected to ground, probe the Fused B+ circuit of the Cooling Fan Relay connector.<br>Is the voltage above 11.0 volts?<br>Yes → Go To 3<br>No → Repair the open or short to ground in the Fused B+ circuit. Check and replace any open fuses.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 3 | Using a 12-volt test light connected to 12-volts, probe the Ground circuit in the Cooling Fan Relay harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the open in the Ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 4 | Disconnect the PCM harness connectors.<br>Measure the resistance of the (K173) Cooling Fan Relay Control circuit between the Cooling Fan Relay connector and the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Repair the open in the (K173) Cooling Fan Relay Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 5 | All |

## P1491-COOLING FAN RELAY CONTROL CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Measure the resistance between ground and the (K173) Cooling Fan Relay Control circuit at Relay connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the short to ground in the (K173) Cooling Fan Relay control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

## Symptom:

## P1492-BATTERY TEMPERATURE SENSOR VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P1492-BATTERY TEMPERATURE SENSOR VOLTAGE TOO HIGH**

When Monitored: With the ignition key on.

Set Condition: The PCM senses the voltage from the Battery Temperature Sensor above 4.9 volts for 3 seconds.

| POSSIBLE CAUSES |
|---|
| BATTERY TEMP SENSOR VOLTS ABOVE 4.8 VOLTS |
| BATTERY TEMPERATURE SENSOR |
| (K118) BATT TEMP SIGNAL CIRCUIT OPEN |
| (K118) BATT TEMP SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (K4) SENSOR GROUND CIRCUIT OPEN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>Record all DTCs and the related Freeze Frame data.<br>With the DRBIII®, monitor the Battery Temperature Sensor voltage.<br>Is the voltage above 4.8 volts?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 2 | Turn the ignition off.<br>Disconnect the Battery Temp Sensor connector.<br>Ignition on, engine not running.<br>With the DRBIII® in sensors, read the Battery Temperature voltage value.<br>Connect a jumper wire between the (K118) Batt Temp Signal circuit and the (K4) Sensor ground circuit at the Battery Temp Sensor connector.<br>Did the Battery Temp Sensor voltage change from greater than 4.5 volts to less than 1.0 volt?<br>Yes → Replace the Battery Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 3<br>**NOTE: Remove the jumper wire before continuing.** | All |

## P1492-BATTERY TEMPERATURE SENSOR VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Ignition on, engine not running.<br>Measure the voltage on the (K118) Battery Temp Signal circuit at the Sensor harness connector.<br>Is the voltage above 5.2 volts?<br><br>Yes → Repair the short to voltage in the (K118) Batt Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 4 | All |
| 4 | Turn the ignition off.<br>Measure the resistance of the (K118) Battery Temp Signal circuit from the Battery Temp Sensor harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K118) Batt Temp Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 5 | Measure the resistance in the (K4) Sensor ground circuit from the PCM harness connector to the Sensor connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K4) Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module in accordance with the Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

## Symptom:

## P1493-BATTERY TEMPERATURE SENSOR VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P1493-BATTERY TEMPERATURE SENSOR VOLTAGE TOO LOW**

When Monitored: With the ignition on.

Set Condition: The PCM senses the voltage from the Battery Temperature Sensor to be below 0.5 volt for 3 seconds.

| POSSIBLE CAUSES |
|---|
| BATTERY TEMP SENSOR VOLTS BELOW 0.5 OF A VOLT |
| BATTERY TEMPERATURE SENSOR |
| (K118) BATT TEMP SIGNAL CIRCUIT SHORTED TO GROUND |
| (K118) BATT TEMP SIGNAL CIRCUIT SHORTED TO THE (K4) SENSOR GROUND CIRCUIT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>Record all DTCs and the related Freeze Frame data.<br>With DRBIII®, monitor the Ambient/Battery Temperature Sensor voltage.<br>Is the voltage below 0.5 of a volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 2 | Ignition on, engine not running.<br>With the DRBIII® in Sensors, read the Battery Temperature voltage value.<br>Disconnect the Battery Temperature Sensor harness connector.<br>Did the Battery Temperature Sensor voltage change from below 1.0 volt to above 4.5 volts?<br>Yes → Replace the Battery Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between ground and the (K118) Batt Temp Signal circuit in the Battery Temp Sensor harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K118) Batt Temp Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 4 | All |

## P1493-BATTERY TEMPERATURE SENSOR VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the resistance between the (K118) Batt Temp Signal circuit and the (K4) Sensor ground circuit at the Battery Temp Sensor harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short between the (K4) Sensor ground and the (K118) Batt Temp Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 5 | All |
| 5 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

## Symptom:

## P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT

**When Monitored and Set Condition:**

**P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT**

When Monitored: Immediately after a cold start, with battery/ambient temperature between 40 deg. F and 90 deg. F and coolant temperature within 10 deg. F of battery/ambient.

Set Condition: The state of the switch does not change when the solenoid is energized.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| LDP VACUUM SUPPLY |
| LEAK DETECTION PUMP |
| (K107) LDP SWITCH SIGNAL CIRCUIT OPEN |
| (K107) LDP SWITCH SIGNAL CIRCUIT SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 2 | Turn the ignition off.<br>Disconnect the vacuum supply hose at the Leak Detection Pump.<br>Connect a vacuum gauge to the disconnected vacuum supply hose at the Leak Detection Pump.<br>Start the engine and read the vacuum gauge.<br>Does the vacuum gauge read at least 13″ Hg?<br>Yes → Go To 3<br>No → Repair leak or obstruction in vacuum hose as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Connect the vacuum supply hose at the LDP.<br>Disconnect the Leak Detection Pump electrical harness connector.<br>Start the engine.<br>With the DRBIII® in Inputs/Outputs, read the Leak Detect Pump Switch state.<br>Connect a jumper wire between 12-volts and the (K107) LDP Switch Signal circuit.<br>Did the Leak Detect Pump Sw state change when the jumper was connected?<br><br>Yes → Replace the Leak Detection Pump.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Go To 4<br><br>**NOTE: Remove the jumper wire before continuing.** | All |
| 4 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K107) LDP Switch Signal circuit from the PCM harness connector to LDP harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 5<br><br>No → Repair the open in the (K107) Leak Detection Pump Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 5 | Measure the resistance between ground and the (K107) LDP Switch Signal circuit at the LDP harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K107) LDP Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Go To 6 | All |
| 6 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module in accordance with the Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## Symptom:

## P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT

**When Monitored and Set Condition:**

**P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT**

When Monitored: Continuously when the ignition is on and battery voltage is greater than 10.4 volts.

Set Condition: The state of the solenoid circuit does not match the PCM's desired state.

| POSSIBLE CAUSES |
|---|
| GOOD TRIP EQUAL TO ZERO |
| (K125) GENERATOR SOURCE CIRCUIT OPEN |
| (K106) LDP SOLENOID CONTROL CIRCUIT OPEN |
| (K106) LDP SOLENOID CONTROL CIRCUIT SHORTED TO GROUND |
| LEAK DETECTION PUMP |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 2 | Turn the ignition off.<br>Disconnect the Leak Detection Pump electrical harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the Leak Detection Pump.<br>Using a 12-volt test light connected to ground, check the (K125) Generator Source circuit at the LDP connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 3<br>No → Repair the open in the (K125) Generator Source circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>Connect a 12-volt test light to a good 12-volt source.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the Leak Detection Pump.<br>Probe the (K106) LDP Solenoid Control circuit with the test light while the Pump is actuating.<br>Does the test light blink?<br><br>Yes → Go To 4<br><br>No → Go To 5 | All |
| 4 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Leak Detection Pump.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (K106) LDP Solenoid Control circuit from the PCM harness connector to the LDP harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (K106) Leak Detection Pump Solenoid Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |
| 6 | Measure the resistance between ground and the (K106) LDP Solenoid Control circuit at the Solenoid harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K106) LDP Solenoid Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6.<br><br>No → Go To 7 | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 6. | All |

## Symptom:
## P1594-CHARGING SYSTEM VOLTAGE TOO HIGH

**When Monitored and Set Condition:**

**P1594-CHARGING SYSTEM VOLTAGE TOO HIGH**

When Monitored: With the ignition key on and the engine speed greater than 0 RPM.

Set Condition: When the PCM regulates the generator field and there are no detected field problems, but the voltage output does not decrease.

| POSSIBLE CAUSES |
|---|
| CHARGING SYSTEM OPERATION |
| (K20) GENERATOR FIELD DRIVER CIRCUIT SHORTED TO GROUND |
| GENERATOR FIELD COIL SHORTED TO GROUND |
| BATTERY TEMPERATURE SENSOR |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Battery must be fully charged and be capable of passing a load test. Note: Generator Belt tension and condition must be checked before continuing.**<br>Ignition on, engine not running.<br>With the DRBIII®, read DTCs and the related Freeze Frame data then clear the DTCs.<br>Start the engine.<br>With the DRBIII®, read DTCs.<br>Does the Generator light illuminate and is a DTC set?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 2 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the Generator Field Harness connector.<br>Carefully inspect the related connectors for corrosion or spread terminals before continuing.<br>Measure the resistance between Ground and the (K20) Gen Field Control circuit at the Generator connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K20) Generator Field Driver circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 3 | All |

## P1594-CHARGING SYSTEM VOLTAGE TOO HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Measure the resistance between ground and the Generator Field terminals on the Generator.<br>Is the resistance below 100 ohms?<br><br>Yes → Replace or repair the Generator.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 4 | All |
| 4 | Connect the PCM harness connectors and the Generator harness connector.<br>Ignition on, engine not running.<br>With the DRBIII® in Inputs/Outputs, read the Batt Temp Sensor value.<br>Using a thermometer measure under hood temperature near Battery tray.<br>Is the thermometer temperature within 10 deg of DRBIII® Battery temperature?<br><br>Yes → Go To 5<br><br>No → Replace the Battery Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 5 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

**Symptom List:**

**P1595-SPEED CONTROL SOLENOID CIRCUITS**
**P1683-SPD CTRL PWR RELAY; OR S/C 12V DRIVER CKT**

**Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1595-SPEED CONTROL SOLENOID CIRCUITS.**

**When Monitored and Set Condition:**

**P1595-SPEED CONTROL SOLENOID CIRCUITS**

When Monitored: With the ignition key on, the speed control switched on, the SET switch pressed and the vehicle in drive gear moving above 35 MPH.

Set Condition: The powertrain control module actuates the vacuum and vent solenoids but they do not respond.

**P1683-SPD CTRL PWR RELAY; OR S/C 12V DRIVER CKT**

When Monitored: With the ignition key on and the speed control switched on.

Set Condition: The speed control power supply circuit is either open or shorted to ground.

| POSSIBLE CAUSES |
|---|
| (Z1) GROUND CIRCUIT OPEN |
| INTERMITTENT CONDITION |
| (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT |
| (V30) S/C BRAKE SWITCH OUTPUT CIRCUIT OPEN |
| BRAKE LAMP SWITCH |
| (V32) S/C POWER SUPPLY CIRCUIT OPEN |
| S/C VACUUM SOLENOID |
| (V36) S/C VACUUM SOL CONTROL CIRCUIT OPEN |
| (V36) S/C VACUUM SOL CONTROL CIRCUIT SHORTED TO GROUND |
| S/C VENT SOLENOID |
| (V35) S/C VENT SOL CONTROL CIRCUIT OPEN |
| (V35) S/C VENT SOL CONTROL CIRCUIT SHORTED TO GROUND |
| PCM |

## P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>**NOTE: In the below step you will need to actuate both S/C solenoids separately. Note the operation of the each solenoid when actuated.**<br>With the DRBIII®, actuate the Speed Control Vacuum Solenoid and note operation.<br>With the DRBIII®, actuate the Speed Control Vent Solenoid and note operation.<br>Choose the conclusion that best matches the solenoids operation.<br><br>Vacuum Solenoid not operating<br>Go To 2<br><br>Vent Solenoid not operating<br>Go To 5<br><br>Both S/C Solenoids not operating<br>Go To 8<br><br>Both S/C Solenoids operating<br>Go To 13 | All |
| 2 | Turn the ignition off.<br>Disconnect the Speed Control Servo harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the Speed Control Vacuum Solenoid.<br>Using a 12-volt test light connected to 12-volts, probe the (V36) S/C Vacuum Sol Control circuit at the S/C Servo harness connector.<br>Does the test light illuminate brightly and flash?<br><br>Yes → Replace the Speed Control Servo.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (V36) S/C Vacuum Sol Control circuit between the PCM harness connector and Speed Control Servo harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 4<br><br>No → Repair the open in the (V36) S/C Vacuum Sol Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 4 | Measure the resistance between ground and the (V36) S/C Vacuum Sol Control circuit at the PCM harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (V36) S/C Vacuum Sol Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 12 | All |

## P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Turn the ignition off.<br>Disconnect the Speed Control Servo harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the S/C Vent Solenoid.<br>Using a 12-volt test light connected to 12-volts, probe the (V35) S/C Vent Sol Control circuit in the Speed Control Servo harness connector.<br>Does the test light illuminate brightly and flash?<br><br>Yes → Replace the Speed Control Servo.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 6 | All |
| 6 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (V35) S/C Vent Sol Control circuit between the PCM harness connector and S/C Servo harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 7<br><br>No → Repair the open in the (V35) S/C Vent Solenoid Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 7 | Measure the resistance between ground and the (V35) S/C Vent Sol Control circuit at the PCM harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (V35) S/C Vent Sol Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 12 | All |
| 8 | Turn the ignition off.<br>Disconnect the S/C Servo harness connector.<br>Ignition on, engine not running.<br>Turn the Cruise Control on.<br>Using a 12-volt test light connected to ground, probe the (V30) S/C Brake Switch Output circuit in the S/C Servo harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Replace the Speed Control Servo.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 9 | All |
| 9 | Turn the ignition off.<br>Measure the resistance of the (V30) S/C Brake Switch Output circuit from the S/C Servo harness connector to the Brake Lamp Switch harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 10<br><br>No → Repair the open in the (V30) S/C Brake Switch Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 10 | Disconnect the Brake Lamp Switch harness connector.<br>Ignition on, engine not running.<br>Turn the Cruise Control on, it may be necessary to hold the On button down while checking the following circuit.<br>Using a 12-volt test light connected to ground, probe the (V32) S/C Power Supply circuit in the Brake Lamp Switch harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Replace the Brake Lamp Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 11 | All |
| 11 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (V32) S/C Power Supply circuit between the PCM harness connector and the Brake Lamp Switch harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 12<br><br>No → Repair the open in the (V32) S/C Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 12 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If the there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 13 | Turn the ignition off.<br>Disconnect the S/C Servo harness connector.<br>Using a 12-volt test light connected to 12-volts, probe the (Z1) Ground circuit in the S/C Servo harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Repair the open in the (Z1) Ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## Symptom:
## P1596-SPEED CONTROL SWITCH ALWAYS HIGH

**When Monitored and Set Condition:**

**P1596-SPEED CONTROL SWITCH ALWAYS HIGH**

When Monitored: With the ignition key on.

Set Condition: An open circuit is detected in the speed control on/off switch circuit. The circuit must be above 4.8 volts for more than 2 minutes to set the DTC.

| POSSIBLE CAUSES |
|---|
| SPEED CONTROL ON/OFF SWITCH OPERATION |
| S/C ON/OFF SWITCH |
| CLOCKSPRING |
| (V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE |
| (V37) S/C SWITCH SIGNAL CIRCUIT OPEN BETWEEN PCM AND CLOCK SPRING |
| (K4) SENSOR GROUND CIRCUIT OPEN BETWEEN PCM AND CLOCKSPRING |
| (V37) S/C SWITCH SIGNAL CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH |
| (K4) SENSOR GROUND CIRCUIT OPEN BETWEEN CLOCKSPRING AND S/C SWITCH |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Engine Running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII® in Sensors, read the Speed Control inputs state.<br>While monitoring the DRBIII®, push the Speed Control On/Off Switch several times, then leave it on.<br>Did the DRBIII® show Speed Control Switching off and on?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Disconnect the S/C On/Off Switch 2-way harness connector only.<br>Measure the resistance across the S/C On/Off Switch.<br>Is the resistance between 20.3K and 20.7K ohms?<br>Yes → Go To 3<br>No → Replace the On/Off Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Disconnect the upper and lower 6-way clockspring harness connectors per Service Information.<br>Measure the resistance of the (K4) Sensor ground circuit between the upper and lower 6-way clockspring harness connectors.<br>Measure the resistance of the (V37) S/C Switch Signal circuit between the upper and lower 6-way clockspring harness connectors.<br>Was the resistance above 5.0 ohms for either circuit?<br>Yes → Replace the clockspring.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br>No → Go To 4 | All |
| 4 | Connect the Clockspring harness connectors per Service Information.<br>Disconnect the Speed Control On/Off Switch 2-way harness connector only.<br>Ignition on, engine not running.<br>Measure the voltage on the (V37) S/C Switch Signal circuit in the On/Off Switch 2-way connector.<br>Is the voltage above 5.2 volts?<br>Yes → Repair the short to voltage in the (V37) S/C Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Disconnect the lower Clockspring 6-way harness connector per Service Information.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the (V37) S/C Switch Signal circuit from the PCM harness connector to the lower Clockspring harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 6<br>No → Repair the open in the (V37) S/C Switch Signal circuit between the PCM and Clockspring.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 6 | Measure the resistance of the (K4) Sensor ground circuit from the PCM harness connector to the lower Clockspring harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 7<br>No → Repair the open (K4) Sensor ground circuit between the PCM and Clockspring.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 7 | Disconnect the upper clockspring harness connector per Service Information.<br>Measure the resistance of the (V37) S/C Switch Signal circuit from the upper Clockspring harness connector to the On/Off switch harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 8<br>No → Repair the open in the (V37) S/C Switch Signal circuit, Clockspring to S/C Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 8 | Measure the resistance of the (K4) Sensor ground circuit from the On/Off Switch 2-way harness connector to the upper Clockspring harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 9<br><br>No → Repair the open in the (K4) Sensor ground circuit between the Clockspring and S/C Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 9 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## Symptom:
## P1597-SPEED CONTROL SWITCH ALWAYS LOW

**When Monitored and Set Condition:**

**P1597-SPEED CONTROL SWITCH ALWAYS LOW**

When Monitored: With the ignition key on and battery voltage above 10.4 volts.

Set Condition: When switch voltage is less than 0.39 of a volt for 2 minutes.

| POSSIBLE CAUSES |
|---|
| S/C SWITCH VOLTAGE BELOW 1.0 VOLT |
| S/C ON/OFF SWITCH |
| S/C RESUME/ACCEL SWITCH |
| CLOCKSPRING SHORTED TO GROUND |
| (V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO GROUND |
| (V37) S/C SWITCH SIGNAL CIRCUIT SHORTED TO (K4) SENSOR GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs and record the related Freeze Frame data.<br>With the DRBIII®, read the S/C Switch volts status.<br>Is the S/C Switch voltage below 1.0 volt?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 2 | Turn the ignition off.<br>Disconnect the S/C ON/OFF Switch harness connector.<br>Ignition on, engine not running.<br>With the DRBIII® in Sensors, read the S/C Switch volts.<br>Did the S/C Switch volts change to 5.0 volts?<br>Yes → Replace the S/C ON/OFF Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br>No → Go To 3 | All |
| 3 | Turn the ignition off.<br>Disconnect the S/C RESUME/ACCEL Switch harness connector.<br>Ignition on, engine not running.<br>With the DRBIII® in Sensors, read the S/C Switch volts.<br>Did the S/C Switch volts go above 4.0 volts?<br>Yes → Replace the Resume/Accel Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br>No → Go To 4 | All |

## P1597-SPEED CONTROL SWITCH ALWAYS LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Disconnect the clockspring 6-way harness connector (instrument panel wiring side) per Service Information.<br>Ignition on, engine not running.<br>With the DRBIII® in Sensors, read the S/C Switch voltage.<br>Did the S/C Switch volts change to 5.0 volts?<br><br>Yes → Replace the Clockspring.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Connect the Clockspring harness connectors per Service Information.<br>Disconnect the PCM harness connectors.<br>Measure the resistance between the (V37) S/C Switch Signal circuit and ground at S/C ON/OFF Switch harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (V37) S/C Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 6 | All |
| 6 | Measure the resistance between the (V37) S/C Signal circuit and the (K4) Sensor ground circuit at the ON/OFF Switch harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Repair the short between the (K4) Sensor ground and the (V37) S/C Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 7 | All |
| 7 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## Symptom:
## P1682-CHARGING SYSTEM VOLTAGE TOO LOW

**When Monitored and Set Condition:**

**P1682-CHARGING SYSTEM VOLTAGE TOO LOW**

When Monitored: With the ignition key on and the engine running over 1500 RPM after 25 seconds.

Set Condition: When the PCM regulates the generator field and there are no detected field problems, but the voltage output does not increase.

| POSSIBLE CAUSES |
|---|
| CHARGING VOLTAGE BELOW 15.1 VOLTS |
| BATTERY TEMPERATURE SENSOR |
| RESISTANCE IN THE BATTERY POSITIVE CIRCUIT |
| RESISTANCE IN THE GENERATOR GROUND |
| (K125) GEN FIELD SOURCE CIRCUIT OPEN |
| (K125) GEN FIELD SOURCE CIRCUIT SHORTED TO GROUND |
| (K20) GEN FIELD CONTROL CIRCUIT OPEN |
| GENERATOR FIELD COIL HIGH RESISTANCE |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Turn the ignition off.<br>**NOTE: Battery must be fully charged and capable of passing a battery load test.**<br>**Note: Generator Belt tension and condition must be checked before continuing.**<br>**NOTE: Inspect the vehicle for any aftermarket accessories that may exceed the maximum Generator output.**<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Start the engine.<br>Record all DTCs and the related Freeze Frame data.<br>With the DRBIII®, read the target charging voltage.<br>Is the target charging voltage above 15.1 volts?<br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 2 | All |

## P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 2 | Turn the ignition off.<br>**Note: Generator Belt tension and condition must be checked before continuing.**<br>Start the engine.<br>Allow the engine to reach normal operating temperature.<br>With the DRBIII® in sensors, read the Battery Temp Sensor value.<br>Using a Thermometer, measure under hood temperature.<br>Is the temperature within 10° F of Battery temperature?<br>Yes → Go To 3<br>No → Replace the Battery Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 3 | Ignition on, engine not running.<br>Measure the voltage between the Generator B+ Terminal and the Battery Positive Post.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>**CAUTION: Ensure all wires are clear of the engine's moving parts.**<br>Start the engine.<br>Is the voltage above 0.4 of a volt?<br>Yes → Repair the excessive resistance in the Battery Positive circuit between the Generator and Battery.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 4 | All |
| 4 | Ignition on, engine not running.<br>Record all DTCs and the related Freeze Frame data.<br>Carefully inspect all connectors for corrosion or spread terminals before continuing.<br>With the DRBIII® actuate the Generator Field Driver.<br>While backprobing, measure the voltage on the (K125) Gen Field Source circuit at back of Generator.<br>Is the voltage above 10.0 volts?<br>Yes → Go To 5<br>No → Repair the open in the (K125) Gen Field Source circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 5 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the Generator Field harness connector.<br>Measure the resistance between ground and the (K125) Gen Field Source circuit in the PCM harness connector.<br>Is the resistance below 100 ohms?<br>Yes → Repair the short to ground in the (K125) Gen Field Source circuit and replace the PCM.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br>No → Go To 6 | All |

## P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 6 | Measure the resistance of the (K20) Gen Field Control circuit from the Generator harness connector to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 7<br><br>No → Repair the open in the (K20) Gen Field Control circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |
| 7 | Connect the PCM harness connectors.<br>Connect the Generator Field harness connector.<br>Start the engine.<br>**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.**<br>Warm the engine to operating temperature.<br>**Caution: Ensure all wires are clear of the engine's moving parts.**<br>Measure the voltage between the Generator case and Battery Negative Post.<br>Is the voltage above 0.1 of a volt?<br><br>Yes → Repair the excessive resistance in the Generator Ground circuit between the Generator Case and Battery Negative side.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 8 | All |
| 8 | Turn the ignition off.<br>Disconnect the Generator Field harness connector at back of the Generator.<br>Measure resistance across the Generator Field Terminals at the Generator.<br>Is the resistance above 15 ohms?<br><br>Yes → Replace or repair the Generator as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3.<br><br>No → Go To 9 | All |
| 9 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 3. | All |

**Symptom:**

## P1685 WRONG OR INVALID KEY MSG RECEIVED FROM SKIM

| POSSIBLE CAUSES |
|---|
| NO COMMUNICATION WITH SKIM |
| SKIM TROUBLE CODES SET |
| NO VIN PROGRAMMED IN THE PCM |
| INCORRECT VIN IN PCM |
| INVALID SKIM KEY NOT PRESENT |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read the PCM DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Go To 7 | All |
| 2 | With the DRBIII®, attempt to communicate with the SKIM.<br>Can the DRBIII® communicate with the SKIM?<br>Yes → Go To 3<br>No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category.<br>Perform SKIS VERIFICATION. | All |
| 3 | With the DRB III®, check for SKIM DTCs.<br>Are any DTCs present in the SKIM?<br>Yes → Repair all SKIM DTCs.<br>Perform SKIS VERIFICATION.<br>No → Go To 4 | All |
| 4 | With the DRB III®, display the VIN that is programmed in the PCM.<br>Has a VIN been programmed into the PCM?<br>Yes → Go To 5<br>No → Program the correct VIN into the PCM and retest.<br>Perform SKIS VERIFICATION. | All |
| 5 | With the DRB III®, display the VIN that is programmed in the PCM.<br>Was the correct VIN programmed into the PCM?<br>Yes → Go To 6<br>No → Replace and program the Powertrain Control Module per Service Information.<br>Perform SKIS VERIFICATION. | All |

## P1685 WRONG OR INVALID KEY MSG RECEIVED FROM SKIM — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 6 | Turn the ignition off.<br>Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information.<br>Ignition on, engine not running.<br>With the DRB III®, erase all SKIM and PCM DTCs.<br>Attempt to start and idle the engine.<br>With the DRB III®, read the PCM DTCs.<br>Does the DRB III® display this code?<br><br>Yes → Replace and program the Powertrain Control Module per Service Information.<br>Perform SKIS VERIFICATION.<br><br>No → Test Complete. | All |
| 7 | **NOTE: This DTC could have been set if the SKIM harness connector was disconnected, or if the SKIM was replaced recently.**<br>**NOTE: All keys that the customer uses for this vehicle must be tested to verify they are operating properly.**<br>**NOTE: Ensure the customer is not attempting to use a non-SKIM duplicate key.**<br>Ignition on, engine not running.<br>Verify the correct VIN is programmed into the PCM and SKIM.<br>Turn the ignition off.<br>With the next customer key turn the ignition key on and crank the engine to start.<br>With the DRB III®, read the PCM DTCs. Look for P1685<br>Does the DTC return?<br><br>Yes → Replace the Ignition Key.<br>Perform SKIS VERIFICATION.<br><br>No → Test Complete.<br><br>**NOTE: If this DTC cannot be reset, it could have been an actual theft attempt.** | All |

## Symptom:
## P1686 NO SKIM BUS MESSAGE RECEIVED

| POSSIBLE CAUSES |
|---|
| NO SKIM BUS MESSAGES |
| LOSS OF SKIM COMMUNICATION |
| PCI BUS CIRCUIT OPEN FROM PCM TO SKIM |
| SKIM/PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read the PCM DTCs and record the related Freeze Frame data.<br>Is the Good Trip Counter displayed and equal to zero?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform SKIS VERIFICATION. | All |
| 2 | Ignition on, engine not running.<br>With the DRBIII®, attempt to communicate with the SKIM.<br>**NOTE: This test will indicate if the Bus is operational from the DLC to the SKIM.**<br>Was the DRBIII® able to communicate with the SKIM?<br>Yes → Go To 3<br>No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category.<br>Perform SKIS VERIFICATION. | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the SKIM harness connector.<br>Measure the resistance of the PCI Bus circuit between the PCM harness connector and the SKIM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 4<br>No → Repair the PCI Bus circuit between the PCM and the SKIM for an open.<br>Perform SKIS VERIFICATION. | All |

## P1686 NO SKIM BUS MESSAGE RECEIVED — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Turn the ignition off.<br>Replace the Sentry Key Immobilizer Module in accordance with the Service Information.<br>Ignition on, engine not running.<br>Display and erase all PCM and SKIM DTCs.<br>Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle.<br>With the DRBIII®, display PCM DTCs.<br>Does the DRBIII® display the same DTC?<br><br>Yes → Replace and program the Powertrain Control Module per Service Information.<br>Perform SKIS VERIFICATION.<br><br>No → Test Complete. | All |

## Symptom:
## P1687-NO CLUSTER BUS MESSAGE

**When Monitored and Set Condition:**

**P1687-NO CLUSTER BUS MESSAGE**

When Monitored: Ignition key on.

Set Condition: No messages received from the MIC (Instrument Cluster) for 20 seconds.

| POSSIBLE CAUSES |
|---|
| NO CLUSTER BUS MESSAGE |
| COMMUNICATE WITH CLUSTER |
| INSTRUMENT CLUSTER OPERATION |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, erase DTCs.<br>Cycle the ignition key on and off several times.<br>With the DRBIII®, read DTC's.<br>Does the DTC reset?<br>Yes → Go To 2<br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | With the DRBIII®, attempt to communicate with the Instrument cluster.<br>Can communication be established with the Instrument Cluster?<br>Yes → Go To 3<br>No → Refer to the Communication Category and perform the appropriate symptom (Diagnostic test) related to no communication with cluster.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 3 | Start the engine<br>Allow the engine to idle.<br>Is the correct engine speed display in the instrument cluster (Tach)?<br>Yes → Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Refer to the Instrument Cluster Category and perform the appropriate symptom.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

**Symptom:**

**P1696-PCM FAILURE EEPROM WRITE DENIED**

| POSSIBLE CAUSES |
| --- |
| PCM FAILURE |

**Repair Instructions:**

**PCM FAILURE**

Replace and program the Powertrain Control Module per Service Information.

Perform POWERTRAIN VERIFICATION TEST VER - 5.

## Symptom:
## P1698-NO BUS MESSAGE FROM TRANS CONTROL MODULE

| POSSIBLE CAUSES |
|---|
| NO BUS MESSAGE FROM TRANS INTERMITTENT |
| PCM PCI BUS CIRCUIT OPEN |
| NO BUS MESSAGE FROM TRANS |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, erase DTCs.<br>Cycle the ignition key on and off several times.<br>With the DRBIII®, read DTCs.<br>Does the DTC reset?<br><br>Yes → Go To 2<br><br>No → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>**NOTE: This DTC could have been set when the TCM was disconnected during transmission Diagnostics.** | All |
| 2 | Ignition on, engine not running.<br>Connect the DRBIII®I and access Powertrain Control Module.<br>**Note: This test checks for other PCI BUS codes. That indicates diferent circuits in the BUS.**<br>With the DRBIII®, read DTCs.<br>Is a DTC also set for NO SKIM BUS MESSAGE and/or No MIC BUS MESSAGE?<br><br>Yes → Go To 3<br><br>No → Refer to the Communication Category and perform the appropriate symptom related to the no communication with TCM.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## P1698-NO BUS MESSAGE FROM TRANS CONTROL MODULE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | With the DRBIII®, read DTCs. This is to ensure power and grounds to the PCM are operational.<br>**NOTE: If the DRBIII® will not read PCM DTC's, follow the ″NO RESPONSE TO PCM (SCI only)″ symptom path, if vehicle will start. For NO START Conditions follow symptom ″NO RESPONSE″ in Starting category .**<br>Turn the ignition off.<br>Disconnect the PCM harness connector(s).<br>Connect the DRBIII® to the Data Link connector<br>Use Scope input cable CH7058, Cable to Probe adapter CH7062, and the red and black test probes.<br>Connect the scope input cable to the channel one connector on the DRBIII®. Attach the red and black leads and the cable to probe adapter to the scope input cable.<br>Select DRBIII® Standalone.<br>Select lab scope.<br>Select Live.<br>Select 12 volt square wave.<br>Press F2 for Scope.<br>Press F2 and use the down arrow to set voltage range to 20 volts. Press F2 again when complete.<br>Connect the Black lead to the PCM ground. Connect the Red lead to the PCM PCI Bus circuit<br>Ignition on, engine not running.<br>Observe the voltage displayed on the DRBIII® Lab Scope.<br>What is the voltage displayed on the scope?<br><br>Pulse from 0 to approximately 7.5 volts<br>Test Complete.<br><br>Steady 0 volts<br>Repair the open PCI Bus circuit to PCM.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:
## P1899-P/N SWITCH PERFORMANCE

| POSSIBLE CAUSES |
|---|
| DRBIII® DISPLAYS P/N & D/R NOT IN CORRECT POSITION |
| TRS T41 SENSE (P/N SENSE) CIRCUIT SHORTED TO GROUND |
| TRS T41 (P/N SENSE) CIRCUIT OPEN |
| TRS (P/N SWITCH) |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read the PNP switch input state.<br>While moving the gear selector through all gear positions Park to 1st and back to Park, watch the DRBIII® display.<br>Did the DRBIII® display P/N and D/R in the correct gear positions?<br><br>Yes → Refer to the INTERMITTENT CONDITION Symptom (Diagnostic Procedure).<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Disconnect the TRS P/N switch harness connector.<br>Measure the resistance between ground and the TRS T41 (P/N Sense) circuit.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the TRS T41 Sense (P/N Sense) circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 3 | All |
| 3 | Measure the resistance of the TRS T41 (P/N Sense) circuit between the PCM C1 harness connector and the TRS harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 4<br><br>No → Repair the open in the TRS 41 (P/N Sense) circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## P1899-P/N SWITCH PERFORMANCE — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Connect the TRS (P/N) harness connector.<br>Move the gear selector through all gear positions, from Park to 1st and back.<br>While moving the gear selector through the gear positions, measure the resistance between ground and the TRS T41 (P/N) Sense circuit in the PCM C1 harness connector.<br>**NOTE: The circuit is grounded in Park and Neutral and open in the other positions.**<br>Did the display change from above 100 kohms (open) to below 10.0 ohms (grounded)?<br>Yes → Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER-5.<br>No → Replace the TRS Assembly (P/N Switch) per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom:**

***BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII®**

| POSSIBLE CAUSES |
|---|
| DRBIII® DOES NOT SHOW BRAKE SW PRESSED OR RELEASED |
| (F32) FUSED B+ CIRCUIT OPEN |
| (Z1) GROUND CIRCUIT OPEN |
| (V37) BRAKE LAMP SWITCH SIGNAL CIRCUIT |
| (V37) BRAKE LAMP SWITCH SIGNAL CIRCUIT OPEN |
| (V37) BRAKE LAMP SWITCH SIGNAL CIRCUIT SHORT TO GROUND |
| (V37) BRAKE LAMP SWITCH SIGNAL LESS THAN 10.0 VOLTS |
| (V32) S/C POWER SUPPLY CIRCUIT BELOW 10 VOLTS AT BRAKE SWITCH CONN |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII® in Inputs/Outputs, read the Brake Switch state.<br>With the DRBIII® display, press and release the brake pedal several times.<br>Does the DRBIII® display Brake Switch PRESSED and RELEASED?<br><br>Yes → The Brake Lamp Switch is operating properly at this time. Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Disconnect the Brake Lamp Switch harness connector.<br>Using a 12-volt test light connected to ground, probe the (F32) Fused B+ circuit at the Brake Lamp Switch harness connector.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 3<br><br>No → Repair the excessive resistance or short to ground in the (F32) Fused B+ circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 3 | Using a 12-volt test light connect to 12-volts, probe the Brake Lamp Switch ground circuit.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 4<br><br>No → Repair the open in the (Z1) Brake Lamp Switch Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## *BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII® — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Measure the resistance across the Brake Lamp Switch Signal terminal and the Ground terminal (measurement taken across the switch).<br>Apply and release the Brake Pedal while monitoring the ohmmeter.<br>Does the resistance change from below 5.0 ohms to open circuit?<br><br>Yes → Go To 5<br><br>No → Replace the Brake Lamp Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 5 | Disconnect the PCM harness connectors.<br>Measure the resistance of the (V37) Brake Lamp Switch Signal circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the (V37) Brake Lamp Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 6 | Disconnect the CAB harness connector.<br>Measure the resistance between ground and the (V37) Brake Lamp Switch Signal circuit.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (V37) Brake Lamp Switch Signal circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4.<br><br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Brake pedal must be depressed in the next step.<br>Connect the PCM harness connectors.<br>Connect the CAB harness connector.<br>Connect the Brake Lamp Switch harness connector.<br>Using a 12-volt test light connected to ground, probe the (V37) Brake Lamp Switch Signal circuit at the Brake Lamp Switch harness connector.<br>Ignition on, engine not running.<br>Is the test light illuminated and bright?<br><br>Yes → Go To 8<br><br>No → Replace or adjust the brake switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |
| 8 | Turn the ignition off.<br>Disconnect the Brake Switch harness connector.<br>**Note: Check connectors - Clean/repair as necessary.**<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the S/C Vacuum Solenoid.<br>Using a 12-volt test light connected to ground, backprobe the S/C Power Supply Circuit in the Brake Switch harness connector.<br>Did the test light illuminate brightly?<br><br>Yes → Go To 9<br><br>No → Repair the excesssive resistance in the (V32) S/C Power Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

## *BRAKE SWITCH SENSE STATUS DOES NOT CHANGE ON DRBIII® — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 4. | All |

**Symptom:**

## *CHECKING A/C SYSTEM OPERATION WITH NO DTCS

| POSSIBLE CAUSES |
|---|
| A/C CLUTCH RELAY DTC PRESENT |
| REFRIGERATION SYSTEM NOT PROPERLY CHARGED |
| HIGH PRESS CUT-OFF SWITCH |
| LOW PRESSURE SWITCH |
| A/C REQUEST CIRCUIT OPEN |
| A/C SELECT CIRCUIT OPEN |
| A/C CLUTCH COIL |
| A/C COMPRESSOR CLUTCH GROUND CIRCUIT OPEN |
| (C3) A/C CLUTCH RELAY OUTPUT CIRCUIT OPEN |
| (A17) FUSED B+ CIRCUIT |
| A/C CLUTCH RELAY |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read DTCs.<br>Is there an A/C Clutch Relay DTC present?<br>Yes → Diagnose the related DTC(s) before continuing. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Verify that the Refrigerant System is properly charged per Service Procedure.<br>Is the Refrigerant System properly charged?<br>Yes → Go To 3<br>No → Properly charge the Refrigerant System per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 3 | Verify the High Pressure Cut-Off Switch per Service Information.<br>Is the High Pressure Cut-Off Switch OK?<br>Yes → Go To 4<br>No → Replace the High Pressure Cut-Off Switch. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 4 | Verify the Low Pressure Switch operation per Service Information.<br>Is the Low Pressure Switch OK?<br>Yes → Go To 5<br>No → Replace the Low Pressure Switch. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## *CHECKING A/C SYSTEM OPERATION WITH NO DTCS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Engine Running.<br>Turn the A/C system on and the fan on high.<br>With the DRBIII® in Inputs/Outputs, read the A/C request state.<br>Does the A/C request state change?<br>Yes → Go To 6<br>No → Repair the open in the A/C Request circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | With the DRBIII®, read the A/C Select status.<br>Turn the A/C Switch on and off a few times.<br>Does the A/C Select state change?<br>Yes → Go To 7<br>No → Repair the open in the A/C Select circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 7 | Ignition on, engine not running.<br>With the DRBIII®, actuate the A/C Clutch Relay.<br>Connect a test light between the ground circuit and the A/C Clutch Relay Output circuit.<br>Does the test light illuminate brightly on and off with the relay actuation?<br>Yes → Replace the A/C Clutch Coil. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 8 | All |
| 8 | Turn the ignition off.<br>Disconnect the A/C Compressor Clutch harness connector.<br>**NOTE: Check connectors - Clean/repair as necessary.**<br>Measure the resistance between ground and the A/C Compressor Clutch Ground Circuit.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 9<br>No → Repair the A/C compressor clutch ground circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 9 | Remove the A/C Clutch Relay.<br>**Note: Check connectors - Clean/repair as necessary.**<br>Measure the resistance of the A/C Clutch Relay Output circuit between the Relay and the A/C Clutch Coil connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 10<br>No → Repair the open in the (C3) A/C Clutch Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 10 | Measure the voltage on the (A17) Fused B+ circuit in the A/C Clutch Relay connector.<br>Is the voltage above 11.0 volts?<br>Yes → Go To 11<br>No → Repair the open or short to ground in the (A17) Fused B+ circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## *CHECKING A/C SYSTEM OPERATION WITH NO DTCS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 11 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the A/C Clutch Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

**Symptom:**

***CHECKING EVAPORATIVE EMISSION OPERATION WITH NO DTCS**

| POSSIBLE CAUSES |
|---|
| ROLLOVER VALVE |
| WIRE HARNESS INSPECTION |
| VACUUM HARNESS INSPECTION |
| PURGE SYSTEM CONTAMINATED |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Start the engine.<br>Allow the engine to reach normal operating temperature.<br>**Note: Engine must be in closed loop.**<br>With the DRBIII®, go to Purge Vapors Test. Press 3 to flow.<br>**Note: Short Term Adaptive should change.**<br>Did Short Term Adaptive change?<br>Yes → Test Complete.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Remove the Purge Solenoid.<br>Inspect the line from rollover valve to the solenoid.<br>Is liquid fuel in the line?<br>Yes → Replace the Rollover Valve.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 3 | All |
| 3 | At this time, the conditions required to set the DTC are not present.<br>**Note: Use the Freeze Frame Data to help you duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.**<br>**NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.**<br>**Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.**<br>**Note: Refer to any technical service bulletins that may apply.**<br>Perform a wiggle test of the Evap Purge Solenoid wiring while the circuit is actuated with the DRBIII®. Listen for the solenoid to quit actuating. Also watch for the Good Trip Counter to change to 0.<br>Were any problems found?<br>Yes → Repair wire harness/connectors as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 4 | All |

## *CHECKING EVAPORATIVE EMISSION OPERATION WITH NO DTCS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | At this time, the conditions required to set the DTC are not present.<br>**Note: Use the Freeze Frame Data to help you duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.**<br>**Note: Visually inspect the Evap Purge Solenoid and vacuum harness. Look for any chafed, pierced, pinched, or partially broken hoses.**<br>**Note: Refer to any technical service bulletins that may apply.**<br>Were any problems found?<br><br>Yes → Repair vacuum harness/connections as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 5 | All |
| 5 | Turn the ignition off.<br>Remove the Purge solenoid and tap the ports against a clean solid surface.<br>Did any foreign material fall out?<br><br>Yes → Replace the purge solenoid and clean or replace the vacuum and purge lines and Evap canister. Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Test Complete. | All |

**Symptom:**

***CHECKING HARD TO FILL WITH FUEL**

| POSSIBLE CAUSES |
| --- |
| NVLD FILTER PLUGGED |

**Repair Instructions:**

**NVLD FILTER PLUGGED**

Replace the NVLD filter plugged and clean out the Hoses.

Perform POWERTRAIN VERIFICATION TEST VER - 2.

**Symptom:**

***CHECKING RADIATOR FAN OPERATION WITH NO DTCS**

| POSSIBLE CAUSES |
|---|
| FUSED B+ |
| RADIATOR FAN RELAY OUTPUT CIRCUIT OPEN |
| RAD FAN MOTOR |
| RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO GROUND |
| RADIATOR FAN RELAY |
| RADIATOR FAN GROUND CIRCUIT OPEN |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, actuate the Radiator Fan Relay.<br>Does the Radiator Fan Motor cycle on and off?<br>Yes → Test Complete.<br>No → Go To 2 | All |
| 2 | Turn the ignition off.<br>Remove the Radiator Fan Relay.<br>Using a 12-volt test light connected to ground, check the Fused B+ circuit in the Radiator Fan Relay connector.<br>Did the light illuminate brightly?<br>Yes → Go To 3<br>No → Repair the open or short to ground in the Fused B+ circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 3 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Remove the Radiator Fan Relay.<br>Measure the resistance of the Radiator Fan Relay Control circuit from the PDC to the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br>Yes → Go To 4<br>No → Test Complete. | All |
| 4 | Connect the PCM harness connectors.<br>Install the Radiator Fan Relay.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the Radiator Fan Relay.<br>Using a 12-volt test light connected to ground, backprobe the Radiator Fan Relay Output circuit in the Radiator Fan Motor harness connector.<br>Does the test light cycle on and off?<br>Yes → Go To 5<br>No → Go To 7 | All |

## *CHECKING RADIATOR FAN OPERATION WITH NO DTCS — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | Turn the ignition off.<br>Disconnect the Radiator Fan Motor harness connector.<br>Measure the resistance between ground and the Radiator Fan Motor ground circuit.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 6<br><br>No → Repair the open in the Radiator Fan ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 6 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Radiator Fan Motor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 7 | Turn the ignition off.<br>Disconnect the Radiator Fan Motor harness connector.<br>Remove Rad Fan Relay.<br>Measure the resistance of the Radiator Fan Relay Output circuit between the Radiator Fan Motor harness connector and the Radiator Fan Relay connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 8<br><br>No → Repair the open in the Radiator Fan Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |
| 8 | Measure the resistance between ground and the Radiator Fan Relay Output circuit.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the Radiator Fan Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 9 | All |
| 9 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Radiator Fan Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2. | All |

**Symptom:**

## *CHECKING THE PCM POWER AND GROUNDS

| POSSIBLE CAUSES |
|---|
| PCM FUSED B+ CIRCUIT |
| PCM FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| PCM GROUND CIRCUITS |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Using a 12-volt test light connected to ground, probe the PCM Fused B+ circuit in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 2<br>No → Repair the open in the Fused B+ circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 3<br>No → Repair the open in the Ignition Switch Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 3 | Turn the ignition off.<br>Using a 12-volt test light connected to battery voltage, probe the PCM ground circuits in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Test Complete.<br>No → Repair the open in the PCM ground circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:
## *CHECKING FUEL DELIVERY

| POSSIBLE CAUSES |
|---|
| FUEL PUMP RELAY |
| FUEL PRESSURE OUT OF SPECIFICATION |
| RESTRICTED FUEL SUPPLY LINE |
| FUEL PUMP INLET STRAINER PLUGGED |
| FUEL PUMP |
| (A61) FUSED B+ CIRCUIT |
| (A141) FUEL PUMP RELAY OUTPUT CIRCUIT OPEN |
| (Z1) FUEL PUMP GROUND CIRCUIT EXCESSIVE RESISTANCE |
| FUEL PUMP MODULE |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test.<br>**Note: It may be necessary to use a mechanics stethoscope in the next step.**<br>Listen for fuel pump operation at the fuel tank.<br>Does the Fuel Pump operate?<br>Yes → Go To 2<br>No → Go To 5<br>**Caution: Stop All Actuations.** | All |
| 2 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install a fuel pressure gauge to the fuel rail test port.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Choose a conclusion that best matches your fuel pressure reading.<br>Below Specification<br>Go To 3<br>Within Specification<br>Test Complete.<br>Above Specification<br>Replace the fuel filter/fuel pressure regulator.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>**Caution: Stop All Actuations.** | All |

## *CHECKING FUEL DELIVERY — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module.<br>Install special 5/16″ fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module.<br>Attach a fuel pressure test gauge to the ″T″ fitting on tool #6539.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 334 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Is the fuel pressure within specification now?<br>Yes → Repair/replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 4<br>**Caution: Stop All Actuations.** | All |
| 4 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose,fitting or line, the fuel system pressure must be released.**<br>Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.<br>Is the Fuel Inlet Strainer plugged?<br>Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 5 | Turn the ignition off.<br>Disconnect the Fuel Pump Module harness connector.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test.<br>Using a 12-volt test light connected to ground, probe the (A141) Fuel Pump Relay Output circuit at the Fuel Pump Module harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 6<br>No → Go To 8<br>**Caution: Stop All Actuations.** | All |
| 6 | Turn the ignition off.<br>Using a test light connected to 12-volts, backprobe the (Z1) Fuel Pump ground circuit at the Fuel Pump Module harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 7<br>No → Repair the excessive resistance in the (Z1) Fuel Pump Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## *CHECKING FUEL DELIVERY — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 7 | If there are no possible causes remaining, view repair.<br><br>Repair<br>Replace the Fuel Pump Module.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 8 | Turn the ignition off.<br>Remove the Fuel Pump Relay from the PDC.<br>Using a 12-volt test light connected to ground, backprobe the Fuel Pump Relay Fused B+ circuit at the PDC.<br>Does the test light illuminate?<br><br>Yes → Go To 9<br><br>No → Repair the open or short to ground in the (A61) Fuel Pump Realy Fused B+ circuit. Inspect the fuse and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 9 | Measure the resistance of the (A141) Fuel Pump Relay Output circuit from the relay connector to the Fuel Pump Module connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Replace the Fuel Pump Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Repair the open in the (A141) Fuel Pump Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:
## *CHECKING HARD START (FUEL DELIVERY SYSTEM)

| POSSIBLE CAUSES |
|---|
| RESTRICTED FUEL SUPPLY LINE |
| FUEL PUMP MODULE |
| FUEL PUMP INLET STRAINER PLUGGED |
| FAULTY FUEL PUMP MODULE |
| FUEL INJECTORS |
| FUEL CONTAMINATION |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install the fuel pressure gauge at the engine. Refer to the Service Information FUEL DELIVERY Section.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).**<br>Choose a conclusion that best matches your fuel pressure reading.<br>Below Specification<br>Go To 2<br>Within Specification<br>Go To 4 | All |
| 2 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Raise vehicle on hoist, and disconnect the fuel supply line at the fuel pump module. Install special tool #6539 (5/16″) fuel line adapter fuel pressure gauge between the fuel supply line and the fuel pump module.<br>Ignition on, engine not running.<br>With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge.<br>**NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Is the fuel pressure within specification?<br>Yes → Visually and physically inspect the fuel supply lines between the fuel tank and the fuel rail. Repair/replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 3 | All |

## *CHECKING HARD START (FUEL DELIVERY SYSTEM) — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose,fitting or line, the fuel system pressure must be released.**<br>Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer.<br>Is the Fuel Inlet Strainer plugged?<br><br>Yes → Replace the Fuel Pump Inlet Strainer.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Test Complete. | All |
| 4 | **NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.**<br>Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install special tool #6539 (5/16″) fuel line adapter.<br>Install the fuel pressure gauge.<br>Start the engine and allow the fuel system to reach maximum pressure.<br>Turn the ignition off.<br>**NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.<br>Monitor the fuel pressure gauge for a minimum of 5 minutes.<br>**NOTE: The pressure should not fall below 241 KPa (35 psi)**<br>Does the fuel pressure drop?<br><br>Yes → Replace fuel pump module.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Go To 5 | All |
| 5 | **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Remove special tool #C4390.<br>Start the engine and allow the fuel system to reach maximum pressure.<br>Turn the ignition off.<br>**NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Install special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the fuel pump module.<br>Monitor the fuel pressure gauge for a minimum of 5 minutes.<br>**NOTE: The pressure should not fall below 241 KPa (35 psi)**<br>Does the fuel pressure drop?<br><br>Yes → Replace leaking fuel injectors.<br>Perform POWERTRAIN VERIFICATION TEST VER - 2.<br><br>No → Check for fuel contaminants.<br>Perform POWERTRAIN VERIFICATION TEST VER-2. | All |

## Symptom:
## *ENGINE CRANKS DOES NOT START

| POSSIBLE CAUSES |
|---|
| NO START PRE-TEST |
| POWERTRAIN FUSES OPEN |
| SECONDARY INDICATORS PRESENT |
| NO CKP SENSOR SIGNAL WHEN CRANKING ENGINE |
| NO CMP SENSOR SIGNAL WHEN CRANKING ENGINE |
| ENGINE MECHANICAL PROBLEM |
| (A142) ASD RELAY OUTPUT CIRCUIT OPEN |
| FUEL CONTAMINATION |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **Note: The following list of items must be checked before continuing with any no start tests.**<br>The battery must be fully charged and in good condition. A low charged battery may produce invalid test results. If the battery is low, charge the battery and then attempt to start the vehicle by cranking the engine for 15 seconds, 3 consecutive times.<br>This will allow any DTCs to set that may have been erased due to a dead battery.<br>Try to communicate with PCM if not able to communicate check fuses.<br>Ensure the Powers and Ground to the PCM are ok.<br>Make sure the PCM communicates with the DRBIII® and that there are no DTCs stored in the PCM memory. If the PCM reports a No Response condition, refer to the Communication category for the proper tests.<br>Read the PCM DTCs with the DRBIII®. If any DTCs are present, they must be repaired before continuing with any other No Start diagnostic tests. Refer to the Symptom list for the related P-code that is reported by the PCM.<br>Ensure that the PCI bus is functional. Attempt to communicate with the Instrument Cluster and VTSS, If you are unable to establish communicate refer to the Communication category for the proper symptoms.<br>The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the DRBIII® and check for DTCs that may be stored in the Sentry Key Immobilizer Module (SKIM). Repair the DTC(s) before continuing.<br>If no DTCs are found, using the DRBIII®, select Clear PCM (BATT Disconnect).<br>Crank the engine several times. Using the DRBIII®, read DTCs. If a DTC is present perform the DTC diagnostics before continuing.<br>Were any problems found?<br>Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 2 | All |
| 2 | Check for any open fuses in the PDC or Junction Block that may be related to the No Start condition.<br>Are any of the fuses open?<br>Yes → Replace the open fuse and check the related circuit(s) for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5.<br>No → Go To 3 | All |

## *ENGINE CRANKS DOES NOT START — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 3 | Ignition on, engine not running.<br>With the DRBIII®, under DTCs & Related Functions, read the Secondary Indicators while cranking the engine.<br>Are there any Secondary Indicators present while cranking the engine?<br><br>Yes → Refer to symptom list and perform tests related to the secondary indicator that is reported by the DRBIII®.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 4 | All |
| 4 | With the DRBIII® in Sensors, check the Current CKP Count while cranking the engine.<br>Does the CKP Counter change while cranking the engine?<br><br>Yes → Go To 5<br><br>No → Refer to Driveability Symptom P0320-NO CRANK REFERENCE SIGNAL AT PCM.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 5 | With the DRBIII® in Sensors, check the Current CMP Count while cranking the engine.<br>Does the Current CMP Count change while cranking the engine?<br><br>Yes → Go To 6<br><br>No → Refer to Driveability Symptom P0340-NO CAM SIGNAL AT PCM<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |
| 6 | Check for any of the following conditions/mechanical problems.<br>ENGINE VALVE TIMING - must be within specifications<br>ENGINE COMPRESSION - must be within specifications<br>ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks.<br>FUEL - must be free of contamination<br>FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector<br>Are there any engine mechanical problems?<br><br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5.<br><br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Remove the ASD relay from the PDC.<br>Disconnect the PCM harness connectors.<br>Verify the ASD Relay is getting Fused B+ voltage before continuing.<br>Measure the resistance of the (A142) ASD Relay output circuit from the ASD Relay connector to the PCM harness connector, Ignition coil, and the fuel injectors.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 8<br><br>No → Repair the open ASD Relay output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## *ENGINE CRANKS DOES NOT START — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 8 | Verify that the Fuel tank is not empty before continuing.<br>Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual.<br>Was the No Start condition solved after following the above diagnostic procedure?<br><br>Yes → Test Complete.<br><br>No → Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.<br>Perform POWERTRAIN VERIFICATION TEST VER - 5. | All |

## Symptom:
## *FUEL PRESSURE LEAK DOWN

| POSSIBLE CAUSES |
|---|
| CHECKING FUEL LEAK DOWN |
| FUEL INJECTORS |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Before continuing visually and physically inspect the fuel delivery system for external leaks or damage. Repair /replace as necessary.**<br>Turn the ignition off.<br>**WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Install special tool #6539 (5/16″) fuel line adapter.<br>Install the fuel pressure gauge.<br>Start the engine and allow the fuel system to reach maximum pressure.<br>Turn the ignition off.<br>**NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Using special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the engine.<br>Monitor the fuel pressure gauge for a minimum of 5 minutes.<br>**NOTE: The pressure should not fall below 241 KPa (35 psi).**<br>Does the fuel pressure drop?<br>Yes → Replace the fuel pump module. Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Go To 2 | All |
| 2 | **WARNING: The fuel system is under a constant pressure even with the engine off. Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.**<br>Remove special tool #C4390.<br>Start the engine and allow the fuel system to reach maximum pressure.<br>Turn the ignition off.<br>**NOTE: Fuel specification is 334 KPa +/- 34 KPa (49 psi +/- 5 psi).**<br>Install special tool #C4390, Hose Clamp Pliers, pinch the rubber fuel line between the fuel pressure gauge and the fuel pump module.<br>Monitor the fuel pressure gauge for a minimum of 5 minutes.<br>**NOTE: The pressure should not fall below 241 KPa (35 psi)**<br>Does the fuel pressure drop?<br>Yes → Replace leaking fuel injectors. Perform POWERTRAIN VERIFICATION TEST VER - 2.<br>No → Test Complete. | All |

## Symptom:
## *NO CRANK CONDITION

| POSSIBLE CAUSES |
|---|
| MECHANICAL CONDITION |
| TRANSMISSION RANGE SENSOR |
| BATTERY CIRCUIT RESISTANCE TOO HIGH |
| CLUTCH PEDAL POSITION SWITCH |
| (T141) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN |
| TRS T41 SENSE (P/N SENSE) CIRCUIT OPEN |
| (T40) STARTER RELAY OUTPUT CIRCUIT OPEN |
| (A2) FUSED B+ CIRCUIT OPEN |
| STARTER |
| STARTER RELAY |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: Verify the battery is fully charged and capable of passing a load test before continuing.**<br>**WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING.**<br>Turn the engine over by hand to ensure the engine is not seized.<br>Is the engine able to turn over?<br>Yes → Go To 2<br>No → Repair the mechanical condition preventing the starter motor from cranking.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Move the Gear selector through all gear positions, from Park to 1st and back.<br>While moving the gear selector through each gear, measure the resistance between ground and the TRS T41 Sense (P/N Sense) circuit.<br>Did the resistance change from above 10.0 ohms to below 10.0 ohms?<br>Yes → Go To 3<br>No → Replace the Transmission Range Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 3 | Check the Battery Cables for high resistance using the service information procedure.<br>Did either Battery Cable have a voltage drop greater than 0.2 of a volt?<br>Yes → Repair the Battery circuit for high resistance.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 4 | All |

## *NO CRANK CONDITION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Disconnect the Clutch Pedal Position Switch.<br>If this vehicle is not equipped with a manual transmission answer NO to this test and continue.<br>Connect a jumper wire between the two terminals of the Clutch Pedal Position Switch and attempt to start the engine.<br>Does the engine crank?<br><br>Yes → Replace the Clutch Pedal Position Switch.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 5 | All |
| 5 | Turn ignition off.<br>Remove the Starter Relay from PDC.<br>**WARNING: The Parking Brake must be on and the Transmission must be in park for a vehicle equipped with an automatic transmission or Neutral on a Manual transmission.**<br>**Warning: The engine may be cranked in the next step. Keep away from moving engine parts.**<br>Briefly connect a jumper wire between Starter Relay B+ circuit and the (T40) Starter Relay Output circuits.<br>Did the Starter Motor crank the engine?<br><br>Yes → Go To 6<br><br>No → Go To 8 | All |
| 6 | Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, probe the (T141) Fused Ignition Switch Output circuit in the Starter Relay connector.<br>While observing 12-volt test light, hold ignition key in the start position.<br>Does the test light illuminate brightly?<br><br>Yes → Go To 7<br><br>No → Repair the open or high resistance in the (T141) Fused Ignition Switch Output circuit. Inspect related fuses and repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 7 | Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Measure the resistance of the Starter Relay Control circuit between the Relay terminal and the PCM harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Replace the Starter Motor Relay.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Repair the open in the TRS T41 Sense (P/N Sense) circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 8 | Disconnect the Starter Relay Output connector from the Starter Solenoid.<br>Measure the resistance of the (T40) Starter Relay Output circuit between the Relay and the Solenoid harness connector.<br>Is the resistance below 5.0 ohms?<br><br>Yes → Go To 9<br><br>No → Repair the open in the (T40) Starter Relay Output circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## *NO CRANK CONDITION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | Using a 12-volt test light connected to ground, backprobe the (A2) Fused B+ circuit at the Starter Relay terminal.<br>Does the test light illuminate brightly?<br>Yes → Go To 10<br>No → Repair the open or high resistance in the (A2) Fused B+ circuit. Inspect related fuses and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 10 | If there are no other possible causes remaining, review repair.<br>Repair<br>Replace the Starter.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:

## *NO RESPONSE FROM PCM WITH A NO START CONDITION

| POSSIBLE CAUSES |
|---|
| PCM FUSED B+ CIRCUIT |
| PCM NO RESPONCE |
| PCM FUSED IGNITION SWITCH OUTPUT CIRCUIT |
| PCM GROUND CIRCUITS |
| TP SENSOR |
| 5-VOLT SENSOR OPEN OR SHORTED |
| (K7) 5-VOLT SUPPLY CKT SHORT TO GROUND |
| (K6) 5-VOLT CIRCUIT SUPPLY SHORTED TO GROUND |
| PCM |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | **NOTE: The DRBIII® and cable must be operating properly for the results of this test to be valid.**<br>**NOTE: Ensure the ignition switch was on while trying to communicate with the PCM.**<br>Turn the ignition off.<br>Disconnect the PCM harness connectors.<br>Using a 12-volt test light connected to ground, backprobe the PCM Fused B+ circuit in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 2<br>No → Repair the open in the Fused B+ circuit. Inspect and replace fuses as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 2 | Ignition on, engine not running.<br>Using a 12-volt test light connected to ground, backprobe the PCM Fused Ignition Switch Output circuit in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 3<br>No → Repair the open in the Ignition Switch Output circuit. Inspect and replace fuses as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 3 | Turn the ignition off.<br>Using a 12-volt test light connected to 12-volts, backprobe the PCM ground circuits in the PCM harness connector.<br>Does the test light illuminate brightly?<br>Yes → Go To 4<br>No → Repair the PCM ground circuits an open.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## *NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 4 | Connect the PCM harness connectors.<br>Disconnect the TP Sensor harness connector.<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit.<br>Is the voltage between 4.5 and 5.2 volts?<br><br>Yes → Go To 5<br><br>No → Go To 6 | All |
| 5 | Turn the ignition off.<br>Disconnect the MAP Sensor harness connector.<br>**NOTE: Connect the TP Sensor harness connector.**<br>Ignition on, engine not running.<br>Measure the voltage on the (K7) 5-volt Supply circuit in the MAP Sensor harness connector.<br>Is the voltage between 4.5 and 5.2 volts?<br><br>Yes → If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module in accordance with Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 6 | Measure the voltage on the (K7) 5-volt Supply circuit.<br>Disconnect all the sensors that use a 5-volt Supply circuit.<br>Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors.<br><br>Yes → Replace the sensor that is pulling down the 5-volt supply.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 7 | All |
| 7 | Turn the ignition off.<br>Disconnect PCM harness connectors.<br>Measure the resistance between ground and the (K7) 5-volt Supply circuit with all the Sensor harness connectors disconnected.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K7) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 8 | All |
| 8 | Disconnect all sensors that use the (K6) 5-volt Supply.<br>Measure the resistance between ground and the (K6) 5-volt Supply circuit at the PCM harness connector.<br>Is the resistance below 100 ohms?<br><br>Yes → Repair the short to ground in the (K6) 5-volt Supply circuit.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br><br>No → Go To 9 | All |

## *NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 9 | **NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.**<br>Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits.<br>If there is no possible causes remaining, view repair.<br><br>Repair<br>Replace and program the Powertrain Control Module per Service Information.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Symptom:
## *START AND STALL CONDITION

| POSSIBLE CAUSES |
|---|
| CHECKING DTCS |
| CHECKING SKIM DTCS |
| TP SENSOR SWEEP |
| TP SENSOR VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED |
| ECT SENSOR OPERATION |
| OTHER POSSIBLE CAUSES FOR START & STALL |
| FUEL CONTAMINATION |

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 1 | Ignition on, engine not running.<br>With the DRBIII®, read engine DTCs.<br>Are any DTCs present?<br>Yes → Refer to the Driveability Category and perform the appropriate symptom.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 2 | All |
| 2 | **NOTE: If you are unable to communicate with the SKIM, refer to the Communication Category and perform the appropriate symptom.**<br>With the DRBIII®, read the SKIM codes.<br>Are there any SKIM DTCs?<br>Yes → Refer to the Vehicle Theft category and perform the appropriate symptom.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 3 | All |
| 3 | With the DRBIII®, read TP Sensor voltage.<br>While monitoring the DRBIII®, slowly open and close the Throttle.<br>Is the voltage change smooth?<br>Yes → Go To 4<br>No → Replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 4 | With the DRBIII®, read TP Sensor voltage. Throttle must be against stop.<br>Is the voltage 0.92 or less with the Throttle closed?<br>Yes → Go To 5<br>No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## *START AND STALL CONDITION — Continued

| TEST | ACTION | APPLICABILITY |
|---|---|---|
| 5 | **Note: For this test to be valid, the thermostat must be operating correctly.**<br>**Note: This test works best if performed on a cold engine (cold soaked).**<br>**NOTE: If the vehicle was allowed to sit over night with no engine start, coolant temperature should be near ambient temperatures.**<br>Ignition on, engine not running.<br>With the DRBIII®, read the ECT value.<br>**Note: If engine coolant temperature is above 82° C (180° F), allow the engine to cool until 65° C (150° F) is reached.**<br>Start the engine.<br>During engine warm-up, monitor the ECT Sensor value. The temperature value change should be a smooth transition from start up to normal operating temp 82° C (180° F). The value should reach at least 82° C (180° F).<br>Did the Engine Temperature value increase smoothly and did it reach at least 82° C (180° F)?<br>Yes → Go To 6<br>No → Replace the Engine Coolant Temperature Sensor.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |
| 6 | The following additional items should be checked as a possible cause for a start and stall condition.<br>Refer to any Technical Service Bulletins (TSB's) that may apply to the symptom.<br>The exhaust system must be free of any restrictions.<br>The engine compression must be within specifications.<br>The engine valve timing must be within specifications.<br>The engine must be free from vacuum leaks.<br>The throttle body must be free of carbon buildup and dirt.<br>Do any of the above conditions exist?<br>Yes → Repair as necessary.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1.<br>No → Go To 7 | All |
| 7 | Verify that the Fuel tank is not empty before continuing.<br>Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual.<br>Was the No Start condition solved after following the above diagnostic test?<br>Yes → Test Complete.<br>No → Check for contamination/water in the fuel. Ensure the fuel being used in this vehicle meets manufactures Fuel Requirement, refer to the service manual.<br>Perform POWERTRAIN VERIFICATION TEST VER - 1. | All |

## Verification Tests

| BODY VERIFICATION TEST - VER 1 | APPLICABILITY |
|---|---|
| 1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors.<br>**2. NOTE: If the SKIM or PCM was replaced, refer to the service information for proper programming procedures.**<br>**3. NOTE: If the MIC was replaced, configure new cluster with Tire Size, Axle, T-Case Type, and EQ Setting.**<br>4. Ensure all accessories are turned off and the battery is fully charged.<br>5. With the DRBIII®, record and erase all DTC's from ALL modules. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern.<br>6. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTC's from ALL modules.<br>Are any DTCs present or is the original condition still present?<br>Yes → Repair is not complete, refer to the appropriate symptom.<br>No → Repair is complete. | All |

| POWERTRAIN VERIFICATION TEST VER - 1 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. Inspect the engine oil for contamination. If oil contamination is suspected, change the oil and filter.<br>3. If the PCM was not replaced skip steps 4 through 6 and continue with the verification.<br>4. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.<br>5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.<br>6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM<br>7. Attempt to start the engine.<br>8. If the conditions cannot be duplicated, erase all DTCs.<br>Is the vehicle still unable to start and/or are there any DTCs or symptoms remaining?<br>Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure).<br>No → Repair is complete. | All |

## Verification Tests — Continued

| POWERTRAIN VERIFICATION TEST VER - 2 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. If this verification procedure is being performed after a NO TROUBLE CODE repair, perform steps 3 and 4.<br>3. Check to see if the initial symptom still exists. If there are no trouble codes or the symptom no longer exists, the repair was successful and testing is complete.<br>4. If the initial or another symptom exists, the repair is not complete. Check all technical service bulletins or flash updates and return to Symptoms if necessary.<br>5. If this verification procedure is being performed after a DTC repair, perform steps 6 through 13.<br>6. Connect the DRBIII® to the data link connector. Using the DRBIII® erase any diagnostic trouble codes and reset all values.<br>7. If the PCM was not replaced, skip steps 8 through 10, then proceed with the verification.<br>8. If the PCM was replaced the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer System (SKIS), Secret Key data must be updated to enable start.<br>9. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.<br>10. For SKIS theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, and Misc. Place SKIM in secured access mode by using the correct PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM.<br>11. Road test the vehicle. If the test is for an A/C DTC, ensure it is operating during the following test.<br>12. Drive the vehicle for at least 5 minutes at 64 Km/h (40 mph). Ensure the transmission shifts properly through all gears. At some point stop the vehicle and turn off the engine for at least 10 seconds.<br>13. With the DRBIII®, read DTCs.<br>Are any DTCs or symptoms remaining?<br>Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure).<br>No → Repair is complete. | All |

| POWERTRAIN VERIFICATION TEST VER - 3 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. Connect the DRBIII® to the Data Link Connector and erase the DTCs.<br>3. If the PCM was not replaced skip steps 4 through 6 then continue the verification.<br>4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.<br>5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.<br>6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM<br>7. Perform the generator output test per service manual information.<br>8. Start the engine and set the engine speed to 2000 rpm for at least 30 seconds.<br>9. Allow the engine to return to idle.<br>10. Cycle the ignition key off then on.<br>11. With the DRBIII®, read DTCs.<br>Are any DTCs or symptoms remaining?<br>Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure).<br>No → Repair is complete. | All |

## Verification Tests — Continued

| POWERTRAIN VERIFICATION TEST VER - 4 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. With the DRBIII®, erase DTCs.<br>3. If the PCM was not replaced, skip steps 4 through 6, then continue with the verification.<br>4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air bag modules. In addition, if the vehicle is equipped with entry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.<br>5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.<br>6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM<br>7. Turn the speed control ON (if equipped, cruise light will be on).<br>8. Depress and release the SET Switch when the vehicle speed is greater than 35 MPH. The speed control should engage and maintain the selected speed.<br>9. Depress and hold the RESUME/ACCEL Switch. The vehicle speed should increase by at least 2 mph.<br>10. Press and hold the COAST switch. The vehicle speed should decrease.<br>11. Using caution, depress and release the brake pedal. The speed control should disengage.<br>12. Bring the vehicle speed back up to 35 MPH.<br>13. Depress the RESUME/ACCEL switch. The speed control should resume the previously set speed.<br>14. Hold down the SET switch. The vehicle should decelerate.<br>15. Ensure vehicle speed is greater than 35 mph and release the SET Switch. The vehicle should adjust and set a new vehicle speed.<br>16. Depress and release the CANCEL switch. The speed control should disengage.<br>17. Bring the vehicle speed back up above 35 mph and engage speed control.<br>18. Depress the OFF switch to turn OFF, (Cruise light will be off). The speed control should disengage.<br>19. NOTE: OVERSHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET.<br>20. If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as ″lift foot set″), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h).<br>21. It may also decelerate to less than the desired set speed, before finally achieving the desired set speed.<br>22. The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths.<br>23. When the speed control is set with the vehicles operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly.<br>24. If the ″lift foot sets″ are continually used, a speed control overshoot/undershoot condition will develop.<br>25. To ″unlearn″ the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating).<br>26. Then turning the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds.<br>27. This procedure must be performed approximately 10-15 times to completely unlearn the overshoot/undershoot condition.<br>Did the Speed Control pass the above test?<br>Yes → Repair is complete.<br>No → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). | All |

## Verification Tests — Continued

| POWERTRAIN VERIFICATION TEST VER - 5 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. If any existing diagnostic trouble codes have not been repaired, go to the appropriate Symptom List and follow path specified.<br>3. Connect the DRBIII® to the data link connector.<br>4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.<br>5. If the PCM was not replaced skip steps 6 through 8 and continue the verification.<br>6. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with entry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.<br>7. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules.<br>8. For SKIM theft alarm: Connect DRBIII® to data link connectorto Theft Alarm, SKIM, Misc. and place SKIM in secured access mode by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM.<br>9. If the Catalyst was replaced, with the DRBIII® go to the miscellaneous Menu Option ″Catalyst Replaced″ and press enter.<br>10. If a Comprehensive Component DTC was repaired, perform steps 11 and 13. If a Major OBD II Monitor DTC was repaired skip step 11 and continue verification.<br>11. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes.<br>12. With the DRBIII®, monitor the appropriate pre-test enabling conditions until all conditions have been met. Once the conditions have been met, switch screen to the appropriate OBDII monitor, (Audible beeps when the monitor is running).<br>13. If the conditions cannot be duplicated, erase all DTC with the DRBIII®.<br>Did the OBD II monitor run successfully and has the Good Trip Counter changed to one or more?<br>Yes → Repair is complete.<br>No → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). | All |

## Verification Tests — Continued

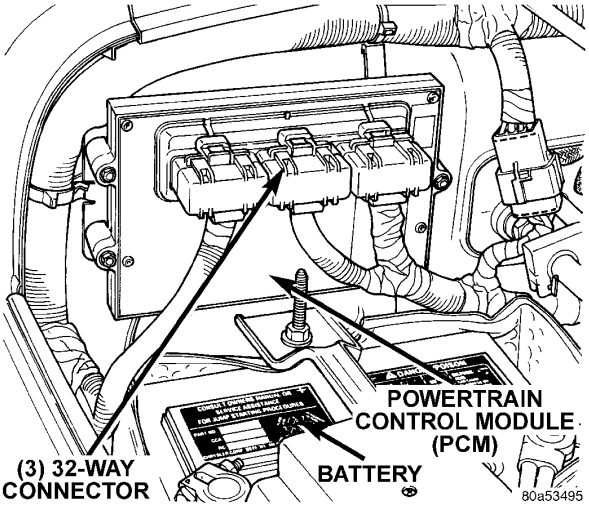
| POWERTRAIN VERIFICATION TEST VER - 6 | APPLICABILITY |
|---|---|
| 1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary.<br>2. If any existing diagnostic trouble codes are not repaired, go to symptom list and follow path specified. After all diagnostic trouble codes have been repaired, return to TEST VER-6A and run LDP Dealer Test Mode under Systems Test in DRBIII.<br>3. If the PCM was not replaced, skip steps 4 through 6 then continue with the verification.<br>4. If the PCM was replaced, the correct VIN and mileage must be programmed or a DTC will set in the ABS and Air Bag modules. In addition, if the vehicle is equipped with a Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start.<br>5. For ABS and Airbag Systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Airbag modules.<br>6. For SKIM theft alarm: Connect DRBIII® to data link conn. Go to Theft Alarm, SKIM, Misc. and place SKIM in secured access mode, by using the appropriate PIN code for this vehicle. Select Update the Secret Key data. Data will be transferred from SKIM to PCM<br>7. The LDP Monitor Test Mode has been added to the DRBIII® to verify repairs to the LDP System. A DRBIII® software program was written which causes the PCM to run the LDP Monitor as part of this test. Test failures will be indicated through a stored DTC.<br>8. LDP Monitor Test Mode is a useful way to run a total system performance test. Use this test to verify any type of LDP system repair.<br>9. Software program makes temporary changes to operating mode of PCM. For this reason, it is critical that test not be interrupted. PCM's left in this mode as result of interrupted test will illuminate the MIL for 8-10 mi of driving with no DTC's stored.<br>10. Erasing DTCs will not change this condition.<br>11. If a vehicle is found to be stuck in the mode described above, the LDP Dealer Test should be re-run in its entirety so that the software program in the DRBIII® can restore the PCM operating mode.<br>12. Note similarity to LDP Monitor screen found under OBDII Monitors. Failure modes are fewer in this System Test than OBDII LDP Monitor. System Test only stores Small Leak DTC to indicate problem with system. No other type of failure mode indication given.<br>13. System Test failure may have been, for example, due to a large leak, but the PCM will set the Small Leak DTC to indicate failures that occurred as part of the system test.<br>14. Connect the DRBIII® to the data link connector. Engine running, turn off all accessories.<br>15. Note: While test is being performed, PCM must see RPM, minimum MAP, No Vehicle speed and minimum Throttle Position sensor (At idle, in park.) With DRBIII® in System Tests, perform the LDP Monitor Test and follow the instructions on the screen.<br>Did the LDP Monitor Test fail and/or have any DTCs set?<br><br>Yes → Check for any related Technical Service Bulletins and/or refer to the apopropriate Symptom list (Diagnostic Procedure)<br><br>No → Repair is complete. | All |

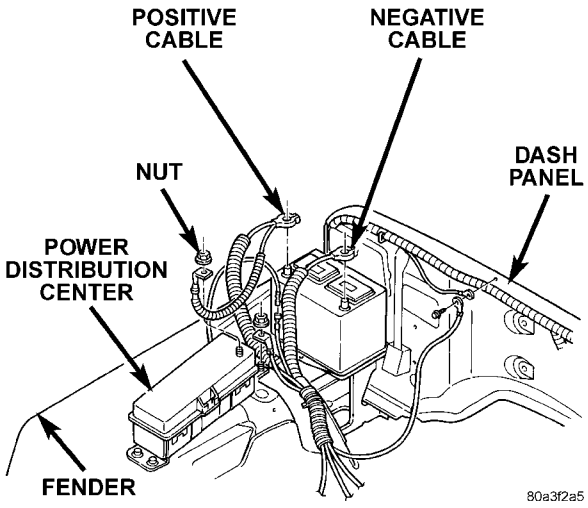
## Verification Tests — Continued

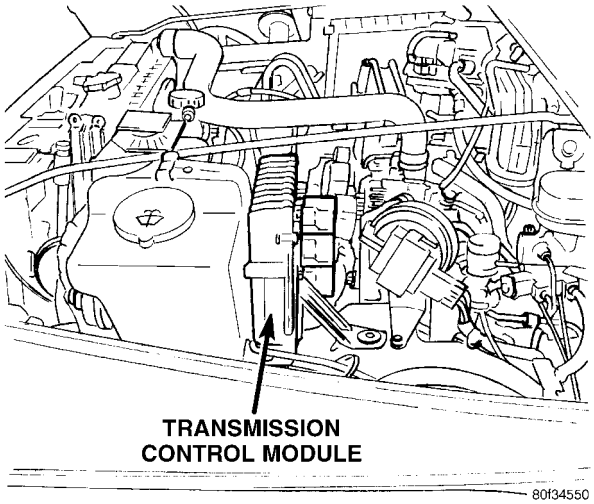
| SKIS VERIFICATION | APPLICABILITY |
|---|---|
| 1. Reconnect all previously disconnected components and connectors.<br>2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKIM. This number can be obtained from the vehicle's invoice or Chrysler's Customer Center (1-800-992-1997).<br>**3. NOTE: When entering the PIN, care should be taken because the SKIM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PINs are entered, the SKIM will Lock Out the DRB for 1 hour.**<br>4. To exit Lock Out mode, the ignition key must remain in the Run position continually for 1 hour. Turn off all accessories and connect a battery charger if necessary.<br>5. With the DRB, select Theft Alarm, SKIM and Miscellaneous. Then, select the desired procedure and follow the steps that will be displayed.<br>6. If the SKIM has been replaced, ensure all of the vehicle ignition keys are programmed to the new SKIM.<br>**7. NOTE: Prior to returning vehicle to the customer, perform a module scan to be sure that all DTCs are erased. Erase any DTCs that are found.**<br>8. With the DRB, erase all DTCs. Perform 5 ignition key cycles leaving the key on for at least 90 seconds per cycle.<br>9. With the DRB, read the SKIM DTCs.<br>Are there any SKIM DTCs?<br>Yes → Repair is not complete, refer to appropriate symptom.<br>No → Repair is complete. | All |

# 8.0 COMPONENT LOCATIONS

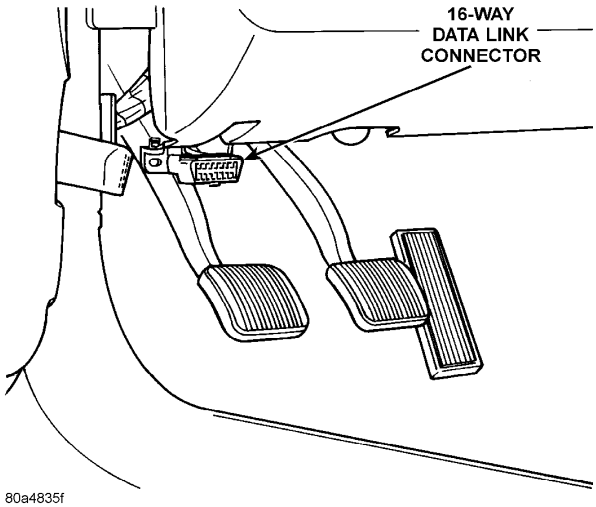
## 8.1 CONTROL MODULES AND PDC



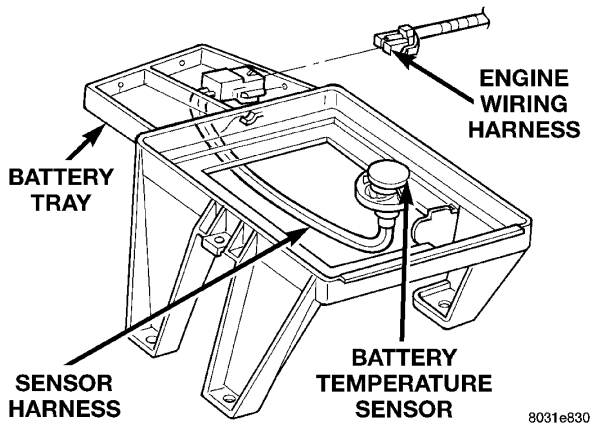




## 8.2 DATA LINK CONNECTOR



## 8.3 SENSORS AND SOLENOIDS

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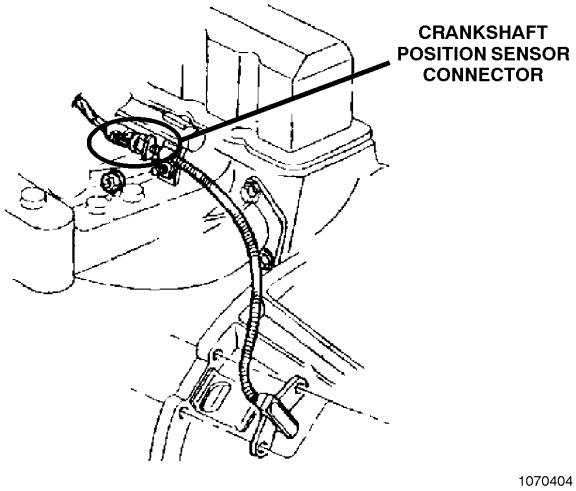


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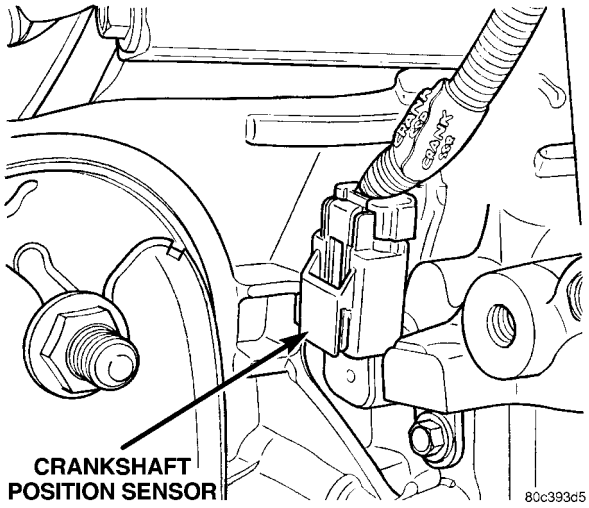


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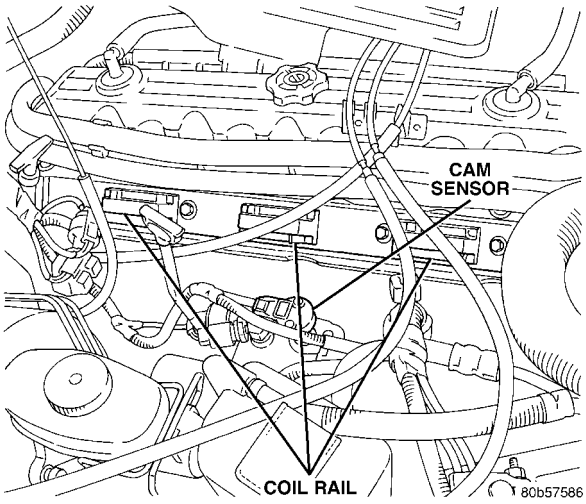


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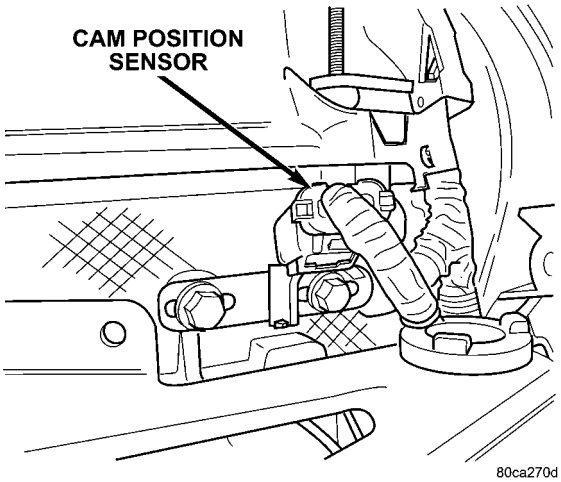


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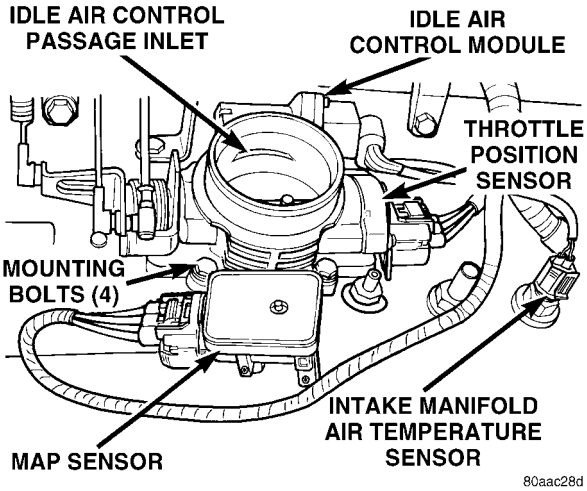

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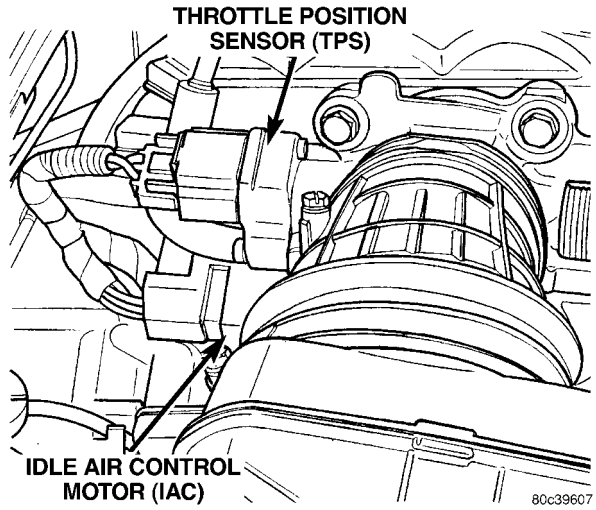


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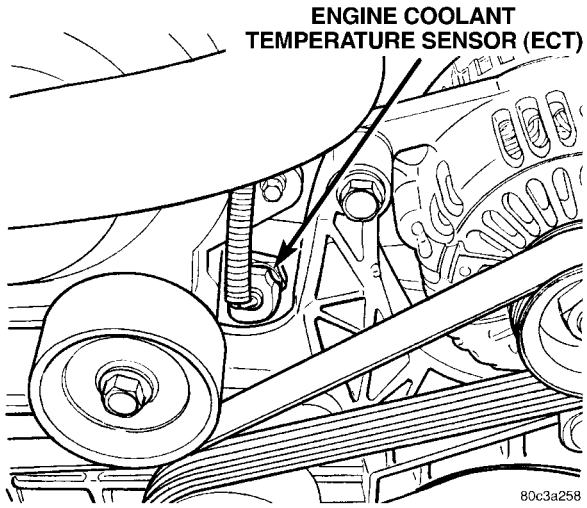


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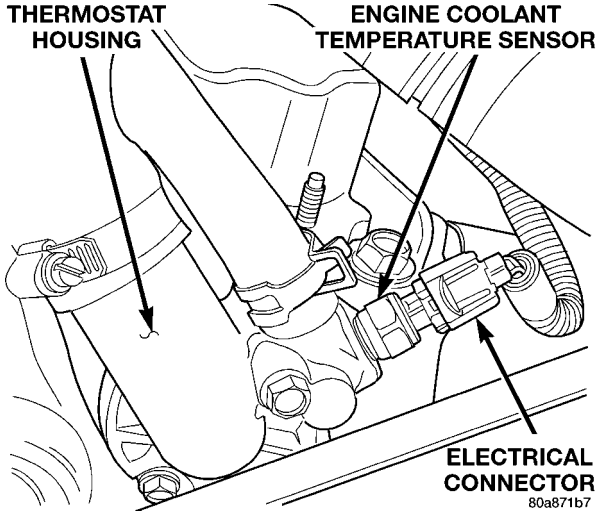


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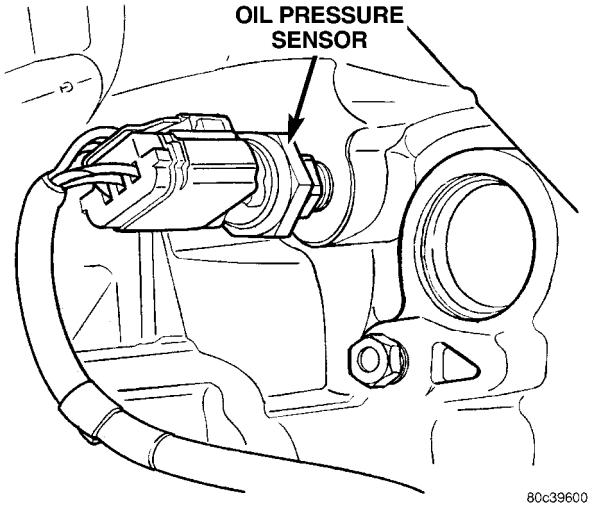


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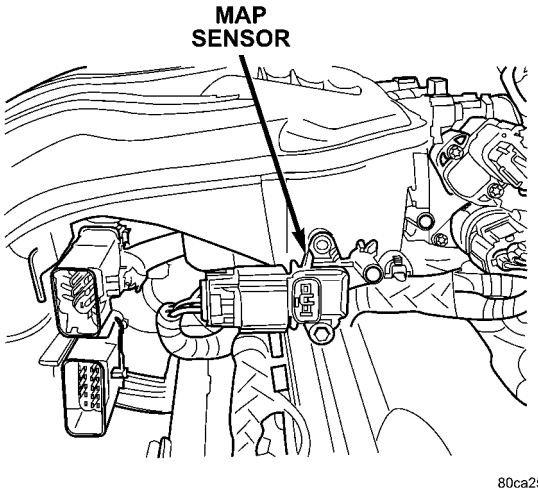


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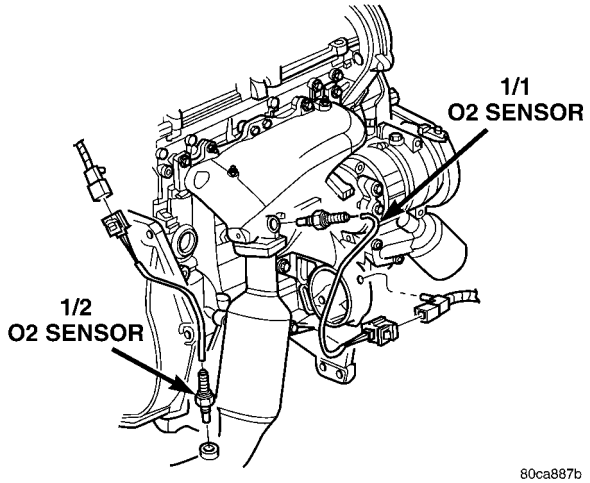
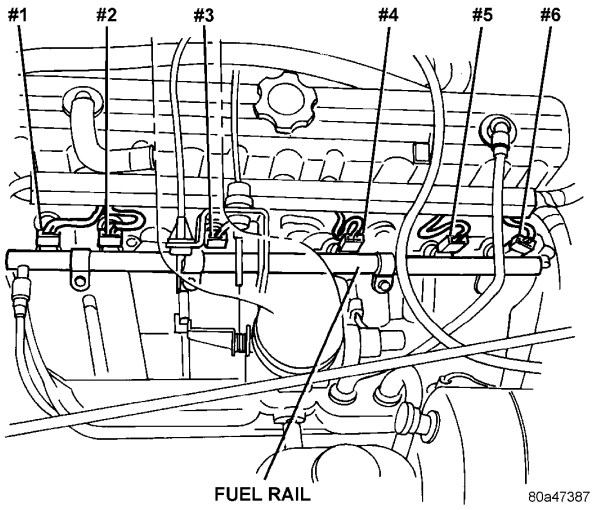
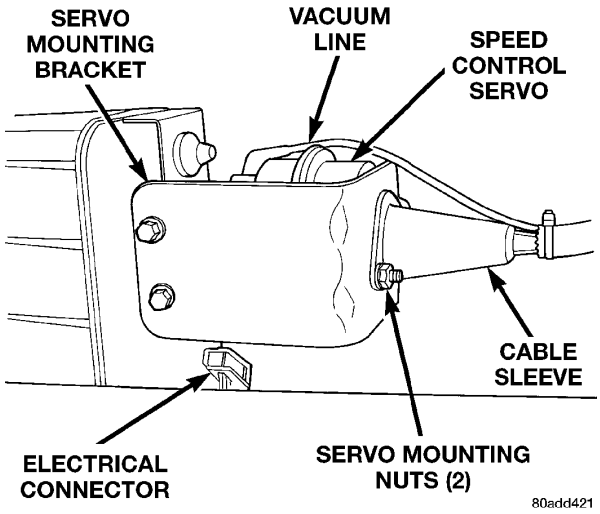


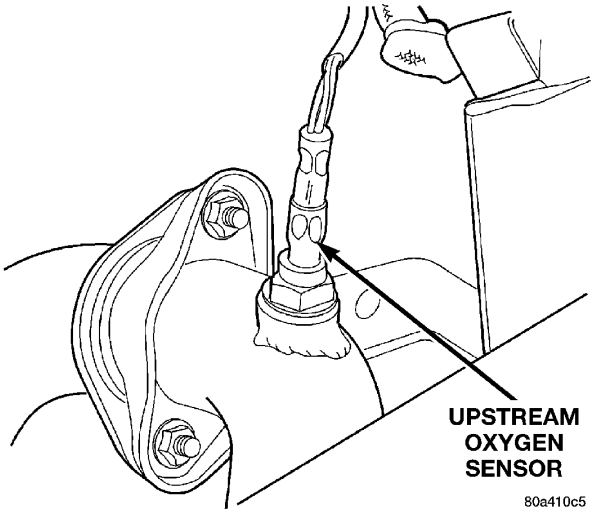
## 8.3 SENSORS AND SOLENOIDS (Continued)

**4.0L**

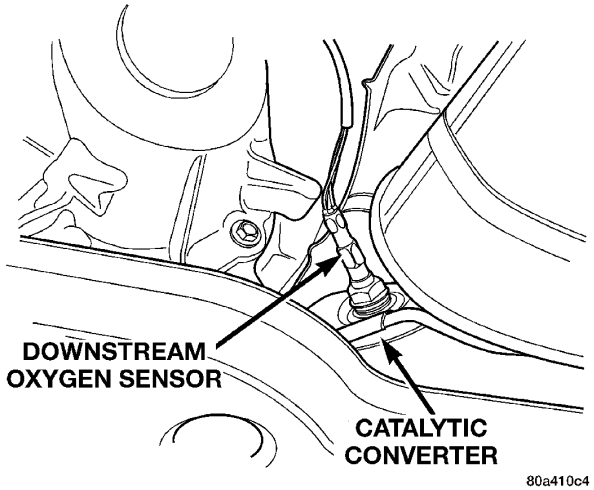


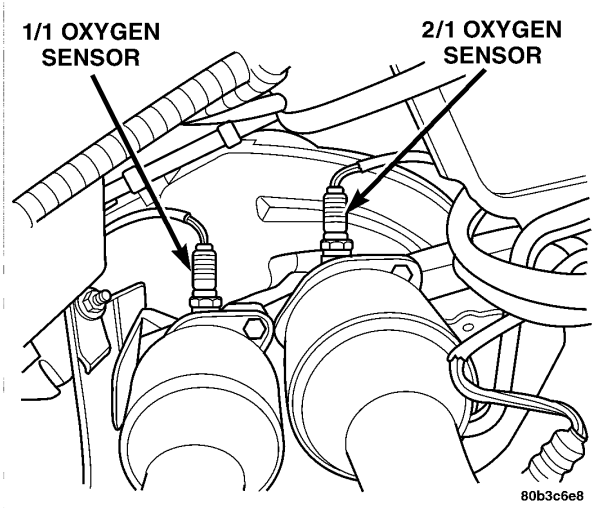

**1/1 Federal & BUX**



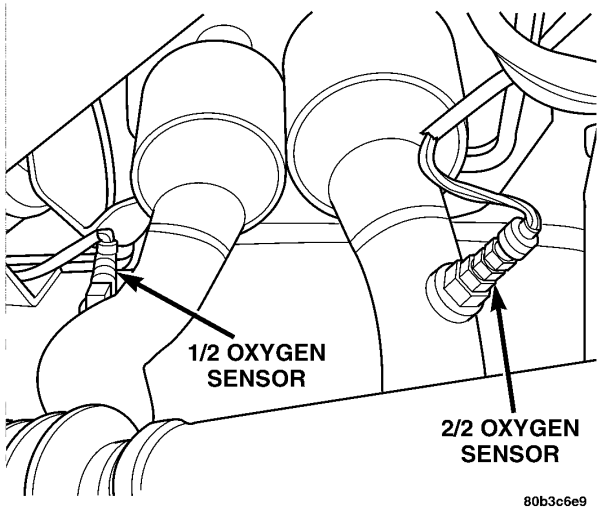

**1/2 Federal & BUX**



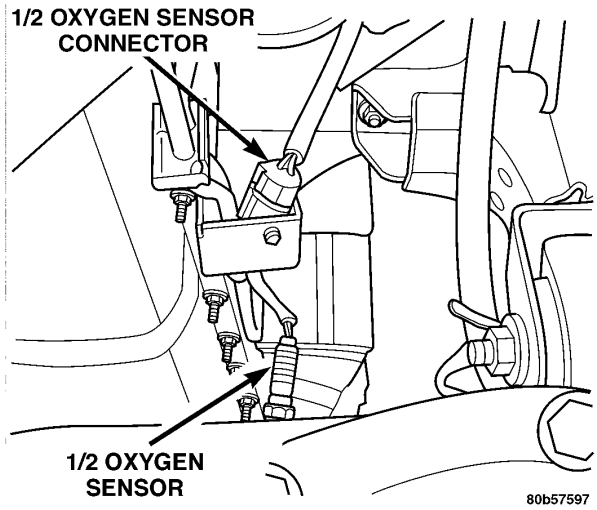

**1/1 and 2/1 Calif & EURO III**

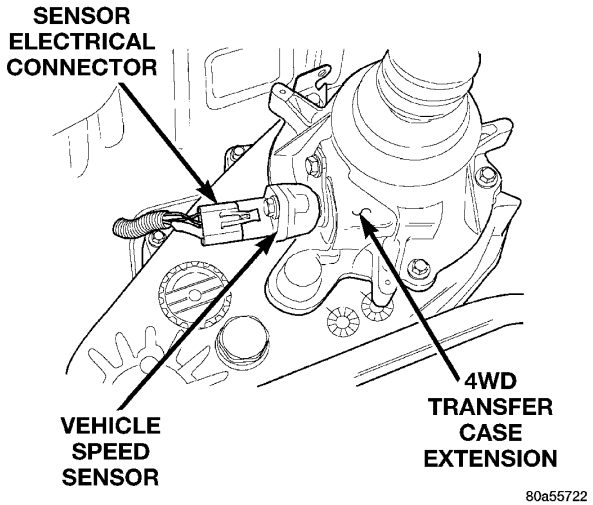



**1/2 and 2/2 Calif. & EURO III**

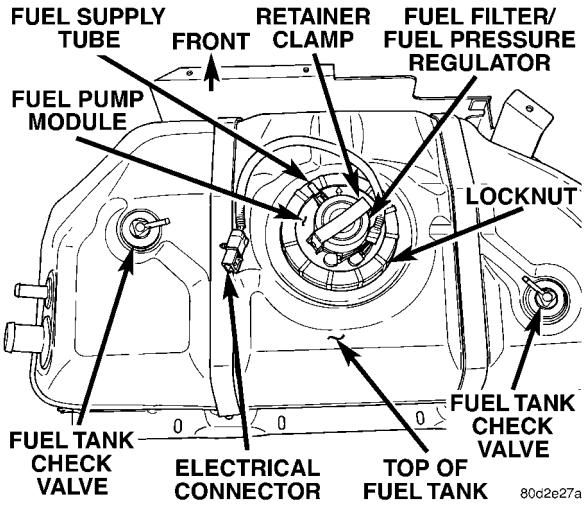


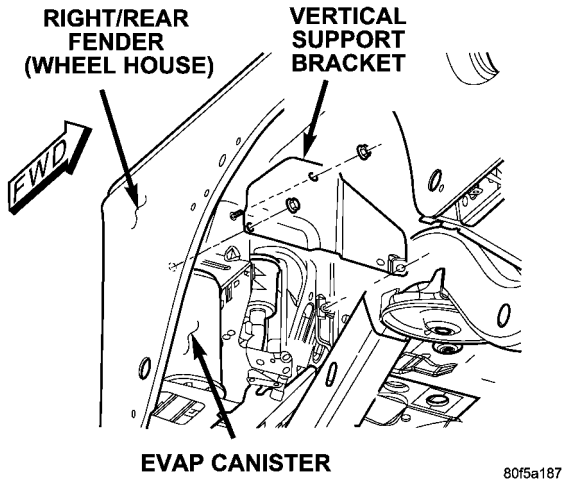
### 1.2 Calif. & EURO III

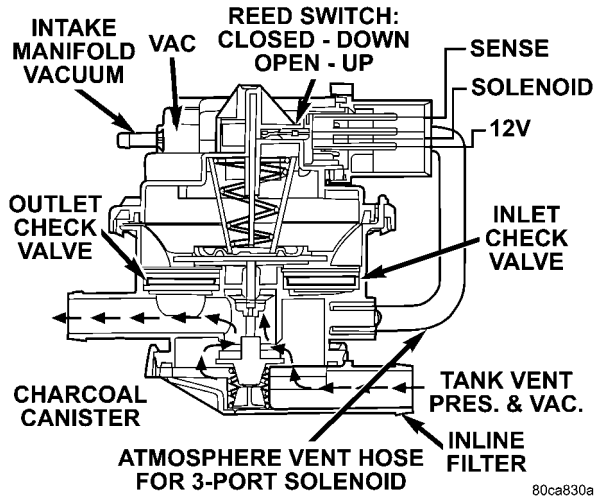


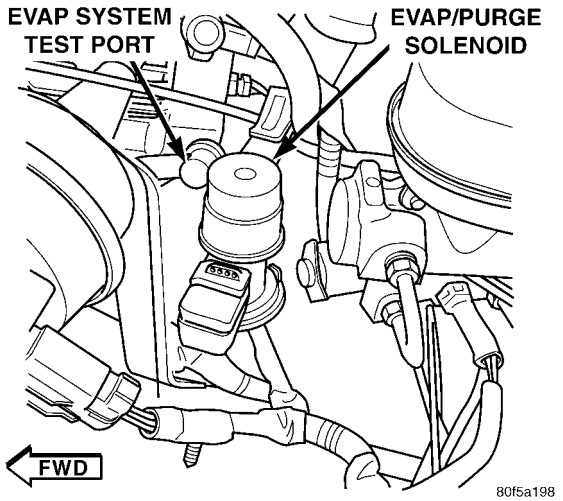




## 8.4 FUEL SYSTEM

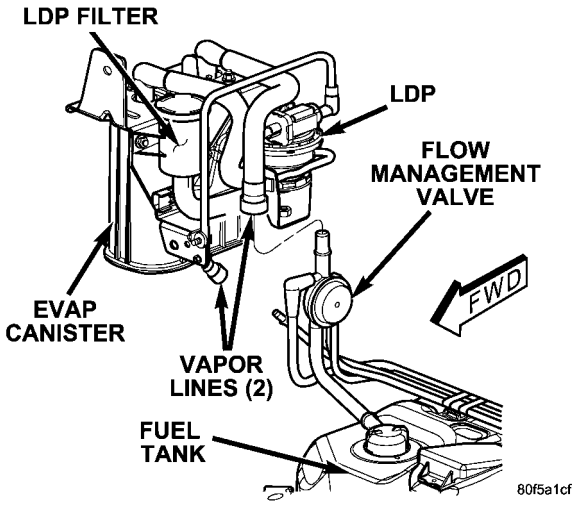


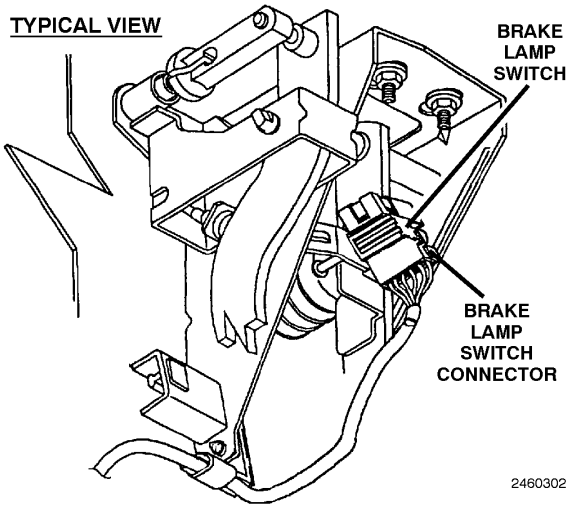



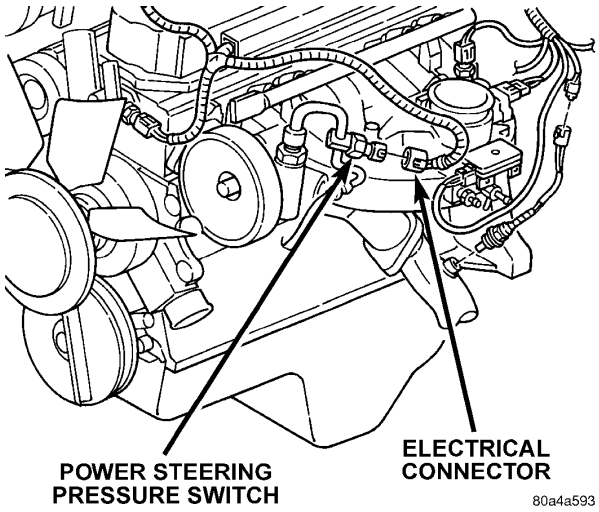



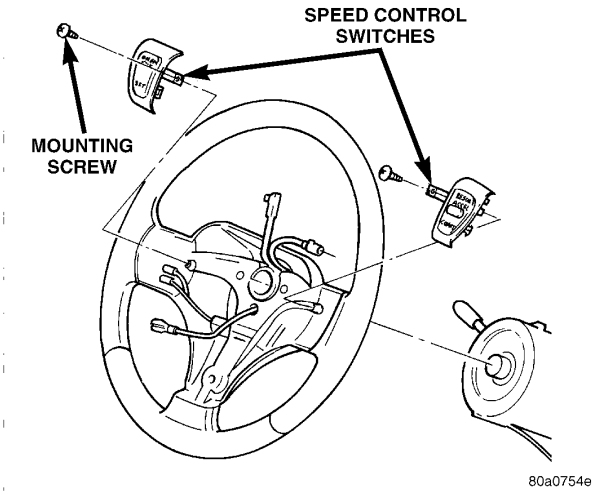
## 8.4 FUEL SYSTEM (Continued)



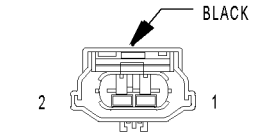

## 8.5 SWITCHES



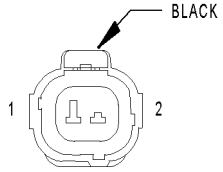
# 9.0 CONNECTOR PINOUTS




A/C COMPRESSOR CLUTCH

**A/C COMPRESSOR CLUTCH**

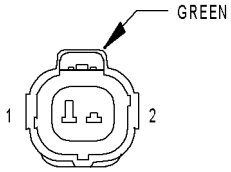
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C3 20DB/BK (4.0L) | A/C COMPRESSOR CLUTCH RELAY OUTPUT |
| 1 | C3 18DB/BK (2.4L) | A/C COMPRESSOR CLUTCH RELAY OUTPUT |
| 2 | Z246 18BK/OR (2.4L) | GROUND |
| 2 | Z1 20BK (4.0L) | GROUND |




A/C HIGH PRESSURE SWITCH (4.0L)

**A/C HIGH PRESSURE SWITCH (4.0L)**

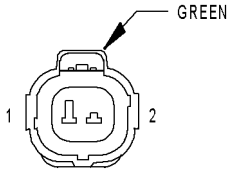
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C90 20LG | A/C SELECT SIGNAL |
| 2 | C22 20DB/WT | A/C SWITCH SIGNAL |




A/C LOW PRESSURE SWITCH (2.4L)

**A/C LOW PRESSURE SWITCH (2.4L)**

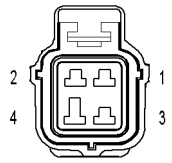
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C21 18DB/OR | A/C REQUEST SIGNAL |
| 2 | C90 20LG | A/C SELECT SIGNAL |




A/C LOW PRESSURE SWITCH (4.0L)

**A/C LOW PRESSURE SWITCH (4.0L)**

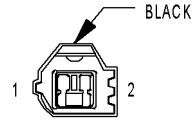
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C21 20DB/OR | A/C REQUEST SIGNAL |
| 2 | C22 20DB/WT | A/C SWITCH SIGNAL |




A/C PRESSURE TRANSDUCER (2.4L)

**A/C PRESSURE TRANSDUCER (2.4L)**

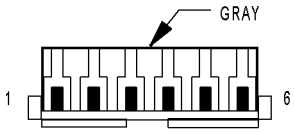
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K4 20BK/LB | SENSOR GROUND |
| 2 | K6 20VT/WT | 5 VOLT SUPPLY |
| 3 | C18 18DB | A/C PRESSURE SIGNAL |
| 4 | - | - |




BATTERY TEMPERATURE SENSOR

**BATTERY TEMPERATURE SENSOR**

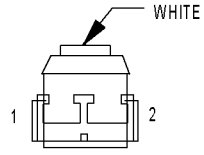
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K118 18PK/YL | BATTERY TEMPERATURE SENSOR SIGNAL |
| 2 | K4 20BK/LB | SENSOR GROUND |




BRAKE LAMP SWITCH

**BRAKE LAMP SWITCH**

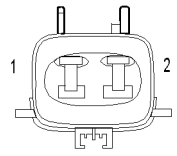
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K29 20WT/PK | BRAKE LAMP SWITCH SENSE |
| 1 | K29 20WT/PK | BRAKE LAMP SWITCH SENSE |
| 2 | Z1 20 BK | GROUND |
| 3 | V32 20YL/RD | SPEED CONTROL ON/OFF SWITCH SENSE |
| 4 | V30 20DB/RD | SPEED CONTROL BRAKE LAMP SWITCH OUTPUT |
| 5 | F32 18PK/DB | FUSED B(+) |
| 6 | L50 18WT/TN | BRAKE LAMP SWITCH OUTPUT |




BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID

**BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID**

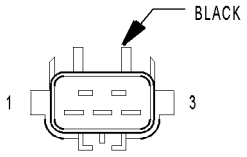
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K29 20WT/PK | BRAKE LAMP SWITCH SENSE |
| 2 | G5 20DB/WT | FUSED IGNITION SWITCH OUTPUT (RUN-START) |




C120 (2.4L)

**C120 (2.4L)**

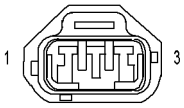
| CAV | CIRCUIT |
|---|---|
| 1 | C25 12YL |
| 2 | Z213 12BK |




C180

**C180**

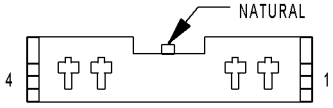
| CAV | CIRCUIT |
|---|---|
| 1 | K107 18OR |
| 2 | K106 18WT/DG |
| 3 | K125 18WT/DB |




CAMSHAFT POSITION SENSOR (4.0L)

**CAMSHAFT POSITION SENSOR (4.0L)**

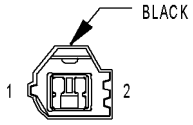
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K44 18TN/YL | CAMSHAFT POSITION SENSOR SIGNAL |
| 2 | K4 20BK/LB | SENSOR GROUND |
| 3 | K7 20OR | 5V SUPPLY |




CLOCKSPRING C1

**CLOCKSPRING C1**

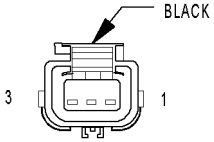
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | X3 20RD/YL | HORN RELAY CONTROL |
| 2 | V37 20RD/LG | SPEED CONTROL SWITCH SIGNAL |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | - | - |




CLUTCH PEDAL POSITION SWITCH (M/T)

**CLUTCH PEDAL POSITION SWITCH (M/T)**

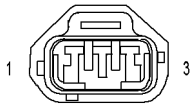
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | T141 18YL/RD | FUSED IGNITION SWITCH OUTPUT (START) |
| 2 | A41 18YL | FUSED IGNITION SWITCH OUTPUT (START) |




CRANKSHAFT POSITION SENSOR (2.4L/4.0L A/T)

**CRANKSHAFT POSITION SENSOR (2.4L/4.0L A/T)**

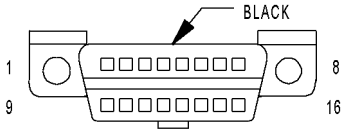
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K7 20OR (4.0L) | 5V SUPPLY |
| 1 | K24 18GY/BK (2.4L) | CRANKSHAFT POSITION SENSOR SIGNAL |
| 2 | K4 18BK/LB (2.4L) | SENSOR GROUND |
| 2 | K4 20BK/LB | SENSOR GROUND |
| 3 | K24 18GY/BK (4.0L) | CRANKSHAFT POSITION SENSOR SIGNAL |
| 3 | K7 18OR (2.4L) | 5V SUPPLY |




CRANKSHAFT POSITION SENSOR (4.0L M/T)

**CRANKSHAFT POSITION SENSOR (4.0L M/T)**

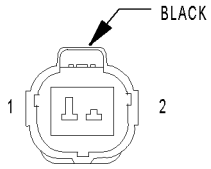
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K24 18GY/BK | CRANKSHAFT POSITION SENSOR SIGNAL |
| 2 | K4 20BK/LB | SENSOR GROUND |
| 3 | K7 20OR | 5 VOLT SUPPLY |




DATA LINK CONNECTOR

**DATA LINK CONNECTOR**

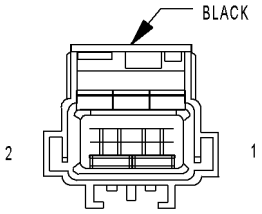
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | - | - |
| 2 | D25 20VT/YL | PCI BUS |
| 3 | - | - |
| 4 | Z2 20BK/LG | GROUND |
| 5 | Z12 20BK/TN | GROUND |
| 6 | D32 20LG/WT | SCI RECEIVE |
| 7 | D21 20PK | SCI TRANSMIT |
| 8 | - | - |
| 9 | - | - |
| 10 | - | - |
| 11 | - | - |
| 12 | - | - |
| 13 | - | - |
| 14 | D20 20LG/PK | SCI RECEIVE |
| 15 | - | - |
| 16 | M1 20PK/WT | FUSED B(+) |




ENGINE COOLANT TEMPERATURE SENSOR

**ENGINE COOLANT TEMPERATURE SENSOR**

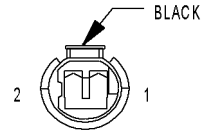
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K4 20BK/LB (4.0L) | SENSOR GROUND |
| 1 | K4 18BK/LB (2.4L) | SENSOR GROUND |
| 2 | K2 18TN/BK | ENGINE COOLANT TEMPERATURE SENSOR SIGNAL |




ENGINE OIL PRESSURE SWITCH

**ENGINE OIL PRESSURE SWITCH**

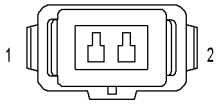
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | G60 18GY/YL | OIL PRESSURE SIGNAL |
| 2 | - | - |




EVAP/PURGE SOLENOID

**EVAP/PURGE SOLENOID**

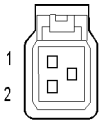
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K52 18PK/BK | EVAP/PURGE SOLENOID CONTROL |
| 2 | F12 20RD/LG | FUSED IGNITION SWITCH OUTPUT (RUN-START) |




FUEL INJECTOR NO. 1 (2.4L)

**FUEL INJECTOR NO. 1 (2.4L)**

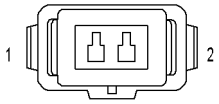
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K11 18WT/DB | FUEL INJECTOR NO. 1 DRIVER |




FUEL INJECTOR NO. 1 (4.0L)

**FUEL INJECTOR NO. 1 (4.0L)**

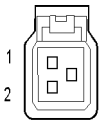
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K11 18WT/DB | FUEL INJECTOR NO. 1 DRIVER |




FUEL INJECTOR NO. 2 (2.4L)

**FUEL INJECTOR NO. 2 (2.4L)**

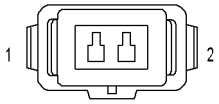
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K12 18TN | FUEL INJECTOR NO. 2 DRIVER |




FUEL INJECTOR NO. 2 (4.0L)

**FUEL INJECTOR NO. 2 (4.0L)**

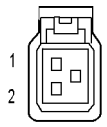
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K12 18TN | FUEL INJECTOR NO. 2 DRIVER |




FUEL INJECTOR NO. 3 (2.4L)

**FUEL INJECTOR NO. 3 (2.4L)**

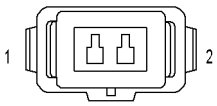
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K13 18YL/WT | FUEL INJECTOR NO. 3 DRIVER |




FUEL INJECTOR NO. 3
(4.0L)

**FUEL INJECTOR NO. 3 (4.0L)**

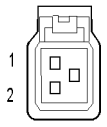
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K13 18YL/WT | FUEL INJECTOR NO. 3 DRIVER |




FUEL INJECTOR NO. 4
(2.4L)

**FUEL INJECTOR NO. 4 (2.4L)**

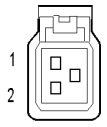
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K14 18LB/BR | FUEL INJECTOR NO. 4 DRIVER |




FUEL INJECTOR NO. 4
(4.0L)

**FUEL INJECTOR NO. 4 (4.0L)**

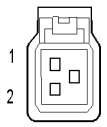
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K14 18LB/BR | FUEL INJECTOR NO. 4 DRIVER |




FUEL INJECTOR NO. 5
(4.0L)

**FUEL INJECTOR NO. 5 (4.0L)**

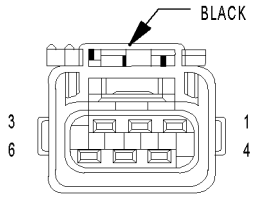
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K38 18GY | FUEL INJECTOR NO. 5 DRIVER |




FUEL INJECTOR NO. 6
(4.0L)

**FUEL INJECTOR NO. 6 (4.0L)**

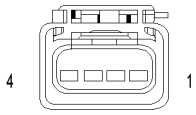
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K58 18BR/DB | FUEL INJECTOR NO. 6 DRIVER |




FUEL PUMP MODULE (A/T)

**FUEL PUMP MODULE (A/T)**

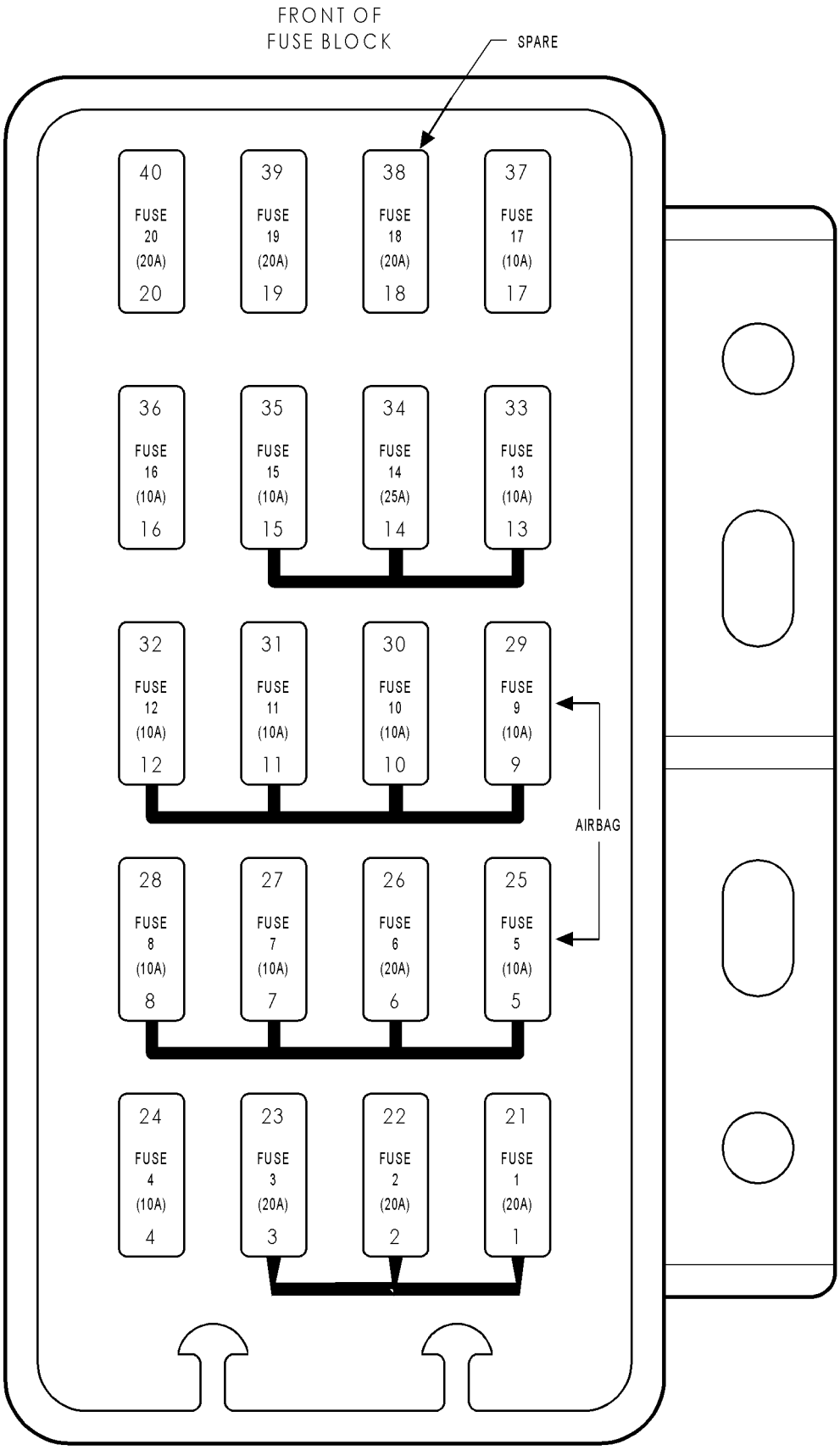
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | A141 18DG/WT | FUEL PUMP RELAY OUTPUT |
| 2 | K226 20DB/LG | FUEL LEVEL SENSOR SIGNAL |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | Z1 18BK | GROUND |
| 5 | - | - |
| 6 | - | - |




FUEL PUMP MODULE (M/T)

**FUEL PUMP MODULE (M/T)**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | A141 18DG/WT | FUEL PUMP RELAY OUTPUT |
| 2 | K226 20DB/LG | FUEL LEVEL SENSOR SIGNAL |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | Z1 18BK | GROUND |


FRONT OF
FUSE BLOCK
SPARE
40
FUSE
20
(20A)
20
39
FUSE
19
(20A)
19
38
FUSE
18
(20A)
18
37
FUSE
17
(10A)
17
36
FUSE
16
(10A)
16
35
FUSE
15
(10A)
15
34
FUSE
14
(25A)
14
33
FUSE
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(10A)
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FUSE
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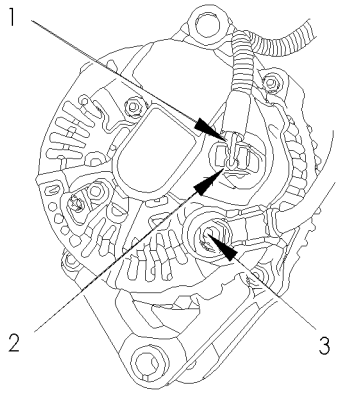
(10A)
12
31
FUSE
11
(10A)
11
30
FUSE
10
(10A)
10
29
FUSE
9
(10A)
9
AIRBAG
28
FUSE
8
(10A)
8
27
FUSE
7
(10A)
7
26
FUSE
6
(20A)
6
25
FUSE
5
(10A)
5
24
FUSE
4
(10A)
4
23
FUSE
3
(20A)
3
22
FUSE
2
(20A)
2
21
FUSE
1
(20A)
1

**FUSES (FUSE/RELAY BLOCK)**

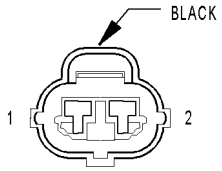
| FUSE NO. | AMPS | FUSED CIRCUIT | FUNCTION |
|---|---|---|---|
| 1 | 20A | F33 18PK/RD | FUSED B(+) |
| 1 | 20A | F33 20PK/RD | FUSED B(+) |
| 2 | 20A | F32 18PK/DB | FUSED B(+) |
| 3 | 20A | X13 16BK/RD (SUBWOOFER) | FUSED B(+) |
| 4 | 10A | Z1 20BK | DOOR AJAR SWITCH OUTPUT |
| 5 | 10A | F23 18DB/YL | FUSED IGNITION SWITCH OUTPUT (RUN) |
| 6 | 20A | V23 18BR/PK (HARD TOP) | FUSED IGNITION SWITCH OUTPUT (RUN) |
| 7 | 10A | F20 20VT/WT | FUSED IGNITION SWITCH OUTPUT (RUN) |
| 8 | 10A | F24 20RD/DG | FUSED IGNITION SWITCH OUTPUT (RUN) |
| 9 | 10A | F14 18LG/YL | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 9 | 10A | F14 18LG/YL | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 10 | 10A | G5 20DB/WT | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 10 | 10A | G5 20DB/WT | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 11 | 10A | F12 20RD/LG | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 12 | 10A | F15 20DB | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 12 | 10A | F15 20DB | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 13 | 10A | L5 20BK/GY | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 14 | 10A | X12 20PK | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 15 | 10A | F81 20DB/RD (HARD TOP) | FUSED REAR WINDOW DEFOGGER RELAY OUTPUT |
| 16 | 10A | L22 20LG/DG (BUILT-UP-EXPORT) | DIMMER SWITCH LOW BEAM OUTPUT |
| 16 | 10A | L22 20LG/DG (BUILT-UP-EXPORT) | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 17 | 25A | V6 16PK/BK | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 17 | 25A | V6 16PK/BK | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 18 | 15A | F38 16LB | FUSED IGNITION SWITCH OUTPUT (RUN) |
| 19 | 20A | - | - |
| 20 | 20A | T141 18YL/RD | FUSED IGNITION SWITCH OUTPUT (START) |
| 20 | 20A | T141 18YL/RD | FUSED IGNITION SWITCH OUTPUT (START) |




GENERATOR

**GENERATOR**

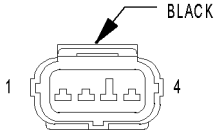
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | - | FIELD WIRES |
| 2 | - | FIELD WIRE CONNECTOR |
| 3 | - | B(+) (OUTPUT TERMINAL) |




GENERATOR

**GENERATOR**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K125 18WT/DB | GENERATOR SOURCE |
| 2 | K20 18DG | GENERATOR FIELD |

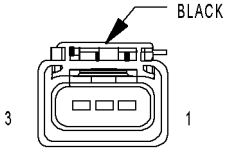



IDLE AIR CONTROL MOTOR

**IDLE AIR CONTROL MOTOR**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K59 18VT/BK | IDLE AIR CONTROL NO. 4 DRIVER |
| 2 | K40 18BR/WT | IDLE AIR CONTROL NO. 3 DRIVER |
| 3 | K60 18YL/BK | IDLE AIR CONTROL NO. 2 DRIVER |
| 4 | K39 18GY/RD | IDLE AIR CONTROL NO. 1 DRIVER |

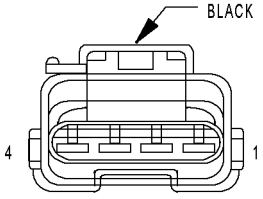





IGNITION COIL PACK (2.4L)

**IGNITION COIL PACK (2.4L)**

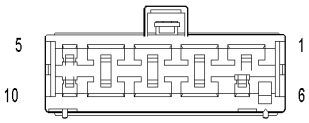
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K17 18DB/TN | IGNITION COIL NO. 2 DRIVER |
| 2 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 3 | K19 18GY | IGNITION COIL NO. 1 DRIVER |




IGNITION COIL PACK (4.0L)

**IGNITION COIL PACK (4.0L)**

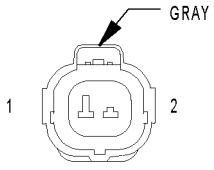
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K19 18BK/GY | IGNITION COIL NO. 1 DRIVER |
| 2 | F42 18DG/LG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 3 | K17 18DB/TN | IGNITION COIL NO. 2 DRIVER |
| 4 | K18 18RD/YL | IGNITION COIL NO. 3 DRIVER |




IGNITION SWITCH

**IGNITION SWITCH**

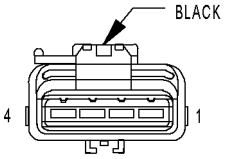
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | A1 18RD | FUSED B(+) |
| 2 | A21 18DB | IGNITION SWITCH OUTPUT (RUN-START) |
| 3 | F22 12WT/PK | IGNITION SWITCH OUTPUT (RUN-ACC) |
| 4 | F30 12RD/PK | FUSED B(+) |
| 5 | G26 20LB | KEY-IN IGNITION SWITCH SENSE |
| 6 | A41 18YL | IGNITION SWITCH OUTPUT (START) |
| 7 | A31 18BK/DG | IGNITION SWITCH OUTPUT (RUN-ACC) |
| 8 | A22 14BK/OR | IGNITION SWITCH OUTPUT (RUN) |
| 9 | A2 14PK/BK | FUSED B(+) |
| 10 | Z1 16BK | GROUND |




INTAKE AIR TEMPERATURE SENSOR

**INTAKE AIR TEMPERATURE SENSOR**

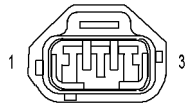
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K4 20BK/LB (4.0L) | SENSOR GROUND |
| 1 | K4 18BK/LB (2.4L) | SENSOR GROUND |
| 2 | K21 18BK/RD | INTAKE AIR TEMPERATURE SENSOR SIGNAL |




LEAK DETECTION PUMP

**LEAK DETECTION PUMP**

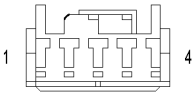
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | - | - |
| 2 | K125 18WT/DB | GENERATOR SOURCE |
| 3 | K106 18WT/DG | LEAK DETECTION PUMP SOLENOID CONTROL |
| 4 | K107 18OR | LEAK DETECTION PUMP SWITCH SENSE |




MANIFOLD ABSOLUTE PRESSURE SENSOR (4.0L)

**MANIFOLD ABSOLUTE PRESSURE SENSOR (4.0L)**

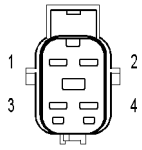
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K4 20BK/LB | SENSOR GROUND |
| 2 | K1 18DG/RD | MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL |
| 3 | K7 20OR | 5V SUPPLY |




OVERDRIVE OFF SWITCH

**OVERDRIVE OFF SWITCH**

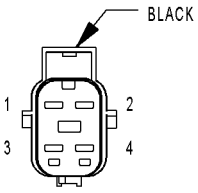
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | Z1 20BK | GROUND |
| 2 | T6 18OR/WT | OVERDRIVE OFF SWITCH SENSE |
| 3 | T56 18DG/LB | OVERDRIVE OFF SWITCH INDICATOR |
| 4 | E2 20OR | PANEL LAMPS FEED |




OXYGEN SENSOR
1/1 UPSTREAM

**OXYGEN SENSOR 1/1 UPSTREAM**

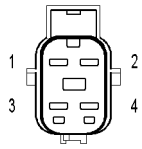
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F142 18OR/DG | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 2 | K99 18BR/OR | GROUND |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | K41 18BK/DG | OXYGEN SENSOR 1/1 SIGNAL |




OXYGEN SENSOR
1/2 DOWNSTREAM

**OXYGEN SENSOR 1/2 DOWNSTREAM**

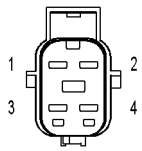
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F142 18OR/DG (BUILT-UP-EXPORT) | FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 1 | A242 18VT/OR (EXCEPT BUILT-UP-EXPORT/JAPAN LOW EMISSIONS VEHICLE) | OXYGEN SENSOR DOWNSTREAM HEATER RELAY OUTPUT |
| 2 | K199 18BR/WT (BUILT-UP-EXPORT) | OXYGEN SENSOR 1/2 HEATER CONTROL |
| 2 | Z1 18BK (EXCEPT BUILT-UP-EXPORT/JAPAN LOW EMISSIONS VEHICLE) | GROUND |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | K141 18TN/WT | OXYGEN SENSOR 1/2 SIGNAL |




OXYGEN SENSOR
2/1 UPSTREAM
(EXCEPT EXPORT/
JAPAN LOW EMISSION VEHICLE)

**OXYGEN SENSOR 2/1 UPSTREAM (EXCEPT EXPORT/JAPAN LOW EMISSION VEHICLE)**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | F142 18OR/DG | FUSED AUTO SHUT DOWN RELAY OUTPUT |
| 2 | K299 18BR/WT | O2 SENSOR 2/1 HEATER CONTROL |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | K241 18LG/RD | OXYGEN SENSOR 2/1 SIGNAL |

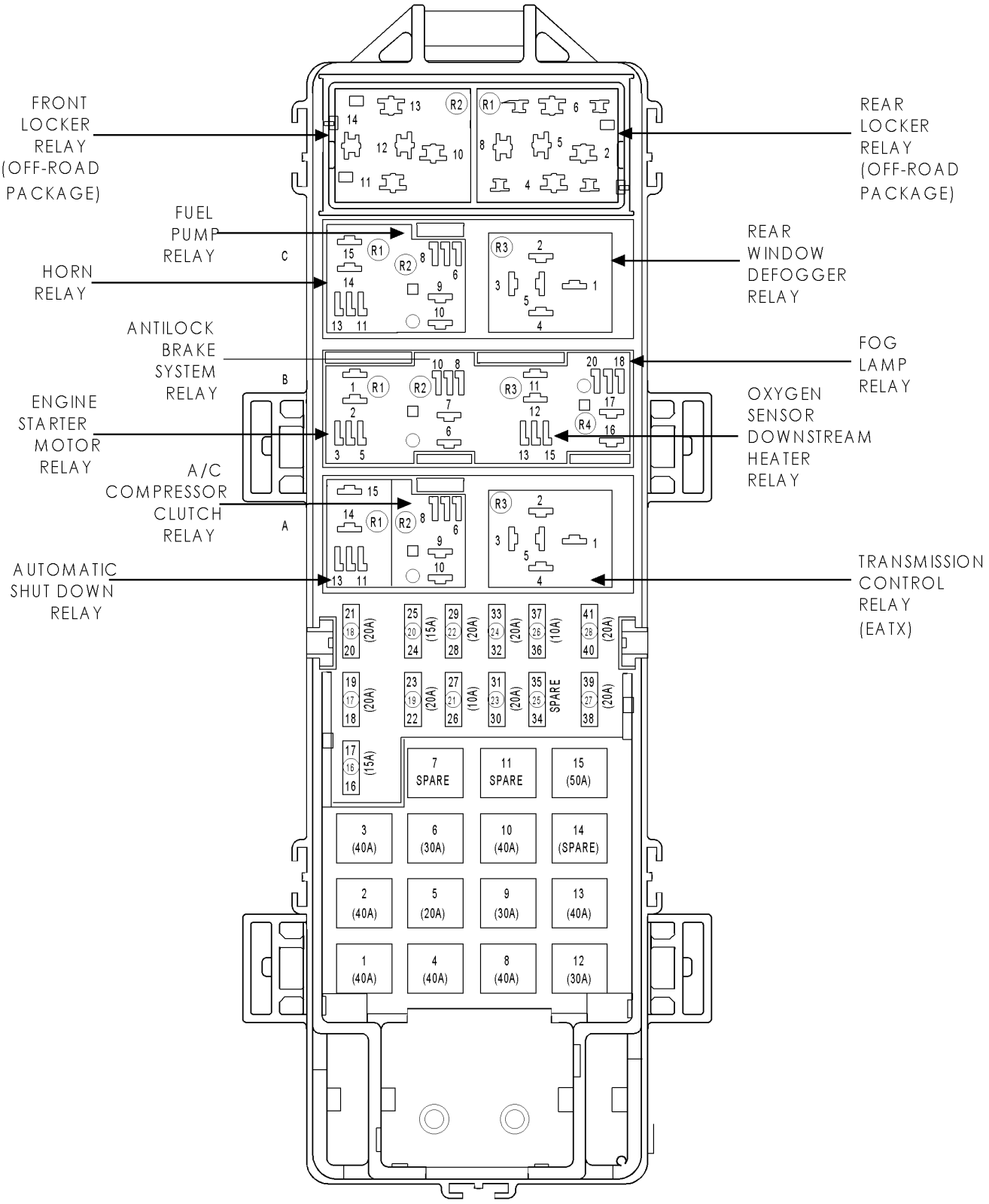



OXYGEN SENSOR
2/2 DOWNSTREAM
(EXCEPT EXPORT/
JAPAN LOW EMISSION VEHICLE)

**OXYGEN SENSOR 2/2 DOWNSTREAM (EXCEPT EXPORT/JAPAN LOW EMISSION VEHICLE)**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | A242 18VT/OR | OXYGEN SENSOR DOWNSTREAM HEATER RELAY OUTPUT |
| 2 | Z1 18BK | GROUND |
| 3 | K4 20BK/LB | SENSOR GROUND |
| 4 | K341 18TN/WT | OXYGEN SENSOR 2/2 SIGNAL |

POWER DISTRIBUTION CENTER



**FUSES (PDC)**

| FUSE NO. | AMPS | FUSED CIRCUIT | FUNCTION |
|---|---|---|---|
| 1 | 40A | A111 12RD/LB | FUSED B(+) |
| 2 | 40A | A4 12BK/PK | FUSED B(+) |
| 3 | 40A | A6 12RD/BK | FUSED B(+) |
| 4 | 40A | C24 12DB/PK (2.4L) | FUSED B(+) |
| 5 | 20A | A30 16RD/WT (A/T) | FUSED B(+) |
| 6 | 30A | A2 14PK/BK | FUSED B(+) |
| 7 | - | - | - |
| 8 | 40A | A10 12RD/DG (ABS) | FUSED B(+) |
| 9 | 30A | A14 14RD/WT | FUSED B(+) |
| 9 | 30A | A14 14RD/WT | FUSED B(+) |
| 10 | 40A | A3 12RD/WT | FUSED B(+) |
| 11 | - | - | - |
| 12 | 30A | A20 12RD/DB (ABS) | FUSED B(+) |
| 13 | 40A | F30 12RD/PK | FUSED B(+) |
| 14 | - | - | - |
| 15 | 50A | M1 16PK/WT (EXCEPT ABS/ABS CANADA) | FUSED B(+) |
| 15 | 50A | M1 20PK/WT (ABS EXCEPT CANADA) | FUSED B(+) |
| 16 | 15A | F142 18OR/DG | AUTOMATIC SHUT DOWN RELAY OUTPUT |
| 17 | 20A | F70 16PK/BK | FUSED B(+) |
| 18 | 20A | F31 18VT | FUSED B(+) |
| 18 | 20A | F31 18VT | FUSED B(+) |
| 19 | 20A | F39 16PK/LG (FRONT FOG LAMPS) | FUSED B(+) |
| 20 | 15A | F60 16RD/WT | FUSED B(+) |
| 21 | 10A | A17 20RD/GY | FUSED B(+) |
| 22 | 20A | A1 18RD | FUSED B(+) |
| 23 | 20A | A61 18DG/BK | FUSED B(+) |
| 24 | 20A | M1 20PK/WT (OFF-ROAD PACKAGE) | FUSED B(+) |
| 25 | - | - | - |
| 26 | 10A | M1 20PK/WT | FUSED B(+) |
| 27 | 20A | L9 18BK/WT | FUSED B(+) |
| 28 | 20A | F42 18DG/LG | AUTOMATIC SHUT DOWN RELAY OUTPUT |

**A/C COMPRESSOR CLUTCH RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A6 | F12 20RD/LG | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| A7 | - | - |
| A8 | C13 18DB/OR | A/C COMPRESSOR CLUTCH RELAY CONTROL |
| A9 | C3 20DB/BK | A/C COMPRESSOR CLUTCH RELAY OUTPUT |
| A10 | A17 20RD/GY | FUSED B(+) |

**AUTOMATIC SHUT DOWN RELAY**

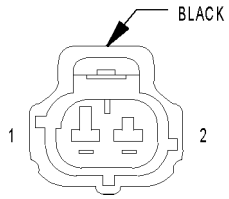
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A11 | K51 18DB/YL | AUTOMATIC SHUT DOWN RELAY CONTROL |
| A12 | - | - |
| A13 | F15 20DB | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| A13 | F15 20DB | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| A14 | A142 14DG/PK | AUTOMATIC SHUT DOWN RELAY OUTPUT |
| A15 | A14 14RD/WT | FUSED B(+) |

**ENGINE STARTER MOTOR RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B1 | A2 14PK/BK | FUSED B(+) |
| B2 | T40 14BR (EXCEPT ABS) | ENGINE STARTER MOTOR RELAY OUTPUT |
| B2 | T40 12BR (ABS) | ENGINE STARTER MOTOR RELAY OUTPUT |
| B3 | T41 20BR/LB | PARK/NEUTRAL POSITION SWITCH SENSE |
| B4 | - | - |
| B5 | T141 18YL/RD | FUSED IGNITION SWITCH OUTPUT (START) |

**OXYGEN SENSOR DOWNSTREAM HEATER RELAY**

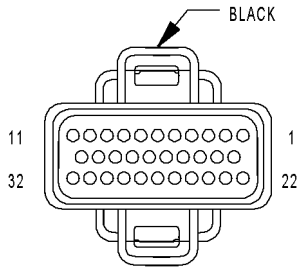
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B11 | F142 18OR/DG | FUSED B(+) |
| B11 | F142 18OR/DG | FUSED B(+) |
| B12 | A242 18VT/OR | OXYGEN SENSOR DOWNSTREAM HEATER RELAY OUTPUT |
| B13 | F142 18OR/DG | FUSED B(+) |
| B13 | F142 18OR/DG | FUSED B(+) |
| B14 | - | - |
| B15 | K512 18RD/YL | OXYGEN SENSOR DOWNSTREAM HEATER RELAY OUTPUT |




POWER STEERING PRESSURE SWITCH (2.4L)

**POWER STEERING PRESSURE SWITCH (2.4L)**

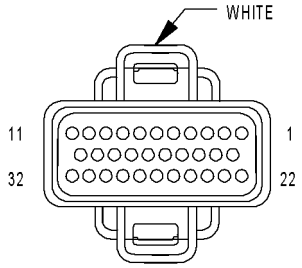
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K10 18DB/OR | POWER STEERING PRESSURE SWITCH SENSE |
| 2 | Z1 20BK | GROUND |




POWERTRAIN CONTROL MODULE C1

**POWERTRAIN CONTROL MODULE C1**

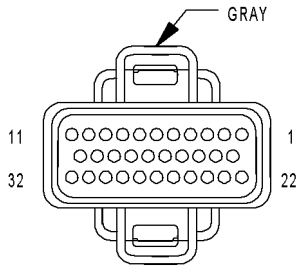
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A1 | K18 18RD/YL (4.0L) | IGNITION COIL NO. 3 DRIVER |
| A2 | F15 18DB/WT | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| A3 | - | - |
| A4 | K4 18BK/LB | SENSOR GROUND |
| A5 | - | - |
| A6 | T41 18BK/WT | PARK/NEUTRAL POSITION SWITCH SENSE |
| A7 | K19 18BK/GY | IGNITION COIL NO. 1 DRIVER |
| A8 | K24 18GY/BK | CRANKSHAFT POSITION SENSOR SIGNAL |
| A9 | - | - |
| A10 | K60 18YL/BK | IDLE AIR CONTROL NO. 2 DRIVER |
| A11 | K40 18BR/WT | IDLE AIR CONTROL NO. 3 DRIVER |
| A12 | K10 18DB/BR (2.4L) | POWER STEERING PRESSURE SWITCH SENSE |
| A13 | T141 18YL/RD | FUSED IGNITION SWITCH OUTPUT (START) |
| A14 | K77 18BR/WT (OFF-ROAD PACKAGE) | TRANSFERCASE POSITION SENSOR INPUT |
| A15 | K21 18BK/RD | INTAKE AIR TEMPERATURE SENSOR SIGNAL |
| A16 | K2 18TN/BK | ENGINE COOLANT TEMPERATURE SENSOR SIGNAL |
| A17 | K7 18OR | 5V SUPPLY |
| A18 | K44 18TN/YL | CAMSHAFT POSITION SENSOR SIGNAL |
| A19 | K39 18GY/RD | IDLE AIR CONTROL NO. 1 DRIVER |
| A20 | K59 18VT/BK | IDLE AIR CONTROL NO. 4 DRIVER |
| A21 | - | - |
| A22 | A14 14RD/WT | FUSED B(+) |
| A23 | K22 18OR/DB | THROTTLE POSITION SENSOR SIGNAL |
| A24 | K41 18BK/DG | OXYGEN SENSOR 1/1 SIGNAL |
| A25 | K141 18TN/WT | OXYGEN SENSOR 1/2 SIGNAL |
| A26 | K241 18LG/RD (4.0L EXCEPT BUILT-UP-EXPORT/ 4.0L JAPAN LOW EMMISION VEHICLE) | OXYGEN SENSOR 2/1 SIGNAL |
| A27 | K1 18DG/RD | MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL |
| A28 | - | - |
| A29 | K341 18TN/WT (4.0L EXCEPT BUILT-UP-EXPORT/ 4.0L JAPAN LOW EMISSION VEHICLE) | OXYGEN SENSOR 2/2 SIGNAL |
| A30 | - | - |
| A31 | Z12 14BK/TN | GROUND |
| A32 | Z12 14BK/TN | GROUND |




POWERTRAIN CONTROL MODULE C2

**POWERTRAIN CONTROL MODULE C2**

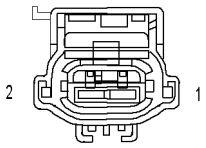
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B1 | - | - |
| B2 | - | - |
| B3 | - | - |
| B4 | K11 18WT/DB | FUEL INJECTOR NO. 1 DRIVER |
| B5 | K13 18YL/WT | FUEL INJECTOR NO. 3 DRIVER |
| B6 | K38 18GY (4.0L) | FUEL INJECTOR NO. 5 DRIVER |
| B7 | - | - |
| B8 | - | - |
| B9 | K17 18DB/TN | IGNITION COIL NO. 2 DRIVER |
| B10 | K20 18DG | GENERATOR FIELD |
| B11 | - | - |
| B12 | K58 18BR/DB (4.0L) | FUEL INJECTOR NO. 6 DRIVER |
| B13 | - | - |
| B14 | - | - |
| B15 | K12 18TN | FUEL INJECTOR NO. 2 DRIVER |
| B16 | K14 18LB/BR | FUEL INJECTOR NO. 4 DRIVER |
| B17 | K173 18LG (2.4L) | HIGH SPEED RADIATOR RELAY INPUT |
| B18 | - | - |
| B19 | C18 18DB (2.4L) | A/C PRESSURE SIGNAL |
| B20 | - | - |
| B21 | - | - |
| B22 | - | - |
| B23 | G60 18GY/YL | ENGINE OIL PRESSURE SENSOR SIGNAL |
| B24 | - | - |
| B25 | - | - |
| B26 | - | - |
| B27 | G7 18WT/OR | VEHICLE SPEED SENSOR SIGNAL |
| B28 | - | - |
| B29 | - | - |
| B30 | - | - |
| B31 | K6 18VT/WT | 5V SUPPLY |
| B32 | - | - |




POWERTRAIN CONTROL MODULE C3

**POWERTRAIN CONTROL MODULE C3**

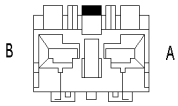
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| C1 | C13 18DB/OR (A/C) | A/C COMPRESSOR CLUTCH RELAY CONTROL |
| C2 | - | - |
| C3 | K51 18DB/YL | AUTOMATIC SHUT DOWN RELAY CONTROL |
| C4 | V36 18TN/RD (SPEED CONTROL) | SPEED CONTROL VACUUM SOLENOID CONTROL |
| C5 | V35 18LG/RD (SPEED CONTROL) | SPEED CONTROL VENT SOLENOID CONTROL |
| C6 | - | - |
| C7 | - | - |
| C8 | K99 18BR/OR | OXYGEN SENSOR UPSTREAM CONTROL |
| C9 | K512 18RD/YL (4.0L) | OXYGEN SENSOR DOWNSTREAM HEATER RELAY CONTROL |
| C10 | K106 18WT/DG | LEAK DETECTION PUMP SOLENOID CONTROL |
| C11 | V32 18YL/RD (SPEED CONTROL) | SPEED CONTROL ON/OFF SWITCH SENSE |
| C12 | A142 14DG/PK | AUTOMATIC SHUT DOWN RELAY OUTPUT |
| C13 | T10 18YL/DG (A/T) | TORQUE MANAGEMENT REQUEST SENSE |
| C14 | K107 18OR | LEAK DETECTION PUMP SWITCH SENSE |
| C15 | K118 18PK/YL | BATTERY TEMPERATURE SENSOR SIGNAL |
| C16 | K299 18BR/WT | OXYGEN SENSOR HEATER CONTROL |
| C17 | - | - |
| C18 | - | - |
| C19 | K31 18BR | FUEL PUMP RELAY CONTROL |
| C20 | K52 18PK/BK | EVAP/PURGE SOLENOID CONTROL |
| C21 | - | - |
| C22 | C21 18DB/OR (A/C) | A/C SWITCH SENSE |
| C23 | C90 18LG (A/C) | A/C SELECT INPUT |
| C24 | K29 18WT/PK | BRAKE LAMP SWITCH SENSE |
| C25 | K125 18WT/DB | GENERATOR SOURCE |
| C26 | K226 18DB/LG | FUEL LEVEL SENSOR SIGNAL |
| C27 | D21 18PK | SCI TRANSMIT |
| C28 | - | - |
| C29 | D32 18LG/WT | SCI RECEIVE |
| C30 | D25 18VT/YL | PCI BUS |
| C31 | - | - |
| C32 | V37 18RD/LB (SPEED CONTROL) | SPEED CONTROL SWITCH SIGNAL |




RADIATOR FAN MOTOR (2.4L)

**RADIATOR FAN MOTOR (2.4L)**

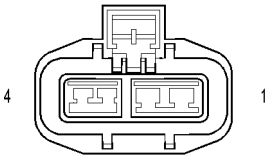
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C23 12DB | FUSED HIGH SPEED RADIATOR RELAY OUTPUT |
| 2 | Z213 12BK | GROUND |




RADIATOR FAN MOTOR CIRCUIT BREAKER (2.4L)

**RADIATOR FAN MOTOR CIRCUIT BREAKER (2.4L)**

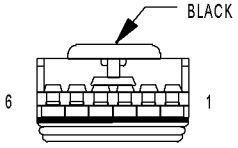
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A | C25 12YL | HIGH SPEED RADIATOR RELAY OUTPUT |
| B | C23 12DB | FUSED HIGH SPEED RADIATOR RELAY OUTPUT |




RADIATOR FAN MOTOR RELAY (2.4L)

**RADIATOR FAN MOTOR RELAY (2.4L)**

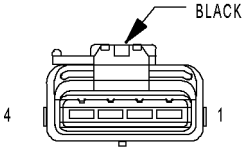
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C24 12DB/PK | FUSED B(+) |
| 2 | C25 12YL | HIGH SPEED RADIATOR RELAY OUTPUT |
| 3 | Z212 18BK | GROUND |
| 4 | K173 18LG | HIGH SPEED RADIATOR RELAY INPUT |




SENTRY KEY IMMOBILIZER MODULE

**SENTRY KEY IMMOBILIZER MODULE**

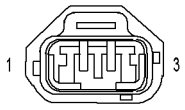
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | - | - |
| 2 | D25 20VT/YL | PCI BUS |
| 3 | - | - |
| 4 | F15 20DB | FUSED IGNITION SWITCH OUTPUT (RUN-START) |
| 5 | Z1 20BK | GROUND |
| 6 | F33 20PK/RD | FUSED B(+) |




SPEED CONTROL SERVO

**SPEED CONTROL SERVO**

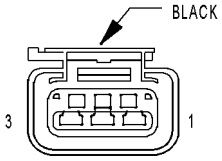
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | V36 18TN/RD | SPEED CONTROL VACUUM SOLENOID CONTROL |
| 2 | V35 18LG/RD | SPEED CONTROL VENT SOLENOID CONTROL |
| 3 | V30 20DB/RD | SPEED CONTROL BRAKE LAMP SWITCH OUTPUT |
| 4 | Z1 18BK | GROUND |




THROTTLE POSITION SENSOR (4.0L)

**THROTTLE POSITION SENSOR (4.0L)**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K7 20OR | 5-VOLT SUPPLY |
| 2 | K4 20BK/LB | SENSOR GROUND |
| 3 | K22 18OR/DB | THROTTLE POSITION SENSOR #1 SIGNAL |

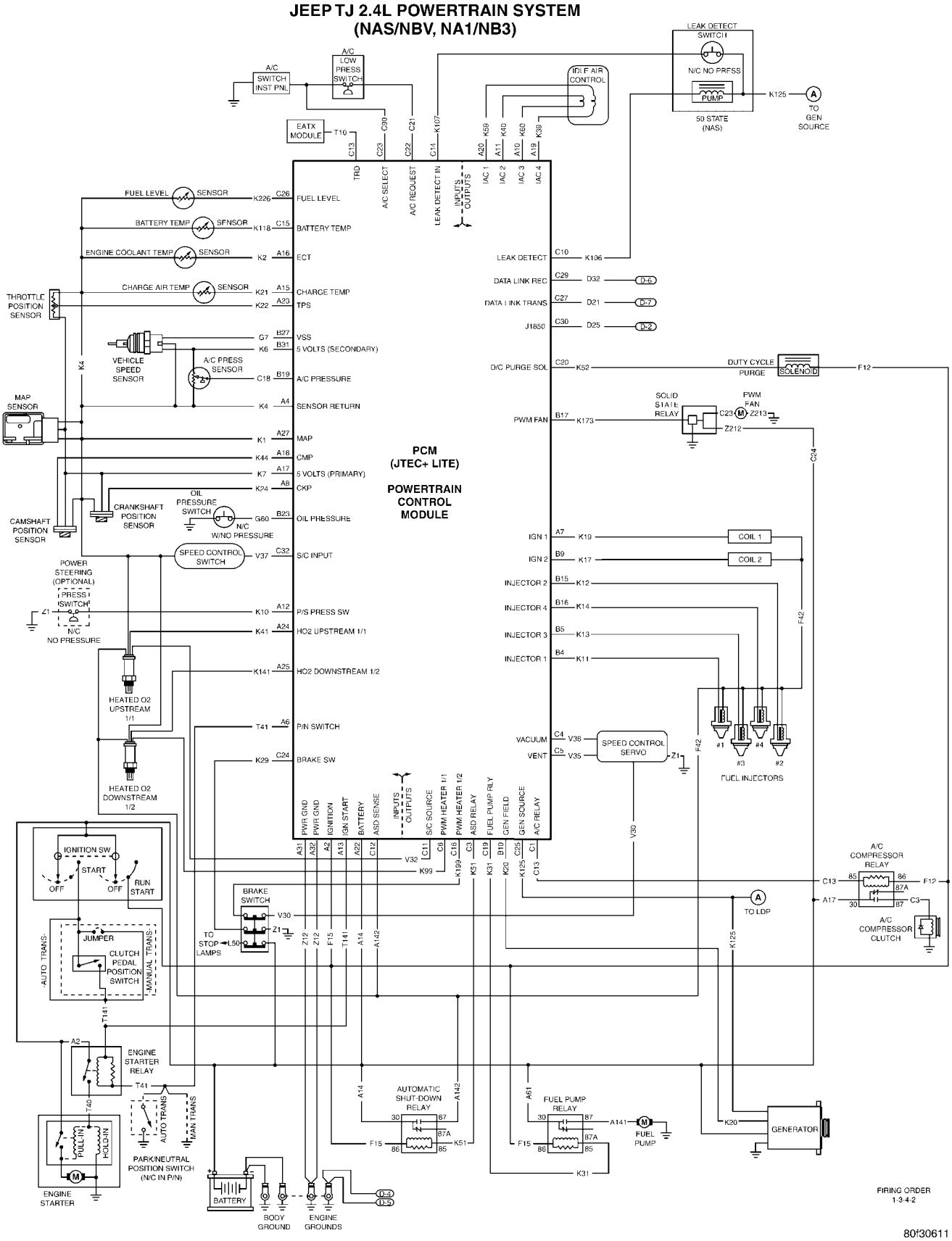



VEHICLE SPEED SENSOR

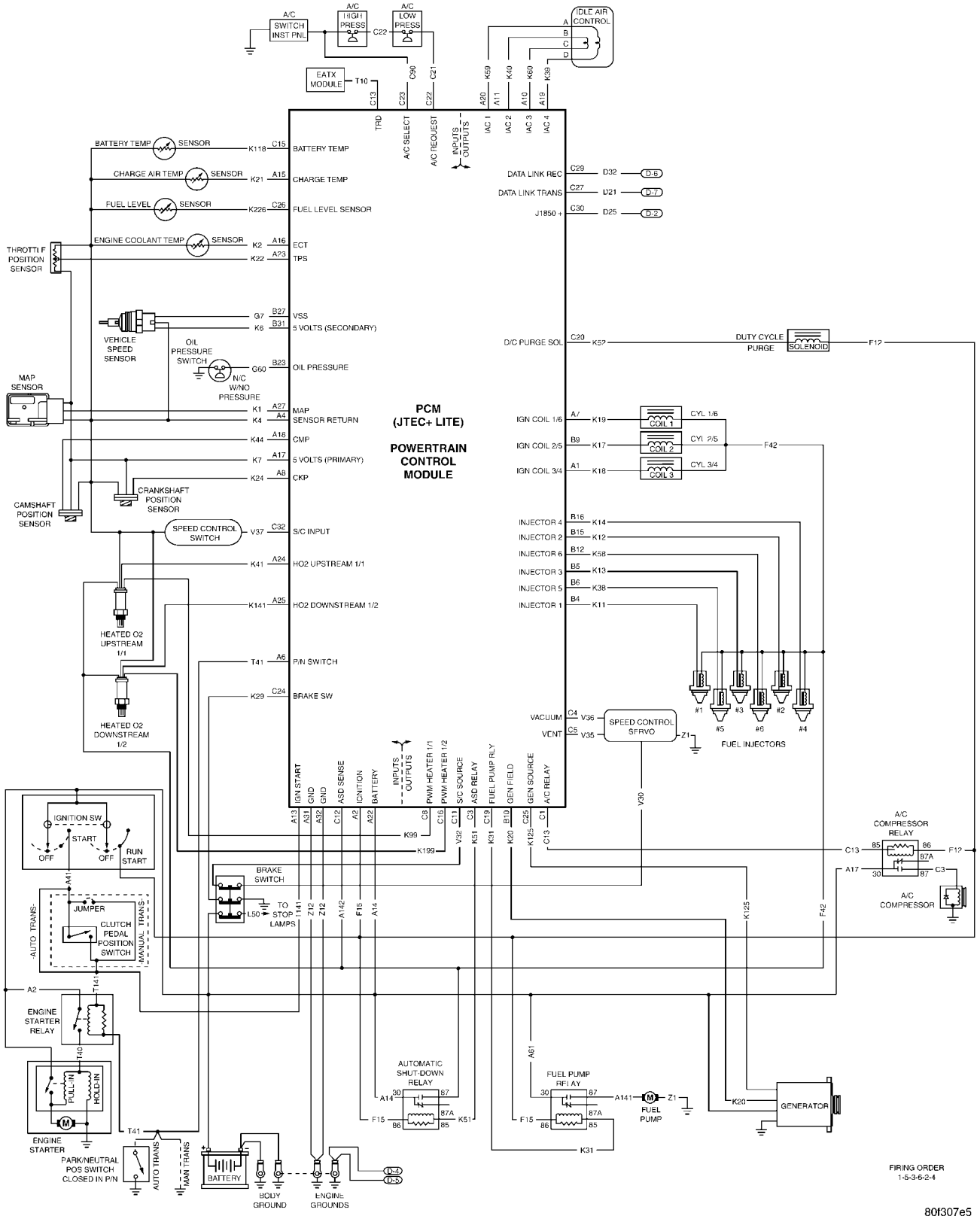
**VEHICLE SPEED SENSOR**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | K6 18VT/WT | 5V SUPPLY |
| 2 | K4 20BK/LB | SENSOR GROUND |
| 3 | G7 18WT/OR | VEHICLE SPEED SENSOR SIGNAL |

# 10.0 SCHEMATIC DIAGRAMS



## JEEP TJ 4.0L POWERTRAIN SYSTEM (NA1/NB3)

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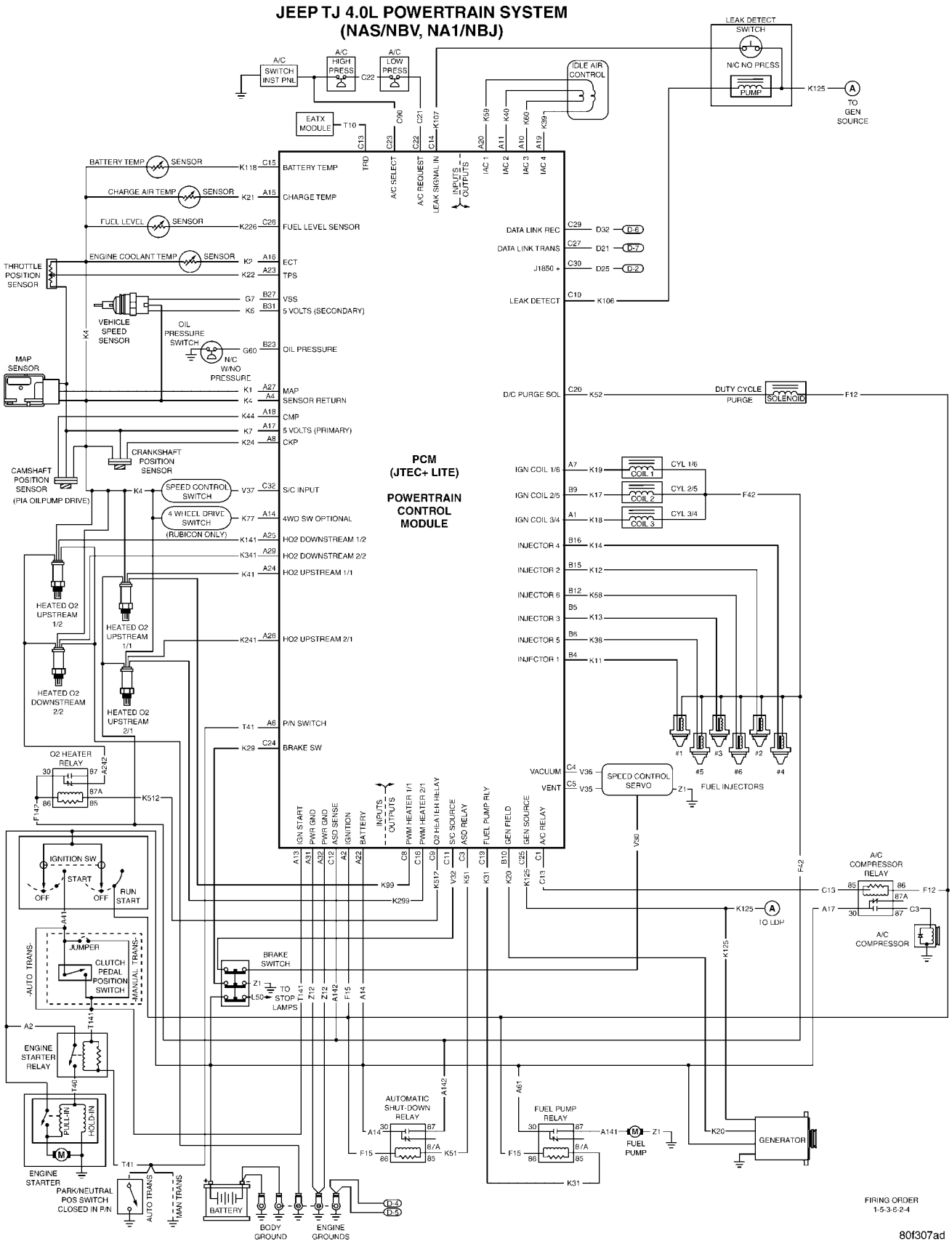
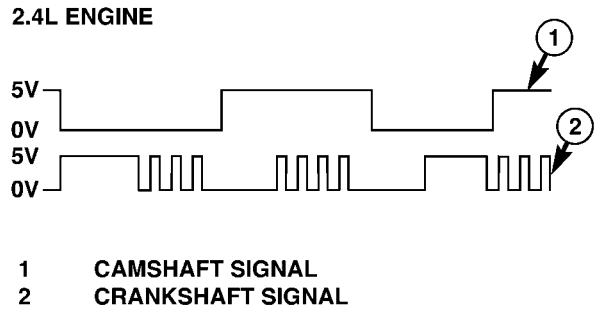

JEEP TJ 4.0L POWERTRAIN SYSTEM
(NAS/NBV, NA1/NBJ)
PCM
(JTEC+ LITE)
POWERTRAIN
CONTROL
MODULE
A/C SWITCH INST PNL
A/C HIGH PRESS
A/C LOW PRESS
EATX MODULE
IDLE AIR CONTROL
LEAK DETECT SWITCH
N/C NO PRESS
PUMP
TO GEN SOURCE
BATTERY TEMP SENSOR
CHARGE AIR TEMP SENSOR
FUEL LEVEL SENSOR
ENGINE COOLANT TEMP SENSOR
THROTTLE POSITION SENSOR
VEHICLE SPEED SENSOR
OIL PRESSURE SWITCH
N/C W/NO PRESSURE
MAP SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
(PIA OILPUMP DRIVE)
SPEED CONTROL SWITCH
4 WHEEL DRIVE SWITCH
(RUBICON ONLY)
HEATED O2 UPSTREAM 1/2
HEATED O2 UPSTREAM 1/1
HEATED O2 DOWNSTREAM 2/2
HEATED O2 UPSTREAM 2/1
O2 HEATER RELAY
IGNITION SW
START
RUN
OFF
JUMPER
CLUTCH PEDAL POSITION SWITCH
AUTO TRANS
MANUAL TRANS
BRAKE SWITCH
TO STOP LAMPS
ENGINE STARTER RELAY
PULL-IN
HOLD-IN
ENGINE STARTER
PARK/NEUTRAL POS SWITCH CLOSED IN P/N
AUTO TRANS
MAN TRANS
BATTERY
BODY GROUND
ENGINE GROUNDS
AUTOMATIC SHUT-DOWN RELAY
FUEL PUMP RELAY
FUEL PUMP
GENERATOR
DUTY CYCLE PURGE SOLENOID
SPEED CONTROL SERVO
FUEL INJECTORS
A/C COMPRESSOR RELAY
A/C COMPRESSOR
FIRING ORDER
1-5-3-6-2-4
80f307ad

## NOTES

# 11.0 CHARTS AND GRAPHS

**2.4L**

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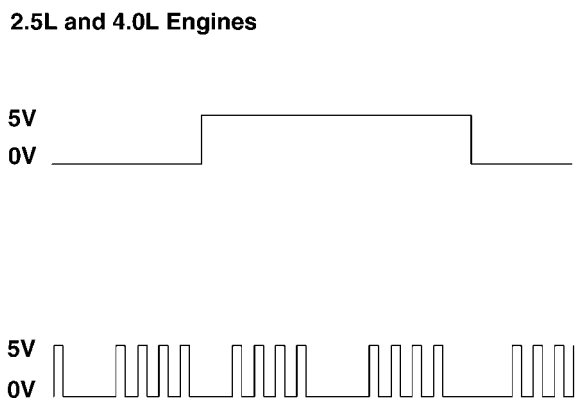
**4.0L**

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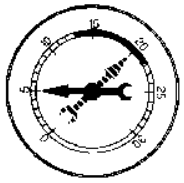
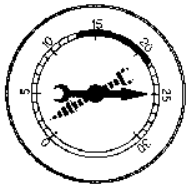
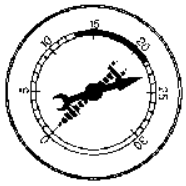
**NORMAL READING RANGE AT IDLE**



**BLOWN HEAD GASKET AT IDLE**



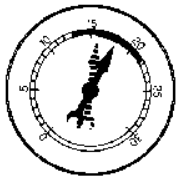
**NORMAL READING RAPID ACCELERATION/ DECELERATION**



**WORN RINGS OR DILUTED OIL RAPID ACCELERATION/ DECELERATION**

**LATE VALVE TIMING, VACUUM LEAK AT IDLE**

**RESTRICTED EXHAUST (DROPS TOWARD ZERO AS ENGINE RPM INCREASES)**



**POOR VALVE SEATING AT IDLE**

**STICKING VALVE AT IDLE**

**WORN VALVE GUIDES (STEADIES AS ENGINE SPEED INCREASES)**

**WORN VALVE SPRINGS (MORE PRONOUNCED AS ENGINE SPEED INCREASES)**

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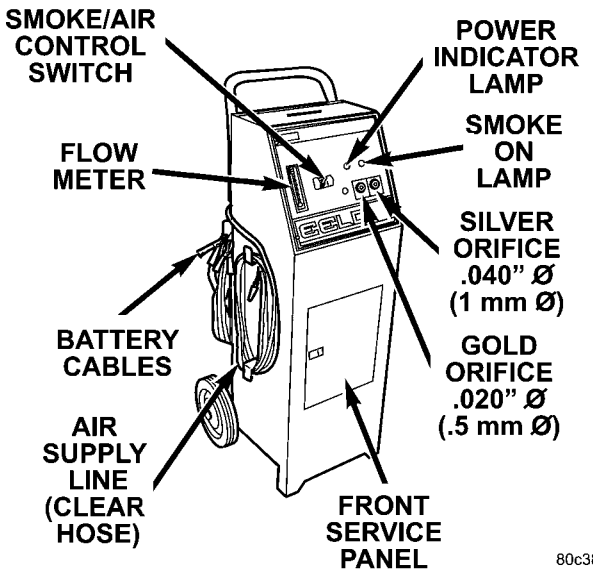


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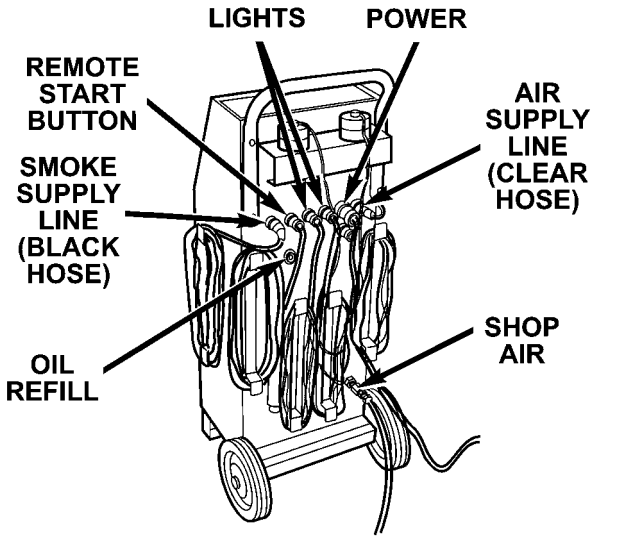


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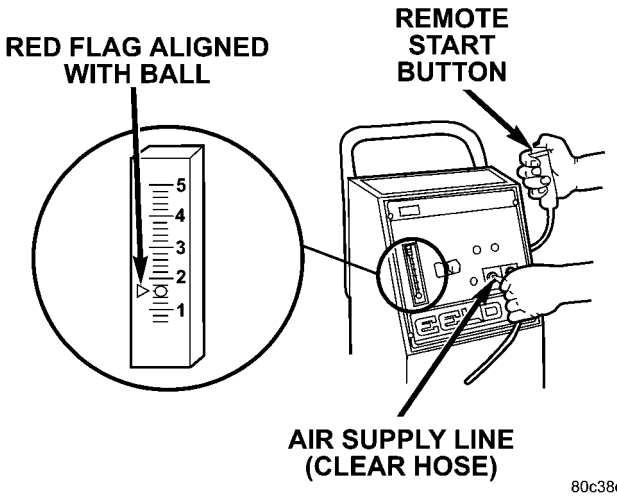
## EELD CALIBRATION

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## O2 SENSOR CONFIGURATION

| | | |
|---|---|---|
| AB 3.9L | 1/1 | UPSTREAM |
| AB 3.9L | 1/2 | DOWNSTREAM |
| | | |
| AB 5.2L | 1/1 | LEFT BANK UPSTREAM |
| AB 5.2L | 1/2 | LEFT BANK DOWNSTREAM |
| AB 5.2L | 2/1 | RIGHT BANK UPSTREAM |
| AB 5.2L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| AB 5.9L | 1/1 | UPSTREAM |
| AB 5.9L | 1/2 | DOWNSTREAM |
| | | |
| AN 2.5L | 1/1 | UPSTREAM |
| AN 2.5L | 1/2 | DOWNSTREAM |
| | | |
| AN 3.9L | 1/1 | UPSTREAM |
| AN 3.9L | 1/2 | DOWNSTREAM |
| | | |
| AN 4.7L | 1/1 | LEFT BANK UPSTREAM |
| AN 4.7L | 1/2 | LEFT BANK DOWNSTREAM |
| AN 4.7L | 2/1 | RIGHT BANK UPSTREAM |
| AN 4.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| AN 5.9L 2WD | 1/1 | LEFT BANK UPSTREAM |
| AN 5.9L 2WD | 1/2 | PRE CATALYST |
| AN 5.9L 2WD | 1/3 | POST CATALYST |
| AN 5.9L 2WD | 2/1 | RIGHT BANK UPSTREAM |
| | | |
| AN 5.9L 4WD | 1/1 | UPSTREAM |
| AN 5.9L 4WD | 1/2 | DOWNSTREAM |
| | | |
| DN 3.9L | 1/1 | UPSTREAM |
| DN 3.9L | 1/2 | DOWNSTREAM |
| | | |
| DN 4.7L | 1/1 | LEFT BANK UPSTREAM |
| DN 4.7L | 1/2 | LEFT BANK DOWNSTREAM |
| DN 4.7L | 2/1 | RIGHT BANK UPSTREAM |
| DN 4.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| DN 5.9L | 1/1 | UPSTREAM |
| DN 5.9L | 1/2 | DOWNSTREAM |
| | | |
| DR 3.7L | 1/1 | UPSTREAM |
| DR 3.7L | 1/2 | DOWNSTREAM |
| | | |
| DR 4.7L | 1/1 | LEFT BANK UPSTREAM |
| DR 4.7L | 1/2 | LEFT BANK DOWNSTREAM |
| DR 4.7L | 2/1 | RIGHT BANK UPSTREAM |
| DR 4.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| DR 5.7L | 1/1 | LEFT BANK UPSTREAM |
| DR 5.7L | 1/2 | LEFT BANK DOWNSTREAM |
| DR 5.7L | 2/1 | RIGHT BANK UPSTREAM |
| DR 5.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| DR 5.9L | 1/1 | UPSTREAM |
| DR 5.9L | 1/2 | DOWNSTREAM |
| | | |
| DR 8.0L | 1/1 | LEFT BANK UPSTREAM |
| DR 8.0L | 1/2 | PRE CATALYST |
| DR 8.0L | 1/3 | POST CATALYST |
| DR 8.0L | 2/1 | RIGHT BANK UPSTREAM |
| | | |
| KJ 2.4L | 1/1 | UPSTREAM |
| KJ 2.4L | 1/2 | DOWNSTREAM |
| | | |
| KJ 3.7L | 1/1 | LEFT BANK UPSTREAM |
| KJ 3.7L | 1/2 | LEFT BANK DOWNSTREAM |
| KJ 3.7L | 2/1 | RIGHT BANK UPSTREAM |
| KJ 3.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| TJ 2.4L | 1/1 | UPSTREAM |
| TJ 2.4L | 1/2 | DOWNSTREAM |
| | | |
| TJ 4.0L | 1/1 | FRONT UPSTREAM |
| TJ 4.0L | 1/2 | FRONT DOWNSTREAM |
| TJ 4.0L | 2/1 | REAR UPSTREAM |
| TJ 4.0L | 2/2 | REAR DOWNSTREAM |
| | | |
| WJ 4.0L | 1/1 | FRONT UPSTREAM |
| WJ 4.0L | 1/2 | FRONT DOWNSTREAM |
| WJ 4.0L | 2/1 | REAR UPSTREAM |
| WJ 4.0L | 2/2 | REAR DOWNSTREAM |
| | | |
| WJ 4.7L | 1/1 | LEFT BANK UPSTREAM |
| WJ 4.7L | 1/2 | LEFT BANK DOWNSTREAM |
| WJ 4.7L | 2/1 | RIGHT BANK UPSTREAM |
| WJ 4.7L | 2/2 | RIGHT BANK DOWNSTREAM |
| | | |
| WJ 5.9L | 1/1 | UPSTREAM |
| WJ 5.9L | 1/2 | DOWNSTREAM |
| | | |
| ZB 8.3L | 1/1 | LEFT BANK UPSTREAM |
| ZB 8.3L | 1/2 | LEFT BANK DOWNSTREAM |
| ZB 8.3L | 2/1 | RIGHT BANK UPSTREAM |
| ZB 8.3L | 2/2 | RIGHT BANK DOWNSTREAM |

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## NOTES