TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

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 2002 Wrangler (TJ) with 2.5L 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 ("XXRE/XXRH" 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 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 • 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 Open Short To Ground Short To Voltage Inputs Checked For Rationality Outputs Checked For Functionality	Done Stop Testing = Yes Oxygen Sensor Heater Oxygen Sensor Response Catalytic Converter Efficiency Except EWMA • up to 6 tests per trip and a one trip fault (SBEC) and a two-trip fault on JTEC EGR System Evaporative Emission System (Purge and Leak) Non-LDP or LDP	**Fuel Control Monitor** Monitors Fuel Control System For: Fuel System Lean Fuel System Rich Requires 3 Consecutive *Fuel System Good Trips* to Extinguish The MIL **Misfire Monitor** Monitors For Engine Misfire at: 4 X 1000 RPM Counter (4000 Revs) (Type B) **200 X 3 (600) RPM Counter (Type A)
Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL*	Requires 3 Consecutive *Global Good Trips* to Extinguish the MIL*	Requires 3 Consecutive *Global Good Trips* To Extinguish the MIL **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.

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

3.2.3 TRANSMISSION CONTROL

The automatic transmission used on this vehicle is a 30RH model, non electronic controlled. Connections to the PCM are limited to the Torque Converter Clutch, Park Neutral Switch, and Vehicle Speed Sensor.

TORQUE CONVERTER ELECTRONICS

The torque converter contains a converter clutch mechanism. The converter clutch is an electronically controlled mechanism that engages in 3rd gear. The PCM grounds the TCC Solenoid Control circuit to lock up the torque converter. The torque converter is not a serviceable component. It should be replaced as an assembly when: diagnosis indicates a malfunction has occurred, or when a major malfunction allows debris to enter the converter.

3.2.4 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)

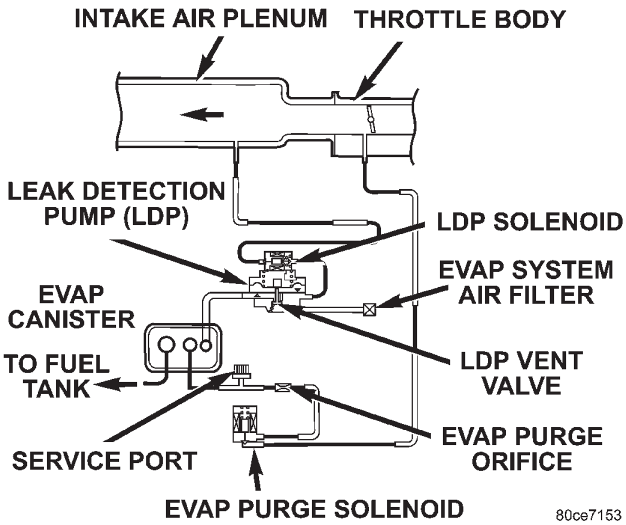
Service Port: Used with special tools like the Miller Evaporative Emissions Leak Detector (EELD) to test for leaks in the system.

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.

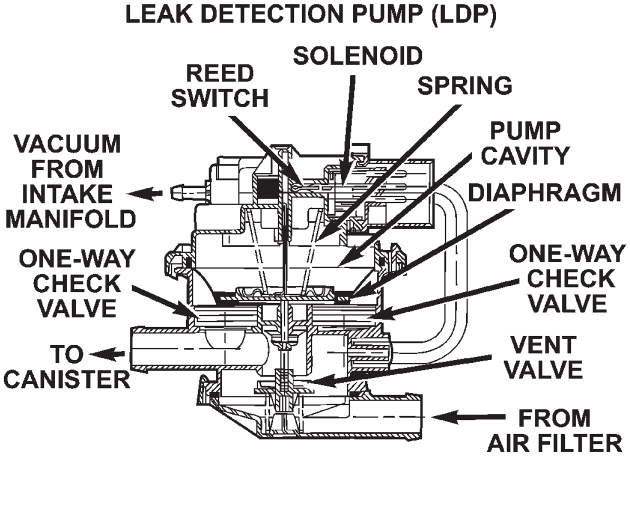


LEAK DETECTION PUMP (LDP) COMPONENTS

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.

LEAK DETECTION PUMP (LDP)

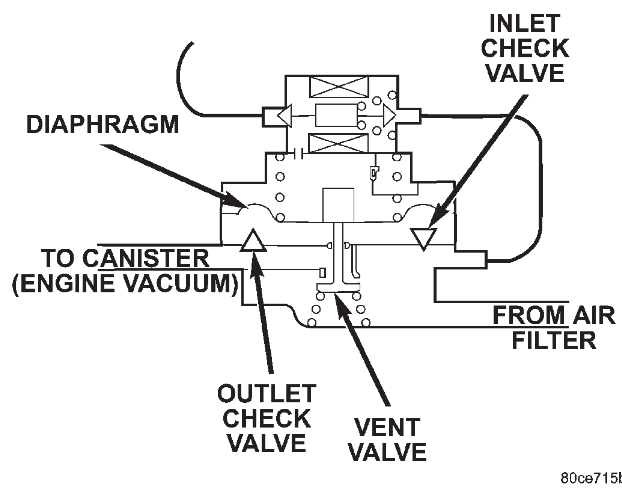


The diaphragm is pulled up by engine vacuum, and pushed down by spring pressure, as the LDP solenoid turns on and off. The LDP also has a magnetic reed switch to signal diaphragm position to the PCM. When the diaphragm is down, the switch is closed, which sends a 12 V (system voltage) signal to the PCM. 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)

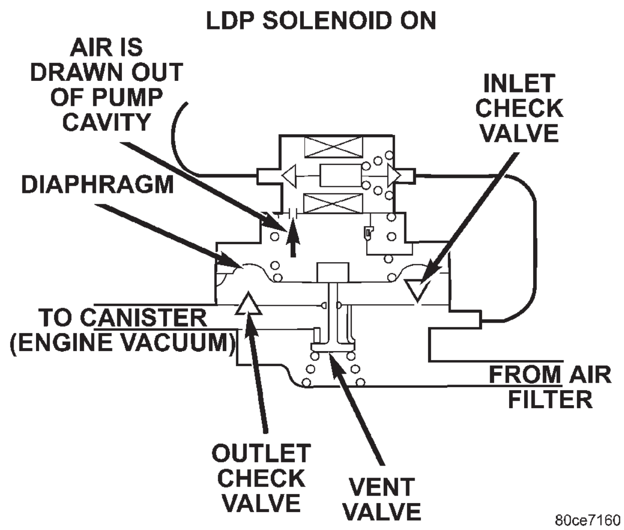
When the LDP is at rest (no electrical/vacuum) the diaphragm is allowed to drop down if the internal (EVAP system) pressure is not greater than the return spring. The LDP solenoid blocks the engine vacuum port and opens the atmospheric pressure port connected through the EVAP system air filter. The vent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

BEFORE START-UP



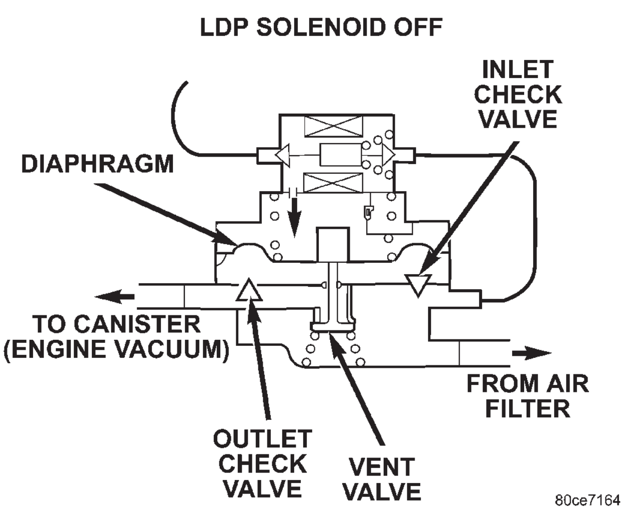
DIAPHRAGM UPWARD MOVEMENT

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 diaphragm, 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

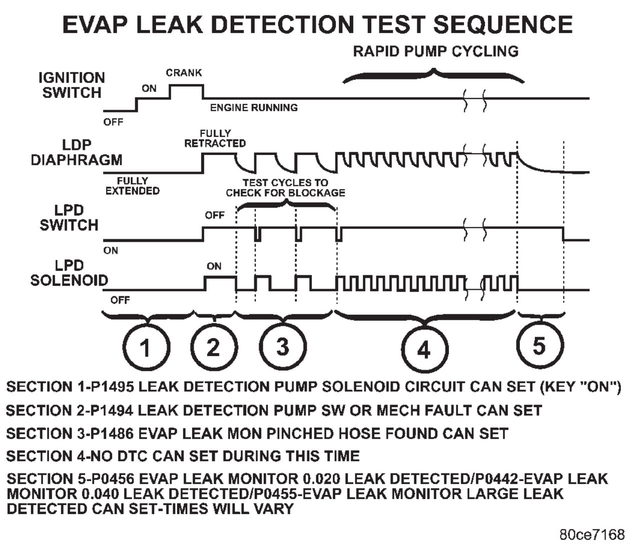


FIGURE 6 SECTION 1

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.

3.2.5 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.

3.2.6 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.

3.2.7 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.

3.2.8 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 transponder 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.

3.2.9 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).

3.2.10 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.

3.2.11 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 HANDLING NO TROUBLE CODE PROBLEMS

Symptom checks cannot be used properly unless the driveability problem characteristic actually happens while the vehicle is being tested.

Select the symptom that most accurately describes the vehicle's driveability problem and then perform the test routine that pertains to this symptom. Perform each routine test in sequence until the problem is found.

SYMPTOM	DIAGNOSTIC TEST
HARD START	CHECKING THE FUEL PRESSURE CHECKING COOLANT SENSOR CALIBRATION CHECKING THROTTLE POSITION SENSOR CALIBRATION CHECKING MAP SENSOR CALIBRATION CHECKING THE MINIMUM IDLE AIR FLOW CHECKING IDLE AIR CONTROL MOTOR OPERATION CHECKING EVAP EMISSION SYSTEM CHECKING IAT SENSOR
ENGINE STALL IN GEAR	CHECK TCC OPERATION
HESITATION/SAG/STUMBLE	CHECKING PCM POWER AND GND CKT CHECKING THE FUEL PRESSURE CHECKING COOLANT SENSOR CALIBRATION CHECKING THROTTLE POSITION SENSOR CALIBRATION CHECKING MAP SENSOR CALIBRATION CHECKING THE MINIMUM IDLE AIR FLOW CHECKING IDLE AIR CONTROL MOTOR OPERATION CHECK EVAP EMISSION SYSTEM
SURGE	CHECKING PCM POWER AND GND CKT CHECKING THE FUEL PRESSURE CHECKING COOLANT SENSOR CALIBRATION CHECKING THROTTLE POSITION SENSOR CALIBRATION CHECKING MAP SENSOR CALIBRATION CHECKING THE MINIMUM IDLE AIR FLOW CHECKING IDLE AIR CONTROL MOTOR OPERATION CHECKING EVAP EMISSION SYSTEM
LACK OF POWER/SLUGGISH	CHECKING PCM POWER AND GND CKT CHECKING THE FUEL PRESSURE CHECKING COOLANT SENSOR CALIBRATION CHECKING THROTTLE POSITION SENSOR CALIBRATION CHECKING MAP SENSOR CALIBRATION CHECKING THE MINIMUM IDLE AIR FLOW CHECKING IDLE AIR CONTROL MOTOR OPERATION

SYMPTOM	DIAGNOSTIC TEST
POOR FUEL ECONOMY	CHECKING PCM POWER AND GND CKT
	CHECKING THE FUEL PRESSURE
	CHECKING COOLANT SENSOR CALIBRATION
	CHECKING THROTTLE POSITION SENSOR CALIBRATION
	CHECKING THE MINIMUM IDLE AIR FLOW
	CHECKING IDLE AIR CONTROL MOTOR OPERATION
	CHECKING EVAP EMISSION SYSTEM
	CHECKING IAT SENSOR

3.3.5 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.

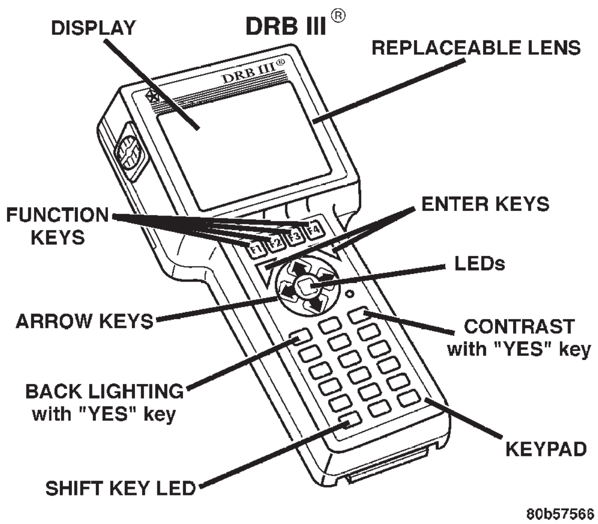
3.5.1 DRBIII® DOES NOT POWER UP

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 in assembly only. Attempting to remove or repair certain system subcomponents 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 0 - 500 volts DC
Ohms (resistance)*	0 - 1.12 megohms

FUNCTION	INPUT LIMIT
Frequency Measured Frequency Generated	0 - 10 kHz
Temperature	-50 - 600°C -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 filler adapter #8382
fuel pressure adapter (C-6631) or #6539
fuel pressure kit (C-4799-B) or #5069
fuel release hose (C-4799-1)
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
EEPROM	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_2Sensor	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:
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
INTERMITTENT CONDITION
GENERATOR FIELD SOURCE (+) CIRCUIT OPEN
GENERATOR FIELD DRIVER CIRCUIT SHORT TO GROUND
GENERATOR FIELD DRIVER CIRCUIT OPEN
GENERATOR FIELD COIL OPEN
GENERATOR FIELD COIL SHORTED
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. Using a 12-volt test light connected to ground, backprobe the Generator Field Driver circuit at the back of the Generator. With the DRBIII®, actuate the Generator Field Driver circuit. Does the test light blink? Yes → Go To 2 No → Go To 3	All
2	**NOTE: The conditions that set this DTC are not present at this time. The following tests may help in identifying the intermittent condition.** Ignition on, engine not running. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. With the DRBIII® actuate the Generator Field Driver circuit. Wiggle the wire harness from the Generator to PCM. With the DRBIII®, read DTCs. Does the DTC return? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All

P0622-GENERATOR FIELD NOT SWITCHING PROPERLY — Continued

TEST	ACTION	APPLICABILITY
3	Ignition on, engine not running. Record all DTCs and freeze frame data. Carefully inspect all Connectors for corrosion or spread Terminals before continuing. With the DRBIII® actuate the Generator Field Driver circuit. Backprobe the Generator Field Source (+) circuit at back of Generator with a volt meter. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open in the Generator Field Source (+) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
4	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Driver circuit in the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field harness connector. **Note: Check Connectors - Clean/repair as necessary.** Measure the resistance of the Generator Field Driver circuit between the PCM harness connector and the Generator Field harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
6	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance across the Generator Field Terminals at the Generator. Is the resistance below 0.5 of an ohm? Yes → Replace the Generator. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 7	All
7	Turn the ignition off. Disconnect the Generator Field harness connector at back of the Generator. **Note: Check connectors - Clean/repair as necessary.** Measure resistance across the Generator Field Terminals at the Generator. Is the resistance above 15 ohms? Yes → Repair the Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 8	All

P0622-GENERATOR FIELD NOT SWITCHING PROPERLY — Continued

TEST	ACTION	APPLICABILITY
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom:
P1492-AMBIENT/BATT TEMP SENSOR VOLTS TOO HIGH

When Monitored and Set Condition:

P1492-AMBIENT/BATT TEMP SENSOR VOLTS TOO HIGH

When Monitored: With the ignition key on.

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
AMBIENT/BATT SIGNAL CIRCUIT SHORT TO 12-VOLTS
AMBIENT/BATT SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
AMBIENT/BATT TEMPERATURE SENSOR
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, monitor the Ambient Battery Temperature Sensor voltage. Is the voltage above 4.8 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the AMBIENT/BATT harness connector. **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.** Start the engine. Allow the engine to idle. Measure the voltage of the AMBIENT/BATT Signal circuit at the AMBIENT/BATT harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the AMBIENT/BATT Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All

P1492-AMBIENT/BATT TEMP SENSOR VOLTS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the AMBIENT/BATT harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the AMBIENT/BATT Signal circuit between the AMBIENT/BATT harness connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the AMBIENT/BATT Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
4	Turn the ignition off. Disconnect the AMBIENT/BATT Temperature Sensor harness connector. Disconnect PCM harness connector. Measure the resistance in the Sensor ground circuit from the PCM harness connector to the Sensor connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
5	Turn the ignition off. Disconnect the AMBIENT/BATT Temperature Sensor connector. Ignition on, engine not running. With the DRBIII® in sensors, read the Ambient/Bat Tmp Vlt value. Connect a jumper wire between the AMB/BATT Signal circuit and the Sensor Ground circuit at the AMB\BATT connector. Did the Ambient/Batt Temp voltage value change from greater than 4.5 volts to less than 1.0 volt? Yes → Replace the AMBIENT/BATT Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

P1492-AMBIENT/BATT TEMP SENSOR VOLTS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Ambient/Batt signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All

Symptom:
P1493-AMBIENT/BATT TEMP SEN VOLTS TOO LOW

When Monitored and Set Condition:

P1493-AMBIENT/BATT TEMP SEN VOLTS TOO LOW

When Monitored: With the ignition on.

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
AMBIENT/BATT TEMPERATURE SENSOR
AMBIENT/BATT TEMP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
AMBIENT/BATT TEMPERATURE SIGNAL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs and record the related Freeze Frame information. With DRBIII®, monitor Ambient/Battery Temperature Sensor volts. Is the voltage below 0.5 of a volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the AMBIENT/BATT harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the AMBIENT/BATT Temperature Sensor Signal circuit in the AMBIENT/BATT Temperature Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the AMBIENT/BATT Temperature Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All

P1493-AMBIENT/BATT TEMP SEN VOLTS TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the AMBIENT/BATT Temperature Sensor harness connector. Disconnect the PCM harness connectors. Measure the resistance between the AMBIENT/BATT Temperature Sensor Signal circuit and the sensor ground circuit at the AMBIENT/BATT Temp Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the AMBIENT/BATT Temperature Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 4	All
4	Ignition on, engine not running. With the DRBIII® in sensors, read the Ambient/Batt TMP VLT value. Disconnect the AMBIENT/BATT Temperature Sensor harness connector. Did the Ambient/Batt Temperature Voltage value change from below 1.0 volt to above 4.5 volts? Yes → Replace the AMBIENT/BATT Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Ambient/Batt Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	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
TARGET VOLTAGE DIFFERS FROM BATTERY VOLTAGE
INTERMITTENT CONDITION
AMBIENT/BATT TEMPERATURE SENSOR
GENERATOR FIELD COIL SHORT TO GROUND
GENERATOR FIELD SHORT TO GROUND
POWERTRAIN CONTROL MODULE

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.** Ignition on, engine not running. With DRBIII®, actuate the Generator Field Driver. With a 12-volt test light connected to ground, backprobe the Generator Field Driver circuit in the back of Generator Field harness connector. Does the test light illuminate brightly and flash? Yes → Go To 2 No → Go To 6	All
2	Ignition on, engine not running. With the DRBIII®, actuate the Generator Field Driver. With DRBIII®, stop the Generator Field Driver actuation. With DRBIII®, read the Target Charging voltage. Is the Target Charging voltage above 13 volts? Yes → Go To 3 No → Go To 4	All

P1594-CHARGING SYSTEM VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Start the engine. With the DRBIII®, manually set the engine speed to 1600 RPM. With DRBIII®, read both the Battery voltage and the Target Charging voltage. Compare the Target Charging Voltage to the Battery Voltage reading. Monitor voltage for 5 minutes, if necessary. Was there ever more than a 1.0 volt difference between Battery voltage and Target Charging Voltage? Yes → Replace the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
4	Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the AMBIENT/BATT temperature. Using a thermometer measure under hood temperature near Battery tray. Is the thermometer temperature within 10 deg of DRBIII® Battery temperature? Yes → Go To 5 No → Replace the AMBIENT/BATT Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
5	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRB Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All
6	Turn the ignition off. Disconnect the PCM harness connector. Disconnect the Field Harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between Ground and the Generator Field Driver circuit at the Generator connector. Is the resistance below 100 ohms? Yes → Repair or replace the shorted Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 7	All

P1594-CHARGING SYSTEM VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance between Ground and the Generator Field Driver Circuit in the PCM harness connector. Is the resistance below 100 ohms? Yes → Replace or repair the Generator Field Coil for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	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
AMBIENT/BATT TEMPERATURE SENSOR
INTERMITTENT CONDITION
B (+) CIRCUIT HIGH RESISTANCE
GENERATOR GROUND HIGH RESISTANCE
GENERATOR FIELD SOURCE (+) CIRCUIT OPEN
GENERATOR FIELD SOURCE CIRCUIT SHORTED TO GROUND
GENERATOR FIELD DRIVER CIRCUIT OPEN
GENERATOR FIELD COIL HIGH RESISTANCE
PCM, DRIVER CIRCUIT

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: Battery must be fully charged and capable of passing a battery load test.** **Note: Generator Belt tension and condition must be checked before continuing.** **NOTE: Inspect the vehicle for any aftermarket accessories that may exceed the maximum Generator output.** **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.** Start the engine. With theDRBIII®, read the target charging voltage. Is the target charging voltage above 15.1 volts? Yes → Go To 2 No → Go To 4	All

P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. **Note: Battery must be fully charged.** **Note: Generator Belt tension and condition must be checked before continuing.** Start the engine. Allow the engine to reach normal operating temperature. With the DRBIII® in sensors, read the AMBIENT/BATT TEMP DEG. Using a Thermometer, measure under hood temperature. Is the temperature within 10 F degrees of Battery temperature? Yes → Go To 3 No → Replace the Ambient/Batt Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
3	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STANK IN A DIRECT LINE WITH THE FAN. SO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and /or a DTC to set. Review the DRB Freeze Frame information. If possible, try to duplicate the condition under which the DTC was set. Refer to any Technical Service Bulletins (TSB's) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All
4	Ignition on, engine not running. Measure the voltage between the Generator B(+) Terminal and the Battery (+) Post. **Caution: Ensure all wires are clear of the engine's moving parts.** Start the engine. Is the voltage above 0.4 of a volt? Yes → Repair the high resistance in the B(+) Circuit between the Generator and Battery. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All

P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
5	Start the engine. **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.** Warm the engine to operating temperature. **Caution: Ensure all wires are clear of the engine's moving parts.** Measure the voltage between the Generator case and Battery (-) Post. Is the voltage above 0.1 of a volt? Yes → Repair the high resistance in the Generator Ground circuit between the Generator Case and Battery (-) side. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 6	All
6	Ignition on, engine not running. Record all DTCs and freeze frame data, now erase Codes. Carefully inspect all Connectors for corrosion or spread Terminals before continuing. With the DRBIII® actuate the Generator Field Driver circuit. While backprobing, measure the voltage of the Generator Field Source (+) circuit at back of Generator. Is the voltage above 10.0 volts? Yes → Go To 7 No → Repair the open in the Generator Field Source (+) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
7	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the generator field harness connector. Measure the resistance between ground and the Generator Field Source circuit in the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Generator Field Source circuit and replace the PCM. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 8	All
8	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field harness connector. **Note: Check Connectors - Clean/repair as necessary.** Measure the resistance of the Generator Field Driver circuit between the PCM harness connector and the Generator harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

P1682-CHARGING SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the Generator Field harness connector at back of the Generator. **Note: Check connectors - Clean/repair as necessary.** Measure resistance across the Generator Field Terminals at the Generator. Is the resistance above 15 ohms? Yes → Replace or repair the Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 10	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

Symptom:
*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS

POSSIBLE CAUSES
GENERATOR BELT CONDITION
DTC RESET
WIRE HARNESS INSPECTION
B (+) CIRCUIT HIGH RESISTANCE
GENERATOR FIELD SOURCE (+) CIRCUIT OPEN
GENERATOR FIELD COIL HIGH RESISTANCE
GENERATOR FIELD DRIVER CIRCUIT OPEN
GENERATOR GROUND HIGH RESISTANCE
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Verify that the Battery is able to pass a load test before continuing.** Ignition on, engine not running. With the DRBIII®, read the Battery voltage and record the results. Measure Battery voltage B(+) to B(-) Terminal and record the results. Compare the two voltage readings. Is the voltage difference less than one volt? Yes → Go To 2 No → Go To 8	All
2	Ignition on, engine not running. Measure the voltage between the Generator B(+) Terminal and the Battery (+) Post. **Caution: Ensure all wires are clear of the engine's moving parts.** Start the engine. Is the voltage above 0.4 of a volt? Yes → Repair the high resistance in the B(+) Circuit between the Generator and Battery . Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 3	All
3	Ignition on, engine not running. Record all DTCs and freeze frame data, now erase Codes. Carefully inspect all Connectors for corrosion or spread Terminals before continuing. With the DRBIII® actuate the Generator Field Driver circuit. While backprobing, measure the voltage of the Generator Field Source (+) circuit at back of Generator. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the Generator Field Source (+) circuit for an open or short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
4	Start the engine. Warm the engine to operating temperature. **Caution: Ensure all wires are clear of the engine's moving parts.** Measure the voltage between the Generator case and Battery (-) Post. Is the voltage above 0.1 of a volt? Yes → Repair high resistance in the Generator Ground circuit between the Generator Case and Battery (-) side. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 5	All
5	Turn the ignition off. Disconnect the Generator Field harness connector at back of the Generator. **Note: Check connectors - Clean/repair as necessary.** Measure resistance across the Generator Field Terminals at the Generator. Is the resistance above 15 ohms? Yes → Replace or repair the Generator as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 6	All
6	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the Generator Field harness connector. **Note: Check Connectors - Clean/repair as necessary.** Measure the resistance of the Generator Field Driver circuit between the PCM harness connector and the Generator harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Generator Field Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
8	Turn the ignition off. **NOTE: Battery condition must be verified prior to this test.** Inspect the Generator Belt tension and condition. Is the Generator Belt OK? Yes → Go To 9 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All

*CHECKING CHARGING SYSTEM OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
9	Ignition on, engine not running. With the DRBIII®, actuate the Generator Field. Using a 12-volt test light, backprobe the Generator Field Driver Terminal at the back of the Generator. **Note: The test light should blink On and Off every 1.4 seconds.** While monitoring the 12-volt test light, wiggle the Field Terminals back to the PCM and ASD Relay. Was there any interruption in the normal cycle of the test light? Yes → Repair the wire or connector where the wiggling interrupted the voltage cycle. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Go To 10	All
10	Start the engine. Turn on all accessories. Raise engine speed to 2000 RPM for 30 seconds then return to idle. With the DRBIII®, read DTCs. Are there any "Charging System" Trouble Codes? Yes → Refer to Symptom list for the related Charging DTCs. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	All

Symptom:
*CHECKING THE AMBIENT/BATTERY TEMPERATURE SENSOR

POSSIBLE CAUSES
AMBIENT/BATT (OUT OF CALIBRATION)
AMBIENT/BATT TEMPERATURE SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII® in sensors, read the Ambient/Bat Tmp Deg value and record the reading. Using a temperature probe, measure the air temperature near the AMBIENT/BATT Temp Sensor. Is the recorded AMBIENT/BATT temperature value within 10° of the temperature probe reading? Yes → Go To 2 No → Replace the AMBIENT/BATT Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3.	All
2	Turn the ignition off. Disconnect the AMBIENT/BATT harness Connector. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper across the Terminals of the AMBIENT/BATT (harness side). Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the AMBIENT/BATT voltage. Is the voltage reading equal to zero? Yes → Replace the AMBIENT/BATT temperature sensor. Perform POWERTRAIN VERIFICATION TEST VER - 3. No → Test Complete.	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. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
P1685 WRONG OR INVALID KEY MSG RECEIVED FROM SKIM

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

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the PCM DTCs. Look for P1685. Is the Starts Since Set counter for DTC P1685 displayed and equal to 0? Yes → Go To 2 No → Go To 7	All
2	With the DRBIII®, attempt to communicate with the SKIM. Turn the ignition on. Can the DRB III® communicate with the SKIM? Yes → Go To 3 No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category. Perform SKIS VERIFICATION.	All
3	Turn the ignition on. With the DRB III®, check for SKIM DTCs. Are any DTCs present in the SKIM? Yes → Repair all SKIM DTCs. Perform SKIS VERIFICATION. No → Go To 4	All
4	Turn the ignition on. With the DRB III®, display the VIN that is programmed in the PCM. Has a VIN been programmed into the PCM? Yes → Go To 5 No → Program the correct VIN into the PCM and retest. Perform SKIS VERIFICATION.	All
5	Turn the ignition on. With the DRB III®, display the VIN that is programmed in the PCM. Was the correct VIN programmed into the PCM? Yes → Go To 6 No → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All

P1685 WRONG OR INVALID KEY MSG RECEIVED FROM SKIM — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Turn the ignition on. With the DRB III®, erase all SKIM and PCM DTCs. Attempt to start and idle the engine. With the DRB III®, read the PCM DTCs. Does the DRB III® display this code? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. 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.** **NOTE: All keys that the customer uses for this vehicle must be tested to verify they are operating properly.** **NOTE: Ensure the customer is not attempting to use a non-SKIM duplicate key.** Turn the ignition on. Verify the correct VIN is programmed into the PCM and SKIM. Turn the ignition off. With the next customer key turn the ignition key on and crank the engine to start. With the DRB III®, read the PCM DTCs. Look for P1685 Is the Starts Since Set counter for DTC P1685 displayed and equal to 0? Yes → Replace the Ignition Key. Perform SKIS VERIFICATION. No → Test Complete. **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
SKIM/PCM
INTERMITTENT CONDITION
LOSS OF SKIM COMMUNICATION
PCI BUS CIRCUIT OPEN FROM PCM TO SKIM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB III®, read the PCM DTCs. Look for P1686. Is the Starts Since Set counter on the DTC screen for P1686 equal to Zero? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition on. With the DRB III, attempt to communicate with the SKIM. **NOTE: This test will indicate if the Bus is operational from the DLC to the SKIM.** Was the DRB III able to communicate with the SKIM? Yes → Go To 3 No → Refer to symptom BUS +/- SIGNAL OPEN FROM SKIM in the COMMUNICATION category. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the SKIM harness connector. Measure the resistance of the PCI Bus circuit between the PCM harness connector and the SKIM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PCI Bus circuit between the PCM and the SKIM for an open. Perform SKIS VERIFICATION.	All
4	Turn the ignition off. Replace the Sentry Key Immobilizer Module in accordance with the Service Information. Turn the ignition on. Display and erase all PCM and SKIM DTCs. Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle. With the DRBIII®, display PCM DTCs. Does the DRBIII® display the same DTC? Yes → Replace and program the PCM in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All

P1686 NO SKIM BUS MESSAGE RECEIVED — Continued

TEST	ACTION	APPLICABILITY
5	**WARNING: KEEP CLEAR OF THE ENGINE'S MOVING PARTS.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform SKIS VERIFICATION. 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
INTERMITTENT CONDITION
COMMUNICATE WITH CLUSTER
INSTRUMENT CLUSTER OPERATION
PCM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTCs. Cycle the ignition key on and off several times. With the DRBIII®, read DTC's. Does the DTC reset? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, attempt to communicate with the Instrument cluster. Can communication be established with the Instrument Cluster? Yes → Go To 3 No → Refer to the Communication Category and perform the appropriate symptom related to no communication with cluster. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Start the engine Allow the engine to idle. Is the correct engine speed display in the instrument cluster (Tach)? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Refer to the Instrument Category and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

P1687-NO CLUSTER BUS MESSAGE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Test Complete.	All

Symptom:

P1696-PCM FAILURE EEPROM WRITE DENIED

POSSIBLE CAUSES
PCM FAILURE

Repair Instructions:

PCM FAILURE

Replace and program the Powertrain Control Module in accordance with the Service Information.

Perform POWERTRAIN VERIFICATION TEST VER - 5.

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

Symptom:
*NO RESPONSE FROM PCM (SCI ONLY)

POSSIBLE CAUSES
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
CHECK PCM POWERS AND GROUNDS
CONTROLLER ANTILOCK BRAKE
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. Did the vehicle pass this test? Yes → Go To 2 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Is this vehicle equipped with antilock brakes? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRB from the DLC. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Go To 6	All
4	Turn the ignition off. Disconnect the CAB harness connectors. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Transmit circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Controller Antilock Brake in accordance with the service information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM (SCI ONLY) — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRBIII® from the DLC. Measure the resistance between ground and the SCI Transmit circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Transmit circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 6	All
6	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRBIII® from the DLC. Measure the resistance between ground and the SCI Receive circuit. Is the resistance below 5.0 ohms? Yes → Repair the SCI Receive circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRBIII® from the DLC. Measure the resistance of the SCI Receive circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the SCI Receive circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
8	Turn the ignition off. Disconnect the PCM C3 harness connector. Disconnect the DRBIII® from the DLC. Measure the resistance of the SCI Transmit circuit between the PCM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the SCI Transmit circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
9	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. 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.** **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.** Turn the ignition on. Using the DRB, attempt to communicate with the following control modules: Airbag Control Module SKIM (SENTRY KEY IMMOBILIZER) MIC (INSTRUMENT CLUSTER) Was the DRBIII® able to communicate with one or more Module(s)? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: If the DRB can not communicate with a single module, refer to the category list for the related symptom.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All
3	Turn the ignition off. Disconnect the PCM harness connector. Disconnect the DRB from the Data Link Connector (DLC). Disconnect the negative battery cable. Measure the resistance of the PCI Bus circuit between the Data Link Connector (DLC) and the PCM connector. Is the resistance below 5.0 ohms? Yes → Go To 4 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.** Turn the ignition on. Measure the voltage of the PCI Bus circuit at the Data Link Connector (DLC). Is the voltage above 1.5 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Using a voltmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. **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.** Turn the ignition on. While monitoring the voltmeter, disconnect each module the vehicle is equipped with one at a time. Is the voltage steadily above 1.5 volts with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. 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. Disconnect the negative battery cable. Using a ohmmeter, connect one end to the PCI Bus circuit at the DLC, and the other end to ground. While monitoring the ohmmeter, disconnect each module the vehicle is equipped with one at a time. Is the resistance below 1000.0 ohms with all the modules disconnected? Yes → Repair the PCI Bus circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to ground was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

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

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

When Monitored and Set Condition:

P0031-1/1 O2 SENSOR 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.

P0032-1/1 O2 SENSOR 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.

P0037-1/2 O2 SENSOR 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.

P0038-1/2 O2 SENSOR 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.

P0051-2/1 O2 SENSOR 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.

P0052-2/1 O2 SENSOR 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.

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

POSSIBLE CAUSES
FUSED ASD RELAY FEED CIRCUIT OPEN
HEATER CONTROL CIRCUIT OPEN
INTERMITTENT CONDITION
HEATER ELEMENT CHECK
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater test. Monitor the O2 Heater Voltage for 5 minutes. Did the voltage drop down close to zero during the Heater test? Yes → Go To 2 No → Go To 3	All
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
3	Disconnect the O2 Sensor harness connector. Measure the resistance of the O2 Heater element at the O2 Sensor connector(component side). **NOTE: The resistance value increases with temperature.** Is the resistance between 4.0 and 5.0 ohms at 70° F(21.1°C)? Yes → Go To 4 No → Replace the O2 sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

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

TEST	ACTION	APPLICABILITY
4	Disconnect the O2 Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor to the PCM harness connector.. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the controlled ground circuit for high resistance or an open. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Disconnect the O2 Sensor harness connector. Ignition on, engine not running. Measure the voltage of the Fused ASD Relay feed circuit. Is the voltage above 12.0 volts? Yes → Go To 6 No → Repair the open in the Fused ASD Relay feed circuit. Inspect the related fuse, an open fuse may be caused by a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0071-BATTERY TEMP SENSOR PERFORMANCE

When Monitored and Set Condition:

P0071-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
INTERMITTENT CONDITION
BATTERY TEMPERATURE SENSOR VOLTAGE BELOW 1.0 VOLT
SENSOR GROUND CIRCUIT HIGH RESISTANCE
BATTERYTEMPERATURE SENSOR SIGNAL CIRCUIT HIGH RESISTANCE
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read the Battery Temp Sensor voltage. Is the voltage above 4.6 volts? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Using a jumper, connect the terminals of the Ambient Temperature Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read the Battery Temperature Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the Battery Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0071-BATTERY TEMP SENSOR PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop test by back probing the Sensor ground circuit at the Ambient Temperature Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the high resistance in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop test by back probing the Battery Temperature Sensor Signal circuit at the Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 6 No → Repair the high resistance in the Battery Temperature Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Battery Temp Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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 SIGNAL CIRCUIT SHORTED TO GROUND
INTERMITTENT CONDITION
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5 VOLT SUPPLY CIRCUIT OPEN
MAP SENSOR INTERNAL FAILURE
PCM 5 VOLT SUPPLY CIRCUIT
PCM MAP SENSOR SIGNAL

TEST	ACTION	APPLICABILITY
1	Start the engine. With the DRBIII®, read the MAP Sensor voltage. Is the voltage below 0.1 of a volt? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 6	All
3	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the MAP Sensor voltage. Is the voltage above 1.2 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0107-MAP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance in the 5 Volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0107-MAP SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: The conditions that set the DTC are not present at this time. The following list below may help in indentifying the intermittent condition.** **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.** While the engine is running at normal operating temperatures, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible try and duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the MAP Sensor Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
MAP SENSOR SIGNAL CIRCUIT SHORTED TO 5 VOLT SUPPLY CIRCUIT
MAP SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
MAP SENSOR INTERNAL FAILURE
MAP SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Start the engine. With the DRBIII®, read the MAP Sensor voltage. Is the voltage above 4.6 volts? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the MAP Sensor Signal circuit and the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to the 5 Volt Supply circuit in the MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0108-MAP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the MAP Sensor Signal circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the MAP Sensor harness connector. Connect a jumper wire between the MAP Sensor Signal circuit and the Sensor ground circuit. Ignition on, engine not running. With the DRBIII®, monitor the MAP Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the MAP Sensor Signal circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Sensor ground circuit from the PCM harness connector to the MAP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0108-MAP SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The conditions that set the DTC are not present at this time. The following list below may help in indentifying the intermittent condition.** **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.** While the engine is running at normal operating temperatures, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible try and duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the MAP Sensor Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
IAT SENSOR VOLTAGE BELOW 1.0 VOLT
SENSOR GROUND CIRCUIT HIGH RESISTANCE
IAT SENSOR SIGNAL CIRCUIT HIGH RESISTANCE
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Inlet Air Temperature Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage above 4.6 volts? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the Intake Air Temperature Sensor harness connector. Using a jumper wire, jumper across the IAT Sensor harness connector. Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage below 1.0 volt? Yes → Replace the Intake Air Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0111-INTAKE AIR TEMP PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop test by back probing the Sensor ground circuit at the IAT Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the high resistance in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Perform a voltage drop test by back probing the IAT Sensor Signal circuit at the IAT Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 6 No → Repair the high resistance in the IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Intake Air Temp Signal circuit at the Sensor connector and PCM connector. Turn the ignition on and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0112-INTAKE AIR TEMP SENSOR VOLTAGE LOW

When Monitored and Set Condition:

P0112-INTAKE AIR TEMP SENSOR VOLTAGE 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
INTERMITTENT CONDITION
IAT SENSOR INTERNAL FAILURE
IAT SENSOR SIGNAL SHORTED TO GROUND
IAT SENSOR SIGNAL SHORTED TO SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage below 1.0 volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the IAT harness connector. Ignition on, engine not running. With the DRBIII®, read IAT voltage. Is the voltage above 1.0 volt? Yes → Replace the IAT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the IAT Sensor Signal circuit in the IAT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0112-INTAKE AIR TEMP SENSOR VOLTAGE LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the IAT Sensor Signal circuit and the Sensor ground circuit at the IAT Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list below may help in indentifying the intermittent condition.** **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.** While the engine is running at normal operating temperatures, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible try and duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Intake Air Temp Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0113-INTAKE AIR TEMP SENSOR VOLTAGE HIGH

When Monitored and Set Condition:

P0113-INTAKE AIR TEMP SENSOR VOLTAGE 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
INTERMITTENT CONDITION
IAT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
IAT SENSOR INTERNAL FAILURE
IAT SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the IAT voltage. Is the voltage above 4.8 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the IAT Sensor harness connector. Start the engine and allow it to idle. Measure the voltage on the IAT Sensor Signal circuit. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the IAT harness connector. Connect a jumper wire between the IAT Sensor Signal circuit and the Sensor ground circuit in the IAT harness connector. Ignition on, engine not running. With the DRBIII®, read IAT voltage. Is the voltage below 1.0 volt? Yes → Replace the IAT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0113-INTAKE AIR TEMP SENSOR VOLTAGE HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the PCM harness connector (s). Measure the resistance of the IAT Sensor Signal circuit from the IAT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the IAT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Sensor ground circuit from the IAT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and Miller special tool # 6801, backprobe the IAT Signal circuit at the IAT Sensor and the PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0117-ECT SENSOR VOLTAGE TOO LOW

When Monitored and Set Condition:

P0117-ECT 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) Sensor circuit voltage at the PCM goes below 0.8 of a volt for more than 3 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECT SENSOR INTERNAL FAILURE
ECT SENSOR SIGNAL SHORTED TO GROUND
ECT SENSOR SIGNAL SHORTED TO SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the ECT Sensor voltage. Is the ECT Sensor voltage below 1.0 volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the ECT harness connector. Ignition on, engine not running. With the DRBIII®, read ECT voltage. Is the voltage above 1.0 volt? Yes → Replace the ECT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the ECT Sensor Signal circuit at the ECT Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0117-ECT SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the ECT Sensor Signal circuit and the Sensor ground circuit at the ECT Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the ECT Signal circuit at the ECT connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0118-ECT SENSOR VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0118-ECT 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
INTERMITTENT CONDITION
ECT SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
ECT SENSOR INTERNAL FAILURE
ECT SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running.. With the DRBIII®, read ECT voltage. Is the voltage above 4.9 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the ECT Sensor harness connector. Ignition on, engine not running. Measure the voltage on the ECT Sensor Signal circuit at the ECT Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the ECT harness connector. Connect a jumper wire between the ECT Sensor Signal circuit and the Sensor ground circuit in the ECT harness connector. Ignition on, engine not running. With the DRBIII®, read the ECT voltage. Is the voltage below 1.0 volt? Yes → Replace the ECT Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0118-ECT SENSOR VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the ECT Sensor Signal circuit from the ECT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the ECT Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Sensor ground circuit from the ECT Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the ECT Signal circuit at the ECT connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP

When Monitored and Set Condition:

P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP

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
INTERMITTENT CONDITION
HIGH RESISTANCE IN MAP 5 VOLT SUPPLY CIRCUIT
MAP 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAP SENSOR
HIGH RESISTANCE IN MAP SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE TO GROUND IN MAP SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE IN MAP SENSOR GROUND CIRCUIT
PCM
TPS 5 VOLT SUPPLY CIRCUIT HIGH RESISTANCE
TPS 5 VOLT SUPPLY CIRCUIT RESISTANCE TO GROUND
THROTTLE POSITION SENSOR
HIGH RESISTANCE IN TPS SIGNAL CIRCUIT
TPS SIGNAL HAS HIGH RESISTANCE TO GROUND
HIGH RESISTANCE IN SENSOR GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Diagnose any TPS or MAP component DTC first before continuing.** **NOTE: If the P0500 - No Vehicle Speed Signal is set along with this DTC, refer to the P0500 diagnostics before continuing.** **NOTE: The throttle plate and linkage should be free of binding and carbon build up.** **NOTE: Ensure the throttle plate is at the idle position.** Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip displayed and equal to zero? Yes → Go To 2 No → Go To 18	All

P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
2	Start the engine. With the DRBIII®, monitor the MAP Sensor voltage. Snap the throttle. Does the DRBIII® display MAP voltage from below 2.0 volts at idle to above 3.5 volts at WOT? Yes → Go To 3 No → Go To 11	All
3	Ignition on, engine not running. With the DRBIII®, monitor the TPS voltage while slowly depressing the throttle pedal from the idle position to the WOT position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Go To 18 No → Go To 4	All
4	Turn the ignition off. Disconnect the TPS harness connector. Disconnect the PCM harness connector. Measure the resistance of the 5 Volt Supply circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the high resistance in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. Disconnect the TPS harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the 5 Volt Supply circuit from the TPS harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Disconnect the TPS harness connector. With the DRBIII®, monitor the TPS voltage. Ignition on, engine not running. Connect a jumper wire between the TPS Signal circuit and the Sensor ground circuit . Does the DRBIII® display TPS voltage from approximately 4.9 volts to below 0.5 of a volt? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All

P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the TPS Signal circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the high resistance in the TPS Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the Throttle Position Sensor Signal circuit from the Throttle Position Sensor harness connector. Is the resistance below 100 ohms? Yes → Go To 9 No → Repair the short to ground in the Throttle Position Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the Sensor ground circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the high resistance in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the 5 Volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP — Continued

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

P0121-TPS VOLTAGE DOES NOT AGREE WITH MAP — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the Sensor ground circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 17 No → Repair the high resistance in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
17	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
18	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0122-TPS VOLTAGE LOW

When Monitored and Set Condition:

P0122-TPS VOLTAGE 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
THROTTLE POSITION SENSOR SWEEP
INTERMITTENT CONDITION
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5 VOLT SUPPLY CIRCUIT OPEN
THROTTLE POSITION SENSOR INTERNAL FAILURE
TPS SIGNAL CIRCUIT SHORTED TO GROUND
THROTTLE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
PCM 5 VOLT SUPPLY CIRCUIT
PCM TPS SIGNAL CIRCUIT

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the Throttle Position Sensor voltage. Is the voltage below 0.2 of a volt? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Ignition on, engine not running. Measure the voltage of the 5 Volt Supply circuit at the TPS harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 7	All
3	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Is the voltage above 4.5 volts? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0122-TPS VOLTAGE LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Measure the resistance between ground and the TPS Signal circuit at the TPS harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Throttle Position Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Measure the resistance between the TPS Signal circuit and the Sensor ground circuit at the TPS harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the TPS Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Measure the resistance between ground and the 5 Volt Supply circuit at the TPS harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the 5 Volt Supply circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0122-TPS VOLTAGE LOW — Continued

TEST	ACTION	APPLICABILITY
10	Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Slowly open the throttle from the idle position to the wide open throttle position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Go To 11 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the TPS Signal circuit at the Sensor connector and PCM connector. Sweep the TPS and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Look for parameter values to change and/or a DTC to set. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0123-THROTTLE POSITION SENSOR VOLTAGE HIGH

When Monitored and Set Condition:

P0123-THROTTLE POSITION SENSOR VOLTAGE HIGH

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

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

POSSIBLE CAUSES
THROTTLE POSITION SENSOR SWEEP
INTERMITTENT CONDITION
THROTTLE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO 5 VOLT SUPPLY CIRCUIT
THROTTLE POSITION SENSOR SIGNAL CIRCUIT SHORTED TO BATTERY VOLTAGE
THROTTLE POSITION SENSOR INTERNAL FAILURE
SENSOR GROUND CIRCUIT OPEN
THROTTLE POSITION SENSOR SIGNAL CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the throttle is fully closed and free from binding or carbon build up.** Start the engine. With the DRBIII®, read the Throttle Position Sensor voltage. Is the voltage above 4.5 volts? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Measure the resistance between the TPS Signal circuit and the 5 Volt Supply circuit at the TPS harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to the 5 Volt Supply circuit in the TPS Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0123-THROTTLE POSITION SENSOR VOLTAGE HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Ignition on, engine not running. Measure the voltage on the TPS Signal circuit at the TPS harness connector. **NOTE: If the voltage reading is below 5.3 volts answer NO to this test and continue.** If the voltage is above 5.3 volts, disconnect the Clock Spring harness connector. With the Clock Spring harness disconnected and if the TPS voltage drops to 5.0 volts, replace the Clock Spring. Is the voltage still above 5.3 volts with the Clock Spring harness disconnected? Yes → Repair the short to battery voltage in the TPS Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Connect a jumper wire between the TPS Signal circuit and the Sensor ground circuit. Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Is the voltage below 0.5 of a volt? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Measure the resistance of the Sensor ground circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the Throttle Position Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the TPS Signal circuit from the TPS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Throttle Position Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0123-THROTTLE POSITION SENSOR VOLTAGE HIGH — Continued

TEST	ACTION	APPLICABILITY
8	Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Slowly open the throttle from the idle position to the wide open throttle position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Go To 9 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the TPS Signal circuit at the TPS connector and PCM connector. Sweep the TPS and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
ECT SENSOR (OUT OF CALIBRATION)
LOW COOLANT LEVEL
ECT WIRE HARNESS INTERMITTENT
THERMOSTAT OPERATION

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 5	All
2	**NOTE: If a ECT DTC set along with this code, diagnose the ECT DTC first.** **NOTE: Inspect the ECT terminals and related PCM terminals. Ensure the terminals are free from corrosion and damage.** **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.** **Note: Extremely cold outside ambient temperatures may have caused this DTC to set.** **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.** Check the coolant system to make sure that the coolant is in good condition and at the proper level. Is the coolant level and condition OK? Yes → Go To 3 No → Inspect the vehicle for a coolant leak and add the necessary amount of coolant. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0125-CLOSED LOOP TEMP NOT REACHED — Continued

TEST	ACTION	APPLICABILITY
3	**Note: For this test to be valid, the thermostat must be operating correctly.** **Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. 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). **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the engine. 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). Was the Eng Coolant Tmp Deg value increase a smooth transition and did it reach at least 180°? Yes → Go To 4 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	**Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. 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. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. 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. **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.** Using the appropriate service information, determine the proper opening temperature of the thermostat. Did the thermostat open at the proper temperature? Yes → Test Complete. No → Replace the thermostat. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Perform a wiggle test on the related wire harnesses with the engine running. Watch for the Good Trip Counter to change to 0. Were any problems found? Yes → Repair wire harness/connectors as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

P0131-1/1 O2 SENSOR SHORTED TO GROUND
P0137-1/2 O2 SENSOR SHORTED TO GROUND
P0151-2/1 O2 SENSOR SHORTED TO GROUND
P0157-2/2 O2 SENSOR SHORTED TO GROUND

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0131-1/1 O2 SENSOR SHORTED TO GROUND.

When Monitored and Set Condition:

P0131-1/1 O2 SENSOR SHORTED TO GROUND

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.

P0137-1/2 O2 SENSOR SHORTED TO GROUND

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.

P0151-2/1 O2 SENSOR SHORTED TO GROUND

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.

P0157-2/2 O2 SENSOR SHORTED TO GROUND

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
INTERMITTENT CONDITION
O2 SENSOR OPERATION
O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT

P0131-1/1 O2 SENSOR SHORTED TO GROUND — Continued

POSSIBLE CAUSES
O2 SENSOR SIGNAL SHORTED HEATER GROUND CIRCUIT
PCM

TEST	ACTION	APPLICABILITY
1	Start the engine. Allow the engine to idle for 4 to 5 minutes. With the DRBIII®, read the O2 Sensor voltage. Is the voltage below 0.16 of a volt? Yes → Go To 2 No → Go To 7	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.** Start the engine. Disconnect the O2 Sensor harness connector. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 0.16 of a volt? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the O2 Sensor harness connector. Measure the resistance between ground and the O2 Sensor Signal circuit at the O2 Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the O2 Sensor harness connector. Measure the resistance between the O2 Sensor Signal circuit and the Sensor ground circuit at the O2 Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P0131-1/1 O2 SENSOR SHORTED TO GROUND — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the O2 Sensor harness connector. **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.** Verify what type of O2 Heater ground is used on the O2 Sensor being tested. Measure the resistance between the O2 Sensor Signal circuit and the Heater ground circuit at the O2 Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the O2 Sensor Signal circuit short to the Heater ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**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.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

P0132-1/1 O2 SENSOR SHORTED TO VOLTAGE
P0138-1/2 O2 SENSOR SHORTED TO VOLTAGE
P0152-2/1 O2 SENSOR SHORTED TO VOLTAGE
P0158-2/2 O2 SENSOR SHORTED TO VOLTAGE

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

When Monitored and Set Condition:

P0132-1/1 O2 SENSOR SHORTED TO VOLTAGE

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.

P0138-1/2 O2 SENSOR SHORTED TO VOLTAGE

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.

P0152-2/1 O2 SENSOR SHORTED TO VOLTAGE

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.

P0158-2/2 O2 SENSOR SHORTED TO VOLTAGE

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
INTERMITTENT CONDITION
O2 SENSOR OPERATION
O2 SENSOR SIGNAL SHORTED TO VOLTAGE
O2 HEATER GROUND CIRCUIT OPEN
O2 HEATER SUPPLY CIRCUIT OPEN
O2 SENSOR SIGNAL CIRCUIT SHORTED TO O2 HEATER SUPPLY CIRCUIT
O2 SENSOR SIGNAL OPEN

P0132-1/1 O2 SENSOR SHORTED TO VOLTAGE — Continued

POSSIBLE CAUSES
O2 SENSOR GROUND CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Start the engine. Allow the engine to idle for 4 to 5 minutes. With the DRBIII®, read the O2 Sensor voltage. Is the voltage above 1.5 volts? Yes → Go To 2 No → Go To 10	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.** Start the engine. Disconnect the O2 Sensor harness connector. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage below 1.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the O2 Sensor harness connector Ignition on, engine not running. Measure the voltage of the O2 Sensor Signal circuit at the O2 Sensor harness connector. Is the voltage above 1.5 volts? Yes → Repair the short to voltage in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the O2 Sensor harness connector. **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.** Verify which relay is used to supply power for the O2 Sensor Heater being tested. Measure the resistance between the O2 Sensor Signal circuit and the O2 Heater Supply circuit at the O2 Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the O2 Sensor Signal circuit for a short to the O2 Heater Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P0132-1/1 O2 SENSOR SHORTED TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the O2 Sensor harness connector Disconnect the PCM harness connector. Measure the resistance of the O2 Sensor Signal circuit from the O2 Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the O2 Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the O2 Sensor ground circuit from the O2 Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the O2 Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Turn the ignition off. Disconnect the O2S harness connector. Ignition on, engine not running. With the DRBIII® actuate the O2 HEATER TEST. Measure the voltage of the relay output circuit. Is the voltage above 11.0 volts? No → Repair the OPEN Heater Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. Yes → Go To 8	All
8	Turn the ignition off. Disconnect the O2 Sensor harness connector. Disconnect the PCM harness connector. **NOTE: The O2 Sensor Heater ground may be a Pulse Width Modulated circuit or a chassis ground depending on the type of O2 Sensor being tested.** Measure the resistance of the O2 Sensor ground (PWM) circuit from the O2 Sensor connector to the PCM connector or measure the resistance between ground and the O2 S Heater ground. Is the resistance below 5.0 ohms? Yes → Go To 9. No → Repair the open in the O2 Sensor ground (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0132-1/1 O2 SENSOR SHORTED TO VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
10	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

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

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

When Monitored and Set Condition:

P0133-1/1 O2 SENSOR 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.

P0139-1/2 O2 SENSOR 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.

P0153-2/1 O2 SENSOR 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.

P0159-2/2 O2 SENSOR 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.

P0133-1/1 O2 SENSOR SLOW RESPONSE — Continued

POSSIBLE CAUSES
INTERMITTENT CONDITION
EXHAUST LEAK
O2 SENSOR SIGNAL CIRCUIT VOLTAGE DROP
O2 SENSOR GROUND CIRCUIT VOLTAGE DROP
O2 SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip counter displayed and equal to zero? Yes → Go To 2 No → Go To 6	All
2	Start the engine. Inspect the exhaust for leaks between the engine and the related O2 Sensor. Are there any exhaust leaks? Yes → Repair or replace the leaking exhaust parts as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Back probe the O2 Sensor Signal circuit at the O2 Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 4 No → Repair the high resistance on the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	**NOTE: Ensure the voltmeter leads meet the terminals in the connector and that there is good terminal to wire connection.** **NOTE: Ensure the voltmeter leads are connected for positive polarity** Back probe the O2 Sensor ground circuit at the O2 Sensor harness connector and PCM harness connector. Start the engine. Allow the engine to idle. Is the voltage below 0.10 of a volt? Yes → Go To 5 No → Repair the high resistance on the O2 Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0133-1/1 O2 SENSOR SLOW RESPONSE — Continued

TEST	ACTION	APPLICABILITY
5	If there are no possible causes remaining, view repair. Repair Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the O2 Sensor Signal circuit at the Sensor connector and PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

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

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

When Monitored and Set Condition:

P0135-1/1 O2 SENSOR 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.

P0141-1/2 O2 SENSOR 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.

P0155-2/1 O2 SENSOR 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.

P0161-2/2 O2 SENSOR 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
INTERMITTENT CONDITION
O2 HEATER ELEMENT
O2 SENSOR HEATER SUPPLY CIRCUIT OPEN
O2 SENSOR HEATER GROUND CIRCUIT OPEN

P0135-1/1 O2 SENSOR HEATER FAILURE — Continued

POSSIBLE CAUSES
O2 SENSOR HEATER CONTROL CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: Wait a minimum of 8 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stabilize between 0.4 and 0.6 of a volt during the Heater test? Yes → Go To 2 No → Go To 3	All
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
3	Turn the ignition off. **NOTE: Allow the O2 Sensor to cool to room temperature.** Disconnect the O2 Sensor harness connector. Measure the resistance across the O2 Sensor Heater element component side. **NOTE: The resistance value increases with temperature.** Is the resistance value between 4.0 and 5.0 ohms at 70°F (21.1°C)? Yes → Go To 4 No → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0135-1/1 O2 SENSOR HEATER FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: This test depends on the type of Heated O2 Sensor being tested. The PWM Heated O2 Sensor uses the ASD Relay to supply voltage to the heater element and the other type uses an O2 Heater Relay.** Turn the ignition off. Disconnect the O2 Sensor harness connector. Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. Measure the voltage on the O2 Heater supply circuit. Is the voltage above 11.0 volts? Yes → Go To 5 No → Repair the open in the O2 Sensor Heater Supply cricuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: There may be two types of O2 Heater ground circuits used on this vehicle. Verify which type of O2 Heater ground circuit is being tested, PWM circuit or the O2 Heater Relay ground circuit.** Turn the ignition off. Disconnect the O2 Sensor harness connector. Disconnect the PCM harness connector. **NOTE: If you are testing a Pulse Width Modulated Heated O2 Sensor, measure the resistance of the PWM circuit from the O2 sensor connector to the PCM harness connector.** **NOTE: If you are testing a Heated O2 Sensor that uses an O2 Heater Relay to supply power to the O2 Heater, measure the resistance between ground and the Heater ground terminal of the O2 harness connector.** Is the resistance above 5.0 ohms? Yes → Repair the open in either the O2 Sensor Heater ground or the Pulse Width Modulated circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	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.** Disconnect the O2 Sensor connector. Disconnect the PCM harness connector. Remove the O2 Heater Relay if it applies to the type of Heated O2 Sensor being tested. **NOTE: Measure the resistance between ground and the PWM circuit if it applies to the Heated O2 Sensor being tested.** **NOTE: Measure the resistance between ground and the O2 Heater Relay Control circuit if it applies to the Heated O2 Sensor being tested.** Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0136-1/2 O2 SENSOR HEATER CIRCUIT MALFUNCTION

When Monitored and Set Condition:

P0136-1/2 O2 SENSOR 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
INTERMITTENT CONDITION
O2 HEATER RELAY FUSED IGNITION VOLTAGE OPEN OR SHORTED TO GROUND
O2 SENSOR HEATER RELAY CONTROL CIRCUIT OPEN
O2S HEATER RELAY CONTROL SHORT TO GROUND
O2S HEATER RELAY COIL OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the DTC Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn ignition off. Remove the O2 Heater Relay. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch circuit of the O2 Heater Relay pin in the PDC. With the DRBIII®, actuate the ASD Relay. Does the test light illuminate brightly when the relay actuates? Yes → Go To 3 No → Repair the open and/or short to ground in the Heater Relay Fused Ignition Switch circuit. Check the related fuse. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance of the O2S Heater Relay Control circuit from the PDC (Heater Relay) connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open O2 Sensor Heater Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Remove the O2 Sensor Heater Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance between ground and the O2S Heater Relay Control circuit at the PDC connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Sensor Heater Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Remove the Heater Relay from the PDC. Measurement is taken at the Heater Relay component. Measure the resistance of the O2S Heater Relay Coil. Is the resistance above 100 ohms? Yes → Replace the O2S Heater Relay. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are not possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

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

TEST	ACTION	APPLICABILITY
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
FUEL PRESSURE OUT OF SPECS
RESTRICTED FUEL SUPPLY LINE
FUEL PUMP INLET STRAINER PLUGGED
FUEL PUMP MODULE
LOW FUEL PUMP VOLUME
O2 SENSOR
O2 SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
O2 SENSOR HEATER OPERATION
TPS VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
THROTTLE POSITION SENSOR SWEEP
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL PROBLEM
FUEL FILTER/PRESSURE REGULATOR
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.** Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip counter displayed and equal to zero? Yes → Go To 2 No → Go To 17	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.** Install a fuel pressure gauge to the fuel rail. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Turn the ignition off. Choose a conclusion that best matches your fuel pressure reading. Below Specification Go To 3 Within Specification Go To 6 Above Specification Replace the fuel pressure regulator and fuel filter. Perform POWERTRAIN VERIFICATION TEST VER - 5. **CAUTION: Stop All Actuations.**	All
3	Turn the ignition off. **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.** Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module. Install special 5/16 fuel line adapter tool #6539 or #6631 between disconnected fuel line and the fuel pump module. Attach a fuel pressure test gauge to the T fitting on tool #6539 or #6631. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Is the fuel pressure within specification? Yes → Repair or replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4 **Caution: Stop All Actuations.**	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. **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.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	**Note: The fuel pressure must be within specification before continuing.** Turn the ignition off. **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.** Disconnect the fuel supply line at the fuel rail. Connect fuel line adapter #6539(5/16″) or #6631(3/8″) to the disconnected fuel supply line. Insert the other end of the adapter into a graduated container. **Caution: Do not operate the fuel pump for more than 7 seconds in the next step. Fuel pump module reservoir may run empty and damage to the fuel pump will result.** **Note: Specification: A good fuel pump will deliver at least 1/4 liter (1/2 pint) of fuel in 7 seconds.** Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test for 7 seconds. Is the fuel pump volume within specification? Yes → Go To 7 No → Check for a kinked/damaged fuel supply line between the fuel tank and fuel rail. If OK, replace the fuel pump module. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Caution: Stop All Actuations.**	All
7	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor and Exhaust System to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, read the O2 Sensor voltage. Is the voltage above 4.5 volts? Yes → Go To 8 No → Go To 14	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stay above 4.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
9	Ignition on, engine not running. With the DRBIII®, read TP Sensor voltage. **NOTE: The throttle must be against the stop.** Is the voltage 0.92 of a volt or less with the Throttle closed? Yes → Go To 10 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Ignition on, engine not running. With the DRBIII®, read the TP Sensor voltage. While monitoring the DRBIII®, slowly open and close the throttle. Does the voltage increase and decrease smoothly? Yes → Go To 11 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	Turn the ignition off. Connect a Vacuum Gauge to a Manifold Vacuum source. Start the engine. Allow the engine to idle. **Note: If engine will not idle, maintain a constant RPM above idle.** With the DRBIII® in Sensors, read the MAP Sensor vacuum value. Is the DRBIII® reading within 1″ of the Vacuum Gauge reading? Yes → Go To 12 No → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
12	**Note: For this test to be valid, the thermostat must be operating correctly.** **Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. 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. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. 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). Did the Engine Coolant Temperature increase smoothly and did it reach at least 82°C (180°F)? Yes → Go To 13 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
13	Check for any of the following conditions/mechanical problems. AIR INDUCTION SYSTEM - must be free from leaks. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 17	All
14	**NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. Disconnect the O2 Sensor harness connector. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the O2 Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the O2 Sensor Signal circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 16	All
16	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
17	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
O2 SENSOR
O2 SENSOR SIGNAL CIRCUIT OPEN
O2 SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
O2 SENSOR HEATER OPERATION
EVAP SYSTEM OPERATION
TPS VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
THROTTLE POSITION SENSOR SWEEP
FUEL FILTER/PRESSURE REGULATOR
MAP SENSOR OPERATION
ECT SENSOR OPERATION
ENGINE MECHANICAL PROBLEM
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.** Ignition on, engine not running. With the DRBIII®, read DTCs. **NOTE: Any O2 Sensor, TPS, ECT, MAP, or EVAP DTCs must be repaired before continuing.** Is the Good Trip counter displayed and equal to zero? Yes → Go To 2 No → Go To 15	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.** Install a fuel pressure gauge to the fuel rail. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Turn the ignition off. Choose a conclusion that best matches your fuel pressure reading. Within Specification Go To 3 Above Specification Replace the fuel filter/pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Caution: Stop All Actuations.**	All
3	Ignition on, engine not running. With the DRBIII®, read the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Go To 4 No → Go To 11	All
4	Turn the ignition off. **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.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor O2 Sensor voltage for at least 2 minutes. Does the voltage stay above 4.5 volts? Yes → Replace the O2 Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. 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.** Start the engine. **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.** Allow the engine to reach normal operating temperature. With the DRBIII® select System Tests, perform the Purge Vapors Test. Observe the Short Term Adaptive value and press 3 to flow. **NOTE: Short Term Adaptive value change.** Did the Short Term Adaptive value change? Yes → Go To 6 No → Refer to the Driveability category and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Ignition on, engine not running. With the DRBIII®, read TPS voltage. **NOTE: The throttle must be against the stop.** Is the voltage 0.92 of a volt or less with the Throttle closed? Yes → Go To 7 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Ignition on, engine not running. With the DRBIII®, read the TPS voltage. While monitoring the DRBIII®, slowly open and close the throttle. Does the voltage increase and decrease smoothly? Yes → Go To 8 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off. Connect a Vacuum Gauge to a Manifold Vacuum source. Start the engine. Allow the engine to idle. **Note: If engine will not idle, maintain a constant RPM above idle.** With the DRBIII® in Sensors, read the MAP Sensor vacuum value. Is the DRBIII® reading within 1″ of the Vacuum Gauge reading? Yes → Go To 9 No → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	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.** **Note: This test works best if performed on a cold engine (cold soak)** Ignition on, engine not running. 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. **Note: If engine coolant temperature is above 82°C (180°F), allow the engine to cool until 65°C (150°F) is reached.** Start the Engine. 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). Did the Engine Coolant Temperature value increase a smooth transition and did it reach at least 82°C Yes → Go To 10 No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Check for any of the following conditions/mechanical problems. AIR INDUCTION SYSTEM - must be free from restrictions. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All
11	Disconnect the O2 Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the O2 Sensor voltage. Is the O2 Sensor voltage above 4.5 volts? Yes → Replace the O2 Sensor Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All
12	Turn the ignition off. Disconnect the PCM harness connectors. Disconnect the O2 Sensor harness connector. Measure the resistance of the O2 Sensor Signal circuit from the PCM harness connector to the O2 Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 13 No → Repair the open in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0172-1/1 FUEL SYSTEM RICH — Continued

TEST	ACTION	APPLICABILITY
13	**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.** Turn the ignition off. Disconnect the O2 Sensor harness connector. Start the engine. Measure the voltage on the O2 Sensor Signal circuit at the O2 Sensor harness connector. Is the voltage above 5.0 volts? Yes → Repair the short to voltage in the O2 Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 14	All
14	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
15	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
WIRE HARNESS INSPECTION
ASD RELAY OUTPUT CIRCUIT
FUEL INJECTOR
FUEL INJECTOR DRIVER CIRCUIT OPEN
FUEL INJECTOR DRIVER CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Fuel Injector harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, backprobe the ASD Relay Output circuit at the Fuel Injector harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open in the ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	Turn the ignition off. Disconnect the Fuel Injector harness connector. Ignition on, engine not running. Using a 12-volt test light connected to 12-volts, backprobe the Fuel Injector Driver circuit. With the DRBIII®, actuate the Fuel Injector. Does the test light blink/flicker? Yes → Replace the Fuel Injector. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0201-INJECTOR #1 CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Fuel Injector harness connector. Disconnect the PCM harness connectors. Measure the resistance of the Fuel Injector Driver circuit from the Fuel Injector harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the Fuel Injector Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. Disconnect the Fuel Injector harness connector. Disconnect the PCM harness connectors. Measure the resistance between ground and the Fuel Injector Driver circuit at the Fuel Injector harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Fuel Injector Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**At this time, the conditions required to set the DTC are not present.** **NOTE: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as: VSS, MAP, ECT and Load.** **NOTE: Visually inspect the related wire harness, look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any technical service bulletins that may apply.** Perform a wiggle test of the wire harness and connectors while the engine is running. Listen for the engine to miss or stall. Also, watch for the Good Trip Counter to change to zero. Were any problems found? Yes → Repair the wire harness/connector as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
SECONDARY IGNITION
ENGINE MECHANICAL PROBLEM
FUEL SYSTEM PROBLEM
ERRATIC CAM/CRANK SENSOR SIGNALS
OTHER POSSIBLE CAUSES FOR MIS-FIRE
PCM

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, select DTCs and RELATED FUNCTIONS. Read and record the FREEZE FRAME DATA. Select OBD II MONITORS. Read and record the MIS-FIRE SIMILAR CONDITIONS WINDOW DATA. With these screens, attempt to duplicate the condition(s) that has set this DTC. When the vehicle is operating in the SIMILAR CONDITIONS WINDOW, refer to the WHICH CYLINDER IS MISFIRING screen. Observe the WHICH CYLINDER IS MISFIRING screen for at least one minute. Is the DRBIII® counting mis-fires at this time? Yes → Go To 2 No → Go To 8	All
2	With the DRBIII®, read the FREEZE FRAME DATA. Use the FREEZE FRAME DATA and attempt to determine the cause of the Misfire DTC. In the FREEZE FRAME DATA, is the LOAD VALUE over 50% and the operating temp normal? Yes → Check secondary ignition components and perform a cylinder leakage test. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Go To 3	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
3	Check for any of the following conditions/mechanical problems. ENGINE VACUUM - must be at least 13 inches in neutral ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications CYLINDER LEAKAGE TEST - must be within specifications CAM LOBES - must not be worn excessively WEAK or BROKEN VALVE SPRINGS ENGINE PCV SYSTEM - must flow freely TORQUE CONVERTER STALL SPEED - must be within specifications POWER BRAKE BOOSTER - no internal vacuum leaks FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Go To 4	All
4	With the DRBIII®, read the FREEZE FRAME DATA. Use the FREEZE FRAME DATA and attempt to determine the cause of the Misfire DTC. In the FREEZE FRAME, are the adaptive fuel percentages greater than +/- 15%? Yes → Refer to the Driveablitiy Category and perform the Checking Fuel Delivery symptom. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Go To 5	All
5	With the DRBIII®, read the FREEZE FRAME DATA. Use the FREEZE FRAME DATA and attempt to determine the cause of the Misfire DTC. In the FREEZE FRAME DATA, is the engine RPM over 3000 and the operating temp normal? Yes → Test CMP and CKP signals with Lab Scope, check valve timing, and perform running vacuum test. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Go To 6	All
6	**Note: Anything that affects the speed of the crankshaft can cause a misfire DTC.** The following are other possible causes for mis-fire: Injector harness connectors, PCM power grounds, restricted exhaust, intake restriction, damaged trigger wheel, contaminated fuel, carbon build up on valves, or the accessory drive belt (serpentine belt). Check for any TSB's that may relate to a Misfire DTC. Do any of the above causes exist? Yes → Repair as necessary. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Go To 7	All

P0300-MULTIPLE CYLINDER MIS-FIRE — Continued

TEST	ACTION	APPLICABILITY
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST.	All
8	**NOTE: The conditions that set the DTC are not present at this time.** An intermittent problem may have been caused by moisture in the secondary ignition. **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.** With the DRBIII®, select DTC's AND RELATED FUNCTIONS. Read and record the FREEZE FRAME DATA. Select OBD II MONITORS. Read and record MIS-FIRE SIMILAR CONDITIONS WINDOW DATA. With these screens, attempt to duplicate the condition that has set the Misfire DTC. While using FREEZE FRAME DATA, pay particular attention to the DTC setting conditions, such as speed, temp, load, and map vacuum. Does the mis-fire reoccur? Yes → Restart diagnostics beginning with Test 2. Perform FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST. No → Test Complete.	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
CAM POSITION SENSOR SIGNAL
CHECKING INTERMITTENT CKP SIGNAL WITH LAB SCOPE
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5 VOLT SUPPLY CIRCUIT OPEN
5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
CKP SENSOR SIGNAL CIRCUIT SHORTED GROUND
CKP SENSOR SIGNAL CIRCUIT OPEN
CKP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CKP SENSOR SIGNAL SHORTED TO 5 VOLT SUPPLY CIRCUIT
CRANK SENSOR GROUND CIRCUIT OPEN
PCM - 5 VOLT SUPPLY
PCM - CKP SENSOR SIGNAL
CRANKSHAFT POSITION SENSOR

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read the Current CKP State while cranking the engine. Does the DRBIII® display Current CKP State Present while cranking the engine? Yes → Go To 2 No → Go To 4	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: An intermittent failure with the Cam Position Sensor may cause the P0320 code to set.** Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CMP Signal circuit in the CMP Sensor connector and the PCM harness connector. **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.** Ignition on, engine not running. Wiggle the related wire harness and gently tap on the Cam Position Sensor. Monitor the lab scope screen. Start the engine. Lightly tap on the CMP Sensor and wiggle the related wire harness. Observe the lab scope screen, looking for any erratic pulses generated by the CMP Sensor. Did the CMP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	**NOTE: The following tests may help in identifying a possible intermittent condition with the Crank Sensor or its related wire harness.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CKP Signal circuit in the Crank Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **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.** Start the engine. Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and the related wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CKP Sensor. Did the CKP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
4	Turn the ignition off. Disconnect the CKP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the Crank Sensor 5 Volt Supply circuit at the CKP Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 5 No → Go To 13	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the CKP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the CKP Sensor Signal circuit at the CKP Sensor harness connector. Is the voltage between 4.5 and 5.0 volts? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off. Disconnect the CKP Sensor harness connector. Measure the resistance of the Sensor ground circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: Inspect the slots on the flywheel for damage. If a problem is found repair as necessary.** If there are no possible causes remaining, view repair. Repair Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off. Disconnect the CKP Sensor harness connector. Measure the resistance between ground and the CKP Sensor Signal circuit at the CKP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
9	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the PCM harness connectors. Measure the resistance of the CKP Sensor Signal circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the CKP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the CKP Sensor Signal circuit at the CKP Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to battery voltage in the CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the CKP Sensor Signal circuit and the 5 Volt Supply circuit at the CKP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to the 5 Volt Supply circuit in the CKP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All
12	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
13	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the CKP Sensor harness connector. Measure the resistance between ground and the 5 Volt Supply circuit at the CKP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 14	All
14	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the 5 Volt Supply circuit from the CKP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 15 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0320-NO CRANK REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the CKP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the 5 Volt Supply circuit at the CKP Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to battery voltage in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 16	All
16	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
P0340-NO CAM SIGNAL AT PCM

When Monitored and Set Condition:

P0340-NO CAM 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
CRANK POSITION SENSOR SIGNAL
CHECKING INTERMITTENT CMP SIGNAL WITH LAB SCOPE
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5 VOLT SUPPLY CIRCUIT OPEN
5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
CMP SENSOR SIGNAL CIRCUIT SHORTED GROUND
CMP SENSOR SIGNAL CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
CMP SENSOR SIGNAL SHORTED TO 5 VOLT SUPPLY CIRCUIT
CAM POSITION SENSOR GROUND CIRCUIT OPEN
PCM - 5 VOLT SUPPLY
PCM - CMP SENSOR SIGNAL
CAMSHAFT POSITION SENSOR

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read the Current CMP State while cranking the engine. Does the DRBIII® display Current CMP State Present while cranking the engine? Yes → Go To 2 No → Go To 4	All

P0340-NO CAM SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: An intermittent Crank Position Sensor failure may cause the P0340 code to set.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CKP Signal circuit in the Crank Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **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.** Start the engine. Lightly tap on the Crank Sensor and wiggle the CKP Sensor connector and wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CKP Sensor. Did the CKP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Crank Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	**NOTE: The following tests may help in identifying a possible intermittent condition with the Cam Sensor or its related wire harness.** Ignition on, engine not running. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CMP Signal circuit in the Cam Sensor connector and the PCM harness connector. Wiggle the related wire harness and connections. Monitor the lab scope screen. **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.** Start the engine. Lightly tap on the Cam Sensor and wiggle the CMP Sensor connector and wire harness. Observe the lab scope screen. Look for any erratic pulses generated by the CMP Sensor. Did the CMP Sensor generate any erratic pulses? Yes → Carefully inspect the wire harness and connections, repair as necessary, if ok, replace the Cam Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
4	Turn the ignition off. Disconnect the CMP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit at the CMP Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 5 No → Go To 13	All

P0340-NO CAM SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the CMP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the voltage between 4.5 and 5.0 volts? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the Sensor ground circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: Inspect the Camshaft sprocket for damage per the Service Information. If a problem is found repair as necessary.** If there are no possible causes remaining, view repair. Repair Replace the Camshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off. Disconnect the CMP Sensor harness connector. Measure the resistance between ground and the CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
9	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the CMP Sensor Signal circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0340-NO CAM SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the CMP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to battery voltage in the CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the CMP Sensor Signal circuit and the 5 Volt Supply circuit at the CMP Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to the 5 Volt Supply circuit in the CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All
12	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
13	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the CMP Sensor harness connector. Measure the resistance between ground and the 5 Volt Supply circuit at the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 14	All
14	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the 5 Volt Supply circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 15 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0340-NO CAM SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the CMP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit at the CMP Sensor harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to battery voltage in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 16	All
16	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	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
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT
COIL RAIL RESISTANCE
IGNITION COIL
IGNITION COIL DRIVER CIRCUIT OPEN

P0351-IGNITION COIL # 1 PRIMARY CIRCUIT — Continued

POSSIBLE CAUSES
IGNITION COIL DRIVER CIRCUIT SHORTED TO GROUND
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 8	4.0L POWER TECH I-6
2	Turn the ignition off. Disconnect the coil rail harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Relay. Using a 12-volt test light connected to ground, check the ASD Relay output circuit at the coil harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ASD relay output circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Stop All Actuations**	4.0L POWER TECH I-6
3	Turn the ignition off. Disconnect the coil rail harness connector. **Note: The following resistance measurement should be taken at 70-80 degrees F.** Measure the primary resistance of the coil rail. Is the resistance value between 0.53 and 0.65 of an ohm? Yes → Go To 4 No → Replace the coil rail. Perform POWERTRAIN VERIFICATION TEST VER - 5.	4.0L POWER TECH I-6
4	Turn the ignition off. Disconnect the Ignition Coil Rail harness connector. Using a 12-volt test light connected to a 12-volt source, probe the Ignition Coil Driver circuit. Crank the engine for 5 seconds while observing the test light. Does the test light blink/flicker? Yes → Replace the Ignition Coil Rail. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	4.0L POWER TECH I-6

P0351-IGNITION COIL # 1 PRIMARY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Coil Rail harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Ignition Coil Driver circuit from the Ignition Coil connector to the PCM connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	4.0L POWER TECH I-6
6	Turn the ignition off. Disconnect the Coil Rail harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the Ignition Coil Driver circuit and ground. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	4.0L POWER TECH I-6
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	4.0L POWER TECH I-6
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	4.0L POWER TECH I-6

Symptom:
P0351-IGNITION COIL #1 PRIMARY CRICUIT

When Monitored and Set Condition:

P0351-IGNITION COIL #1 PRIMARY CRICUIT

When Monitored: With battery voltage greater than 8 volts during engine cranking or greater than 12 volts with the engine running. Engine RPM less than 2016.

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
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT
IGNITION COIL RESISTANCE
IGNITION COIL
IGNITION COIL DRIVER CIRCUIT OPEN
IGNITION COIL DRIVER CIRCUIT SHORTED TO GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 8	2.5L POWER TECH I-4
2	Turn the ignition off. Disconnect the coil harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit at the coil harness connector. With the DRBIII®, actuate the ASD Relay. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open/high resistance or short to ground in the ASD relay output circuit. Inspect the related fuse. Perform POWERTRAIN VERIFICATION TEST VER - 5. **Stop All Actuations**	2.5L POWER TECH I-4

P0351-IGNITION COIL #1 PRIMARY CRICUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Ignition Coil harness connector. Measure the primary resistance of the coil. Is the resistance value between 0.95 of an ohm and 1.2 ohms? Yes → Go To 4 No → Replace the ignition coil. Perform POWERTRAIN VERIFICATION TEST VER - 5.	2.5L POWER TECH I-4
4	Turn the ignition off. Disconnect the Ignition Coil harness connector. Using a 12-volt test light connected to a 12-volt source, probe the Ignition Coil Driver circuit. Crank the engine for 5 seconds while observing the test light. Does the test light blink/flicker? Yes → Replace the Ignition Coil. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	2.5L POWER TECH I-4
5	Turn the ignition off. Disconnect the coil harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Ignition Coil Driver circuit from the Ignition Coil connector to the PCM connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	2.5L POWER TECH I-4
6	Turn the ignition off. Disconnect the Coil harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the Ignition Coil Driver circuit and ground. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Ignition Coil Driver circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	2.5L POWER TECH I-4
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	2.5L POWER TECH I-4

P0351-IGNITION COIL #1 PRIMARY CRICUIT — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	2.5L POWER TECH I-4

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
INTERMITTENT CONDITION
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. With the DRBIII®, read DTCs. Is the Good Trip counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All

P0420-1/1 CATALYTIC CONVERTER EFFICIENCY — Continued

TEST	ACTION	APPLICABILITY
2	Inspect the Catalytic Converter for the following damage. Damage Catalytic Converter, dent and holes. Severe discoloration caused by overheating the Catalytic Converter. Catalytic Converter broke internally. Leaking Catalytic Converter. Were any problems found? Yes → Replace the Catalytic Converter. Repair the condition that may have caused the failure. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Start Engine and let idle. **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.** Check for exhaust leaks between the engine and the appropriate downstream O2 Sensor. Is there any exhaust leaks? Yes → Repair or replace leaking exhaust parts as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	**Check the exhaust for excessive smoke from internal oil or coolant leaks.** Is there an oil or coolant consumption condition present? Yes → Repair engine mechanical condition as necessary and replace Catalytic Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5. 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.** Review vehicle repair history. Has the Downstream O2 Sensor been replaced without replacing the Upstream O2 Sensor? Yes → Replace the appropriate Upstream Oxygen Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace the Catalytic Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0420-1/1 CATALYTIC CONVERTER EFFICIENCY — Continued

TEST	ACTION	APPLICABILITY
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
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 (STUCK CLOSED)

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 8	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. Were any problems found? Yes → Repair or Replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
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. Were any problems found? Yes → Repair or replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P0441-EVAP PURGE FLOW MONITOR — Continued

TEST	ACTION	APPLICABILITY
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. Were any problems found? Yes → Repair or replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. 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. Is the vacuum supply hose and throttle body vacuum nipple free from defects? Yes → Go To 6 No → Repair the vacuum supply hose/tube as necessary. 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 and canister if contamination is found** Turn the ignition off. Disconnect the vacuum hoses at the EVAP Purge Solenoid. Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port. (component side) Does the Evap Purge Solenoid hold vacuum? Yes → Go To 7 No → Replace the Evap Purge Solenoid. 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) Ignition on, engine not running. With the DRBIII®, actuate the EVAP Purge Solenoid and observe the vacuum gauge. Does the vacuum drop when the solenoid is actuated? Yes → Test Complete. No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0441-EVAP PURGE FLOW MONITOR — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
EVAPORATIVE EMISSION LEAK DETECTION
EVAP PURGE SOLENOID LEAKS/STUCK OPEN
INTERMITTENT LDP MONITOR FAILURE

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.** Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 5	All

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

TEST	ACTION	APPLICABILITY
2	To continue testing you will need Miller Tool #8404 Evaporative Emission Leak Detector (EELD). **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.** **NOTE: The fuel tank should have between 20% and 80% of fuel tank capacity to properly test the Evap system.** Disconnect the vacuum supply hose at the Leak Detection Pump. 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. Using the DRBIII®, select Engine/System Tests and actuate the Leak Detect Pump Test (Option 3/Hold PSI). **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.** Connect the red power lead of Miller Tool #8404 to the battery positive terminal and the black ground lead to battery negative terminal. **NOTE: See Charts and Graph support material EELD Calibration Setup for an example.** Connect shop air to the #8404 EELD. Set the smoke/air control switch to AIR. 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). Press the remote smoke/air start button. Position the red flag on the air flow meter so it is aligned with the indicator ball. 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. Install the service port adapter #8404-14 on the vehicle's service port. Connect the Air supply hose from the EELD to the service port. Press the remote button to activate AIR flow. **NOTE: Larger volume fuel tanks, and/or those with less fuel, may require 4 to 5 minutes to fill.** Compare the flow meter indicator ball reading to the red flag. ABOVE the red flag indicates a leak present. BELOW the red flag indicates a sealed system. Is the indicator ball above the red flag? Yes → Go To 3 No → Go To 5	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.** To continue testing, you will need Miller Tool #8404 Evaporative Emissions Leak Detector (EELD). Remove the Air supply hose from the service port. Connect the SMOKE supply tip (black hose) to the service port. Set the smoke/air control switch to SMOKE. **NOTE: The flow meter indicator ball will not move at this point.** Press the remote smoke/air start button. **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.** **NOTE: For optimal performance, introduce smoke into the system for an additional 60 seconds; continue introducing smoke at 15 second intervals, as necessary.** 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. 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. The exiting smoke deposits a residual fluid that is either bright green or bright yellow in color when viewed with a UV light. Was a leak found? Yes → Repair or replace the leaking component as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6. 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.** Turn the ignition off. Disconnect the vacuum hoses at the Evap Purge Solenoid. Using a hand vacuum pump, apply 10 inches of vacuum to the Evap Purge Solenoid vacuum source port on the component side. **NOTE: Monitor the vacuum gauge for at least 15 seconds.** Does the Evap Purge Solenoid hold vacuum? Yes → Go To 5 No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

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

TEST	ACTION	APPLICABILITY
5	At this time, the conditions required to set the DTC are not present. **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.** **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.** **Note: Refer to any Technical Service Bulletins (TSB's) that may apply.** With the DRBIII® in System Tests, perform the LDP Monitor Test. This will force the PCM to run the LDP Monitor. If the monitor fails, further diagnosis is required to find faulty component. If the monitor passes, the condition is not present at this time. Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Test Complete.	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
INTERMITTENT CONDITION
EVAP PURGE SOLENOID
EVAP PURGE SOLENOID CONTROL CIRCUIT OPEN
EVAP PURGE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the DTC Specific Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Evap Purge Solenoid connector. Measure the resistance between the terminals of the Evap Purge Solenoid. Is the resistance between 30.0 and 40.0 ohms? Yes → Go To 3 No → Replace the Evap Purge Solenoid. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	Turn the ignition off. Disconnect the Evap Purge Solenoid harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Evap Purge Solenoid Control circuit from the PCM harness connector to the Evap Purge Solenoid harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the Evap Purge Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0443-EVAP PURGE SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Evap Purge Solenoid harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Evap Purge Solenoid Control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Evap Purge Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the Evap Purge Solenoid harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage on the Fused Ignition Switch Output circuit at the EVAP Purge Solenoid harness connector. Is the voltage above 10.0 volts? Yes → Go To 6 No → Repair the open in the Fused Ignition Switch Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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. **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.** Remove the fuel tank. Remove the fuel pump module from the fuel tank. Inspect the inside of the fuel tank for any obstructions or deformities. Is the fuel tank free from defects? Yes → Go To 2 No → Repair or replace the fuel tank as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
2	If there are no possible causes remaining, view repair. Repair Replace the Fuel Level Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
P0462-FUEL LEVEL SENDING UNIT VOLTS TOO LOW

When Monitored and Set Condition:

P0462-FUEL LEVEL SENDING UNIT VOLTS 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
INTERMITTENT CONDITION
FUEL LEVEL SENSOR
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the Fuel Level Sensor voltage. Is the Fuel Level Sensor voltage below 0.2 of a volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Ignition on, engine not running. With the DRBIII®, read the Fuel Level Sensor voltage. Did the Fuel Level Sensor voltage change from below 0.2 of a volt to above 4.0 volts? Yes → Replace the Fuel Level Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Fuel Level Sensor Signal circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P0462-FUEL LEVEL SENDING UNIT VOLTS TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Fuel Level Sensor Signal circuit and the Sensor ground circuit. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in the Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Signal circuit at the Fuel Pump Module connector and PCM connector. Turn the ignition on and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary or refer to the Instrument Category in the Body Diagnostic Manual and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All

Symptom:
P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH

When Monitored and Set Condition:

P0463-FUEL LEVEL SENDING UNIT VOLTS 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 SIGNAL CIRCUIT OPEN
INTERMITTENT CONDITION
FUEL LEVEL SENSOR
FUEL LEVEL SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the Fuel Level Sensor voltage. Is the fuel level sensor voltage above 4.9 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Fuel Pump Module electrical harness connector. Connect a jumper wire between the Fuel Level Sensor Signal circuit and the Sensor ground circuit at the Fuel Pump Module harness connector. Ignition on, engine not running. With the DRBIII®, read the Fuel Level Sensor voltage. Did the Fuel Level Sensor voltage change from above 4.9 volts to below 0.4 of a volt? Yes → Replace the fuel level sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All

P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Sensor ground circuit from the PCM harness connector to the Fuel Pump Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage on the Fuel Level Sensor Signal circuit at the Fuel Pump Module harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Turn the ignition off. Disconnect the fuel pump module harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - It is critical that the connector is free from any signs of corrosion or deformities - Clean/repair as necessary.** Measure the resistance of the Fuel Level Sensor signal circuit from the PCM harness connector to the Fuel Pump Module harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair open in the Fuel Level Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P0463-FUEL LEVEL SENDING UNIT VOLTS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Signal circuit at the Fuel Pump Module connector and PCM connector. Turn the ignition on and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary or refer to the Instrument Category in the Body Diagnostic Manual and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All

Symptom:
P0500-NO VEHICLE SPEED SENSOR SIGNAL

When Monitored and Set Condition:

P0500-NO VEHICLE SPEED SENSOR SIGNAL

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
INTERMITTENT CONDITION
5 VOLT SUPPLY CIRCUIT OPEN
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT OPEN
VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SIGNAL CIRCUIT SHORTED TO VOLTAGE
VEHICLE SPEED SENSOR
PCM SIGNAL CIRCUIT
PCM 5 VOLT SUPPLY CIRCUIT

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read PCM DTCs. Is the Good Trip Counter displayed and equal to 0? Yes → Go To 2 No → Go To 11	All
2	Turn the ignition off. Disconnect the VSS harness connector. Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit at the VSS harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 3 No → Go To 8	All

P0500-NO VEHICLE SPEED SENSOR SIGNAL — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the Vehicle Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Vehicle Speed Signal circuit from the PCM harness connector to the VSS harness connector. Is the resistance above 5.0 ohms? Yes → Repair the open in the Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the PCM harness connector(s). Disconnect the Vehicle Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Vehicle Speed Signal circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the PCM harness connector. Disconnect the VSS harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage on the Vehicle Speed Signal circuit at the PCM harness connector. Is the voltage above 5.3 volts? Yes → Repair the short to voltage in the Vehicle Speed Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Disconnect the VSS harness connector. Connect a jumper wire to the Vehicle Speed Signal circuit in the VSS harness connector. Ignition on, engine not running. Quickly and repeatedly tap the jumper wire to ground. With the DRBIII® read the Vehicle Speed Signal display. Is the DRBIII® reading Vehicle Speed above 0 MPH? Yes → Replace the Vehicle Speed Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0500-NO VEHICLE SPEED SENSOR SIGNAL — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the VSS harness connector. Disconnect the PCM harness connector. Measure the resistance in the 5 Volt Supply circuit from the VSS harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	Turn the ignition off. Disconnect the VSS harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the 5 Volt Supply circuit at the VSS harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Speed Sensor Signal circuit at the Speed Sensor connector and the PCM connector. Drive the vehicle and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary.. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
IAC #1 DRIVER CIRCUIT SHORTED TO #2, #3, OR #4
IAC #2 DRIVER CIRCUIT SHORTED TO #3 OR #4
IAC #3 DRIVER CIRCUIT SHORTED TO #4
IAC DRIVER CIRCUIT SHORTED TO VOLTAGE
IAC DRIVER CIRCUIT SHORTED TO GROUND
IAC MOTOR OPERATION
IAC MOTOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip displayed and equal to zero? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the IAC Motor harness connector. Disconnect the Powertrain Control Module harness connectors. **Note: The following steps are checking for a short between the IAC Driver Circuits.** Measure the resistance between the IAC #1 Driver circuit and #2, #3, #4 Driver circuits. Is the resistance below 5.0 ohms on any of the Drivers? Yes → Repair the IAC Driver Circuits shorted together. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All

P0505-IDLE AIR CONTROL MOTOR CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the IAC Motor harness connector. Disconnect the Powertrain Control Module harness connectors. **Note: The following steps are checking for a short between the IAC Driver Circuits.** Measure the resistance between the IAC #2 Driver circuit and #3, #4 Driver circuits. Is the resistance below 5.0 ohms on any of the Drivers? Yes → Repair the IAC Driver Circuits shorted together. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Disconnect the IAC Motor harness connector. Disconnect the Powertrain Control Module harness connectors. **Note: The following steps are checking for a short between the Driver Circuits.** Measure the resistance between the IAC #3 Driver circuit and the #4 Driver circuit. Is the resistance below 5.0 ohms? Yes → Repair the IAC Driver Circuits shorted together. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the IAC Motor harness connector. Disconnect the Powertrain Control Module harness connector. Remove the ASD Relay. Using a jumper wire, jumper between the Fused B+ circuit and ASD Relay Output circuit in the PDC. Ignition on, engine not running. Measure the voltage of each of the IAC Driver circuit. Is the voltage above 1.0 volt at any IAC Driver circuit? Yes → Repair the IAC Driver circuit(s) for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Disconnect IAC Motor harness connector. Disconnect the PCM harness connector. Repeat each measurement for each IAC Driver circuit. Measure the resistance of each IAC Driver circuit to ground. Is the resistance below 100 ohms at any IAC Driver circuit? Yes → Repair the IAC Driver circuit(s) for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All

P0505-IDLE AIR CONTROL MOTOR CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the IAC Motor harness connector. Start and idle the engine. Using a test light connected to ground, probe the IAC Driver #1 circuit for 10 seconds. Repeat the above test for the remaining IAC Motor Driver circuits. Does the test light turn on and off while probing each IAC Motor Driver circuit? Yes → Replace the Idle Air Control Motor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0522-OIL PRESSURE SENSOR VOLTS LOW

When Monitored and Set Condition:

P0522-OIL PRESSURE SENSOR VOLTS LOW

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

Set Condition: The oil pressure sensor voltage at PCM goes below 0.1 of a volt for 0.5 of a second.

POSSIBLE CAUSES
INTERMITTENT CONDITION
OIL PRESSURE 5-VOLT SUPPLY CIRCUIT OPEN
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
OIL PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Start the engine. With the DRBIII® in Sensors, read the Oil Pressure Sensor voltage. Is the Oil Pressure Sensor voltage below 0.1 of a volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 3 No → Repair the open in the Oil Pressure Sensor 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance between the Oil Pressure Sensor Signal circuit and ground (B-). Is the resistance below 100 ohms? Yes → Repair the short to ground in the Oil Pressure Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P0522-OIL PRESSURE SENSOR VOLTS LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Oil Pressure Sensor Signal circuit and the Sensor ground circuit at the Oil Pressure Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to Sensor ground in the Oil Pressure Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII® in Sensors, read the Oil Pressure Sensor voltage. Is the voltage above 4.5 volts? Yes → Replace the Oil Pressure Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Oil Pressure Sensor Signal circuit at the sensor connector and the PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All

Symptom:
P0523-OIL PRESSURE SENSOR VOLTS HIGH

When Monitored and Set Condition:

P0523-OIL PRESSURE SENSOR VOLTS 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
INTERMITTENT CONDITION
OIL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
OIL PRESSURE SENSOR
SENSOR GROUND CIRCUIT OPEN
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII® in Sensors, read the Oil Pressure Sensor voltage. Is the Oil Pressure Sensor voltage above 4.8 volts? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Disconnect the PCM harness connector(s). Measure the resistance of the Oil Pressure Sensor Signal Circuit from the PCM harness connector to the Oil Pressure Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the open in the Oil Pressure Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Install a jumper wire between the Sensor Signal circuit, and Sensor ground circuit, at the Sensor harness connector. Ignition on, engine not running. With the DRBIII® in Sensors, read the Oil Pressure Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the Oil Pressure Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P0523-OIL PRESSURE SENSOR VOLTS HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Sensor Ground circuit from the Oil Press Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the Sensor ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the Oil Pressure Sensor Signal circuit. Is the test light illuminated and bright? Yes → Repair the short to battery voltage in the Oil Pressure Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the Powertrain Control Module. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, back probe the Oil Pressure Signal circuit at the Sensor connector and the PCM connector. Start the engine and look for any differences in the two patterns. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	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
INTERMITTENT CONDITION
POWER STEERING PRESSURE SWITCH GROUND CIRCUIT OPEN
POWER STEERING PRESSURE SWITCH SENSE CIRCUIT SHORTED TO GROUND
POWER STEERING SWITCH SENSE CIRCUIT OPEN
POWER STEERING PRESSURE SWITCH
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Power Steering Pressure Switch harness connector. Measure the resistance of the Ground circuit in the Power Steering Pressure Switch connector. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the open in the Power Steering Pressure Switch ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Turn the ignition off. Disconnect the Power Steering Pressure Switch harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the Power Steering Pressure Switch Sense circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Power Steering Pressure Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P0551-POWER STEERING SWITCH FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Power Steering Pressure Switch harness connector. Disconnect the PCM harness connector(s). Measure resistance of Power Steering Pressure Switch Sense circuit from PCM harness connector to Power Steering Pressure Sensor harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the Power Steering Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Turn the ignition off. Disconnect the Power Steering Pressure Switch harness connector. Ignition on, engine not running. Connect a Jumper Wire to the Power Steering Pressure Switch Sense Circuit at harness connector. Using the DRBIII®, while monitoring the Power Steering Pressure Switch. Touch the Jumper Wire to the Ground circuit at the Power Steering Pressure Switch harness connector several times. Did the Power Steering Pressure Switch status change from Hi to Low? Yes → Replace the Power Steering Pressure Switch. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	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
INTERMITTENT CONDITION
EXHAUST LEAK
O2 SENSOR SIGNAL CIRCUIT VOLTAGE DROP
O2 SENSOR GROUND CIRCUIT VOLTAGE DROP
O2 SENSOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 6	All

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

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

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

TEST	ACTION	APPLICABILITY
6	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **NOTE: Check for contaminates that may have damaged the O2 Sensor: contaminated fuel, unapproved silicone, oil and coolant.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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.** **Note: Extremely cold outside ambient temperatures may cause this DTC to set.** Verify that the coolant level is not low and correct as necessary. Start the engine. With the DRBIII®, set the engine RPM to 1500 and allow the engine to warm up for 10-15 minutes. With the DRBIII®, monitor the ENG COOLANT TMP DEG value during the warm up cycle. Make sure the transition of temperature change is smooth. Did the engine temperature reach a minimum of 80° C (176° F)? Yes → Test Complete. 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. 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
INTERMITTENT CONDITION
FUEL PUMP RELAY
FUEL PUMP RELAY CONTROL CIRCUIT OPEN
FUEL PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the Fuel Pump Relay. Is the Fuel Pump Relay clicking? Yes → Go To 2 No → Go To 3	All
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All

P1282-FUEL PUMP/SYSTEM RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Fuel Pump Relay. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between terminals 1 (85) and 2 (86) of the Fuel Pump Relay. Is the resistance between 50 and 90 ohms? Yes → Go To 4 No → Replace the Fuel Pump Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Fuel Pump Relay control circuit between the Fuel Pump Relay connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the Fuel Pump Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the Fuel Pump Relay control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Fuel Pump Relay control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage on the Fused Ignition Switch output circuit in the Fuel Pump Relay connector. Is the voltage above 10.0 volts? Yes → Go To 7 No → Repair the open in the Fused Ignition Switch Output circuit. NOTE: Check for an open fuse. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. 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
INTERMITTENT CONDITION
VACUUM LEAK
AIR INDUCTION SYSTEM
MINIMUM IDLE AIR FLOW OUT OF SPECS
THROTTLE BODY AND THROTTLE LINKAGE
IAC DRIVER CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **NOTE: All MAP Sensor, IAC, and/or TPS codes present must be diagnosed first before proceeding.** With the DRBIII®, read DTCs. Is the Good Trip displayed and equal to zero? Yes → Go To 2 No → Go To 8	All
2	Inspect the Intake Manifold for vacuum leaks. Inspect the Power Brake Booster for any vacuum leaks. Inspect the PCV system for proper operation or any vacuum leaks. Were any problems found? Yes → Repair vacuum leak as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 3	All

P1294-TARGET IDLE NOT REACHED — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the vacuum line at the PCV valve. Install Miller Tool #6714 (0.185″ air metering orifice) into the disconnected vacuum line in place of the PCV valve. Disconnect the purge hose from the fitting on the throttle body. The purge hose is located on the front of the throttle body next to the MAP sensor. Cap the fitting at the throttle body after the purge hose has been disconnected. Start the engine. Ensure that all accessories are off. Allow the engine to reach operating temperature above 82°C (180°F). With the DRBIII® in System Tests, perform the Minimum Air Flow function. Is the engine RPM between 500 and 900? Yes → Test complete Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Inspect the Air Induction System for the following problems. Restrictions: Dirty Air Cleaner, Foreign material trap in the air intake tube, etc. Leaks: Air Intake tube connection, Air Cleaner housing, etc. Were any problems found? Yes → Repair or replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 5	All
5	Inspect the throttle body plate carbon build up or other restrictions. Inspect the throttle linkage for binding and smooth operation. Ensure the throttle plate is resting on the stop at idle. Remove IAC, inspect the pintle and its seating surface inside the throttle body. Were any problems found? Yes → Clean and/or replace the throttle body as needed. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Turn the ignition off. Disconnect IAC Motor harness connector. Disconnect the PCM harness connector. Measure the resistance of the IAC Driver circuit from the IAC Motor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the IAC Driver circuit(s). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1294-TARGET IDLE NOT REACHED — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	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
INTERMITTENT CONDITION
5 VOLT SUPPLY CIRCUIT OPEN
MAP SENSOR
MAP SENSOR 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
PCM
PCM SENSE

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.** Ignition on, engine not running. With the DRBIII® in Sensors, read the MAP sensor voltage. Is the voltage below 2.35 volts? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the voltage above 4.5 volts? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. With the DRBIII® in Sensors, read the MAP Sensor voltage. Is the voltage above 4.5 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

P1296-NO 5 VOLTS TO MAP SENSOR — Continued

TEST	ACTION	APPLICABILITY
4	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector and the PCM connector. Measure the resistance of the 5 Volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open or high resistance in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. Disconnect the MAP Sensor Electrical harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the MAP Sensor 5 Volt Supply circuit for resistance to ground. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5 VOLT SUPPLY CIRCUIT OPEN
MAP SENSOR INTERNAL FAILURE
MAP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
MAP SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
MAP SENSOR VACUUM PORT
PCM 5 VOLT SUPPLY CIRCUIT
PCM MAP SENSOR SIGNAL

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.** Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip displayed and equal to zero? Yes → Go To 2 No → Go To 12	All
2	Ignition on, engine not running. With the DRBIII®, read the MAP Sensor voltage. Is the voltage below 3.19 volts? Yes → Go To 3 No → Go To 12	All

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. Measure the voltage of the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the voltage between 4.5 to 5.2 volts? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off. Disconnect the MAP Sensor harness connector. Ignition on, engine not running. With the DRBIII®, monitor the MAP Sensor voltage. Is the voltage above 1.2 volts? Yes → Replace the MAP Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the MAP Sensor Signal circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between the MAP Sensor Signal circuit and the Sensor ground circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to Sensor ground in the MAP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. Remove the MAP Sensor. Inspect the vacuum port, check for restrictions or any foreign materials. Were any restriction found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

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

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the 5 Volt Supply circuit at the MAP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All
10	Turn the ignition off. Disconnect the MAP Sensor harness connector. Disconnect the PCM harness connector. Measure the resistance of the 5 Volt Supply circuit from the MAP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the open on the 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** **NOTE: Remove the MAP Sensor and inspect the MAP and vacuum passage for restrictions and foriegn material** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	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
INTERMITTENT CONDITION
FUSED IGNITION SWITCH OUTPUT CIRCUIT
ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND
ASD RELAY CONTROL CIRCUIT OPEN
ASD RELAY RESISTANCE
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the DTC Specific Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Remove the ASD Relay from the PDC. Ignition on, engine not running. Measure the voltage on the Fused Ignition Switch Output circuit at the ASD Relay connector in the PDC. Is the voltage above 10.0 volts? Yes → Go To 3 No → Repair the open or short to ground in the Fused Ignition Output. Check all related fuses and replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance between ground and the ASD Relay Control circuit at the PDC. Is the resistance below 100 ohms? Yes → Repair the short to ground in the ASD Relay control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All

P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the ASD Relay from the PDC. Measure the resistance between terminals 85 and 86 of the ASD Relay. Is the resistance between 50 and 80 ohms? Yes → Go To 5 No → Replace the ASD Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance of the ASD Relay Control circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the ASD Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	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
INTERMITTENT CONDITION
ASD RELAY
ASD RELAY OUTPUT CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
ASD OUTPUT CIRCUIT OPEN
PCM - START
PCM - NO START

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 9	All
2	Attempt to start the engine. Did the engine start? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance of the ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM — Continued

TEST	ACTION	APPLICABILITY
4	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Install a substitute relay for the ASD Relay. Attempt to start the vehicle. Did the engine start? Yes → Replace the ASD Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the PCM harness connector(s). Measure the resistance of the ASD Relay Output circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the ASD Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	Turn the ignition off. Remove the ASD relay from the PDC. Measure the voltage of the Fused B+ circuit at the ASD Relay connector. Is the voltage above 10.0 volts? Yes → Go To 8 No → Repair the open or short to ground in the fused B+ circuit. Note: Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1389-NO ASD RELAY OUTPUT VOLTAGE AT PCM — Continued

TEST	ACTION	APPLICABILITY
9	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	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
CMP AND CKP OUT OF SYNC
CHECKING INTERMITTENT CMP SIGNAL WITH LAB
HARNESS INSPECTION
TONE WHEEL/PULSE RING INSPECTION
WIRING HARNESS INSPECTION
TONE WHEEL/PULSE RING INSPECTION
CHECKING INTERMITTENT CKP SIGNAL WITH LAB
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR

TEST	ACTION	APPLICABILITY
1	**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.** Start the engine and run until operating temp is reached. (Closed Loop) With the DRBIII® under the Misc. menu, choose the Set Sync Signal function and observe the Actual Sync Setting. Does the Actual Sync Setting read In Range? Yes → Go To 2 No → With the DRBIII®, synchronize the Cam and Crank Position Sensors. If the vehicle has a distributor it may be necessary to adjust the distributor to get the Cam and Crank within specifications. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the CMP Signal circuit in the CMP harness connector. **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.** Start the engine. Observe the lab scope screen. Are there any irregular or missing signals? Yes → Go To 3 No → Go To 6	All
3	Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight. Refer to any TSBs that may apply. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. Remove the Camshaft Position Sensor. Inspect the Tone Wheel/Pulse Ring for damage, foreign material, or excessive movement. Were any problems found? Yes → Repair or replace the Tone Wheel/Pulse Ring as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace the Camshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CMP Signal circuit in the PCM harness connector and in the CMP harness connector. **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.** Start the engine. Observe the lab scope screen. Wiggle the related wire harness and gently tap on the Cam Position Sensor. Look for any differences between the Channel 1 and Channel 2 patterns, generated by the CMP Sensor. Does the DRBIII® screen display any missing or irregular patterns? Yes → Replace the Camshaft Position Sensor or repair the wiring/ connection concern.. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Turn the ignition off. With the DRBIII® lab scope probe and the Miller special tool #6801, backprobe the CKP Signal circuit in the CKP harness connector. **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.** Start the engine. Observe the lab scope screen. Are there any irregular or missing signals? Yes → Go To 8 No → Go To 11	All
8	Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals. Ensure the Crankshaft Position Sensor and the Camshaft Position Sensor are properly installed and the mounting bolt(s) tight. Refer to any TSBs that may apply. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
9	Turn the ignition off. Remove the Crankshaft Position Sensor. Inspect the Tone Wheel/Flex Plate slots for damage, foreign material, or excessive movement. Were any problems found? Yes → Repair or replace the Tone Wheel/Flex Plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 10	All

P1391-INTERMITTENT LOSS OF CMP OR CKP — Continued

TEST	ACTION	APPLICABILITY
10	If there are no possible causes remaining, view repair. Repair Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	**NOTE: The conditions that set this DTC are not present at this time. The following test may help in identifying the intermittent condition.** Turn the ignition off. With the DRBIII® as a Dual Channel Lab Scope and the Miller special tool #6801, backprobe the CKP Signal circuit in the PCM harness connector and CKP harness connector. Both of the graphs should be identical. **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.** Start the engine. Monitor the DRBIII® lab scope screen, both patterns should be the same. Wiggle the related wire harness and gently tap on the Crank Position Sensor. Look for any differences between Channel 1 and Channel 2 patterns generated by the CKP Sensor. Were any erratic or missing signals noticed? Yes → Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. 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
INTERMITTENT CONDITION
CMP SENSOR CONNECTOR/WIRING
CKP SENSOR CONNECTOR/WIRING
DAMAGED TONE WHEEL/FLEX PLATE (CRANKSHAFT)
CRANKSHAFT POSITION SENSOR
FAULTY PCM

TEST	ACTION	APPLICABILITY
1	**Note: Check for any TSB's that may apply to this symptom.** 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. Ignition on, engine not running. With the DRBIII® in the miscellaneous menu, choose ″Clear PCM (battery disconnect)″ to reset the PCM. With the DRBIII®, choose the ″Misfire Pretest screen. Road test the vehicle and re-learn the adaptive numerator. The adaptive numerator is learned when the ″Adaptive Numerator Done Learning″ line on the Mis-fire Pre-test screen changes to ″Yes″. Did the adaptive numerator re-learn? Yes → Go To 2 No → Go To 3	All

P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
3	Turn ignition off. **Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Make sure the Camshaft Position Sensor is tight.** **Note: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Turn the ignition off. **Note: Visually inspect the Crankshaft Position Sensor and related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Make sure the sensor mounting bolt(s) are tight.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off. Disconnect and remove the crankshaft position sensor. Inspect the tone wheel/flexplate slots for damage, foreign material, or excessive movement. Is the tone wheel/flexplate free from defects? Yes → Go To 6 No → Repair/replace tone wheel/flex plate as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1398-MIS-FIRE ADAPTIVE NUMERATOR AT LIMIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. With the DRBIII® lab scope probe and the Miller special tool #6801, back probe the CKP Signal circuit in the PCM harness connector. **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..** Start the engine and observe the lab scope screen for any erratic CKP Sensor pulses. Were any erratic Crank Position signals detected? Yes. Replace the Crankshaft Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No. Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. 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
INTERMITTENT CONDITION
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. With the DRBIII®, read DTCs. Is the DTC Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 5	All
2	**Note: All previously disconnected hose(s) reconnected.** 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. The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized. 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. Did the pressure drop when the hose was disconnected? Yes → Go To 3 No → Replace the EVAP Canister. 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.** 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. The flow meter gauge on the EELD reads 0 LPM the EVAP system completely pressurized. Disconnect the EVAP hoses at the Purge Solenoid. Did the pressure drop when the hose was disconnected? Yes → Go To 4 No → Repair or replace hose/tube as necessary. 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. Inspect the LDP pressure hose for any obstructions or physical damage. Is the LDP pressure hose free from defects? Yes → Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Repair/replace hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
5	At this time, the conditions required to set the DTC are not present. **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.** **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.** **Note: Refer to any Technical Service Bulletins (TSB's) that may apply.** With the DRBIII® in System Tests, perform the LDP Monitor Test. This will force the PCM to run the LDP Monitor. If the monitor fails, further diagnosis is required to find faulty component. If the monitor passes, the condition is not present at this time. Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Test Complete.	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
LDP SWITCH SENSE CIRCUIT SHORTED TO GROUND
LDP VACUUM SUPPLY
WIRE HARNESS/INTERMITTENT
FAULTY LEAK DETECTION PUMP
LDP SWITCH SENSE CIRCUIT OPEN
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the DTC Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the vacuum supply hose at the Leak Detection Pump. Connect a vacuum gauge to the disconnected vacuum supply hose at the Leak Detection Pump. Start the engine and read the vacuum gauge. Does the vacuum gauge read at least 13″ Hg? Yes → Go To 3 No → Repair leak or obstruction in vacuum hose as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1494-LEAK DETECTION PUMP SW OR MECHANICAL FAULT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Leak Detect Pump Sw state. While observing the Leak Detect Pump Sw state, connect a jumper wire between a good 12 volt source (B+) and the LDP Switch Sense circuit. Did the Leak Detect Pump Sw state change when the jumper was connected? Yes → Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 4	All
4	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the LDP Switch Sense circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the LDP Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 5	All
5	Turn the ignition off. Disconnect the Leak Detection Pump harness connector. Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the LDP Switch Sense Circuit from the PCM harness connector to LDP harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Leak Detection Pump Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
7	At this time, the conditions required to set the DTC are not present. **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.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB's) that may apply.** Perform a wiggle test of the LDP wiring while the circuit is actuated with the DRBIII®. Listen for the LDP to quit actuating. Also watch for the Good Trip Counter to change to 0. Were any problems found? Yes → Repair wire harness/connectors as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Test Complete.	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
GENERATOR SOURCE CIRCUIT OPEN
LEAK DETECTION PUMP SOLENOID CONTROL CIRCUIT OPEN
LDP SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
LEAK DETECTION PUMP
WIRING HARNESS INTERMITTENT
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the DTC Good Trip Counter displayed and equal to zero? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Leak Detection Pump. Using a 12 volt test light connected to ground, check the Generator Source circuit at the LDP connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open in the Generator Source circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Connect a 12 volt test light to a good 12 volt source. Ignition on, engine not running. With the DRBIII®, actuate the Leak Detection Pump. Check the LDP Solenoid Control circuit with the test light while the Pump is actuating. Does the test light blink? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
5	Turn the ignition off. Disconnect the Leak Detection Pump electrical harness connector. Disconnect the PCM harness connector(s). Measure the resistance between ground and the LDP Solenoid Control circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the LDP Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 6	All
6	Turn the ignition off. Disconnect the Leak Detection Pump Solenoid harness connector. Disconnect the PCM harness connector(s).. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the LDP Solenoid control Circuit from the PCM harness connector to the LDP harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Leak Detection Pump Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
8	At this time, the conditions required to set the DTC are not present. **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.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **NOTE: Refer to any Technical Service Bulletins (TSB's) that may apply.** Perform a wiggle test of the LDP wiring while the circuit is actuated with the DRBIII®. Listen for the LDP to quit actuating. Also watch for the Good Trip Counter to change to 0. Did the LDP Solenoid ever stop or start clicking? Yes → Repair as necessary where wiggling caused problem to appear. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Test Complete.	All

Symptom:
P1899-P/N SWITCH PERFORMANCE

POSSIBLE CAUSES
INTERMITTENT TRS SENSE CIRCUIT
P/N SWITCH
PARK/NEUTRAL SENSE CIRCUIT OPEN
PARK/NEUTRAL SENSE CIRCUIT SHORTED TO GROUND
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Is the Good Trip Counter for P-1899 displayed and equal to 0? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition on. With the DRBIII®, read the PNP switch input state. While moving the gear selector through all gear positions Park to 1st and back to Park, watch the DRBIII® display. Did the DRBIII® display PNP Switch and D/R in the correct gear positions? Yes → Test Complete. No → Go To 3	All
3	Turn the ignition off. Disconnect the PCM C1 harness connector. Disconnect the PNP switch harness connector. **Check connectors - Clean/repair as necessary** Measure the resistance of the PNP switch sense circuit between the PCM C1 harness connector and the PNP switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PNP sense circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Disconnect the PCM C1 harness connector. Disconnect the PNP switch harness connector. **Check connectors - Clean/repair as necessary** Measure the resistance between ground and the PNP switch sense circuit. Is the resistance below 5.0 ohms? Yes → Repair the PNP switch sense circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All

P1899-P/N SWITCH PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the PCM C1 harness connector. Check connectors - Clean/repair as necessary Move the gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through the gear positions, measure the resistance between ground and the PNP switch sense circuit in the PCM C1 harness connector. Did the display change from above 10.0 ohms to below 10.0 ohms? Yes → Go To 6 No → Replace the Park/Neutral Position Switch in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	At this time, the conditions required to set the DTC are not present. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
*CHECKING EVAPORATIVE EMISSION OPERATION WITH NO DTCS

POSSIBLE CAUSES
PURGE SYSTEM CONTAMINATED
ROLLOVER VALVE
VACUUM HARNESS INTERMITTENT
WIRING HARNESS INTERMITTENT

TEST	ACTION	APPLICABILITY
1	Start the engine. Allow the engine to reach normal operating temperature. **Note: Engine must be in closed loop.** With the DRBIII®, go to Purge Vapors Test. Press 3 to flow. **Note: Short Term Adaptive should change.** Did Short Term Adaptive change? Yes → Test Complete. No → Go To 2	All
2	At this time, the conditions required to set the DTC are not present. **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.** **Note: Visually inspect the Evap Purge Solenoid and vacuum harness. Look for any chafed, pierced, pinched, or partially broken hoses.** **Note: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair vacuum harness/connections as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 3	All
3	At this time, the conditions required to set the DTC are not present. **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.** **NOTE: Visually inspect the related wire harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any technical service bulletins that may apply.** 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. Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 4	All

*CHECKING EVAPORATIVE EMISSION OPERATION WITH NO DTCS — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the Purge Solenoid. Inspect the line from rollover valve to the solenoid. Is liquid fuel in the line? Yes → Replace the Rollover Valve. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 5	All
5	Turn the ignition off. Remove the Purge solenoid and tap the ports against a clean solid surface. Did any foreign material fall out? Yes → Replace the purge solenoid and clean or replace the vacuum and purge lines and Evap canister. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Test Complete.	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
FUEL PUMP CAPACITY (VOLUME) OUT OF SPECS
FUEL PUMP RELAY FUSED B+ CIRCUIT
FUEL PUMP RELAY OUTPUT CIRCUIT OPEN
FUEL PUMP GROUND CIRCUIT OPEN/HIGH RESISTANCE
FUEL PUMP MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test. **Note: It may be necessary to use a mechanics stethoscope in the next step.** Listen for fuel pump operation at the fuel tank. Does the Fuel Pump operate? Yes → Go To 2 No → Go To 6 **Caution: Stop All Actuations.**	All
2	Turn the ignition off. **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.** Install a fuel pressure gauge to the fuel rail test port. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 339 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Choose a conclusion that best matches your fuel pressure reading. Below Specification Go To 3 Within Specification Go To 5 Above Specification Replace the fuel filter/fuel pressure regulator. Perform POWERTRAIN VERIFICATION TEST VER - 1. **Caution: Stop All Actuations.**	All

*CHECKING FUEL DELIVERY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. **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.** Raise vehicle on hoist, and disconnect the fuel pressure line at the fuel pump module. Install special 5/16″ fuel line adapter tool #6539 between disconnected fuel line and the fuel pump module. Attach a fuel pressure test gauge to the ″T″ fitting on tool #6539. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test and observe the fuel pressure gauge. **NOTE: Fuel pressure specification is 334 KPa +/- 34 KPa (49.2 psi +/- 5 psi).** Is the fuel pressure within specification now? Yes → Repair/replace fuel supply line as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 4 **Caution: Stop All Actuations.**	All
4	Turn the ignition off. **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.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
5	**Note: The fuel pressure must be within specification before continuing.** Turn the ignition off. **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.** Disconnect the fuel supply line at the fuel rail. Connect fuel line adapter #6539(5/16″) or #6631(3/8″) to the disconnected fuel supply line. Insert the other end of the adapter into a graduated container. **Caution: Do not operate the fuel pump for more than 7 seconds in the next step. Fuel pump module reservoir may run empty and damage to the fuel pump will result.** **Note: Specification: A good fuel pump will deliver at least 1/4 liter (1/2 pint) of fuel in 7 seconds.** Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test for 7 seconds. Is the fuel pump capacity within specification? Yes → Test Complete. No → Check for a kinked/damaged fuel supply line between the fuel tank and fuel rail. If OK, replace the fuel pump module. Perform POWERTRAIN VERIFICATION TEST VER - 1. **Caution: Stop All Actuations.**	All

*CHECKING FUEL DELIVERY — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the fuel pump module harness connector. Ignition on, engine not running. With the DRBIII®, actuate the ASD Fuel System test. Using a 12 volt test light connected to ground, probe the Fuel Pump Relay Output circuit at the Fuel Pump Module harness connector. Does the test light illuminate brightly? Yes → Go To 7 No → Go To 9 **Caution: Stop All Actuations.**	All
7	Turn the ignition off. Disconnect the Fuel Pump Module harness connector. **Note: Check connectors - It is critical that the connector is free from any signs of corrosion or deformities - Clean/repair as necessary.** Using a test light connected to 12-volts, backprobe the Fuel Pump ground circuit at the Fuel Pump Module harness connector. Does the test light illuminate brightly? Yes → Go To 8 No → Repair the open and/or high resistance in the Fuel Pump Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
8	If there are no possible causes remaining, view repair. Repair Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
9	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. Using a 12 volt test light connected to ground, backprobe the Fuel Pump Relay Fused B+ circuit at the PDC. Does the test light illuminate? Yes → Go To 10 No → Repair the open in the Fuel Pump Realy Fused B+ circuit. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
10	Turn the ignition off. Remove the Fuel Pump Relay from the PDC. Disconnect the Fuel Pump Module harness connector. **NOTE: Check connectors - It is critical that the connector is free from any signs of corrosion or deformities** Measure the resistance of the Fuel Pump Relay Output circuit from the relay connector to the fuel pump module connector. Is the resistance below 5.0 ohms? Yes → Replace the Fuel Pump Relay. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the open in the Fuel Pump Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*CHECKING IAC MOTOR

POSSIBLE CAUSES
IAC MOTOR OPERATION
IAC DRIVER CIRCUIT OPEN
IAC MOTOR

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, monitor engine RPM. With the DRBIII®, set the engine speed to 1400 RPM. Does the engine speed reach 1400 rpm? Yes → The IAC Motor is operation normally Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Disconnect IAC Motor harness connector. Disconnect the PCM harness connector. Repeat each measurement for each IAC Driver circuit. Measure the resistance of each IAC Driver circuit between the IAC Motor harness connector and the PCM harness connector. Is the resistance below 5.0 ohms at all IAC Driver circuits? Yes → Replace the Idle Air Control Motor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Repair the open IAC Driver circuit(s). Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING MAP SENSOR OPERATION WITH NO DTC'S

POSSIBLE CAUSES
MAP SENSOR OPERATION
MAP SENSOR

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Attach a vacuum gauge to a manifold vacuum source. **NOTE: If the engine will not idle, maintain a constant engine speed above idle.** Allow the engine to idle. With the DRBIII®, monitor the MAP sensor vacuum. Compare the MAP vacuum value on the DRBIII® and the vacuum reading on the vacuum gauge. Are the vacuum readings within 1 inch of vacuum of each other? Yes → The MAP sensor is operating normally. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the MAP sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING MINIMUM AIRFLOW

POSSIBLE CAUSES
THROTTLE PLATE/LINKAGE BINDING
VACUUM LEAK
MINIMUM IDLE AIR FLOW OUT OF SPECS
THROTTLE BODY DIRTY
THROTTLE BODY

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Check the throttle plate and linkage for a binding condition. The throttle linkage must be at idle position. Ensure the throttle plate is fully closed and against it's stop. Is the throttle plate and linkage free of damage? Yes → Go To 2 No → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
2	Inspect the Intake Manifold for vacuum leaks. Inspect the Power Brake Booster for any vacuum leaks. Inspect the PCV system for proper operation or any vacuum leaks. Were any problems found? Yes → Repair vacuum leak as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Turn the ignition off. Disconnect the vacuum line at the PCV valve. Install Miller Tool #6714 (0.185″ air metering orifice) into the disconnected vacuum line in place of the PCV valve. Disconnect the purge hose from the fitting on the throttle body. The purge hose is located on the front of the throttle body next to the MAP sensor. Cap the fitting at the throttle body after the purge hose has been disconnected. Start the engine. Ensure that all accessories are off. Allow the engine to reach operating temperature above 82°C (180°F). With the DRBIII® in System Tests, perform the Minimum Air Flow function. Is the engine RPM between 500 and 900? Yes → Test complete Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All

*CHECKING MINIMUM AIRFLOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the Throttle Body. **WARNING: Clean throttle body in a well ventilated area. Wear rubber or butyl gloves. Do not let cleaner come in contact with eyes or skin. Avoid ingesting cleaner. Wash thoroughly after using cleaner.** While holding the throttle open, spray the entire throttle body bore and the manifold side of the throttle plate with Mopar Throttle Body Cleaner. Clean the IAC motor passage also. Use compressed air to dry the throttle body. Re-install the throttle body. **Note: Miller Tool #6714 (0.185″ air metering orifice) still attached to the PCV vacuum line and the purge hose fitting on the throttle body capped.** Start the engine. Ensure that all accessories are off. Allow the engine to reach operating temperature above 82°C (180°F). With the DRBIII® in System Tests, perform the Minimum Air Flow function. Is the engine RPM between 500 and 900? Yes → Repair complete. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace the Throttle Body. Perform POWERTRAIN VERIFICATION TEST VER - 5. **CAUTION: Stop all actuations. Turn the engine off.**	All

Symptom:
*CHECKING RADIATOR FAN OPERATION WITH NO DTCS

POSSIBLE CAUSES
FUSED B(+) CIRCUIT OPEN
RADIATOR FAN GROUND CIRCUIT OPEN
RAD FAN MOTOR
RADIATOR FAN RELAY OUTPUT CIRCUIT OPEN
RADIATOR FAN RELAY

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Does the Radiator Fan Motor cycle on and off? Yes → Test Complete. No → Go To 2	All
2	Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Using a 12-volt Test Light connected to ground, backprobe the Radiator Fan Relay Output circuit in the Radiator Fan Motor harness connector. Does the test light cycle on and off? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition off. Disconnect the Radiator Fan Motor harness connector. Measure the resistance between ground and the Radiator Fan Motor ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the Radiator Fan ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	If there are no possible causes remaining, view repair. Repair Replace the Radiator Fan Motor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Turn the ignition off. Disconnect the Radiator Fan Relay Connector. Using a 12-volt Test Light connected to ground, check the Fused B(+) circuit in the Radiator Fan Relay connector. Did the light illuminate brightly? Yes → Go To 6 No → Repair the open in the Fused B(+) Circuit. Inspect the related fuse and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

*CHECKING RADIATOR FAN OPERATION WITH NO DTCS — Continued

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

Symptom:
*CHECKING RADIATOR FAN RELAY OUTPUT

POSSIBLE CAUSES
RADIATOR FAN RELAY OPERATION
GROUND CIRCUIT OPEN
RADIATOR FAN MOTOR
FUSED B+ CIRCUIT
RADIATOR FAN RELAY OUTPUT CIRCUIT
RADIATOR FAN RELAY

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Is the Radiator Fan actuating? Yes → The Radiator Fan System operating properly at this time. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Turn the ignition off. Disconnect the Radiator Fan harness connector. Measure the resistance between ground and the Ground circuit in the Radiator Fan harness connector. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the open in the Ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
3	Disconnect the Radiator Fan harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Radiator Fan Relay. Measure the voltage of the Radiator Fan Relay Output circuit in the Radiator Fan harness connector. Is the voltage above 11.0 volts? Yes → Replace the Radiator Fan Motor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 4	All
4	Turn the ignition off. Remove the Radiator Fan Relay from the PDC. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the PDC. Does the test light illuminate brightly? Yes → Go To 5 No → Repair the open in the Fused B+ circuit. Inspect fuses and replace as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

*CHECKING RADIATOR FAN RELAY OUTPUT — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Remove the Radiator Fan Relay from the PDC. Disconnect the Radiator Fan harness connector. Using a jumper wire, jumper the Fused B+ circuit and the Radiator Fan Output circuit in the Radiator Fan Relay harness connector. Measure the resistance of the Radiator Fan Relay Output circuit between the PDC and the Radiator Fan harness connector. Is the resistance below 5.0 ohms? Yes → Replace the Radiator Fan Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Repair the open in the Radiator Fan Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR

POSSIBLE CAUSES
ECT SENSOR OPERATION
ECT SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: The engine coolant temperature must be below 62°C (150°F).** Ignition on, engine not running. With the DRBIII®, monitor the ECT value. Start the engine. Does the ECT reach 82°C (180°F) and was it a smooth transition? Yes → Engine Coolant Temperature sensor is operating normally. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the Engine Coolant Temperature Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

Symptom:
*CHECKING THE INTAKE AIR TEMPERATURE SENSOR

POSSIBLE CAUSES
IAT SENSOR OPERATION
IAT SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: Do not allow more than a 5 minute delay during the removal of the IAT sensor and measuring the temperature.** Ignition on, engine not running. With the DRBIII®, read and record the IAT temperature value. Remove the IAT sensor. Using a temperature probe, measure the temperature inside the opening of the IAT sensor. Compare both temperature readings. Are the temperature readings within 12°C (10°F) of one another? Yes → The IAT sensor is operating normally. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the IAT sensor. 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. Disconnect the PCM harness connector. Using a 12-volt test light connected to ground, probe the PCM Fused B+ circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 2 No → Repair the open in the Fused B+ circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the PCM Fused Ignition Switch Output circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open in the Ignition Switch Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Turn the ignition off. Disconnect the PCM harness connector. Using a 12-volt test light connected to battery voltage, probe the PCM ground circuits in the PCM harness connector. Does the test light illuminate brightly? Yes → Test Complete. No → Repair the open in the PCM ground circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*CHECKING THROTTLE POSITION SENSOR OPERATION WITH NO DTCS

POSSIBLE CAUSES
THROTTLE POSITION SENSOR VOLTAGE ABOVE 1.5 VOLTS
THROTTLE POSITION SENSOR SWEEP
TP SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the throttle and linkage is not binding and is operating properly.** Ignition on, engine not running. With the DRBIII®, read the Throttle Position Sensor voltage. Is the voltage above 1.5 volts? Yes → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 2	All
2	Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Slowly open the throttle from the idle position to the wide open throttle position. Does voltage start at approximately 0.8 of a volt and go above 3.5 volts with a smooth transition? Yes → Throttle Position Sensor Operating normally. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 2.	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
INTERMITTENT CONDITION
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
A/C CLUTCH RELAY
A/C CLUTCH RELAY CONTROL CIRCUIT SHORT TO GROUND
A/C CLUTCH RELAY CONTROL CIRCUIT OPEN
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running With the DRBIII®, actuate the A/C Clutch Relay. Is the A/C Clutch Relay clicking? Yes → Go To 2 No → Go To 3	All

P0645-A/C CLUTCH RELAY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. With the DRBIII®, actuate the A/C Clutch Relay and wiggle the related wiring harness. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Test Complete.	All
3	Turn the ignition off. Disconnect the A/C Clutch harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the Fused Ignition Switch Output Circuit in the A/C clutch relay connector. Is the voltage above 10.0 volts? Yes → Go To 4 No → Repair the open/short to ground in the Fused Ignition Switch Output circuit. Inspect and replace fuse as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
4	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between Terminals 1(85) and 2 (86) of the A/C Clutch Relay. Is the resistance between 50.0 and 90.0 ohms? Yes → Go To 5 No → Replace the A/C Clutch Relay. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P0645-A/C CLUTCH RELAY CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the PCM harness connector(s). Remove the A/C Clutch Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the A/C Clutch Control Circuit at the PCM connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the A/C Clutch Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	Turn the ignition off. Disconnect the PCM harness connector(s). Remove the A/C Clutch Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the A/C Clutch Relay Control Circuit between the Relay harness connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the A/C Clutch Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	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
A/C CLUTCH RELAY OUTPUT CIRCUIT OPEN
FUSED B(+) CIRCUIT OPEN
A/C CLUTCH RELAY

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is there an A/C Clutch Relay DTC present? Yes → Diagnose the Relay DTC first before continuing. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All
2	Turn the ignition off. Verify that the Refrigerant System is properly charged per Service Procedure. Is the Refrigerant System properly charged? Yes → Go To 3 No → Properly charge the Refrigerant System per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
3	Turn the ignition off. Verify the High Pressure Cut-Off Switch per Service Information. Is the High Pressure Cut-Off Switch OK? Yes → Go To 4 No → Replace the High Pressure Cut-Off Switch. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
4	Turn the ignition off. Verify the Low Pressure Switch operation per Service Information. Is the Low Pressure Switch OK? Yes → Go To 5 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	Ignition on, engine not running. Turn the A/C system on and the fan on high. With the DRBIII® in Inputs/Outputs, read the A/C request state. Does the A/C request state change? Yes → Go To 6 No → Repair the open in the A/C Request circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Ignition on, engine not running. With the DRBIII®, read the A/C Select status. Turn the A/C Switch on and off a few times. Does the A/C Select state change? Yes → Go To 7 No → Repair the open in the A/C Select circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
7	Ignition on, engine not running. With the DRBIII®, actuate the A/C clutch relay. Connect a test light between the ground circuit and the A/C Clutch Relay Output circuit. Does the test light illuminate brightly on and off with the relay actuation? Yes → Replace the A/C Clutch Coil. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Turn the ignition off. Disconnect the A/C compressor clutch harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance between ground and the A/C Compressor Clutch Ground Circuit. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the A/C compressor clutch ground circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	Turn the ignition off. Disconnect the A/C Clutch harness connector. Remove the A/C Clutch Relay. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the A/C Clutch Relay Output circuit between the Relay and the A/C Clutch Coil connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the A/C Clutch Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

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

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Remove the A/C Clutch Relay. **Note: Check connectors - Clean/repair as necessary.** Measure the voltage of the Fused B(+) circuit in the A/C Clutch Relay connector. Is the voltage above 11.0 volts? Yes → Go To 11 No → Repair the open in the Fused B(+) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
11	If there are no possible causes remaining, view repair. Repair Replace the A/C Clutch Relay. Perform POWERTRAIN VERIFICATION TEST VER - 5.	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
GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
S/C BRAKE SWITCH OUTPUT CIRCUIT
SPEED CONTROL SWITCH OUTPUT OPEN
BRAKE LAMP SWITCH
SPEED CONTROL POWER SUPPLY CIRCUIT
PCM (S/C POWER SUPPLY)
SPEED CONTROL VACUUM SOLENOID
SPEED CONTROL VACUUM SOLENOID CONTROL CIRCUIT OPEN
PCM (VACUUM SOLENOID)
SPEED CONTROL VACUUM SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
SPEED CONTROL VENT SOLENOID
SPEED CONTROL VENT SOLENOID CONTROL CIRCUIT OPEN
SPEED CONTROL VENT SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
PCM (VENT SOLENOID)

P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. **NOTE: In the below step you will need to actuate both S/C solenoids separately. Note the operation of the each solenoid when actuated.** With the DRBIII®, actuate the Speed Control Vacuum Solenoid and note operation. With the DRBIII®, actuate the Speed Control Vent Solenoid and note operation. Choose the conclusion that best matches the solenoids operation. Vacuum Solenoid not operating Go To 2 Vent Solenoid not operating Go To 6 Both S/C Solenoids not operating Go To 10 Both S/C Solenoids operating Go To 15	All
2	Turn the ignition off. Disconnect the Speed Control Servo harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Speed Control Vacuum Solenoid. Using a 12-volt test light connected to 12-volts, probe the Speed Control Vacuum Solenoid Control circuit. Does the test light illuminate brightly and flash? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 3	All
3	Turn the ignition off. Disconnect the S/C Servo harness connector. Disconnect the PCM harness connector. Measure the resistance of the Speed Control Vacuum Solenoid Control circuit between the PCM harness connector and Speed Control Servo harness connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the Speed Control Vacuum Solenoid Control circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
4	Turn the ignition off. Disconnect the S/C Servo harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the Speed Control Vacuum Solenoid Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the Speed Control Vacuum Solenoid Control circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 5	All

P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
5	If the there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
6	Turn the ignition off. Disconnect the Speed Control Servo harness connector. Ignition on, engine not running. With the DRBIII®, actuate the Speed Control Vent Solenoid. Using a 12-volt test light connected to 12-volts, probe the Speed Control Vent Solenoid Control circuit in the Speed Control Servo harness connector. Does the test light illuminate brightly and flash? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 7	All
7	Turn the ignition off. Disconnect the S/C Servo harness connector. Disconnect the PCM harness connector. Measure the resistance of the Speed Control Vent Solenoid Control circuit between the PCM harness connector and Speed Control Servo harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Speed Control Vacuum Solenoid Control circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
8	Turn the ignition off. Disconnect the S/C Servo harness connector. Disconnect the PCM harness connector. Measure the resistance between ground and the Speed Control Vent Solenoid Control circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the Speed Control Vacuum Solenoid Control circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 9	All
9	If the there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the S/C Servo harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the S/C Brake Switch Output circuit in the S/C Servo harness connector. Does the test light illuminate brightly? Yes → Replace the Speed Control Servo. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 11	All
11	Turn the ignition off. Disconnect the Speed Control Servo harness connector. Disconnect the Brake Lamp Switch harness connector. Measure the resistance of the Speed Control Brake Switch Output circuit between the Speed Control Servo harness connector and Brake Lamp Switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the Speed Control Brake Switch Output circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
12	Disconnect the Brake Lamp Switch harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the Speed Control Power Supply circuit in the Brake Lamp Switch harness connector. Does the test light illuminate brightly? Yes → Replace the Brake Lamp Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 13	All
13	Turn the ignition off. Disconnect the PCM harness connector. Disconnect the Brake Lamp Switch harness connector. Measure the resistance of the Speed Control Power Supply circuit between the PCM harness connector and the Brake Lamp Switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 14 No → Repair the Speed Control Supply circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
14	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1595-SPEED CONTROL SOLENOID CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the S/C Servo harness connector. Using a 12-volt test light connected to 12-volts, probe the ground circuit in the S/C Servo harness connector. Does the test light illuminate brightly? Yes → Go To 16 No → Repair the ground circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
16	**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.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Test Complete.	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
INTERMITTENT CONDITION
SPEED CONTROL ON/OFF SWITCH
CLOCKSPRING SIGNAL/GROUND CIRCUIT OPEN
SPEED CONTROL SWITCH SIGNAL CKT SHORT TO VOLTAGE
SPEED CONTROL SWITCH GROUND CIRCUIT OPEN CLOCKSPRING TO S/C SWITCH
SPEED CONTROL SWITCH GROUND CIRCUIT OPEN PCM TO CLOCKSPRING
SPEED CONTROL SW SIG CKT OPEN PCM TO CLOCK SPRING
SPEED CONTROL SW SIG CKT OPEN CLOCKSPRING TO S/C SWITCH
POWERTRAIN CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Speed Control inputs state. While monitoring the DRBIII®, push the Speed Control On/Off Switch several times, then leave it on. Did the DRBIII® show Speed Control Switching off and on? Yes → Go To 2 No → Go To 3	All

P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Test Complete.	All
3	Turn the ignition off. Disconnect the Speed Control On/Off Switch 2-way harness connector only. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance across the S/C On/Off Switch. Is the resistance between 20.3K and 20.7K ohms? Yes → Go To 4 No → Replace the On/Off Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
4	Turn the ignition off. Disconnect the upper and lower 6-way clockspring harness connectors. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the K4 sensor ground circuit between the upper and lower 6-way clockspring harness connectors. Measure the resistance of the V37 speed control switch signal circuit between the upper and lower 6-way clockspring harness connectors. Was the resistance above 5.0 ohms for either circuit? Yes → Replace the clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 5	All
5	Turn the ignition off. Disconnect the Speed Control On/Off Switch 2-way harness connector only. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. Measure the voltage of the S/C Switch Signal Circuit at the On/Off Switch 2-way connector. Is the voltage above 6.0 volts? Yes → Repair the short to battery voltage in the Speed Control Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 6	All

P1596-SPEED CONTROL SWITCH ALWAYS HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Clockspring 6-way harness connector (instrument panel harness side) . Disconnect the PCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the S/C Switch Signal Circuit between the PCM and the Clockspring Connector. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the open in the Speed Control Switch Signal circuit between the PCM and the Clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
7	Turn the ignition off. Disconnect the Speed Control On/Off Switch 2-way harness connector. Disconnect the clockspring 6-way harness connector (S/C switch side) **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the S/C Switch Sensor Ground Circuit between the On/Off Switch 2-way harness connector to the clockspring harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the ground circuit from clockspring to S/C switch for an open. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
8	Turn the ignition off. Disconnect the clockspring 6-way harness connector (instrument panel harness side). Disconnect the PCM harness connector(s). **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the S/C Switch Sensor Ground Circuit between the PCM harness connector to the clockspring harness connector. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open in the ground circuit from PCM to clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
9	Turn the ignition off. Disconnect the On/Off switch 2-way harness connector. Disconnect the upper clockspring harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the S/C Switch Signal Circuit between the clockspring harness connector and the On/Off switch harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the open in the Speed Control Switch Signal Circuit between the Clockspring and the S/C switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. 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
INTERMITTENT CONDITION
SPEED CONTROL ON/OFF SWITCH
SPEED CONTROL RESUME/ACCEL SWITCH
CLOCKSPRING SHORTED TO GROUND
S/C SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
S/C SIGNAL CIRCUIT SHORT TO SENSOR GROUND
PCM

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read the S/C Switch volts status. Is the S/C Switch voltage below 1.0 volt? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the S/C ON/OFF Switch harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch volts. Did the S/C Switch volts change to 5.0 volts? Yes → Replace the S/C ON/OFF Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 3	All
3	Turn the ignition off. Disconnect the S/C RESUME/ACCEL Switch harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch volts. Did the S/C Switch volts go above 4.0 volts? Yes → Replace the Resume/Accel Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 4	All

P1597-SPEED CONTROL SWITCH ALWAYS LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the clockspring 6-way harness connector (instrument panel wiring side). Ignition on, engine not running. With the DRBIII® in Sensors, read the S/C Switch volts. Did the S/C Switch volts change to 5.0 volts? Yes → Replace the Clockspring. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 5	All
5	Turn the ignition off. Disconnect the S/C ON/OFF Switch harness connector. Disconnect the PCM harness connectors. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the S/C Switch Signal circuit and ground (B-) at S/C ON/OFF Switch harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the S/C Switch Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 6	All
6	Turn the ignition off. Disconnect the S/C ON/OFF Switch harness connector. Disconnect the PCM harness connectors. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the S/C Signal circuit and the Sensor Ground circuit at the ON/OFF switch harness connector. Is the resistance below 5.0 ohms? Yes → Repair the short to Sensor ground in theS/C Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

P1597-SPEED CONTROL SWITCH ALWAYS LOW — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** **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.** With the engine running at normal operating temperature, monitor the DRBIII® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRBIII® Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Test Complete.	All

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

POSSIBLE CAUSES
DRBIII® DOES NOT SHOW BRAKE SW PRESSED OR RELEASED
FUSED B(+) CIRCUIT OPEN
BRAKE LAMP SWITCH GROUND CIRCUIT OPEN
BRAKE SWITCH (SENSE CKT)
BRAKE LAMP SWITCH SENSE CIRCUIT OPEN
BRAKE LAMP SWITCH SENSE CIRCUIT SHORT TO GROUND
BRAKE LAMP SWITCH OUTPUT LESS THAN 10.0 VOLTS
S/C POWER SUPPLY CIRCUIT BELOW 10 VOLTS AT BRAKE SWITCH CONN
POWERTRAIN CONTROL MODULE (BRAKE SENSE)

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII® in Inputs/Outputs, read the Brake Switch state. With the DRBIII® display, press and release the brake pedal several times. Does the DRBIII® display brake switch PRESSED and RELEASED? Yes → The Brake Lamp Switch is operating properly at this time. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 2	All
2	Turn the ignition off. Disconnect the brake switch harness connector. Using a 12-volt test light connected to ground, check the fused B(+) circuit at the brake switch harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the open/high resistance in the Fused B(+) circuit. Check and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
3	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Measure the resistance between ground and the Brake Lamp Switch ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the open in the 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	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance between the Brake Lamp Switch Sense terminal and the Ground terminal (measurement taken across the switch). Apply and release the Brake Pedal while monitoring the ohmmeter. Does the resistance change from below 5.0 ohms to open circuit? Yes → Go To 5 No → Replace the Brake Switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
5	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the PCM harness connectors. Measure the resistance of the Brake Lamp Switch Sense circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the Brake Lamp Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
6	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the PCM harness connectors. Disconnect the CAB harness connector. Measure the resistance between ground and the Brake Lamp Switch Sense circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Brake Lamp Switch Sense circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4. No → Go To 7	All
7	Turn the ignition off. Brake pedal must be depressed in the next step. Using a 12-volt test light connected to ground, check the brake lamp switch output circuit at the brake switch harness connector. Is the test light illuminated and bright? Yes → Go To 8 No → Replace or adjust the brake switch. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All
8	Turn the ignition off. Disconnect the Brake Switch harness connector. **Note: Check connectors - Clean/repair as necessary.** Ignition on, engine not running. With the DRBIII®, actuate the S/C Vacuum Solenoid. Using a 12-volt test light connected to ground, backprobe the S/C Power Supply Circuit in the Brake Switch harness connector. Did the test light illuminate brightly? Yes → Go To 9 No → Refer to symptom list for problems related to the S/C Power Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

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

TEST	ACTION	APPLICABILITY
9	If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 4.	All

Symptom:
*ENGINE CRANKS DOES NOT START

POSSIBLE CAUSES
NO START PRE-TEST
POWERTRAIN FUSES OPEN
SECONDARY INDICATORS PRESENT
SET SYNC SPECIFICATION
NO CKP SENSOR SIGNAL WHEN CRANKING ENGINE
NO CMP SENSOR SIGNAL WHEN CRANKING ENGINE
ENGINE MECHANICAL PROBLEM
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.** 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. This will allow any DTC's to set that may have been erased due to a dead battery. Try to communicate with PCM if not able to communicate check fuses. Ensure the Powers and Ground to the PCM are ok. Make sure the PCM communicates with the DRBIII® and that there are no DTC's stored in the PCM memory. If the PCM reports a No Response condition, refer to the Communication category for the proper tests. Read the PCM DTC's with the DRBIII®. If any DTC's 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. 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. The Sentry Key Immobilizer System must be operating properly. Check for proper communication with the DRBIII® and check for DTC's that may be stored in the Sentry Key Immobilizer Module (SKIM). Repair the DTC(s) before continuing. If no DTC's are found, using the DRBIII®, select Clear PCM (BATT Disconnect). Crank the engine several times. Using the DRBIII®, read DTC's. If a DTC is present perform the DTC diagnostics before continuing. Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 2	All

*ENGINE CRANKS DOES NOT START — Continued

TEST	ACTION	APPLICABILITY
2	Check for any open fuses in the PDC or Junction Block that may be related to the No Start condition. Are any of the fuses open? Yes → Replace the open fuse and check the related circuit(s) for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, under DTCs & Related Functions, read the Secondary Indicators while cranking the engine. Are there any Secondary Indicators present while cranking the engine? Yes → Refer to symptom list and perform tests related to the secondary indicator that is reported by the DRBIII®. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Start the engine. With the DRBIII® in Miscellaneous, check the ″Set Sync Signal″. Is the ″Set Sync Signal″ within specifications? Yes → Go To 5 No → With the DRBIII, synchronize the Cam and Crank Position Sensors. If the vehicle has a distributor, it may be necessary to adjusted the distributor to get the reading within specifactions. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	With the DRBIII® in Sensors, check the Current CKP Count while cranking the engine. Does the CKP Counter change while cranking the engine? Yes → Go To 6 No → Refer to Driveability Symptom P0320-NO CRANK REFERENCE SIGNAL AT PCM. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	With the DRBIII® in Sensors, check the Current CMP Count while cranking the engine. Does the Current CMP Count change while cranking the engine? Yes → Go To 7 No → Refer to Driveability Symptom P0340-NO CAM SIGNAL AT PCM Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

*ENGINE CRANKS DOES NOT START — Continued

TEST	ACTION	APPLICABILITY
7	Check for any of the following conditions/mechanical problems. ENGINE VALVE TIMING - must be within specifications ENGINE COMPRESSION - must be within specifications ENGINE EXHAUST SYSTEM - must be free of any restrictions or leaks. FUEL - must be free of contamination FUEL INJECTOR - plugged or restricted injector; control wire not connected to correct injector Are there any engine mechanical problems? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Turn the ignition off. Remove the ASD relay from the PDC. Disconnect the PCM harness connectors. Verify the ASD Relay is getting Fused B+ voltage before continuing. Measure the resistance of the ASD relay output circuit from the ASD Relay connector to the PCM harness connector, Ignition coil, and the fuel injectors. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the open ASD Relay output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	Verify that the Fuel tank is not empty before continuing. Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual. Was the No Start condition solved after following the above diagnostic procedure? Yes → Test Complete. 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. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

Symptom:
*NO CRANK CONDITION

POSSIBLE CAUSES
MECHANICAL CONDITION
TRANSMISSION RANGE SENSOR
BATTERY CIRCUIT RESISTANCE TOO HIGH
IGNITION SWITCH OUTPUT CIRCUIT OPEN
STARTER RELAY CONTROL CIRCUIT OPEN
STARTER RELAY OUTPUT CIRCUIT OPEN
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.** **WARNING: MAKE SURE THE BATTERY IS DISCONNECTED, THEN WAIT TWO MINUTES BEFORE PROCEEDING.** Turn the engine over by hand to ensure the engine is not seized. Is the engine able to turn over? Yes → Go To 2 No → Repair the mechanical condition preventing the starter motor from cranking. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connectors. Move the Gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through each gear, measure the resistance between ground and the P/N Position Switch Sense circuit. Did the resistance change from above 10.0 ohms to below 10.0 ohms? Yes → Go To 3 No → Replace the Transmission Range Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
3	Turn the ignition off. Check the Battery Cables for high resistance using the service information procedure. Did either Battery Cable have a voltage drop greater than 0.2 of a volt? Yes → Repair the Battery circuit for high resistance. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 4	All

*NO CRANK CONDITION — Continued

TEST	ACTION	APPLICABILITY
4	Turn ignition off. Remove the Starter Relay from PDC. **WARNING: The Parking Brake must be on and the Transmission must be in park for a vehicle equipped with an automatic transmission.** **Warning: The engine may be cranked in the next step. Keep away from moving engine parts.** Briefly connect a jumper wire between Starter Relay B+ circuit and the Starter Relay Output circuits. Did the Starter Motor crank the engine? Yes → Go To 5 No → Go To 7	All
5	Turn the ignition off. Remove the Starter Relay from the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, probe the Ignition Switch Output circuit in the Starter Relay connector. While observing 12-volt test light, hold ignition key in the start position. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the open or high resistance in the Ignition Switch Output circuit. Inspect related fuses and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
6	Turn the ignition off. Remove the Starter Relay from the PDC. Disconnect the PCM harness connector. Measure the resistance of the Starter Relay Control circuit between the Relay terminal and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Replace the Starter Motor Relay. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Repair the open in the Starter Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
7	Turn the ignition off. Remove the Starter Relay from the PDC. Disconnect the Starter Relay Output connector from the Starter Solenoid. Measure the resistance of the Starter Relay Output circuit between the Relay and the Solenoid harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the Starter Relay Output circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO CRANK CONDITION — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Remove the Starter Relay from the PDC. Using a 12-volt test light connected to ground, backprobe the Fused B+ circuit at the Starter Relay terminal. Does the test light illuminate brightly? Yes → Go To 9 No → Repair the open or high resistance in the Fused B(+) Circuit. Inspect related fuses and repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
9	If there are no other possible causes remaining, review repair. Repair Replace the Starter. 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
THROTTLE POSISITON SENSOR
5 VOLT SENSOR OPEN OR SHORTED
PRIMARY 5-VOLT SUPPLY CKT SHORT TO GROUND
AUXILIARY 5-VOLT CIRCUIT SUPPLY SHORT 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.** **NOTE: Ensure the ignition switch was on when trying to communicate with the PCM.** Turn the ignition off. Disconnect the PCM harness connector(s). Using a 12-volt test light connected to ground, backprobe the PCM Fused B+ circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 2 No → Repair the Fused B+ circuit for an open. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
2	Turn the ignition off. Disconnect the PCM harness connector(s). Ignition on, engine not running. Using a 12-volt test light connected to ground, backprobe the PCM Fused Ignition Switch Output circuit in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Ignition Switch Output circuit for an open. Inspect and replace fuses as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

*NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM harness connector(s). Using a 12-volt test light connected to 12 volts, backprobe the PCM ground circuits in the PCM harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the PCM ground circuits an open. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
4	Turn the ignition off. Disconnect the TPS harness connector. Ignition on, engine not running. Measure the voltage on the TPS 5 Volt Supply circuit. Is the voltage between 4.5 and 5.2 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector. **NOTE: Verify the TPS harness connector is connected.** Ignition on, engine not running. Measure the voltage on the MAP Sensor 5 Volt Supply circuit. Is the voltage between 4.5 and 5.2 volts? Yes → If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module in accordance with Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
6	Turn the ignition off. Disconnect the TPS harness connector. Ignition on, engine not running. Measure the voltage on the 5 Volt Supply circuit. Disconnect all the sensors that use a 5 Volt Supply circuit. Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors. Yes → Replace the sensor that is pulling down the 5 Volt supply. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect PCM harness connector. Disconnect all the sensors that share the Primary 5 Volt Supply circuit. Measure the resistance between ground and the Primary 5 Volt Supply circuit. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Primary 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 8	All

*NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the PCM harness connector. Disconnect all sensors that receive Auxiliary 5 Volt Supply. Measure the resistance between ground and the Auxiliary 5 Volt Supply circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Auxiliary 5 Volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 9	All
9	If there is no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
*START AND STALL CONDITION

POSSIBLE CAUSES
CHECKING DTCS
CHECKING SKIM DTCS
THROTTLE POSITION SENSOR SWEEP
THROTTLE POSITION SENSOR VOLTAGE GREATER THAN 0.92 VOLTS WITH THROTTLE CLOSED
ENGINE COOLANT TEMPERATURE SENSOR OPERATION
OTHER POSSIBLE CAUSES FOR START & STALL
FUEL CONTAMINATION

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Are any DTCs present? Yes → Refer to the Driveability Category and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 2	All
2	Ignition on, engine not running. **NOTE: If you are unable to communicate with the SKIM, refer to the Communication Category and perform the appropriate symptom.** With the DRBIII®, read the SKIM codes. Are there any SKIM DTCs? Yes → Refer to the Vehicle Theft category and perform the appropriate symptom. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 3	All
3	Ignition on, engine not running. With the DRBIII®, read TPS VOLTS. While monitoring the DRBIII®, slowly open and close the Throttle. Is the voltage change smooth? Yes → Go To 4 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
4	Ignition on, engine not running. With the DRBIII®, read Throttle Position voltage. Throttle must be against stop. Is the voltage 0.92 or less with the Throttle closed? Yes → Go To 5 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. 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.** **Note: This test works best if performed on a cold engine (cold soaked).** **NOTE: If the vehicle was allowed to sit over night with no engine start, coolant temperature should be near ambient temperatures.** Ignition on, engine not running. With the DRBIII®, read the Engine Coolant Temperature value. **Note: If engine coolant temperature is above 82° C (180° F), allow the engine to cool until 65° C (150° F) is reached.** Start the engine. During engine warm-up, monitor the Engine Coolant Temperature 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). Did the Engine Temperature value increase smoothly and did it reach at least 82° C (180° F)? Yes → Go To 6 No → Replace the Engine Coolant Temperature Sensor. 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. Refer to any Technical Service Bulletins (TSB's) that may apply to the symptom. The exhaust system must be free of any restrictions. The engine compression must be within specifications. The engine valve timing must be within specifications. The engine must be free from vacuum leaks. The throttle body must be free of carbon buildup and dirt. Do any of the above conditions exist? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Verify that the Fuel tank is not empty before continuing. Follow the diagnostics for Checking Fuel Delivery under the Driveability section of this manual. Was the No Start condition solved after following the above diagnostic test? Yes → Test Complete. 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. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All

Symptom:
P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored and Set Condition:

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT

When Monitored: During Electronically Modulated Converter Clutch (EMCC) Operation.

Set Condition: Transmission must be in EMCC, with input speed > than 1750 RPM. TCC-L/R Solenoid achieves the maximum duty cycle and can not pull engine speed within 60 RPM of input speed. Also when the transmission is in FEMCC and the engine slips TCC > than 100 RPM for 10 seconds.

POSSIBLE CAUSES
CHECK FOR MISFIRE CODES
INTERMITTENT TCC SOLENOID
CHECK THE TRANS FLUID LEVEL AND CONDITION
INPUT SHAFT SEALS
INTERNAL PROBLEM OR TCC SOLENOID
OIL PUMP/SHAFT/SEALS
TORQUE CONVERTER
VALVE BODY

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Is the Good Trip counter for P0740 displayed and Equal to 0? Yes → Go To 2 No → Go To 12	All

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition on. With the DRBIII®, read DTCs. Are any of the following DTCs present? P0122 Test Complete. P0123 Test Complete. P0743 Test Complete. P1696 Test Complete. P0320 Test Complete. Misfire codes? Go To 3 No → Go To 4	All
3	Turn ignition on. With the DRBIII®, read DTCs. Are any Misfire codes present? Yes → Repair all Misfire codes before proceeding. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
4	Check the transmission fluid level and condition per the service information. Is fluid level OK and clear of contamination? Yes → Go To 5 No → Repair the fluid level and condition as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Turn the ignition on. With the DRBIII®, perform the TCC System test. Did the engine stall? Yes → Go To 6 No → Go To 9	All
6	Start engine. With the DRBIII®, perform the Gov and 3-4 Shift Valve System Test. Did the engine stall? Yes → Go To 7 No → Go To 8	All

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Replace the TCC Solenoid (part of the Transmission Solenoid Assembly) in accordance with the Service Information. Perform the Gov and 3-4 Shift Valve System Test. With the DRBIII®, select 4th gear. Did the engine stall? Yes → Repair the internal transmission problem in accordance with the Service Information. Check for blocked passage(s). Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
8	Turn the ignition off. Remove the transmission oil pump and inspect the reaction shaft, input shaft and input shaft seals. Are any of the parts worn or damaged? Yes → Repair or replace the parts as necessary. Replace the Torque Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All
9	Turn ignition off. Connect a pressure gauge to the transmission cooler out port with a ″T″ connector Start engine. With the DRB, perform the TCC System test. Monitor the gauge pressure while performing the TCC System test. Did the cooler out pressure increase when the TCC was actuated? Yes → Go To 10 No → Repair the valve body in accordance with the Service Information. Check for a blockage or leak in the TCC hydraulic circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Turn ignition off. Remove the transmission oil pump and inspect the reaction shaft, input shaft and input shaft seals. Are any of the parts damaged or worn? Yes → Repair or replace worn or damaged parts as necessary in accordance with the Service Information and replace the Torque Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	If there are no possible causes remaining, view repair. Repair Replace the Torque Converter. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0740-TORQUE CONVERTER CLUTCH CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
12	At this time, the conditions required to set the DTC are not present. **Note: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom:
P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS

When Monitored and Set Condition:

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS

When Monitored: Continuously with the key on.

Set Condition: This code will set if the voltage detected on the Torque Converter Clutch Solenoid Control circuit at the PCM is different than the expected voltage.

POSSIBLE CAUSES
P1765 DTC PRESENT
INTERMITTENT - TCC SOLENOID CONTROL CIRCUIT
TRANSMISSION CONTROL RELAY OUTPUT
TCC SOLENOID CONTROL CIRCUIT OPEN
TCC SOLENOID CONTROL CIRCUIT OPEN INTERNAL
FUSED B+ CIRCUIT OPEN
TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND INTERNAL
TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO GROUND
TCC SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
TCC SOLENOID CONTROL CIRCUIT SHORT TO SOLENOID CIRCUITS INTERNAL
TCC SOLENOID CONTROL CIRCUIT SHORTED TO OTHER CIRCUITS
TCC SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS INTERNAL
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
TRANSMISSION CONTROL RELAY - POOR CONTACTS
PCM - TCC SOLENOID CONTROL CIRCUIT

TEST	ACTION	APPLICABILITY
1	Ignition on, engine not running. With the DRBIII®, read DTCs. Is the Good Trip Counter for P0743 displayed and equal to 0? Yes → Go To 2 No → Go To 18	All

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read Transmission DTCs. Is the DTC P1765 present? Yes → Perform diagnostics on P1765 TRANS 12 VOLT SUPPLY RELAY CTRL CIRCUIT first before proceeding. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 3	All
3	With the DRBIII®, read Transmission DTCs. Are DTCs, P0743, P0748 and P0753 present? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connector. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector. Does the test light illuminate brightly? Yes → Replace the Transmission Solenoid Assembly in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Turn the ignition off to the lock position. Remove the Transmission Control Relay. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused B+ circuit in the Transmission Control Relay connector. **NOTE: The light must illuminate brightly. Compare the brightness to being connected directly to the battery.** Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B+ circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connector. Remove the Transmission Control Relay. Measure the resistance between ground and the Fused Transmission Relay Control Output circuit. Is the resistance below 5.0 ohms? Yes → Repair the Transmission Relay Output circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connector. Check connectors - Clean/repair as necessary Ignition on, engine not running. Connect a jumper wire between the Fused Transmission Relay Output circuit and the Fused B+ in the Transmission Relay connector. Using a 12-volt test light connected to ground, check the Fused Transmission Relay Control Output circuit in the Transmission Solenoid Assembly harness connector. **NOTE: The light must illuminate brightly. Compare the brightness to being connected directly to the battery.** Does the test light illuminate brightly? Yes → Go To 8 No → Repair the Fused Transmission Control Relay Output circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connector. Check connectors - Clean/repair as necessary Ignition on, engine not running. Connect a jumper wire between the Fused Transmission Relay Output circuit and the Fused B+ in the Transmission Relay connector. Using a 12-volt test light connected to ground, check the Transmission Relay Control Output circuit in the Fused Transmission Solenoid Assembly harness connector. Does the test light illuminate brightly? Yes → Replace the Transmission Control Relay. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All
9	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connectors. Disconnect the PCM harness connector. **Check connectors - Clean/repair as necessary.** Measure the resistance of the TCC Solenoid Control circuit between the Transmission Solenoid Assembly harness connector and the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 10 No → Repair the TCC Solenoid Control circuit for an open. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
10	Turn the ignition off to the lock position. Disconnect the Transmission Solenoid Assembly harness connector. Disconnect the PCM harness connectors. **Check connectors - Clean/repair as necessary** Measure the resistance between ground and the TCC Solenoid Control circuit in the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the TCC Solenoid Control circuit for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Disconnect the Transmission Solenoid Assembly harness connector. Ignition on, engine not running. Measure the voltage of the TCC Solenoid Control circuit. Is the voltage above 0.5 volt? Yes → Repair the TCC Solenoid Control circuit for a short to voltage. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 12	All
12	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Disconnect the Transmission Solenoid Assembly harness connector. Remove the Transmission Control Relay. **Check connectors - Clean/repair as necessary** Measure the resistance between the TCC Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector. Is the resistance between the TCC Solenoid Control circuit and any other circuit below 100 kohms? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
13	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Remove the Transmission Control Relay. Measure the resistance of the TCC Solenoid Control circuit between the PCM harness connector and the Fused Transmission Control Relay Output circuit connector. Is the resistance between 25.0 ohms and 60.0 ohms Yes → Go To 14 No → Replace the Transmission Solenoid Assembly in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
14	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. **Check connectors - Clean/repair as necessary** Measure the resistance between the TCC Solenoid Control circuit and ground. Is the resistance below 5.0 ohms? Yes → Repair or Replace the Transmission Solenoid Assembly for a short to ground. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 15	All

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. **Check connectors - Clean/repair as necessary** **NOTE: Resistance between the TCC Solenoid Control circuit and the Governor Pressure Solenoid Control circuit should be 28 to 68 ohms.** Measure the resistance between the TCC Solenoid Control circuit and the Governor Pressure Solenoid Control circuit in the PCM harness connector. **NOTE: Resistance between the TCC Solenoid Control circuit and the 3-4 Shift Solenoid Control circuit should be 50 to 120 ohms.** Measure the resistance between the TCC Solenoid Control circuit and the 3-4 shift Solenoid Control circuit in the PCM harness connector. Is the resistance of both measurements within the specified ranges? Yes → Go To 16 No → Replace the Transmission Solenoid Assembly in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
16	Turn the ignition off to the lock position. Disconnect the PCM harness connectors. Remove the Transmission Control Relay. **Check connectors - Clean/repair as necessary** **NOTE: Resistance between the TCC Solenoid circuit and the circuits below should be above 100 kohms.** Measure the resistance between the Transmission TCC Solenoid Control circuit and the Governor Pressure Solenoid Control circuit in the PCM harness connector. *Sensor Ground circuit in the C2 PCM harness connector. *Transmission Temp Sensor Signal circuit in the PCM harness connector. *Governor Pressure Sensor Signal circuit in the PCM harness connector. *Transmission 5-volt Supply circuit in the C2 PCM harness connector. Are the resistance values, to any of the listed circuits, below 100 kohms? Yes → Replace the Transmission Solenoid Assembly in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 17	All
17	If there are no possible causes remaining, view repair. Repair Replace the Powertrain Control Module in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
18	At this time, the conditions required to set the DTC are not present. **NOTE: Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.** **NOTE: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, broken, bent, pushed out, corroded terminals, or partially broken wires.** **NOTE: Refer to any technical service bulletins that may apply.** Were any problems found? Yes → Repair as necessary. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Test Complete.	All

Symptom List:

- **ANTENNA FAILURE**
- **COP FAILURE**
- **EEPROM FAILURE**
- **INTERNAL FAULT**
- **RAM FAILURE**
- **SERIAL LINK INTERNAL FAULT**
- **STACK OVERFLOW FAILURE**

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ANTENNA FAILURE.

When Monitored and Set Condition:

ANTENNA FAILURE

When Monitored: Every 250 milliseconds with the ignition on.

Set Condition: The SKIM's microcontroller determines that an antenna circuit fault has occurred for 2.0 consecutive seconds.

COP FAILURE

When Monitored: With the ignition on.

Set Condition: The COP timer is not reset by the micro controller every 65.5 milliseconds.

EEPROM FAILURE

When Monitored: With the ignition on.

Set Condition: When the value written to EEPROM memory does not equal the value read back after the write operation.

INTERNAL FAULT

When Monitored: With the ignition on.

Set Condition: The SKIM has detected a fault during an internal self test.

RAM FAILURE

When Monitored: With the ignition on.

Set Condition: The RAM fails a test that checks the RAM's ability to retain memory.

SERIAL LINK INTERNAL FAULT

When Monitored: With the ignition on.

Set Condition: The SKIM fails an internal J1850 communication self test.

STACK OVERFLOW FAILURE

When Monitored: With the ignition on.

Set Condition: The micro controller has exceeded its stack space limit.

ANTENNA FAILURE — Continued

POSSIBLE CAUSES
SKIM INTERNAL DTC FAILURE

TEST	ACTION	APPLICABILITY
1	**Note: This trouble code indicates an internal SKIM fault.** With the DRBIII®, read and record the SKIM DTCs and then erase the SKIM DTCs Perform 10 ignition key cycles, leaving the ignition key on for a minimum of 90 seconds per cycle. With the DRBIII® , read the SKIM DTCs. Did the same SKIM DTC return? Yes → Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:
PCM STATUS FAILURE
SERIAL LINK EXTERNAL FAULT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be PCM STATUS FAILURE.

When Monitored and Set Condition:

PCM STATUS FAILURE

When Monitored: With the ignition on.

Set Condition: This DTC exists when a PCM STATUS message was not received from the PCM for at least 20.0 consecutive seconds.

SERIAL LINK EXTERNAL FAULT

When Monitored: At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM reset, or during SECRET KEY transfers to the PCM.

Set Condition: When the SKIM does not receive an expected PCI BUS message transmission acknowledgement from the PCM after 3 transmit attempts.

POSSIBLE CAUSES
INTERMITTENT WIRING HARNESS PROBLEM
WIRING HARNESS INSPECTION
SKIM/PCM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the PCM has proper power and ground connections before continuing.** With the DRBIII®, read and record the SKIM DTC's then erase the SKIM DTC's. Turn the ignition off. Wait 2 minutes. Turn the ignition on. With the DRBIII®, read the SKIM DTC's. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 4	All

PCM STATUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. **NOTE: Visually inspect the related wiring harness and CCD/PCI Bus (whichever applicable) circuits. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair as necessary. Perform SKIS VERIFICATION. No → Go To 3	All
3	**NOTE: Before proceeding it will be necessary to obtain the SKIM PIN number.** Turn the ignition on. With the DRBIII®, display and erase all PCM and SKIM DTC's. Perform 5 ignition key cycles, leaving the ignition key on for a minimum of 90 seconds per cycle. With the DRBIII®, read the SKIM DTC's. Does the code appear? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All
4	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:
ROLLING CODE FAILURE
VIN MISMATCH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be ROLLING CODE FAILURE.

When Monitored and Set Condition:

ROLLING CODE FAILURE

When Monitored: At ignition on, after ignition on during any rolling code handshake that occurs with the PCM due to a SKIM or PCM reset.

Set Condition: When a PCM STATUS message with a Valid Key status is not received by the SKIM within 3.5 seconds of transmitting the last Valid Key Code message to the PCM.

VIN MISMATCH

When Monitored: With the ignition on.

Set Condition: When the VIN received from the PCM does not match the VIN stored in the SKIM's EEPROM.

POSSIBLE CAUSES
VERIFYING PCM VIN
INTERMITTENT WIRING HARNESS PROBLEM
PCM

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the SKIM DTC's. Turn the ignition off. Wait 10 seconds. Turn the ignition on and wait 2 minutes. With the DRBIII®, read the SKIM DTC's. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 4	All

ROLLING CODE FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: Ensure that a VIN has been programmed into the PCM. If a VIN is not displayed, attempt to program the PCM with the correct vehicle VIN before continuing.** Turn the ignition on. With the DRBIII®, select Engine system from the main menu. Display and record the Vehicle Identification Number. Does the VIN recorded from the PCM match the VIN of the vehicle? Yes → Go To 3 No → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All
3	Turn the ignition off. Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Turn the ignition on. With the DRBIII®, display and clear all PCM and SKIM DTC's. Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle. With the DRBIII®, check for SKIM DTC's. Does the DRBIII® display the same DTC? Yes → Replace and program the Powertrain Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All
4	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Symptom List:

TRANSPONDER COMMUNICATION FAILURE
TRANSPONDER CYCLIC REDUNDANCY CHECK (CRC) FAILURE
TRANSPONDER ID MISMATCH
TRANSPONDER RESPONSE MISMATCH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be TRANSPONDER COMMUNICATION FAILURE.

When Monitored and Set Condition:

TRANSPONDER COMMUNICATION FAILURE

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the SKIM does not receive a transponder response after 8 consecutive transponder read attempts within 2.0 seconds.

TRANSPONDER CYCLIC REDUNDANCY CHECK (CRC) FAILURE

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When 5 consecutive transponder signal transmissions are sent to the SKIM with the correct message format but with invalid data.

TRANSPONDER ID MISMATCH

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the transponder ID read by the SKIM does not match any of the transponder ID's stored in the SKIM's memory.

TRANSPONDER RESPONSE MISMATCH

When Monitored: At ignition on and during Key Programming Mode.

Set Condition: When the transponder's crypto algorithm result fails to match the SKIM's result.

POSSIBLE CAUSES
CHECKING MULTIPLE KEY OPERATION
SKIM
INTERMITTENT WIRING HARNESS PROBLEM
REPLACE IGNITION KEY

TRANSPONDER COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read and record the SKIM DTCs. With the DRBIII®, erase the SKIM DTCs. **NOTE: Perform the following test several times to ensure the DTC is current.** Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 7	All
2	Are there multiple vehicle ignition keys available? Yes → Go To 3 No → Go To 4	All
3	**NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.** With the DRBIII®, erase the SKIM DTC's. Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTC's. Is the DTC present for all ignition keys? Yes → Replace the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Test Complete.	All
4	With the DRBIII®, attempt to reprogram the ignition keys to the SKIM. With the DRBIII®, erase the SKIM DTC's. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTC's. Does the DTC reset? Yes → Go To 5 No → Test Complete.	All
5	Replace the ignition key with a new key. With the DRBIII®, program the new ignition key to the SKIM. With the DRBIII®, erase the SKIM DTC's Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTC's. Does the DTC reset? Yes → Go To 6 No → Test Complete.	All

TRANSPONDER COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
6	If there are no possible causes remaining, view repair. Repair Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION.	All
7	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **NOTE: Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: Refer to any Technical Service Bulletins (TSB) that may apply.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform SKIS VERIFICATION. No → Test Complete.	All

Verification Tests

BODY VERIFICATION TEST - VER 1	APPLICABILITY
1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors. 2. If the Sentry Key Immobilizer Module (SKIM) or the Powertrain Control Module (PCM) were replaced, continue to next step. If the SKIM or PCM were not replaced, proceed to number 10. 3. Obtain the Vehicle's unique PIN number assigned to it's original SKIM module from either the vehicle's invoice or from Chrysler's Customer Center (1-800-992-1997). 4. With the DRBIII, select THEFT ALARM, SKIM, MISCELLANEOUS and select ″Skim Module Replaced″ function. Enter the 4 digit PIN number to put SKIM in ″Access Mode″. 5. The DRBIII will prompt you through the following steps. (1) Program the country code into the SKIM's memory. (2) Program the vehicle's VIN number into the SKIM's memory. (3) Transfer the vehicle's Secret Key data from the PCM. 6. Once secured access mode is active, the SKIM will remain in that mode for 60 seconds. 7. Using the DRBIII, program all customer keys into the SKIM's memory. This requires that the SKIM be in secured access mode, using the 4 digit code. 8. Note: If the PCM is replaced, the unique Secret Key data must be transferred from the SKIM to the PCM. This procedure requires the SKIM to be placed in secured access mode using the 4-digit code. 9. Note: If 3 attempts are made to enter secured access mode using an incorrect PIN, secured access mode will be locked out for 1 hour which causes the DRB III to display ″Bus +\- Signals Open″. To exit this mode, turn ignition to the ″Run″ pos. for 1 hour. 10. Ensure all accessories are turned off and the battery is fully charged. 11. Ensure that the Ignition is on, and with the DRBIII®, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning. 12. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTC's from ALL modules. Are any DTCs present or is the original complaint still present? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

Verification Tests — Continued

FUEL SYSTEM/MISFIRE MONITOR VERIFICATION TEST	APPLICABILITY
1. If any existing DTCs have not been repaired, go to the appropriate Symptom List and follow the path specified. 2. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 3. Connect the DRBIII® to the data link connector. 4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories. 5. If the PCM was not replaced skip steps 6 and 7 and continue with the verification. 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 Sentry Key Immobilizer Module (SKIM), Secret Key data must be updated to enable start. 7. 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. **8. Note: Make sure that Misfire detection is enabled if you repaired a Misfire DTC. Low fuel level or an un-learned Adaptive Numerator can disable the Misfire monitor.** **9. Note: If the PCM has been replaced or disconnected during testing, the Adaptive Numerator must be re-learned in order for the Misfire Monitor to run.** 10. With the DRB III®, monitor the Similar Conditions to attempt to duplicate the conditions that the vehicle was operating at when the DTC was set. 11. If the conditions cannot be duplicated, with the DRBIII®, erase DTCs. Did the OBD II monitor fail or are any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). 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. 2. Inspect the engine oil for contamination. If oil contamination is suspected, change the oil and filter. 3. If the PCM was not replaced skip steps 4 through 6 and continue with the verification. 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. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 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 7. Attempt to start the engine. 8. If the conditions cannot be duplicated, erase all DTCs. Is the vehicle still unable to start and/or are there any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). 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. 2. If this verification procedure is being performed after a NO TROUBLE CODE repair, perform steps 3 and 4. 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. 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. 5. If this verification procedure is being performed after a DTC repair, perform steps 6 through 13. 6. Connect the DRBIII® to the data link connector. Using the DRBIII® erase any diagnostic trouble codes and reset all values. 7. If the PCM was not replaced, skip steps 8 through 10, then proceed with the verification. 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. 9. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 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. 11. Road test the vehicle. If the test is for an A/C DTC, ensure it is operating during the following test. 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. 13. With the DRBIII®, read DTCs. Are any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). 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. 2. Connect the DRBIII® to the Data Link Connector and erase the DTCs. 3. If the PCM was not replaced skip steps 4 through 6 then continue the verification. 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. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 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 7. Perform the generator output test per service manual information. 8. Start the engine and set the engine speed to 2000 rpm for at least 30 seconds. 9. Allow the engine to return to idle. 10. Cycle the ignition key off then on. 11. With the DRBIII®, read DTCs. Are any DTCs or symptoms remaining? Yes → Check for any related Technical Service Bulletins and/or refer to the appropriate Symptom list (Diagnostic Procedure). 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. 2. With the DRBIII®, erase DTCs. 3. If the PCM was not replaced, skip steps 4 through 6, then continue with the verification. 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. 5. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 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 7. Turn the speed control ON (if equipped, cruise light will be on). 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. 9. Depress and hold the RESUME/ACCEL Switch. The vehicle speed should increase by at least 2 mph. 10. Press and hold the COAST switch. The vehicle speed should decrease. 11. Using caution, depress and release the brake pedal. The speed control should disengage. 12. Bring the vehicle speed back up to 35 MPH. 13. Depress the RESUME/ACCEL switch. The speed control should resume the previously set speed. 14. Hold down the SET switch. The vehicle should decelerate. 15. Ensure vehicle speed is greater than 35 mph and release the SET Switch. The vehicle should adjust and set a new vehicle speed. 16. Depress and release the CANCEL switch. The speed control should disengage. 17. Bring the vehicle speed back up above 35 mph and engage speed control. 18. Depress the OFF switch to turn OFF, (Cruise light will be off). The speed control should disengage. 19. NOTE: OVERSHOOT/UNDERSHOOT FOLLOWING SPEED CONTROL SET. 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). 21. It may also decelerate to less than the desired set speed, before finally achieving the desired set speed. 22. The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. 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. 24. If the ″lift foot sets″ are continually used, a speed control overshoot/undershoot condition will develop. 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). 26. Then turning the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. 27. This procedure must be performed approximately 10-15 times to completely unlearn the overshoot/undershoot condition. Did the Speed Control pass the above test? Yes → Repair is complete. No → Repair is not complete, refer to appropriate symptom.	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. 2. If any existing diagnostic trouble codes have not been repaired, go to the appropriate Symptom List and follow path specified. 3. Connect the DRBIII® to the data link connector. 4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories. 5. If the PCM was not replaced skip steps 6 through 8 and continue the verification. 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. 7. For ABS and Air Bag systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Air Bag modules. 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. 9. If the Catalyst was replaced, with the DRBIII® go to the miscellaneous Menu Option ″Catalyst Replaced″ and press enter. 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. 11. After the ignition has been off for at least 10 seconds, restart the vehicle and run 2 minutes. 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). 13. If the conditions cannot be duplicated, erase all DTC with the DRBIII®. Did the OBD II monitor run successfully and has the Good Trip Counter changed to one or more? Yes → Repair is complete. 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. 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. 3. If the PCM was not replaced, skip steps 4 through 6 then continue with the verification. 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. 5. For ABS and Airbag Systems: Enter correct VIN and Mileage in PCM. Erase codes in ABS and Airbag modules. 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 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. 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. 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. 10. Erasing DTCs will not change this condition. 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. 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. 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. 14. Connect the DRBIII® to the data link connector. Engine running, turn off all accessories. 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. Did the LDP Monitor Test fail and/or have any DTCs set? Yes → Check for any related Technical Service Bulletins and/or refer to the apopropriate Symptom list (Diagnostic Procedure) No → Repair is complete.	All

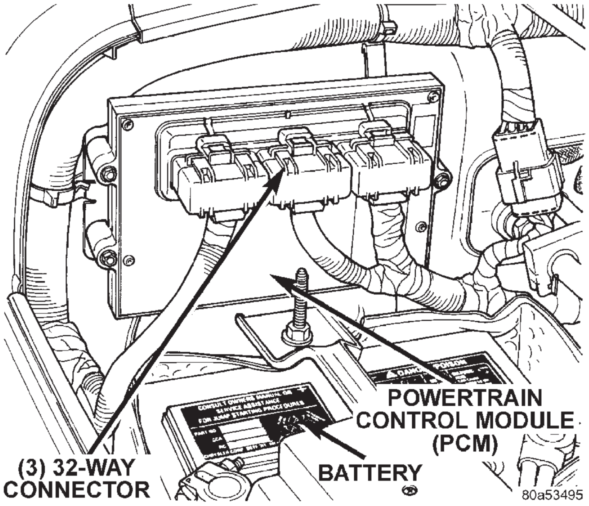
Verification Tests — Continued

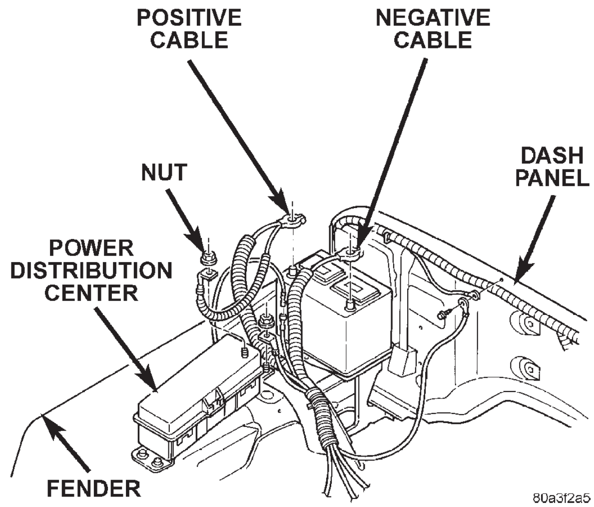
SKIS VERIFICATION	APPLICABILITY
1. Reconnect all previously disconnected components and connectors. 2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKIM. This number can be obtained from the vehicle's invoice or Chrysler's Customer Center (1-800-992-1997). **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 III for 1 hour.** 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. 5. With the DRBIII®, select Theft Alarm, SKIM and Miscellaneous. Then, select the desired procedure and follow the steps that will be displayed. 6. If the SKIM has been replaced, ensure all of the vehicle ignition keys are programmed to the new SKIM. **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.** 8. With the DRBIII®, erase all DTCs. Perform 5 ignition key cycles leaving the key on for at least 90 seconds per cycle. 9. With the DRBIII®, read the SKIM DTCs. Are there any SKIM DTCs? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

NOTES

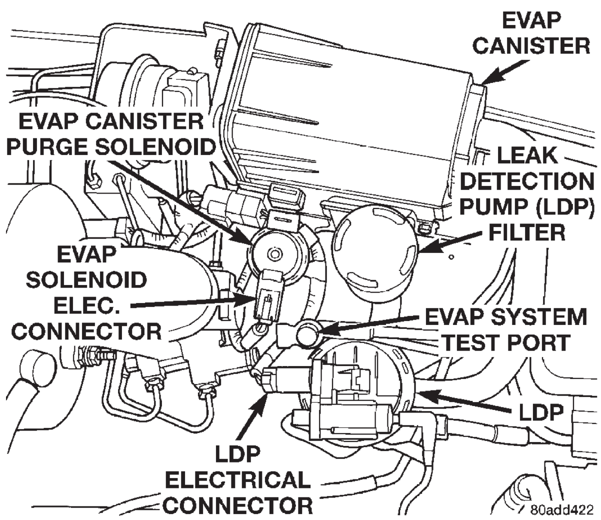
8.0 COMPONENT LOCATIONS

8.1 CONTROL MODULES AND PDC





8.2 CONTROLS AND SOLENOIDS



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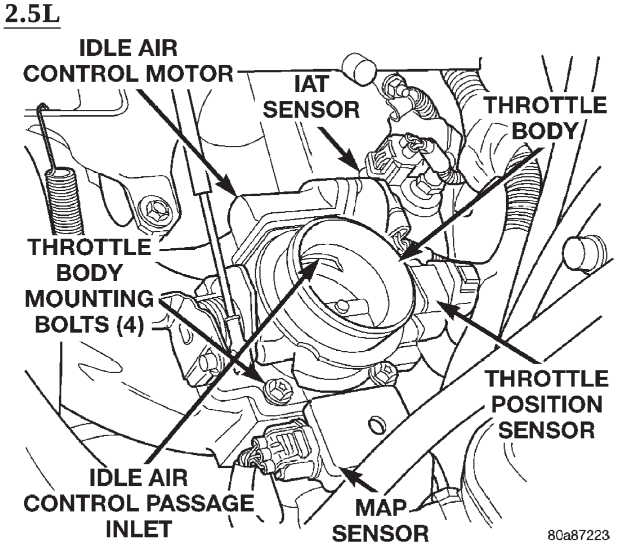

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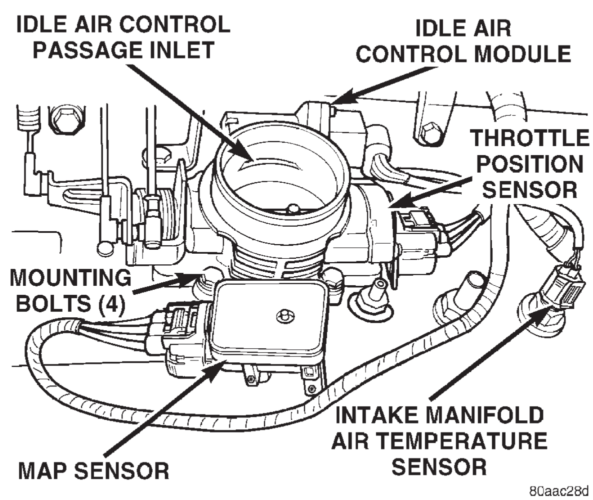

8.2 CONTROLS AND SOLENOIDS (Continued)

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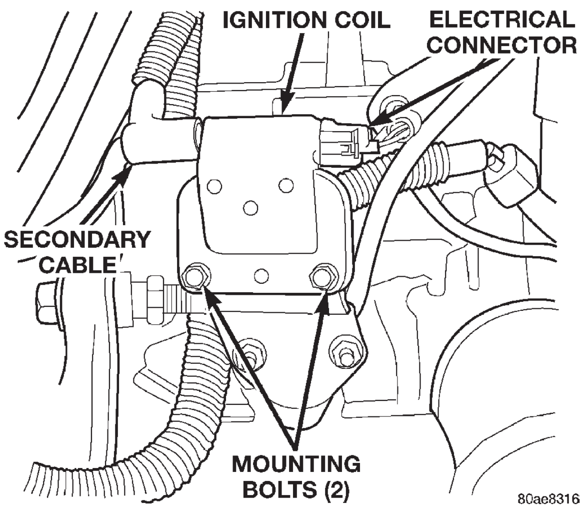

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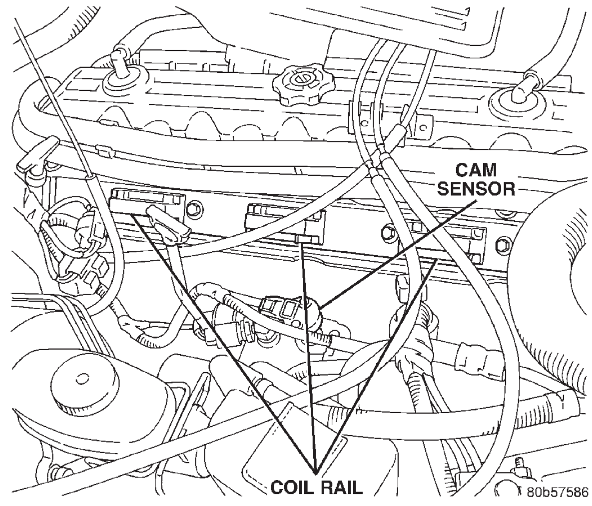

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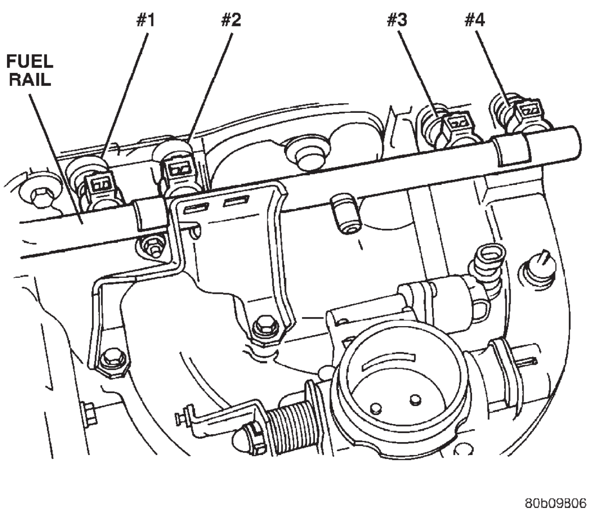

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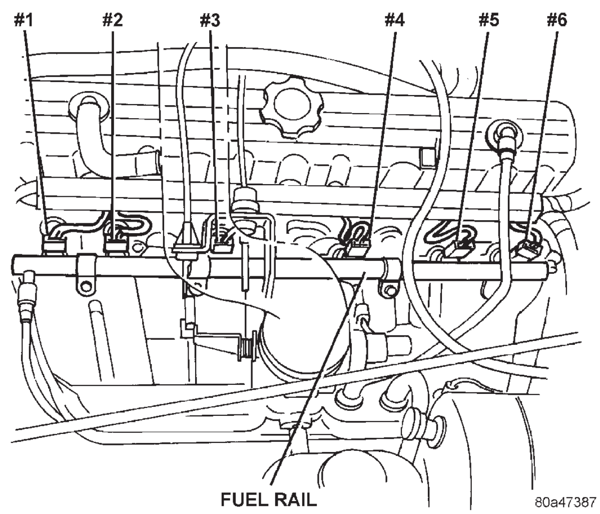

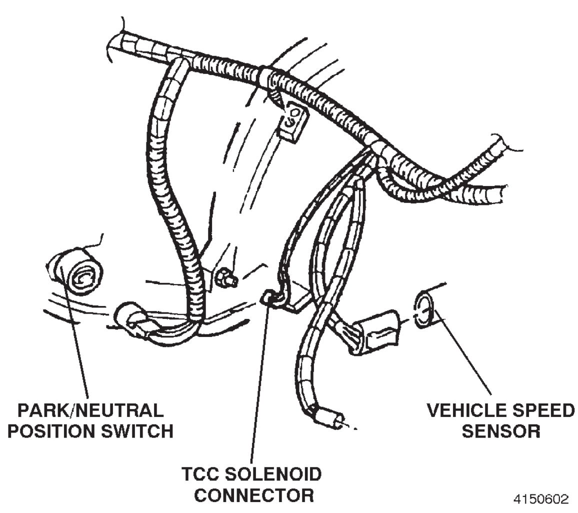

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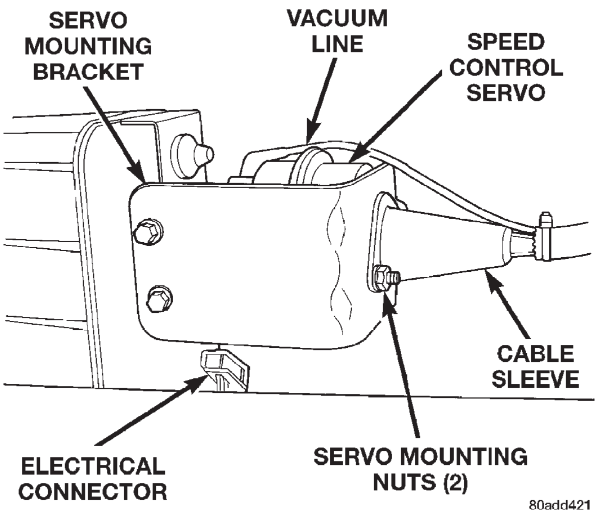

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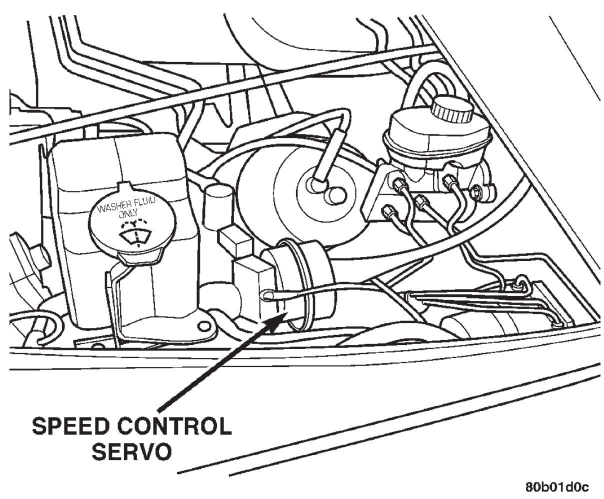
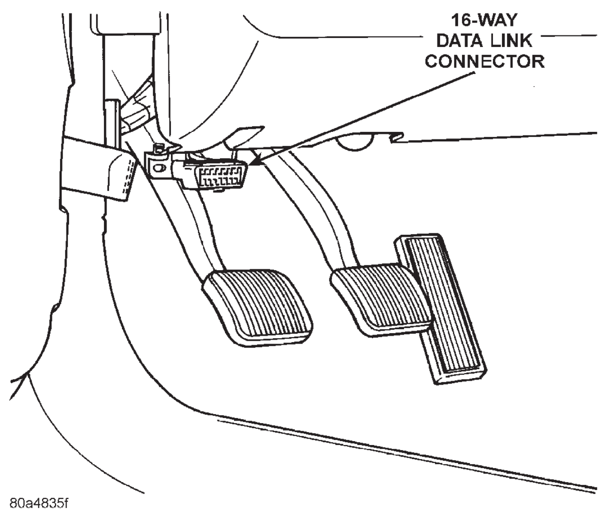
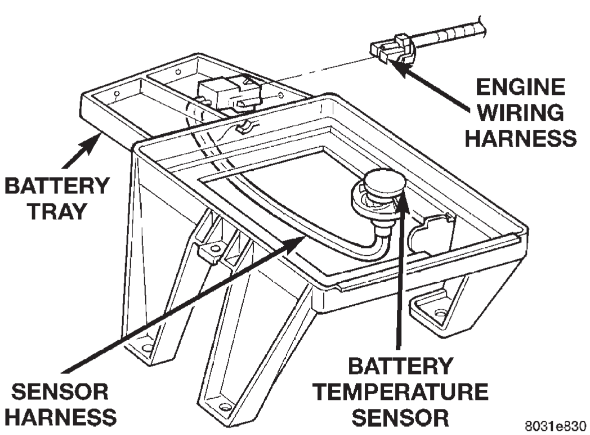
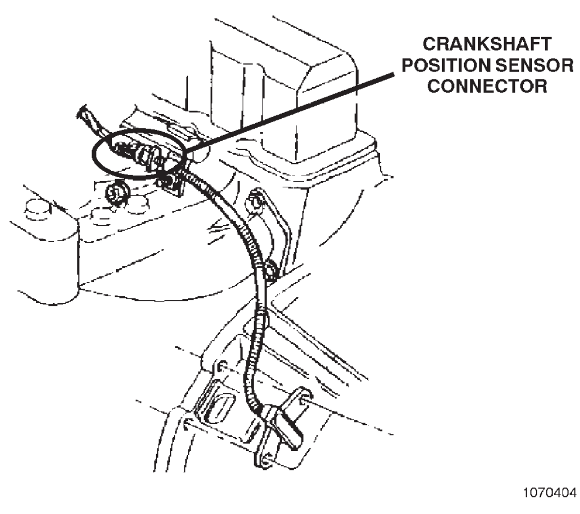


8.3 DATA LINK CONNECTOR



8.4 SENSORS





8.4 SENSORS (Continued)

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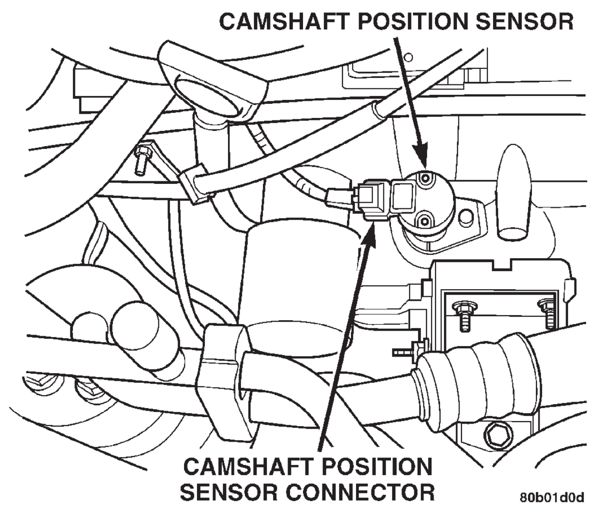

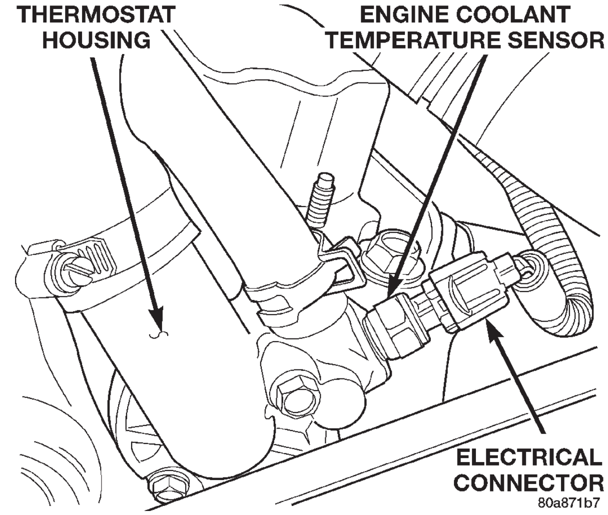

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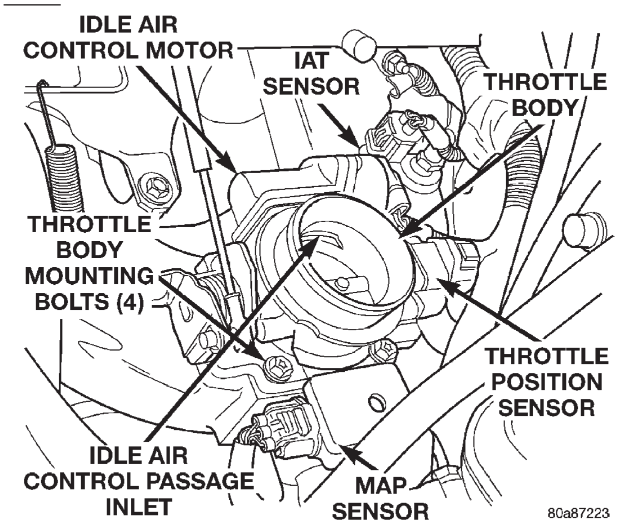

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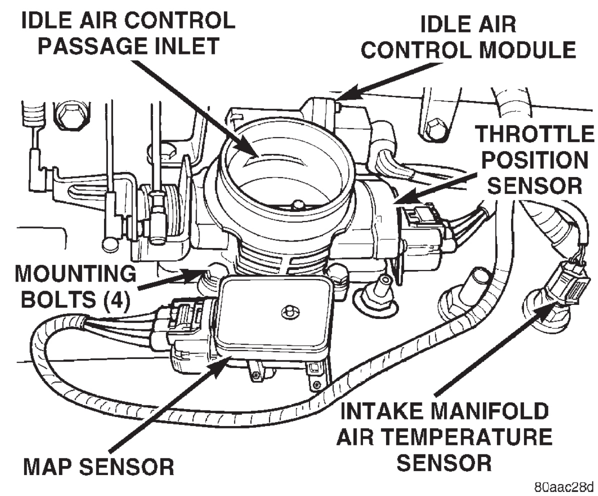

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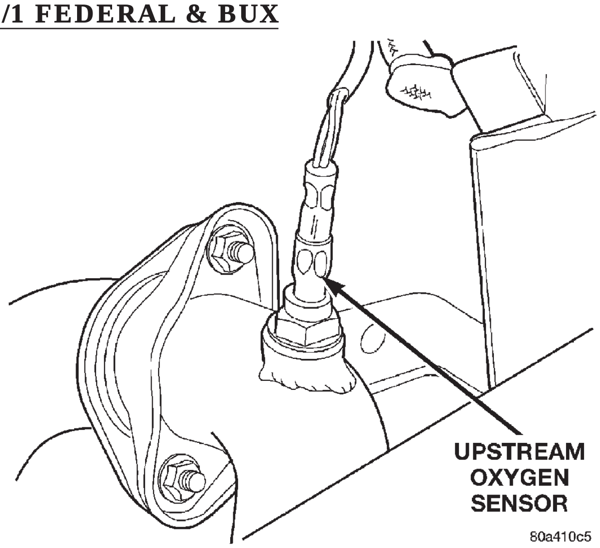
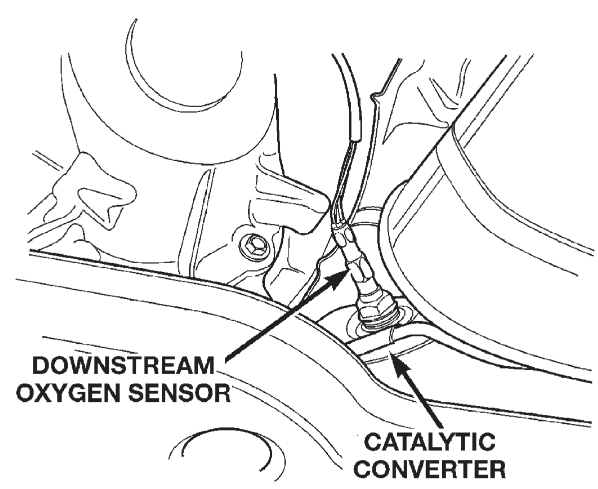
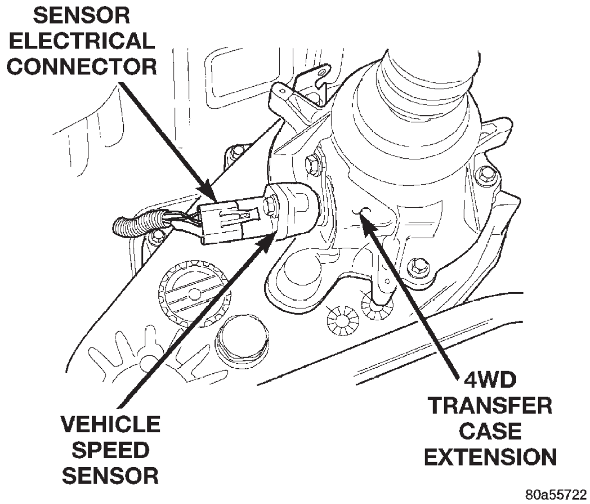
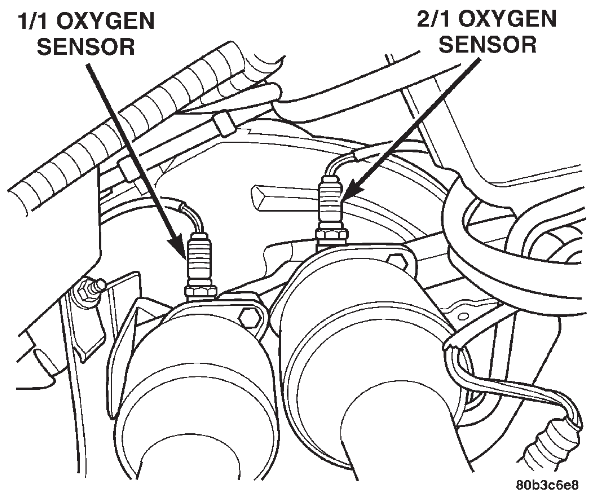


1/2 FEDERAL & BUX





1/1 AND 2/1 CALIF. & EURO III



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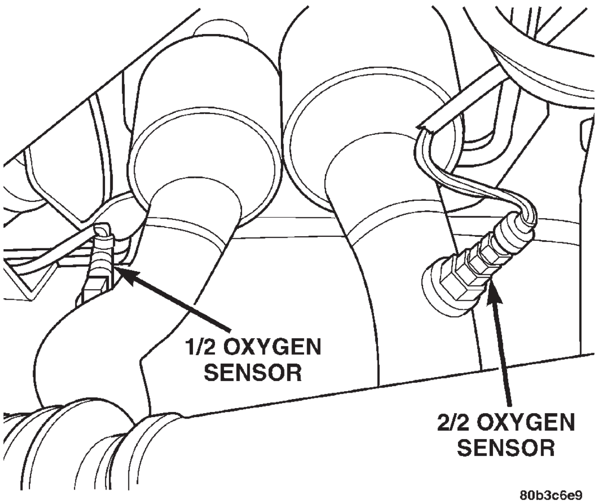

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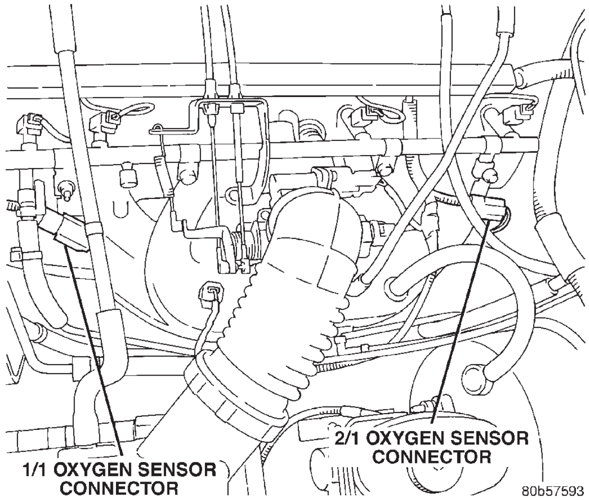

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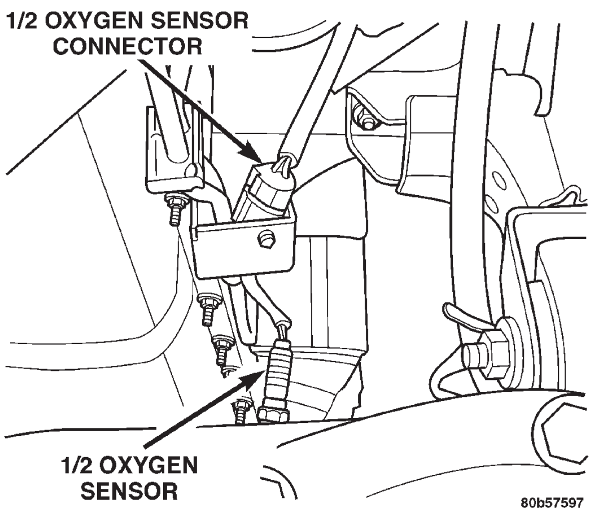
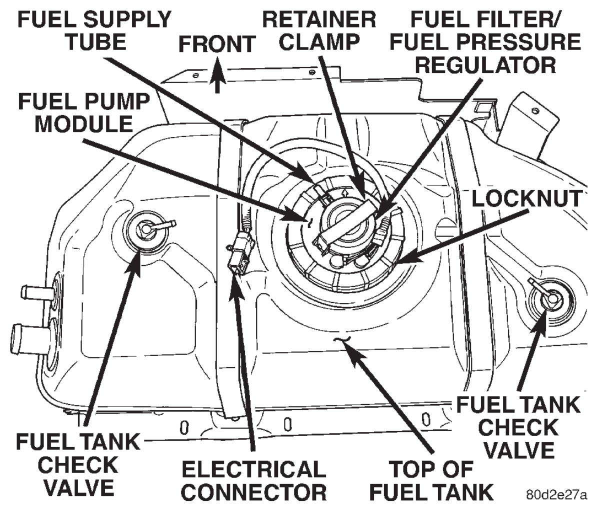
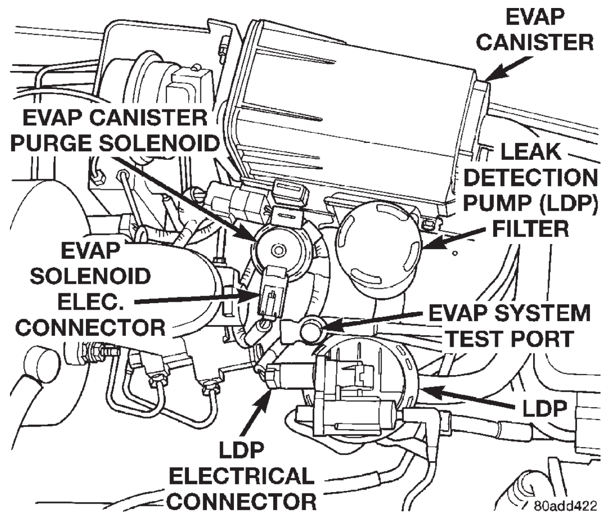
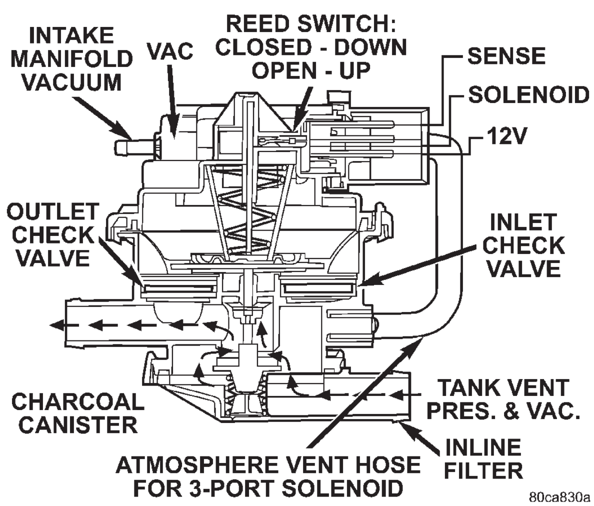
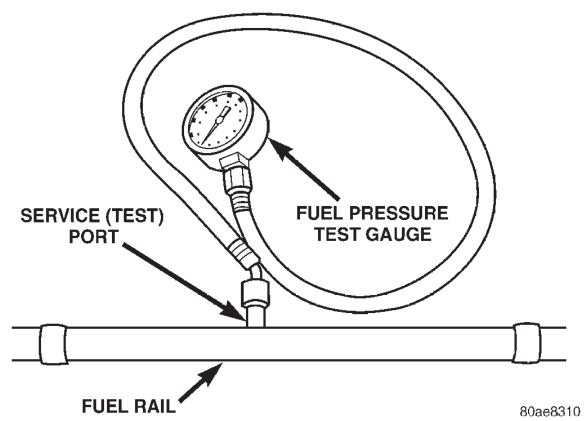


8.5 FUEL SYSTEM

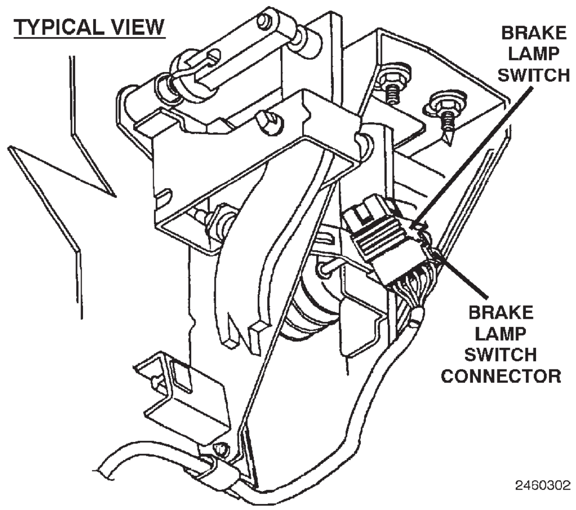


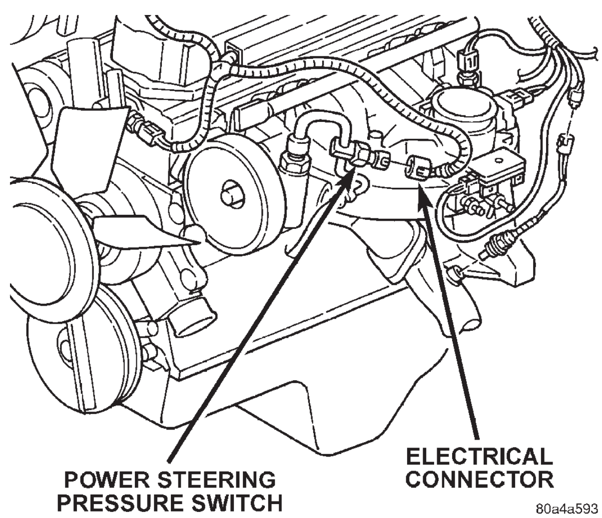


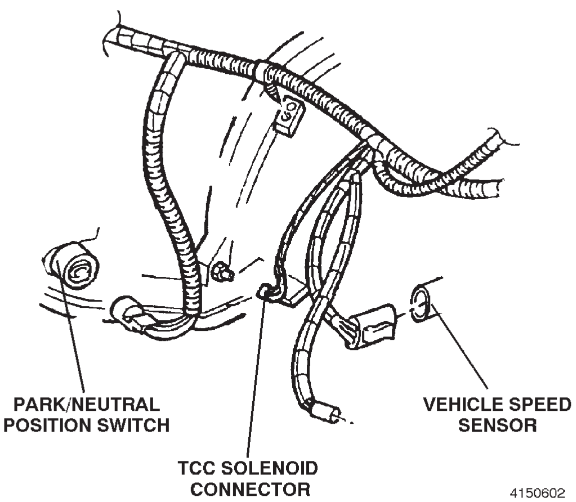




8.6 SWITCHES



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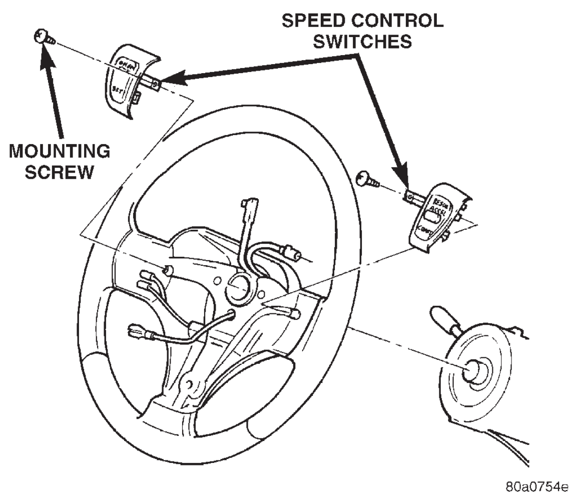
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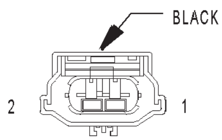
NOTES

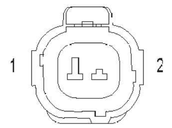
9.0 CONNECTOR PINOUTS



A/C COMPRESSOR CLUTCH

A/C COMPRESSOR CLUTCH - BLACK 2 WAY

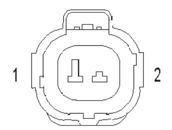
CAV	CIRCUIT	FUNCTION
1	C3 20DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
2	Z1 20BK	GROUND



A/C HIGH PRESSURE SWITCH

A/C HIGH PRESSURE SWITCH - 2 WAY

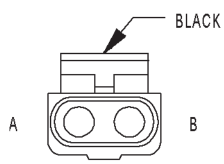
CAV	CIRCUIT	FUNCTION
1	C90 20LG	A/C HIGH PRESSURE SWITCH OUTPUT
2	C22 20DB/WT	A/C HIGH PRESSURE SWITCH SENSE



A/C LOW PRESSURE SWITCH

A/C LOW PRESSURE SWITCH - 2 WAY

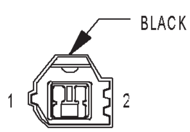
CAV	CIRCUIT	FUNCTION
1	C21 20DB/OR	A/C SWITCH SENSE
2	C22 20DB/WT	A/C LOW PRESSURE SWITCH SENSE



BACK-UP LAMP SWITCH (MT)

BACK-UP LAMP SWITCH (M/T) - BLACK 2 WAY

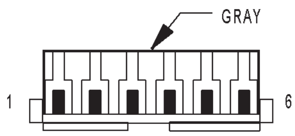
CAV	CIRCUIT	FUNCTION
A	L1 18VT/BK	BACK-UP LAMP FEED
B	F20 18VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN)



BATTERY TEMPERATURE SENSOR

BATTERY TEMPERATURE SENSOR - BLACK 2 WAY

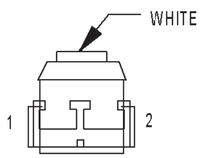
CAV	CIRCUIT	FUNCTION
1	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K167 20BK/LB	SENSOR GROUND



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH - GRAY 6 WAY

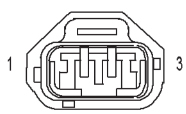
CAV	CIRCUIT	FUNCTION
1	K29 20WT/PK	BRAKE LAMP SWITCH SENSE
2	Z1 20 BK (SUBWOOFER)	GROUND
2	Z1 20BK	GROUND
3	V32 20YL/RD	SPEED CONTROL ON/OFF SWITCH SENSE
4	V30 20DB/RD	SPEED CONTROL BRAKE LAMP SWITCH OUTPUT
5	F32 18PK/DB	FUSED B(+)
6	L50 18WT/TN	BRAKE LAMP SWITCH OUTPUT



BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID

BRAKE TRANSMISSION SHIFT INTERLOCK SOLENOID - WHITE 2 WAY

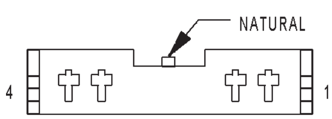
CAV	CIRCUIT	FUNCTION
1	K29 20WT/PK	BRAKE LAMP SWITCH SENSE
2	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)



CAMSHAFT POSITION SENSOR

CAMSHAFT POSITION SENSOR - 3 WAY

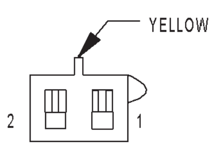
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	K4 20BK/LB	SENSOR GROUND
3	K7 20OR	5V SUPPLY



CLOCKSPRING C1

CLOCKSPRING C1 - NATURAL 4 WAY

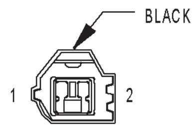
CAV	CIRCUIT	FUNCTION
1	X3 20RD/YL	HORN RELAY CONTROL
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
3	K4 20BK/LB	SENSOR GROUND
4	-	-



CLOCKSPRING C2

CLOCKSPRING C2 - YELLOW 2 WAY

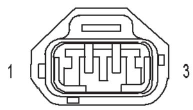
CAV	CIRCUIT	FUNCTION
1	R45 18DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 18BK/LB	DRIVER SQUIB 1 LINE 1



CLUTCH PEDAL POSITION SWITCH (M/T)

CLUTCH PEDAL POSITION SWITCH (M/T) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	T141 14YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
2	A41 14YL	FUSED IGNITION SWITCH OUTPUT (START)



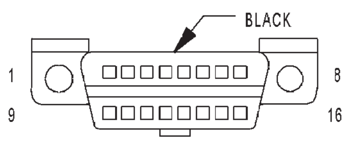
CRANKSHAFT POSITION SENSOR

CRANKSHAFT POSITION SENSOR - 3 WAY

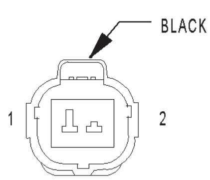
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 20BK/LB	SENSOR GROUND
3	K7 20OR	5V SUPPLY

DATA LINK CONNECTOR - BLACK 16 WAY

CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS
3	-	-
4	Z12 20BK/LB	GROUND
5	Z12 20BK/TN	GROUND
6	D32 20LG	SCI RECEIVE
7	D21 20PK	SCI TRANSMIT
8	-	-
9	-	-
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	M1 20PK/WT	FUSED B(+)



DATA LINK CONNECTOR

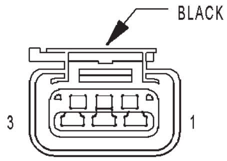


ENGINE COOLANT TEMPERATURE SENSOR

ENGINE COOLANT TEMPERATURE SENSOR - BLACK 2 WAY

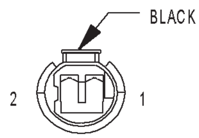
CAV	CIRCUIT	FUNCTION
1	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
2	K4 20BK/LB	SENSOR GROUND

CONNECTOR PINOUTS



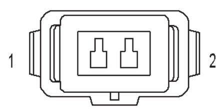
ENGINE OIL PRESSURE SENSOR - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K6 20VT/OR	5V SUPPLY
2	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K4 20BK/LB	SENSOR GROUND



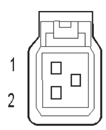
EVAP/PURGE SOLENOID - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K52 20PK/BK	EVAP/PURGE SOLENOID CONTROL
2	F12 20RD/LG	FUSED IGNITION SWITCH OUTPUT (RUN-START)



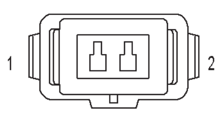
FUEL INJECTOR NO. 1 (2.5L) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER



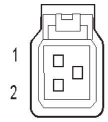
FUEL INJECTOR NO. 1 (4.0L) - 2 WAY

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 (2.5L) - 2 WAY

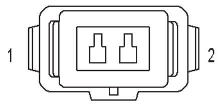
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER



FUEL INJECTOR NO. 2 (4.0L)

FUEL INJECTOR NO. 2 (4.0L) - 2 WAY

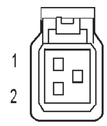
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K12 18TN	FUEL INJECTOR NO. 2 DRIVER



FUEL INJECTOR NO. 3 (2.5L)

FUEL INJECTOR NO. 3 (2.5L) - 2 WAY

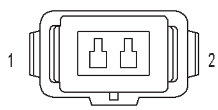
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER



FUEL INJECTOR NO. 3 (4.0L)

FUEL INJECTOR NO. 3 (4.0L) - 2 WAY

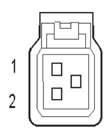
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER



FUEL INJECTOR NO. 4 (2.5L)

FUEL INJECTOR NO. 4 (2.5L) - 2 WAY

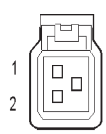
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER



FUEL INJECTOR NO. 4 (4.0L)

FUEL INJECTOR NO. 4 (4.0L) - 2 WAY

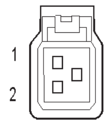
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER



FUEL INJECTOR NO. 5 (4.0L)

FUEL INJECTOR NO. 5 (4.0L) - 2 WAY

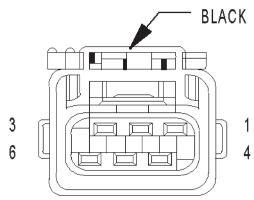
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K38 18PK/BK (LHD CALIFORNIA/EUROPEAN)	FUEL INJECTOR NO. 5 DRIVER
2	K38 18GY	FUEL INJECTOR NO. 5 DRIVER



FUEL INJECTOR NO. 6
(4.0L)

FUEL INJECTOR NO. 6 (4.0L) - 2 WAY

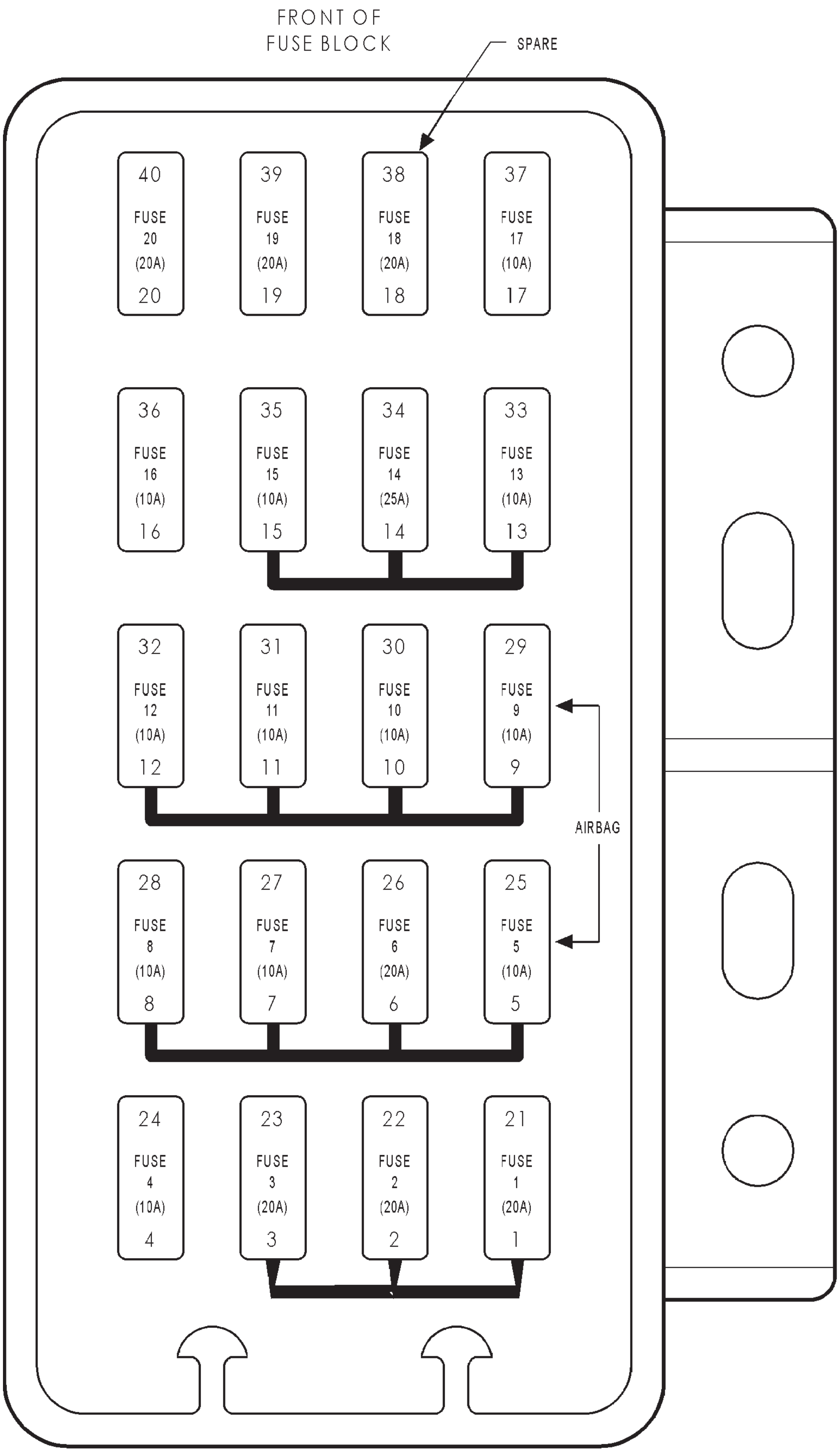
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K16 18LG/BK	FUEL INJECTOR NO. 6 DRIVER



FUEL PUMP
MODULE

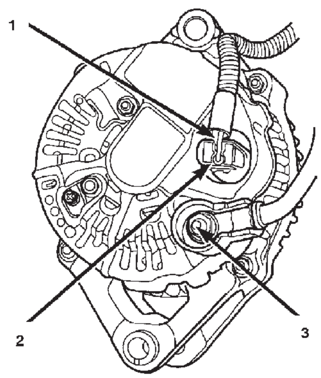
FUEL PUMP MODULE - BLACK 6 WAY

CAV	CIRCUIT	FUNCTION
1	A141 18DG/WT	FUEL PUMP RELAY OUTPUT
2	-	-
3	K226 20DB/LG	FUEL LEVEL SENSOR SIGNAL
4	K4 20BK/LB	SENSOR GROUND
5	-	-
6	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
13
(10A)
13
32
FUSE
12
(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

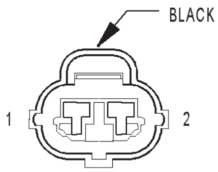
FUSES (FUSE/RELAY BLOCK)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	F33 20PK/RD	FUSED B(+)
1	20A	F33 18PK/RD	FUSED B(+)
2	20A	F32 18PK/DB	FUSED B(+)
3	20A	X60 16DG/RD	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	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 (RHD)	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	25A	V6 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	25A	V6 16PK/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
15	10A	X12 16PK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
16	10A	L22 10LG/DG	DIMMER SWITCH LOW BEAM OUTPUT
17	10A	F81 20DB/RD	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
18	20A	SPARE	-
19	20A	F38 16LB	FUSED IGNITION SWITCH OUTPUT (RUN)
19	20A	F38 16LB	FUSED IGNITION SWITCH OUTPUT (RUN)
20	20A	T141 14YL/RD (A/T)	FUSED IGNITION SWITCH OUTPUT (START)



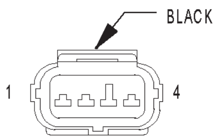
GENERATOR - 3 WAY

CAV	CIRCUIT	FUNCTION
1	-	FIELD WIRES
2	-	FIELD WIRE CONNECTOR
3	-	B(+) (OUTPUT TERMINAL)



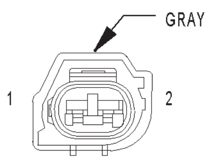
GENERATOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K125 18WT/DB	GENERATOR SOURCE
2	K20 18DG	GENERATOR FIELD



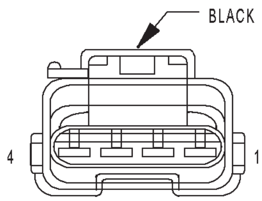
IDLE AIR CONTROL MOTOR - BLACK 4 WAY

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 (2.5L) - GRAY 2 WAY

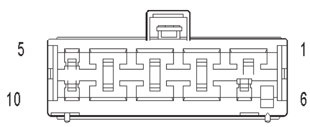
CAV	CIRCUIT	FUNCTION
1	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K19 18GY	IGNITION COIL NO. 1 DRIVER



IGNITION
COIL PACK
(4.0L)

IGNITION COIL PACK (4.0L) - BLACK 4 WAY

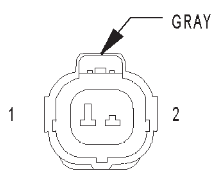
CAV	CIRCUIT	FUNCTION
1	K19 18GY	IGNITION COIL NO. 1 DRIVER
2	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
4	K18 18RD/YL	IGNITION COIL NO. 3 DRIVER



IGNITION
SWITCH

IGNITION SWITCH - 10 WAY

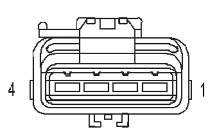
CAV	CIRCUIT	FUNCTION
1	A1 14RD	FUSED B(+)
2	A21 14DB	IGNITION SWITCH OUTPUT (RUN-START)
3	F22 12WT/PK	IGNITION SWITCH OUTPUT (RUN-ACC)
4	F30 12RD/PK	FUSED B(+)
5	G26 20LB	KEY-IN IGNITION SWITCH SENCE
6	A41 14YL	IGNITION SWITCH OUTPUT (START)
7	A31 14BK/DG	IGNITION SWITCH OUTPUT (RUN-ACC)
8	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
9	A2 12PK/BK	FUSED B(+)
10	Z1 20BK (RHD)	GROUND
10	Z1 16BK (LHD)	GROUND



INTAKE AIR
TEMPERATURE
SENSOR

INTAKE AIR TEMPERATURE SENSOR - GRAY 2 WAY

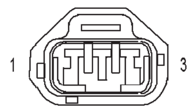
CAV	CIRCUIT	FUNCTION
1	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
2	K4 20BK/LB	SENSOR GROUND



LEAK
DETECTION PUMP

LEAK DETECTION PUMP - 4 WAY

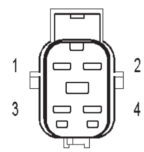
CAV	CIRCUIT	FUNCTION
1	K107 18OR	LEAK DETECTION PUMP SWITCH SENSE
2	K106 20WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
3	K125 18WT/DB	GENERATOR SOURCE
4	-	-



MANIFOLD ABSOLUTE PRESSURE SENSOR

MANIFOLD ABSOLUTE PRESSURE SENSOR - 3 WAY

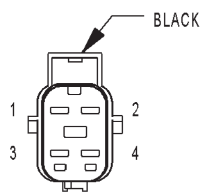
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K1 18DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
3	K7 20OR	5V SUPPLY



OXYGEN SENSOR 1/1 UPSTREAM

OXYGEN SENSOR 1/1 UPSTREAM - 4 WAY

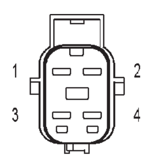
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K299 18BR/WT (ABS)	GROUND
2	K99 18BR/OR	GROUND
3	K4 20BK/LB	SENSOR GROUND
4	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL



OXYGEN SENSOR 1/2 DOWNSTREAM

OXYGEN SENSOR 1/2 DOWNSTREAM - BLACK 4 WAY

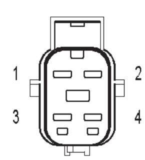
CAV	CIRCUIT	FUNCTION
1	A242 18VT/OR (4.0L CALIFORNIA)	OXYGEN SENSOR DOWNSTREAM HEATER RELAY OUTPUT
1	F142 18OR/DG (EXCEPT 4.0L CALIFORNIA)	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
2	Z1 18BK(4.0L CALIFORNIA)	GROUND
2	K299 18BR/WT (ABS)	GROUND
2	K99 18BR/OR	GROUND
3	K4 10BK/LB	SENSOR GROUND
4	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL



OXYGEN SENSOR 2/1 UPSTREAM (4.0L CALIFORNIA/EUROPEAN III)

OXYGEN SENSOR 2/1 UPSTREAM (4.0L CALIFORNIA/EUROPEAN III) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	OXYGEN SENSOR UPSTREAM HEATER RELAY OUTPUT
2	K299 18BR/WT	GROUND
3	K4 20BK/LB	SENSOR GROUND
4	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL

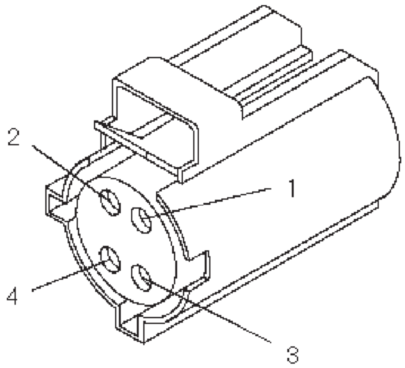


OXYGEN SENSOR 2/2 DOWNSTREAM (4.0L CALIFORNIA/EUROPEAN III)

OXYGEN SENSOR 2/2 DOWNSTREAM (4.0L CALIFORNIA/EUROPEAN III) - 4 WAY

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	OXYGEN SENSOR 2/2 SIGNAL

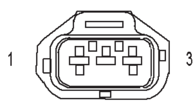
CONNECTOR PINOUTS



OXYGEN SENSOR CONNECTOR (COMPONENT SIDE)

OXYGEN SENSOR CONNECTOR (COMPONENT SIDE) - 4 WAY

CAV	CIRCUIT	FUNCTION
1	-	GROUND
2	-	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	-	OXYGEN SENSOR GROUND
4	-	OXYGEN SENSOR SIGNAL

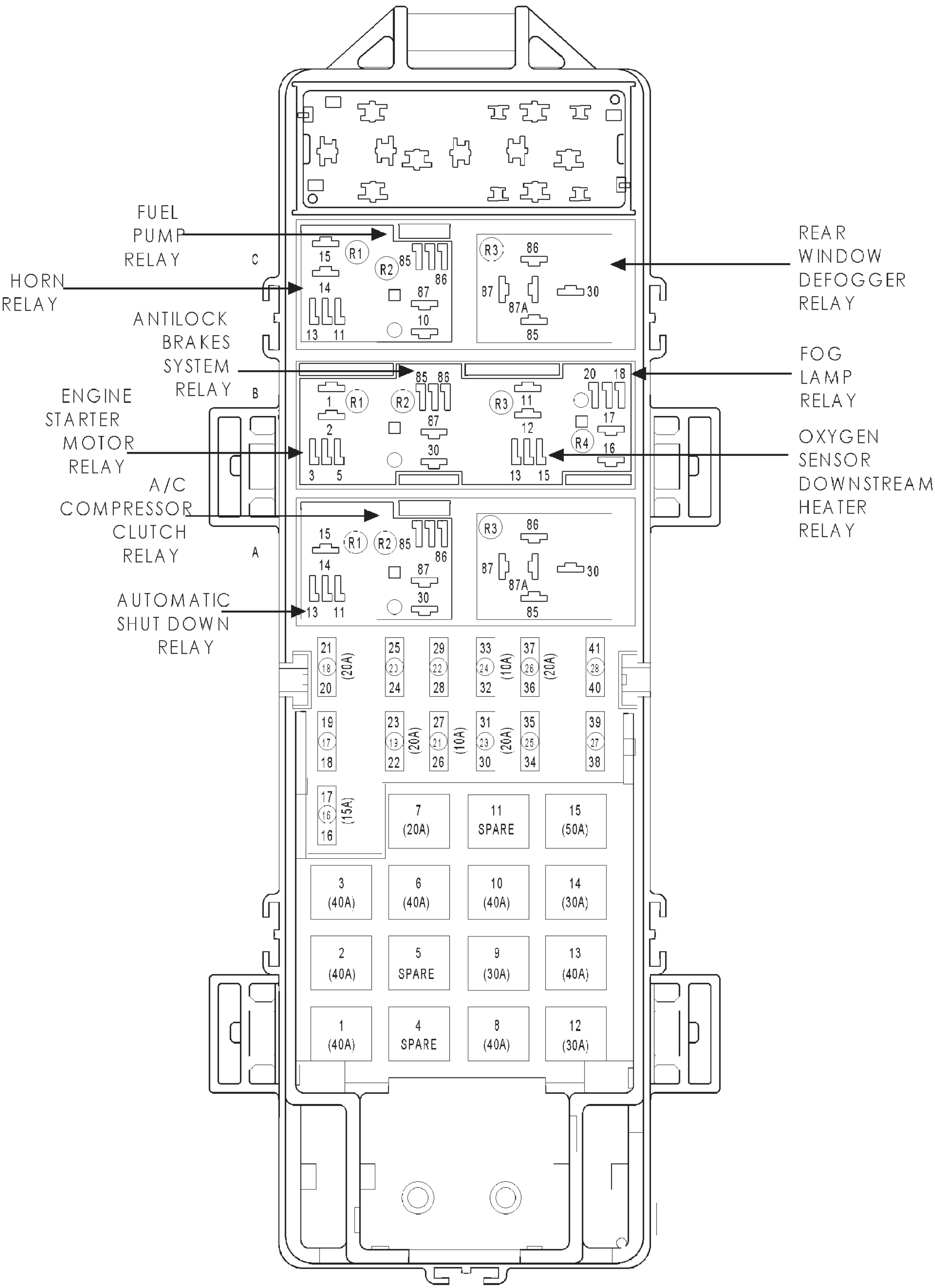


PARK/NEUTRAL POSITION SWITCH (A/T)

PARK/NEUTRAL POSITION SWITCH (A/T) - 3 WAY

CAV	CIRCUIT	FUNCTION
1	F20 18VT/WT	FUSED IGNITION SWITCH OUTPUT (RUN)
2	T41 20BR/LB	PARK/NEUTRAL POSITION SWITCH SENSE
3	L1 18VT/BK	BACK-UP LAMP FEED

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	-	-	-
5	-	-	-
6 (ABS)	40A	A10 12PK/BK	FUSED B(+)
7 (ABS)	20A	L9 16BK/WT	FUSED B(+)
8	40A	A10 12RD/DG	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	FUSED B(+)
13	40A	F30 12RD/PK	FUSED B(+)
14	30A	A1 14RD	FUSED B(+)
15	50A	M1 16PK/WT	FUSED B(+)
16	15A	F142 18OR/DG	AUTOMATIC SHUT DOWN RELAY OUTPUT
17	-	-	-
18	20A	F31 18VT	FUSED B(+)
18	20A	F31 18VT	FUSED B(+)
19	20A	F39 16PK/LG	FUSED B(+)
20	-	-	-
21	10A	A17 20RD/GY	FUSED B(+)
22	-	-	-
23	20A	A61 18DG/BK	FUSED B(+)
24	10A	M1 20PK/WT	FUSED B(+)
25	-	-	-
26	20A	F42 18DG/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT
27	-	-	-
28	-	-	-

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

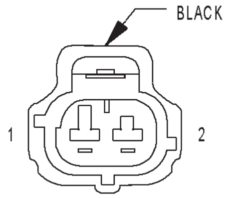
CAV	CIRCUIT	FUNCTION
B1	A2 12PK/BK	FUSED B(+)
B2	T40 12BR	ENGINE STARTER MOTOR RELAY OUTPUT
B3	T41 20BR/LB	PARK/NEUTRAL POSITION SWITCH SENSE
B4	-	-
B5	T141 14YL/RD	FUSED IGNITION SWITCH OUTPUT (START)

FUEL PUMP RELAY

CAV	CIRCUIT	FUNCTION
C6	F15 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
C6	F15 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
C8	K31 18BR	FUEL PUMP RELAY CONTROL
C7	-	-
C9	A141 18DG/WT	FUEL PUMP RELAY OUTPUT
C10	A61 18DG/BK	FUSED B(+)

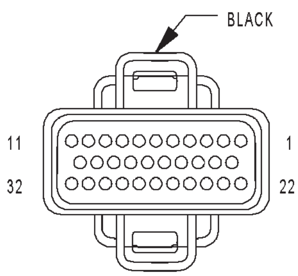
OXYGEN SENSOR DOWNSTREAM HEATER RELAY

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 (2.5L) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	K10 18DB/BR	POWER STEERING PRESSURE SWITCH SENSE

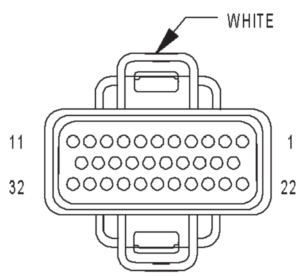


POWERTRAIN CONTROL MODULE C1 - BLACK 32 WAY

CAV	CIRCUIT	FUNCTION
A1	K18 18RD/YL (4.0L)	IGNITION COIL NO. 3 DRIVER
A2	F15 18DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
A3	-	-
A4	K4 18BK/LB	SENSOR GROUND
A5	-	-
A6	T41 18BR/LB	PARK/NEUTRAL POSITION SWITCH SENSE
A7	K19 18GY	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 (2.5L)	POWER STEERING PRESSURE SWITCH SENSE
A13	-	-
A14	-	-
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	A4 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 CALIFORNIA)	OXYGEN SENSOR 2/1 SIGNAL
A27	K1 18DG/RD	MANIFOLD ABSOLUTE PRESSURE SENSOR SIGNAL
A28	-	-
A29	K341 18TN (4.0L CALIFORNIA)	OXYGEN SENSOR 2/2 SIGNAL
A31	Z12 14BK/TN	GROUND
A30	-	-
A32	Z12 14BK/TN	GROUND

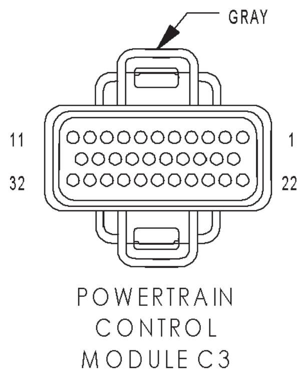
POWERTRAIN CONTROL MODULE C2 - WHITE 32 WAY

CAV	CIRCUIT	FUNCTION
B8	-	-
B1	-	-
B2	-	-
B3	-	-
B4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
B5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
B6	K15 18PK/BK (LHD 4.0L CALIFORNIA)	FUEL INJECTOR NO. 5 DRIVER
B6	K38 18GY (4.0L)	FUEL INJECTOR NO. 5 DRIVER
B7	-	-
B9	K17 18DB/TN (4.0L)	IGNITION COIL NO. 2 DRIVER
B10	K20 18DG	GENERATOR FIELD
B11	T23 18OR/LG	TRANSMISSION LOW/OVERDRIVE SOLENOID
B12	K16 18LG/BK (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	-	-
B18	-	-
B19	-	-
B20	-	-
B21	-	-
B22	-	-
B23	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
B24	-	-
B25	-	-
B26	-	-
B27	G7 18WT/OR (RHD)	VEHICLE SPEED SENSOR SIGNAL
B27	G7 20WT/OR (LHD 4.0L CALIFORNIA/EUROPEAN)	VEHICLE SPEED SENSOR SIGNAL
B28	-	-
B29	-	-
B30	-	-
B31	K6 18VT/OR	5V SUPPLY
B32	-	-



POWERTRAIN CONTROL MODULE C2

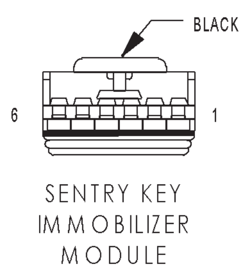
CONNECTOR PINOUTS



POWERTRAIN CONTROL MODULE C3 - GRAY 32 WAY

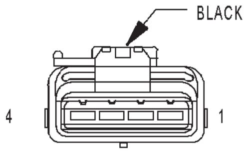
CAV	CIRCUIT	FUNCTION
C1	C13 18DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
C2	-	-
C3	K51 18DB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
C4	V36 18TN/RD (SPEED CONTROL)	SPEED CONTROL VACUUM SOLENOID CONTROL
C5	V35 18LG/RD (SPEED CONTROL)	SPEED CONTROL VENT SOLENOID CONTROL
C6	-	-
C7	-	-
C8	K299 18BR/WT (EXCEPT 4.0L CALIFORNIA)	OXYGEN SENSOR UPSTREAM CONTROL
C8	K99 18BR/OR (4.0L CALI-FORNIA)	OXYGEN SENSOR UPSTREAM CONTROL
C9	K512 18RD/YL (4.0L CALI-FORNIA)	OXYGEN SENSOR DOWNSTREAM HEATER RELAY CONTROL
C10	K106 18WT/DG (DRL)	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	-	-
C14	K107 18OR (DRL)	LEAK DETECTION PUMP SWITCH SENSE
C15	K118 18PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
C16	K299 18BR/WT	OXYGEN SENSOR UPSTREAM 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 SWITCH SENSE
C23	C90 18LG	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	SCI RECEIVE
C30	D25 18VT/YL	PCI BUS
C31	-	-
C32	V37 18RD/LG (SPEED CONTROL)	SPEED CONTROL SWITCH SIGNAL

CONNECTOR PINOUTS



SENTRY KEY IMMOBILIZER MODULE - BLACK 6 WAY

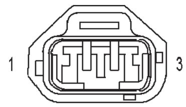
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS
3	Z12 20BK/LB	GROUND
4	F15 20DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	Z1 20BK	GROUND
6	F33 18PK/RD	FUSED B(+)



SPEED CONTROL SERVO

SPEED CONTROL SERVO - BLACK 4 WAY

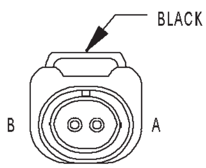
CAV	CIRCUIT	FUNCTION
1	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	SPEED CONTROL BRAKE LAMP SWITCH OUTPUT
4	Z1 18BK	GROUND



THROTTLE POSITION SENSOR

THROTTLE POSITION SENSOR - 3 WAY

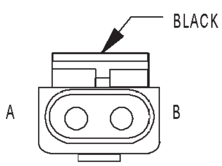
CAV	CIRCUIT	FUNCTION
1	K7 20OR	5V SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL



TORQUE CONVERTER CLUTCH SOLENOID

TORQUE CONVERTER CLUTCH SOLENOID - BLACK 2 WAY

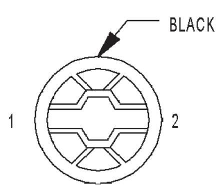
CAV	CIRCUIT	FUNCTION
A	F12 20RD/LG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
B	T23 18OR/LG	TRANSMISSION LOW/OVERDRIVE SOLENOID



TRANSFER CASE SWITCH

TRANSFER CASE SWITCH - BLACK 2 WAY

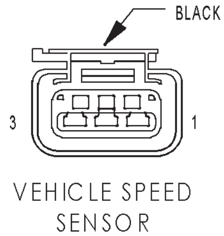
CAV	CIRCUIT	FUNCTION
A	G107 20BK/RD	4WD SENSE
B	Z1 20BK	GROUND



TRANSMISSION RANGE INDICATOR ILLUMINATION (PRNDL)

TRANSMISSION RANGE INDICATOR ILLUMINATION (PRNDL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	E2 20OR	FUSED PANEL LAMPS DIMMER SWITCH SIGNAL
2	Z1 20BK	GROUND

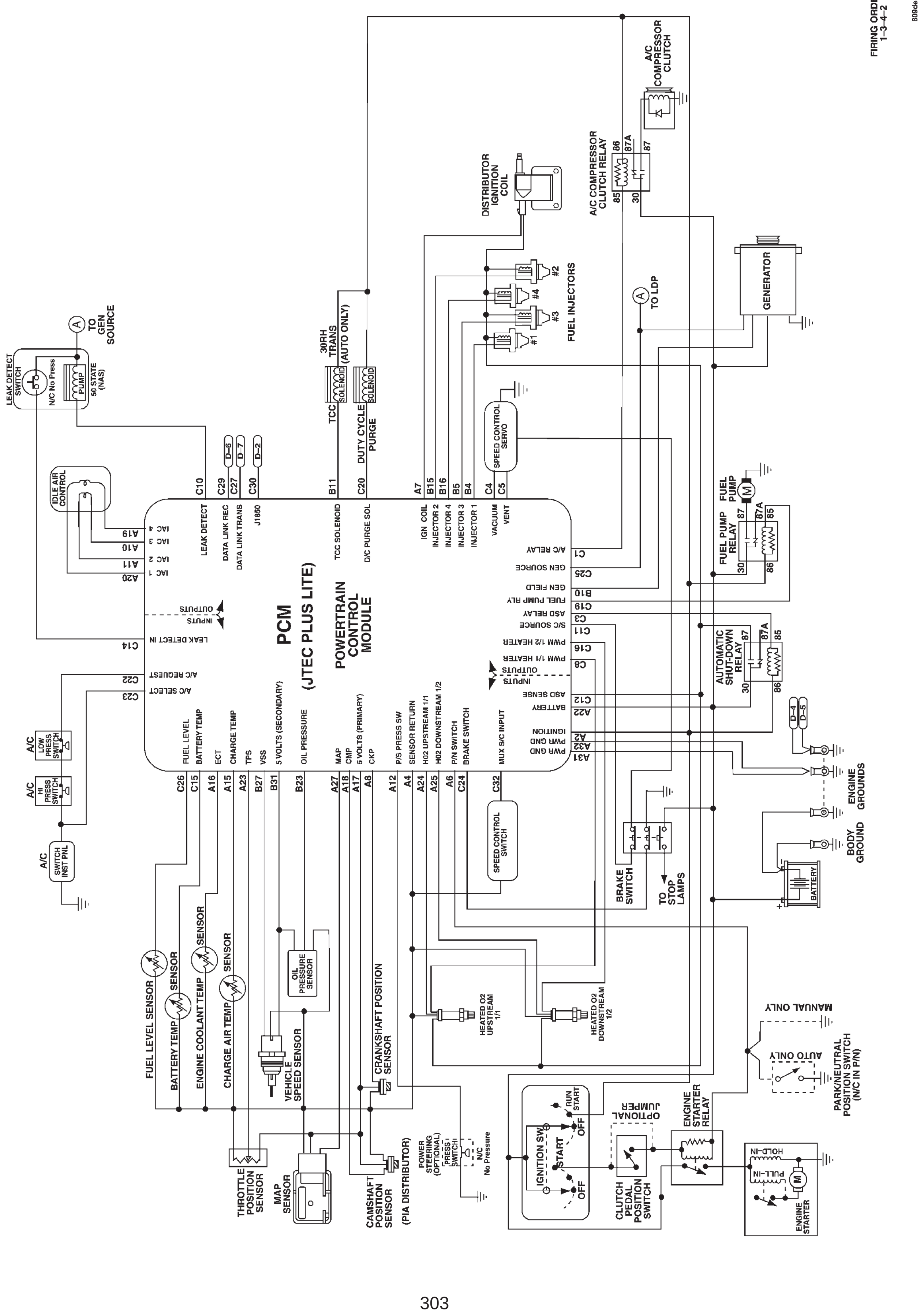


VEHICLE SPEED SENSOR - BLACK 3 WAY

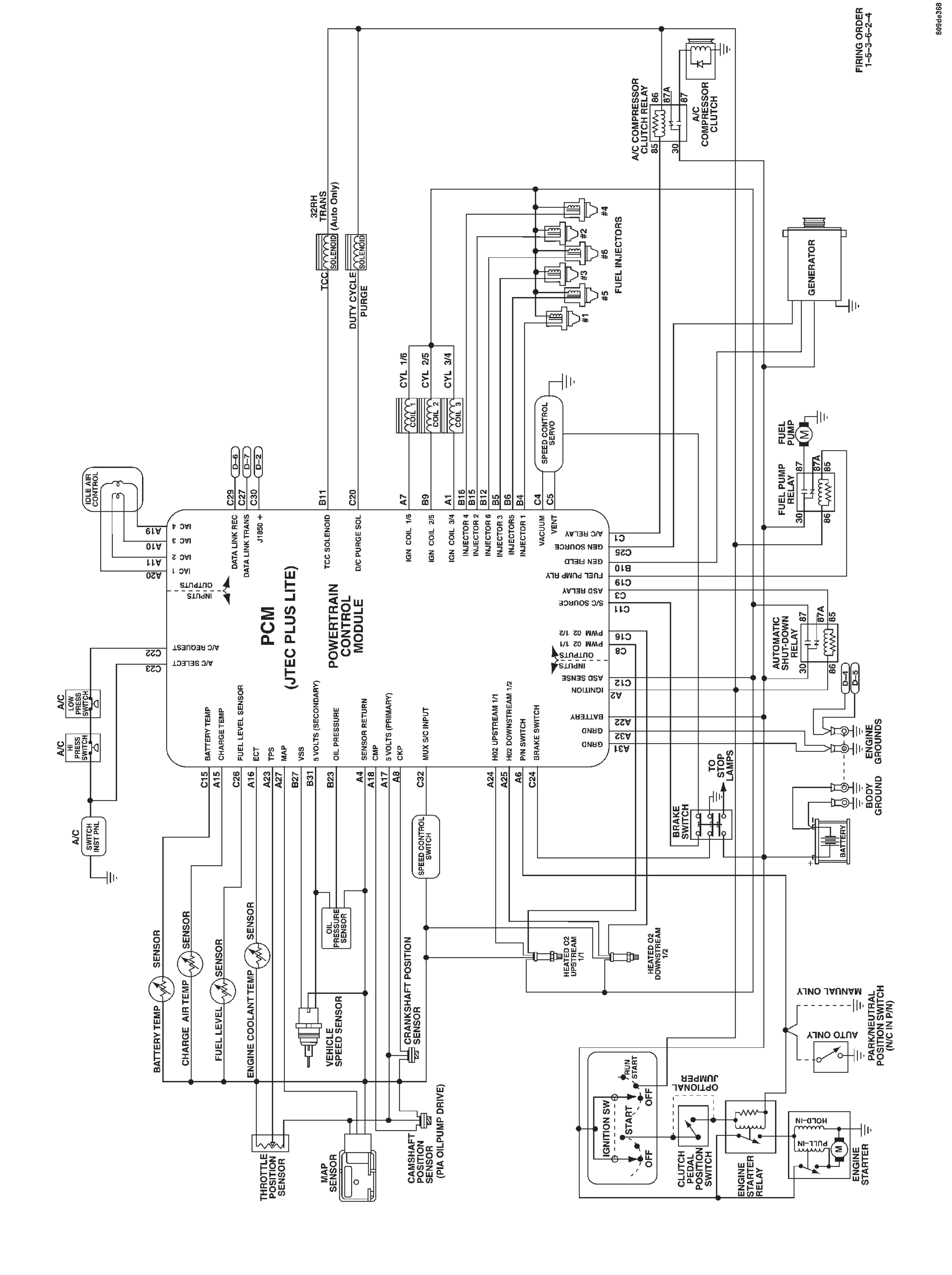
CAV	CIRCUIT	FUNCTION
1	K6 20VT/OR	5V SUPPLY
2	K4 20BK/LB	SENSOR GROUND
3	G7 20WT/OR	VEHICLE SPEED SENSOR SIGNAL

10.0 SCHEMATIC DIAGRAMS

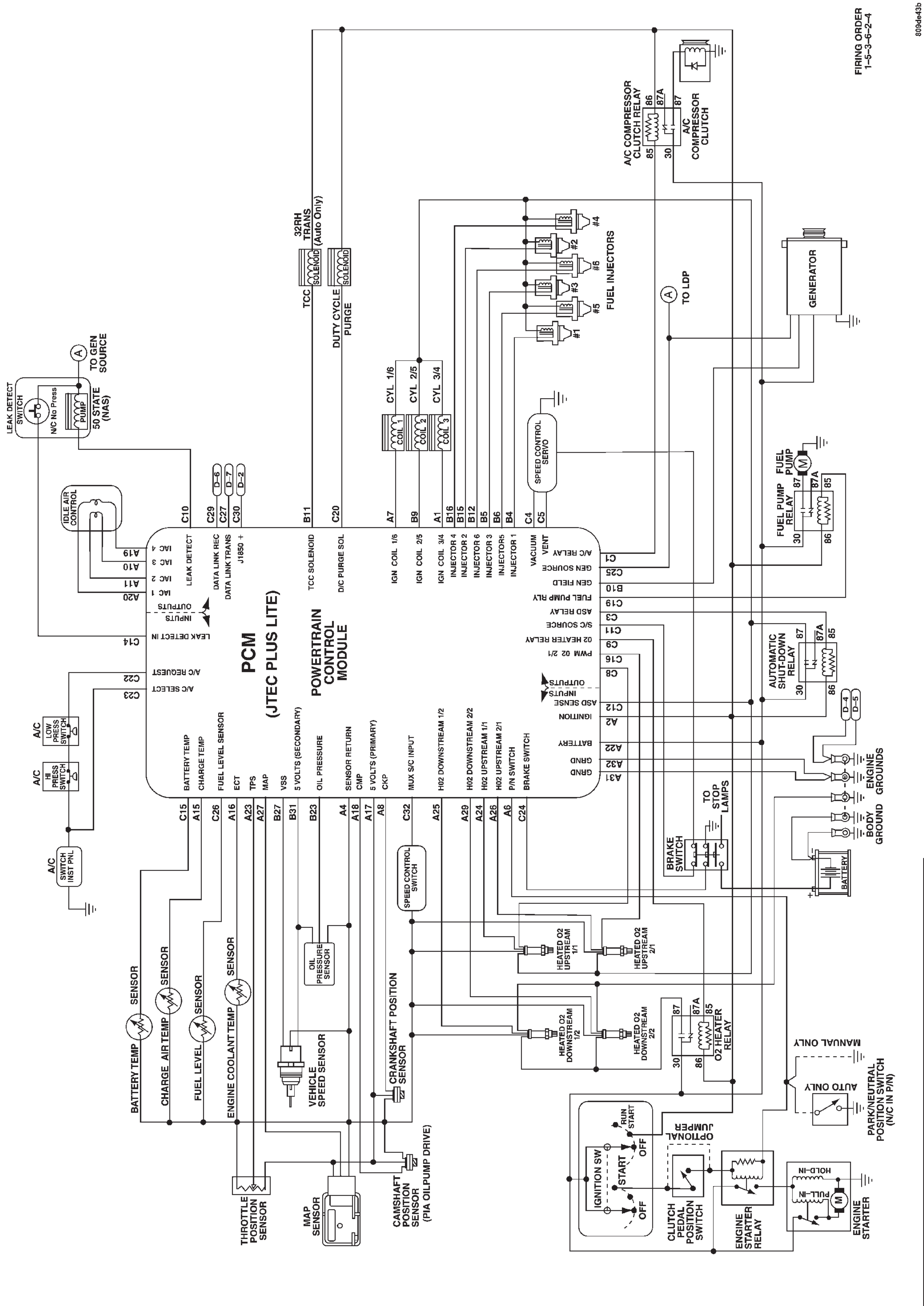
10.1 2001 JEEP TJ 2.5L JTEC SYSTEM



10.2 2001 JEEP TJ 4.0L JTEC SYSTEM



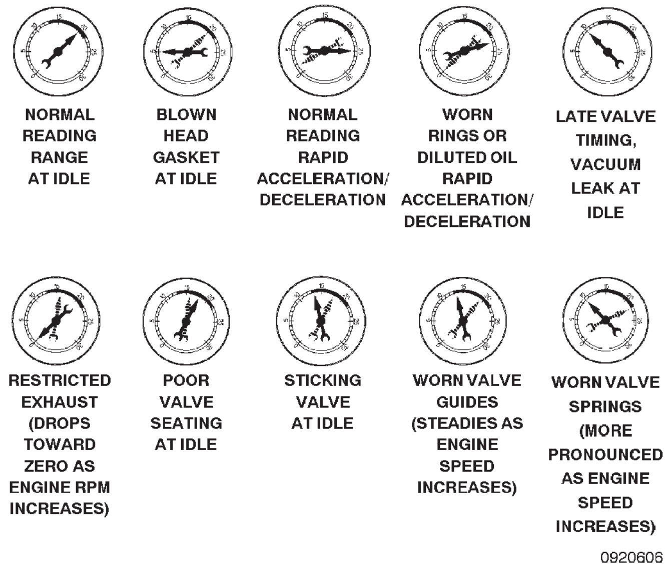
10.3 2001 JEEP TJ 4.0L JTEC SYSTEM

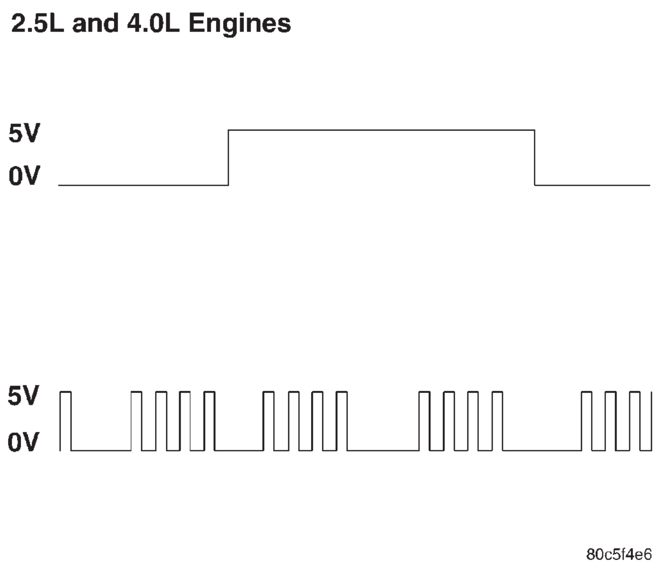


NOTES

CHARTS AND GRAPHS

11.0 CHARTS AND GRAPHS





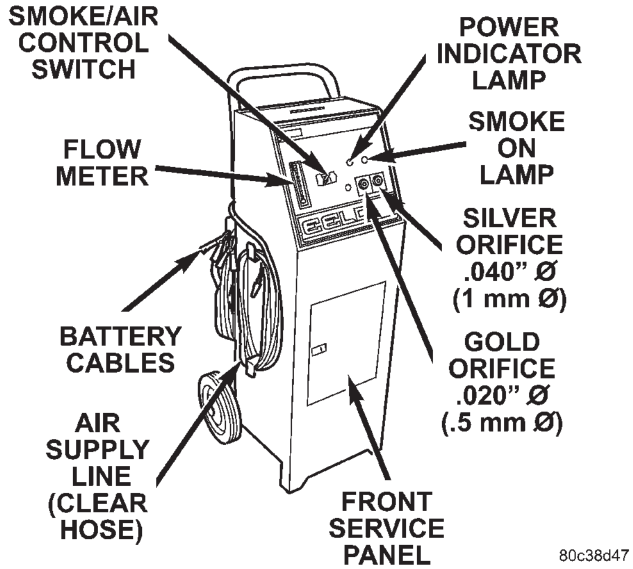
O2 SENSOR CONFIGURATION

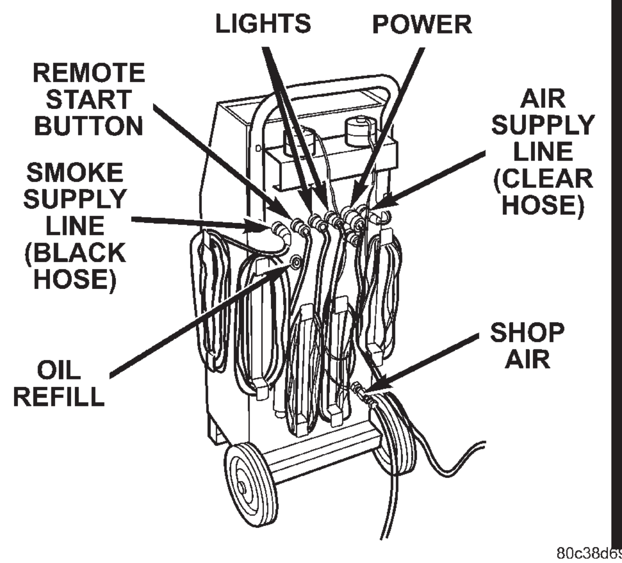
AB 3.9L	1/1	UPSTREAM
AB 3.9L	1/2	DOWNSTREAM
AB 5.2L	1/1	LEFT BANK UPSTREAM
AB 5.2L	1/2	LEFT BANK DOWNSTREAM
AB 5.2L	2/1	RIGHT BANK UPSTREAM
AB 5.2L	2/2	RIGHT BANK DOWNSTREAM
AB 5.9L L/D	1/1	UPSTREAM
AB 5.9L L/D	1/2	DOWNSTREAM
AN 2.5L	1/1	UPSTREAM
AN 2.5L	1/2	DOWNSTREAM
AN 3.9L	1/1	UPSTREAM
AN 3.9L	1/2	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
BE/BR 5.9L HD	1/1	LEFT BANK UPSTREAM
BE/BR 5.9L HD	2/1	RIGHT BANK UPSTREAM
BE/BR 5.9L LD	1/1	UPSTREAM
BE/BR 5.9L LD	1/2	DOWNSTREAM
BE/BR 8.0L HD	1/1	LEFT BANK UPSTREAM
BE/BR 8.0L HD	2/1	RIGHT BANK UPSTREAM
BE/BR 8.0L MD	1/1	LEFT BANK UPSTREAM
BE/BR 8.0L MD	1/2	PRE CATALYST
BE/BR 8.0L MD	1/3	POST CATALYST
BE/BR 8.0L MD	2/1	RIGHT BANK UPSTREAM
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 5.2L	1/1	UPSTREAM
DN 5.2L	1/2	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 5.9L LD	1/1	UPSTREAM
DR 5.9L LD	1/2	DOWNSTREAM
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
SR 8.0L	1/1	LEFT BANK UPSTREAM
SR 8.0L	1/2	LEFT BANK DOWNSTREAM
SR 8.0L	2/1	RIGHT BANK UPSTREAM
SR 8.0L	2/2	RIGHT BANK DOWNSTREAM
TJ 2.5L	1/1	UPSTREAM
TJ 2.5L	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

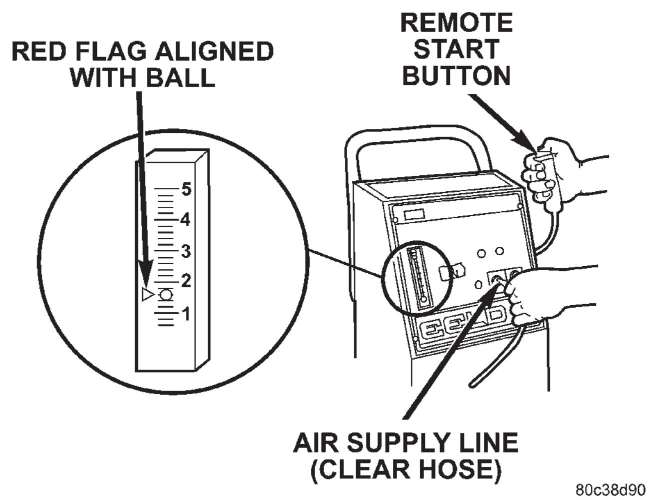
* LD = Light Duty
* MD = Medium Duty
* HD = Heavy Duty

80d138b1





EELD CALIBRATION



NOTES