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1.0 INTRODUCTION

The procedures contained in this manual include all specifications, instructions and graphics needed to diagnose engine control module (ECM) and sentry key immobilizer system (SKIS) problems; they are no start, diagnostic trouble code (DTC) and no trouble code problems for the ECM. The diagnostics in this manual are based on the trouble condition or symptom being present at the time of diagnosis.

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

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. IT IS RECOMMENDED THAT YOU REVIEW THE ENTIRE MANUAL TO BECOME FAMILIAR WITH ALL NEW AND CHANGED DIAGNOSTIC PROCEDURES.

This manual will cover all the necessary requirements to begin a logical diagnostic path for each problem. If there is a diagnostic trouble code (DTC) detected, go to the trouble code test. If there are no DTCs present, go to a no trouble code (*), symptom based test.

This book reflects many suggested changes from readers of past issues. 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 procedures manual covers all 2005 PT body vehicles equipped with the 2.2L direct injection diesel engine.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the engine control module (ECM) and sentry key immobilizer system (SKIS) is done in six basic steps:

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

NOTE: All tests in this manual should be performed with the engine at operating temperature, unless specified within a particular test.

2.0 IDENTIFICATION OF SYSTEM

The ECM is located in the left side of the engine compartment attached to the left inner fender behind the left front headlamp. The sentry key immobilizer module (SKIM) is located below the steering column behind the steering wheel.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 GENERAL DESCRIPTION

The 2.2L direct injection diesel engine system is equipped with the latest technical advances. The on-board diagnostics incorporated in the engine control module and SKIM are intended to assist the field technician in repairing vehicle problems by the quickest means.

The engine system incorporates a common rail fuel delivery design. This design utilizes electronically controlled solenoid valve type fuel injectors. Each injector is controlled individually by the ECM. Injector timing and fuel quantity are controlled by the ECM based on inputs from various sensors. The precision control of the injectors by the ECM helps to reduce the engine noise, odor and smoke.

3.2 FUNCTIONAL OPERATION

3.2.1 ECM ON-BOARD DIAGNOSTICS

The ECM has been programmed to monitor different circuits of the diesel fuel injection system. This monitoring is called on-board diagnostics.

Certain criteria must be met for a diagnostic trouble code to be entered into the ECM memory. The criteria may be a range of: engine rpm, engine temperature, time or other input signals to the ECM. If all of the criteria for monitoring a system or circuit are met, and a problem is sensed, then a DTC will be stored in the ECM memory.

It is possible that a DTC for a monitored circuit may not be entered into the ECM memory, even though a malfunction has occurred. This may happen when the monitoring criteria have not been met.

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

3.2.2 ECM OPERATING MODES

As input signals to the ECM change, the ECM adjusts its response to the output devices. For example, the ECM must calculate a different fuel quantity and fuel timing for engine idle condition than it would for a wide open throttle condition. There are several different modes of operation that determine how the ECM responds to the various input signals.

Ignition Switch On (Engine Off)

When the ignition is turned on the ECM activates the glow plug relay for a time period that is determined by engine coolant temperature, atmospheric temperature and battery voltage. The ECM also activates the fuel/lift pump to prime the fuel system.

Engine Start-Up Mode

The ECM uses the engine coolant temperature sensor, fuel pressure sensor and the crankshaft position sensor (engine speed) inputs to determine fuel injection quantity.

Normal Driving Modes

Engine idle, warm-up, acceleration, deceleration and wide open throttle modes are controlled based on all of the sensor inputs to the ECM. The ECM uses these sensor inputs to adjust fuel quantity and fuel injector timing.

Overheat Protection Mode

If the engine temperature is above 105°C (221°F), engine speed above 1000 rpm and vehicle speed is above 30 km/h (19 MPH) the ECM will activate the high speed fan and will limit fuel quantity for engine protection.

Limp-In Mode

If there is a fault detected with the accelerator pedal position sensor the ECM will set the engine speed at 3000 RPM.

Overspeed Protection Mode

If the ECM detects engine RPM that exceeds 5000 RPM, the ECM will shut off fuel to the injectors until engine RPM falls below 4850. (A DTC does not set for engine overspeed. However, the DRBIII® is able to display the absolute maximum engine RPM, coolant temperature and vehicle speed that the ECM has detected during the life of the ECM).

After-Run Mode

The ECM transfers RAM information to EEPROM and performs an Input/Output state check.

3.2.3 MONITORED CIRCUITS

The ECM is able to monitor and identify most driveability related trouble conditions. Some circuits are directly monitored through ECM feedback circuitry. In addition, the ECM monitors the voltage state of some circuits and compares those states with expected values. Other systems are monitored indirectly when the ECM conducts a rationality test to identify problems.

Although most subsystems of the engine control module are either directly or indirectly monitored, there may be occasions when diagnostic trouble codes are not immediately identified. For a trouble code to set, a specific set of conditions must occur and unless these conditions occur, a DTC will not set.

3.2.4 SKIS OVERIVEW

The sentry key immobilizer system (SKIS) is designed to prevent unauthorized vehicle operation. The system consists of a sentry key immobilizer module (SKIM), ignition key(s) equipped with a transponder chip and the ECM. When the ignition switch is turned on, the SKIM interrogates the ignition key. If the ignition key is Valid or Invalid, the SKIM sends a J1850 Bus message to the ECM indicating ignition key status. Upon receiving this message the ECM will terminate engine operation or allow the engine to continue to operate.

3.2.5 SKIS ON-BOARD DIAGNOSTICS

The sentry key immobilizer module (SKIM) has been programmed to transmit and monitor many different coded messages as well as J1850 Bus messages. This monitoring is called On-Board Diagnostics. Certain criteria must be met for a DTC to be entered into SKIM memory. The criteria may be a range of; input voltage, J1850 Bus message or coded messages to the SKIM. If all the criteria for monitoring a circuit or function are met and a fault is detected, a DTC will be stored in the SKIM memory.

3.2.6 SKIS OPERATION

When ignition power is supplied to the SKIM, the SKIM performs an internal self-test. After the self-test is complete, 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 - an electronically stored value (identification number) that is unique to each SKIS. The secret key is stored in the SKIM, ECM and all ignition key transponders.

Challenge - 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 encrypted response message. The transponder uses the crypto algorithm to receive, decode and respond to the message sent by SKIM. After responding to the coded message, the transponder sends a transponder ID message to the SKIM. The SKIM compares the transponder ID message to the available valid key codes in SKIM memory (8 key maximum at any one time). After validating the ignition key, the SKIM sends a J1850 Bus message called a seed request to the ECM, then waits for the ECM response. If the ECM does not respond, the SKIM will send the seed request again. After twenty failed attempts, the SKIM will stop sending the seed request and store a trouble code in memory. If the ECM sends a seed response, the SKIM sends a valid/invalid key message to the ECM. This is an encrypted message that is generated using the following:

- VIN - Vehicle Identification Number
- Seed - a random number that is generated by the ECM at each ignition key cycle

The VIN and the seed are two variables used in the rolling code algorithm that encrypts the valid/invalid key message. The ECM 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 an ECM status message from the ECM. If the ECM does not respond with a valid key message to the SKIM, a fault is detected and a code is stored.

The SKIS incorporates a warning lamp located in the instrument cluster. The lamp receives switched ignition voltage and is hardwired to the instrument cluster. The SKIS lamp is actuated when the SKIM sends a J1850 Bus message to the instrument cluster requesting the lamp on, off or flashing. The instrument cluster then provides the ground for the lamp.

The SKIM will request lamp operation for the following:

– bulb check at ignition on
– to alert the vehicle operator to a SKIS malfunction
– when the SKIM is in customer key programming mode

For all faults except transponder faults the lamp remains on steady. In the event of a transponder fault the lamp will flash at a rate of 1Hz (once per second). If a fault is present, the lamp will remain on or flashing for the complete ignition cycle. If an invalid key signal is received by the ECM, the ECM will allow the engine to start and idle for 2 seconds then stall. This may occur up to six times. After the sixth attempt, the ECM prevents the engine from cranking until the fault is corrected.

3.3 DIAGNOSTIC TROUBLE CODES

Each diagnostic trouble code (DTC) is diagnosed by following a specific procedure. The diagnostic test procedure contains step-by-step instruction for determining the cause of the DTC 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 diagnosis by reading the DTCs using the DRBIII®. This will direct you to the specific test(s) that must be performed.

3.3.1 HARD CODE

A DTC that comes back within one cycle of the ignition key is a hard code. This means that the problem is current every time the ECM/SKIM checks that circuit or function. Procedures in this manual verify if the DTC is a hard code at the beginning of each test. When the fault is not a hard code, an intermittent test must be performed.

NOTE: If the DRBIII® displays faults for multiple components (i.e. ECT, VSS, IAT sensors) identify and check the shared circuits for possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate schematic to identify shared circuits.

3.3.2 INTERMITTENT CODE

A DTC that is not current every time the ECM/SKIM checks the circuit or function is an intermittent code. Most intermittent DTCs are caused by wiring or connector problems. Problems 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 checks may assist you in identifying a possible intermittent problem.

- Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.
- Visually inspect the related wire harness. Look for chafed, pierced, or partially broken wire.
- Refer to hotlines or technical service bulletins that may apply.

NOTE: Electromagnetic (radio) interference can cause an intermittent system malfunction. This interference can interrupt communication between the ignition key transponder and the SKIM.

3.3.3 ECM DIAGNOSTIC TROUBLE CODES

IMPORTANT NOTE: Before replacing the ECM 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 ECM driver/control circuit failures are caused by internal failures to components (i.e. relays and solenoids) and shorted circuits (i.e. sensor pull-ups, drivers and ground circuits). These faults are difficult to detect when a double fault has occurred and only one DTC has set.

NOTE: If the DRBIII® displays faults for multiple components (i.e. VSS, ECT, Batt Temp, etc.), identify and check the shared circuits for possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate wiring diagrams to identify shared circuits.

A/C CLUTCH RELAY CIRCUIT OPEN CIRCUIT
A/C CLUTCH RELAY CIRCUIT SHORT CIRCUIT
ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH
ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH
ACC PEDAL POSITION SENSOR 1 CKT SUPPLY VOLTAGE TOO HIGH OR LOW
ACC PEDAL POSITION SENSOR 2 CKT POTENTIOMETER PLAUSIBILITY 1/2
ACC PEDAL POSITION SENSOR 2 CKT SIGNAL VOLTAGE TOO HIGH
ACC PEDAL POSITION SENSOR 2 CKT SUPPLY VOLTAGE TOO HIGH OR LOW
A/D CONVERTER ERROR 5 VOLT SUPPLY FAILURE
A/D CONVERTER ERROR GROUND TO APP FAILURE
A/D CONVERTER ERROR RAM TEST FAILURE
AFTER RUN SHUT OFF ERROR-INJ. POWERSTAGE
AFTER RUN SHUT OFF ERROR-ZERO QUANTITY
AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO HIGH
AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO LOW
ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY
ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE
BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH
BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO LOW
BATTERY SENSE LINE 1 VOLTAGE TOO HIGH
BATTERY SENSE LINE 1 VOLTAGE TOO LOW
BATTERY SENSE LINE 2 VOLTAGE TOO HIGH
BATTERY SENSE LINE 2 VOLTAGE TOO LOW
BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH
BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW
BOOST PRESSURE SENSOR PLAUSIBILITY
BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH
BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW
BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW
BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY AFTER INIT.
BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT
CABIN HEATER RELAY #1 OPEN CIRCUIT
CABIN HEATER RELAY #1 SHORT CIRCUIT
CABIN HEATER RELAY #2 OPEN CIRCUIT
CABIN HEATR RELAY #2 SHORT CIRCUIT
CAPACITOR VOLTAGE 1 VOLTAGE TOO HIGH
CAPACITOR VOLTAGE 1 VOLTAGE TOO LOW
CKP POSITION SENSOR CIRCUIT DYNAMIC PLAUSIBILITY
CLUTCH UPSTOP SWITCH PERFORMANCE PLAUSIBILITY
CMP POSITION SENSOR CIRCUIT CMP/CKP SYNC FAILURE
CMP POSITION SENSOR CIRCUIT DYNAMIC PLAUSIBILITY
CMP POSITION SENSOR CIRCUIT SIGNAL FREQUENCY TOO HIGH
CMP POSITION SENSOR CIRCUIT STATIC PLAUSIBILITY
CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE
CYLINDER 1-INJECTOR CIRCUIT LOAD DROP
CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
CYLINDER 2-INJECTOR CIRCUIT CURRENT DECREASE
CYLINDER 2-INJECTOR CIRCUIT LOAD DROP
CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
CYLINDER 3-INJECTOR CIRCUIT CURRENT DECREASE

CYLINDER 3-INJECTOR CIRCUIT LOAD DROP
CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
CYLINDER 4-INJECTOR CIRCUIT CURRENT DECREASE
CYLINDER 4-INJECTOR CIRCUIT LOAD DROP
CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
ECM ERROR GATE ARRAY - COMMUNICATION
ECM ERROR GATE ARRAY - QUANTITY STOP
ECM ERROR RECOVERY HAS OCCURRED
ECM ERROR REDUNDANT OVERRUN MONITORING
EEPROM PLAUSIBILITY CHECKSUM ERROR
EEPROM PLAUSIBILITY CODE WORD INCORRECT OR MISSING
EEPROM PLAUSIBILITY COMMUNICATION ERROR
EEPROM PLAUSIBILITY VARIATION NUMBER ERROR
EEPROM PLAUSIBILITY VIN CHECKSUM ERROR
EEPROM PLAUSIBILITY WRITE ERROR
EGR SOLENOID CIRCUIT NEGATIVE DEVIATION
EGR SOLENOID CIRCUIT OPEN CIRCUIT
EGR SOLENOID CIRCUIT SHORT CIRCUIT
ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH
ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW
FAN 1 CONTROL CIRCUIT OPEN CIRCUIT
FAN 1 CONTROL CIRCUIT SHORT CIRCUIT
FAN 2 CONTROL CIRCUIT OPEN CIRCUIT
FAN 2 CONTROL CIRCUIT SHORT CIRCUIT
FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH
FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW
FUEL PRESS SENSOR CIRCUIT MALF SUPPLY VOLTAGE TOO HIGH OR LOW
FUEL PRESSURE SOLENOID OPEN CIRCUIT
FUEL PRESSURE SOLENOID POWER STAGE ERROR
FUEL PRESSURE SOLENOID SHORT CIRCUIT
FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING
FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED
FUEL RAIL PRESSURE MALFUNCTION POSITIVE DEVIATION AT ENGINE SPEED TOO HIGH
FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH - SHUT OFF
FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW
GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH
GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO LOW
GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE TOO HIGH
GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE TOO LOW
GENERATOR FIELD CONTROL MALF HIGH GENERATOR CURRENT
GENERATOR FIELD CONTROL MALF OPEN CIRCUIT
GENERATOR FIELD CONTROL MALF SHORT CIRCUIT
GENERATOR FIELD CURRENT TOO HIGH
GENERATOR FIELD CURRENT TOO LOW
GLOW PLUG 1 CONTROL CIRCUIT OPEN CIRCUIT
GLOW PLUG 1 CONTROL CIRCUIT SHORT CIRCUIT
IGNITION SWITCH PLAUSIBILITY
INJECTOR CLASSIFICATION ERROR CHECKSUM ERROR
INJECTOR CLASSIFICATION ERROR INVALID INJECTOR CLASS
INTAKE AIR TEMPERATURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH
INTAKE AIR TEMPERATURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW
INTAKE PORT SWIRL ACTUATOR OPEN CIRCUIT
INTAKE PORT SWIRL ACTUATOR SHORT CIRCUIT
J1850 COMMUNICATION BUS LOST ARBITRATION
J1850 COMMUNICATION BUS RECEIVE TIMEOUT
J1850 COMMUNICATION BUS SHORT TO GROUND
J1850 COMMUNICATION BUS SHORT TO VOLTAGE
J1850 COMMUNICATION BUS SPI ERROR
J1850 COMMUNICATION BUS TRANSMIT BUFFER OVERRUN
J1850 COMMUNICATION BUS UNAUTHORIZED RESET
LIFT PUMP RELAY CONTROL OPEN CIRCUIT
LIFT PUMP RELAY CONTROL SHORT CIRCUIT
MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH
MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW
MASS AIR FLOW SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

MIL/DIAG LAMP VIA J1850 BUS - IN FRAME RESPONSE ERROR
MIL/DIAG LAMP VIA J1850 BUS - STATUS ERROR
S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY
S/C SWITCH SIGNAL CIRCUIT SIGNAL VOLTAGE TOO HIGH
SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH
SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW
SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH
SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW
SKIM SYSTEM INVALID KEY CODE RECEIVED
SKIM SYSTEM INVALID SECRET KEY IN EEPROM
SKIM SYSTEM KEY COMMUNICATION TIMED OUT
SKIM SYSTEM WRITE ACCESS TO EEPROM FAILURE
STARTER RELAY CIRCUIT SHORT CIRCUIT
SYSTEM VOLTAGE TOO HIGH
SYSTEM VOLTAGE TOO LOW
TURBOCHARGER WASTEGATE SOL CKT NEGATIVE DEVIATION
TURBOCHARGER WASTEGATE SOL CKT OPEN CIRCUIT
TURBOCHARGER WASTEGATE SOL CKT POSITIVE DEVIATION
TURBOCHARGER WASTEGATE SOL CKT SHORT CIRCUIT
VEHICLE SPEED SENSOR FREQUENCY TOO HIGH
VEHICLE SPEED SENSOR PLAUSIBILITY
VEHICLE SPEED SENSOR SIGNAL VOLTAGE TOO HIGH
VOLTAGE REGULATOR SIGNAL VOLTAGE TOO HIGH
VOLTAGE REGULATOR SIGNAL VOLTAGE TOO LOW

3.3.4 SKIM DIAGNOSTIC TROUBLE CODES

ANTENNA FAILURE
COP FAILURE
EEPROM FAILURE
INTERNAL FAULT
PCM STATUS FAILURE
RAM FAILURE
ROLLING CODE FAILURE
SERIAL LINK EXTERNAL FAULT
SERIAL LINK INTERNAL FAULT
STACK OVERFLOW FAILURE
TRANSPONDER COMMUNICATION FAILURE
TRANSPONDER CRC (CYCLIC REDUNDANCY CHECK) FAILURE
TRANSPONDER ID MISMATCH
TRANSPONDER RESPONSE MISMATCH
VIN MISMATCH

3.3.5 HANDLING NO TROUBLE CODE PROBLEMS

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. When there are no trouble codes present, refer to the no trouble code (*) tests.

3.4 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading the DTCs, erasing the DTCs, lab scope usage and other DRBIII® functions.

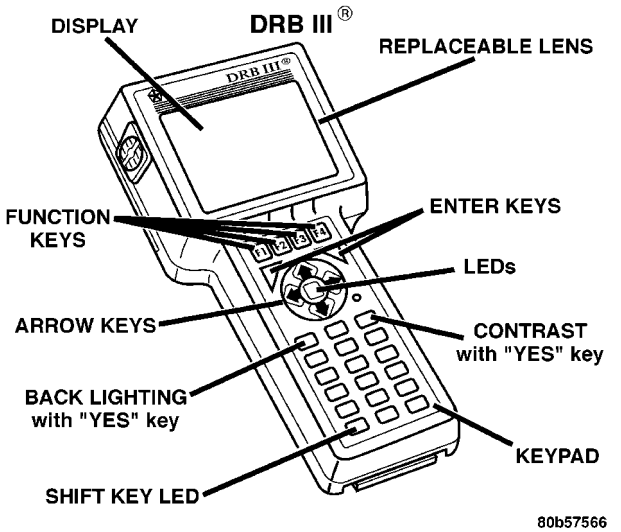
3.4.1 DRBIII® DOES NOT POWER UP

If the LEDs 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 at data link connector cavity 16. A minimum of 11.0 volts is required to adequately power the DRBIII®. Check for proper ground connection at data link connector cavities 4 and 5.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of a faulty cable or vehicle wiring.

3.4.2 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: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS. FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.

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 AREA 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 electrical contact.

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

4.2.2 VEHICLE PREPARATION FOR TESTING

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

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the powertrain system are intended to be serviced as an assembly 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 OR POSSIBLE FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND 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, tip 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
Frequency Measure Frequency Generated	0-10 kHz
Temperature	-58 - +1100°F -50 - +600°C

* 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.
- The circuit being tested must be protected by a 10 amp fuse or circuit breaker.

- Use the low current shunt to measure circuits up to 10 amps. Use the high current shunt to measure circuits exceeding 10 amps.
- 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.

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 hang the DRBIII® from the rear view mirror. Do not attempt to read the DRBIII® while driving. 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 circuit integrity at any control module, use the terminal side (not the wire end) of the harness connector. Do not probe through the insulation; this will damage it and eventually cause it to fail because of corrosion.

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

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box) scan tool
DRBIII® SuperCard 2 (CH8361)
vacuum gauge
ammeter
ohmmeter
voltmeter
jumper wires and probes
oscilloscope

6.0 GLOSSARY OF TERMS

A/C	air conditioning
APP	accelerator pedal position (sensor)
ASD	auto shut down
backfire, popback	fuel ignites either in the intake or the exhaust system
BP	boost pressure (sensor)
CKP	crankshaft position (sensor)
CMP	camshaft position (sensor)
cuts out, misses	a steady pulsation or inability of the engine to maintain a consistent rpm
DLC	data link connector
detonation, spark knock	a mild to severe ping, especially under loaded engine conditions
ECM	engine control module
ECT	engine coolant temperature (sensor)
EGR	exhaust gas recirculation (solenoid/valve)
hard start	the engine takes longer than usual to start, even though it is able to crank at normal speed
IAT	intake air temperature (sensor)
lack of power, sluggish	the engine power output has been reduced
MAF	mass air flow (sensor)
MIL	malfunction indicator lamp
ms	millisecond(s)
PDC	power distribution center
poor fuel economy	there is significantly less fuel mileage than other vehicles of the same design and configuration
runs rough/ unstable idle	the engine runs unevenly at idle causing the engine to shake if it is severe enough
S/C	speed control
SCI	standard corporate interface
SKIM	sentry key immobilizer module
SKIS	sentry key immobilizer system
start and stall	the engine starts but immediately dies (stalls)
surge	engine rpm fluctuation without corresponding change in accelerator pedal position
SRC	signal range check
VSS	vehicle speed sensor

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom:

*NO RESPONSE FROM ECM (PCI BUS) - DIESEL ONLY

POSSIBLE CAUSES
ECM PCI NO RESPONSE
PCI BUS CIRCUIT OPEN
ENGINE 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 DRB, enter Anti-Lock Brakes. With the DRB, enter Body then Electro/Mechanical Cluster (MIC). With the DRB, 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 ROAD TEST VERIFICATION - VER-2.	All
2	With the DRB read ECM Diagnostic Trouble Codes. This is to ensure power and grounds to the ECM are operational. **NOTE: If the DRB will not read ECM DTCs, follow the NO RESPONSE TO ECM (SCI only) symptom path.** Turn the ignition off. Disconnect the ECM harness connectors. 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 DRB. 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. Press F2 again when complete. Connect the Black lead to ground. Connect the Red lead to the PCI Bus circuit in the ECM connector. Turn the ignition on. Observe the voltage display on the DRB Lab Scope. Does the voltage pulse from 0 to approximately 7.5 volts? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the PCI Bus circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***NO RESPONSE FROM ECM (SCI ONLY) - DIESEL ONLY**

POSSIBLE CAUSES
CHECK ECM POWERS AND GROUNDS
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE
SCI TRANSMIT CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Perform the symptom Checking ECM Power and Ground Circuits in the Driveability category. Did the vehicle pass this test? Yes → Go To 2 No → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the DRB 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 ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the DRB from the DLC. Turn the ignition on. Measure the voltage of the SCI Transmit circuit. Is the voltage above 1.0 volt? Yes → Repair the SCI Transmit circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the DRB from the DLC. Measure the resistance of the SCI Transmit circuit between the ECM connector and the DLC. Is the resistance below 5.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the SCI Transmit circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	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

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the PCM/ECM harness connector. Note: If equipped with NGC follow the caution below. **CAUTION: DO NOT PROBE THE PCM HARNESS CONNECTORS. PROBING THE PCM HARNESS CONNECTORS WILL DAMAGE THE PCM TERMINALS RESULTING IN POOR TERMINAL TO PIN CONNECTION. INSTALL MILLER SPECIAL TOOL #8815 TO PERFORM DIAGNOSIS.** 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/ECM harness 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
4	**NOTE: Reconnect the PCM/ECM 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 7.0 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 7.0 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

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
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. **NOTE: Total bus resistance to ground thru all of the modules is typically between 350 to 1000 ohms. The more modules on the bus, the lower the total bus resistance will be.** Is the resistance below 150.0 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:

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: When the ECM detects voltage above 4.83 volts on the Ambient Air Temperature Sensor Signal circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
AMBIENT AIR TEMP SENSOR GROUND CIRCUIT OPEN
AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT OPEN
MAF/AMBIENT AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, then on. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the MAF/Ambient Temperature Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Ambient Air Temperature Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 3 No → Repair the Ambient Air Temperature Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire.**	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Measure the resistance of the Ambient Air Temperature Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 4 No → Repair the Ambient Air Temperature Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the ECM harness connector and the MAF/Ambient Air Temperature Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Ambient Air Temperature Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Connect a jumper wire between the Ambient Air Temperature Sensor Signal and the Sensor Ground circuits in the MAF/Ambient Air Temperature Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs. Does the DRB display P0070 AMBIENT AIR TEMP. SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW? Yes → Replace the MAF/Ambient Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: When the ECM detects voltage below 0.073 volt on the Ambient Air Temperature Sensor Signal circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
AMBIENT AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
MAF/AMBIENT AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, then on. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Measure the resistance between ground and the Ambient Air Temperature Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 3 No → Repair the Ambient Air Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0070-AMBIENT AIR TEMPERATURE CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Measure the resistance between the Ambient Air Temperature Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Ambient Air Temperature Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the MAF/Ambient Air Temperature Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs. Does the DRB display P0070 AMBIENT AIR TEMP SIGNAL VOLTAGE TOO HIGH? Yes → Replace the MAF/Ambient Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH
P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW
P0100-MASS AIR FLOW SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH.

When Monitored and Set Condition:

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on or engine running below 3800 rpm.

Set Condition: The MAF Sensor Signal voltage is above 4.5 volts.

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on or enigne running below 3800 rpm.

Set Condition: The Mass Air Flow Sensor Signal voltage is below 0.2 volt.

P0100-MASS AIR FLOW SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Sensor Reference Voltage A voltage to the MAF is below 4.8 volts or above 5.2 volts for at least 100 ms.

POSSIBLE CAUSES
ASD RELAY OUTPUT CIRCUIT OPEN
ECM - SENSOR REFERENCE VOLTAGE A SUPPLY CIRCUIT
MASS AIRFLOW SENSOR
SENSOR GROUND OPEN
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE A CIRCUIT OPEN
MAF SENSOR SIGNAL CIRCUIT OPEN
SENSOR REFERENCE VOLTAGE A CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
MAF SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECM SENSOR GROUND CIRCUIT OPEN
SENSOR REFERENCE VOLTAGE A CIRCUIT SHORTED TO GROUND
MAF SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
SENSOR REFERENCE VOLTAGE A CIRCUIT SHORTED TO VOLTAGE

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

POSSIBLE CAUSES
MAF SENSOR CIRCUIT SHORTED TO VOLTAGE
ECM - MAF SENSOR SIGNAL CIRCUIT

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** **NOTE: Inspect the turbocharger inlet tube between the MAF Sensor and the turbocharger for damage, restriction or poor connection.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRB III display a Mass Air Flow Sensor DTC? Yes → Go To 2 No → Go To 15	All
2	**NOTE: A malfunctioning EGR system can cause this DTC to set. Refer to symptom Checking the EGR System in the Driveability category to check EGR system operation.** Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage A circuit in MAF Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the MAF Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the MAF Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the MAF Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the MAF Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the MAF Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the MAF Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the MAF Sensor Signal circuit and the Sensor Ground circuit at of the MAF Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the MAF Sensor Signal for a short to Sensor Ground . Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Turn the ignition off. Disconnect the MAF Sensor harness connector. Connect a jumper wire between MAF Sensor Signal circuit and the Sensor Reference Voltage A circuit at the MAF Sensor harness connector . Turn the ignition on. With the DRBIII, read the MAF VOLTS. Does the DRBIII display between 4.0 and 5.5 volts? Yes → Go To 8 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the MAF Sensor and the ECM. Is the resistance below 10.0 ohms? Yes → Go To 9 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage between the Sensor Reference Voltage A circuit and the Sensor Ground circuit at the MAF Sensor harness connector. Is the voltage above 4.5 volts? Yes → Go To 10 No → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. With the DRBIII®, actuate the ASD Relay. Measure the voltage of the ASD Relay Output circuit at the MAF Sensor harness connector Is the voltage above 10.0 volts? Yes → Replace the MAF Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Reference Voltage A circuit. Is the resistance below 10.0 ohms? Yes → Go To 12 No → Repair the Sensor Reference Voltage A circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Reference Voltage A circuit and the Sensor Ground circuit at the MAF Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 13 No → Repair the Sensor Reference Voltage A circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Sensor Reference Voltage A circuit at the MAF harness connector. Is the resistance below 1000 ohms? Yes → Repair the Sensor Reference Voltage A circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 14	All
14	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage A circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the Sensor Reference Voltage A circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
15	**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 and 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH
P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO LOW
P0606-ECM ERROR GATE ARRAY - COMMUNICATION
P0606-ECM ERROR GATE ARRAY - QUANTITY STOP
P0606-ECM ERROR RECOVERY HAS OCCURRED
P0606-ECM ERROR REDUNDANT OVERRUN MONITORING
P1601-CAPACITOR VOLTAGE 1 VOLTAGE TOO HIGH
P1601-CAPACITOR VOLTAGE 1 VOLTAGE TOO LOW
P1606-AFTER RUN SHUT OFF ERROR-INJECTION POWERSTAGE
P1606-AFTER RUN SHUT OFF ERROR-ZERO QUANTITY
P1608-A/D CONVERTER ERROR APP SENSOR GROUND FAILURE
P1608-A/D CONVERTER ERROR INTERNAL FAILURE
P1608-A/D CONVERTER ERROR VOLTAGE FAILURE
P1610-VOLTAGE REGULATOR SIGNAL VOLTAGE TOO HIGH
P1610-VOLTAGE REGULATOR SIGNAL VOLTAGE TOO LOW
P1680-EEPROM PLAUSIBILITY CHECKSUM ERROR
P1680-EEPROM PLAUSIBILITY CODE WORD INCORRECT OR MISSING
P1680-EEPROM PLAUSIBILITY COMMUNICATION ERROR
P1680-EEPROM PLAUSIBILITY VARIATION NUMBER ERROR
P1680-EEPROM PLAUSIBILITY VIN CHECKSUM ERROR
P1680-EEPROM PLAUSIBILITY WRITE ERROR
P1685-SKIM SYSTEM INVALID SECRET KEY IN EEPROM
P1685-SKIM SYSTEM WRITE ACCESS TO EEPROM FAILURE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH.

When Monitored and Set Condition:

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Barometric Pressure Sensor Signal is above 4.86 volts for 2.0 seconds.

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Barometric Pressure Sensor Signal is below 0.22 volt for 2.0 seconds.

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

P0606-ECM ERROR GATE ARRAY - COMMUNICATION

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P0606-ECM ERROR GATE ARRAY - QUANTITY STOP

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P0606-ECM ERROR RECOVERY HAS OCCURRED

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P0606-ECM ERROR REDUNDANT OVERRUN MONITORING

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P1601-CAPACITOR VOLTAGE 1 VOLTAGE TOO HIGH

When Monitored: With the engine running. During every 180° of engine rotation.

Set Condition: The ECM determines that the capacitor voltage is greater than 100 volts.

P1601-CAPACITOR VOLTAGE 1 VOLTAGE TOO LOW

When Monitored: With the engine running. During every 180° of engine rotation.

Set Condition: The ECM determines that the capacitor voltage is less than 91 volts.

P1606-AFTER RUN SHUT OFF ERROR-INJECTION POWERSTAGE

When Monitored: At ignition off.

Set Condition: The ECM detects the engine speed has not fallen below 650 RPM within 0.5 seconds after ignition off.

P1606-AFTER RUN SHUT OFF ERROR-ZERO QUANTITY

When Monitored: At ignition off.

Set Condition: The ECM detects the engine speed has not fallen below 650 RPM within 0.5 seconds after ignition off.

P1680-EEPROM PLAUSIBILITY CHECKSUM ERROR

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

P1680-EEPROM PLAUSIBILITY CODE WORD INCORRECT OR MISSING

When Monitored: With the ignition on.

Set Condition: The ECM detects the codeword test routine not yet performed (for injector classification).

P1680-EEPROM PLAUSIBILITY COMMUNICATION ERROR

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P1680-EEPROM PLAUSIBILITY VARIATION NUMBER ERROR

When Monitored: With the ignition on.

Set Condition: The ECM detects incorrect software programming.

P1680-EEPROM PLAUSIBILITY VIN CHECKSUM ERROR

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P1680-EEPROM PLAUSIBILITY WRITE ERROR

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

P1685-SKIM SYSTEM INVALID SECRET KEY IN EEPROM

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal mismatch of the secret key code when performing an internal EEPROM check.

P1685-SKIM SYSTEM WRITE ACCESS TO EEPROM FAILURE

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal EEPROM fault.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates an internal ECM problem except in the case of DTC P0606 where it may indicate a fuel injector problem. Using the Service Information, check the fuel injectors for leakage before replacing the ECM.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Intake Air Temperature Sensor Signal voltage is above 4.83 volts.

POSSIBLE CAUSES
INTERMITTENT CONDITION
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
INTAKE AIR TEMP SENSOR GROUND CIRCUIT OPEN
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT OPEN
INTAKE AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the IAT Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 3 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire.**	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance of the Intake Air Temperature Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 4 No → Repair the Intake Air Temperature Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the IAT Sensor harness connector. Connect a jumper wire between the IAT Sensor Signal and IAT Sensor Ground circuits in the IAT Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs. Does the DRB display P0110 INTAKE AIR TEMP. SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW? Yes → Replace the Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the ECM harness connector and the IAT Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Intake Air Temperature Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Intake Air Temperature Sensor Signal voltage is below 0.073 volt for more than 60 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
INTAKE AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs for at least 2 minutes. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the IAT Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs for at least 2 minutes. Does the DRB display P0110 INTAKE AIR TEMP SIGNAL VOLTAGE TOO HIGH? Yes → Replace the Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance between ground and the Intake Air Temperature Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance between the Intake Air Temperature Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Engine Coolant Temperature Sensor Signal voltage is above 4.95 volts for more than 1 second.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM ECT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECT SENSOR GROUND CIRCUIT OPEN
ECT SENSOR
ECT SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If multiple DTCs are present, the most likely cause is a 5-Volt Supply or Sensor Ground circuit shorted to voltage or ground. Refer to the Service Information Wiring section for circuits that would affect multiple DTCs.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage above 4.90 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the ECT Sensor harness connector. Turn the ignition on. Measure the voltage on the ECT Sensor Signal circuit. Is the voltage above 5.5 volts? Yes → Repair the ECT Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECT Sensor harness connector. Connect a jumper wire between the ECT Sensor harness connector cavities. Turn the ignition on. With the DRB, read the ECT Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the ECT Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the ECT Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the ECT Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance of the ECT Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the ECT Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Engine Coolant Temperature Sensor Signal voltage is below 0.073 volt for more than 3 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECT SENSOR
ECT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECT SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage below 0.073 volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the ECT Sensor harness connector. Turn the ignition on. With the DRB, read the ECT Sensor voltage. Is the voltage above 4.0 volts? Yes → Replace the ECT Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance between ground and the ECT Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the ECT Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance between the ECT Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the ECT Sensor Signal and Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Fuel Rail Pressure Sensor Signal voltage is above 4.75 volts for 0.1 second.

POSSIBLE CAUSES
ECM - FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - FUEL PRESSURE SENSOR SIGNAL OPEN
FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
FUEL PRESSURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 3 Voltage is between 4.7 and 5.4 volts. Go To 4 Voltage is below 4.7 volts. Go To 9	All
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the 5-Volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the 5-volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Sensor Ground circuit at the Fuel Pressure Sensor and ECM harness connectors. Is the voltage above 1.0 volt at either connector? Yes → Repair the Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7 **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM could be damaged. Retest the Fuel Pressure Sensor circuit.**	All
7	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Connect a jumper wire between the Fuel Pressure Sensor Signal circuit and the Sensor Ground circuit in the Fuel Pressure Sensor harness connector. Turn the ignition on and monitor the DRB for DTCs. Is DTC P0190 FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW present? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
10	**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 and 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Fuel Rail Pressure Sensor Signal voltage is below 0.25 volt for 0.1 second.

POSSIBLE CAUSES
FUEL PRESSURE SENSOR
INTERMITTENT CONDITION
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
ECM - FUEL PRESSURE SENSOR SIGNAL SHORTED TO GROUND

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Is the voltage between 4.7 and 5.3 volts? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Fuel Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Fuel Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
6	**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 and 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Fuel Pressure Sensor 5-Volt Supply voltage is below 4.9 volts or above 5.1 volts for 100 ms.

POSSIBLE CAUSES
CHECK FOR SENSOR REFERENCE VOLTAGE A CIRCUIT DTCS
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, read ECM DTCs. Is the High or Low DTC for P0641 SENSOR REFERENCE VOLTAGE A CIRCUIT set with this DTC? Yes → Refer to the symptom list for the related symptom(s). Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE
P0201-CYLINDER 1-INJECTOR CIRCUIT LOAD DROP
P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0202-CYLINDER 2-INJECTOR CIRCUIT CURRENT DECREASE
P0202-CYLINDER 2-INJECTOR CIRCUIT LOAD DROP
P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0203-CYLINDER 3-INJECTOR CIRCUIT CURRENT DECREASE
P0203-CYLINDER 3-INJECTOR CIRCUIT LOAD DROP
P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0204-CYLINDER 4-INJECTOR CIRCUIT CURRENT DECREASE
P0204-CYLINDER 4-INJECTOR CIRCUIT LOAD DROP
P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

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

When Monitored and Set Condition:

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0201-CYLINDER 1-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0202-CYLINDER 2-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0202-CYLINDER 2-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0203-CYLINDER 3-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0203-CYLINDER 3-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

P0204-CYLINDER 4-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0204-CYLINDER 4-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO VOLTAGE
COMMON DRIVER CIRCUIT SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
COMMON DRIVER CIRCUIT SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR CONTROL CIRCUIT OPEN
COMMON DRIVER CIRCUIT OPEN
FUEL INJECTOR

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine and test drive the vehicle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Disconnect all of the Cylinder Fuel Injector harness connectors. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of each Fuel Injector Control circuit. Is the voltage above 1.0 volt for any of the measurements? Yes → Repair the appropriate Fuel Injector Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect all of the Cylinder Fuel Injector harness connectors. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Common Driver circuit. Is the voltage above 1.0 volt? Yes → Repair the Common Driver circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance between ground and each Fuel Injector Control circuit. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the appropriate Fuel Injector Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance between ground and the Common Driver circuit. Is the resistance below 1000 ohms? Yes → Repair the Common Driver circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance between each of the Fuel Injector Control circuits and the Common Driver circuit. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the Fuel Injector Control circuit and Common Driver circuit for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance of each Fuel Injector Control circuit between its respective injector harness connector and the ECM harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 8 No → Repair the appropriate Fuel Injector Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance of each Common Driver circuit between the ECM harness connector and each Fuel Injector harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 9 No → Repair the Common Driver circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Using the DTC information to identify the correct cylinder number, replace the Cylinder Fuel Injector in accordance with the Service Information. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
10	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0235-BOOST PRESSURE SENSOR PLAUSIBILITY

When Monitored and Set Condition:

P0235-BOOST PRESSURE SENSOR PLAUSIBILITY

When Monitored: With the engine idling.

Set Condition: When the engine is idling, the boost pressure sensor input does not agree with the barometric pressure sensor input for at least 6 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HIGH RESISTANCE IN THE BOOST PRESSURE SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE IN THE BOOST PRESSURE SENSOR GROUND CIRCUIT
HIGH RESISTANCE IN THE SENSOR REFERENCE VOLTAGE B CIRCUIT
BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** **NOTE: This DTC can be set by a Barometric Pressure Sensor that is not functioning correctly. Ensure there are no Barometric Pressure Sensor DTCs present.** **CAUTION: Using the DRB, ensure that the atmospheric pressure sensor reads accurate atmospheric pressure before continuing.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, wait 30 seconds, then start and idle the engine for at least 30 seconds. **NOTE: Engine idle speed must be below 870 RPM.** With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0235-BOOST PRESSURE SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Boost Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the Boost Pressure Sensor Signal circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 4 No → Repair the Boost Pressure Sensor Ground circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Reference Voltage B circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Sensor Reference Voltage B circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Replace the Boost Pressure Sensor. Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle, pausing several times to cycle the ignition. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All

P0235-BOOST PRESSURE SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor Signal voltage exceeds 4.85 volts for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN
BOOST PRESSURE SENSOR
POOR CONNECTOR TERMINAL CONTACT
ENGINE CONTROL MODULE (INTERNAL)
ENGINE CONTROL MODULE (SENSOR SIGNAL SHORTED TO VOLTAGE)

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: Ensure all turbocharger inlet and outlet tubes are connected properly, without damage and restriction before continuing with this test. Also ensure the wastegate actuator and actuator rod are attached and functioning properly.** **NOTE: If a P0243 DTC is present with this DTC, diagnose P0243 DTC before continuing.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the Boost Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Ground circuit. Is the voltage above 1.0 volt? Yes → Repair the Boost Pressure Sensor Ground circuit for a short to voltage. Note: The ECM will need to be checked for proper operation before the repair is completed. A short to voltage on a ground circuit can damage the ECM. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5 **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM could be damaged. Retest the Fuel Pressure Sensor circuit.**	All
5	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Boost Pressure Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. **NOTE: Ensure all harness connectors are connected.** Turn the ignition on. Measure the voltage of the Boost Pressure Sensor Signal circuit by back probing ECM harness connector C1, cavity 11. Is the voltage above 4.85 volts? Yes → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Turn the ignition on. With the DRBIII®, erase ECM DTCs. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Ensure good terminal contact between the Turbocharger Boost Pressure Sensor harness connector and the sensor. The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Turbocharger Boost Pressure Sensor Signal voltage is below 0.30 volt for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B CIRCUIT OPEN
BOOST PRESSURE SENSOR
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
BOOST PRESSURE SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, read the Turbocharger Boost Pressure Sensor voltage. Is the voltage below 0.3 volt? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. Measure the voltage between ground and the Sensor Reference Voltage B circuit. Is the voltage above 4.9 volts? Yes → Go To 3 No → Repair the Sensor Reference Voltage B circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. Connect a jumper wire between the Boost Pressure Sensor Signal and Sensor Reference Voltage B circuits. With the DRB, read the Boost Pressure Sensor voltage. Is the Boost Pressure Sensor voltage above 4.5 volts? Yes → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Boost Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Boost Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Boost Pressure Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Boost Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Boost Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Boost Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
8	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0235-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored and Set Condition:

P0235-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Sensor Reference Voltage B voltage to the Boost Pressure Sensor is below 4.9 volts or above 5.1 volts for at least 200 ms.

POSSIBLE CAUSES
INTERMITTENT CONDITION
APP SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
APP SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO SENSOR GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, wait 30 seconds, then turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All

P0235-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage between ground and the Sensor Reference Voltage B circuit at the Boost Pressure Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the Sensor Reference Voltage B circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Sensor Reference Voltage B circuit at the Boost Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Sensor Reference Voltage B circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Sensor Reference Voltage B circuit at the Boost Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Sensor Reference Voltage B circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit at the APP Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the APP Sensor 1 5-Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0235-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage between ground and the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit at the APP Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the APP Sensor 1 5-Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT NEGATIVE DEVIATION
P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT POSITIVE DEVIATION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT NEGATIVE DEVIATION.

POSSIBLE CAUSES
INTERMITTENT CONDITION
VACUUM SUPPLY
TURBOCHARGER WASTEGATE SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure all turbocharger inlet and outlet tubes are connected properly, without damage and restriction before continuing with this test. Also ensure the wastegate actuator and actuator rod are attached and functioning properly.** **NOTE: MAF Sensor or EGR system problems can cause this DTC to set. Refer to the symptom list to check for proper MAF Sensor and EGR system operations.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT NEGATIVE DEVIATION — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect both vacuum lines at the Turbocharger Wastegate Solenoid. Using a vacuum line connection tee, connect the vacuum supply line to the Turbocharger Wastegate Solenoid Output line at the Turbocharger Wastegate Solenoid. Disconnect the vacuum line at the Turbocharger Wastegate. Connect a vacuum gauge to the Turbocharger Wastegate Solenoid Output line at the Turbocharger Wastegate. Start the engine. With the engine at idle, note the vacuum gauge reading. Is the vacuum above 22 inches? Yes → Go To 3 No → Inspect the vacuum hoses/tubes for damage, restriction and leaks. If OK, refer to the Service Information to check the Vacuum Pump operation. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Install a substitute Turbocharger Wastegate Solenoid in place of the vehicle's Turbocharger Wastegate Solenoid. **NOTE: Ensure the ECM and Turbocharger Wastegate Solenoid harness connectors are connected.** Test drive the vehicle. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Turbocharger Wastegate Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Turbocharger Wastegate Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
TURBOCHARGER WASTEGATE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
TURBOCHARGER WASTEGATE SOLENOID CONTROL CKT OPEN
TURBOCHARGER WASTEGATE SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Turbocharger Wastegate Solenoid Control circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Turbocharger Wastegate Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Turbocharger Wastegate Solenoid Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Turbocharger Wastegate Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Install a substitute Turbocharger Wastegate Solenoid in place of the vehicle's Turbocharger Wastegate Solenoid. **NOTE: Ensure the ECM and Turbocharger Wastegate Solenoid harness connectors are connected.** Turn the ignition on. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Go To 6 No → Replace the Turbocharger Wastegate Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to battery on the Turbocharger Wastegate Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
TURBOCHARGER WASTEGATE SOLENOID
TURBOCHARGER WASTEGATE SOLENOID CONTROL SHORT TO VOLTAGE
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - INTERNAL SHORT TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Does the DRB display P0243 TURBOCHARGER WASTEGATE OPEN CIRCUIT? Yes → Replace the Turbocharger Wastegate Solenoid. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0243-TURBOCHARGER WASTEGATE SOLENOID CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Turn the ignition on. Measure the voltage of the Turbocharger Wastegate Solenoid Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Turbocharger Wastegate Solenoid harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Turbocharger Wastegate Solenoid Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Turbocharger Wastegate Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY
P0335-CRANKSHAFT POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY.

When Monitored and Set Condition:

P0335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects a change in engine speed that has occurred more rapidly than is physically possible by the engine.

P0335-CRANKSHAFT POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION

When Monitored: With the engine running.

Set Condition: The ECM detects engine speed above 5,100 for at least 0.5 second.

POSSIBLE CAUSES
CRANKSHAFT POSITION SENSOR
ENGINE CONTROL MODULE
OPEN SHIELD CIRCUIT
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**CAUTION: Engine damage is possible when engine speed exceeds 5100 RPM.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Test drive the vehicle and monitor the DRBIII® for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All

P0335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the CKP Sensor harness connector. Measure the resistance of the Shield circuit. Is the resistance below 10.0 ohms? Yes → Go To 3 No → Repair the Shield circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Replace the Crankshaft Position Sensor in accordance with the Service Information. With the DRB, erase ECM DTCs. Perform several drive cycles, turning the ignition off for at least 10 seconds between each drive cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Refer to the Service Information to check for engine mechanical problems that may have occurred due to excessive engine speed. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**CAUTION: Refer to the Service Information to check for engine mechanical problems that may have occurred due to excessive engine RPM.** **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 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 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. Check the CKP Sensor wiring harness for incorrect routing which may cause EMI interference. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0340-CMP POSITION SENSOR CIRCUIT CRANKSHAFT FAILURE
P0340-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0340-CMP POSITION SENSOR CIRCUIT CRANKSHAFT FAILURE.

When Monitored and Set Condition:

P0340-CMP POSITION SENSOR CIRCUIT CRANKSHAFT FAILURE

When Monitored: With the engine cranking or running.

Set Condition: The ECM does not detect CKP Sensor input.

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY

When Monitored: The engine speed is above 790 RPM.

Set Condition: The ECM compares the current crankshaft RPM to the last calculated crankshaft RPM and the acceleration or deceleration is greater than is physically possible.

POSSIBLE CAUSES
CRANKSHAFT POSITION SENSOR
ENGINE CONTROL MODULE
OPEN SHIELD CIRCUIT
INTERMITTENT CONDITION
CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT(S) SHORTED TO GROUND
CKP SENSOR CIRCUITS SHORTED TOGETHER
CKP SENSOR SIGNAL CIRCUITS OPEN
CKP SENSOR SIGNAL CIRCUIT(S) SHORTED TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Attempt to start the engine. Did the engine start? Yes → Go To 2 No → Go To 3	All

P0340-CMP POSITION SENSOR CIRCUIT CRANKSHAFT FAILURE — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and both of the CKP Sensor Signal circuits. Is the resistance above 1000 ohms for both measurements? Yes → Go To 4 No → Repair the CKP Sensor Signal circuit(s) for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the CKP Sensor Signal circuits. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the CKP Sensor Signal circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of CKP Sensor Signal circuits. Is the resistance below 10.0 ohms for both measurements? Yes → Go To 6 No → Repair the CKP Sensor Signal circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0340-CMP POSITION SENSOR CIRCUIT CRANKSHAFT FAILURE — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of both CKP Sensor Signal circuits. Is the voltage below 1.0 volt for both measurements? Yes → Go To 7 No → Repair the CKP Sensor Signal circuit(s) for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Using the DRB lab scope, backprobe both of the CKP Sensor Signal circuits at the ECM harness connector. **NOTE: Refer to Charts and Graphs to view a correct CKP Sensor signal.** Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRB. Does the DRB display a steady clean CKP Signal pattern for each circuit? Yes → Go To 8 No → Replace the Crankshaft Position Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the CKP Sensor harness connector. Measure the resistance of the Shield circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Shield circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH
P0340-CMP/CKP POSITION SENSOR CIRCUIT - STATIC PLAUSIBILITY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH.

When Monitored and Set Condition:

P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects that engine speed is greater than 10,000 RPM.

P0340-CMP/CKP POSITION SENSOR CIRCUIT - STATIC PLAUSIBILITY

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects the Camshaft Sensor Signal is missing.

POSSIBLE CAUSES
DAMAGED CMP SENSOR OR CAMSHAFT
ECM
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CMASHAFT POSITION SENSOR
ECM SENSOR GROUND CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
CMP SENSOR CIRCUIT SHORTED TO VOLTAGE

P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 13	All
3	Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit in CMP Sensor harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Measure the voltage of the CMP Sensor Signal circuit. Is the voltage above 10.0 volts? Yes → Go To 5 No → Go To 10	All
5	Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the test light on? Yes → Repair the CMP Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All

P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the CMP Sensor harness connector and the ECM harness connector. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition on. Disconnect the IAT Sensor harness connector. Disconnect the Camshaft Position Sensor harness connector. Connect one end of a jumper wire to the IAT Sensor signal circuit in the IAT Sensor harness connector. Connect the other end of the jumper wire to the Sensor Ground circuit in the Camshaft Position Sensor harness connector. With the DRBIII® in Engine, Sensors, read the Intake Air Temp volts. Is the voltage below 1.0 volt? Yes → Go To 8 No → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Remove the CMP Sensor. Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks. Inspect the camshaft for conditions such as damage, debris or cracked teeth. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	Turn the ignition off. With the DRBIII® lab scope lead, backprobe the CMP Signal circuit. Set the DRBIII® lab scope settings as follows: Time = 0.2s/Div, 20 volts scale, Offset = 0.00 volts, Probe = X10, Coupling = DC. While observing the DRBIII® display, crank the engine. **NOTE: The DRBIII® should display a digital signal (square wave) similar to that shown in Charts and Graphs.** Does the DRBIII® display an uninterrupted digital signal (square wave)? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Camshaft Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0340-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the CMP Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 11 No → Repair the CMP Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the CMP Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the CMP Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All
12	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the CMP Sensor Signal circuit and the Sensor Ground circuit at the CMP Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the CMP Sensor Signal and Sensor Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
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.** **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 DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Remove the CMP Sensor and the CKP Sensor, checking for loose mounting screws and debris on the sensor magnets that can corrupt the sensor signal. 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - OPEN CIRCUIT
P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - SHORT CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - OPEN CIRCUIT.

When Monitored and Set Condition:

P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM does not detect voltage on the Glow Plug Relay 1 Control circuit.

P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Glow Plug Relay.

Set Condition: The ECM detects excessive current on the Glow Plug Relay Control circuit when attempting to actuate the Glow Plug Relay.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
GLOW PLUG RELAY
GLOW PLUG RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG RELAY CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG RELAY CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, actuate the Glow Plug Relay. Is the Glow Plug Relay clicking? Yes → Go To 2 No → Go To 3	All

P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove Glow Plug Relay 1 from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of the Glow Plug Relay. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 5 No → Replace the Glow Plug Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Glow Plug Relay from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Glow Plug Relay Control circuit. Is the voltage above 1.0 volt? Yes → Repair the Glow Plug Relay Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All

P0380-GLOW PLUG RELAY 1 CONTROL CIRCUIT - OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the Glow Plug Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Glow Plug Relay Control circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the Glow Plug Relay Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Remove the Glow Plug Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Glow Plug Relay Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 8 No → Repair the Glow Plug Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0403-EGR SOLENOID CIRCUIT NEGATIVE DEVIATION

When Monitored and Set Condition:

P0403-EGR SOLENOID CIRCUIT NEGATIVE DEVIATION

When Monitored: With the engine running.

Set Condition: The ECM detects EGR flow is less than the requested flow.

POSSIBLE CAUSES
EGR VALVE
INTERMITTENT CONDITION
CHECKING VACUUM SUPPLY
EGR SOLENOID
ENGINE CONTROL MODULE - INTERNAL

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect both vacuum lines at the EGR Solenoid. Using an appropriate connector, connect the vacuum supply line to the EGR Solenoid Output line at the EGR Solenoid. Disconnect the EGR Solenoid Output line at the EGR Valve. Connect a vacuum gauge to the EGR Solenoid Output line at the EGR Valve. Start the engine. With the engine at idle, note the vacuum gauge reading. Is the vacuum above 22 inches? Yes → Go To 3 No → Inspect the vacuum hoses/tubes for damage, restriction and leaks. If OK, refer to the Service Information to check the Vacuum Pump operation. Perform ROAD TEST VERIFICATION - VER-2.	All

P0403-EGR SOLENOID CIRCUIT NEGATIVE DEVIATION — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: The engine must be at operating temperature for this test to be valid.** Turn the ignition off. Disconnect the EGR Solenoid Output line at the EGR Valve. Connect a vacuum gauge to the EGR Solenoid Output line at the EGR Valve Start the engine and observe the vacuum gauge reading for 1 minute. **NOTE: The vacuum reading should increase to above 18 inches approximately 5 seconds after the engine is started. The vacuum should decrease to below 2 inches within 40 seconds of engine run time.** Did the vacuum reading increase to above 18 inches then decrease below 2 inches as described? Yes → Go To 4 No → Replace the EGR Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**NOTE: This test may set additional DTCs. They should be disregarded.** Turn the ignition off. Disconnect both vacuum lines at the EGR Solenoid. Using an appropriate connector, connect the vacuum supply line to the EGR Solenoid Output line at the EGR Solenoid. Test drive the vehicle and note the vehicles performance. **NOTE: With the connector in place, the EGR valve will receive full vacuum supply with the engine running. This should cause a severe reduction in engine power.** **NOTE: Other DTCs may be set in the ECM with the connection tee in place during test drive. When the test is complete, use the DRB III and clear all ECM DTCs.** Does the vehicle exhibit a severe loss of power? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the EGR Valve. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0403-EGR SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0403-EGR SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the EGR Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
EGR SOLENOID CONTROL CIRCUIT OPEN
EGR SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0403-EGR SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the EGR Solenoid Control circuit. Is the resistance above 100 kohms? Yes → Go To 4 No → Repair the EGR Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the EGR Solenoid Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the EGR Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Install a substitute EGR Solenoid in place of the vehicle's EGR Solenoid. **NOTE: Ensure the ECM and EGR Solenoid harness connectors are connected.** Turn the ignition on. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Go To 6 No → Replace the EGR Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0403-EGR SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P0403-EGR SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0403-EGR SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the EGR Solenoid.

Set Condition: The ECM detects excessive current draw on the EGR Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
EGR SOLENOID
EGR SOLENOID CONTROL SHORTED TO VOLTAGE
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - INTERNAL SHORT TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Does the DRB display P0403 EGR OPEN CIRCUIT? Yes → Replace the EGR Solenoid. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0403-EGR SOLENOID CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Turn the ignition on. Measure the voltage of the EGR Solenoid Control circuit at the EGR Solenoid harness connector. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the EGR Solenoid Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the EGR Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0480-FAN 1 CONTROL CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0480-FAN 1 CONTROL CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Radiator Fan Relay 1 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
LOW SPEED RADIATOR FAN RELAY
LOW SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO GROUND
LOW SPEED RADIATOR FAN CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Is the Low Speed Radiator Fan Relay clicking? Yes → Go To 2 No → Go To 3	All

P0480-FAN 1 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove the Low Speed Radiator Fan Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of the Low Speed Radiator Fan Relay. Turn the ignition on. With the DRB, actuate the Low Speed Fan Relay. Is the Low Speed Radiator Fan Relay clicking? Yes → Replace the Low Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the Low Speed Radiator Fan Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Low Speed Radiator Fan Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Low Speed Radiator Fan Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0480-FAN 1 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the Low Speed Radiator Fan Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Low Speed Radiator Fan Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Low Speed Radiator Fan Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0480-FAN 1 CONTROL CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0480-FAN 1 CONTROL CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Radiator Fan Relay 1.

Set Condition: The ECM detects excessive current on the Radiator Fan Relay 1 Control circuit when attempting to actuate the Radiator Fan Relay 1.

POSSIBLE CAUSES
INTERMITTENT CONDITION
LOW SPEED RADIATOR FAN RELAY
LOW SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Is the Low Speed Radiator Fan Relay clicking? Yes → Go To 2 No → Go To 3	All

P0480-FAN 1 CONTROL CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Install a substitute relay in place of the Low Speed Radiator Fan Relay. Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Is the Low Speed Radiator Fan Relay clicking? Yes → Replace the Low Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Low Speed Radiator Fan Relay from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Low Speed Radiator Fan Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Low Speed Radiator Fan Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0481-FAN 2 CONTROL CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0481-FAN 2 CONTROL CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Radiator Fan Relay 2 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
HIGH SPEED RADIATOR FAN RELAY
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO GROUND
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Is the High Speed Radiator Fan Relay clicking? Yes → Go To 2 No → Go To 3	All

P0481-FAN 2 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove the High Speed Radiator Fan Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of the High Speed Radiator Fan Relay. Turn the ignition on. With the DRB, actuate the High Speed Fan Relay. Is the High Speed Radiator Fan Relay clicking? Yes → Replace the High Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the High Speed Radiator Fan Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the High Speed Radiator Fan Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the High Speed Radiator Fan Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0481-FAN 2 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the High Speed Radiator Fan Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the High Speed Radiator Fan Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the High Speed Radiator Fan Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0481-FAN 2 CONTROL CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0481-FAN 2 CONTROL CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Radiator Fan Relay 2.

Set Condition: The ECM detects excessive current on the Radiator Fan Relay 2 Control circuit when attempting to actuate the Radiator Fan Relay 2.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HIGH SPEED RADIATOR FAN RELAY
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Is the High Speed Radiator Fan Relay clicking? Yes → Go To 2 No → Go To 3	All

P0481-FAN 2 CONTROL CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Install a substitute relay in place of the High Speed Radiator Fan Relay. Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Is the High Speed Radiator Fan Relay clicking? Yes → Replace the High Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove the High Speed Radiator Fan Relay from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the High Speed Radiator Fan Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the High Speed Radiator Fan Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH
P0500-VEHICLE SPEED SENSOR PLAUSIBILITY
P0500-VEHICLE SPEED SENSOR SIGNAL VOLTAGE TOO HIGH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH.

When Monitored and Set Condition:

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects a vehicle speed greater than 240 km/h (149 MPH) for more than 0.5 seconds.

P0500-VEHICLE SPEED SENSOR PLAUSIBILITY

When Monitored: With the engine under load and engine speed greater than 1500 RPM while vehicle speed is below 1 km/h (0 MPH).

Set Condition: The ECM compares the amount of fuel the fuel injectors are delivering to the vehicle speed from the VSS. The VSS indicates a vehicle speed that is not plausible with the present amount of fuel being delivered for at least 5 seconds.

P0500-VEHICLE SPEED SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects a signal voltage that indicates a vehicle speed greater than 240 km/h (149 MPH) for at least 1.5 seconds.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO VOLTAGE
SPEEDOMETER PINION AND DRIVE TEETH DAMAGED
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT OPEN
VEHICLE SPEED SENSOR SIGNAL CIRCUIT OPEN

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

POSSIBLE CAUSES
ECM - SENSOR GROUND CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
VEHICLE SPEED SENSOR

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. With the DRB, read Vehicle Speed. Does the DRB display an accurate Vehicle Speed? Yes → Go To 2 No → Go To 3	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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove the Vehicle Speed Sensor. Inspect the Speedometer Pinion and drive teeth on the Output Shaft (located in the transmission). Inspect the VSS for metal debris and damage to the Sensor and connector. Are both components OK? Yes → Go To 4 No → Repair or replace the Speedometer Pinion or internal components as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Choose the following voltage range that the signal circuit measured in. Below 4.5 volts Go To 5 Between 4.5 and 5.5 volts Go To 8 Above 5.5 volts Go To 16	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Vehicle Speed Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Vehicle Speed Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance between ground and the Vehicle Speed Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the Vehicle Speed Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Vehicle Speed Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Vehicle Speed Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage B circuit. Choose the voltage range in which the Sensor Reference Voltage B circuit measured. Below 4.5 volts Go To 9 Between 4.5 and 5.5 volts Go To 12 Above 5.5 volts Go To 15	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Sensor Reference Voltage B circuit. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the Sensor Reference Voltage B circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance between ground and the Sensor Reference Voltage B circuit. Is the resistance above 1000 ohms? Yes → Go To 11 No → Repair the Sensor Reference Voltage B circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Reference Voltage B circuit and the Sensor Ground circuit at the VSS harness connector. Is the resistance above 1000 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Reference Voltage B circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Vehicle Speed Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 13 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage between the Sensor Reference Voltage B circuit and Sensor Ground circuit in the VSS harness connector. Is the voltage above 4.5 volts? Yes → Go To 14 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
14	Block the rear wheels to prevent the vehicle from rolling backward as necessary and lift the front wheels of the vehicle off the ground. Using the Labscope function of the DRB, set the Range to ±20.0v, Offset to 4.00v, Probe to x10, Coupling to DC, then the Time/Division to +10ms/Div. Backprobe the VSS Signal circuit at the ECM with the Labscope probe. Start the engine and place the transmission in first gear with the engine at idle . **NOTE: The speedometer should read approximately 8 km/h (5 MPH) at idle.** Compare the resulting Labscope pattern with the VSS graphic in the Charts and Graphs section of this manual. Is the Labscope pattern of this vehicle similar to the VSS graphic? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Vehicle Speed Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
15	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage B circuit. Is the voltage below 1.0 volt? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Reference Voltage B circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Vehicle Speed Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects Battery Temperature Sensor Signal voltage above 4.87 volts.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BATTERY TEMPERATURE SENSOR GROUND CIRCUIT OPEN
BATTERY TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
BATTERY TEMPERATURE SENSOR
BATTERY TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Battery Temperature Sensor voltage. Is the voltage above 4.5 volts? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Turn the ignition on. Measure the voltage on the Battery Temperature Sensor Signal circuit. Is the voltage above 5.5 volts? Yes → Repair the Battery Temperature Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

— Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Connect a jumper wire between the Battery Temperature Sensor harness connector cavities. Turn the ignition on. With the DRB, read the Battery Temperature Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the Battery Temperature Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Connect a jumper wire between ground and the Battery Temperature Sensor Signal circuit. Turn the ignition on. With the DRB, read the Battery Temperature Sensor voltage. Is the voltage below 1.0 volt? Yes → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Battery Temperature Sensor harness connector. Measure the resistance of the Battery Temperature Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Battery Temperature Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects Battery Temperature Sensor Signal voltage below 0.175 volt.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BATTERY TEMPERATURE SENSOR
BATTERY TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
BATTERY TEMPERATURE SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Battery Temperature Sensor voltage. Is the Battery Temperature Sensor voltage below 0.3 volt? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the Battery Temperature Sensor harness connector. Turn the ignition on. With the DRB, read the Battery Temperature Sensor voltage. Is the voltage above 4.0 volts? Yes → Replace the Battery Temperature Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0514-BATTERY TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Battery Temperature Sensor harness connector. Measure the resistance between ground and the Battery Temperature Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Battery Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Battery Temperature Sensor harness connector. Measure the resistance between the Battery Temperature Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Battery Temperature Sensor Signal and Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0560-SYSTEM VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0560-SYSTEM VOLTAGE TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects battery voltage is above 16.5 volts.

POSSIBLE CAUSES
GROUND CIRCUIT HIGH RESISTANCE
BATTERY SUPPLY OR ASD RELAY OUTPUT CIRCUIT HIGH RESISTANCE
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
GENERATOR INTERNALLY SHORTED TO GROUND
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1511 or P1512 is present with this DTC, diagnose DTCs P1511 and P1512 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: The battery must be fully charged and the generator belt must be in good condition and tensioned properly before continuing.** Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to 12-volts, check all of the ECM Ground circuits including the Battery(-) Sense circuit. Does the test light illuminate brightly for each circuit? Yes → Go To 2 No → Repair the Ground circuit(s) for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Using a 12-volt test light connected to ground, check all of the ECM Battery Supply and ASD Relay Output circuits including the Battery(+) Sense circuit. Does the test light illuminate brightly for each circuit? Yes → Go To 3 No → Repair the Battery Supply or ASD Relay Output circuit(s) for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
3	Turn the ignition off. Disconnect ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Control circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Generator Field Control circuit for a short to ground. Perform CHARGING VERIFICATION - VER-3.	All
4	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Control terminal on the back of the Generator. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform CHARGING VERIFICATION - VER-3. No → Repair or replace the Generator as necessary. Perform CHARGING VERIFICATION - VER-3.	All

Symptom List:

P0560-SYSTEM VOLTAGE TOO LOW
P1536-GENERATOR FIELD CURRENT TOO HIGH
***CHECKING THE CHARGING SYSTEM OPERATION**

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0560-SYSTEM VOLTAGE TOO LOW.

When Monitored and Set Condition:

P0560-SYSTEM VOLTAGE TOO LOW

When Monitored: With the engine running.

Set Condition: The ECM detects battery voltage is below 10.0 volts.

P1536-GENERATOR FIELD CURRENT TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects the current on the Generator Field above 10.7 amps.

POSSIBLE CAUSES
INTERMITTENT CONDITION
GENERATOR BELT CONDITION OR TENSION
GENERATOR FIELD
HIGH RESISTANCE IN THE VOLTAGE SUPPLY CIRCUIT(S) TO THE ECM
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
GENERATOR FUSED B+ CIRCUIT HIGH RESISTANCE
GENERATOR FIELD CONTROL CIRCUIT OPEN
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
GENERATOR GROUND CIRCUIT HIGH RESISTANCE
ASD RELAY OUTPUT CIRCUIT TO GENERATOR OPEN
BODY GROUND CIRCUIT OPEN
ENGINE CONTROL MODULE
HIGH RESISTANCE ON THE FUSED B+ CIRCUIT
HIGH RESISTANCE ON THE GROUND CIRCUIT

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If there are any Battery Sense DTCs (P1511 or P1512) present, diagnose the Battery Sense DTCs first.** **NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator capacity.** **NOTE: The battery must be fully charged before continuing.** Inspect the generator belt condition and tension. Were any problems found? Yes → Go To 2 No → Repair as necessary. Perform CHARGING VERIFICATION - VER-3.	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times. Allow the engine to run for at least 30 seconds each run cycle while turning the ignition off for at least 10 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 14	All
3	Connect the positive lead of a voltmeter to the generator B+ (12V) terminal and the negative lead to the battery positive (+) post. **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. Is the voltage on the voltmeter below 0.4 volt? Yes → Go To 4 No → Repair the Generator Fused B+ circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
4	Connect the positive lead of a voltmeter to the generator case (housing) and the negative lead to the battery negative (-) post. **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. Is the voltage on the voltmeter below 0.4 volt? Yes → Go To 5 No → Repair the Generator Ground circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Measure the voltage between the body and the negative battery terminal. Is the voltage below 0.4 volt? Yes → Go To 6 No → Repair the Body Ground circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
6	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance of the Field Control terminals on the back of the Generator. Is the resistance between 2 and 6 ohms? Yes → Go To 7 No → Repair or replace the Generator as necessary. Perform CHARGING VERIFICATION - VER-3.	All
7	Turn the ignition off. With a voltmeter, measure and record the voltage between the Battery terminals. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the ASD Relay Output circuits and Battery(+) Sense circuit in the ECM C1 harness connector. Are all voltage measurements within 0.5 volt of each other? Yes → Go To 8 No → Repair the circuit that had high resistance. Perform CHARGING VERIFICATION - VER-3.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Generator Field Control circuit. Is the voltage below 1.0 volt? Yes → Go To 9 No → Repair the Generator Field Control circuit for a short to voltage. Perform CHARGING VERIFICATION - VER-3.	All
9	Turn the ignition off. Disconnect ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Control circuit. Is the resistance above 1000 ohms? Yes → Go To 10 No → Repair the Generator Field Control circuit for a short to ground. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance of the Generator Field Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the Generator Field Control circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
11	Turn the ignition off. Disconnect the generator harness connector. Turn the ignition on. Measure the voltage of the ASD Relay Output circuit. Is the voltage above 10.0 volts? Yes → Go To 12 No → Repair the ASD Relay Output circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
12	Turn the ignition off. Disconnect the ECM harness connectors. Remove Fuse 13 from the PDC. Measure the resistance of the Fused B+ circuit at ECM harness connector cavity C1-19. Is the resistance below 5.0 ohms? Yes → Go To 13 No → Repair the Fused B+ circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
13	Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to 12-volts, check the Ground circuit at ECM harness connector cavity C1-20. Does the test light illuminate brightly? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform CHARGING VERIFICATION - VER-3. No → Repair the Ground circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
14	**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 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 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 CHARGING VERIFICATION - VER-3. No → Test Complete.	All

Symptom:

P0579-S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY

When Monitored and Set Condition:

P0579-S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY

When Monitored: With the ignition on.

Set Condition: The ECM detects an invlalid voltage on the S/C Switch Signal circuit.

POSSIBLE CAUSES
SPEED CONTROL SWITCH
INTERMITTENT CONDITION
HIGH RESISTANCE IN THE S/C SWITCH SIGNAL CIRCUIT
HIGH RESISTANCE IN THE S/C SWITCH GROUND CIRCUIT
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and activate the Speed Control. At some point during the test drive, move the S/C Switch to each of its positions. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the S/C Switch harness connectors. Disconnect the ECM harness connectors. Measure the resistance of the S/C Switch Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the S/C Switch Signal circuit for high resistance. Perform SPEED CONTROL VERIFICATION - VER-4.	All

P0579-S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the S/C Switch harness connectors. Disconnect the ECM harness connectors. Measure the resistance of the S/C Switch Ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the S/C Switch Ground circuit for high resistance. Perform SPEED CONTROL VERIFICATION - VER-4.	All
4	Start the engine. With the DRBIII®, read the S/C SWITCH VOLTS. Observe the S/C Switch volts on the DRBIII® while pressing and holding the S/C Switch lever in each position separately. **NOTE: Pressing the cruise lever to each of its positions should result in the following voltages: ON/OFF 0.60 - 1.15v, COAST/SET 3.17 - 3.57v, ACC/RES 3.89 - 4.19v, CANCEL 1.60 - 2.00v, Switch lever at rest 4.33 - 4.80v.** Does each switch position produce the correct voltage? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4. No → Replace the S/C Switch. Perform SPEED CONTROL VERIFICATION - VER-4.	All
5	**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 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 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 SPEED CONTROL VERIFICATION - VER-4. No → Test Complete.	All

Symptom:

P0579-S/C SWITCH SIGNAL CIRCUIT SIGNAL VOLTAGE TOO HIGH

POSSIBLE CAUSES
ECM - S/C SIGNAL CIRCUIT OPEN
ECM - S/C SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - SENSOR GROUND OPEN
S/C SWITCH GROUND CIRCUIT OPEN
S/C SWITCH SIGNAL CIRCUIT OPEN
S/C SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
SPEED CONTROL SWITCH
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and activate the Speed Control. At some point during the test drive, move the S/C Switch to each of its positions. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the S/C Switch harness connector. Turn the ignition on. Measure the voltage of the S/C Switch Signal circuit. Select the appropriate voltage reading. Below 4.5 volts. Go To 3 Between 4.5 and 5.5 volts. Go To 4 Above 5.5 volts Go To 6	All

P0579-S/C SWITCH SIGNAL CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the S/C Switch Signal circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4. No → Repair the S/C Switch Signal circuit for an open. Perform SPEED CONTROL VERIFICATION - VER-4.	All
4	Turn the ignition off. Disconnect the S/C Switch harness connector. Turn the ignition on. Connect a jumper wire between the S/C Switch Signal circuit and the Sensor Ground at the S/C Switch harness connector. With the DRB, read the S/C Switch volts. Does the DRB display below 0.5 volt? Yes → Replace the Speed Control Switch. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 5	All
5	Turn the ignition off. Disconnect the S/C Switch harness connector. Measure the resistance between ground and the S/C Switch Ground circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4. No → Repair the S/C Switch Ground circuit for an open. Perform SPEED CONTROL VERIFICATION - VER-4.	All
6	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Turn the ignition on. Measure the voltage of the S/C Switch Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the S/C Switch Signal circuit for a short to voltage. Perform SPEED CONTROL VERIFICATION - VER-4. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4.	All

P0579-S/C SWITCH SIGNAL CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FANS. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FANS. 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 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 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 SPEED CONTROL VERIFICATION - VER-4. No → Test Complete.	All

Symptom:

P0615-STARTER RELAY CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0615-STARTER RELAY CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on, engine not running and the clutch pedal depressed.

Set Condition: The ECM detects excessive current on the Starter Relay Control circuit when attempting to actuate the Starter Relay.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SUBSTITUTE STARTER RELAY
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Attempt to start the engine several times, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Install a substitute relay in place of the Starter Relay. Turn the ignition on. With the DRBIII®, erase DTCs. Attempt to start the engine several times, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Replace the Starter Relay. Perform ROAD TEST VERIFICATION - VER-2.	All

P0615-STARTER RELAY CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Starter Relay from the PDC. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Starter Relay Control circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Starter Relay Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**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 ignition on, the engine not running and the clutch pedal depressed, 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH
P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO LOW
P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE TOO HIGH
P0620-GENERATOR FIELD CONTROL MALF CHARGING VOLTS TOO LOW
P0620-GENERATOR FIELD CONTROL MALF OPEN CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH.

When Monitored and Set Condition:

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects ASD voltage is more than 2 volts higher than battery voltage.

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO LOW

When Monitored: With the engine running.

Set Condition: The ECM detects ASD voltage is more than 2 volts lower than battery voltage.

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM senses battery voltage above 16.0 volts.

P0620-GENERATOR FIELD CONTROL MALF CHARGING VOLTS TOO LOW

When Monitored: With the engine running.

Set Condition: The ECM senses battery voltage that is 1volt or more below desired charging voltage.

P0620-GENERATOR FIELD CONTROL MALF OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Generator Field Control circuit.

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH — Continued

POSSIBLE CAUSES
INTERMITTENT CONDITION
GENERATOR BELT CONDITION OR TENSION
GENERATOR FIELD
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
GENERATOR FIELD CONTROL CIRCUIT OPEN
HIGH RESISTANCE ON THE FUSED B+ CIRCUIT
HIGH RESISTANCE ON THE GROUND CIRCUIT
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If there are any Battery Sense DTCs (P1511 or P1512) present with this DTC, diagnose the Battery Sense DTCs first.** **NOTE: Inspect the vehicle for aftermarket accessories that may exceed the Generator capacity.** **NOTE: The battery must be fully charged before continuing.** Inspect the generator belt condition and tension. Were any problems found? Yes → Go To 2 No → Repair as necessary. Perform CHARGING VERIFICATION - VER-3.	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times. Allow the engine to run for at least 30 seconds at more than 1200 RPM each run cycle while turning the ignition off for at least 10 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 10	All
3	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance of the Field Control terminals on the back of the Generator. Is the resistance between 2 and 6 ohms? Yes → Go To 4 No → Repair or replace the Generator as necessary. Perform CHARGING VERIFICATION - VER-3.	All

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Generator Field Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Generator Field Control circuit for a short to voltage. Perform CHARGING VERIFICATION - VER-3.	All
5	Turn the ignition off. Disconnect ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Generator Field Control circuit for a short to ground. Perform CHARGING VERIFICATION - VER-3.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance of the Generator Field Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Generator Field Control circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove Fuse 13 from the PDC. Measure the resistance of the Fused B+ circuit at ECM harness connector cavity C1-19. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Fused B+ circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Measure the resistance of the Ground circuit at ECM harness connector cavity C1-20. Is the resistance below 5.0 ohms? Yes → Go To 9 No → Repair the Ground circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
9	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform CHARGING VERIFICATION - VER-3.	All
10	**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 and at more than 1200 RPM, 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 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 CHARGING VERIFICATION - VER-3. No → Test Complete.	All

Symptom:

P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT

When Monitored and Set Condition:

P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Generator Field.

Set Condition: The ECM detects excessive current on the Generator Field Control circuit when attempting to actuate the Generator Field.

POSSIBLE CAUSES
INTERMITTENT CONDITION
GENERATOR FIELD
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO VOLTAGE
GENERATOR FIELD CONTROL CIRCUIT SHORTED TO GROUND
GENERATOR FIELD CONTROL CIRCUIT OPEN
HIGH RESISTANCE ON THE FUSED B+ CIRCUIT
HIGH RESISTANCE ON THE GROUND CIRCUIT
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times. Allow the engine to run for at least 30 seconds at more than 1200 RPM each run cycle while turning the ignition off for at least 10 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Disconnect the Generator Field harness connector. Measure the resistance of the Field Control terminals on the back of the Generator. Is the resistance between 2 and 6 ohms? Yes → Go To 3 No → Repair or replace the Generator as necessary. Perform CHARGING VERIFICATION - VER-3.	All

P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Generator Field Control circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Generator Field Control circuit for a short to voltage. Perform CHARGING VERIFICATION - VER-3.	All
4	Turn the ignition off. Disconnect ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance between ground and the Generator Field Control circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Generator Field Control circuit for a short to ground. Perform CHARGING VERIFICATION - VER-3.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Measure the resistance of the Generator Field Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Generator Field Control circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Remove Fuse 13 from the PDC. Measure the resistance of the Fused B+ circuit at ECM harness connector cavity C1-19. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Fused B+ circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Measure the resistance of the Ground circuit at ECM harness connector cavity C1-20. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Ground circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform CHARGING VERIFICATION - VER-3.	All
9	**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 and at more than 1200 RPM, 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 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 CHARGING VERIFICATION - VER-3. No → Test Complete.	All

Symptom:

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM does not detect voltage on the Fuel/Lift Pump Relay Control circuit when the Fuel/Lift Pump Relay is commanded off.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
FUEL LIFT PUMP RELAY
FUEL LIFT PUMP RELAY CONTROL CIRCUIT SHORTED TO GROUND
FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the Fuel Lift Pump Relay. Does the Fuel Lift Pump Relay cycle on and off? Yes → Go To 2 No → Go To 3	All

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove the Fuel Lift Pump Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the Automatic Shut Down Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of the Fuel Lift Pump Relay. Turn the ignition on. With the DRB, actuate the Fuel Lift Pump Relay. Does the Fuel Lift Pump Relay cycle on and off? Yes → Replace the Fuel Lift Pump Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the Fuel Lift Pump Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Lift Pump Relay Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Fuel Lift Pump Relay Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the Fuel Lift Pump Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Lift Pump Relay Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Fuel Lift Pump Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Fuel/Lift Pump Relay.

Set Condition: The ECM detects excessive current on the Fuel/Lift Pump Relay Control circuit when attempting to actuate the Fuel/Lift Pump Relay.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FUEL LIFT PUMP RELAY
FUEL LIFT PUMP RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate the Fuel Lift Pump Relay. Does the Fuel Lift Pump Relay cycle on and off? Yes → Go To 2 No → Go To 3	All

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Install a substitute relay in place of the Fuel Lift Pump Relay. Turn the ignition on. With the DRB, actuate the Fuel Lift Pump Relay. Does the Fuel Lift Pump Relay cycle on and off? Yes → Replace the Fuel Lift Pump Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Remove the Fuel Lift Pump Relay from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Fuel Lift Pump Relay Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Fuel Lift Pump Relay Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Sensor Reference Voltage A circuit or the Fuel Pressure Sensor 5-Volt Supply circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE A SHORTED TO VOLTAGE
ENGINE CONTROL MODULE
FUEL PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the MAF and APP Sensor harness connectors. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Sensor Reference Voltage A circuit. Is the voltage above 1.0 volt? Yes → Repair the Sensor Reference Voltage A circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3 **NOTE: Remove the jumper wire and reinstall the ASD Relay.**	All

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Fuel Pressure Sensor 5-Volt Supply circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Fuel Pressure Sensor 5-Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire and reinstall the ASD Relay.**	All
4	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW

When Monitored and Set Condition:

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to ground on the Sensor Reference Voltage A circuit or a short to ground on the Fuel Pressure Sensor 5-Volt Supply circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FUEL PRESSURE SENSOR SHORTED TO GROUND
MASS AIR FLOW SENSOR SHORTED TO GROUND
ACCELERATOR PEDAL POSITION SENSOR 2 SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE A CIRCUIT SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE A CIRCUIT SHORTED TO SENSOR GROUND
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor 5-Volt Supply circuit. Is the voltage above 4.8 volts? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage A circuit. Is the voltage above 4.8 volts? Yes → Replace the Mass Air Flow Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Accelerator Pedal Position Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage A circuit. Is the voltage above 4.8 volts? Yes → Replace the Accelerator Pedal Position Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the MAF Sensor and Accelerator Pedal Position Sensor harness connectors. Measure the resistance between ground and the Sensor Reference Voltage A circuit. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the Sensor Reference Voltage A circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the MAF Sensor harness connector. Measure the resistance between the Sensor Reference Voltage A circuit and the MAF Sensor Ground circuit. Disconnect the Accelerator Pedal Position Sensor harness connector. Measure the resistance between the Sensor Reference Voltage A circuit and both Accelerator Pedal Position Sensor Ground circuits. Is the resistance above 100 kohms for each measurement? Yes → Go To 7 No → Repair the Sensor Reference Voltage A circuit for a short to the Sensor Ground circuit that measured below 100 kohms. Perform ROAD TEST VERIFICATION - VER-2.	All

P0641-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Pressure Sensor harness connector. Measure the resistance between ground and the Fuel Pressure Sensor 5-Volt Supply circuit. Is the resistance above 100 kohms? Yes → Go To 8 No → Repair the Fuel Pressure Sensor 5-Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Pressure Sensor harness connector. Measure the resistance between the Fuel Pressure Sensor 5-Volt Supply circuit and the Sensor Ground circuit. Is the resistance above 100 kohms? Yes → Go To 9 No → Repair the Fuel Pressure Sensor 5-Volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
9	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0645-A/C CLUTCH RELAY CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P0645-A/C CLUTCH RELAY CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the A/C Clutch Relay Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
A/C CLUTCH RELAY
A/C CLUTCH RELAY CONTROL CKT OPEN
A/C CLUTCH RELAY CONTROL CIRCUIT SHORT TO GROUND
ECM

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. 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 OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, probe the ASD Relay Output circuit in the PDC. Does the test light illuminate? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the PDC. With the DRBIII®, actuate the A/C Clutch Relay. Does the test light cycle on and off? Yes → Replace the A/C Clutch Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Disconnect the ECM harness connector. Measure the resistance of the A/C Clutch Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the A/C Clutch Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

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

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Disconnect the ECM harness connector. Measure the resistance between ground and the A/C Clutch Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the A/C Clutch Relay Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
P0645-A/C CLUTCH RELAY CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P0645-A/C CLUTCH RELAY CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and A/C selected on.

Set Condition: The ECM detects excessive current on the A/C Clutch Relay Control circuit when attempting to actuate the A/C Clutch Relay.

POSSIBLE CAUSES
INTERMITTENT CONDITION
A/C CLUTCH RELAY
A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ECM

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. 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
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the PDC. With the DRBIII®, actuate the A/C Clutch Relay. Does the test light cycle on and off? Yes → Replace the A/C Clutch Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Remove the A/C Clutch Relay from the PDC. Disconnect the ECM harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the A/C Clutch Relay Control circuit. Is the voltage above 1.0 volt? Yes → Repair the A/C Clutch Relay Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Sensor Reference Voltage B circuit or the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO VOLTAGE
ACCELERATOR PEDAL POSITION SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Did this DTC set again? Yes → Go To 2 No → Go To 5	All

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the Vehicle Speed Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Sensor Reference Voltage B circuit. Is the voltage above 1.0 volt? Yes → Repair the Sensor Reference Voltage B circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3 **NOTE: Remove the jumper wire and reinstall the ASD Relay.**	All
3	Turn the ignition off. Disconnect the Accelerator Pedal Position Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage on the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire and reinstall the ASD Relay.**	All
4	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW

When Monitored and Set Condition:

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to ground on the Sensor Reference Voltage B circuit, or a short to ground on the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE, VEHICLE SPEED, OR APP SENSOR SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO SENSOR GROUND
ACCELERATOR PEDAL POSITION SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ACCEL PEDAL POSITION SENSOR 1 5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition on. With the DRBIII® in Sensors, monitor the Accelerator Pedal Position and Boost Pressure Sensors only. One at a time while monitoring the DRB sensor readings, disconnect then reconnect the Boost Pressure, Accelerator Pedal Position, and Vehicle Speed Sensor harness connectors. **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. **NOTE: If one of the sensors is shorted to ground internally, disconnecting it will cause the voltage reading on the DRB to rise for the monitored sensor that has not been disconnected.** **NOTE: Disconnecting components will generate new DTCs which should be ignored.** Did either of the monitored sensor voltage readings rise when one sensor was disconnected? Yes → Replace the Sensor that, when disconnected, caused the DRB sensor readings to rise. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Boost Pressure and Vehicle Speed Sensors harness connectors. Measure the resistance between ground and the Sensor Reference Voltage B circuit. Is the resistance above 100 kohms? Yes → Go To 4 No → Repair the Sensor Reference Voltage B circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance between the Sensor Reference Voltage B circuit and the Vehicle Speed Sensor Ground circuit. Disconnect the Boost Pressure Sensor harness connector. Measure the resistance between the Sensor Reference Voltage B circuit and the Boost Pressure Sensor Ground circuit. Is the resistance above 100 kohms for each measurement? Yes → Go To 5 No → Repair the Sensor Reference Voltage B circuit for a short to the Sensor Ground circuit that measured below 100 kohms. Perform ROAD TEST VERIFICATION - VER-2.	All

P0651-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Accelerator Pedal Position Sensor harness connector. Measure the resistance between ground and the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Accelerator Pedal Position Sensor harness connector. Measure the resistance between the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit and both Sensor Ground circuits. Is the resistance above 100 kohms for each measurement? Yes → Go To 7 No → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY

When Monitored and Set Condition:

P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY

When Monitored: During after-run.

Set Condition: The internal ECM timer determines that the ASD Relay has shut off before the AFTER-RUN mode of operation has been completed.

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ASD RELAY
ASD RELAY CONTROL CIRCUIT OPEN INTERMITTENTLY
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, check for additional DTCs. Are other DTCs present? Yes → Refer to the Symptom List for diagnosis of the other DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 5	All

P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the ASD Relay. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 4 No → Replace the ASD Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the ASD Relay Control circuit while wiggling the wiring harness and connectors between the ECM and the PDC. Was the resistance above 5.0 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the ASD Relay Control circuit for an intermittent open. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE

When Monitored and Set Condition:

P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE

When Monitored: During after-run.

Set Condition: The internal ECM timer determines that the ASD Relay remains on too long when AFTER-RUN mode of operation has been completed.

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ASD RELAY
ASD RELAY CONTROL CIRCUIT SHORTED TO GROUND INTERMITTENTLY
ASD RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, check for additional DTCs. Are other DTCs present? Yes → Refer to the Symptom List for diagnosis of the other DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 6	All

P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the ASD Relay. Turn the ignition on. With the DRBIII®, erase DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 4 No → Replace the ASD Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the ASD Relay Control circuit while wiggling the wiring harness and connectors. Was the resistance below 1000 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the ASD Relay Control circuit for an intermittent short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the ASD Relay from the PDC. Turn the ignition on. Measure the voltage of the ASD Relay Output circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the ASD Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P0685-ASD RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE — Continued

TEST	ACTION	APPLICABILITY
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT

P0703-BRAKE SWITCH SIGNAL CKTS PLAUS W/REDUNDANT CONTACT AFTER INITIALIZATION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT.

When Monitored and Set Condition:

P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT

When Monitored: With the ignition on.

Set Condition: The ECM detects the Primary Brake Switch Signal circuit and Secondary Brake Switch Signal circuit inputs to the ECM do not agree.

P0703-BRAKE SWITCH SIGNAL CKTS PLAUS W/REDUNDANT CONTACT AFTER INITIALIZATION

When Monitored: With the ignition on.

Set Condition: The ECM detects the Primary Brake Switch Signal circuit and Secondary Brake Switch Signal circuit inputs to the ECM do not agree.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BRAKE LAMP SWITCH - SECONDARY OPEN
BRAKE LAMP SWITCH FUSED B+ CIRCUIT OPEN
SECONDARY BRAKE SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
BRAKE LAMP SWITCH - PRIMARY OPEN
SECONDARY BRAKE SWITCH GROUND CIRCUIT OPEN
SECONDARY BRAKE SWITCH SIGNAL CIRCUIT OPEN
PRIMARY BRAKE SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
PRIMARY BRAKE SWITCH SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - PRIMARY BRAKE SIGNAL
ENGINE CONTROL MODULE - SECONDARY BRAKE SIGNAL

P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. While observing the PRIM BRAKE SWITCH status on the DRB display, press and release the brake pedal several times. Does the DRB display PRIM BRAKE SWITCH: PRESSED and RELEASED for the appropriate pedal position? Yes → Go To 2 No → Go To 11	All
2	Turn the ignition on. While observing the SEC BRAKE SWITCH status on the DRB display, press and release the brake pedal several times. Does the DRB display SEC BRAKE SWITCH: PRESSED and RELEASED for the appropriate pedal position? Yes → Go To 3 No → Go To 4	All
3	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
4	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Turn the ignition on. Measure the voltage between the Secondary Brake Switch Signal circuit and ground. Is the voltage above 9.0 volts? Yes → Go To 5 No → Go To 8	All

P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT — Continued

TEST	ACTION	APPLICABILITY
5	Disconnect the Brake Lamp Switch harness connector. Turn the ignition on. While monitoring the SEC BRAKE SWITCH status with the DRB, connect a jumper wire between ground and the Secondary Brake Switch Signal circuit. Does the DRB display change from PRESSED to RELEASED? Yes → Adjust or replace the Brake Lamp Switch in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Measure the resistance between ground and the Secondary Brake Switch Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Secondary Brake Switch Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Secondary Brake Switch Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 9 No → Repair the Secondary Brake Switch Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Secondary Brake Switch Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the Secondary Brake Switch Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY WITH REDUNDANT CONTACT — Continued

TEST	ACTION	APPLICABILITY
11	Disconnect the Brake Lamp Switch harness connector. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Does the test light illuminate brightly? Yes → Go To 12 No → Repair the Brake Lamp Switch Fused B+ circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Disconnect the Brake Lamp Switch harness connector. Turn the ignition on. While monitoring the PRIM BRAKE SWITCH status with the DRB, connect a jumper wire between the Primary Brake Switch Signal circuit and the Fused B(+) circuit. Does the DRB display change from RELEASED to PRESSED? Yes → Adjust or replace the Brake Lamp Switch in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All
13	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage between the Primary Brake Switch Signal circuit and ground. Is the voltage above 1.0 volt? Yes → Repair the Primary Brake Switch Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 14	All
14	Turn the ignition off. Disconnect the Brake Lamp Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Primary Brake Switch Signal circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Primary Brake Switch Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
P0833-CLUTCH UPSTOP SWITCH PERF PLAUSIBILITY

When Monitored and Set Condition:

P0833-CLUTCH UPSTOP SWITCH PERF PLAUSIBILITY

When Monitored: With the engine running and vehicle speed exceeds 50 km/h (31 MPH).

Set Condition: Vehicle speed has exceeded 50 km/h (31 MPH) 6 times without the ECM detecting a clutch switch state change.

POSSIBLE CAUSES
CLUTCH PEDAL SWITCH
CLUTCH PEDAL SWITCH SENSE CIRCUIT OPEN
CLUTCH PEDAL SWITCH SENSE CIRCUIT SHORTED TO GROUND
ECM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the Clutch switch states while pressing and releasing the Clutch Pedal several times. Did the DRB indicate the correct clutch pedal state when pressing and releasing the Clutch Pedal? Yes → Go To 2 No → Go To 3	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.** 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

P0833-CLUTCH UPSTOP SWITCH PERF PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Clutch Pedal Switch harness connector. Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the Clutch Switch state while using a jumper wire to connect the Clutch Pedal Switch Sense circuit to ground at the Clutch Pedal Switch harness connector. **NOTE: Leave jumper connected to ground for 5 seconds then disconnect jumper and note DRB reading for both conditions.** Does the DRB display RELEASED and PRESSED? Yes → Replace the Clutch Pedal Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Clutch Pedal Switch harness connector. Measure the resistance of the Clutch Pedal Switch Sense circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Clutch Pedal Switch Sense circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Clutch Pedal Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Clutch Pedal Switch Sense circuit. Is the resistance below 1000 ohms? Yes → Repair the Clutch Pedal Switch Sense circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING
P1130-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED
P1130-FUEL RAIL PRESSURE MALFUNCTION POSITIVE DEVIATION
P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH-SHUT OFF
P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING.

When Monitored and Set Condition:

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING

When Monitored: With the ignition on.

Set Condition: The fuel rail pressure sensor indicates fuel pressure sensor deviation is too large with the solenoid fully open.

P1130-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED

When Monitored: With the engine running.

Set Condition: The ECM detects the fuel pressure sensor deviation is too large with the solenoid closed.

P1130-FUEL RAIL PRESSURE MALFUNCTION POSITIVE DEVIATION

When Monitored: With the engine running.

Set Condition: The fuel pressure sensor indicates fuel pressure fuel pressure sensor deviation at engine speed is too high.

P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH-SHUT OFF

When Monitored: With the ignition on.

Set Condition: The fuel rail pressure sensor indicates fuel pressure above 1450 BAR (21,000 PSI) at any time.

P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW

When Monitored: With the engine running.

Set Condition: The ECM determines that the fuel rail pressure is too low for a given engine speed.

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

POSSIBLE CAUSES
AIR IN FUEL SYSTEM
CHECKING FOR OTHER DTC'S
CHECKING THE FUEL DELIVERY SYSTEM
CHECKING THE FUEL DELIVERY SYSTEM
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR
FUEL PRESSURE SOLENOID
FUEL PRESSURE SOLENOID
FUEL PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
INJECTOR COMMON DRIVER CIRCUIT OPEN
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Turn the ignition on. With the DRBIII®, read the ECM DTCs. Are there any other DTCs present? Yes → Refer to symptom list for problems related to the DTC other than P1130. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB III® at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: Refer to the Service Information and perform the Air Bleed Procedure before continuing diagnosis.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. **NOTE: Driving the vehicle up and down steep hills or rapid cornering with a low fuel level can cause this DTC to set. Verify with customer if Low Fuel Light was illuminated when fault occurred.** Test drive the vehicle under various load and speed conditions to attempt to duplicate the fault. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 13	All
3	Turn the ignition off. **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Inspect the entire fuel system for leakage. Is there any evidence of leakage? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Mixing any other fuels such as gasoline or kerosine can cause this DTC to set.** Turn the ignition off. **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Inspect the fuel system for contamination. Is the fuel contaminated? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine. Does the engine start and idle? Yes → Go To 6 No → Go To 9	All
6	Start the engine. With the DRBIII® in Sensors, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure readings. **NOTE: If there is air in the fuel system, the Actual Fuel Pressure will oscillate above and below the Fuel Pressure Setpoint.** Does Actual Fuel Pressure oscillate above and below the Fuel Pressure Setpoint? Yes → Refer to the Service Information to purge air from the fuel system. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Start the engine. With the DRBIII® in Sensors, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure readings. **NOTE: A sticking Fuel Pressure Solenoid is indicated by Actual Fuel Pressure gradually dropping below the Fuel Pressure Setpoint then suddenly increasing (spiking) above the Fuel Pressure Setpoint.** Does Actual Fuel Pressure gradually decrease then suddenly increase (spike) above the Fuel Pressure Yes → Replace the Fuel Pressure Solenoid in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
8	Refer to the appropriate Service Information and refer to Diagnosis and Testing Fuel Delivery System table. **NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, failed fuel pressure solenoid, air in fuel system, failed fuel sending unit, contaminated fuel, faulty injector.** Were there any problems with the Fuel Delivery System? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Fuel Pressure Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance between ground and each of the Fuel Injector Control circuits. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the appropriate Fuel Injector Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 10	All
10	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance of the Common Injector Driver circuit between the ECM harness connector and each Fuel Injector harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 11 No → Repair the Injector Common Driver circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Refer to the appropriate Service Information and refer to Diagnosis and Testing Fuel Delivery System table. **NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, failed fuel pressure solenoid, air in fuel system, failed fuel sending unit, contaminated fuel, faulty injector.** Were there any problems with the Fuel Delivery System? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All

P1130-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Replace the Fuel Pressure Solenoid in accordance with the Service Information. Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start and test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the ECM display a P1130 DTC? Yes → Replace the Fuel Pump in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
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.** **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 DRB III® 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT
P1131-FUEL PRESSURE SOLENOID POWERSTAGE ERROR
P1131-FUEL PRESSURE SOLENOID SHORT CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT.

When Monitored and Set Condition:

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Fuel Pressure Solenoid Control circuit.

P1131-FUEL PRESSURE SOLENOID POWERSTAGE ERROR

When Monitored: When the ignition is turned off.

Set Condition: The ECM detects engine speed does not fall below 740 RPM within 1.5 second after ignition off.

P1131-FUEL PRESSURE SOLENOID SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Fuel Pressure Solenoid.

Set Condition: The ECM detects excessive current on the Fuel Pressure Solenoid Control circuit when attempting to actuate the Fuel Pressure Solenoid.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
FUEL PRESSURE SOLENOID CONTROL SHORTED TO VOLTAGE
FUEL PRESSURE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SOLENOID CONTROL CIRCUIT OPEN
FUEL PRESSURE SOLENOID
ENGINE CONTROL MODULE

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, turning the ignition off for at least 30 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Solenoid Control circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Fuel Pressure Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Pressure Solenoid Control circuit. **NOTE: The Fuel Pressure Solenoid Control circuit is duplicated at ECM cavities C1-80 and C1-81.** Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Fuel Pressure Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Solenoid Control circuit. **NOTE: The Fuel Pressure Solenoid Control circuit is duplicated at ECM cavities C1-80 and C1-81.** Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the Fuel Pressure Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. **NOTE: The DRB should display P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT.** Turn the ignition off. Connect a jumper wire between cavity 1 and cavity 2 of the Fuel Pressure Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. **NOTE: The DRB should display P1131-FUEL PRESSURE SOLENOID SHORT CIRCUIT.** Does the DRB display the appropriate DTC for each condition? Yes → Replace the Fuel Pressure Solenoid in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
8	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1205-INJECTOR CLASSIFICATION ERROR
P1205-INJECTOR CLASSIFICATION ERROR CHECKSUM ERROR

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1205-INJECTOR CLASSIFICATION ERROR.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
VERIFY INJECTOR CLASSIFICATIONS

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII® check for the correct classification of all of the Fuel Injectors. Are all of the injectors classified correctly? Yes → Go To 2 No → Program the Engine Control Module with the correct Injector Classification in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, turning the ignition off for at least 15 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Replace the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1270-INTAKE PORT SWIRL ACTUATOR SHORT CIRCUIT

When Monitored and Set Condition:

P1270-INTAKE PORT SWIRL ACTUATOR SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Intake Port Swirl Actuator.

Set Condition: The ECM detects excessive current on the Intake Port Swirl Actuator Control circuit when attempting to actuate the Intake Port Swirl Actuator.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SWIRL SOLENOID
SWIRL SOLENOID CONTROL SHORT TO VOLTAGE
ECM

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. With the DRBIII®, actuate the Swirl Solenoid. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Disconnect the Swirl Solenoid harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Swirl Solenoid Control circuit. Is the voltage below 1.0 volt? Yes → Go To 3 No → Repair the Swirl Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P1270-INTAKE PORT SWIRL ACTUATOR SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute Swirl Solenoid. Turn the ignition on. With the DRB, erase ECM DTCs. With the DRBIII®, actuate the Swirl Solenoid. With the DRBIII®, read the ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Swirl Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1270-INTAKE PORT SWIRL ACTUATOR OPEN CIRCUIT

When Monitored and Set Condition:

P1270-INTAKE PORT SWIRL ACTUATOR OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects low voltage on the Swirl Solenoid Control circuit when the Swirl Solenoid is commanded off.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
SWIRL SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
SWIRL SOLENOID CONTROL CKT OPEN
SWIRL SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. With the DRBIII®, actuate the Swirl Solenoid. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Swirl Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1270-INTAKE PORT SWIRL ACTUATOR OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Swirl Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Swirl Solenoid Control circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Swirl Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Swirl Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Swirl Solenoid Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Swirl Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Install a substitute Swirl Solenoid in place of the vehicle's Swirl Solenoid. **NOTE: Ensure the ECM and Swirl Solenoid harness connectors are connected.** Turn the ignition on. With the DRBIII®, actuate the Swirl Solenoid. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Swirl Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH
P1511-BATTERY SENSE LINE 1 VOLTAGE TOO LOW
P1512-BATTERY SENSE LINE 2 VOLTAGE TOO HIGH
P1512-BATTERY SENSE LINE 2 VOLTAGE TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH.

When Monitored and Set Condition:

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH

When Monitored: With the ignition on or the engine running.

Set Condition: The ECM detects Battery Sense circuit voltage above 16.0 volts.

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO LOW

When Monitored: With the ignition on or the engine running.

Set Condition: The ECM detects Battery Sense circuit voltage below 6.0 volts.

P1512-BATTERY SENSE LINE 2 VOLTAGE TOO HIGH

When Monitored: With the ignition on or the engine running.

Set Condition: The ECM detects Battery Sense circuit voltage above 4.9 volts.

P1512-BATTERY SENSE LINE 2 VOLTAGE TOO LOW

When Monitored: With the ignition on or the engine running.

Set Condition: The ECM detects Battery Sense circuit voltage below -5.0 volts.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FUSE 13 OPEN
ECM GROUND CIRCUIT(S) OPEN
GROUND CIRCUIT SHORTED TO VOLTAGE
GROUND CIRCUIT OPEN
FUSED B+ CIRCUIT SHORTED TO GROUND
FUSED B+ CIRCUIT OPEN
ENGINE CONTROL MODULE

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0560-SYSTEM VOLTAGE TOO HIGH is present with this DTC, perform diagnostics for P0560 first.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Remove and inspect Fuse 13 from the PDC. Is the fuse OK? Yes → Go To 3 No → Repair the short that caused the fuse to open and replace the fuse. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to 12-volts, check both of the ECM ground circuits in ECM harness connector C1 cavities 1 and 2. Did the test light illuminate for both cavities? Yes → Go To 4 No → Repair the ECM Ground circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Ground circuit in ECM harness connector cavity C1-20. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the ECM harness connectors. Remove Fuse 13 from the PDC. **NOTE: A short to ground on any circuit associated with Fuse 13 may cause this DTC to set.** Measure the resistance between ground and the Fused B+ circuit in ECM harness connector C1-19. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Fused B+ circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Measure the resistance between the Battery negative terminal and the Ground circuit in ECM harness connector cavity C1-20. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove Fuse 13 from the PDC. Measure the resistance of the Fused B+ circuit at ECM harness connector cavity C1-19. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Fused B+ circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
9	**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 and 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1605-IGNITION SWITCH PLAUSIBILITY

When Monitored and Set Condition:

P1605-IGNITION SWITCH PLAUSIBILITY

When Monitored: When the ignition is first turned on.

Set Condition: The ECM initializes with the ignition off.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ENGINE CONTROL MODULE
FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT SHORTED TO GROUND

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC is set when the ECM sees a change from On to Off and then back On within a few milliseconds during ECM initialization at Key On. Look for an intermittent open or short to ground on the Ignition Switch Sense circuit.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition switch on and off several times, pausing for at least 10 seconds at each key off and key on. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ignition switch harness connector. Measure the resistance of the Fused Ignition Switch Output (RUN/START) circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the Fused Ignition Switch Output (RUN/START) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1605-IGNITION SWITCH PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ignition switch harness connector. Measure the resistance between ground and the Fused Ignition Switch Output (RUN/START) circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Fused Ignition Switch Output (RUN/START) circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	If there are no possible causes remaining, view repair. Repair Using the schematic, ensure no shared circuits on the Fused Ignition Switch Output (RUN/START) ckt are causing an initial low spike in circuit voltage. If all other components are OK, replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1641-CABIN HEATER 1 CONTROL OPEN CIRCUIT

When Monitored and Set Condition:

P1641-CABIN HEATER 1 CONTROL OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM does not detect voltage on the Cabin Heater Relay 1 Control circuit when the Cabin Heater Relay 1 is commanded off.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
CABIN HEATER RELAY 1
CABIN HEATER RELAY 1 CONTROL CIRCUIT SHORTED TO GROUND
CABIN HEATER RELAY 1 CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate Cabin Heater Relay 1. Is the Cabin Heater Relay 1 clicking? Yes → Go To 2 No → Go To 3	All

P1641-CABIN HEATER 1 CONTROL OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove Cabin Heater Relay 1 from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of Cabin Heater Relay 1. Turn the ignition on. With the DRB, actuate Cabin Heater Relay 1. Is the Cabin Heater Relay 1 clicking? Yes → Replace Cabin Heater Relay 1. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove Cabin Heater Relay 1 from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Cabin Heater Relay 1 Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Cabin Heater Relay 1 Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P1641-CABIN HEATER 1 CONTROL OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove Cabin Heater Relay 1 from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Cabin Heater Relay 1 Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Cabin Heater Relay 1 Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P1641-CABIN HEATER 1 CONTROL SHORT CIRCUIT

When Monitored and Set Condition:

P1641-CABIN HEATER 1 CONTROL SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Cabin Heater Relay 1.

Set Condition: The ECM detects excessive current on the Cabin Heater Relay 1 Control circuit when attempting to actuate the Cabin Heater Relay 1.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CABIN HEATER RELAY 1
CABIN HEATER RELAY 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate Cabin Heater Relay 1. Is the Cabin Heater Relay 1 clicking? Yes → Go To 2 No → Go To 3	All

P1641-CABIN HEATER 1 CONTROL SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Install a substitute relay in place of Cabin Heater Relay 1. Turn the ignition on. With the DRB, actuate Cabin Heater Relay 1. Is the Cabin Heater Relay 1 clicking? Yes → Replace Cabin Heater Relay 1. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove Cabin Heater Relay 1 from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Cabin Heater Relay 1 Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Cabin Heater Relay 1 Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P1642-CABIN HEATER 2 CONTROL OPEN CIRCUIT

When Monitored and Set Condition:

P1642-CABIN HEATER 2 CONTROL OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM does not detect voltage on the Cabin Heater Relay 2 Control circuit when the Cabin Heater Relay 2 is commanded off.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ASD RELAY OUTPUT CIRCUIT OPEN
CABIN HEATER RELAY 2
CABIN HEATER RELAY 2 CONTROL CIRCUIT SHORTED TO GROUND
CABIN HEATER RELAY 2 CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate Cabin Heater Relay 2. Is the Cabin Heater Relay 2 clicking? Yes → Go To 2 No → Go To 3	All

P1642-CABIN HEATER 2 CONTROL OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Remove Cabin Heater Relay 2 from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of Cabin Heater Relay 2. Turn the ignition on. With the DRB, actuate Cabin Heater Relay 2. Is the Cabin Heater Relay 2 clicking? Yes → Replace Cabin Heater Relay 2. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove Cabin Heater Relay 2 from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Cabin Heater Relay 2 Control circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Cabin Heater Relay 2 Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P1642-CABIN HEATER 2 CONTROL OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Remove Cabin Heater Relay 2 from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Cabin Heater Relay 2 Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Cabin Heater Relay 2 Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P1642-CABIN HEATER 2 CONTROL SHORT CIRCUIT

When Monitored and Set Condition:

P1642-CABIN HEATER 2 CONTROL SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the Cabin Heater Relay 2.

Set Condition: The ECM detects excessive current on the Cabin Heater Relay 2 Control circuit when attempting to actuate the Cabin Heater Relay 2.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CABIN HEATER RELAY 2
CABIN HEATER RELAY 2 CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, actuate Cabin Heater Relay 2. Is the Cabin Heater Relay 2 clicking? Yes → Go To 2 No → Go To 3	All

P1642-CABIN HEATER 2 CONTROL SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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.** **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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Turn the ignition off. Install a substitute relay in place of Cabin Heater Relay 2. Turn the ignition on. With the DRB, actuate Cabin Heater Relay 2. Is the Cabin Heater Relay 2 clicking? Yes → Replace Cabin Heater Relay 2. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove Cabin Heater Relay 2 from the PDC. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Cabin Heater Relay 2 Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Cabin Heater Relay 2 Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P1651-MIL/DIAG LAMP VIA J1850 BUS IN FRAME RESPONSE ERROR
P1651-MIL/DIAG LAMP VIA J1850 BUS STATUS ERROR

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1651-MIL/DIAG LAMP VIA J1850 BUS IN FRAME RESPONSE ERROR.

When Monitored and Set Condition:

P1651-MIL/DIAG LAMP VIA J1850 BUS IN FRAME RESPONSE ERROR

When Monitored: With the ignition on.

Set Condition: The ECM receives an incorrect response from the instrument cluster when a J1850 message to actuate the MIL is transmitted.

P1651-MIL/DIAG LAMP VIA J1850 BUS STATUS ERROR

When Monitored: With the ignition on.

Set Condition: The ECM has not received any J1850 messages from the instrument cluster.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
REFER TO COMMUNICATION SECTION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Cycle the ignition switch from OFF to ON. Monitor the DRBIII® for ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 2 No → Go To 3	All

P1651-MIL/DIAG LAMP VIA J1850 BUS IN FRAME RESPONSE ERROR — Continued

TEST	ACTION	APPLICABILITY
2	Start and idle the engine. With the DRBIII®, select Instrument Cluster and read the PCM/ECM Monitors. **NOTE: If the DRB is unable to communicate with the Instrument cluster, refer to the appropriate symptom in the Body Diagnostic Information** Does the DRB display accurate monitors? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Refer to Body Diagnostic Information for problems related to Communication with ECM. Perform ROAD TEST VERIFICATION - VER-2.	All
3	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1652-J1850 COMMUNICATION BUS LOST ARBITRATION
P1652-J1850 COMMUNICATION BUS RECEIVE TIMEOUT
P1652-J1850 COMMUNICATION BUS SHORT TO GROUND
P1652-J1850 COMMUNICATION BUS SHORT TO VOLTAGE
P1652-J1850 COMMUNICATION BUS SPI ERROR
P1652-J1850 COMMUNICATION BUS TRANSMIT BUFFER OVER-RUN
P1652-J1850 COMMUNICATION BUS UNAUTHORIZED RESET

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1652-J1850 COMMUNICATION BUS LOST ARBITRATION.

When Monitored and Set Condition:

P1652-J1850 COMMUNICATION BUS LOST ARBITRATION

When Monitored: With the ignition on.

Set Condition: The ECM fails to broadcast any messages on the J1850 Bus circuit.

P1652-J1850 COMMUNICATION BUS SHORT TO GROUND

When Monitored: With the ignition on.

Set Condition: The ECM detects continuous low voltage on the J1850 Bus circuit.

P1652-J1850 COMMUNICATION BUS SHORT TO VOLTAGE

When Monitored: With the ignition on.

Set Condition: The ECM detects continuous high voltage on the J1850 Bus circuit.

P1652-J1850 COMMUNICATION BUS UNAUTHORIZED RESET

When Monitored: With the ignition on.

Set Condition: An unauthorized reset of the J1850 hardware occurs during normal operation.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
VERIFY INSTRUMENT CLUSTER COMMUNICATION
INTERMITTENT CONDITION

P1652-J1850 COMMUNICATION BUS LOST ARBITRATION — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® attempt to communicate with the Instrument Cluster. **NOTE: If there are other DTCs set with this DTC, refer to the Symptom List and repair other stored ECM DTCs before diagnosing this DTC.** Is the Instrument Cluster communicating with the DRB? Yes → Go To 2 No → Refer to the appropriate symptom in the Body Diagnostic Information. Perform ROAD TEST VERIFICATION - VER-2.	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Turn the ignition off then turn the ignition on and wait 60 seconds. With the DRBIII®, read the ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1685-SKIM SYSTEM INVALID KEY CODE RECEIVED

When Monitored and Set Condition:

P1685-SKIM SYSTEM INVALID KEY CODE RECEIVED

When Monitored: With the ignition on.

Set Condition: The ECM receives a message from the SKIM indicating an incorrect message was received from the ignition key.

POSSIBLE CAUSES
SKIM/IGNITION KEY FAULT

TEST	ACTION	APPLICABILITY
1	This fault indicates a SKIS problem. View repair. Yes → Refer to SKIS information for the related symptom(s). Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P1685-SKIM SYSTEM KEY COMMUNICATION TIMED OUT

When Monitored and Set Condition:

P1685-SKIM SYSTEM KEY COMMUNICATION TIMED OUT

When Monitored: With the ignition on.

Set Condition: Communication between the ECM and the SKIM is not completed within 2.0 seconds

POSSIBLE CAUSES
ECM
PCI CIRCUIT OPEN
INTERMITTENT CONDITION
CHECK FOR SKIM COMMUNICATION AND DTCS

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Cycle the ignition switch from OFF to ON. Monitor the DRBIII® for ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRB, check for Sentry Key Immobilizer Module communication and DTCs. Are any SKIS problems or DTCs present? Yes → Refer to symptom list for problems related to SKIM Communication and DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P1685-SKIM SYSTEM KEY COMMUNICATION TIMED OUT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the SKIM harness connector. Measure the resistance of the PCI Bus circuit between the ECM harness connector and the SKIM harness connector. Is the resistance below 10.0 ohms? Yes → Replace and Program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the PCI circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1685-SKIM SYSTEM SKIM ERROR

POSSIBLE CAUSES
SKIM
INTERMITTENT CONDITION
CHECK FOR SKIM COMMUNICATION AND DTCS
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, check for Sentry Key Immobilizer Module communication and DTCs. Are any SKIS problems or DTCs present? Yes → Refer to symptom list for problems related to SKIM Communication and DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition on and off several times pausing 10 seconds between each key cycle. With the DRBIII®, read the ECM DTCs. Are any P1685 DTCs present? Yes → Go To 3 No → Go To 4	All
3	Replace and program the SKIM in accordance with the Service Information. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition on and off several times pausing for 10 seconds between key cycles. With the DRBIII®, read ECM DTCs. Are there any P1685 DTCs present? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The test is complete. Perform ROAD TEST VERIFICATION - VER-2.	All

P1685-SKIM SYSTEM SKIM ERROR — Continued

TEST	ACTION	APPLICABILITY
4	**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 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 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH
P2120-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH
P2120-ACC PEDAL POSITION SENSOR 1 CKT SUPPLY VOLTAGE TOO HIGH OR LOW
P2125-ACC PEDAL POSITION SENSOR 2 CIRCUIT PLAUSIBILITY WITH 1 CIRCUIT
P2125-ACC PEDAL POSITION SENSOR 2 CKT SIGNAL VOLTAGE TOO HIGH
P2125-ACC PEDAL POSITION SENSOR 2 CKT SUPPLY VOLTAGE TOO HIGH OR LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH.

When Monitored and Set Condition:

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH

When Monitored: With the engine speed above 790 rpm and vehicle speed above 0 km/h.

Set Condition: The ECM detects the Accelerator Pedal and the Brake Pedal have been depressed at the same time for longer than the allowable time.

P2120-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects voltage on the Accelerator Pedal Position Sensor Signal circuit above 4.67 volts for 0.32 second.

P2120-ACC PEDAL POSITION SENSOR 1 CKT SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Accelerator Pedal Position Sensor 1 5-Volt Supply voltage is too high or too low.

P2125-ACC PEDAL POSITION SENSOR 2 CIRCUIT PLAUSIBILITY WITH 1 CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM determines that the APP Sensor 1 and APP Sensor 2 signals do not agree.

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

P2125-ACC PEDAL POSITION SENSOR 2 CKT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects voltage on the Accelerator Pedal Position Sensor Signal circuit above 3.0 volts.

P2125-ACC PEDAL POSITION SENSOR 2 CKT SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Accelerator Pedal Position Sensor 1 5-Volt Supply voltage is too high or too low.

POSSIBLE CAUSES
ACCELERATOR PEDAL POSITION SENSOR
ECM - APP SENSOR 1 5-VOLT SUPPLY CIRCUIT
SENSOR GROUND OPEN (APP SENSOR)
INTERMITTENT CONDITION
APP SENSOR 1 5-VOLT SUPPLY OR SENSOR REFERENCE VOLTAGE A CIRCUIT OPEN
APP SENSOR SIGNAL CIRCUIT OPEN
APP SENSOR 1 5-VOLT SUP OR SENSOR REF VOLTAGE A CKT SHORTED TO SENSOR GROUND
APP SENSOR SIGNAL CIRCUIT SHORTED TO REFERENCE VOLTAGE A
APP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
APP SENSOR 1 5-VOLT SUPPLY OR SENSOR REF VOLTAGE A CIRCUIT SHORTED TO GROUND
VERIFY APP SENSOR OPERATION
APP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
APP SENSOR 1 5-VOLT SUPPLY OR SENSOR REF VOLTAGE A CIRCUIT SHORTED TO VOLTAGE
ECM - SENSOR GROUND OPEN
APP SENSOR CIRCUIT SHORTED TO VOLTAGE
APP SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
ECM - APP SENSOR SIGNAL CIRCUIT

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: The APP Sensor is a device that contains 2 separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.** **NOTE: The APP Sensor 1 signal should always be 1.7 times the voltage of the APP Sensor 2 signal.** Turn the ignition on. With the DRB, read the APP Sensor 1 and APP Sensor 2 Volts with the accelerator pedal in the at rest position. Does the DRB display between 0.67 and 1.03 volt for sensor 1 and 0.39 and 0.60 volt for sensor 2? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition on. Fully depress the accelerator pedal. With the DRB, read the voltage for APP Sensor 1 and APP Sensor 2. Does the DRB display between 3.79 and 4.55 volts for sensor 1 and 2.23 and 2.67 volts for sensor 2? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition on. With the DRB, read the APP Sensor 1 and APP Sensor 2 percentages (%). With the accelerator pedal in the idle position, slowly depress the accelerator pedal until the pedal is fully depressed. **NOTE: The percentage readings for APP Sensors 1 and 2 should increase smoothly as the pedal is depressed.** Does the percentage increase smoothly for both readings with the accelerator pedal travel? Yes → Go To 4 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

TEST	ACTION	APPLICABILITY
4	**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 and 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 DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set by slowly pressing and releasing the accelerator pedal several times. 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 ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
5	**NOTE: Perform the rest of this diagnostic procedure on the individual APP Sensor Potentiometer (1 or 2) that did not display the correct voltages in the previous test.** Turn the ignition off. Disconnect the APP Sensor harness connector. Turn the ignition on. Measure the voltage of the 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit in APP Sensor harness connector. Is the voltage between 4.7 and 5.3 volts? Yes → Go To 6 No → Go To 15	All
6	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the APP Sensor Signal circuit and the Sensor Reference Voltage A circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the APP Sensor Signal circuit for a Short to the Sensor Reference Voltage A circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the APP Sensor harness connector. Connect a jumper wire between APP Sensor Signal circuit and the 5-volt supply circuit at the APP Sensor harness connector . With the DRB, read the PEDAL OUTPUT VOLTS. Does the DRB display between 4.0 and 5.5 volts? Yes → Go To 8 No → Go To 11	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the APP Sensor Ground circuit. Is the voltage above 1.0 volt? Yes → Repair the App Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the APP Sensor and the ECM. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the APP Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the APP Sensor harness connector. Using a 12-volt test light connected to 12-volts, check the Sensor Ground circuit of the appropriate potentiometer. Does the test light illuminate brightly? Yes → Replace the Accelerator Pedal Position Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the APP Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 12 No → Repair the APP Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the APP Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the APP Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the APP Sensor Signal circuit and the Sensor Ground circuit at the APP Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the APP Sensor Signal and Sensor Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 14	All
14	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the APP Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the APP Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
15	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Accelerator Pedal Position Sensor 1 5-volt Supply (Sensor Reference Voltage A on Sensor 2) circuit. Is the resistance below 10.0 ohms? Yes → Go To 16 No → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
16	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit and both Sensor Ground circuits in the APP Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 17 No → Repair the 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH — Continued

TEST	ACTION	APPLICABILITY
17	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit. Is the resistance below 1000 ohms? Yes → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 18	All
18	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the Accelerator Pedal Position Sensor 1 5-Volt Supply (Sensor Reference Voltage A on Sensor 2) circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***A/C INOPERATIVE**

POSSIBLE CAUSES
A/C LOW PRESSURE SIGNAL CIRCUIT OPEN
A/C HIGH PRESSURE SWITCH OPEN
CHECK FOR ECM DTCS
FUSED B+ CIRCUIT OPEN
A/C COMPRESSOR CLUTCH RELAY
A/C LOW PRESSURE SWITCH OPEN
A/C COMPRESSOR CLUTCH RELAY OUTPUT CIRCUIT SHORTED TO GROUND
A/C HIGH PRESSURE SIGNAL CIRCUIT OPEN
A/C COMPRESSOR CLUTCH RELAY OUTPUT CIRCUIT OPEN
A/C REQUEST SIGNAL CIRCUIT OPEN
A/C COMPRESSOR CLUTCH GROUND CIRCUIT OPEN
A/C-HEATER CONTROL SWITCH
A/C CLUTCH
ECM - PRESSURE SIGNAL OPEN

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the refrigerant system is properly charged. Refer to the appropriate Service Information.** With the DRBIII®, check for ECM DTCs. Are any A/C related DTCs present? Yes → Return to the symptom list and choose the symptom(s). Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, actuate the A/C Compressor Clutch Relay. Observe the A/C Compressor Clutch during actuation. Is the A/C Compressor Clutch clicking? Yes → Go To 3 No → Go To 9	All

*A/C INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the A/C High Pressure Switch harness connector. Connect a jumper wire between the terminals of the A/C High Pressure Switch harness connector. Start the engine and turn on the A/C. Does the A/C operate? Yes → Replace the A/C High Pressure Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4 **NOTE: Reconnect the A/C High Pressure Switch.**	All
4	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Connect a jumper wire between the terminals of the A/C Low Pressure Switch harness connector. Start the engine and turn on the A/C. Does the A/C operate? Yes → Replace the A/C Low Pressure Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5 **NOTE: Reconnect the A/C Low Pressure Switch.**	All
5	Turn the ignition off. Disconnect the A/C High Pressure Switch harness connector. Connect a jumper wire between ground and the A/C High Pressure Signal circuit. Start the engine and turn on the A/C. Does the A/C operate? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Connect a jumper wire between ground and the A/C Low Pressure Signal circuit. Start the engine and turn on the A/C. Does the A/C operate? Yes → Go To 7 No → Repair the A/C Low Pressure Signal circuit for an open. **NOTE: Reconnect the A/C Low Pressure Switch.**	All
7	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Disconnect the A/C-Heater Control Switch harness connector. Measure the resistance of the A/C Request Signal circuit. Is the resistance below 5.0 ohms? Yes → Check the A/C - Heater Control Switch Ground circuit for high resistance. If it is OK, replace the A/C-Heater Control Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the A/C Request Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*A/C INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the A/C High Pressure Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the A/C High Pressure Signal circuit. Is the resistance below 5.0 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the A/C High Pressure Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Reconnect all connectors.**	All
9	**NOTE: If the A/C Clutch fuse is open, refer to the system schematics for all circuits that are powered by the A/C Clutch fuse to determine the cause of the blown fuse.** Turn the ignition off. Remove the A/C Compressor Clutch 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 10 No → Repair the Fused B+ circuit. Inspect fuse and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Install a substitute relay in place of the A/C Compressor Clutch Relay. Turn the ignition on. With the DRBIII®, actuate the A/C Compressor Clutch Relay. Does the A/C Compressor Clutch Relay cycle on and off? Yes → Replace the A/C Compressor Clutch Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 11	All
11	Turn the ignition off. Remove the A/C Compressor Clutch Relay from the PDC. Disconnect the A/C Compressor Clutch harness connector. Measure the resistance between ground and the A/C Compressor Clutch Relay Output circuit. Is the resistance above 1000 ohms? Yes → Go To 12 No → Repair the A/C Compressor Clutch Relay Output circuit for a short to ground. Inspect fuse and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All

*A/C INOPERATIVE — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Remove the A/C Compressor Clutch Relay from the PDC. Disconnect the A/C Compressor Clutch harness connector. Measure the resistance of the A/C Compressor Clutch Relay Output circuit. Is the resistance below 5.0 ohms? Yes → Go To 13 No → Repair the A/C Compressor Clutch Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the A/C Compressor Clutch harness connector. Using a 12-volt test light connected to 12-volts, check the A/C Compressor Clutch Ground circuit. Does the test light illuminate brightly? Yes → Replace the A/C Clutch in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the A/C Compressor Clutch Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*A/C OPERATES IN ALL MODE SWITCH POSITIONS

POSSIBLE CAUSES
A/C HIGH PRESSURE SWITCH
A/C LOW PRESSURE SWITCH
A/C COMPRESSOR CLUTCH
CHECK FOR ECM DTCS
A/C COMPRESSOR CLUTCH RELAY
A/C COMPRESSOR CLUTCH RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE
A/C HIGH PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
A/C LOW PRESSURE SIGNAL CIRCUIT SHORTED TO GROUND
A/C REQUEST SIGNAL CIRCUIT SHORTED TO GROUND
A/C-HEATER CONTROL SWITCH

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, check for ECM DTCs. Are any DTCs present? Yes → Return to the symptom list and choose the symptom(s). Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	Turn the ignition off. Disconnect the A/C Compressor Clutch 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 A/C Compressor Clutch and Compressor. Does the A/C Compressor run with the harness connector disconnected? Yes → Replace the A/C Compressor Clutch in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Remove the A/C Compressor Clutch Relay from the PDC. Disconnect the A/C Compressor Clutch harness connector. Turn the ignition on. Measure the voltage of the A/C Compressor Clutch Relay Output circuit. Is the voltage above 1.0 volt? Yes → Repair the A/C Compressor Clutch Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

*A/C OPERATES IN ALL MODE SWITCH POSITIONS — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the A/C-Heater Control Switch harness connector. Start the engine. Is the A/C Compressor off? Yes → Replace the A/C-Heater Control Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Disconnect the A/C - Heater Control Switch harness connector. Measure the resistance between ground and the A/C Request Signal circuit. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the A/C Request Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Start the engine. Is the A/C Compressor off? Yes → Replace the A/C Low Pressure Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Turn the ignition off. Disconnect the A/C Low Pressure Switch harness connector. Disconnect the A/C High Pressure Switch harness connector. Measure the resistance between ground and the A/C Low Pressure Signal circuit. Is the resistance above 100 kohms? Yes → Go To 8 No → Repair the A/C Low Pressure Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the A/C High Pressure Switch harness connector. Start the engine. Is the A/C Compressor off? Yes → Replace the A/C High Pressure Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the A/C High Pressure Switch harness connector. Measure the resistance between ground and the A/C High Pressure Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 10 No → Repair the A/C High Pressure Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

*A/C OPERATES IN ALL MODE SWITCH POSITIONS — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Install a substitute relay in place of the A/C Compressor Clutch Relay. Turn the ignition on. With the DRBIII®, actuate the A/C Compressor Clutch Relay. Does the A/C Compressor Clutch cycle on and off? Yes → Replace the A/C Compressor Clutch Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***CHECKING THE ACCELERATOR PEDAL POSITION SENSOR CALIBRATION**

POSSIBLE CAUSES
APP SENSOR 1
APP SENSOR 2
APP SENSOR IDLE VOLTAGE
APP SENSOR WIDE OPEN THROTTLE VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: The APP Sensor is a device that contains 2 separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.** **NOTE: The APP Sensor 1 signal should always be 1.7 times the voltage of the APP Sensor 2 signal.** **NOTE: Ensure the accelerator pedal is free from any restriction or binding before continuing.** Turn the ignition on. With the DRB, read the APP Sensor 1 and APP Sensor 2 Volts with the accelerator pedal in the at rest position. Does the DRB display between 0.67 and 1.03 volt for sensor 1 and 0.39 and 0.60 volt for sensor 2? Yes → Go To 2 No → Replace the APP Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition on. While back probing, measure the voltage of the APP Sensor 1 Signal circuit at the ECM. Monitor the voltmeter while slowly pressing the accelerator pedal completely down. Did the voltage increase smoothly with pedal travel? Yes → Go To 3 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition on. While back probing, measure the voltage of the APP Sensor 2 Signal circuit at the ECM. Monitor the voltmeter while slowly pressing the accelerator pedal completely down. Did the voltage increase smoothly with pedal travel? Yes → Go To 4 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ACCELERATOR PEDAL POSITION SENSOR CALIBRATION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition on. Fully depress the accelerator pedal. With the DRB, read the voltage for APP Sensor 1 and APP Sensor 2. Does the DRB display between 3.79 and 4.55 volts for sensor 1 and 2.23 and 2.67 volts for sensor 2? Yes → Test Complete. No → Replace the APP Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE BOOST PRESSURE SENSOR CALIBRATION

POSSIBLE CAUSES
TURBOCHARGER BOOST PRESSURE SENSOR CALIBRATION

TEST	ACTION	APPLICABILITY
1	Allow the engine to idle. With the DRBIII®, select Engine, then Sensors. Read the Boost Pressure Voltage. Is the Boost Pressure Voltage between 1.50 and 2.00 volts? Yes → Test Complete. No → Replace the Turbocharger Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE ECM POWER AND GROUND CIRCUITS

POSSIBLE CAUSES
ASD RELAY CONTROL CIRCUIT OPEN
ASD RELAY OUTPUT CIRCUIT(S) OPEN
ECM GROUND CIRCUIT(S) OPEN
FUSED ASD RELAY BATTERY SUPPLY CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT (RUN/START) CIRCUIT OPEN
IGNITION SWITCH OUTPUT (START) CIRCUIT OPEN
SUBSTITUTE ASD RELAY

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to 12-volts, check the ECM ground circuits in ECM harness connector C1 cavities 1, 2 and 20. Did the test light illuminate for each cavity? Yes → Go To 2 No → Repair the ECM Ground circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit in ECM harness connector C1 cavity 22. Is the test light on? Yes → Go To 3 No → Repair the Fused Ignition Switch Output (Run/Start) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit in ECM harness connector C1 cavity 49 while turning the ignition to the CRANK position. Is the test light on? Yes → Go To 4 No → Repair the Ignition Switch Output (Start) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ECM POWER AND GROUND CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to ground, check the Fused B(+) circuit in ECM harness connector C1 cavity 19. Is the test light on? Yes → Go To 5 No → Repair the Fused B(+) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Remove the ASD Relay from the PDC. Disconnect the ECM harness connectors. Connect a jumper wire between the ASD Relay Control circuit at the ECM harness connector and ground. Using a 12-volt test light connected to ground, check the ASD Relay Output circuits at ECM C1 harness connector cavities 4 and 5. Choose the appropriate test result. Both of the circuits illuminate. Test Complete. Only one of the circuits illuminate. Repair the ASD Relay Output circuit(s) that did not illuminate for an open. Perform ROAD TEST VERIFICATION - VER-2. None of the circuits illuminate. Go To 6	All
6	Turn the ignition off. Remove the ASD Relay from the PDC. Using a 12-volt test light connected to ground, check both Fused ASD Relay Battery Supply circuits in ASD Relay connector. Is the test light on for both circuits? Yes → Go To 7 No → Repair the Fused ASD Relay Battery Supply circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ASD Relay from the PDC. Measure the resistance of the ASD Relay Control circuit between the PDC connector and the ECM harness connector. Is the resistance below 10.0 ohms? Yes → Replace the ASD Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the ASD Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE EGR SYSTEM

POSSIBLE CAUSES
ASD RELAY OUTPUT CIRCUIT OPEN
EGR SOLENOID CONTROL CIRCUIT OPEN
EGR VALVE CLOSED
EGR VALVE OPEN
VACUUM SUPPLY HOSE

TEST	ACTION	APPLICABILITY
1	Disconnect the Vacuum Supply Hose at the EGR solenoid. Connect a vacuum gauge to the Vacuum Supply Hose. Start the engine and allow the engine to idle. Is the vacuum above 10 inches of mercury at idle? Yes → Go To 2 No → Repair leaking or restricted Vacuum Supply Hose or faulty Vacuum Supply Pump. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ASD Relay Output circuit at the EGR Solenoid harness connector. Is the test light on? Yes → Go To 3 No → Repair the ASD Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the EGR Solenoid Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 4 No → Repair the EGR Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE EGR SYSTEM — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: This test may set additional DTCs. They should be disregarded.** **NOTE: The Vacuum Output Hose must not be leaking or restricted for the result of this test to be valid.** Turn the ignition off. Disconnect the Vacuum Supply and Vacuum Output Hoses in the EGR Solenoid vacuum connector. Connect the Vacuum Supply Hose to the Vacuum Output Hose. Test drive the vehicle and observe vehicle performance. Is there a power reduction on vehicle acceleration? Yes → Go To 5 No → Replace the EGR Valve. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the vacuum hose at the EGR valve. Connect a hand held vacuum pump to the EGR Valve. Start the engine and allow it to idle. Note the tone of the idling engine while slowly increasing the vacuum pump to 25 inches. **NOTE: There should be a noticeable change in engine tone as the vacuum opens the EGR valve. There should also be a drop in MAF Sensor volts by approximately 0.4 volt.** Does the engine tone change when vacuum is applied to the EGR Valve? Yes → Test Complete. No → Replace the EGR Valve. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION

POSSIBLE CAUSES
FAN MOTOR GROUND CIRCUIT OPEN
RADIATOR FAN
FUSED B+ CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
HIGH SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
LOW SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
HIGH SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO GROUND
LOW SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT SHORTED TO GROUND
HIGH SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT OPEN
LOW SPEED RADIATOR FAN RELAY OUTPUT CIRCUIT OPEN
HIGH SPEED RADIATOR FAN RELAY
LOW SPEED RADIATOR FAN RELAY

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, actuate the Low Speed Radiator Fan then the High Speed Radiator Fan. Does the fan operate properly for High and Low speed? Yes → Test Complete. No → Go To 2	All
2	Turn the ignition off. Disconnect the Radiator Fan harness connector. Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Using a 12-volt test light connected to ground, probe the Low Speed Radiator Fan Relay Output circuit at the Radiator Fan harness connector during actuator test. Does the test light cycle on and off during the actuator test? Yes → Go To 3 No → Go To 9	All
3	Turn the ignition off. Disconnect the Radiator Fan harness connector. Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Using a 12-volt test light connected to ground, probe the High Speed Radiator Fan Relay Output circuit at the Radiator Fan harness connector during actuator test. Does the test light cycle on and off during the actuator test? Yes → Go To 4 No → Go To 5	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Radiator Fan harness connector. Using a 12-volt test light connected to 12-volts, check the Ground circuit in the Radiator Fan harness connector. Does the test light illuminate brightly? Yes → Replace the Radiator Fan. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Radiator Fan Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**NOTE: If the High Speed Radiator Fan Relay fuse or fuselink is open, refer to the system schematics for all circuits that are powered by the High Speed Radiator Fan Relay fuse or fuselink to determine the cause of the blown fuse/fuselink.** Remove the High Speed Radiator Fan Relay. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the High Speed Radiator Fan Relay connector. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B+ (Fuse/Fuselink) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the High Speed Radiator Fan Relay. Measure the resistance between ground and the High Speed Radiator Fan Relay Output circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the High Speed Radiator Fan Relay Output circuit for a short to ground. Inspect the fuse or fuselink and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the High Speed Radiator Fan Relay. Connect a jumper wire across High Speed Radiator Fan Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the High Speed Radiator Fan Relay Output circuit in the Radiator Fan harness connector. Does the test light illuminate brightly? Yes → Go To 8 No → Repair the High Speed Radiator Fan Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the High Speed Radiator Fan Relay. Turn the ignition on. Measure the voltage on the High Speed radiator Fan Relay Output circuit. Is the voltage below 1.0 volt? Yes → Replace the High Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the High Speed Radiator Fan Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
9	**NOTE: If the Low Speed Radiator Fan Relay fuse or fuselink is open, refer to the system schematics for all circuits that are powered by the Low Speed Radiator Fan Relay fuse or fuselink to determine the cause of the blown fuse/fuselink.** Remove the Low Speed Radiator Fan Relay. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Low Speed Radiator Fan Relay connector. Does the test light illuminate brightly? Yes → Go To 10 No → Repair the Fused B+ (Fuse/Fuselink) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the Low Speed Radiator Fan Relay. Measure the resistance between ground and the Low Speed Radiator Fan Relay Output circuit. Is the resistance above 1000 ohms? Yes → Go To 11 No → Repair the Low Speed Radiator Fan Relay Output circuit for a short to ground. Inspect the fuse or fuselink and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the Low Speed Radiator Fan Relay. Connect a jumper wire across Low Speed Radiator Fan Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the Low Speed Radiator Fan Relay Output circuit in the Radiator Fan harness connector. Does the test light illuminate brightly? Yes → Go To 12 No → Repair the Low Speed Radiator Fan Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the Radiator Fan harness connector. Remove the Low Speed Radiator Fan Relay. Turn the ignition on. Measure the voltage on the Low Speed Radiator Fan Relay Output circuit. Is the voltage below 1.0 volt? Yes → Replace the Low Speed Radiator Fan Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Low Speed Radiator Fan Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***CHECKING THE ENGINE COOLANT TEMPERATURE SENSOR CALIBRATION**

POSSIBLE CAUSES
ECT SENSOR - COLD
ECT SENSOR - HOT

TEST	ACTION	APPLICABILITY
1	**NOTE: The thermostat must be operating correctly for this test to be valid.** With the DRBIII® in Sensors, read and note the engine coolant temperature. Using a temperature probe, measure the engine block temperature near the ECT Sensor. **NOTE: The engine temperature should be below 50°C (120°F).** Are the readings within 7°C (13°F) of each other? Yes → Go To 2 No → Replace the Engine Coolant Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
2	**NOTE: The thermostat must be operating correctly for this test to be valid.** Start the engine and bring the engine to operating temperature (thermostat open). Turn the engine off and wait 10 minutes to allow the engine temperature to stabilize. Using a temperature probe, measure the engine block temperature near the ECT Sensor. With the DRBIII®, select Engine, then Sensors and read the engine coolant temperature. Are the readings within 7°C (13°F) of each other? Yes → Test Complete. No → Replace the Engine Coolant Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
*CHECKING THE ENGINE MECHANICAL SYSTEMS

POSSIBLE CAUSES
CHECKING ENGINE MECHANICAL SYSTEMS

TEST	ACTION	APPLICABILITY
1	**NOTE: The following items should be checked as a possible cause of a Driveability or No-Start problem.** **WARNING: Do not attempt to remove or separate high pressure fuel line. Attempting to do so could result in severe bodily injury or death.** Engine Valve Timing - must be within specification Engine Compression - must be within specifications Camshaft Lobes - check for abnormal wear Camshaft Position Sensor - check the camshaft position sensor tooth for debris and deterioration Crankshaft Position Sensor - check the crankshaft tone wheel for debris and deterioration Engine Exhaust System - must be free of any restriction Engine Drive Chain and Sprockets - must be properly positioned Vacuum System - must operate properly and be free of any vacuum leaks Fuel - must have adequate supply and must be free of contamination (ie. debris, water and gasoline) Fuel Injectors - must not be plugged or restricted Fuel Lift Pump - must operate properly (where applicable) Fuel Injection Pump - must be producing the correct output volume and pressure Inspect the Fuel Lines, Fuel Filter and Fuel Pressure Relief Valve for signs of restriction and leaks **NOTE: Check for any Technical Service Bulletins that may relate to the problem.** Are there any problems evident? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

***CHECKING THE FUEL/LIFT PUMP MOTOR OPERATION**

POSSIBLE CAUSES
LIFT PUMP OUTPUT TEST
FUSED B+ CIRCUIT OPEN
FUEL LIFT PUMP RELAY
LIFT PUMP RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
LIFT PUMP RELAY OUTPUT CIRCUIT SHORTED TO GROUND
LIFT PUMP RELAY OUTPUT CIRCUIT OPEN
LIFT PUMP GROUND CIRCUIT OPEN
LIFT PUMP MOTOR

TEST	ACTION	APPLICABILITY
1	**NOTE: If any Fuel Lift Pump DTCs are present, diagnose the DTCs first.** Turn the ignition on. With the DRB, actuate the Lift Pump Relay. Gain access to the Lift Pump Motor to determine if it is cycling on and off. Does the Lift Pump Motor cycle on and off? Yes → Go To 2 No → Go To 3	All
2	**NOTE: The Lift Pump fuel output must be sufficient to prime the Injector Pump.** Refer to the Service Information to test the Lift Pump pressure and volume output. Did the Lift Pump pass the Lift Pump pressure and volume test? Yes → Test Complete. No → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
3	**NOTE: If the Lift Pump Relay fuse is open, refer to the system schematics for all circuits that are powered by the Lift Pump Relay fuse to determine the cause of the open fuse.** Remove the Lift Pump Relay from the IPM. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Lift Pump Relay connector in the IPM. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused B+ (Fuse) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE FUEL/LIFT PUMP MOTOR OPERATION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Install a substitute relay in place of the Lift Pump Relay. Turn the ignition on. With the DRB, actuate the Lift Pump Relay. Does the Lift Pump Motor cycle on and off? Yes → Replace the Fuel Lift Pump Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Lift Pump Motor harness connector. Remove the Lift Pump Relay. Turn the ignition on. Measure the voltage on the Lift Pump Relay Output circuit. Is the voltage above 1.0 volt? Yes → Repair the Lift Pump Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the Lift Pump Motor harness connector. Remove the Lift Pump Relay. Measure the resistance between ground and the Lift Pump Relay Output circuit. Is the resistance above 100 kohms? Yes → Go To 7 No → Repair the Lift Pump Relay Output circuit for a short to ground. Inspect the fuse and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the Lift Pump Motor harness connector. Remove the Lift Pump Relay. Connect a jumper wire across Lift Pump Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the Lift Pump Relay Output circuit in the Lift Pump Motor harness connector. Is the test light illuminated brightly? Yes → Go To 8 No → Repair the Lift Pump Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the Lift Pump Motor harness connector. Using a 12-volt test light connected to 12-volts, check the Lift Pump Ground circuit. Is the test light illuminated brightly? Yes → Go To 9 No → Repair the Lift Pump Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE FUEL/LIFT PUMP MOTOR OPERATION — Continued

TEST	ACTION	APPLICABILITY
9	If there are no possible causes remaining, view repair. Repair Replace the Lift Pump Motor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE GLOW PLUG OPERATION

POSSIBLE CAUSES
GLOW PLUGS
FUSED B+ CIRCUIT OPEN
GLOW PLUG RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG RELAY OUTPUT CIRCUIT SHORTED TO GROUND
GLOW PLUG RELAY OUTPUT CIRCUIT OPEN
GLOW PLUG RELAY

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the Glow Plug harness connectors for all cylinders. Turn the ignition on. With the DRB, actuate the Glow Plug Relay. Using a 12-volt test light connected to ground, probe each Glow Plug harness connector during actuator test. Does the test light cycle on and off for each circuit during the actuator test? Yes → Go To 2 No → Go To 3	All
2	Refer to the Service Information and perform the Glow Plug Test. Are all Glow Plugs operating properly? Yes → Test Complete. No → Replace the Glow Plug(s) as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
3	**NOTE: If the Glow Plug Relay fuselink is open, refer to the system schematics for all circuits that are powered by the Glow Plug Relay fuselink to determine the cause of the blown fuselink.** Remove the Glow Plug Relay. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Glow Plug Relay connector, cavity 30 in the PDC. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused B+ (Fuselink) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect all the Glow Plug harness connectors. Remove the Glow Plug Relay. Turn the ignition on. Measure the voltage on the Glow Plug Relay Output circuit. Is the voltage above 1.0 volt? Yes → Repair the Glow Plug Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All

*CHECKING THE GLOW PLUG OPERATION — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect all the Glow Plug harness connectors. Remove the Glow Plug Relay. Measure the resistance between ground and the Glow Plug Relay Output circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Glow Plug Relay Output circuit for a short to ground. Inspect the fuselink and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect all the Glow Plug harness connectors. Remove the Glow Plug Relay. Connect a jumper wire across Glow Plug Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the Glow Plug Relay Output circuit at each Glow Plug harness connector. Is the test light on at each Glow Plug harness connector? Yes → Go To 7 No → Repair the Glow Plug Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Refer to the Service Information and perform the Glow Plug Test. Are all Glow Plugs operating properly? Yes → Go To 8 No → Replace the Glow Plug(s) as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
8	If there are no possible causes remaining, view repair. Repair Replace the Glow Plug Relay. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
*CHECKING THE SPEED CONTROL OPERATION

POSSIBLE CAUSES
BRAKE SWITCH SIGNAL
ECM DTC(S) PRESENT
ENGINE CONTROL MODULE
SPEED CONTROL SWITCH
VSS SIGNAL
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the ECM DTCs. Are there any ECM DTCs present? Yes → Refer to symptom list for problems related to the ECM DTC. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 2	All
2	Start the engine. With the DRBIII®, read the S/C SWITCH VOLTS. Observe the S/C Switch volts on the DRBIII® while pressing and holding the S/C Switch lever in each position separately. **NOTE: Pressing the cruise lever to each of its positions should result in the following voltages: ON/OFF 0.60 - 1.15v, COAST/SET 3.17 - 3.57v, ACC/RES 3.89 - 4.19v, CANCEL 1.60 - 2.00v, Switch lever at rest 4.33 - 4.80v.** Does each switch position produce the correct voltage? Yes → Go To 3 No → Refer to symptom list for problems related to the S/C Switch. Perform SPEED CONTROL VERIFICATION - VER-4.	All
3	Test drive the vehicle above 60 km/h (35 MPH). Attempt to Set the Speed Control. Does the Speed Control function properly? Yes → Test Complete. No → Go To 4	All
4	Turn the ignition on. With the DRBIII® in Sensors, read Vehicle Speed. Have an assistant drive the vehicle while you are observing the Vehicle Speed on the DRBIII®. While observing vehicle speed on the DRBIII®, note any rapid changes (signal dropouts) in the reading that do not correspond with actual vehicle speed. Is the DRBIII® displaying an accurate vehicle speed? Yes → Go To 5 No → Refer to symptom list for problems related to the Vehicle Speed Sensor. Perform SPEED CONTROL VERIFICATION - VER-4.	All

*CHECKING THE SPEED CONTROL OPERATION — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the Primary and Secondary brake switch states while pressing and releasing the Brake Pedal several times. Did the DRBIII® indicate the correct brake pedal state when pressing and releasing the Brake Pedal? Yes → Go To 6 No → Refer to symptom list for problems related to Brake Switch Signal. Perform SPEED CONTROL VERIFICATION - VER-4.	All
6	**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.** 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 SPEED CONTROL VERIFICATION - VER-4. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4.	All

Symptom:

***CHECKING THE VEHICLE SPEED SIGNAL**

POSSIBLE CAUSES
ENGINE CONTROL MODULE
VSS DTCS PRESENT
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO VOLTAGE
SPEEDOMETER PINION AND DRIVE TEETH DAMAGED
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR REFERENCE VOLTAGE B CIRCUIT SHORTED TO SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
SENSOR REFERENCE VOLTAGE B CIRCUIT OPEN
VEHICLE SPEED SENSOR SIGNAL CIRCUIT OPEN
ECM - SENSOR GROUND CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
VEHICLE SPEED SENSOR

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, select Engine, then Sensors. While an assistant is test driving the vehicle, note the Vehicle Speed reading on the DRB. While reading the VSS Signal, note any rapid changes (signal drop-outs) that do not correspond with actual vehicle speed. Does the DRB display an accurate vehicle speed reading? Yes → Test Complete. No → Go To 2	All
2	Turn the ignition on. With the DRB, read ECM DTCs. Are any VSS DTCs present? Yes → Refer to symptom list for problems related to VSS DTCs. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

*CHECKING THE VEHICLE SPEED SIGNAL — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Vehicle Speed Sensor. Inspect the Speedometer Pinion and drive teeth on the Output Shaft (located in the transmission). Inspect the VSS for metal debris and damage to the Sensor and connector. Are both components OK? Yes → Go To 4 No → Repair or replace the Speedometer Pinion or internal components as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Choose the following voltage range that the signal circuit measured in. Below 4.5 volts Go To 5 Between 4.5 and 5.5 volts Go To 8 Above 5.5 volts Go To 16	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Vehicle Speed Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Vehicle Speed Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance between ground and the Vehicle Speed Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the Vehicle Speed Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE VEHICLE SPEED SIGNAL — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Vehicle Speed Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Vehicle Speed Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage B circuit. Choose the voltage range in which the Sensor Reference Voltage B circuit measured. Below 4.5 volts Go To 9 Between 4.5 and 5.5 volts Go To 12 Above 5.5 volts Go To 15	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Sensor Reference Voltage B circuit. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the Sensor Reference Voltage B circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance between ground and the Sensor Reference Voltage B circuit. Is the resistance above 1000 ohms? Yes → Go To 11 No → Repair the Sensor Reference Voltage B circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE VEHICLE SPEED SIGNAL — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Reference Voltage B circuit and the Sensor Ground circuit at the VSS harness connector. Is the resistance above 1000 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Reference Voltage B circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Measure the resistance of the Vehicle Speed Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 13 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage between the Sensor Reference Voltage B circuit and Sensor Ground circuit in the VSS harness connector. Is the voltage above 4.5 volts? Yes → Go To 14 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
14	Block the rear wheels to prevent the vehicle from rolling backward as necessary and lift the front wheels of the vehicle off the ground. Using the Labscope function of the DRB, set the Range to ±20.0v, Offset to 4.00v, Probe to x10, Coupling to DC, then the Time/Division to +10ms/Div. Backprobe the VSS Signal circuit at the ECM with the Labscope probe. Start the engine and place the transmission in first gear with the engine at idle . **NOTE: The speedometer should read approximately 8 km/h (5 MPH) at idle.** Compare the resulting Labscope pattern with the VSS graphic in the Charts and Graphs section of this manual. Is the Labscope pattern of this vehicle similar to the VSS graphic? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Vehicle Speed Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE VEHICLE SPEED SIGNAL — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage B circuit. Is the voltage below 1.0 volt? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Reference Voltage B circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
16	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ASD Relay from the PDC. Connect a jumper wire between cavity 30 and cavity 87 of the ASD Relay connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Vehicle Speed Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***CHECKING THE VISCOUS/CABIN HEATER RELAY**

POSSIBLE CAUSES
FUSED B+ CIRCUIT OPEN
CABIN HEATER RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
CABIN HEATER RELAY OUTPUT CIRCUIT SHORTED TO GROUND
CABIN HEATER RELAY OUTPUT CIRCUIT OPEN
CABIN HEATER RELAY

TEST	ACTION	APPLICABILITY
1	**NOTE: Testing either of the Cabin Heater Relays is accomplished in the same manner. Substitute the appropriate relay number and cabin heater number for the suspect circuit.** **NOTE: Cabin Heater Relay 2 controls two Cabin Heaters and both should be disconnected and tested where appropriate.** Turn the ignition off. Disconnect the suspect Cabin Heater harness connector(s). Turn the ignition on. With the DRB, actuate the appropriate Cabin Heater Relay. Using a 12-volt test light connected to ground, probe the appropriate Cabin Heater Relay Output circuit at the Cabin Heater harness connector(s) during actuator test. Does the test light cycle on and off during the actuator test? Yes → Test Complete. No → Go To 2	All
2	**NOTE: If the Cabin Heater Relay fuse or fuselink is open, refer to the system schematics for all circuits that are powered by the Cabin Heater Relay fuse or fuselink to determine the cause of the blown fuse/fuselink.** Remove the appropriate Cabin Heater Relay for the suspect circuit. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the Cabin Heater Relay connector. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Fused B+ (Fuse/Fuselink) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the appropriate Cabin Heater harness connector(s) for the suspect circuit. Remove the appropriate Cabin Heater Relay. Turn the ignition on. Measure the voltage on the Cabin Heater Relay Output circuit. Is the voltage above 1.0 volt? Yes → Repair the Cabin Heater Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

*CHECKING THE VISCOUS/CABIN HEATER RELAY — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the appropriate Cabin Heater harness connector(s) for the suspect circuit. Remove the appropriate Cabin Heater Relay. Measure the resistance between ground and the Cabin Heater Relay Output circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Cabin Heater Relay Output circuit for a short to ground. Inspect the fuse or fuselink and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the appropriate Cabin Heater harness connector(s) for the suspect circuit. Remove the appropriate Cabin Heater Relay. Connect a jumper wire across Cabin Heater Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the Cabin Heater Relay Output circuit in the Cabin Heater harness connector. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Cabin Heater Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	If there are no possible causes remaining, view repair. Repair Replace the Cabin Heater Relay. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***ENGINE CRANKS BUT WILL NOT START**

POSSIBLE CAUSES
CAMSHAFT POSITION SENSOR SIGNAL PROBLEM
CRANKSHAFT POSITION SENSOR SIGNAL PROBLEM
ECM CODES PRESENT
ECT SENSOR
ENGINE CONTROL MODULE
ENGINE DRIVE BELT
FUEL INJECTOR DRIVER CIRCUIT(S) SHORTED TO GROUND
FUEL PRESSURE SENSOR
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT OPEN
FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
FUEL SUPPLY CONTAMINATION
FUEL SYSTEM PRESSURE MECHANICAL
FUEL SYSTEM RESTRICTION
GLOW PLUGS
SENSOR GROUND OPEN
SKIM CODES PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: The ECM must have proper power and ground connections for the following tests to be valid. Refer to Checking the ECM Power and Grounds in the symptom list.** Turn the ignition on. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display any ECM DTCs? Yes → Refer to symptom list for problems related to ECM DTC. Perform NO START VERIFICATION - VER-1. No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display any SKIM DTCs? Yes → Refer to symptom list for problems related to SKIM DTC. Perform NO START VERIFICATION - VER-1. No → Go To 3	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
3	Refer to the Service Information to ensure the Engine Drive Belt is installed correctly and the camshaft and crankshaft gears are timed correctly. Were any problems found? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 4	All
4	Using a temperature probe, check the vehicle temperature near the ECT Sensor. Turn the ignition on. With the DRBIII® in Sensors, read the ECT Sensor temperature. Compare the temperature probe reading with the DRBIII® reading. Are the two readings within 10°C of each other? Yes → Go To 5 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
5	**NOTE: Prior to performing this test, be sure to check the Glow Plug Relay operation. Refer to CHECKING GLOW PLUG OPERATION for the related symptom(s).** Refer to the Service Information and check the Glow Plugs for proper operation. Are the Glow Plugs operating properly? Yes → Go To 6 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all 4 Fuel Injector harness connectors. Measure the resistance between Ground and each Fuel Injector Driver circuit at it's respective Fuel Injector harness connector. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the Fuel Injector Driver circuit(s) for a short to ground. Perform NO START VERIFICATION - VER-1. No → Go To 7	All
7	Inspect the fuel system lines for restrictions, leaks or other problems. Is there any evidence of problems? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 8	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Using the DRBIII® lab scope, backprobe the CMP Sensor Signal circuit at the ECM harness connector. Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRBIII®. **NOTE: Refer to Charts and Graphs to view a correct CMP Sensor signal.** Does the DRBIII® display a steady clean CMP Signal pattern? Yes → Go To 9 No → Perform Test for DTC P0340-Camshaft Position Sensor Circuit Static Plausibility. Perform NO START VERIFICATION - VER-1.	All
9	Turn the ignition off. Using the DRBIII® lab scope, backprobe both of the CKP Sensor Signal circuits at the ECM harness connector. **NOTE: Refer to Charts and Graphs to view a correct CKP Sensor signal.** Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRBIII®. Does the DRBIII® display a steady clean CKP Signal pattern for each circuit? Yes → Go To 10 No → Perform Test for DTC P0340-Crankshaft Position Sensor Circuit Dynamic Plausibility. Perform NO START VERIFICATION - VER-1.	All
10	Refer to the Service Information and perform the fuel pressure test. Is the fuel pressure within specification? Yes → Go To 11 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
11	Refer to the Service Information and perform the fuel pressure test. Note the test results. Using the DRBIII®, read the Fuel Pressure and compare the two readings. Are the two readings within 3450 kPa (500 PSI) of each other? Yes → Go To 12 No → Go To 13	All
12	Inspect the fuel supply for contamination. Is the fuel contaminated? Yes → Refer to the Service Information to remove and replace fuel throughout the fuel system. Perform NO START VERIFICATION - VER-1. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform NO START VERIFICATION - VER-1.	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 14 No → Repair the Fuel Pressure Sensor Signal circuit for an open. Perform NO START VERIFICATION - VER-1.	All
14	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Sensor 5-volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 15 No → Repair the Fuel Pressure Sensor 5-volt Supply circuit for an open. Perform NO START VERIFICATION - VER-1.	All
15	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Replace the Fuel Pressure Sensor in accordance with the Service Information. Perform NO START VERIFICATION - VER-1. No → Repair the Sensor Ground circuit for an open. Perform NO START VERIFICATION - VER-1.	All

Symptom:

***ENGINE WILL NOT CRANK**

POSSIBLE CAUSES
BATTERY CABLE HIGH RESISTANCE
BATTERY CABLES
CLUTCH INTERLOCK SWITCH
CLUTCH INTERLOCK SWITCH SIGNAL CIRCUIT OPEN
ECM
MECHANICAL PROBLEM
OPEN FUSED BATTERY (+) CIRCUIT
OPEN IGNITION SWITCH START OUTPUT
SKIM CODES PRESENT
STARTER MOTOR
STARTER RELAY
STARTER RELAY CONTROL CIRCUIT OPEN
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
STARTER RELAY GROUND CIRCUIT OPEN
STARTER RELAY OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: The battery must be fully charged before diagnosing a no crank condition.** Inspect the battery cables for corrosion, looseness or other problems. Is there evidence of problems? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display any SKIM DTCs? Yes → Refer to symptom list for problems related to SKIM. Perform NO START VERIFICATION - VER-1. No → Go To 3	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Starter Relay from the PDC. **WARNING: THE TRANSMISSION MUST BE IN NEUTRAL AND THE PARK BRAKE MUST BE SET FOR THIS TEST.** **WARNING: THE ENGINE MAY CRANK IN THE NEXT STEP. WHEN THE ENGINE IS CRANKING, 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.** Momentarily jumper Starter Relay connector cavities 30 and 87 in the PDC connector. Did the engine crank? Yes → Go To 4 No → Go To 12	All
4	Turn the ignition off. Remove the Starter Relay from the PDC. Install a substitute relay in place of the Starter Relay. Attempt to start the engine. Does the engine crank? Yes → Replace the Starter Relay. Perform NO START VERIFICATION - VER-1. No → Go To 5	All
5	Remove the Starter Relay from the PDC. Using a 12-volt test light connected to ground, check the Ignition Switch Start Output circuit while turning the ignition switch to the START position. Does the test light illuminate with the ignition switch in the START position? Yes → Go To 6 No → Repair the Ignition Switch Output circuit for an open. Perform NO START VERIFICATION - VER-1.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Relay from the PDC. Remove the ASD Relay from the PDC. Using a jumper wire, connect ASD Relay connector cavities 30 and 87 in the PDC. Turn the ignition on. Measure the voltage of the Starter Relay Control circuit. Is the voltage above 1.0 volt? Yes → Repair the Starter Relay Control circuit for a short to voltage. Perform NO START VERIFICATION - VER-1. No → Go To 7	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Relay from the PDC. Measure the resistance of the Starter Relay Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 8 No → Repair the Starter Relay Control circuit for an open. Perform NO START VERIFICATION - VER-1.	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the ECM harness connectors. Measure the resistance between ground and ECM harness connector cavity 102. While observing the ohmmeter, fully depress and release the clutch pedal several times. **NOTE: The ohmmeter should change from above 1000 ohms to below 20 ohms when depressing and releasing the clutch pedal.** Does the ohmmeter change from above 1000 ohms to below 20.0 ohms as indicated in the NOTE? Yes → Replace the ECM in accordance with the Service Information. Perform NO START VERIFICATION - VER-1. No → Go To 9	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Clutch Switch harness connector. Measure the resistance of the Clutch Interlock Switch Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the Clutch Interlock Switch Signal circuit for an open. Perform NO START VERIFICATION - VER-1.	All
10	Turn the ignition off. Disconnect the Clutch Switch harness connector. Connect a jumper wire between the Clutch Interlock Switch Signal circuit and the Ground circuit at the Clutch Switch harness connector. With the transmission in neutral and the clutch fully depressed attempt to crank the engine. Does the engine crank? Yes → Replace the Clutch Interlock Switch. Perform NO START VERIFICATION - VER-1. No → Go To 11	All
11	Turn the ignition off. Disconnect the Clutch Switch harness connector. Measure the resistance between ground and the Ground circuit at the Clutch Switch harness connector. Is the resistance below 10.0 ohms? Yes → Replace the ECM in accordance with the Service Information. Perform NO START VERIFICATION - VER-1. No → Repair the Ground Circuit for an open. Perform NO START VERIFICATION - VER-1.	All
12	Remove the Starter Relay from the PDC. Using a 12-volt test light connected to ground, check the Fused B+ circuit in the Starter Relay connector in the PDC. Is the test light on? Yes → Go To 13 No → Repair the Fused B(+) circuit for an open. Perform NO START VERIFICATION - VER-1.	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Remove the Starter Relay from the PDC. Disconnect the Starter Relay Output wire from the Starter Solenoid. Connect the Starter Relay Output wire (at the Starter) to ground. Using a 12-volt test light connected to 12-volts, check the Starter Relay Output circuit at the Starter Relay connector in the PDC. Does the test light illuminate brightly? Yes → Go To 14 No → Repair the Starter Relay Output circuit for an open. Perform NO START VERIFICATION - VER-1.	All
14	Using the Service Information, check the battery cables for high resistance. Did either battery cable have a voltage drop greater than 0.2 volts? Yes → Replace the battery cable(s). Perform NO START VERIFICATION - VER-1. No → Go To 15	All
15	Turn the ignition off. Attempt to manually rotate the crankshaft 360°. Is the crankshaft able to rotate 360°? Yes → Replace the Starter Motor. Perform NO START VERIFICATION - VER-1. No → Repair the engine mechanical problem. Perform NO START VERIFICATION - VER-1.	All

Symptom List:

ANTENNA FAILURE
COP FAILURE
EEPROM FAILURE
INTERNAL FAULT
RAM FAILURE
ROM 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.

ROM FAILURE

When Monitored: With the ignition on.

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

ANTENNA FAILURE — Continued

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.

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/ECM

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the ECM has proper power and ground connections and that the ECM can communicate with the DRBIII® before continuing.** With the DRBIII®, read and record the SKIM DTCs then erase the SKIM DTCs. Turn the ignition off. Wait 2 minutes. 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 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.** Turn the ignition on. With the DRBIII®, display and erase all ECM and SKIM DTCs. Perform 5 ignition key cycles, leaving the ignition key on for a minimum of 90 seconds per cycle. With the DRBIII®, read the SKIM DTCs. Does the code appear? Yes → Replace and program the Engine 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 ECM VIN
REPLACE SKIM AND CHECK DTC'S
INTERMITTENT WIRING HARNESS PROBLEM
ECM

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, erase the SKIM DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on and wait 2 minutes. With the DRBIII®, read the SKIM DTCs. 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	Turn the ignition on. With the DRBIII®, select Engine system from the main menu. Display and record the Vehicle Identification Number. **NOTE: Ensure that the correct VIN has been programmed into the ECM. If a VIN is not displayed, attempt to program the ECM with the correct vehicle VIN before continuing.** Does the VIN recorded from the ECM match the VIN of the vehicle? Yes → Go To 3 No → Replace and program the Engine 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 ECM and SKIM DTCs. Perform 5 ignition key cycles leaving the ignition key on for 90 seconds per cycle. With the DRBIII®, check for SKIM DTCs. Does the DRBIII® display the same DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → The repair is complete. Perform SKIS VERIFICATION.	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 due to incorrect secret key in the ignition key transponder.

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 DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Is the DTC present for all ignition keys? Yes → Replace and program the Sentry Key Immobilizer Module in accordance with the Service Information. Perform SKIS VERIFICATION. No → Replace the ignition key(s) that cause the SKIM DTC. Perform SKIS VERIFICATION.	All
4	With the DRBIII®, attempt to reprogram the ignition key to the SKIM. With the DRBIII®, erase the SKIM DTCs. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DTC set again? 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 DTCs. Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DTC set again? 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. NOTE: If the SKIM or PCM/ECM was replaced, refer to the service information for proper programming procedures.** 3. Program all RKE transmitters and other options as necessary. 4. Ensure that all accessories are turned off and the battery is fully charged. 5. With the DRBIII®, record and erase all DTC's from ALL modules. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern. 6. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTC's from ALL modules. Are any DTC's present or is the original condition still present? Yes → Repair is not complete, refer to the appropriate symptom. No → Repair is complete.	All

CHARGING VERIFICATION - 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. With the DRB, erase all diagnostic trouble codes (DTCs). 3. Start the engine. 4. Raise the engine speed to 2000 RPM for at least 30 seconds. 5. Allow the engine to idle. 6. Turn the ignition off for 20 seconds. 7. Turn the ignition on. 8. With the DRB, read ECM DTCs. 9. If this DTC has set again, or another DTC has set, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary. 10. If the charging system is functioning correctly and there are no DTCs, the repair is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

NO START VERIFICATION - VER-1	APPLICABILITY
1. NOTE: IMPORTANT! If the Engine Control Module or Sentry Key Immobilizer Module has been replaced, ensure the programming procedure for the module has been performed in accordance with the Service Information. 2. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 3. Inspect the engine oil for contamination. If it is contaminated, change the oil and filter. 4. With the DRB, erase all diagnostic trouble codes (DTCs). 5. Turn the ignition off for at least 10 seconds. 6. Attempt to start the engine. 7. If the engine is unable to start, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary. 8. If the engine starts and continues to run, the repair is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

Verification Tests — Continued

ROAD TEST VERIFICATION - 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 non-DTC test, perform steps 3 and 4. If not, proceed to step 5. 3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete. 4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary. 5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue. 6. If the Engine Control Module (ECM) has not been changed, perform steps 7 and 8, otherwise, continue with step 9. 7. With the DRB III®, erase all diagnostic trouble codes (DTCs), then disconnect the DRB III®. 8. Turn the ignition off for at least 10 seconds. 9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11. 10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position. 11. Ensure no DTCs remain by performing steps 12 through 15. 12. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Relay Control Circuit, drive the vehicle for at least 5 minutes with the A/C on. 13. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue. 14. Upon completion of the road test, turn the engine off and check for DTCs with the DRB III®. 15. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

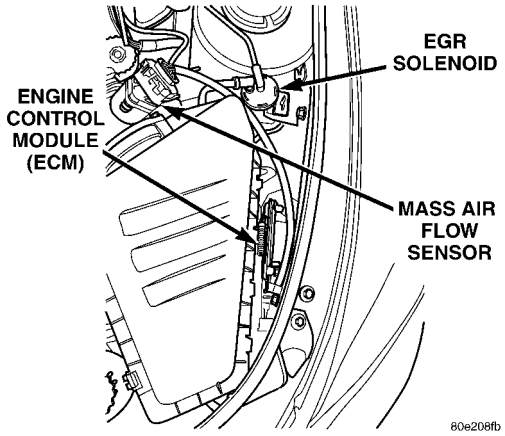
SKIS VERIFICATION	APPLICABILITY
1. Reconnect all previously disconnected components and connectors. 2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to its original SKIM. This number can be obtained from the vehicle's invoice. **3. NOTE: When entering the PIN, care should 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 DRBIII® 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 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. Erase all ECM and SKIM DTCs.** 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

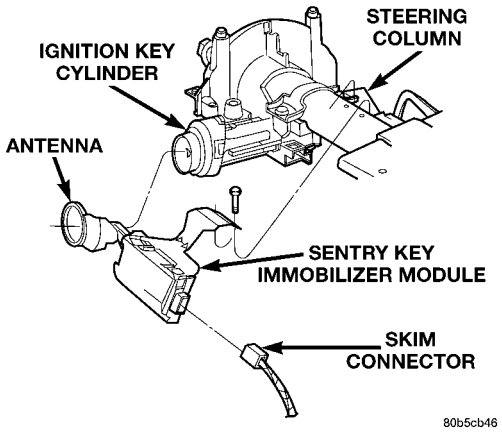
Verification Tests — Continued

SPEED CONTROL VERIFICATION - 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 DRB, erase all diagnostic trouble codes (DTCs). 3. Road test the vehicle at a speed above 60 km/h (35 MPH). 4. Turn the speed control ON/OFF switch on. 5. Depress and release the SET switch. If the speed control does not engage, the repair is not complete, continue with step 12. 6. Quickly depress and release the RESUME/ACCEL switch. If the vehicle speed does not increase by 3 km/h (2 MPH), the repair is not complete, continue with step 12. 7. Using caution, depress and release the brake pedal. If the speed control does not disengage, the repair is not complete, continue with step 12. 8. With the vehicle speed at least 60 km/h (35 MPH), depress the RESUME/ACCEL switch. If the speed control does not resume at the previously set speed, the repair is not complete, continue with step 12. 9. Hold down the COAST switch. If the vehicle does not decelerate, the repair is not complete, continue with step 12. 10. While still holding down the COAST switch, ensure the vehicle speed is at least 60 km/h (35 MPH) and release the COAST switch. If the vehicle does not adjust and set a new vehicle speed, the repair is not complete, continue with step 12. 11. With the speed control engaged, depress the ON/OFF switch. If the speed control does not disengage, the repair is not complete, continue with step 12. 12. If the vehicle did not successfully perform all of the previous steps, check for Technical Service Bulletins (TSBs) that pertain to this speed control problem and then, if necessary, return to the Symptom List. 13. If the vehicle successfully performed all of the previous steps, the speed control system is now functioning as designed. The repair is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

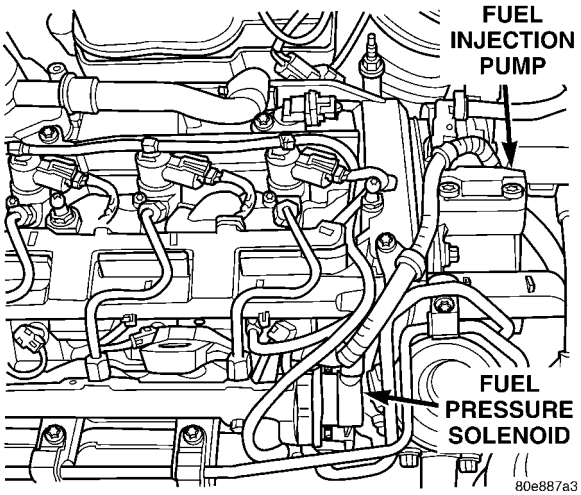
8.0 COMPONENT LOCATIONS

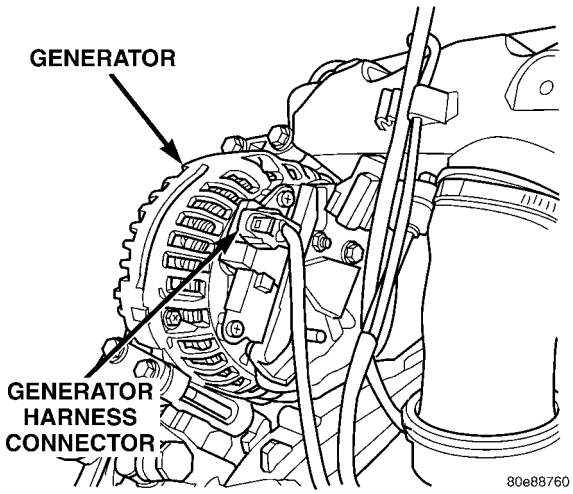
8.1 CONTROL MODULES

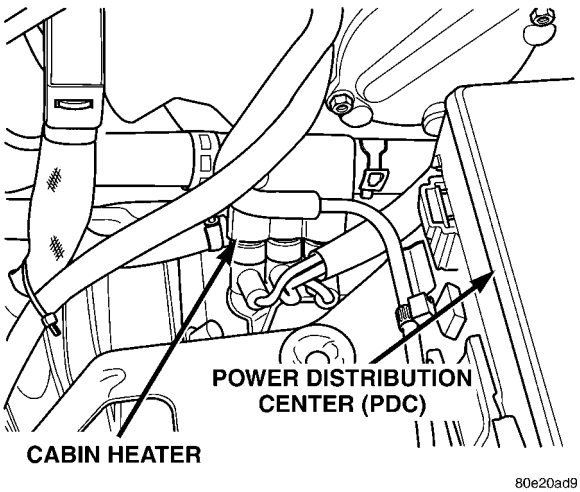


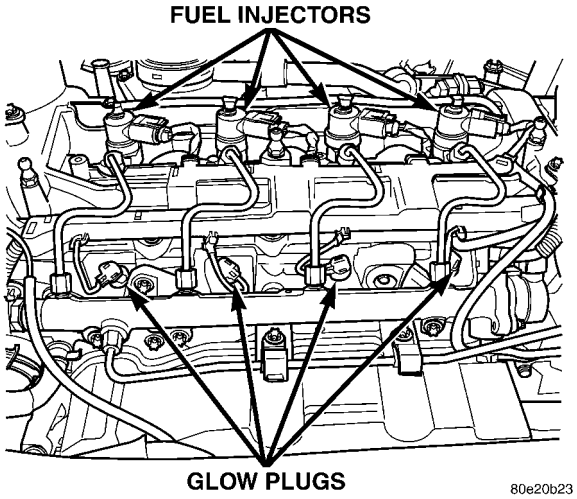


8.2 CONTROLS AND SOLENOIDS

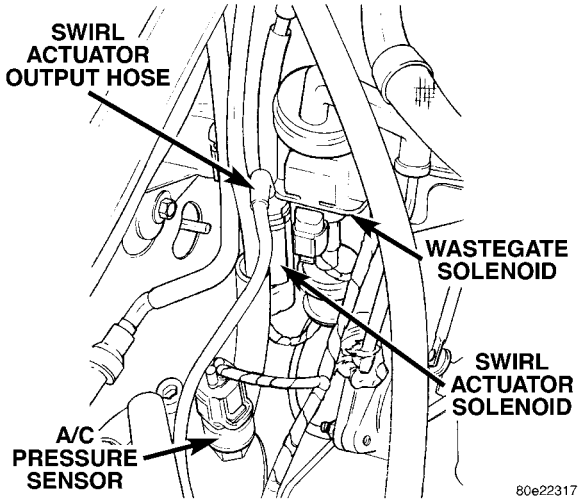


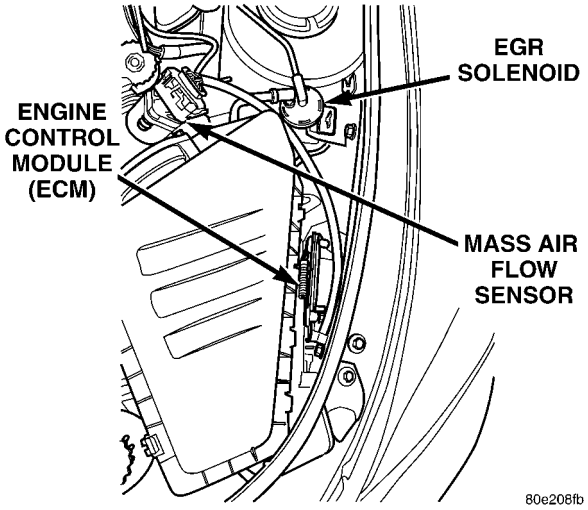




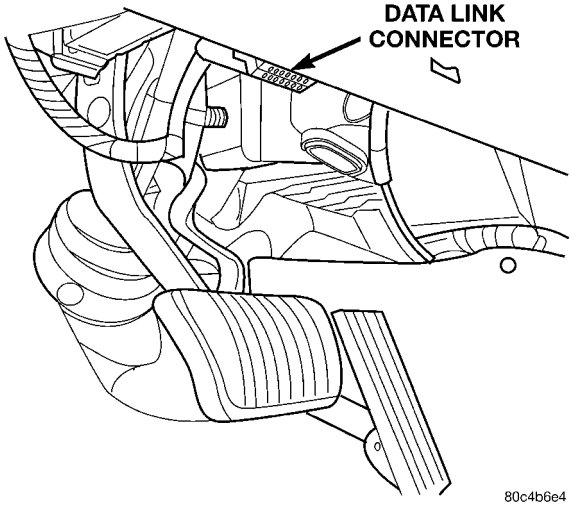


8.2 CONTROLS AND SOLENOIDS (Continued)

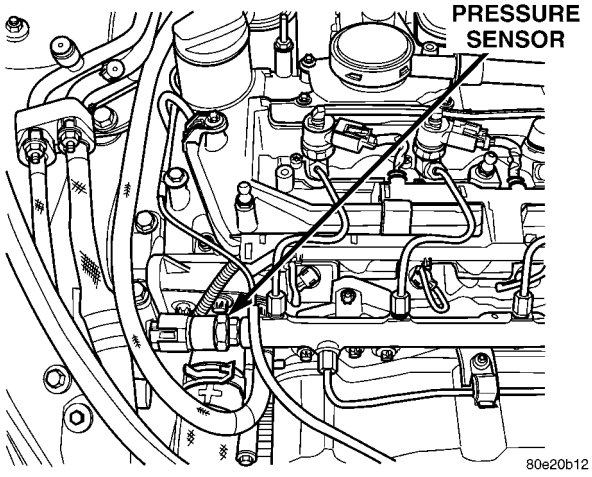


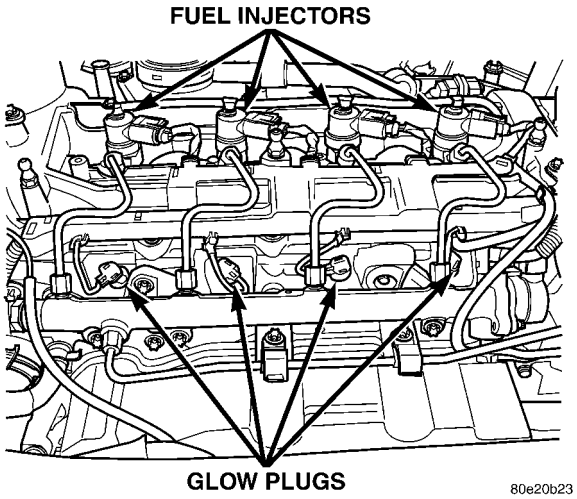


8.3 DATA LINK CONNECTOR

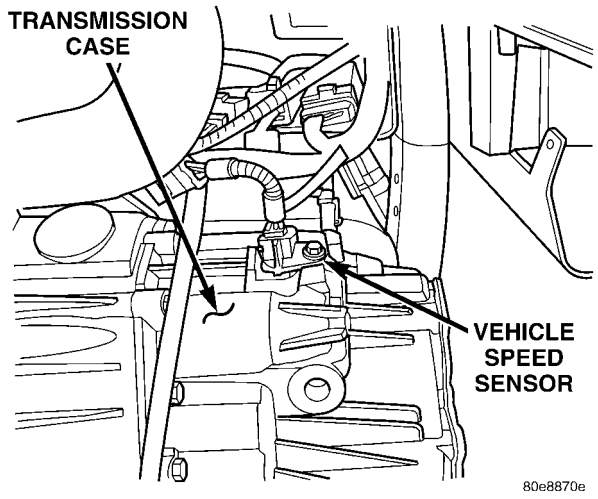


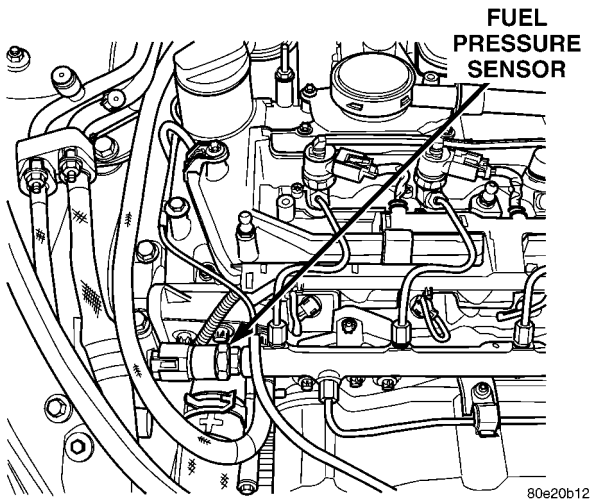
8.4 FUEL SYSTEM

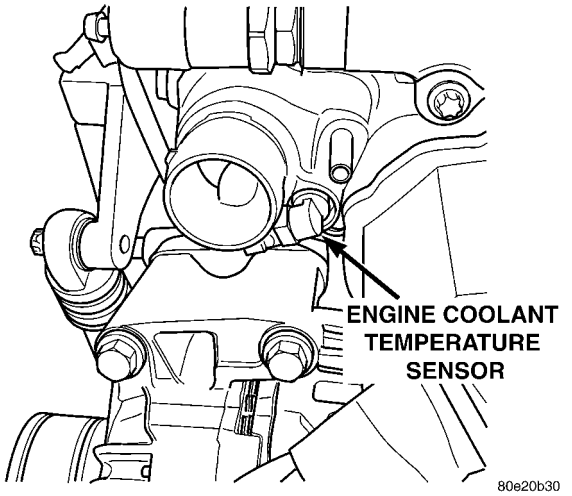


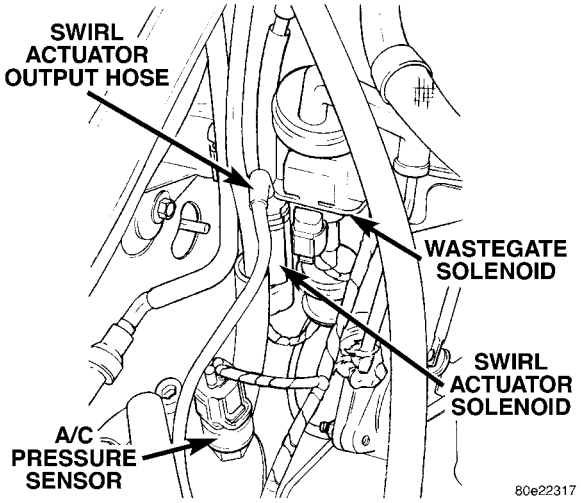


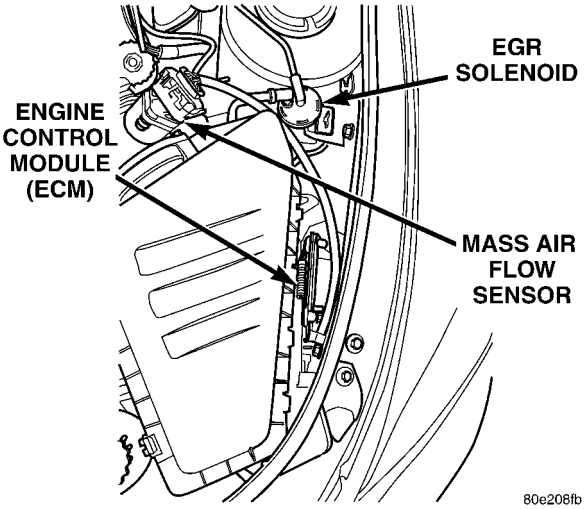
8.5 SENSORS

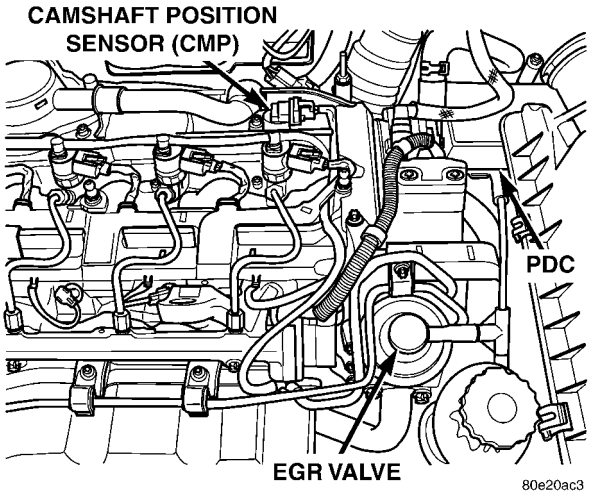

TRANSMISSION CASE
VEHICLE SPEED SENSOR
80e8870e


FUEL PRESSURE SENSOR
80e20b12

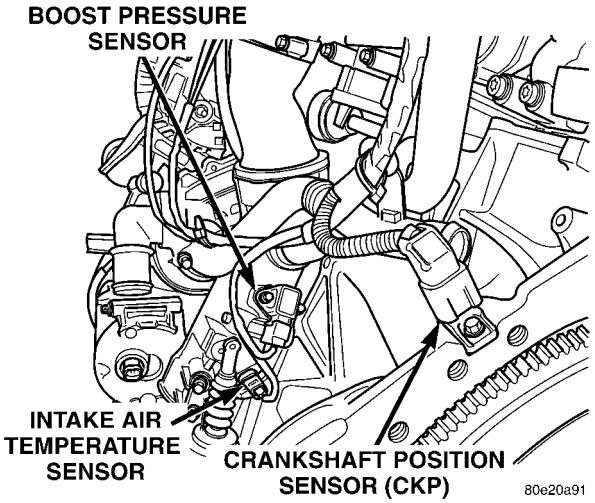

ENGINE COOLANT TEMPERATURE SENSOR
80e20b30

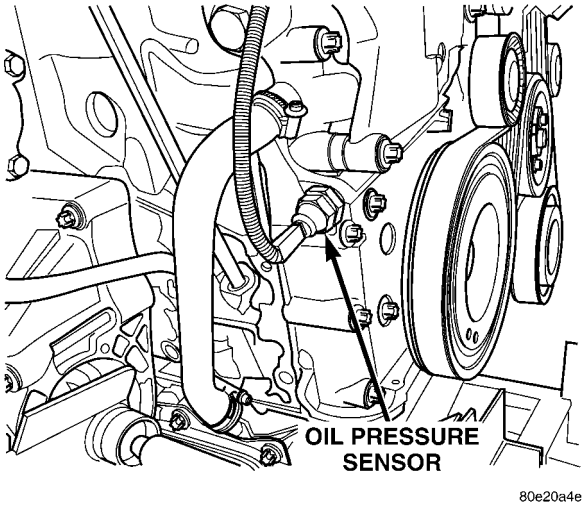

SWIRL ACTUATOR OUTPUT HOSE
WASTEGATE SOLENOID
SWIRL ACTUATOR SOLENOID
A/C PRESSURE SENSOR
80e22317

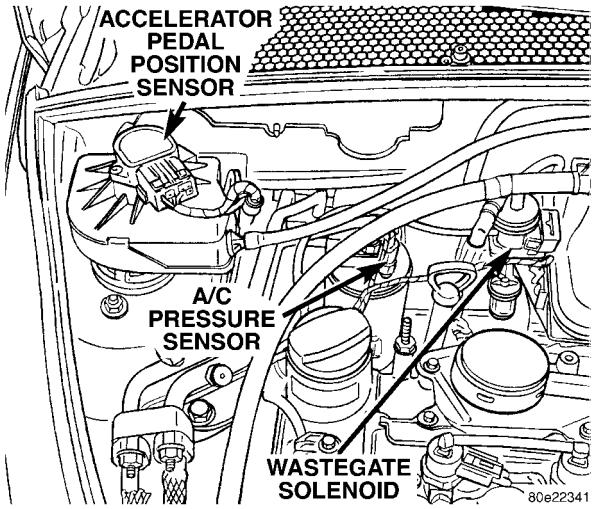

EGR SOLENOID
ENGINE CONTROL MODULE (ECM)
MASS AIR FLOW SENSOR
80e208fb


CAMSHAFT POSITION SENSOR (CMP)
PDC
EGR VALVE
80e20ac3

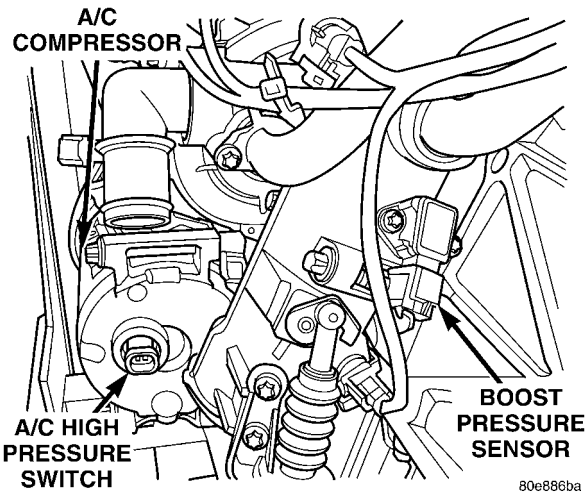
8.5 SENSORS (Continued)



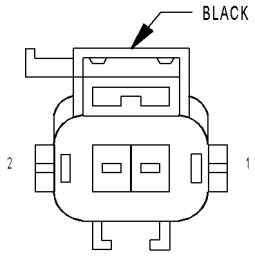




8.6 SWITCHES



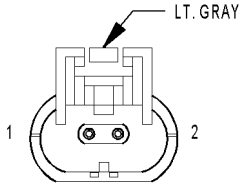
9.0 CONNECTOR PINOUTS



A/C COMPRESSOR CLUTCH (DIESEL)

A/C COMPRESSOR CLUTCH (DIESEL) - BLACK 2 WAY

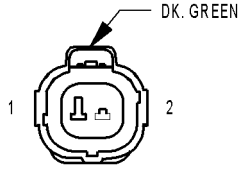
CAV	CIRCUIT	FUNCTION
1	C3 20DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
2	Z1 20BK	GROUND



A/C HIGH PRESSURE SWITCH (DIESEL)

A/C HIGH PRESSURE SWITCH (DIESEL) - LT. GRAY 2 WAY

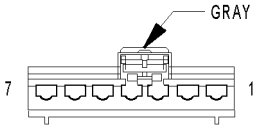
CAV	CIRCUIT	FUNCTION
1	C22 20VT/YL	A/C HIGH PRESSURE SIGNAL
2	C21 20LB/WT	A/C LOW PRESSURE SIGNAL



A/C LOW PRESSURE SWITCH

A/C LOW PRESSURE SWITCH - DK. GREEN 2 WAY

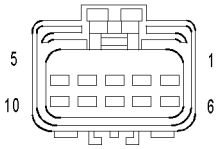
CAV	CIRCUIT	FUNCTION
1	C21 20DB/OR	A/C LOW PRESSURE SIGNAL
2	C20 20BR	A/C REQUEST SIGNAL



A/C-HEATER CONTROL SWITCH

A/C-HEATER CONTROL SWITCH - GRAY 7 WAY

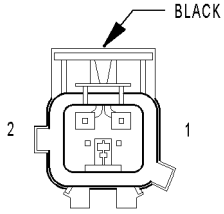
CAV	CIRCUIT	FUNCTION
1	Z8 14BK/VT	GROUND
2	C7 14BK/TN	BLOWER MOTOR HIGH DRIVER
3	C6 18LB	BLOWER MOTOR M2 DRIVER
4	C5 18LG	BLOWER MOTOR M1 DRIVER
5	C4 18TN/BK	BLOWER MOTOR LOW DRIVER
6	C20 20BR	A/C REQUEST SIGNAL
7	E2 20OR	PANEL LAMPS DRIVER



ACCELERATOR PEDAL POSITION SENSOR (1.6L/DIESEL)

ACCELERATOR PEDAL POSITION SENSOR (1.6L/DIESEL) - 10 WAY

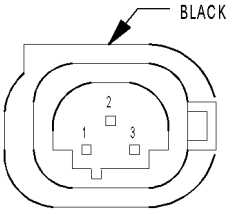
CAV	CIRCUIT	FUNCTION
1	-	-
2	K167 20BR/YL	ACCELERATOR PEDAL POSITION SENSOR NO. 1 GROUND
3	F858 20LG/PK	ACCELERATOR PEDAL POSITION SENSOR NO. 1 5 VOLT SUPPLY
4	K80 20BK/LG	ACCELERATOR PEDAL POSITION SENSOR NO. 1 SIGNAL
5	F859 20DG/PK (1.6L)	ACCELERATOR PEDAL POSITION SENSOR NO. 2 5 VOLT SUPPLY
5	F859 20DG/PK (DIESEL)	SENSOR REFERENCE VOLTAGE A
6	-	-
7	-	-
8	K981 20BR/DG	ACCELERATOR PEDAL POSITION SENSOR NO. 2 GROUND
9	-	-
10	K81 20DB/DG	ACCELERATOR PEDAL POSITION SENSOR NO. 2 SIGNAL



BATTERY TEMPERATURE SENSOR (DIESEL)

BATTERY TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

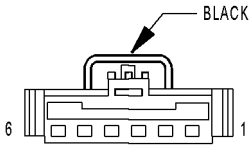
CAV	CIRCUIT	FUNCTION
1	K118 20PK/YL	BATTERY TEMPERATURE SENSOR SIGNAL
2	K4 20BK/LB	SENSOR GROUND



BOOST PRESSURE SENSOR (DIESEL)

BOOST PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

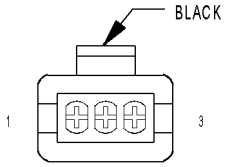
CAV	CIRCUIT	FUNCTION
1	K121 20BR/WT	SENSOR GROUND
2	K1 20BK/YL	BOOST PRESSURE SENSOR SIGNAL
3	K9 20RD/BK	SENSOR REFERENCE VOLTAGE B



BRAKE LAMP SWITCH (DIESEL)

BRAKE LAMP SWITCH (DIESEL) - BLACK 6 WAY

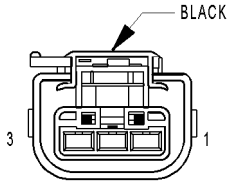
CAV	CIRCUIT	FUNCTION
1	F32 18PK/DB	FUSED B(+)
2	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
2	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
3	-	-
4	-	-
5	Z1 20BK	GROUND
6	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
6	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL



CAMSHAFT POSITION SENSOR (DIESEL)

CAMSHAFT POSITION SENSOR (DIESEL) - BLACK 3 WAY

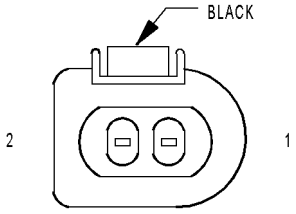
CAV	CIRCUIT	FUNCTION
1	K944 20BR/LG	CAMSHAFT POSITION SENSOR GROUND
2	K44 20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
3	A142 20RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT



CLUTCH PEDAL POSITION SWITCH (UP)

CLUTCH PEDAL POSITION SWITCH (UP) - BLACK 3 WAY

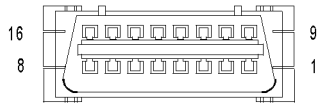
CAV	CIRCUIT	FUNCTION
1	K119 20LG/BK (1.6L/ DIESEL)	CLUTCH UPSTOP SWITCH SIGNAL
2	Z12 20BK/TN	GROUND
3	T141 18YL/RD (2.4L TURBO)	CLUTCH INTERLOCK SWITCH SIGNAL
3	T141 20YL/RD (EXCEPT 2.4L TURBO)	CLUTCH INTERLOCK SWITCH SIGNAL



CRANKSHAFT POSITION SENSOR (DIESEL)

CRANKSHAFT POSITION SENSOR (DIESEL) - BLACK 2 WAY

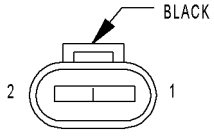
CAV	CIRCUIT	FUNCTION
1	K24 20YL	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
2	K3 20BK	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1



DATA LINK CONNECTOR

DATA LINK CONNECTOR - 16 WAY

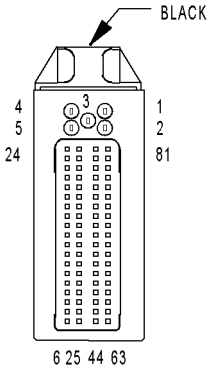
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS
3	-	-
4	Z12 20BK/TN	GROUND
5	Z12 18BK/TN (2.0L RHD MTX)	GROUND
5	Z12 20BK/TN (EXCEPT 2.0L RHD MTX)	GROUND
6	-	-
7	D21 20PK (DIESEL)	SCI TRANSMIT (ECM)
7	D21 20PK (GAS)	SCI TRANSMIT
8	-	-
9	D24 20WT/DG	FLASH PROGRAM ENABLE
10	-	-
11	-	-
12	D20 20LG (GAS)	SCI RECEIVE
13	-	-
14	-	-
15	D15 20WT/DG (EATX)	SCI TRANSMIT (TCM)
16	A14 18RD/WT	FUSED B(+)



EGR SOLENOID (DIESEL)

EGR SOLENOID (DIESEL) - BLACK 2 WAY

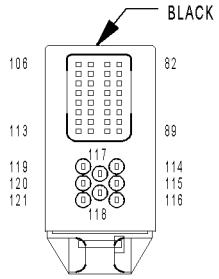
CAV	CIRCUIT	FUNCTION
1	K35 20GY/YL	EGR SOLENOID CONTROL
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



ENGINE CONTROL MODULE C1 (DIESEL)

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

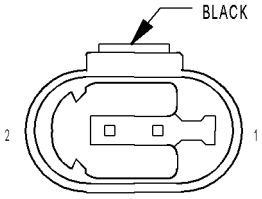
CAV	CIRCUIT	FUNCTION
1	Z12 12BK/LG	GROUND
2	Z12 12BK/LG	GROUND
3	K20 12LB/WT	GENERATOR FIELD CONTROL
4	A142 12RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT
5	A142 12RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT
6	-	-
7	D25 20VT/YL	PCI BUS
8	K944 20BR/LG	CAMSHAFT POSITION SENSOR GROUND
9	K44 20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	K1 20BK/YL	BOOST PRESSURE SENSOR SIGNAL
12	K155 20YL/WT	MASS AIR FLOW SENSOR SIGNAL
13	N20 20LG/VT	FUEL PRESSURE SENSOR SIGNAL
14	K81 20LB/LG	ACCELERATOR PEDAL POSITION SENSOR NO. 2 SIGNAL
15	K80 20BK/LG	ACCELERATOR PEDAL POSITION SENSOR NO. 1 SIGNAL
16	N920 20BR/GY	FUEL PRESSURE SENSOR GROUND
17	K21 20YL/LG	AMBIENT AIR TEMPERATURE SENSOR SIGNAL
18	-	-
19	A14 18RD/LB	FUSED B(+)
20	Z11 20WT/BK	GROUND
21	K4 20BK/LB	SENSOR GROUND
22	F12 20LB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	K9 20RD/BK	SENSOR REFERENCE VOLTAGE B
24	K3 20BK	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	K118 20RD/YL	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K167 20BR/YL	ACCELERATOR PEDAL POSITION SENSOR NO. 1 GROUND
35	F858 20LG/VT	ACCELERATOR PEDAL POSITION SENSOR NO. 1 5 VOLT SUPPLY
36	-	-
37	-	-
38	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
39	-	-
40	K2 20LG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K48 20LG/WT	INLET AIR TEMPERATURE SENSOR SIGNAL
42	Z31 20	GROUND (DRAIN)
43	K24 20YL	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
44	-	-
45	-	-
46	-	-
47	L50 18WT/LB	PRIMARY BRAKE SWITCH SIGNAL
48	K29 20WT/RD	SECONDARY BRAKE SWITCH SIGNAL
49	A41 18YL	FUSED IGNITION SWITCH OUTPUT (START)
50	F859 20LG/PK	SENSOR REFERENCE VOLTAGE A
51	-	-
52	K121 20BR/WT	SENSOR GROUND
53	-	-
54	K957 20BR	MASS AIR FLOW SENSOR GROUND
55	G7 20GY/WT	VEHICLE SPEED SENSOR SIGNAL
56	K981 20LG/BR	ACCELERATOR PEDAL POSITION SENSOR NO. 2 GROUND
57	-	-
58	N907 20BK/VT	VEHICLE SPEED SENSOR GROUND
59	K47 20LB	SWIRL SOLENOID CONTROL
60	Y99 20RD/LB	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20LB/YL	AUTOMATIC SHUT DOWN RELAY CONTROL
62	-	-
63	D21 20RD	SCI TRANSMIT (ECM)
64	-	-
65	-	-
66	-	-
67	-	-
68	-	-
69	C28 20LB/RD	A/C COMPRESSOR CLUTCH RELAY CONTROL
70	C24 20LB/PK	LOW SPEED RADIATOR FAN RELAY CONTROL
71	C27 20LB/BK	HIGH SPEED RADIATOR FAN RELAY CONTROL
72	K31 20BR/LB	FUEL PUMP RELAY CONTROL
73	-	-
74	K90 20YL/BK	STARTER MOTOR RELAY CONTROL
75	C41 20LG/LB	CABIN HEATER RELAY NO. 1 CONTROL
76	K137 20LB/GY	WASTEGATE SOLENOID CONTROL
77	K152 20WT	GLOW PLUG RELAY CONTROL
78	-	-
79	C42 20GY/LB	CABIN HEATER RELAY NO. 2 CONTROL
80	K46 20BK/WT	FUEL PRESSURE SOLENOID CONTROL
81	K46 20BK/WT	FUEL PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL) - BLACK 40 WAY

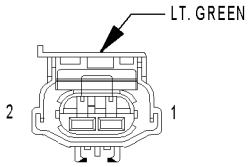
CAV	CIRCUIT	FUNCTION
82	-	-
83	-	-
84	-	-
85	-	-
86	-	-
87	-	-
88	K35 20GY/YL	EGR SOLENOID CONTROL
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-
100	-	-
101	-	-
102	T141 20YL/RD	CLUTCH INTERLOCK SWITCH SIGNAL
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	-
109	C22 20VT/YL	A/C HIGH PRESSURE SIGNAL
110	G9 20GY/BK	RED BRAKE WARNING INDICATOR DRIVER
111	G6 20VT/LG	ENGINE OIL PRESSURE SWITCH SIGNAL
112	K119 20LG/BK	CLUTCH UPSTOP SWITCH SIGNAL
113	-	-
114	-	-
115	K14 12BK/YL	FUEL INJECTOR NO. 4 CONTROL
116	K63 12LB	COMMON INJECTOR DRIVER
117	-	-
118	K11 12BK/LB	FUEL INJECTOR NO. 1 CONTROL
119	K12 12BK/VT	FUEL INJECTOR NO. 2 CONTROL
120	K13 12BK/RD	FUEL INJECTOR NO. 3 CONTROL
121	-	-



ENGINE COOLANT TEMPERATURE SENSOR (DIESEL)

ENGINE COOLANT TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

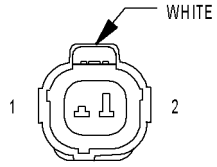
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K2 20LG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE OIL PRESSURE SWITCH

ENGINE OIL PRESSURE SWITCH - LT. GREEN 2 WAY

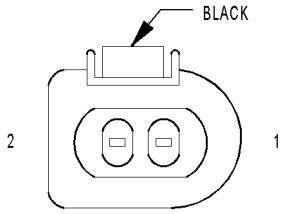
CAV	CIRCUIT	FUNCTION
1	G6 20GY (1.6L)	ENGINE OIL PRESSURE SWITCH SIGNAL
1	G6 20VT/LG (DIESEL)	ENGINE OIL PRESSURE SWITCH SIGNAL
1	G6 20GY (EXCEPT 1.6L/ DIESEL)	OIL PRESSURE SIGNAL
2	-	-



FUEL HEATER MODULE (DIESEL)

FUEL HEATER MODULE (DIESEL) - WHITE 2 WAY

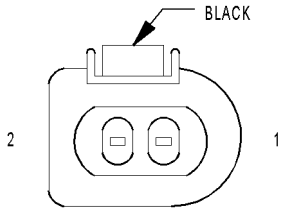
CAV	CIRCUIT	FUNCTION
1	A93 14RD/BK	FUEL HEATER RELAY OUTPUT
2	-	-



FUEL INJECTOR NO. 1 (DIESEL)

FUEL INJECTOR NO. 1 (DIESEL) - BLACK 2 WAY

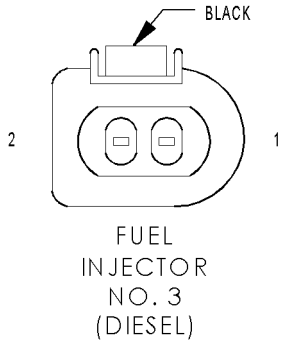
CAV	CIRCUIT	FUNCTION
1	K11 12BK/LB	FUEL INJECTOR NO. 1 CONTROL
2	K63 12BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 2 (DIESEL)

FUEL INJECTOR NO. 2 (DIESEL) - BLACK 2 WAY

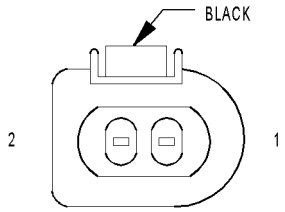
CAV	CIRCUIT	FUNCTION
1	K12 12BK/VT	FUEL INJECTOR NO. 2 CONTROL
2	K63 12LB	COMMON INJECTOR DRIVER



FUEL
INJECTOR
NO. 3
(DIESEL)

FUEL INJECTOR NO. 3 (DIESEL) - BLACK 2 WAY

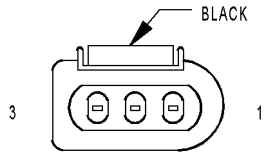
CAV	CIRCUIT	FUNCTION
1	K13 12BK/RD	FUEL INJECTOR NO. 3 CONTROL
2	K63 12LB	COMMON INJECTOR DRIVER



FUEL
INJECTOR
NO. 4
(DIESEL)

FUEL INJECTOR NO. 4 (DIESEL) - BLACK 2 WAY

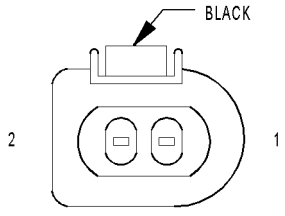
CAV	CIRCUIT	FUNCTION
1	K14 12BK/YL	FUEL INJECTOR NO. 4 CONTROL
2	K63 12BK	COMMON INJECTOR DRIVER



FUEL
PRESSURE
SENSOR
(DIESEL)

FUEL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

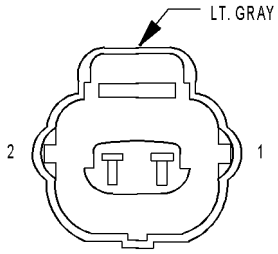
CAV	CIRCUIT	FUNCTION
1	N920 20BR/GY	FUEL PRESSURE SENSOR GROUND
2	N20 20LG/VT	FUEL PRESSURE SENSOR SIGNAL
3	Y99 20RD/LB	FUEL PRESSURE SENSOR 5 VOLT SUPPLY



FUEL
PRESSURE
SOLENOID
(DIESEL)

FUEL PRESSURE SOLENOID (DIESEL) - BLACK 2 WAY

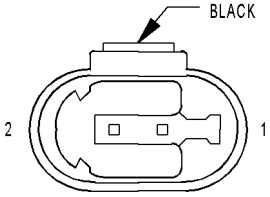
CAV	CIRCUIT	FUNCTION
1	K46 20BK/WT	FUEL PRESSURE SOLENOID CONTROL
2	A142 20RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT



GENERATOR
(DIESEL)

GENERATOR (DIESEL) - LT. GRAY 2 WAY

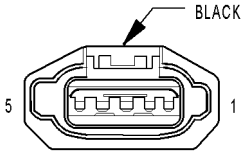
CAV	CIRCUIT	FUNCTION
1	K20 12LB/WT	GENERATOR FIELD CONTROL
2	A142 20RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT



INTAKE
AIR
TEMPERATURE
SENSOR
(DIESEL)

INTAKE AIR TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	K121 20BR/WT	SENSOR GROUND
2	K48 20LG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL

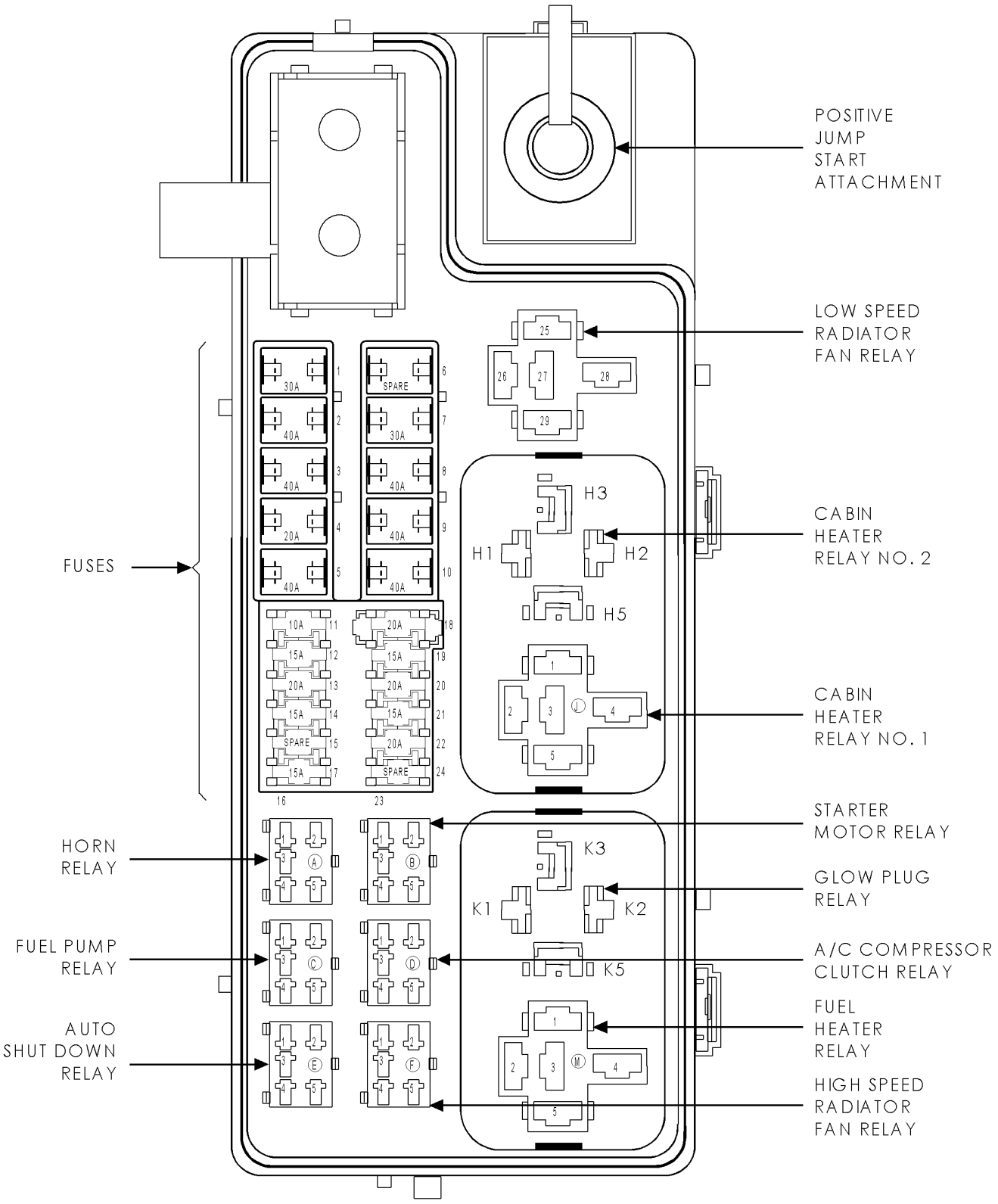


MASS
AIR
FLOW
SENSOR
(DIESEL)

MASS AIR FLOW SENSOR (DIESEL) - BLACK 5 WAY

CAV	CIRCUIT	FUNCTION
1	K21 20YL/LG	AMBIENT AIR TEMPERATURE SENSOR SIGNAL
2	A142 20RD/LG	AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K957 20BR	MASS AIR FLOW SENSOR GROUND
4	F859 20LG/PK	SENSOR REFERENCE VOLTAGE A
5	K155 20YL/WT	MASS AIR FLOW SENSOR SIGNAL

POWER DISTRIBUTION CENTER
DIESEL

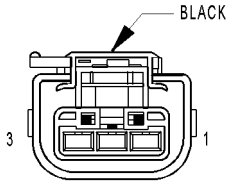


FUEL HEATER RELAY (DIESEL)

CAV	CIRCUIT	FUNCTION
M1	A141 16DG/WT (LHD)	FUEL PUMP RELAY OUTPUT
M1	A141 20DG/WT (RHD)	FUEL PUMP RELAY OUTPUT
M2	A93 14RD/BK	FUEL HEATER RELAY OUTPUT
M3	-	-
M4	A193 14RD/DB	FUSED B(+)
M5	Z12 20BK/TN	GROUND

GLOW PLUG RELAY (DIESEL)

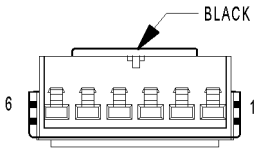
CAV	CIRCUIT	FUNCTION
K1	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT
K2	K152 20WT	GLOW PLUG RELAY CONTROL
K3	A54 10RD	FUSED B(+)
K4	-	-
K5	K154 10GY	GLOW PLUG RELAY OUTPUT



RADIATOR FAN MOTOR (EXCEPT 2.4L TURBO)

RADIATOR FAN MOTOR (EXCEPT 2.4L TURBO) - BLACK 3 WAY

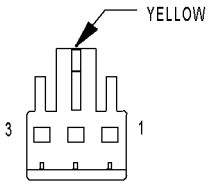
CAV	CIRCUIT	FUNCTION
1	C23 12DG	LOW SPEED RADIATOR FAN RELAY OUTPUT
2	Z1 12BK	GROUND
3	C25 12YL	HIGH SPEED RADIATOR FAN RELAY OUTPUT



SENTRY KEY IMMOBILIZER MODULE

SENTRY KEY IMMOBILIZER MODULE - BLACK 6 WAY

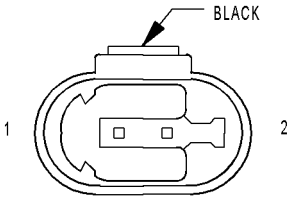
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20VT/YL	PCI BUS
3	-	-
4	G5 20DB/BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
5	Z2 20BK/LG	GROUND
6	M1 18PK	FUSED B(+)



SPEED CONTROL SWITCH

SPEED CONTROL SWITCH - YELLOW 3 WAY

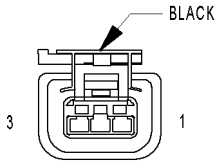
CAV	CIRCUIT	FUNCTION
1	V131 20BK/LG	SPEED CONTROL SWITCH SIGNAL
2	-	-
3	Z123 20RD/TN	GROUND



SWIRL
SOLENOID
(DIESEL)

SWIRL SOLENOID (DIESEL) - BLACK 2 WAY

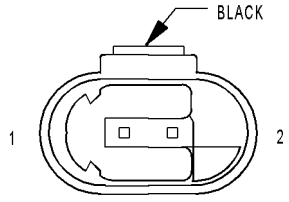
CAV	CIRCUIT	FUNCTION
1	K47 20DB/YL	SWIRL SOLENOID CONTROL
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT



VEHICLE SPEED
SENSOR
(DIESEL)

VEHICLE SPEED SENSOR (DIESEL) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K9 20RD/BK	SENSOR REFERENCE VOLTAGE B
2	N907 20BK/VT	VEHICLE SPEED SENSOR GROUND
3	G7 20GY/WT	VEHICLE SPEED SENSOR SIGNAL



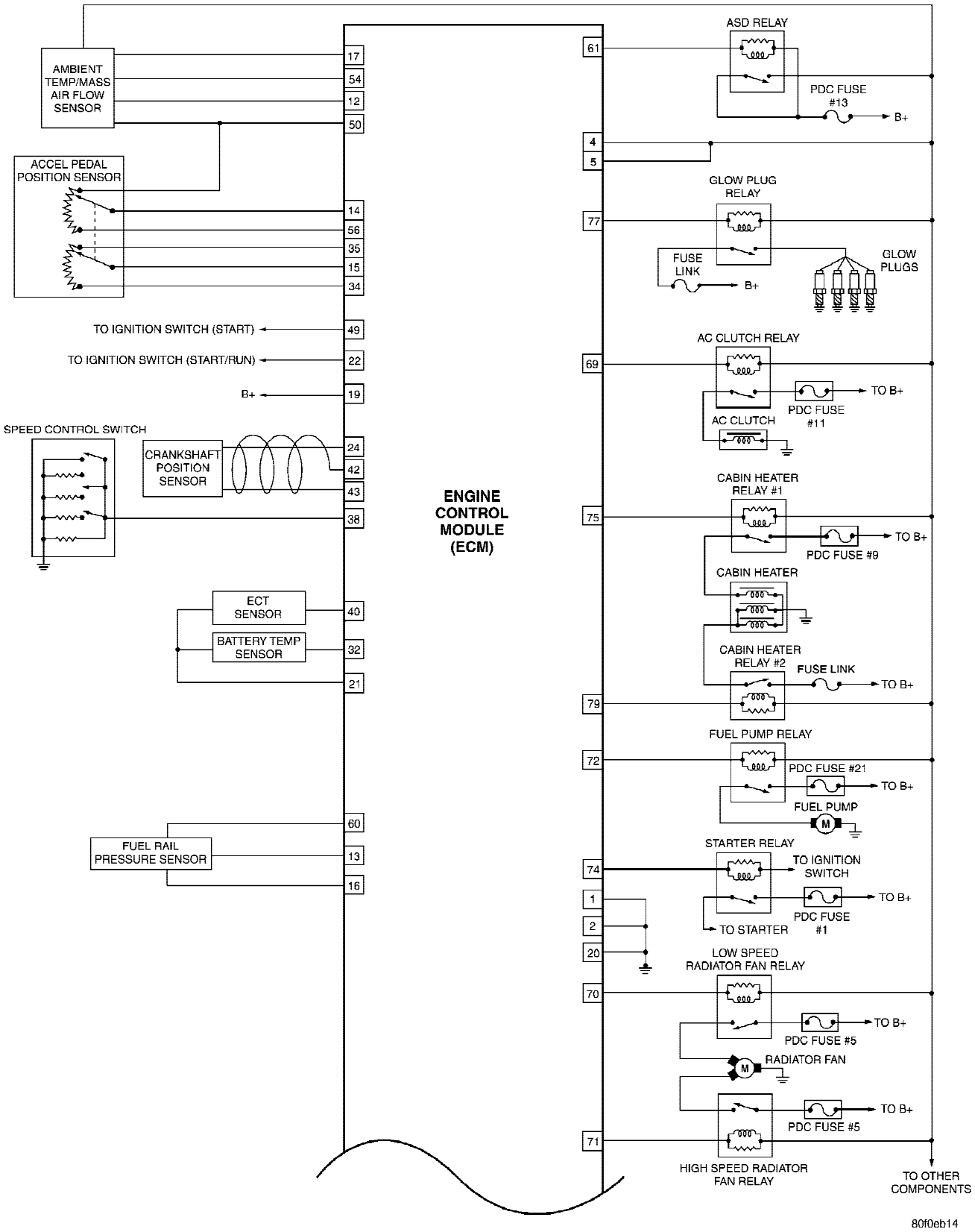
WASTEGATE
SOLENOID
(DIESEL)

WASTEGATE SOLENOID (DIESEL) - BLACK 2 WAY

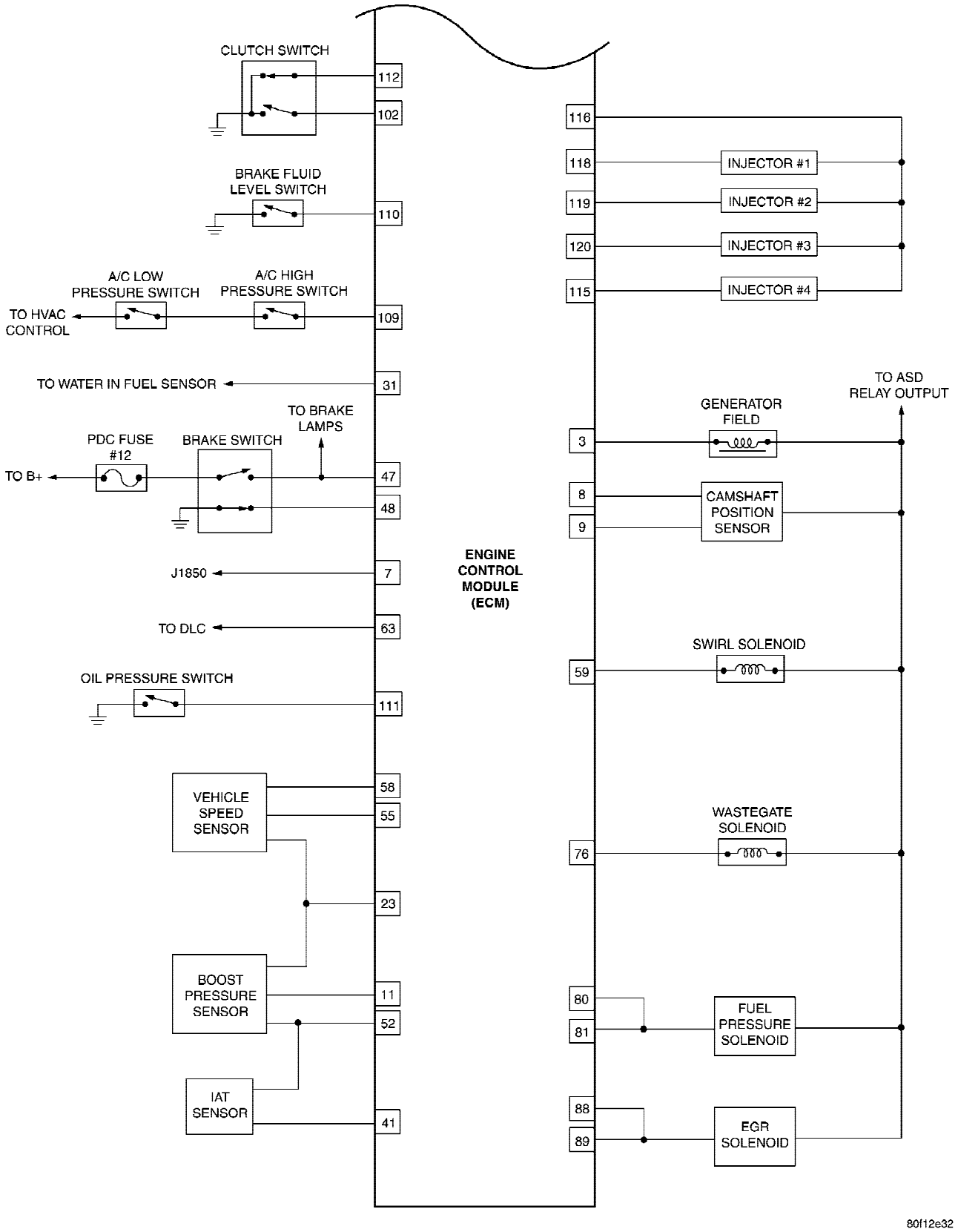
CAV	CIRCUIT	FUNCTION
1	K137 20DB/GY	WASTEGATE SOLENOID CONTROL
2	A142 18DG/OR	AUTOMATIC SHUT DOWN RELAY OUTPUT

10.0 SCHEMATIC DIAGRAMS

10.1 DIESEL ECM PART 1



10.2 DIESEL ECM PART 2



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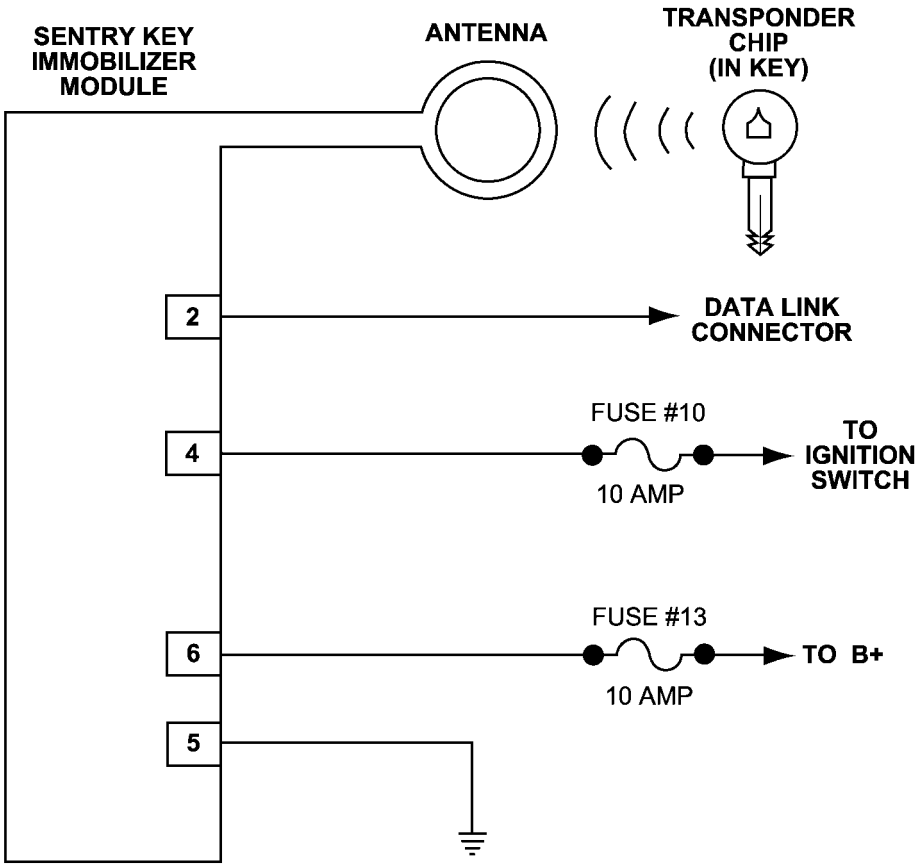
10.3 SKIS



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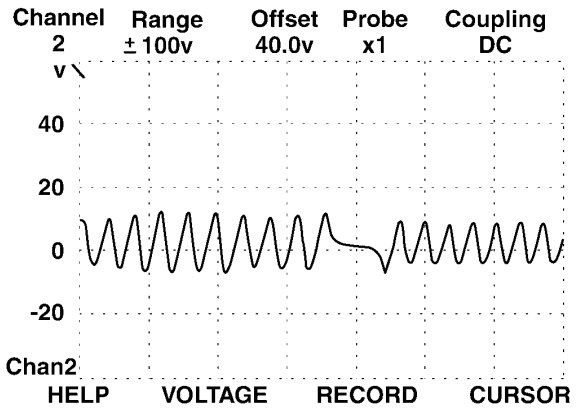
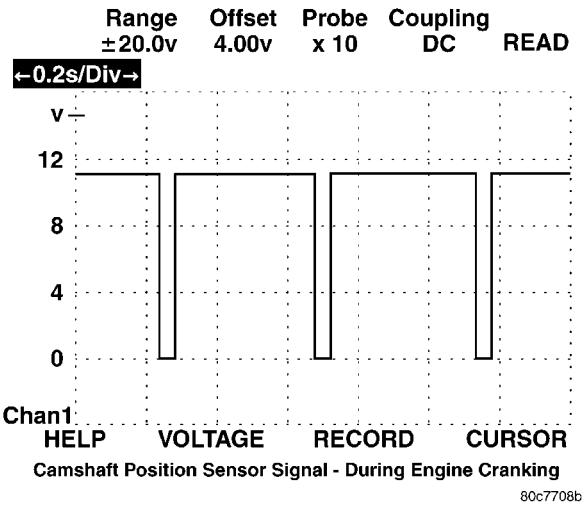
NOTES

11.0 CHARTS AND GRAPHS



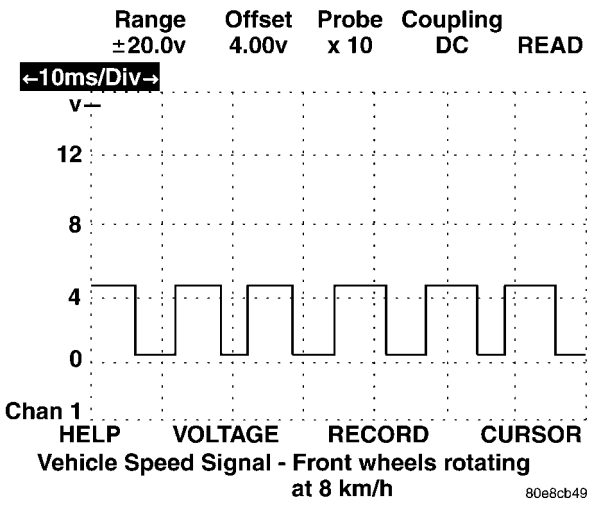
CRANKSHAFT POSITION SENSOR SIGNAL

811cbf3e



Camshaft Position Sensor Signal - During Engine Cranking

80c7708b



Vehicle Speed Signal - Front wheels rotating at 8 km/h

80e8cb49

NOTES