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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 2002 RG body vehicles equipped with the 2.5L 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 between the left headlamp and the integrated power module. 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 2.5L direct injection diesel engine system is equipped with the latest in 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 the 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 many different circuits of the diesel fuel injection system. This monitoring is called on-board diagnostics.

Certain criteria must be met for a 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 has 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 switch 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 lift pump to prime the fuel system.

Engine Start-up Mode

The ECM uses the engine temperature 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 106°C (223°F) and vehicle speed is above 40 km/h (25 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 1100 RPM.

Overspeed Detection Mode

If the ECM detects engine RPM that exceeds 5200 RPM, the ECM will set a DTC in memory, limit engine RPM to no more than 2500 RPM, and illuminate the MIL until the DTC is cleared.

After-Run Mode

The ECM transfers RAM information to ROM 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 PCI 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 PCI 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, PCI Bus message or coded messages to the SKIM. If all of the criteria for monitoring a circuit or function are met and a fault is 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 PCI 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 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 information center. The lamp receives switched ignition voltage and is hardwired to the body control module. The SKIS lamp is actuated when the SKIM sends a PCI Bus message to the body control module requesting the lamp on, off or flashing. The body control module 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 a fault is stored in SKIM memory which prevents the system from operating properly, 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 SKIS 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.

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

A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY

A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

A/C PRESSURE SENSOR CIRCUIT SUPPLY VOLTAGE TOO HIGH OR LOW

ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY

ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH

ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH POTENTIOMETER

ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH

ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO LOW

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

AFTER RUN SHUT OFF ERROR-INJ. POWERSTAGE

AFTER RUN SHUT OFF ERROR-ZERO QUANTITY

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 TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

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

CALCULATED INJECTOR VOLTAGE TOO HIGH

CALCULATED INJECTOR VOLTAGE TOO LOW

CAPACITOR VOLTAGE 1 VOLTAGE TOO HIGH

CAPACITOR VOLTAGE 1 VOLTAGE TOO LOW

CKP POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION

CLUTCH UPSTOP SWITCH PERF PLAUSIBILITY

CLUTCH PEDAL SW OVERRIDE RELAY SHORT CIRCUIT

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 - COMMUNICATION NOT VERIFIED

ECM ERROR GATE ARRAY - COMMUNICATION

ECM ERROR GATE ARRAY - QUANTITY STOP

ECM ERROR RECOVERY HAS OCCURRED

ECM ERROR REDUNDANT OVERRUN MONITORING

ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY

ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE
EEPROM MEMORY WRITE DENIED
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 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 PLAUSIBILITY IN AFTER-RUN
FUEL PRESSURE SOLENOID SHORT CIRCUIT
FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED
FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH - SHUT OFF
FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW
FUEL RAIL PRESSURE MALFUNCTION SOLENOID OPEN
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 CHARGING VOLTS TOO LOW
GENERATOR FIELD CONTROL MALF OPEN CIRCUIT
GENERATOR FIELD CONTROL MALF SHORT CIRCUIT
GENERATOR FIELD CONTROL MALF UNSTABLE CURRENT
GLOW PLUG 1 CONTROL CIRCUIT OPEN CIRCUIT
GLOW PLUG 1 CONTROL CIRCUIT SHORT CIRCUIT
IGNITION SWITCH PLAUSIBILITY
INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH
INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW
LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT
LIFT PUMP RELAY CONTROL CIRCUIT SHORT CIRCUIT
MASS AIR FLOW SENSOR PLAUSIBILITY
MASS AIR FLOW SENSOR PLAUSIBILITY POSITIVE AREA
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
OIL PRESS SENSOR CKT MALF PLAUSIBILITY
OIL PRESS SENSOR CKT MALF SUPPLY VOLTAGE TOO HIGH OR LOW
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 SKIM ERROR
SKIM SYSTEM WRITE ACCESS TO EEPROM FAILURE
STARTER RELAY CIRCUIT SHORT CIRCUIT
SYSTEM VOLTAGE TOO HIGH
SYSTEM VOLTAGE TOO LOW
VEHICLE SPEED SENSOR FREQUENCY TOO HIGH
VEHICLE SPEED SENSOR HIGH LEVEL DURATION
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.

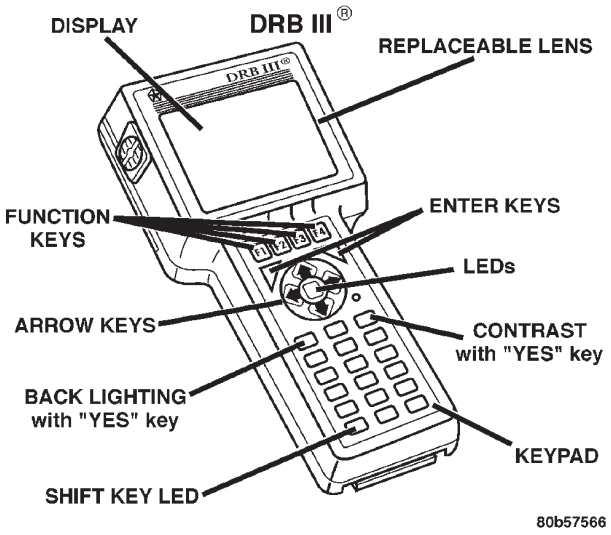
3.4.1 DRBIII® DOES NOT POWER UP

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. For a blank screen, refer to the appropriate diagnostic manual.

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

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

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

When diagnosing a powertrain system problem, 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 individuals performing diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

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

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the powertrain system are intended to be serviced as an assembly 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 POSSIBLY 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 test 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
vacuum gauge
ammeter
ohmmeter
voltmeter
jumper wires and probes
oscilloscope

6.0 GLOSSARY OF TERMS

A/C	air conditioning
APP	accelerator pedal position (sensor)
backfire, popback	fuel ignites in either the intake or the exhaust system
BCM	body control module
BP	boost pressure (sensor)
CKP	crankshaft position (sensor)
CMP	camshaft position (sensor)
cuts out, misses	a steady pulsation or the 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)
IPM	integrated power module
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
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
WIF	water in fuel (sensor)
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 Body then Body Computer. 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, if vehicle will start. For NO START Conditions follow the no start symptom in the powertrain diagnostic information.** 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. Set Probe to x10. 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
CABIN HEATER ASSIST
SCI TRANSMIT CIRCUIT SHORTED TO VOLTAGE
SCI TRANSMIT CIRCUIT SHORTED TO GROUND
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 → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the Cabin Heater Assist C1 harness connector. 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 → Replace the Cabin Heater Assist in accordance with the service information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the DRB from the DLC. Disconnect the ECM harness connectors. Disconnect the Cabin Heater Assist C1 harness connector. Turn the ignition on. Measure the voltage of the SCI Transmit circuit at the DLC connector (cav 7). 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 5	All

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

TEST	ACTION	APPLICABILITY
5	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 → Go To 6 No → Repair the SCI Transmit 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

Symptom:

***PCI BUS COMMUNICATION FAILURE**

POSSIBLE CAUSES
WITH THE DRB PERFORM A MODULE SCAN
OPEN PCI BUS CIRCUIT AT THE DATA LINK CONNECTOR
USING THE DRB, PERFORM THE PCI BUS CONTROL MODE
DISCONNECT THE MODULE(S) HARNESS CONNECTOR
PCI BUS CIRCUIT SHORTED TO VOLTAGE
DISCONNECT THE MODULE(S) HARNESS CONNECTOR
PCI BUS CIRCUIT SHORTED TO GROUND
WIRING HARNESS INTERMITTENT FAILURE

TEST	ACTION	APPLICABILITY
1	**Note: Determine which modules this vehicle is equipped with before beginning.** Connect the Diagnostic Junction Port Tester #8339 to the DRBIII® and to the Diagnostic Junction Port. Using the DRBIII®, along with the Diagnostic Junction Port Tester #8339, select Junction Port Tool then PCI Bus Module Scan and follow the instructions on the DRBIII®. Was the DRBIII® able to scan (I/D or communicate) with any modules? Yes → Refer to the Communication category for the related symptom(s). (Individual module no responses). Perform BODY VERIFICATION TEST - VER 1. No → Go To 2	All
2	Turn the ignition off. Measure the resistance of the PCI Bus circuit between the Data Link Connector and the Diagnostic Junction Port connector. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the PCI Bus circuit for an open between the DLC and the Diagnostic Junction Port. Perform BODY VERIFICATION TEST - VER 1.	All

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
3	**Note: Determine which modules this vehicle is equipped with before beginning.** Connect the Diagnostic Junction Port Tester #8339 to the DRB and to the Diagnostic Junction Port. Using the DRB, along with the Diagnostic Junction Port Tester #8339, select Junction Port Tool then PCI Bus Control Mode and follow the instructions on the DRB. **Note: Perform this function on each pin that is equipped with a PCI Bus circuit.** Did the DRB display No Modules Responding from any of the pins that were scanned? Yes → Go To 4 No → Check the PCI Bus circuit between the DLC and the Diagnostic Junction Port connector for a short to voltage or to ground, repair as necessary. Perform BODY VERIFICATION TEST - VER 1.	All
4	Disconnect the Diagnostic Junction Port Tester cable from the DRB. Keep the tester connected to the Diagnostic Junction Port. Turn the ignition on. Measure the voltage of the PCI Bus circuit on the Diagnostic Junction Port Tester that the DRB displayed No Modules Responding. Is the voltage steadily above 7.0 volts? Yes → Go To 5 No → Go To 6	All
5	Measure the voltage of the PCI Bus circuit on the Diagnostic Junction Port tester that previously measured above 7.0 volts. **Note: Turn the ignition off before disconnecting any module harness connector then turn the ignition on.** Disconnect the module harness connector(s). **NOTE: If the problem occurred on a bus circuit that has more than one module on the same circuit, observe the voltmeter while disconnecting each module connector one at a time.** Is the voltage steadily above 7.0 volts with the module(s) disconnected? Yes → Repair the PCI Bus circuit that measured over 7.0 volts for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. No → Replace the module that when disconnected the short to voltage was eliminated. Perform BODY VERIFICATION TEST - VER 1.	All
6	Disconnect the Diagnostic Junction Port Tester cable from the DRB. Keep the tester connected to the Diagnostic Junction Port. Turn the ignition off. Disconnect the negative battery cable. Measure the resistance between ground and the PCI Bus circuit on the Diagnostic Junction Port Tester that the DRB displayed No Modules Responding. Is the resistance below 100.0 ohms? Yes → Go To 7 No → Go To 8	All

*PCI BUS COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
7	Disconnect the negative battery cable. Measure the resistance between ground and the PCI Bus circuit at the Diagnostic Junction Port tester that previously measured below 100.0 ohms. Disconnect the module harness connector(s). **NOTE: If the problem occurred on a bus circuit that has more than one module on the same circuit, observe the ohmmeter while disconnecting each module connector one at a time.** Is the resistance below 100.0 ohms with the module(s) disconnected? Yes → Repair the PCI Bus circuit that measured below 100.0 ohms 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
8	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.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All

Symptom List:

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY
P0100-MASS AIR FLOW SENSOR PLAUSIBILITY POSITIVE AREA
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 PLAUSIBILITY.

When Monitored and Set Condition:

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY

When Monitored: With the engine running.

Set Condition: The mass airflow measure does not correspond with the engine load measurements.

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

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

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

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
ECM - 5-VOLT SUPPLY CIRCUIT
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
MASS AIRFLOW SENSOR
SENSOR GROUND OPEN
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
MAF SENSOR SIGNAL CIRCUIT OPEN

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY — Continued

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
MAF SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ECM SENSOR GROUND CIRCUIT OPEN
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAF SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
FUEL PRESSURE SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
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. Any of these conditions can cause a MAF Plausibility 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 18	All
2	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage of the 5-volt Supply circuit in MAF Sensor harness connector. Is the voltage between 4.7 and 5.3 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 PLAUSIBILITY — 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 5-volt supply 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 PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage between the 5-volt Supply 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 ECM/PCM Relay. Measure the voltage of the 12-volt Supply 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 ECM/PCM 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 5-volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 12 No → Repair the 5-volt Supply 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 5-volt Supply 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 5-volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the 5-volt Supply circuit at the MAF harness connector. Is the resistance below 1000 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 14	All

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
14	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the 5-volt Supply circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the 5-volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 15	All
15	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the 5-volt Supply circuit and the Sensor Ground circuit at the Fuel Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 16 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
16	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the 5-volt Supply circuit at the Fuel Pressure Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the Fuel Pressure Sensor 5-volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 17	All
17	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the 5-volt Supply circuit in the Fuel Pressure Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the Fuel Pressure Sensor 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

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
18	**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 - COMMUNICATION NOT VERIFIED
P0606-ECM ERROR GATE ARRAY - QUANTITY STOP
P0606-ECM ERROR RECOVERY HAS OCCURRED
P0606-ECM ERROR REDUNDANT OVERRUN MONITORING
P1206-CALCULATED INJECTOR VOLTAGE TOO HIGH
P1206-CALCULATED INJECTOR VOLTAGE TOO LOW
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
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
P1696-EEPROM MEMORY WRITE DENIED

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 4.75 volts.

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Barometric Pressure Sensor Signal is below 0.66 volt.

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 - COMMUNICATION NOT VERIFIED

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 out of range.

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 out of range.

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 an internal failure.

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 an internal failure.

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.

P1696-EEPROM MEMORY WRITE DENIED

When Monitored: With the ignition on.

Set Condition: The ECM detects an internal failure.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: This DTC indicates an internal ECM problem.** 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

P0105-BAROMETRIC PRESSURE CIRCUIT SIGNAL VOLTAGE TOO HIGH — 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

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 4.85 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
BOOST PRESSURE/IAT SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, erase ECM DTCs. 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 Boost Pressure/IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Boost Pressure/IAT Sensor harness connector. Measure the resistance of the Intake Air Temperature Sensor Signal circuit. Is the resistance below 5.0 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 Boost Pressure/IAT Sensor harness connector. Connect a jumper wire between the IAT Sensor Signal and IAT Sensor Ground circuits in the Boost Pressure/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 Boost Pressure/Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the ECM harness connector and the Boost Pressure 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 0.21 volt.

POSSIBLE CAUSES
INTERMITTENT CONDITION
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
BOOST PRESSURE/IAT SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, erase ECM DTCs. 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 ECM harness connectors. Disconnect the Boost Pressure/IAT Sensor harness connector. Measure the resistance between ground and the Intake Air Temperature Sensor Signal circuit. Is the resistance above 100 kohms? Yes → Go To 3 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs. Does the DRB display P0110 INTAKE AIR TEMP SIGNAL VOLTAGE TOO HIGH? Yes → Replace the Boost Pressure/Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

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

TEST	ACTION	APPLICABILITY
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:

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.** Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage above 4.5 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 0.2 volt for more than 1 second.

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	Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage below 0.3 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
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

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

TEST	ACTION	APPLICABILITY
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 4.8 volts.

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.** 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 will 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 0.2 volt.

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.** 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
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. 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

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

TEST	ACTION	APPLICABILITY
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 100 kohms? 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 100 kohms? 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
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 4.7 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.** 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.

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.

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.

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.

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

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. 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

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the appropriate Cylinder Fuel Injector harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the appropriate Fuel Injector Control circuit. Is the voltage above 1.0 volt? Yes → Repair the 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 the Cylinder Fuel Injector harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 the Cylinder Fuel Injector harness connector. Measure the resistance between ground and the Fuel Injector Control circuit. Is the resistance below 1000 ohms? Yes → Repair the Fuel Injector Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Cylinder Fuel Injector harness connector. 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

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Cylinder Fuel Injector harness connector. Measure the resistance between the Fuel Injector Control circuit and the Common Driver circuit. Is the resistance below 1000 ohms? 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 the Cylinder Fuel Injector harness connector. Measure the resistance of the Fuel Injector Control circuit. Is the resistance below 10 ohms? Yes → Go To 8 No → Repair the 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 the Cylinder Fuel Injector harness connector. Measure the resistance of the Common Driver circuit. Is the resistance below 10 ohms? 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. 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 5 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 5-VOLT SUPPLY CIRCUIT
BOOST PRESSURE/INTAKE AIR TEMPERATURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	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
2	Turn the ignition off. Disconnect the Boost Pressure/IAT 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

P0235-BOOST PRESSURE SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Boost Pressure/IAT 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 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/IAT 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 5 No → Repair the 5-Volt Supply circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Replace the Boost Pressure/Intake Air Temperature 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 reset? 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
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 4.5 volts for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE/INTAKE AIR TEMPERATURE SENSOR
POOR CONNECTOR TERMINAL CONTACT
ENGINE CONTROL MODULE (5-VOLT SUPPLY SHORTED TO VOLTAGE)
ENGINE CONTROL MODULE (INTERNAL)
ENGINE CONTROL MODULE (SENSOR SIGNAL SHORTED TO VOLTAGE)

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, read the Boost Pressure Sensor voltage. **NOTE: Ensure the turbocharger wastegate is operating properly. This code can be set if turbocharger boost pressure is too high.** Is the voltage above 4.5 volts? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor 5-volt Supply circuit. Is the voltage above 5.2 volts? Yes → Go To 3 No → Go To 4	All

P0235-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage between ground and the 5-volt Supply circuit. Is the voltage above 1.0 volt? Yes → Repair the 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
4	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness 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 → Go To 5 No → Go To 6	All
5	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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
6	Turn the ignition off. Disconnect the Boost Pressure/IAT 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 7 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
7	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 4.5 volts? Yes → Replace the Boost Pressure/Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC reset? 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/IAT Sensor harness connector and the sensor. The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	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, 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 0.15 volt for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
BOOST PRESSURE/INTAKE AIR TEMPERATURE 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 0.2 volt? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Turn the ignition on. Measure the voltage between ground and the 5-volt Supply circuit. Is the voltage above 4.9 volt? Yes → Go To 3 No → Repair the 5-volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Turn the ignition on. Connect a jumper wire between the Boost Pressure Sensor Signal and 5-volt Supply 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/Intake Air Temperature 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/IAT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Boost Pressure Sensor Signal circuit. Is the resistance above 100 kohms? 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/IAT 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 100 kohms? 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/IAT 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 4.8 volts or above 5.2 volts for at least 100 ms.

POSSIBLE CAUSES
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
APP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
APP SENSOR 5-VOLT SUPPLY 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.** 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
2	Turn the ignition off. Disconnect the Boost Pressure/IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage between ground and the 5-volt Supply circuit at the Boost Pressure/IAT Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the 5-volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

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

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

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

P0335-CKP POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION

When Monitored and Set Condition:

P0335-CKP POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION

When Monitored: With the engine running.

Set Condition: The engine speed sensor signal indicates engine speed is above 5200 RPM for at least 500 milliseconds. NOTE: Engine damage is possible when the engine speed exceeds 5200 RPM.

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

TEST	ACTION	APPLICABILITY
1	**CAUTION: Engine damage is possible when engine speed exceeds 5200 RPM.** **NOTE: This DTC indicates the Engine Speed Sensor has seen an engine speed above 5200 RPM. This can occur if the vehicle is in 5th gear and the vehicle operator performs a downshift and accidentally downshifts from 5th gear to 2nd gear.** 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 4	All
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

P0335-CKP POSITION SENSOR CIRCUIT OVERSPEED RECOGNITION — Continued

TEST	ACTION	APPLICABILITY
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 reset? 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 CORRECTION FOR MAIN INJECTION
P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP DYNAMIC PLAUSIBILITY
P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP SIGNAL FREQUENCY TOO HIGH
P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP STATIC PLAUSIBILITY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0340-CMP CORRECTION FOR MAIN INJECTION.

When Monitored and Set Condition:

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

When Monitored: With the engine running.

Set Condition: The ECM detects more than three camshaft sensor signals within a 10 ms time period.

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

When Monitored: With the engine running.

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

POSSIBLE CAUSES
CHECKING FOR DAMAGE
ECM
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
VERIFY ECM/PCM RELAY OUTPUT
CMP SENSOR SIGNAL CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECM -CMP SENSOR GROUND CIRCUIT OPEN
VERIFY CMP SENSOR OPERATION DURING CRANKING CRANK
CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
CMP SENSOR CIRCUIT SHORTED TO VOLTAGE

P0340-CMP CORRECTION FOR MAIN INJECTION — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: The Timing Belt must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.** 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 ECM/PCM Relay Output circuit in CMP Sensor harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the ECM/PCM 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. 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 CORRECTION FOR MAIN INJECTION — 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/Boost Pressure Sensor harness connector. Disconnect the Camshaft Position Sensor harness connector. Connect one end of a jumper wire to the IATSensor signal circuit in the IAT/Boost Pressure 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 camshaft for conditions such as loose mounting screws, 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 = 0.1s/Div, 20 volts scale, Offset = 0.00volts, 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 the support material.** 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 CORRECTION FOR MAIN INJECTION — 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 of 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:

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE

When Monitored and Set Condition:

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE

When Monitored: With the engine running.

Set Condition: The ECM determines that the camshaft position sensor signal frequency is not plausible with the crankshaft position sensor signal frequency.

POSSIBLE CAUSES
CHECK CAMSHAFT POSITION SENSOR SIGNAL
CHECK CRANKSHAFT POSITION SENSOR SIGNAL
CHECKING CKP SENSOR FOR DAMAGE
CHECKING CMP SENSOR FOR DAMAGE
ENGINE CONTROL MODULE
GEAR ALIGNMENT
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	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 DRB III 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 DRB III display this DTC? Yes → Go To 3 No → Go To 8	All
3	Turn the ignition off. Remove the CMP Sensor. Inspect the camshaft Position Sensor for conditions such as loose mounting screws, damage or debris, also check the camshaft for cracked teeth. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the CKP Sensor. Inspect the Crankshaft Position Sensor for conditions such as loose mounting screws, damage or debris. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Using the DRB lab scope, backprobe the CMP Sensor Signal circuit at the CMP Sensor harness connector. Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRB. **NOTE: Refer to Charts and Graphs to view a correct CMP Sensor signal.** Does the DRB display a steady clean CMP Signal pattern? Yes → Go To 6 No → Perform Test for DTC P0340-Camshaft Position Sensor Circuit Static Plausibility. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Using the DRB lab scope, backprobe both of the CKP Sensor Signal circuits at the CKP Sensor 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 7 No → Perform Test for DTC P0340-Crankshaft Position Sensor Circuit Dynamic Plausibility. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Refer to the Service Information and check alignment of the camshaft sprocket, crankshaft sprocket and injection pump sprocket. Are all of the sprockets aligned correctly? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair or adjust as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE — 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:

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

When Monitored and Set Condition:

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 possible.

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CKP STATIC 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 possible.

POSSIBLE CAUSES
CHECK CRANKSHAFT POSITION SENSOR SIGNAL
ENGINE CONTROL MODULE
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	Attempt to start the engine. Did the engine start? Yes → Go To 2 No → Go To 3	All

P0340-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY — 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 the 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/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Crankshaft Position Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P0380-GLOW PLUG CIRCUIT A OPEN CIRCUIT
P0380-GLOW PLUG CIRCUIT A SHORT CIRCUIT

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

When Monitored and Set Condition:

P0380-GLOW PLUG CIRCUIT A OPEN CIRCUIT

When Monitored: With the ignition on and glow plug operation not active.

Set Condition: The ECM does not detect voltage on the Glow Plug Relay Control circuit when the relay is commanded off.

P0380-GLOW PLUG CIRCUIT A SHORT CIRCUIT

When Monitored: With the ignition on and when attempting to activate the Glow Plug Relay.

Set Condition: The ECM detects excessive current on the Glow Plug Relay Control circuit when the glow plug relay is commanded on.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
SUBSTITUTE 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 CIRCUIT A 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. Disconnect the Glow Plug Relay harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ECM/PCM Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the ECM/PCM 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. 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 5 No → Replace the Glow Plug Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Glow Plug Relay harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 1 and cavity 4 of the ECM/PCM 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 CIRCUIT A OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Glow Plug Relay harness connector. 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. Disconnect the Glow Plug Relay harness connector. 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 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
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
EGR SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
EGR SOLENOID CONTROL CIRCUIT OPEN
SUBSTITUTE EGR SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	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 ECM/PCM Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ECM/PCM 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 reset. Did this DTC reset? 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.

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	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
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

P0403-EGR SOLENOID CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the EGR Solenoid harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 No. 1 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
RADIATOR FAN RELAY NO. 1
LOW SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO GROUND
LOW SPEED RADIATOR FAN CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Does the Radiator Fan cycle on and off? 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

P0480-FAN 1 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ECM/PCM Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ECM/PCM 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 Radiator Fan Relay No. 1. Turn the ignition on. With the DRB, actuate the Low Speed Fan Relay. Do the Radiator Fans cycle on and off? Yes → Replace Radiator Fan Relay No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Low Speed Radiator Fan Control circuit. Is the resistance below 100 kohms? Yes → Repair the Low Speed Radiator Fan Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Low Speed Radiator Fan Control circuit. Is the resistance below 5.0 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.

Set Condition: The ECM detects a short to voltage on the Radiator Fan Relay No. 1 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
RADIATOR FAN RELAY NO. 1
LOW SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Does the Radiator Fan cycle on and off? 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

P0480-FAN 1 CONTROL CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the Radiator Fan Relay No. 1. Turn the ignition on. With the DRB, actuate the Low Speed Radiator Fan Relay. Do the Radiator Fans cycle on and off? Yes → Replace Radiator Fan Relay No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 No. 2 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
RADIATOR FAN RELAY NO. 2 OR 3
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO GROUND
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Does the Radiator Fan cycle on and off? 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

P0481-FAN 2 CONTROL CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Radiator Fan Relay No. 2 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the ECM/PCM Relay Output circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the ECM/PCM Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. One at a time, install a substitute relay in place of Radiator Fan Relays No. 2 and No. 3. Turn the ignition on. With the DRB, actuate the High Speed Fan Relay. Does one Radiator Fan cycle on and off? Yes → Replace the Radiator Fan Relay that the substitute relay caused the radiator fan to cycle on and off. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Radiator Fan Relays No. 2 and No. 3 harness connectors. Disconnect the ECM harness connectors. Measure the resistance between ground and the High Speed Radiator Fan Control circuit. Is the resistance above 100 kohms? 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
6	Turn the ignition off. Disconnect the Radiator Fan Relay No. 2 harness connector. Disconnect the ECM harness connectors. Measure the resistance of the High Speed Radiator Fan Control circuit. Is the resistance below 5.0 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.

Set Condition: The ECM detects a short to voltage on the Radiator Fan Relay No. 2 Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
RADIATOR FAN RELAY NO. 1 OR 3
HIGH SPEED RADIATOR FAN CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Does the Radiator Fan cycle on and off? 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

P0481-FAN 2 CONTROL CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. One at a time, install a substitute relay in place of Radiator Fan Relays No. 2 and then No. 3. Turn the ignition on. With the DRB, actuate the High Speed Radiator Fan Relay. Does one Radiator Fan cycle on and off? Yes → Replace the Radiator Fan Relay that the substitute relay caused the radiator fan to cycle on and off. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect Radiator Fan Relays No. 2 and 3 harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 HIGH LEVEL DURATION
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 the vehicle is capable.

P0500-VEHICLE SPEED SENSOR PLAUSIBILITY

When Monitored: With the engine under load and engine speed greater than 2400 RPM while vehicle speed is below 20 km/h (12 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 cannot be achieved with the present amount of fuel being delivered.

P0500-VEHICLE SPEED SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the engine running.

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
IGNITION SWITCH OUTPUT CIRCUIT OPEN
SPEEDOMETER PINION AND DRIVE TEETH DAMAGED
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE - SHORTED TO VOLTAGE
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
VEHICLE SPEED SENSOR
ENGINE CONTROL MODULE - INTERNAL FAULT

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
1	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
4	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. Turn the ignition on. Measure the voltage of the Ignition Switch Output circuit in the Vehicle Speed Sensor harness connector. Is the voltage above 10.0 volts? Yes → Go To 5 No → Repair the Ignition Switch Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
5	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. Is the voltage above 5.5 volts? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 7 No → Repair the Vehicle Speed Sensor Signal circuit for a short to voltage. 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 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 100 kohms? Yes → Go To 9 No → Repair the Vehicle Speed Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
9	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 100 kohms? Yes → Go To 10 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
10	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 5.0 ohms? Yes → Go To 11 No → Repair the Vehicle Speed Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	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 5.0 ohms? Yes → Go To 12 No → Repair the Vehicle Speed Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. **NOTE: Ensure the ECM harness connectors are connected before continuing.** Turn the ignition on. Connect a jumper wire to the Vehicle Speed Sensor Signal circuit in the VSS harness connector. With the DRB, monitor the VEHICLE SPEED while tapping the other end of the jumper wire to ground. Does the DRB display km/h (MPH) greater than 0? Yes → Replace the Vehicle Speed Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All
13	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:

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	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	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
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

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

TEST	ACTION	APPLICABILITY
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:

P0520- OIL PRESS SENSOR CIRCUIT MALF PLAUSIBILITY

When Monitored and Set Condition:

P0520- OIL PRESS SENSOR CIRCUIT MALF PLAUSIBILITY

When Monitored: At engine start-up.

Set Condition: The oil pressure signal is below the lower limit for 8 seconds after engine start-up.

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT OPEN
ECM - OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - OIL PRESSURE SENSOR SIGNAL SHORT TO GROUND
INCORRECT OIL PRESSURE
OIL PRESSURE SENSOR FAILURE
OIL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, letting the engine run for at least 30 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All
2	Refer to the Service Information and perform the Oil Pressure Test. Is the oil pressure within specification? Yes → Go To 3 No → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All

P0520- OIL PRESS SENSOR CIRCUIT MALF PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Oil Pressure Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 4 Voltage is between 4.7 and 5.4 volts. Go To 5 Voltage is below 4.7 volts. Go To 7	All
4	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Oil 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 Oil Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance of the 5-Volt Supply circuit between the ECM harness connector and the Oil Pressure Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the 5-Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Replace the Oil Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0520- OIL PRESS SENSOR CIRCUIT MALF PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance of the Oil Pressure Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 8 No → Repair the Oil Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance between ground and the Oil Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 9 No → Repair the Oil Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance between Sensor Ground and the Oil Pressure Sensor Signal 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 Oil Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. 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 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:

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects the Oil Pressure Sensor Signal above 4.7 volts for more than 3 seconds.

POSSIBLE CAUSES
ECM - OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - OIL PRESSURE SENSOR SIGNAL OPEN
ENGINE OIL PRESSURE SENSOR
OIL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P0641 or P0651 is present with this DTC, diagnose DTCs P0641 and P0651 before diagnosing this DTC.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Start the engine several times, letting the engine run for at least 30 seconds at a time. With the DRBIII®, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Oil 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 5	All

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Oil 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 Oil 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 Oil Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance of the Sensor Ground circuit. Is the resistance below 5.0 ohms? Yes → Replace the Engine Oil Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the 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 Oil Pressure Sensor harness connector. Measure the resistance of the Oil 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 Oil Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0520-OIL PRESS SENSOR CKT MALF 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 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:

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO LOW

When Monitored: With the engine running.

Set Condition: The ECM detects the Oil Pressure Sensor Signal voltage below .5 volt for more than 3 seconds.

POSSIBLE CAUSES
CHECK THE OIL PRESSURE SENSOR
ECM - OIL PRESSURE SENSOR SIGNAL SHORT TO GROUND
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
OIL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, 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 DRBIII®, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the Oil Pressure Sensor harness connector. Measure the voltage of the Oil Pressure Sensor Signal circuit. Is the voltage between 4.7 and 5.3 volts? Yes → Replace the Engine Oil Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance between ground and the Oil Pressure Sensor Signal circuit. Is the resistance above 100 kohms? Yes → Go To 4 No → Repair the Oil Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0520-OIL PRESS SENSOR CKT MALF SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance between Sensor Ground and the Oil Pressure Sensor Signal circuit. Is the resistance above 100 kohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Oil Pressure Sensor Signal circuit for a short to Sensor Ground. 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 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:

P0520-OIL PRESS SENSOR CKT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored and Set Condition:

P0520-OIL PRESS SENSOR CKT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
5-VOLT SUPPLY 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.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, wait 30 seconds, then start and idle the engine. 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 Oil Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage between ground and the 5-volt Supply circuit at the Oil Pressure Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the 5-volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0520-OIL PRESS SENSOR CKT MALF SUPPLY VOLTAGE TOO HIGH OR LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Oil Pressure Sensor harness connector. Measure the resistance between ground and the 5-volt Supply circuit at the Oil Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the 5-volt Supply 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 Oil Pressure Sensor harness connector. Measure the resistance between Sensor Ground and the 5-volt Supply circuit at the Oil Pressure Sensor harness connector. 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 5-volt Supply circuit for a short to Sensor Ground. 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:

P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY
P0530-A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH
P0530-A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW
P0530-A/C PRESSURE SENSOR CIRCUIT 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 P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY.

When Monitored and Set Condition:

P0530-A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The A/C Pressure Sensor Signal voltage is above 4.84 volts.

P0530-A/C PRESSURE SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The A/C Pressure Sensor Signal voltage is below 0.1 volt.

P0530-A/C PRESSURE SENSOR CIRCUIT SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Sensor Reference Voltage B voltage to the A/C Pressure Sensor is below 4.7 volts or above 5.1 volts for at least 100 ms.

POSSIBLE CAUSES
INTERMITTENT CONDITION
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO 5 VOLT SUPPLY CIRCUIT
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
A/C PRESSURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
A/C PRESSURE SENSOR
A/C PRESSURE SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
A/C PRESSURE SENSOR
SENSOR REFERENCE VOLTAGE B CIRCUIT OPEN
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY — Continued

POSSIBLE CAUSES
A/C PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
ECM - A/C PRESSURE SENSOR SIGNAL
ECM - SENSOR REFERENCE VOLTAGE B CIRCUIT
ECM - SIGNAL VOLTAGE HIGH

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: Ensure the A/C refrigerant System is properly charged per the Service Information.** Start the engine. With the DRBIII®, read the A/C Pressure Sensor voltage. Select the choice that best reflects the DRBIII® reading. Above 4.6 volts Go To 2 Between 0.7 and 4.6 volts Go To 9 Below 0.7 volt Go To 10	All
2	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connector. Measure the resistance between the A/C Pressure Sensor Signal circuit and the 5-volt Supply circuit in the A/C Pressure Sensor harness connector. Is the resistance above 100 kohms? Yes → Go To 3 No → Repair the A/C Pressure Sensor Signal circuit for a short to the 5-volt Supply circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Sensor Ground circuit at the A/C Pressure Sensor and ECM harness connectors. Is the voltage above 1.0 volt at either connector? Yes → Repair the A/C Pressure Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4 **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM may have been damaged. Retest the A/C Pressure Sensor circuit.**	All

P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the A/C Pressure Sensor Signal circuit in the A/C Pressure Sensor harness connector. Is the voltage above 5.5 volts? Yes → Repair the A/C Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Connect a jumper wire between the A/C Pressure Sensor Signal circuit and the Sensor Ground circuit. With the DRBIII®, monitor the A/C Pressure Sensor voltage. Turn the ignition on. Is the voltage below 1.0 volt? Yes → Replace the A/C Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connector. Measure the resistance of the A/C Pressure Sensor Signal circuit. Is the resistance below 5 ohms? Yes → Go To 7 No → Repair the A/C Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Measure the resistance between ground and the Sensor Ground circuit. Is the resistance below 30 ohms? Yes → Go To 8 No → Repair the Sensor Ground 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

P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY — 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
10	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Sensor Reference Voltage B circuit in the A/C Pressure Sensor harness connector. Is the voltage between 4.5 and 5.5 volts? Yes → Go To 11 No → Go To 15	All
11	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Turn the ignition on. With the DRBIII®, monitor the A/C Pressure Sensor voltage. Is the voltage above 0.7 volt? Yes → Replace the A/C Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All
12	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the A/C Pressure Sensor Signal circuit. Is the resistance above 100 kohms? Yes → Go To 13 No → Repair the A/C Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P0530-A/C PRESSURE SENSOR CIRCUIT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the A/C Pressure Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 100 kohms? Yes → Go To 14 No → Repair the A/C Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
14	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
15	Turn the ignition off. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Reference Voltage B circuit. Is the resistance below 5 ohms? Yes → Go To 16 No → Repair the Sensor Reference Voltage B circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
16	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:
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 ECM/PCM 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: 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
2	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Using a 12-volt test light connected to ground, check all of the ECM Battery Supply and ECM/PCM Relay Output circuits including the Battery(+) Sense (Fuel Heater Relay Output) circuit. Does the test light illuminate brightly for each circuit? Yes → Go To 3 No → Repair the Battery Supply or ECM/PCM Relay Output circuit(s) for high resistance. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
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 100 kohms? 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 100 kohms? 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
***CHECKING THE CHARGING SYSTEM OPERATION - DIESEL**

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.

POSSIBLE CAUSES
INTERMITTENT CONDITION
GENERATOR BELT CONDITION OR TENSION
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 GROUND CIRCUIT HIGH RESISTANCE
FUSED ECM/PCM RELAY OUTPUT CIRCUIT TO GENERATOR OPEN
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. Is the generator belt in good condition and tensioned properly? Yes → Go To 2 No → Repair as necessary. Perform CHARGING VERIFICATION - VER-3.	All

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	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 3 No → Repair the Generator Fused B+ circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
3	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 4 No → Repair the Generator Ground circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	All
4	Turn the ignition off, then on. With the DRB, read and record the Battery Voltage. With a voltmeter, measure and record the voltage between the Battery terminals. Compare the DRB Battery Voltage reading to the voltmeter reading. Is the difference between the two readings less than 0.5 volt? Yes → Go To 5 No → Go To 6	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 CHARGING VERIFICATION - VER-3. No → Test Complete.	All

P0560-SYSTEM VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. With a voltmeter, measure and record the voltage between the Battery terminals. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the ECM/PCM Relay Output circuits and Battery(+) Sense (Fuel Heater Relay Output) circuit in the ECM C1 harness connector, pin 19. Are all voltage measurements within 0.5 volt of each other? Yes → Go To 7 No → Repair the circuit that had high resistance. Perform CHARGING VERIFICATION - VER-3.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 8 No → Repair the Generator Field Control circuit for a short to voltage. Perform CHARGING VERIFICATION - VER-3.	All
8	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 9 No → Repair the Generator Field Control circuit for an open. Perform CHARGING VERIFICATION - VER-3.	All
9	Turn the ignition off. Disconnect the generator harness connector. Turn the ignition on. Measure the voltage of the Fused ECM/PCM Relay Output circuit. Is the voltage above 10.0 volts? Yes → Go To 10 No → Repair the Fused ECM/PCM Relay Output circuit for an open. Perform CHARGING VERIFICATION - VER-3.	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 CHARGING VERIFICATION - VER-3.	All

Symptom:

P0579-S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY

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

TEST	ACTION	APPLICABILITY
1	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, actuate each of the S/C Switch buttons. 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
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

P0579-S/C SWITCH SIGNAL CIRCUIT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Replace the S/C Switches. 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, actuate each of the S/C Switch buttons. Monitor the DRB for ECM DTCs. Did this DTC reset? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4. No → The repair is complete. 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 ON/OFF/SET SWITCH
S/C ON/OFF/SET SWITCH SIGNAL CIRCUIT OPEN
S/C SWITCH SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Disconnect the S/C ON/OFF/SET button 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 2 Between 4.5 and 5.5 volts. Go To 3 Above 5.5 volts Go To 5	All
2	Turn the ignition off. Disconnect the S/C ON/OFF/SET 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 ON/OFF/SET Switch Signal circuit for an open. Perform SPEED CONTROL VERIFICATION - VER-4.	All
3	Turn the ignition off. Disconnect the S/C ON/OFF/SET switch harness connector. Turn the ignition on. Connect a jumper wire between the S/C Switch Signal circuit and the Sensor Ground at the ON/OFF/SET Switch harness connector. With the DRB, read the S/C Switch volts. Does the DRB display below 0.5 volt? Yes → Replace the S/C ON/OFF/SET Switch. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 4	All

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

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the S/C ON/OFF/SET Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor 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 Sensor Ground circuit for an open. Perform SPEED CONTROL VERIFICATION - VER-4.	All
5	Turn the ignition off. Disconnect the S/C ON/OFF/SET 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 ON/OFF/SET 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

Symptom:

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

POSSIBLE CAUSES
INTERMITTENT CONDITION
S/C ON/OFF/SET SWITCH
S/C RESUME/ACCEL SWITCH
S/C/ SWITCH SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
S/C SWITCH SIGNAL CIRCUIT SHORTED TO GROUND
ECM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the S/C Switch voltage. Is the S/C Switch voltage below 1.0 volt? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition on. With the DRBIII®, monitor the S/C Switch voltage. Disconnect the S/C ON/OFF/SET Switch harness connector. Did the DRB reading change to above 4.7 volts? Yes → Replace the S/C ON/OFF/SET Switch. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 3	All
3	Turn the ignition on. With the DRBIII®, monitor the S/C Switch voltage. Disconnect the S/C Resume/Accel Switch harness connector. Did the volt change to above 4.7 volts? Yes → Replace the S/C Resume/Accel Switch. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 4	All
4	Turn the ignition off. Disconnect the S/C ON/OFF/SET Switch harness connector. Disconnect the S/C RESUME/ACCEL Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between the S/C Switch Signal circuit and the Sensor Ground circuit in the ECM harness connector. Is the resistance below 5.0 ohms? Yes → Repair the S/C Switch Signal circuit shorted to the Sensor Ground circuit. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 5	All

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

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the S/C ON/OFF/SET Switch harness connector. Disconnect the Speed Control Resume/Accel Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the S/C Switch Signal circuit. Is the resistance below 5.0 ohms? Yes → Repair the S/C Switch Signal circuit for a short to ground. Perform SPEED CONTROL VERIFICATION - VER-4. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace the Engine Control Module in accordance with the Service Information. Perform SPEED CONTROL VERIFICATION - VER-4.	All
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.

Set Condition: The ECM detects a short to voltage on the Starter Relay Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SUBSTITUTE ECM/PCM RELAY
STARTER RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	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. 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
3	Turn the ignition off. Remove the Starter Relay from the IPM. Turn the ignition on. Measure the voltage of the Starter Relay Output 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 Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P0615-STARTER RELAY CIRCUIT SHORT CIRCUIT — 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:

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 BATTERY VOLTAGE TOO LOW
P0620-GENERATOR FIELD CONTROL MALF CHARGING VOLTS TOO LOW
P0620-GENERATOR FIELD CONTROL MALF OPEN CIRCUIT
P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT
P0620-GENERATOR FIELD CONTROL MALF UNSTABLE CURRENT

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 TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM senses battery voltage above 16.5 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

P0620-GENERATOR FIELD CONTROL MALF SHORT CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Generator Field Control circuit.

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 BATTERY(+) SENSE CIRCUIT
HIGH RESISTANCE ON THE BATTERY(-) SENSE CIRCUIT
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	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 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
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Generator Field harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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

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

TEST	ACTION	APPLICABILITY
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 100 kohms? 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 the Fuel Heater Relay from the IPM. Measure the resistance of the Battery(+) Sense (Fuel Heater Relay Output) circuit between the Fuel Heater Relay connector and ECM harness connector cavity C1-19. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Battery(+) Sense (Fuel Heater Relay Output) 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 Battery(-) Sense circuit. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Battery(-) Sense circuit for high resistance. Perform CHARGING VERIFICATION - VER-3.	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 CHARGING VERIFICATION - VER-3.	All

P0620-GENERATOR FIELD CONTROL MALF BATTERY VOLTAGE DEVIATION 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 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:

P0627-FUEL LIFT PUMP RELAY CONTROL CIRCUIT OPEN CIRCUIT

POSSIBLE CAUSES
INTERMITTENT CONDITION
IGNITION SWITCH (RUN/START) 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	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
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 IPM. Turn the ignition on. Using a 12-volt test light connected to ground, check the Ignition Switch (RUN/START) circuit. Did the test light illuminate brightly? Yes → Go To 4 No → Repair the Ignition Switch (RUN/START) circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

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

TEST	ACTION	APPLICABILITY
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 IPM. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Lift Pump Relay Control circuit. Is the resistance above 100 kohms? 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
6	Turn the ignition off. Remove the Fuel Lift Pump Relay from the IPM. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Lift Pump Relay Control circuit. Is the resistance below 5.0 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

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

TEST	ACTION	APPLICABILITY
1	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
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

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

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the Fuel Lift Pump Relay from the IPM. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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	Turn the ignition on. With the DRB, erase ECM DTCs. 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 Engine Oil Pressure Sensor harness connectors. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 ECM/PCM 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 ECM/PCM 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 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
ENGINE OIL PRESSURE SENSOR 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	Turn the ignition on. With the DRB, erase ECM DTCs. 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 Engine Oil Pressure 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 Engine Oil Pressure 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 Engine Oil Pressure 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 Engine Oil Pressure Sensor harness connector. Measure the resistance between the Sensor Reference Voltage A circuit and the Engine Oil Pressure Sensor Ground circuit. Is the resistance above 100 kohms for both measurements? 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
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

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

TEST	ACTION	APPLICABILITY
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
A/C CLUTCH RELAY CONTROL CIRCUIT SHORT TO GROUND
A/C CLUTCH RELAY INTERMITTENT OPERATION
INTERMITTENT CONDITION
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
INTEGRATED POWER MODULE
A/C CLUTCH RELAY
IPM FUSE/RELAY CENTER
A/C CLUTCH RELAY CONTROL CKT OPEN
ECM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Is the A/C Clutch Relay operating? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Wiggle the wiring harness from the A/C Clutch Relay to the ECM while the relay is actuating. Did the A/C Clutch Relay stop when wiggling the wiring harness? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

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

TEST	ACTION	APPLICABILITY
3	**WARNING: KEEP CLEAR OF THE ENGINE'S MOVING PARTS.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRB Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
4	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch circuit in the IPM. Does the test light illuminate? Yes → Go To 5 No → Go To 10	All
5	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the IPM. 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 6	All
6	Turn the ignition off. Disconnect the IPM C3 harness connector. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the IPM harness connector. With the DRBIII®, actuate the A/C Clutch Relay. Does the test light flash on and off? Yes → Replace the IPM Fuse/Relay Center. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All

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

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the IPM C3 harness connector. Disconnect the ECM harness connector. Measure the resistance of the A/C Clutch Relay Control circuit between the IPM C3 harness connector and the ECM harness connector. Is the resistance below 5.0 ohms. Yes → Go To 8 No → Repair the A/C Clutch Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the IPM C3 harness connector. Disconnect the ECM harness connector. Measure the resistance of the A/C Clutch Relay Control circuit in the IPM C3 harness connector to ground. 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 9	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	Turn the ignition off. Disconnect the IPM C3 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch circuit in the IPM harness connector. Does the test light illuminate? Yes → Replace the IPM Fuse/Relay Center. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fused Ignition Switch Output circuit for an open. 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.

Set Condition: The ECM detects a short to voltage on the A/C Clutch Relay Control circuit.

POSSIBLE CAUSES
A/C CLUTCH RELAY INTERMITTENT OPERATION
INTERMITTENT CONDITION
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
INTEGRATED POWER MODULE
A/C CLUTCH RELAY
IPM FUSE/RELAY CENTER
A/C CLUTCH RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ECM

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Is the A/C Clutch Relay operating? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Wiggle the wiring harness from the A/C Clutch Relay to the ECM while the relay is actuating. Did the A/C Clutch Relay stop when wiggling the wiring harness? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

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

TEST	ACTION	APPLICABILITY
3	**WARNING: KEEP CLEAR OF THE ENGINE'S MOVING PARTS.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DRB Freeze Frame information. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
4	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch circuit in the IPM. Does the test light illuminate? Yes → Go To 5 No → Go To 9	All
5	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the IPM. 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 6	All
6	Turn the ignition off. Disconnect the IPM C3 harness connector. Turn the ignition on. Using a 12-volt test light connected to 12-volts, probe the A/C Clutch Relay Control circuit in the IPM harness connector. With the DRBIII®, actuate the A/C Clutch Relay. Does the test light flash on and off? Yes → Replace the IPM Fuse/Relay Center. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All

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

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the IPM C3 harness connector. Disconnect the ECM harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 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 IPM C3 harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the Fused Ignition Switch circuit in the IPM harness connector. Does the test light illuminate? Yes → Replace the IPM Fuse/Relay Center. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fused Ignition Switch Output circuit for an open. 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 5-Volt Supply circuit.

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

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, erase ECM DTCs. 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 Boost Pressure Sensor harness connector. Disconnect the A/C Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 ECM/PCM Relay.**	All

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Accelerator Pedal Position Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage on the Accelerator Pedal Position Sensor 5-Volt Supply circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Accelerator Pedal Position Sensor 5-Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire and reinstall the ECM/PCM 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:
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 the Accelerator Pedal Position Sensor 5-Volt Supply circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE OR ACCEL PEDAL POSITION 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 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
ACCELERATOR PEDAL POSITION SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition on. With the DRBIII® in Sensors, monitor the Accelerator Pedal Position and Boost Pressure Sensors. One at a time while monitoring the DRB sensor readings, disconnect then reconnect the Boost Pressure and Accelerator Pedal Position Sensor harness connectors. **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.** Did the DRB sensor voltage readings rise when one sensor was disconnected? Yes → Replace the Sensor that, when disconnected, caused the other sensor's DRB reading to rise. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

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

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Boost Pressure Sensor and A/C Pressure Sensor 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 A/C Pressure Sensor harness connector. Measure the resistance between the Sensor Reference Voltage B circuit and the A/C Pressure 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 both measurements? 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
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 5-Volt Supply circuit. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the Accelerator Pedal Position Sensor 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 5-Volt Supply circuit and the Sensor Ground circuit. Is the resistance above 100 kohms? Yes → Go To 7 No → Repair the Accelerator Pedal Position Sensor 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

P0651-SENSOR REFERENCE VOLTAGE B CKT 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:

P0685-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY

When Monitored and Set Condition:

P0685-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY

When Monitored: During after-run.

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

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ECM/PCM RELAY
ECM/PCM 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	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-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO EARLY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the ECM/PCM 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 ECM/PCM Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the ECM/PCM Relay from the IPM. Disconnect the ECM harness connectors. Measure the resistance of the ECM/PCM Relay Control circuit while wiggling the wiring harness and connectors between the ECM and the IPM. Was the resistance above 5.0 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the ECM/PCM 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-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE

When Monitored and Set Condition:

P0685-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE

When Monitored: During after-run.

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

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ECM/PCM RELAY
ECM/PCM RELAY CONTROL CIRCUIT SHORTED TO GROUND INTERMITTENTLY
ECM/PCM 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	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-ECM/PCM RELAY CONTROL CIRCUIT SHUTS OFF TOO LATE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the ECM/PCM 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 ECM/PCM Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the ECM/PCM Relay from the IPM. Disconnect the ECM harness connectors. Measure the resistance between ground and the ECM/PCM Relay Control circuit while wiggling the wiring harness and connectors. Was the resistance below 5.0 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the ECM/PCM 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 ECM/PCM Relay from the IPM. Turn the ignition on. Measure the voltage of the ECM/PCM 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 ECM/PCM Relay Output circuit for a short to voltage. 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:

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	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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 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 Primary Brake Switch Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:
P0833-CLUTCH PEDAL PLAUSIBILITY

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	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
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

P0833-CLUTCH PEDAL PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
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 LEAKAGE DETECTED
P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH-SHUT OFF
P1130-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW
P1130-FUEL RAIL PRESSURE MALFUNCTION SOLENOID OPEN

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

When Monitored and Set Condition:

P1130-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED

When Monitored: With the engine running.

Set Condition: The ECM detects the desired flow of fuel at idle is greater than 6000 mm^3/sec.

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) with the engine off.

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 SOLENOID OPEN

When Monitored: With the engine running.

Set Condition: The ECM detects a higher rate of fuel pressure than the target pressure.

POSSIBLE CAUSES
CHECKING FOR OTHER DTC'S
CHECKING THE FUEL PRESSURE
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR
FUEL SYSTEM LEAK

P1130-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED — Continued

POSSIBLE CAUSES
INJECTOR COMMON DRIVER CIRCUIT OPEN
INTERMITTENT CONDITION

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.** 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
2	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. 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 7	All
3	Turn the ignition off. 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
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 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 5	All

P1130-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED — Continued

TEST	ACTION	APPLICABILITY
5	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 6 No → Repair the Injector Common Driver circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Refer to the appropriate Service Information and perform the Fuel Pressure Test. **NOTE: The following is a list of problems that can cause the fuel pressure to become out of specification: restricted fuel filter or fuel lines, failed fuel pressure solenoid, air in fuel system, failed fuel sending unit, gelled fuel, faulty injector.** Is the fuel pressure within specification? Yes → Replace the Fuel Pressure Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair as necessary 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 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:

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT
P1131-FUEL PRESSURE SOLENOID PLAUSIBILITY IN AFTER-RUN
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 PLAUSIBILITY IN AFTER-RUN

When Monitored: When the ignition is turned off.

Set Condition: The ECM detects engine speed does not fall below 650 RPM within 0.5 second after ignition off.

P1131-FUEL PRESSURE SOLENOID SHORT CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Fuel Pressure Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM/PCM 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	**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.** 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 ECM/PCM Relay Output circuit. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the ECM/PCM 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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
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 C2-80 and C2-81.** Is the resistance above 100 kohms? Yes → Go To 5 No → Repair the Fuel Pressure Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P1131-FUEL PRESSURE SOLENOID OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
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:

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 23.0 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 5.0 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 17.50 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 7.98 volts.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FUSE 17 OPEN
ECM GROUND CIRCUIT(S) OPEN
BATTERY(-) SENSE CIRCUIT SHORTED TO VOLTAGE
BATTERY(+) SENSE CIRCUIT SHORTED TO GROUND
BATTERY(-) SENSE CIRCUIT OPEN
BATTERY(+) SENSE 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.** 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 17 from the IPM. 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 ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Battery (-) Sense circuit in ECM harness connector cavity C1-20. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Battery(-) Sense circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Crankcase Vent Heater harness connector. Disconnect the Fuel Heater harness connector. Remove the Fuel Heater Relay from the IPM. Measure the resistance between ground and the Battery(+) Sense (Fuel Heater Relay Output) circuit in ECM harness connector C1-19. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the Battery(+) Sense (Fuel Heater Relay Output) circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

P1511-BATTERY SENSE LINE 1 VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the ECM harness connectors. Measure the resistance between the Battery negative terminal and the Battery(-) Sense circuit in ECM harness connector cavity C1-20. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Battery(-) Sense circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Fuel Heater Relay from the IPM. Measure the resistance of the Battery(+) Sense (Fuel Heater Relay Output) circuit between ECM harness connector C1-19 and the Fuel Heater Relay Output connector in the IPM. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the Battery(+) Sense (Fuel Heater Relay Output) 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
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: With the ignition off.

Set Condition: The ECM detects a short to voltage on the Ignition Switch Sense circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM/PCM RELAY
ENGINE CONTROL MODULE
IGNITION SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
ECM/PCM RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ECM/PCM RELAY CONTROL CIRCUIT SHORTED TO GROUND

TEST	ACTION	APPLICABILITY
1	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 6	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Measure the voltage of all cavities in the ECM harness connectors. Is the voltage above 2.0 volts on any of the cavities? Yes → Go To 3 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Measure the voltage at ECM harness connector C1-22. Is voltage present at ECM harness connector C1-22? Yes → Repair the Ignition Switch Sense circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P1605-IGNITION SWITCH PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Turn the ignition on. Measure the voltage on ECM harness connector C1 cavities 4 and 5. Is the voltage below 2.0 volts on both circuits? Yes → Go To 5 No → Repair the ECM/PCM Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Measure the resistance between ground and the ECM/PCM Relay Control circuit. Is the resistance above 100 kohms? Yes → Replace the ECM/PCM Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the ECM/PCM Relay Control circuit for a short to ground. 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:

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 does not receive a 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
REFER TO COMMUNICATION SECTION
VERIFY INSTRUMENT CLUSTER COMMUNICATION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	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 → [007f]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 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 OVERRUN
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 RECEIVE TIMEOUT.

When Monitored and Set Condition:

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
VERIFY ACTIVE DTC
VERIFY INSTRUMENT CLUSTER COMMUNICATION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® attempt to communicate with the Instrument Cluster. 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

P1652-J1850 COMMUNICATION BUS RECEIVE TIMEOUT — Continued

TEST	ACTION	APPLICABILITY
2	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 List:

P1685-SKIM SYSTEM INVALID KEY CODE RECEIVED
P1685-SKIM SYSTEM INVALID SECRET KEY IN EEPROM
P1685-SKIM SYSTEM KEY COMMUNICATION TIMED OUT
P1685-SKIM SYSTEM SKIM ERROR
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 P1685-SKIM SYSTEM INVALID KEY CODE RECEIVED.

When Monitored and Set Condition:

P1685-SKIM SYSTEM SKIM ERROR

When Monitored: With the ignition on and the immobilizer disarmed.

Set Condition: The ECM detects an open, short to ground, or short to voltage on the immobilizer signal circuit.

P1685-SKIM SYSTEM WRITE ACCESS TO EEPROM FAILURE

When Monitored: With the ignition on.

Set Condition: The ECM determines that the coded message from the PCM does not match the message programmed into memory.

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

P1685-SKIM SYSTEM INVALID KEY CODE RECEIVED — Continued

TEST	ACTION	APPLICABILITY
2	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
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
P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH BRAKE SWITCH
P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH LOW IDLE SWITCH
P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH POTENTIOMETER
P2120-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH
P2120-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO LOW
P2120-ACC PEDAL POSITION SENSOR 1 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.

When Monitored and Set Condition:

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY

When Monitored: With the ignition on.

Set Condition: The Accelerator Pedal Position Sensor Signal is below 1.6% or above 17.6% and the idle switch is not in the correct state. NOTE: The idle switch is designed to transition when the accel position is approximately 16% (1.00 volt). This code sets the ECM to Limp-in Mode, which includes a fixed engine speed of 1100 RPM.

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

When Monitored: With the ignition on.

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 PLAUSIBILITY WITH LOW IDLE SWITCH

When Monitored: With the ignition on.

Set Condition: The Accelerator Pedal Position Sensor Signal is below 0.20 volts, the idle switch transitions at too high a percentage intermittently or the idle switch is not in the correct state intermittently. NOTE: The idle switch is designed to transition when the accel position is approximately 16% (1.00 volt). This code sets the ECM to Limp-in Mode, which includes a fixed engine speed of 1100 RPM.

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY WITH POTENTIOMETER

When Monitored: With the ignition on.

Set Condition: The Accelerator Pedal Position Sensor Signal is below 0.20 volts, the idle switch transitions at too high a percentage intermittently or the idle switch is not in the correct state intermittently. NOTE: The idle switch is designed to transition when the accel position is approximately 16% (1.00 volt). This code sets the ECM to Limp-in Mode, which includes a fixed engine speed of 1100 RPM.

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 4.5 volts.

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

When Monitored: With the ignition on.

Set Condition: The ECM detects voltage on the Accelerator Pedal Position Sensor Signal circuit 0.0 volt.

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 5-Volt Supply voltage is too high or too low.

POSSIBLE CAUSES
APP SENSOR IDLE VOLTAGE
APP SENSOR WIDE OPEN THROTTLE VOLTAGE
ECM - 5-VOLT SUPPLY CIRCUIT
LOW IDLE POSITION SWITCH SENSE CIRCUIT SHORTED TO GROUND
SENSOR GROUND OPEN (APP SENSOR)
SENSOR GROUND OPEN (IDLE SWITCH)
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
APP SENSOR SIGNAL CIRCUIT OPEN
LOW IDLE POSITION SWITCH SENSE CIRCUIT OPEN
5-VOLT SUPPLY CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
VERIFY LOW IDLE POSITION SWITCH OPERATION
APP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
VERIFY APP SENSOR OPERATION
APP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
LOW IDLE POSITION SWITCH SENSE CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ECM - SENSOR GROUND OPEN
APP SENSOR CIRCUIT SHORTED TO VOLTAGE
APP SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
LOW IDLE POSITION SWITCH SENSE CIRCUIT SHORTED TO VOLTAGE
LOW IDLE POSITION SWITCH SENSE GROUND CIRCUIT SHORTED TO VOLTAGE
VERIFY CORRECT SWITCHING
ECM - APP 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: The brake switch must be operational for the result of this test to be valid.** Turn the ignition off. Disconnect the APP Sensor harness connector. Connect one end of a jumper wire to the Low Idle Position Sense circuit at the APP Sensor harness connector. Turn the ignition on. With the DRB, monitor the Low Idle Position Switch input while tapping the other end of the jumper wire to the Sensor Ground circuit at the APP Sensor harness connector. Does the DRB change between LOW IDLE and ABOVE IDLE when tapping the jumper wire? Yes → Go To 2 No → Go To 20	All
2	Turn the ignition on. With the DRB, observe the Low Idle Position Switch input. Press and release the accelerator pedal several times while observing the DRB display. **NOTE: The Low Idle Position Switch input should change from IDLE to ABOVE IDLE when pressing and releasing the accelerator pedal.** Did Low Idle Position Switch input change between LOW IDLE and ABOVE IDLE? Yes → Go To 3 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 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the APP Sensor harness connector. Turn the ignition on. Measure the voltage of the 5-volt Supply circuit in APP Sensor harness connector. Is the voltage between 4.7 and 5.3 volts? Yes → Go To 4 No → Go To 16	All
4	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 5 No → Go To 12	All
5	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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 6	All
6	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 7 No → Repair the APP Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition on. With the DRB, read the PEDAL OUTPUT VOLTS with the accelerator pedal in the at rest position. Does the DRB display between 0.50 and 1.00 volt? Yes → Go To 8 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 — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition on. Fully depress the accelerator pedal. With the DRB, read the PEDAL OUTPUT VOLTS. Does the DRB display between 4.1 and 4.6 volts? Yes → Go To 9 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition on. With the DRB, read the PEDAL OUTPUT VOLTS. With the accelerator pedal in the idle position, slowly depress the accelerator pedal until the pedal is fully depressed. **NOTE: The PEDAL OUTPUT VOLTS should increase smoothly as the pedal is depressed.** Does the voltage increase smoothly with the accelerator pedal travel? Yes → Go To 10 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition on. With the DRB, select Engine and with the custom display feature select Low Idle Switch input and the Accel Pedal %. Slowly depress and release the accelerator pedal several times while monitoring the DRB III display. **NOTE: The Low Idle Position Switch state should change between 5% and 10% of Accelerator Pedal position.** Did the Low Idle Position Switch state change between 5% and 10% of Accelerator Pedal position? Yes → Go To 11 No → Replace the Accelerator Pedal Position Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
11	**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
12	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 13 No → Repair the APP Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	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 14	All
14	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 of 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 15	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM 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
16	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the 5-volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 17 No → Repair the 5-volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
17	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the 5-volt Supply circuit and the Sensor Ground circuit at the APP Sensor harness connector. Is the resistance above 1000 ohms for both of the measurements? Yes → Go To 18 No → Repair the 5-volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
18	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the 5-volt Supply circuit. Is the resistance below 1000 ohms? Yes → Repair the 5-volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 19	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
19	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the 5-volt Supply circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the 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
20	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Low Idle Position Switch Sense circuit. Is the resistance below 10.0 ohms? Yes → Go To 21 No → Repair the Low Idle Position Switch Sense circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
21	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Low Idle Position Switch Sense circuit. Is the resistance above 1000 ohms? Yes → Go To 22 No → Repair the Low Idle Position Switch Sense circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
22	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Low Idle Position Switch Sense circuit and the Sensor Ground circuit at the APP Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 23 No → Repair the Low Idle Position Switch Sense circuit and Sensor Ground circuit for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All

P2120-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
23	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Low Idle Position Switch Sense circuit. Is the voltage above 1.0 volt? Yes → Repair the Low Idle Position Switch Sense circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 24	All
24	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Low Idle Position Switch Ground circuit. Is the voltage above 1.0 volt? Yes → Repair the Low Idle Position Switch Sense Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 25	All
25	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Low Idle Position Switch Sensor Ground circuit between the APP Sensor and the ECM. 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 Low Idle Switch Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE A/C CLUTCH OPERATION

POSSIBLE CAUSES
CHECK THE A/C CLUTCH OPERATION
FUSED B+ CIRCUIT OPEN
A/C CLUTCH RELAY
A/C CLUTCH RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
A/C CLUTCH RELAY OUTPUT CIRCUIT SHORTED TO GROUND
A/C CLUTCH RELAY OUTPUT CIRCUIT OPEN
A/C CLUTCH GROUND CIRCUIT OPEN
A/C CLUTCH

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure that the refrigerant system is properly charged. Refer to the appropriate Service Information.** Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Is the A/C Clutch actuating? Yes → The A/C Clutch System is operating properly at this time. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**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 Clutch Relay from the IPM. Using a 12-volt test light connected to ground, probe the Fused B+ circuit in the IPM. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Fused B+ circuit. Inspect fuse and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Install a substitute relay in place of the A/C Clutch Relay. Turn the ignition on. With the DRBIII®, actuate the A/C Clutch Relay. Does the A/C Clutch Relay cycle on and off? Yes → Replace the A/C Clutch Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

*CHECKING THE A/C CLUTCH OPERATION — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Disconnect the A/C Clutch harness connector. Measure the voltage of the A/C Clutch Relay Output circuit. Is the voltage above 1.0 volt? Yes → Repair the A/C Clutch Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Disconnect the A/C Clutch harness connector. Measure the resistance between ground and the A/C Clutch Relay Output circuit. Is the resistance above 100 kohms? Yes → Go To 6 No → Repair the A/C Clutch Relay Output circuit for a short to ground. Inspect fuse and replace as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Remove the A/C Clutch Relay from the IPM. Disconnect the A/C Clutch harness connector. Measure the resistance of the A/C Clutch Relay Output circuit. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the A/C Clutch Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the A/C Clutch harness connector. Using a 12-volt test light connected to 12-volts, check the A/C Clutch Ground circuit. Does the test light illuminate brightly? Yes → Go To 8 No → Repair the A/C Clutch Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	If there are no possible causes remaining, view repair. Repair Replace the A/C Clutch. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

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

POSSIBLE CAUSES
APP SENSOR
APP SENSOR - IDLE
APP SENSOR - WOT

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the Accelerator pedal is free from any restriction or binding before continuing.** Turn the ignition on. While back probing, measure the voltage of the APP Sensor Signal circuit at the ECM. **NOTE: The accelerator pedal must be released (Idle) for this step.** Is the voltage below 0.6 volt? Yes → Go To 2 No → Replace the Accelerator Pedal Position 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 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 Signal circuit at the ECM. Press the accelerator pedal completely down. Is the voltage above 3.7 volts with the accelerator pedal fully depressed? Yes → Test Complete. No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. 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 DRB, select Engine, Bosch 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
ECM GROUND CIRCUIT(S) OPEN
ECM/PCM RELAY OUTPUT CIRCUIT(S) OPEN
FUSED ECM/PCM RELAY BATTERY SUPPLY CIRCUIT OPEN
FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	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 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 circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Remove the ECM/PCM Relay from the IPM. Using a 12-volt test light connected to ground, check the Fused ECM/PCM Relay Battery Supply circuit in ECM/PCM Relay connector cavity 30. Is the test light on? Yes → Go To 4 No → Repair the Fused ECM/PCM Relay Battery Supply 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. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 in the ECM/PCM Relay connector. Using a 12-volt test light connected to ground, check the ECM/PCM Relay Output circuit in ECM harness connector C1 cavities 4 and 5. Did the test light illuminate for both circuits? Yes → Test Complete. No → Repair the ECM/PCM Relay Output circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*CHECKING THE EGR SYSTEM

POSSIBLE CAUSES
ECM/PCM RELAY OUTPUT CIRCUIT OPEN
EGR SOLENOID CONTROL CIRCUIT OPEN
EGR VALVE
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 ECM/PCM Relay Output circuit at the EGR Solenoid harness connector. Is the test light on? Yes → Go To 3 No → Repair the ECM/PCM 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
4	**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 → Test Complete. No → Replace the EGR Valve. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

***CHECKING THE ELECTRIC RADIATOR FAN OPERATION**

POSSIBLE CAUSES
ACTUATE THE HIGH AND LOW SPEED RADIATOR FAN WITH THE DRB
CHECK FOR RADIATOR FAN RELAY CONTROL DTCS
RADIATOR FAN RELAY NO. 1 OUTPUT CIRCUIT SHORTED TO VOLTAGE
RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT CIRCUIT SHORTED TO VOLTAGE
RADIATOR FAN NO. 1 CONTROL CIRCUIT SHORTED TO VOLTAGE
RADIATOR FAN RELAY NO. 1 FUSED B+ CIRCUIT OPEN
RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT CIRCUIT SHORTED TO GROUND
RADIATOR FAN RELAY NO. 2 FUSED B+ CIRCUIT OPEN
RADIATOR FAN RELAY NO. 3 FUSED B+ CIRCUIT OPEN
RADIATOR FAN NO. 1 CONTROL CIRCUIT SHORTED TO GROUND
RADIATOR FAN RELAY NO. 1
RADIATOR FAN RELAY NO. 1 - INTERNAL SHORT TO VOLTAGE
RADIATOR FAN RELAY NO. 2
RADIATOR FAN RELAY NO. 2 OR NO. 3 - INTERNAL SHORT TO VOLTAGE
RADIATOR FAN RELAY NO. 3
RADIATOR FAN NO. 1 - SHORTED
RADIATOR FAN NO. 2 - SHORTED
RADIATOR FAN RELAY NO. 1 OUTPUT CIRCUIT SHORTED TO GROUND
RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT CIRCUIT OPEN FROM RELAY NO. 2
RADIATOR FAN RELAY NO. 3 GROUND CIRCUIT OPEN
HIGH SPEED RADIATOR FAN DUAL RELAY CONTROL CIRCUIT OPEN
RADIATOR FAN RELAY NO. 1 OUTPUT CIRCUIT OPEN
RADIATOR FAN NO. 1 CONTROL CIRCUIT OPEN
RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT CIRCUIT OPEN FROM RELAY NO. 3
RADIATOR FAN - OPEN
RADIATOR FAN NO. 2 - OPEN

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read DTCs. Are any Radiator Fan DTCs present? Yes → Refer to symptom list for problems related to Radiator Fan control. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: The engine temperature must not be hot enough to cause the radiator fans to be on with the key off.** Turn the ignition off. Observe the radiator fans with the key off. Is either radiator fan running with the key off? Yes → Go To 3 No → Go To 6	All
3	**NOTE: The engine temperature must not be hot enough to cause the radiator fans to be on with the key off.** Turn the ignition off. Observe the radiator fans with the key off. Which radiator fan(s) are running? Fan 1 and Fan 2 Go To 4 Fan 2 Only Go To 5	All
4	**NOTE: The engine temperature must not be hot enough to cause the radiator fans to be on with the key off.** Turn the ignition off. Remove Radiator Fan Relay No. 1. Observe the radiator fans. Did the radiator fans stop running? Yes → Replace Radiator Fan Relay No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Radiator Fan Relay No. 1 Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**NOTE: The engine temperature must not be hot enough to cause the radiator fans to be on with the key off.** Turn the ignition off. One at a time, remove Radiator Fan Relay No. 2 and then Radiator Fan Relay No. 3. Observe the radiator fans after disconnecting each relay. Did the radiator fan stop running? Yes → Replace Radiator Fan Relay that caused the radiator fan to stop. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Radiator Fan Relay No. 2 and No. 3 Common Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition on. With the DRB, actuate the Low Speed Rad Fan and observe the Radiator Fans. **NOTE: Both Radiator Fans should operate at low speed.** Did both Radiator Fans operate as they should? Yes → Go To 7 Fans do not operate on Low Go To 15 Fan 1 on High/Fan 2 not on Go To 23 Fan 1 not on/Fan 2 on High Go To 26	All
7	Turn the ignition on. With the DRB, actuate the High and Low Speed Rad Fans at the same time and observe the Radiator Fans. **NOTE: Both Radiator Fans should operate at high speed.** Did both Radiator Fans operate as they should? Yes → The test is complete. Ensure the ECM will turn the fans on when the engine is hot. Perform ROAD TEST VERIFICATION - VER-2. Fan 1 on High/ Fan 2 not on Go To 8 Fan 1 not on/Fan 2 on High Go To 11	All
8	Turn the ignition off. Disconnect the Radiator Fan Relay No. 2 harness connector. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Did the test light illuminate brightly? Yes → Go To 9 No → Repair the Radiator Fan Relay No. 2 Fused B+ circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Install a substitute relay in place of Radiator Fan Relay No. 2. Turn the ignition on. With the DRB, actuate the High Speed Fan Relay. Does Radiator Fan No. 2 cycle on and off? Yes → Replace Radiator Fan Relay No. 2. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 10	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the Radiator Fan Relay No. 2 harness connector. Disconnect the Radiator Fan No. 2 harness connector. Measure the resistance of the Radiator Fan Relay No. 2 and No. 3 Common Output circuit from Radiator Fan Relay No. 2. Is the resistance below 5.0 ohms? Yes → Test Complete. No → Repair the Radiator Fan Relay No. 2 and No. 3 Common Output circuit from Radiator Fan Relay No. 2 for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Did the test light illuminate brightly? Yes → Go To 12 No → Repair the Radiator Fan Relay No. 3 Fused B+ circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Install a substitute relay in place of Radiator Fan Relay No. 3. Turn the ignition on. With the DRB, actuate the High Speed Fan Relay and then actuate the Low Speed Fan Relay. Does Radiator Fan No. 2 cycle on and off and then both fans cycle on and off when requested? Yes → Replace Radiator Fan Relay No. 3. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All
13	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 2 harness connector. Using a 12-volt test light connected to 12-volts, check the Radiator Fan Relay No. 3 Ground circuit at the Radiator Fan Relay No. 3 harness connector. Did the test light illuminate brightly? Yes → Go To 14 No → Repair the Radiator Fan Relay No. 3 Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
14	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the ECM harness connectors. Measure the resistance of the High Speed Radiator Fan Dual Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Test Complete. No → Repair the High Speed Radiator Fan Dual Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Did the test light illuminate brightly? Yes → Go To 16 No → Repair the Radiator Fan Relay No. 1 Fused B+ circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
16	Turn the ignition off. Install a substitute relay in place of Radiator Fan Relay No. 1. Turn the ignition on. With the DRB, actuate the Low Speed Fan Relay. Do both Radiator Fans cycle on and off? Yes → Replace Radiator Fan Relay No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 17	All
17	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Disconnect the Radiator Fan No. 1 harness connector. Using a 12-volt test light connected to 12-volts, check the Radiator Fan Relay No. 1 Output circuit in the Radiator Fan Relay No. 1 harness connector. Did the test light illuminate? Yes → Repair the Radiator Fan Relay No. 1 Output circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 18	All
18	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 2 harness connector. Using a 12-volt test light connected to 12-volts, check the Radiator Fan Relay No. 3 Ground circuit at the Radiator Fan Relay No. 3 harness connector. Did the test light illuminate brightly? Yes → Go To 19 No → Repair the Radiator Fan Relay No. 3 Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
19	Turn the ignition off. Disconnect the Radiator Fan Relay No. 1 harness connector. Disconnect the Radiator Fan No. 1 harness connector. Measure the resistance of the Radiator Fan Relay No. 1 Output circuit. Is the resistance below 5.0 ohms? Yes → Go To 20 No → Repair the Radiator Fan Relay No. 1 Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
20	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 1 harness connector. Measure the resistance of the Radiator Fan No. 1 Control circuit. Is the resistance below 5.0 ohms? Yes → Go To 21 No → Repair the Radiator Fan No. 1 Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
21	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 2 harness connector. Measure the resistance of the Radiator Fan Relay No. 2 and No. 3 Common Output circuit from Radiator Fan Relay No. 3. Is the resistance below 5.0 ohms? Yes → Go To 22 No → Repair the Radiator Fan Relay No. 2 and No. 3 Common Output circuit from Radiator Fan Relay No. 3 for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
22	Turn the ignition off. Disconnect the Radiator Fan No. 1 harness connector. Connect a fused jumper wire between the Radiator Fan No. 1 harness connector cavities. Turn the ignition on. With the DRB, actuate the Low Speed Fan Relay. Did Radiator Fan No. 2 activate on High speed? Yes → Replace Radiator Fan No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Replace Radiator Fan No. 2. Perform ROAD TEST VERIFICATION - VER-2.	All
23	**NOTE: Radiator Fan No. 2 is fed voltage from Radiator Fan Relay No. 3 during low speed operation and then fed voltage from Radiator Fan Relay No. 2 during high speed operation by a common circuit connected to both relays.** Turn the ignition off. Disconnect the Radiator Fan Relay No. 2 harness connector. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 2 harness connector. Measure the resistance between ground and the Radiator Fan Relay No. 2 and No. 3 Common Output circuit. Is the resistance above 100 kohms? Yes → Go To 24 No → Repair the Radiator Fan Relay No. 2 and No. 3 Common Output circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE ELECTRIC RADIATOR FAN OPERATION — Continued

TEST	ACTION	APPLICABILITY
24	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 1 harness connector. Using a 12-volt test light connected to 12-volts, check the Radiator Fan No. 1 Control circuit. Did the test light illuminate? Yes → Repair the Radiator Fan No. 1 Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 25	All
25	If there are no possible causes remaining, view repair. Repair Replace the Radiator Fan No. 2. Perform ROAD TEST VERIFICATION - VER-2.	All
26	Turn the ignition off. Disconnect the Radiator Fan Relay No. 3 harness connector. Disconnect the Radiator Fan No. 1 harness connector. Measure the voltage on the Radiator Fan No. 1 Control circuit. Is the voltage above 1.0 volt? Yes → Repair the Radiator Fan No. 1 Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 27	All
27	If there are no possible causes remaining, view repair. Repair Replace Radiator Fan No. 1. 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 DRB, 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. Using the DRB, 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 Sprocket - 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 GLOW PLUG OPERATION

POSSIBLE CAUSES
CHECKING THE 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 fuse or fuselink is open, refer to the system schematics for all circuits that are powered by the Glow Plug Relay fuse or fuselink to determine the cause of the blown fuse/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 IPM. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the Fused B+ (Fuse/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 100 kohms? Yes → Go To 6 No → Repair the Glow Plug Relay Output circuit for a short to ground. Inspect the fuse or 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 LIFT PUMP MOTOR OPERATION

POSSIBLE CAUSES
LIFT PUMP OUTPUT TEST
FUSED B+ CIRCUIT OPEN
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 blown 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 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 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 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 MAF SENSOR CALIBRATION

POSSIBLE CAUSES
CHECKING THE MAF SIGNAL AT 2000 RPM
CHECKING THE MAF SIGNAL AT 3000 RPM
CHECKING THE MAF SIGNAL AT 4000 RPM
CHECKING THE MAF SIGNAL AT IDLE

TEST	ACTION	APPLICABILITY
1	Allow the engine to idle for 2 minutes. **NOTE: The induction tubes connected to the MAF Sensor and the turbocharger must be properly connected and without damage, air leaks or restrictions.** With the DRBIII® in Sensors, read the MASS AIR FLOW Volts. Is the voltage between 2.0 and 2.7 volts? Yes → Go To 2 No → Replace the Mass Air Flow Sensor.	All
2	Allow the engine to idle for 2 minutes. **NOTE: The induction tubes connected to the MAF Sensor and the turbocharger must be properly connected and without damage, air leaks or restrictions.** With the DRBIII® in Sensors, read the MASS AIR FLOW Volts. With the transmission in Neutral and the parking brake set, increase engine speed to 2000 rpm and note the DRB reading. Is the voltage between 2.8 and 3.5 volts? Yes → Go To 3 No → Replace the Mass Air Flow Sensor.	All
3	Allow the engine to idle for 2 minutes. **NOTE: The induction tubes connected to the MAF Sensor and the turbocharger must be properly connected and without damage, air leaks or restrictions.** With the DRBIII® in Sensors, read the MASS AIR FLOW Volts. With the transmission in Neutral and the parking brake set, increase engine speed to 3000 rpm and note the DRB reading. Is the voltage between 3.5 and 4.1 volts? Yes → Go To 4 No → Replace the Mass Air Flow Sensor.	All

*CHECKING THE MAF SENSOR CALIBRATION — Continued

TEST	ACTION	APPLICABILITY
4	Allow the engine to idle for 2 minutes. **NOTE: The induction tubes connected to the MAF Sensor and the turbocharger must be properly connected and without damage, air leaks or restrictions.** With the DRBIII® in Sensors, read the MASS AIR FLOW Volts. With the transmission in Neutral and the parking brake set, increase engine speed to 4000 rpm for 5.0 seconds and note DRB reading. Is the voltage between 3.8 and 4.5 volts? Yes → Test Complete. No → Replace the Mass Air Flow Sensor.	All

Symptom:

*CHECKING THE SPEED CONTROL OPERATION

POSSIBLE CAUSES
BRAKE SWITCH SIGNAL
CHECKING CRUISE SWITCHES
CHECKING THE ECM FOR DTC'S
CLUTCH PEDAL SWITCH
CLUTCH PEDAL SWITCH SENSE CIRCUIT OPEN
CLUTCH PEDAL SWITCH SENSE CIRCUIT SHORTED TO GROUND
ENGINE CONTROL MODULE
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 DRB, read the CRUISE SW VOLTS. Observe the cruise switch volts on the DRB while pressing and holding each cruise button separately. **NOTE: Pressing each cruise button should result in the following voltages: ON/OFF 0.67 - 1.00v, SET 3.00 - 3.49v, RESUME/ACCEL 3.90 - 4.19v, CANCEL 1.50 - 1.90v, COAST 2.50 - 2.89v, No Button Pressed 4.39 - 4.90v** Does each switch provide the correct voltage? Yes → Go To 3 No → Refer to symptom list for problems related to S/C Switches. Perform SPEED CONTROL VERIFICATION - VER-4.	All
3	**NOTE: Prior to testing the speed control operation, ensure the Learn Speed Control feature has been performed on the ECM.** 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

*CHECKING THE SPEED CONTROL OPERATION — Continued

TEST	ACTION	APPLICABILITY
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 Signal on the DRB. 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 DRB displaying an accurate Vehicle Speed Signal? Yes → Go To 5 No → Refer to symptom list for problems related to the Vehicle Speed Sensor. Perform SPEED CONTROL VERIFICATION - VER-4.	All
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 DRB 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	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 7 No → Go To 8	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.** 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

*CHECKING THE SPEED CONTROL OPERATION — Continued

TEST	ACTION	APPLICABILITY
8	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 SPEED CONTROL VERIFICATION - VER-4. No → Go To 9	All
9	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 10 No → Repair the Clutch Pedal Switch Sense circuit for an open. Perform SPEED CONTROL VERIFICATION - VER-4.	All
10	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 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
CHECK FOR VSS DTC
IGNITION SWITCH OUTPUT CIRCUIT OPEN
SPEEDOMETER PINION AND DRIVE TEETH DAMAGED
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE - SHORTED TO VOLTAGE
VEHICLE SPEED SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL CIRCUIT OPEN
SENSOR GROUND CIRCUIT OPEN
VEHICLE SPEED SENSOR
ENGINE CONTROL MODULE - INTERNAL FAULT

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
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

*CHECKING THE VEHICLE SPEED SIGNAL — 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 Ignition Switch Output circuit in the Vehicle Speed Sensor harness connector. Is the voltage above 10.0 volts? Yes → Go To 5 No → Repair the Ignition Switch Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	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. Is the voltage above 5.5 volts? Yes → Go To 6 No → Go To 8	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Vehicle Speed Sensor harness connector. Remove the ECM/PCM Relay from the IPM. Connect a jumper wire between cavity 30 and cavity 87 of the ECM/PCM Relay connector. Turn the ignition on. Measure the voltage of the Vehicle Speed Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 7 No → Repair the Vehicle Speed Sensor Signal circuit for a short to voltage. 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 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 100 kohms? Yes → Go To 9 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
9	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 100 kohms? Yes → Go To 10 No → Repair the Vehicle Speed Sensor Signal circuit for a short to the Sensor Ground circuit. 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 of the Vehicle Speed Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 11 No → Repair the Vehicle Speed Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	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 5.0 ohms? Yes → Go To 12 No → Repair the Vehicle Speed Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the Vehicle Speed Sensor harness connector. **NOTE: Ensure the ECM harness connectors are connected before continuing.** Turn the ignition on. Connect a jumper wire to the Vehicle Speed Sensor Signal circuit in the VSS harness connector. With the DRB, monitor the VEHICLE SPEED while tapping the other end of the jumper wire to ground. Does the DRB display km/h (MPH) greater than 0? Yes → Replace the Vehicle Speed Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All
13	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:

***ENGINE CRANKS BUT WILL NOT START**

POSSIBLE CAUSES
CHECK CAMSHAFT POSITION SENSOR SIGNAL
CHECK CRANKSHAFT POSITION SENSOR SIGNAL
CHECKING FOR ECM CODES
CHECKING FOR SKIM CODES
CHECKING THE ECT SENSOR
CHECKING THE GLOW PLUG OPERATION
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
SENSOR GROUND OPEN

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	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 DRB reading. Are the two readings within 10°C of each other? Yes → Go To 4 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
4	**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 5 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
5	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 6	All
6	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 7	All
7	Turn the ignition off. Using the DRB 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 DRB. **NOTE: Refer to Charts and Graphs to view a correct CMP Sensor signal.** Does the DRB display a steady clean CMP Signal pattern? Yes → Go To 8 No → Perform Test for DTC P0340-Camshaft Position Sensor Circuit Static Plausibility. Perform NO START VERIFICATION - VER-1.	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
8	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 9 No → Perform Test for DTC P0340-Crankshaft Position Sensor Circuit Dynamic Plausibility. Perform NO START VERIFICATION - VER-1.	All
9	Refer to the Service Information and perform the fuel pressure test. Is the fuel pressure within specification? Yes → Go To 10 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
10	Refer to the Service Information and perform the fuel pressure test. Note the test results. Using the DRB, read the Fuel Pressure PSI and compare the two readings. Are the two readings within 3450 kPa (500 PSI) of each other? Yes → Go To 11 No → Go To 13	All
11	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 12	All
12	Inspect the fuel supply for contamination. Is the fuel contaminated? Yes → Check the fuel supply for contamination. 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
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

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
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
CHECKING FOR SKIM CODES
CLUTCH INTERLOCK SWITCH
CLUTCH INTERLOCK SWITCH OUTPUT CIRCUIT
ECM
IGNITION SWITCH START OUTPUT CIRCUIT OPEN
IGNITION SWITCH START OUTPUT CIRCUIT OPEN
INSPECT BATTERY CABLES
MECHANICAL PROBLEM
OPEN FUSED BATTERY (+) CIRCUIT
STARTER MOTOR
STARTER RELAY
STARTER RELAY CONTROL CIRCUIT OPEN
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
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 IPM. **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 IPM connector. Did the engine crank? Yes → Go To 4 No → Go To 11	All
4	Remove the Starter Relay from the IPM. Using a 12-volt test light connected to ground, check the Ignition Switch Start Output circuit while fully depressing the clutch pedal and turning the ignition switch to the START position. Does the test light illuminate with the ignition switch in the START position? Yes → Go To 5 No → Go To 9	All
5	Turn the ignition off. Remove the Starter Relay from the IPM. 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 6	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to ground, probe ECM harness connector cavity 49 while fully depressing the clutch pedal and turning the ignition switch to the START position. Does the test light illuminate while the ignition is in the Start position. Yes → Go To 7 No → Repair the Ignition Switch Start Output circuit to the ECM. Perform NO START VERIFICATION - VER-1.	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Relay from the IPM. Remove the ECM/PCM Relay from the IPM. Using a jumper wire, connect ECM/PCM relay connector cavities 30 and 87 in the IPM. 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 8	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Relay from the IPM. Measure the resistance of the Starter Relay Control circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the ECM in accordance with the Service Information. Perform NO START VERIFICATION - VER-1. No → Repair the Starter Relay Control circuit for an open. Perform NO START VERIFICATION - VER-1.	All
9	Turn the ignition off. Remove the Starter Relay from the IPM. Disconnect the Clutch Interlock Switch harness connector. Connect a jumper wire across the Clutch Interlock Switch harness connector. Using a 12-volt test light connected to ground, check the Ignition Switch Start Output circuit at the Starter Relay connector in the IPM and turning the ignition switch to the crank position. Does the test light illuminate with the ignition switch in the crank position? Yes → Replace the Clutch Interlock Switch. Perform NO START VERIFICATION - VER-1. No → Go To 10	All
10	Turn the ignition off. Disconnect the Clutch Interlock Switch harness connector. Remove the Starter Relay from the IPM. Measure the resistance of the Clutch Interlock Switch Output circuit between the IPM and the Clutch Interlock Switch harness connector. Is the resistance below 10.0 ohms?? Yes → Repair the Ignition Switch Start Output circuit to the Clutch Interlock Switch. Perform NO START VERIFICATION - VER-1. No → Repair the Clutch Interlock Switch Output circuit for an open. Perform NO START VERIFICATION - VER-1.	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
11	Remove the Starter Relay from the IPM. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Is the test light on? Yes → Go To 12 No → Repair the Fused B(+) circuit for an open. Perform NO START VERIFICATION - VER-1.	All
12	Turn the ignition off. Remove the Starter Relay from the IPM. 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 IPM. Does the test light illuminate brightly? Yes → Go To 13 No → Repair the Starter Relay Output circuit for an open. Perform NO START VERIFICATION - VER-1.	All
13	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 14	All
14	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
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 microcontroller every 65.5 milliseconds

EEPROM FAILURE

When Monitored: With the ignition on.

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

INTERNAL FAULT

When Monitored: With the ignition on.

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

RAM FAILURE

When Monitored: With the ignition on.

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

SERIAL LINK INTERNAL FAULT

When Monitored: With the ignition on.

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

STACK OVERFLOW FAILURE

When Monitored: With the ignition on.

Set Condition: The microcontroller has exceeded its stack space limit.

ANTENNA FAILURE — Continued

POSSIBLE CAUSES
SKIM INTERNAL DTC FAILURE

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

Symptom List:

PCM STATUS FAILURE
SERIAL LINK EXTERNAL FAULT

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

When Monitored and Set Condition:

PCM STATUS FAILURE

When Monitored: With the ignition on.

Set Condition: This DTC exists when a PCM STATUS message was not received from the ECM 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 ECM due to a SKIM reset, or during SECRET KEY transfers to the ECM.

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

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

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure the ECM has proper power and ground connections 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 ECM due to a SKIM or ECM reset.

Set Condition: When a ECM 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 ECM.

VIN MISMATCH

When Monitored: With the ignition on.

Set Condition: When the VIN received from the ECM 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
PCM

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 a 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 DTC's. 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 IDs stored in the SKIM's memory.

TRANSPONDER RESPONSE MISMATCH

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

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

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

TRANSPONDER COMMUNICATION FAILURE — Continued

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read and record the SKIM DTCs. With the DRBIII®, erase the SKIM DTCs. **NOTE: Perform the following test several times to ensure the DTC is current.** Turn the ignition off. Wait 10 seconds. Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display the DTC that was previously erased? Yes → Go To 2 No → Go To 7	All
2	Are there multiple vehicle ignition keys available? Yes → Go To 3 No → Go To 4	All
3	**NOTE: Perform the following steps using one of the vehicle ignition keys. When finished, repeat the procedure using each of the other vehicle keys one at a time.** With the DRBIII®, erase the SKIM 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 keys 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. With the DRBIII®, record and erase all DTCs from ALL modules. Cycle the ignition on then off. 3. If the Sentry Key Immobilizer Module (SKIM) or the Engine Control Module (ECM) was replaced, proceed to number 12. If the SKIM or ECM was not replaced, continue to the next number. 4. If the Body Control Module (BCM) was replaced, turn the ignition on for 15 seconds (to allow the new BCM to learn VIN) or engine may not start (if VTSS equipped). If the vehicle is equipped with VTSS, use the DRBIII® and enable VTSS. 5. Program all other options as needed. 6. If any actuators were replaced in the HVAC System, with the DRBIII® in HVAC, select System Tests then select HVAC Door Recalibration (manual temperature system only). 7. If any actuators were replaced in the ATC System, with the DRBIII® in Automatic Temp Control, select Miscellaneous then select Reset ATC Head. 8. For Three-Zone HVAC Systems, if HVAC Control/Rear Blower Rear Control was replaced/ Rear Blend Pot Circuit Open/Short DTC was set/any rear blend pot circuit was repaired, proceed to Number 9 & 10. Otherwise, proceed to Number 11. 9. With DRBIII® in HVAC, select System Tests then select HVAC Door Recalibration. Door Recalibration must pass before proceeding to next step. 10. With DRBIII® in HVAC, select System Tests then select Reset Rear Blend Switch Span. Rotate Rear Blend/Mode control on Rear Blower Rear Control to full cold. Wait five seconds, then rotate control to full hot. 11. If any repairs were made to the power sliding door or power liftgate, use the DRBIII® and perform the open and close system tests. Observe the instructions on the DRBIII® screen. Proceed to number 16. 12. Obtain the vehicle's unique PIN assigned to it's original SKIM from either the vehicle's invoice or from Chrysler's Customer Assistance Center (1-800-992-1997). 13. NOTE: Once Secured Access Mode is active, the SKIM will remain in that mode for 60 seconds. 14. With the DRBIII®, select THEFT ALARM, SKIM, MISCELLANEOUS and select SKIM REPLACED. Enter the 4 digit PIN to put the SKIM in Secured Access Mode. 15. The DRBIII® will prompt for the following steps. (1) Program the country code into the SKIM's memory. (2) Program the vehicle's VIN into the SKIM memory. (3) Transfer the vehicle's Secret Key data from the ECM. 16. Using the DRBIII®, program all customer keys into the SKIM memory. This requires that the SKIM be in Secured Access Mode, using the 4 digit PIN. 17. Note: If the ECM is replaced, the VIN and the unique Secret Key data must be transferred from the SKIM to the ECM. This procedure requires the SKIM to be placed in Secured Access Mode using the 4-digit PIN. 18. Note: If 3 attempts are made to enter Secured Access Mode using an incorrect PIN, Secured Access Mode will be locked out for 1 hour which causes the DRBIII® to display ″No Resp from SKIM″. To exit this mode, turn ignition to Run for 1 hour. 19. Ensure that all accessories are turned off and the battery is fully charged. 20. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern. 21. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTCs 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

Verification Tests — Continued

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 reset, 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. 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, erase all diagnostic trouble codes (DTCs), then disconnect the DRB. 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. 15. If the repaired DTC has reset, 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

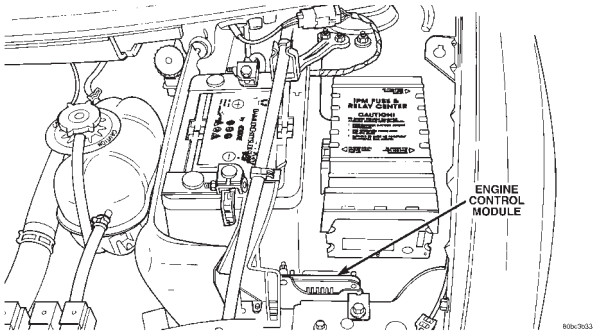
SKIS VERIFICATION	APPLICABILITY
1. Reconnect all previously disconnected components and connectors. 2. Obtain the vehicle's unique Personal Identification Number (PIN) assigned to it's original SKIM. This number can be obtained from the vehicle's invoice or Chrysler's Customer Center (1-800-992-1997). **3. NOTE: When entering the PIN, care should be taken because the SKIM will only allow 3 consecutive attempts to enter the correct PIN. If 3 consecutive incorrect PINs are entered, the SKIM will Lock Out the DRB III for 1 hour.** 4. To exit Lock Out mode, the ignition key must remain in the Run position continually for 1 hour. Turn off all accessories and connect a battery charger if necessary. 5. With the DRBIII®, select Theft Alarm, SKIM and Miscellaneous. Then, select the desired procedure and follow the steps that will be displayed. 6. If the SKIM has been replaced, ensure all of the vehicle ignition keys are programmed to the new SKIM. **7. NOTE: Prior to returning vehicle to the customer, perform a module scan to be sure that all DTCs are erased. Erase any DTCs that are found.** 8. With the DRBIII®, erase all DTCs. Perform 5 ignition key cycles leaving the key on for at least 90 seconds per cycle. 9. With the DRBIII®, read the SKIM DTCs. Are there any SKIM DTCs? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

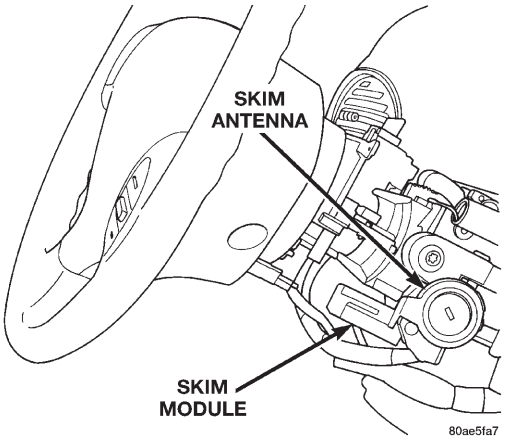
Verification Tests — Continued

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 58 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 56 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 56 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

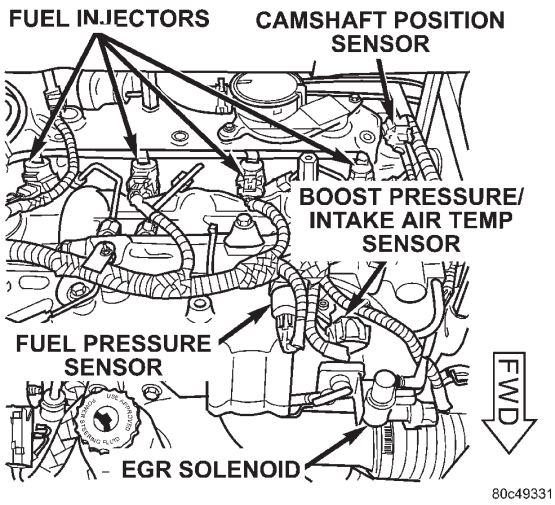
8.0 COMPONENT LOCATIONS

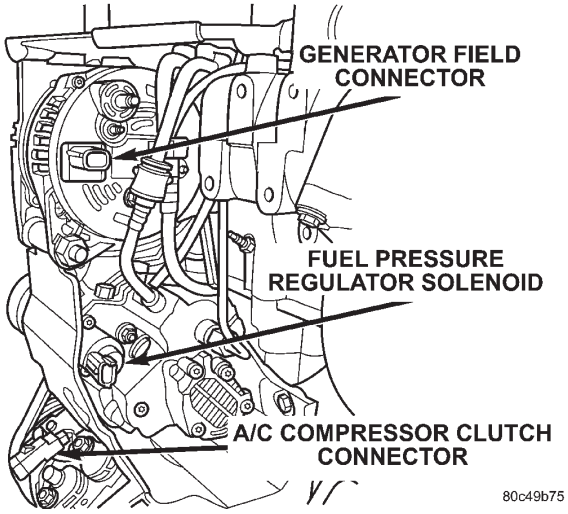
8.1 CONTROL MODULES



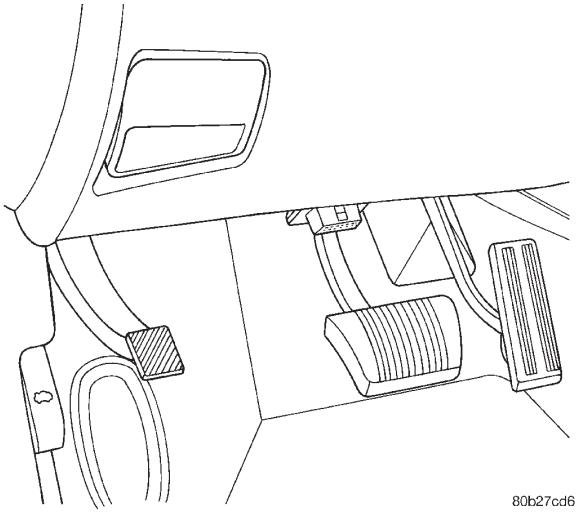


8.2 CONTROLS AND SOLENOIDS

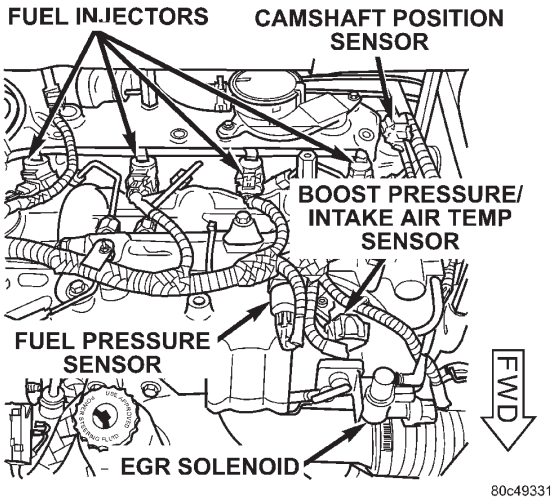


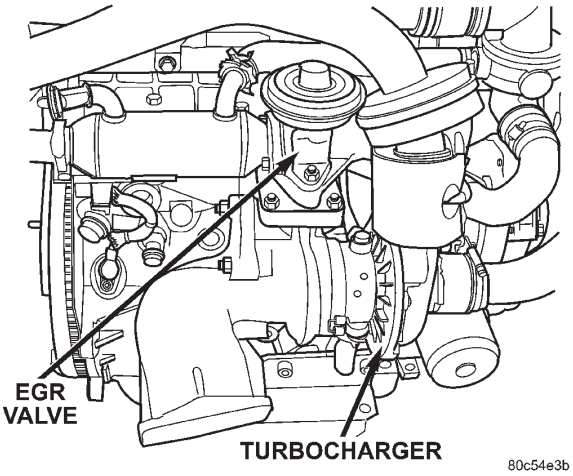


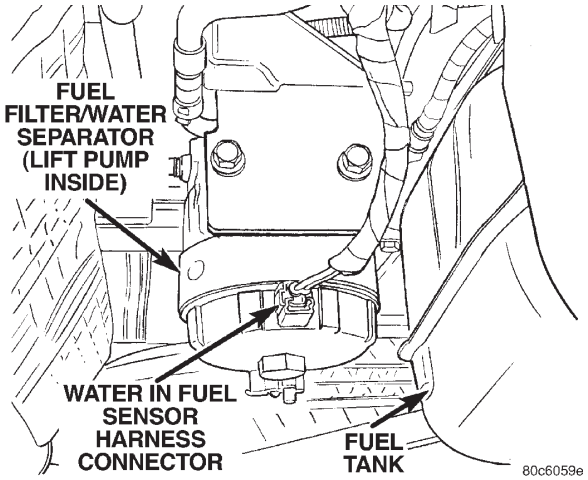
8.3 DATA LINK CONNECTOR



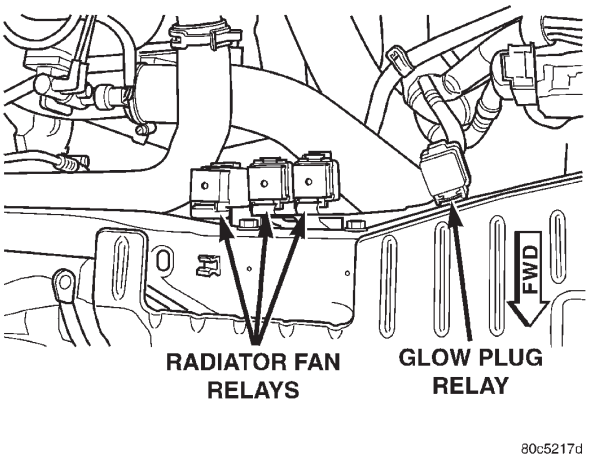
8.4 FUEL SYSTEM



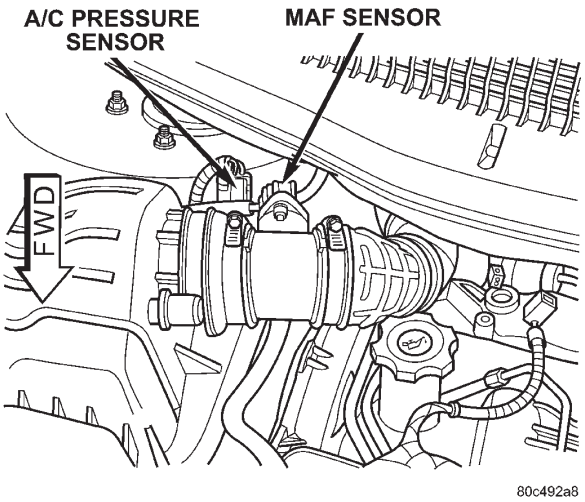


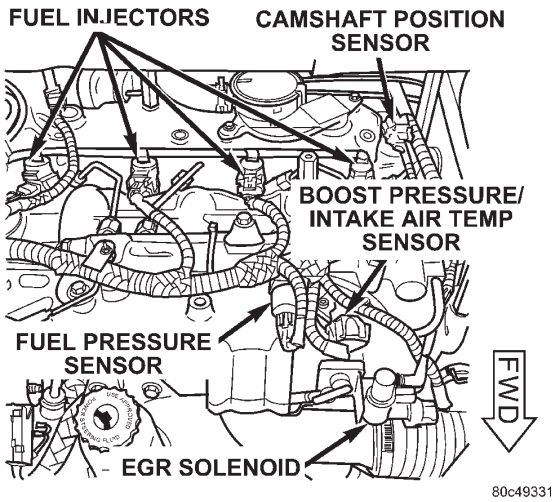


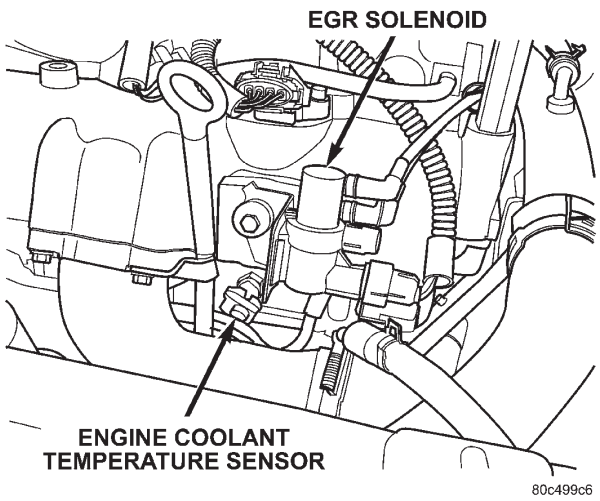
8.5 RELAYS

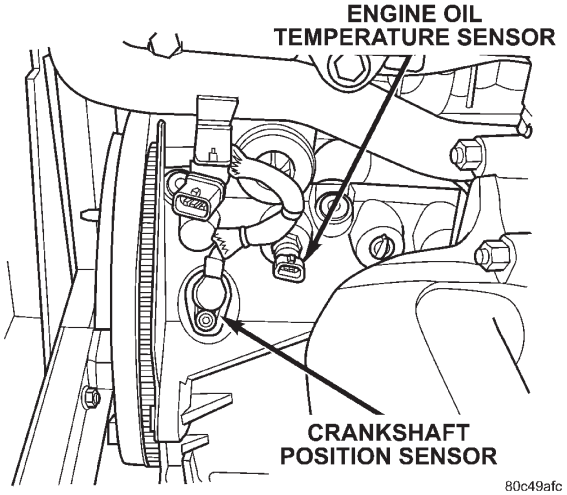


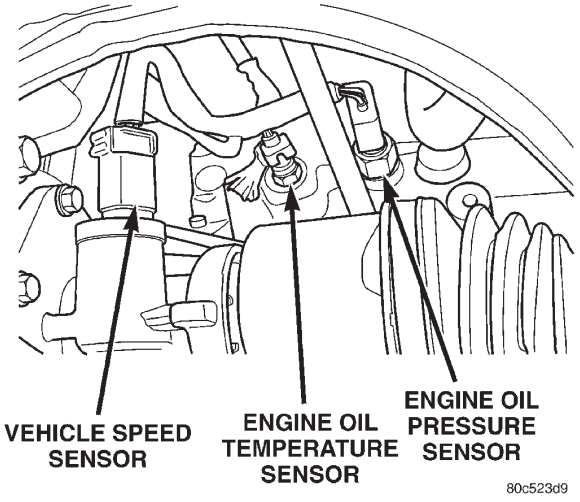
8.6 SENSORS

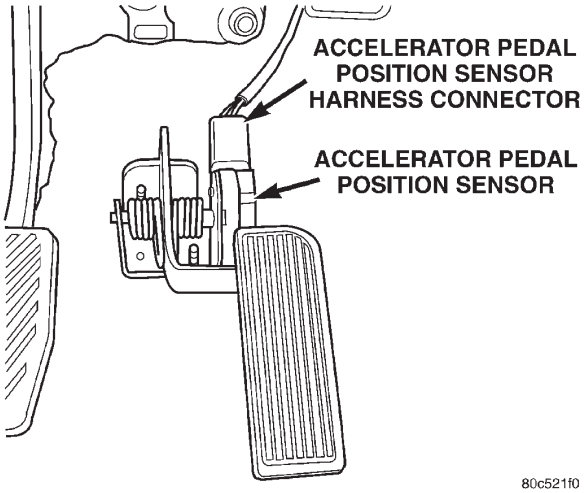

A/C PRESSURE SENSOR
MAF SENSOR
FWD
80c492a8


FUEL INJECTORS
CAMSHAFT POSITION SENSOR
BOOST PRESSURE/ INTAKE AIR TEMP SENSOR
FUEL PRESSURE SENSOR
FWD
EGR SOLENOID
80c49331

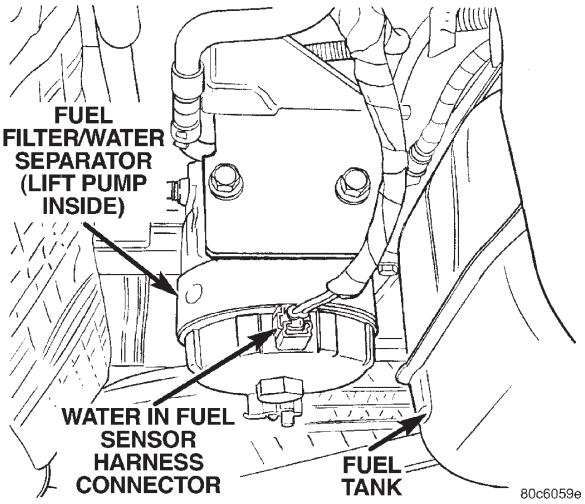

EGR SOLENOID
ENGINE COOLANT TEMPERATURE SENSOR
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ENGINE OIL TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
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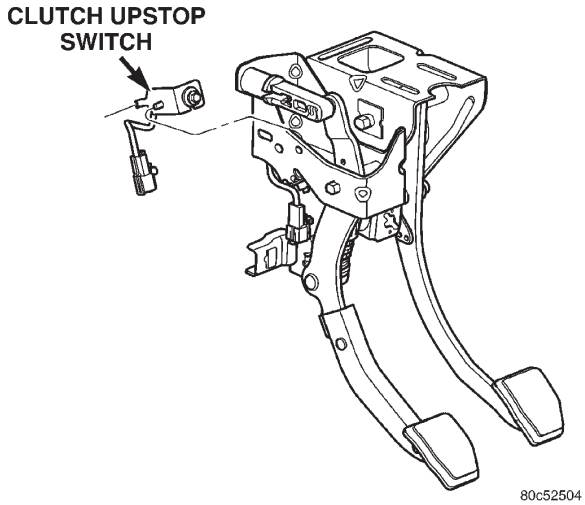

VEHICLE SPEED SENSOR
ENGINE OIL TEMPERATURE SENSOR
ENGINE OIL PRESSURE SENSOR
80c523d9


ACCELERATOR PEDAL POSITION SENSOR HARNESS CONNECTOR
ACCELERATOR PEDAL POSITION SENSOR
80c521f0

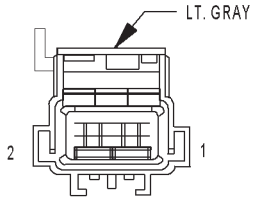
8.6 SENSORS (Continued)



8.7 SWITCHES



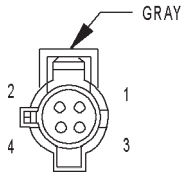
9.0 CONNECTOR PINOUTS



A/C COMPRESSOR CLUTCH

A/C COMPRESSOR CLUTCH - LT. GRAY 2 WAY

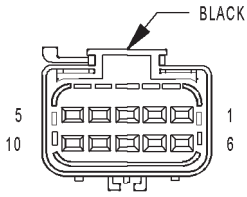
CAV	CIRCUIT	FUNCTION
1	C3 18DB/YL	A/C COMPRESSOR CLUTCH RELAY OUTPUT
2	Z153 18BK/GY	GROUND



A/C PRESSURE SENSOR

A/C PRESSURE SENSOR - GRAY 4 WAY

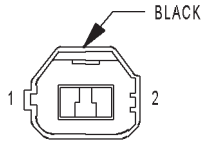
CAV	CIRCUIT	FUNCTION
1	C918 20BK/LB (DIESEL)	A/C PRESSURE SENSOR GROUND
1	K900 18DB/DG (GAS)	SENSOR GROUND
2	F851 20LB/PK (DIESEL)	SENSOR REFERENCE VOLTAGE B
2	F855 18PK/YL (GAS)	5 VOLT SUPPLY
3	C18 20LB/BR (DIESEL)	A/C PRESSURE SENSOR SIGNAL
3	C18 18LB/BR (GAS)	A/C PRESSURE SENSOR SIGNAL
4	-	-



ACCELERATOR PEDAL POSITION SENSOR (DIESEL)

ACCELERATOR PEDAL POSITION SENSOR (DIESEL) - BLACK 10 WAY

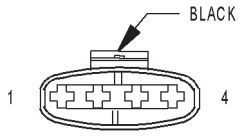
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K4 20BK/LB	LOW IDLE POSITION SWITCH GROUND
4	-	-
5	K151 20WT	LOW IDLE POSITION SWITCH SENSE
6	-	-
7	K22 20OR/DB	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
8	K167 20BR/YL	ACCELERATOR PEDAL POSITION SENSOR GROUND
9	-	-
10	F852 20VT/PK	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY



BATTERY TEMPERATURE SENSOR (DIESEL)

BATTERY TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

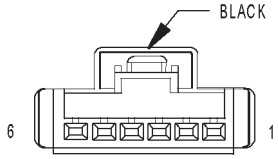
CAV	CIRCUIT	FUNCTION
1	K25 20BR/TN	BATTERY TEMPERATURE SENSOR SIGNAL
2	K900 20DB/DG	SENSOR GROUND



BOOST PRESSURE SENSOR (DIESEL)

BOOST PRESSURE SENSOR (DIESEL) - BLACK 4 WAY

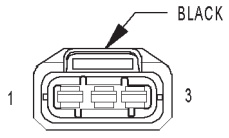
CAV	CIRCUIT	FUNCTION
1	K121 20DB	BOOST PRESSURE SENSOR GROUND
2	K21 20DB/LG	INTAKE AIR TEMPERATURE SENSOR SIGNAL
3	F851 18LB/PK	SENSOR REFERENCE VOLTAGE B
4	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH - BLACK 6 WAY

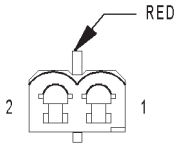
CAV	CIRCUIT	FUNCTION
1	A103 18GY/RD	FUSED B(+)
2	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
3	V30 20VT/WT (GAS)	SPEED CONTROL BRAKE SWITCH OUTPUT
4	V32 20VT/YL (GAS)	SPEED CONTROL ON/OFF SWITCH SENSE
5	Z429 20BK/OR	GROUND
6	B29 20DG/WT	SECONDARY BRAKE SWITCH SIGNAL



CAMSHAFT POSITION SENSOR (DIESEL)

CAMSHAFT POSITION SENSOR (DIESEL) - BLACK 3 WAY

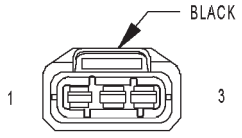
CAV	CIRCUIT	FUNCTION
1	K944 20BK/GY	CAMSHAFT POSITION SENSOR GROUND
2	K44 20DB/GY	CAMSHAFT POSITION SENSOR SIGNAL
3	K342 16BR/WT	ECM/PCM RELAY OUTPUT



CLUTCH PEDAL UPSTOP SWITCH (DIESEL)

CLUTCH PEDAL UPSTOP SWITCH (DIESEL) - RED 2 WAY

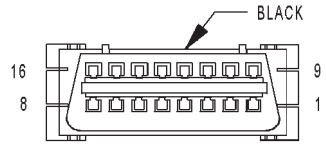
CAV	CIRCUIT	FUNCTION
1	K119 20DB/LG	CLUTCH PEDAL UPSTOP SWITCH SENSE
2	Z150 20BK/LG	GROUND



CRANKSHAFT POSITION SENSOR (DIESEL)

CRANKSHAFT POSITION SENSOR (DIESEL) - BLACK 3 WAY

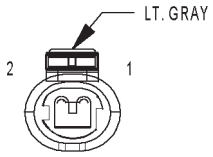
CAV	CIRCUIT	FUNCTION
1	K24 20BR/LB	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
2	K3 20BR/OR	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1
3	Z122 18WT	GROUND (DRAIN)



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK 16 WAY

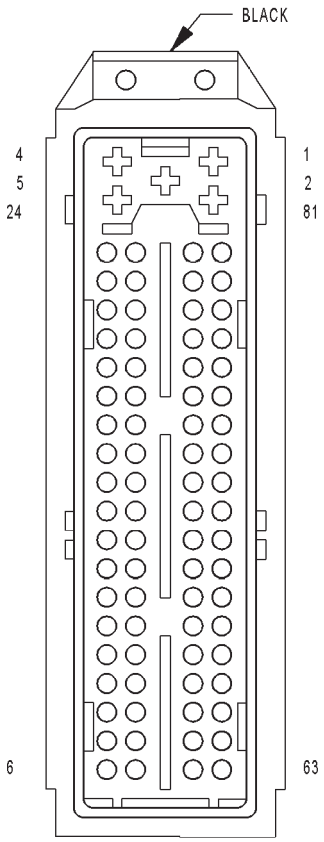
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20WT/VT	PCI BUS
3	-	-
4	Z11 18BK/LG	GROUND
5	Z111 18BK/WT (EXCEPT BUILT-UP-EXPORT)	GROUND
5	Z111 20BK/WT (BUILT-UP-EXPORT)	GROUND
6	D20 20WT/LG (GAS)	SCI RECEIVE
7	D21 20WT/BR (EXCEPT BUILT-UP-EXPORT)	SCI TRANSMIT
7	D21 20WT/DG (BUILT- UP-EXPORT)	SCI TRANSMIT
8	-	-
9	D23 20WT/BR	FLASH PROGRAM ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D16 20WT/OR (GAS)	SCI RECEIVE
15	-	-
16	A105 20DB/RD	FUSED B(+)



EGR SOLENOID (DIESEL)

EGR SOLENOID (DIESEL) - LT. GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	K35 20GY/YL	EGR SOLENOID CONTROL
2	K342 16BR/WT	ECM/PCM RELAY OUTPUT



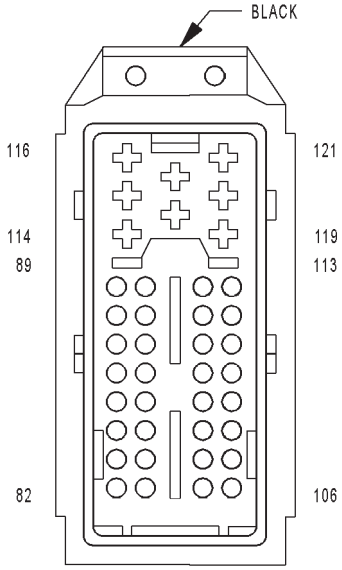
ENGINE CONTROL MODULE C1 (DIESEL)

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

CAV	CIRCUIT	FUNCTION
1	Z130 14BK/BR	GROUND
2	Z131 14BK/DG	GROUND
3	K20 14BR/GY	GENERATOR FIELD CONTROL
4	K342 14BR/WT	ECM/PCM RELAY OUTPUT
5	K342 14BR/WT	ECM/PCM RELAY OUTPUT
6	-	-
7	D25 20WT/VT	PCI BUS
8	K944 20BK/GY	CAMSHAFT POSITION SENSOR SHIELD GROUND
9	K44 20DB/GY	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	K37 20DB/YL	BOOST PRESSURE SENSOR SIGNAL
12	K55 20DB/OR	MASS AIR FLOW SENSOR SIGNAL
13	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
14	-	-
15	K22 20OR/DB	ACCELERATOR PEDAL POSITION SENSOR SIGNAL
16	K80 20DB/TN	FUEL PRESSURE SENSOR GROUND
17	-	-
18	-	-
19	N1 20DB/OR	FUEL HEATER RELAY OUTPUT
20	Z138 20BK/OR	GROUND
21	K900 20DB/DG	SENSOR GROUND
22	F202 20PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	F851 20LB/PK	SENSOR REFERENCE VOLTAGE B
24	K3 20BR/OR	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	G6 20VT/GY	ENGINE OIL PRESSURE SENSOR SIGNAL
31	F853 20LG/PK	WATER IN FUEL SENSOR SIGNAL
32	K25 20BR/TN	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K167 20BR/YL	ACCELERATOR PEDAL POSITION SENSOR GROUND
35	K853 20DB/BR	ACCELERATOR PEDAL POSITION SENSOR 5 VOLT SUPPLY
36	C18 20LB/BR	A/C PRESSURE SENSOR SIGNAL
37	K89 20DB/WT	ENGINE OIL TEMPERATURE SENSOR SIGNAL
38	V37 20VT/TN	SPEED CONTROL SWITCH SIGNAL
39	-	-
40	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K21 20DB/LG	INTAKE AIR TEMPERATURE SENSOR SIGNAL
42	Z122 18WT	GROUND (DRAIN)
43	K24 20BR/LB	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
44	-	-
45	-	-
46	-	-
47	L50 20WT/TN	PRIMARY BRAKE SWITCH SIGNAL
48	B29 20DG/WT	SECONDARY BRAKE SWITCH SIGNAL
49	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
50	F855 20PK/YL	SENSOR REFERENCE VOLTAGE A

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY - Continued

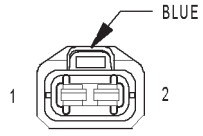
CAV	CIRCUIT	FUNCTION
51	-	-
52	K121 20DB	BOOST PRESSURE SENSOR GROUND
53	-	-
54	K957 20BK/OR	MASS AIR FLOW SENSOR GROUND
55	N7 20DB/OR	VEHICLE SPEED SENSOR SIGNAL
56	C918 20BK/LB	A/C PRESSURE SENSOR GROUND
57	-	-
58	K4 20BK/LB	LOW IDLE POSITION SWITCH GROUND
59	-	-
60	K9 20LB	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20BR/WT	ECM/PCM RELAY CONTROL
62	-	-
63	D21 20WT/BR	SCI TRANSMIT
64	K151 20WT	LOW IDLE POSITION SWITCH SENSE
65	-	-
66	K936 20BR/YL	ENGINE OIL PRESSURE SENSOR GROUND
67	-	-
68	-	-
69	C13 20LB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
70	N210 20DB/DG	LOW SPEED RADIATOR FAN RELAY CONTROL
71	-	-
72	N21 20DB/TN	LIFT PUMP RELAY CONTROL
73	-	-
74	T752 20DG/OR	ENGINE STARTER MOTOR RELAY CONTROL
75	-	-
76	-	-
77	K152 20DB/WT	GLOW PLUG RELAY CONTROL
78	N122 20DB/YL	HIGH SPEED RADIATOR FAN DUAL RELAY CONTROL
79	-	-
80	K87 20BR	FUEL PRESSURE SOLENOID CONTROL
81	K87 20BR	FUEL PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL) - BLACK 40 WAY

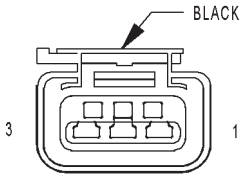
CAV	CIRCUIT	FUNCTION
82	-	-
83	-	-
84	-	-
85	-	-
86	T753 20DG/YL	FUSED IGNITION SWITCH OUTPUT (START)
87	-	-
88	K35 20GY/YL	EGR SOLENOID CONTROL
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	-	-
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-
100	-	-
101	-	-
102	-	-
103	-	-
104	-	-
105	-	-
106	-	-
107	-	-
108	-	-
109	-	-
110	-	-
111	-	-
112	K119 20DB/LG	CLUTCH PEDAL UPSTOP SWITCH SENSE
113	-	-
114	-	-
115	K14 14LB/BR	FUEL INJECTOR NO. 4 CONTROL
116	K111 14DB/LB	COMMON INJECTOR DRIVER
117	-	-
118	K11 14WT/DB	FUEL INJECTOR NO. 1 CONTROL
119	K12 14TN	FUEL INJECTOR NO. 2 CONTROL
120	K13 14BR/LB	FUEL INJECTOR NO. 3 CONTROL
121	-	-



ENGINE COOLANT TEMP SENSOR (DIESEL)

ENGINE COOLANT TEMP SENSOR (DIESEL) - BLUE 2 WAY

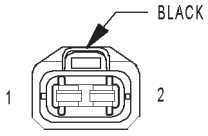
CAV	CIRCUIT	FUNCTION
1	K2 20TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
2	K900 20DB/DG	SENSOR GROUND



ENGINE OIL PRESSURE SENSOR (DIESEL)

ENGINE OIL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

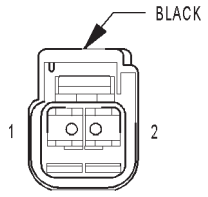
CAV	CIRCUIT	FUNCTION
1	F855 20PK/YL	SENSOR REFERENCE VOLTAGE A
2	G6 20VT/GY	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K936 20BR/YL	ENGINE OIL PRESSURE SENSOR GROUND



ENGINE OIL TEMPERATURE SENSOR (DIESEL)

ENGINE OIL TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

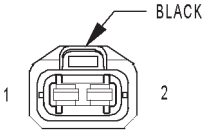
CAV	CIRCUIT	FUNCTION
1	K89 20DB/WT	ENGINE OIL TEMPERATURE SENSOR SIGNAL
2	K900 20DB/OR	SENSOR GROUND



FUEL HEATER (DIESEL)

FUEL HEATER (DIESEL) - BLACK 2 WAY

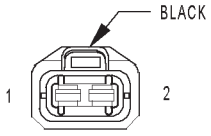
CAV	CIRCUIT	FUNCTION
1	N1 16RD	FUEL HEATER RELAY OUTPUT
2	Z201 18RD	GROUND



FUEL INJECTOR NO. 1 (DIESEL)

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

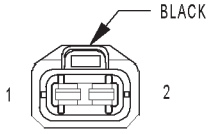
CAV	CIRCUIT	FUNCTION
1	K111 14DB/LB	COMMON INJECTOR DRIVER
2	K11 14WT/DB	FUEL INJECTOR NO. 1 CONTROL



FUEL INJECTOR NO. 2 (DIESEL)

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

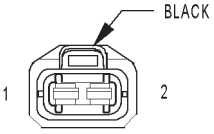
CAV	CIRCUIT	FUNCTION
1	K111 14DB/LB	COMMON INJECTOR DRIVER
2	K12 14TN	FUEL INJECTOR NO. 2 CONTROL



FUEL INJECTOR NO. 3 (DIESEL)

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

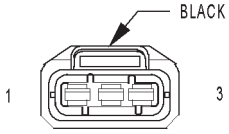
CAV	CIRCUIT	FUNCTION
1	K111 14DB/LB	COMMON INJECTOR DRIVER
2	K13 14BR/LB	FUEL INJECTOR NO. 3 CONTROL



FUEL INJECTOR NO. 4 (DIESEL)

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

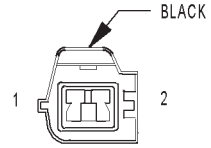
CAV	CIRCUIT	FUNCTION
1	K111 14DB/LB	COMMON INJECTOR DRIVER
2	K14 14LB/BR	FUEL INJECTOR NO. 4 CONTROL



FUEL PRESSURE SENSOR (DIESEL)

FUEL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

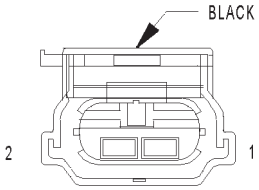
CAV	CIRCUIT	FUNCTION
1	K80 20DB/TN	FUEL PRESSURE SENSOR GROUND
2	K78 20GY	FUEL PRESSURE SENSOR SIGNAL
3	K9 20LB	FUEL PRESSURE SENSOR 5 VOLT SUPPLY



FUEL PRESSURE SOLENOID (DIESEL)

FUEL PRESSURE SOLENOID (DIESEL) - BLACK 2 WAY

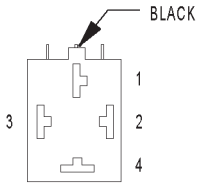
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT	ECM/PCM RELAY OUTPUT
2	K87 16BR	FUEL PRESSURE SOLENOID CONTROL



GENERATOR

GENERATOR - BLACK 2 WAY

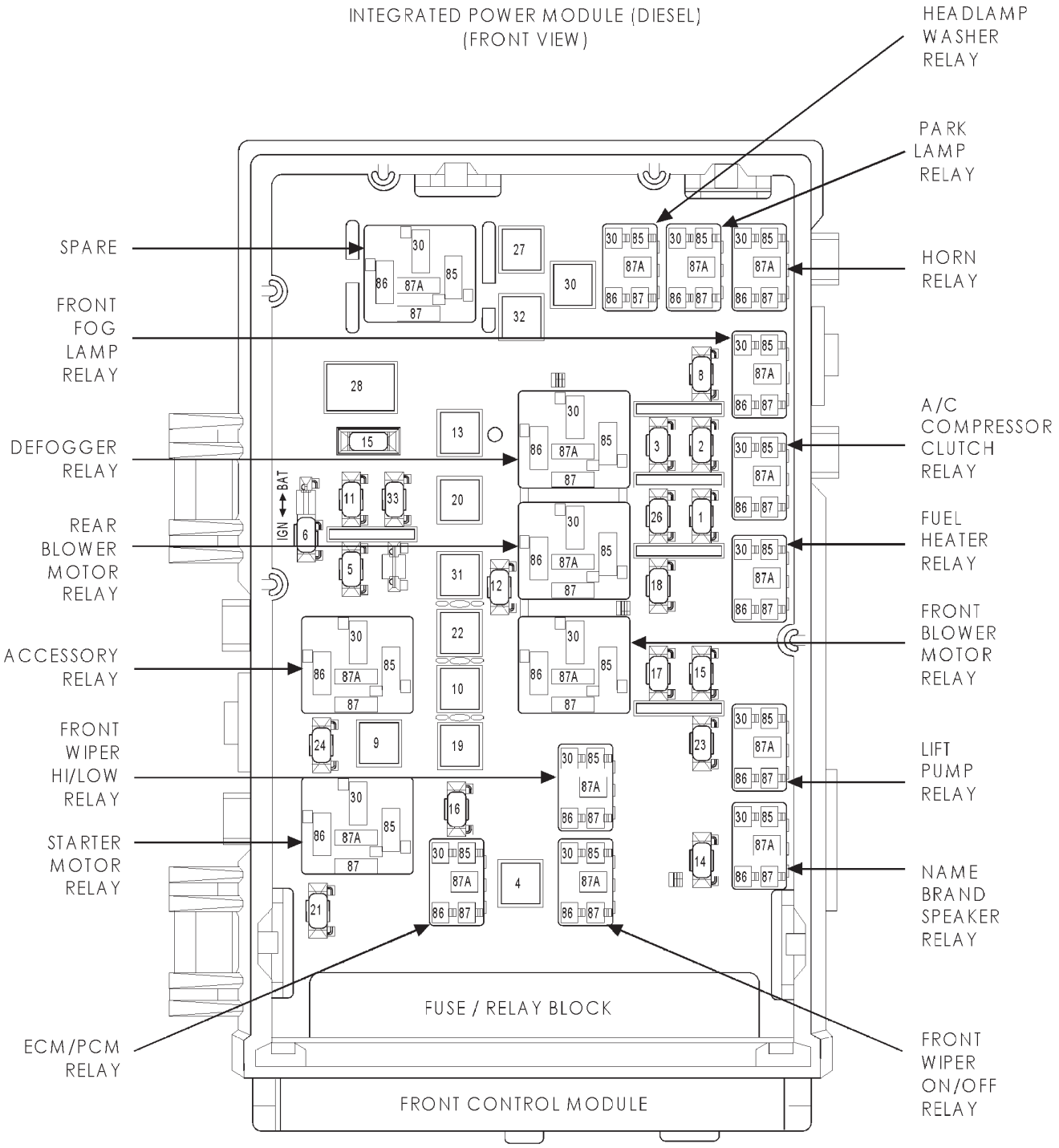
CAV	CIRCUIT	FUNCTION
1	K342 16BR/WT (DIESEL)	ECM/PCM RELAY OUTPUT
1	K342 16BR/WT (GAS)	AUTOMATIC SHUT DOWN RELAY OUTPUT
2	K20 14BR/GY (DIESEL)	GENERATOR FIELD CONTROL
2	K20 18BR/GY (GAS)	GENERATOR FIELD CONTROL



GLOW PLUG
RELAY
(DIESEL)

GLOW PLUG RELAY (DIESEL) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	A202 10RD/WT	FUSED B(+)
2	K152 20DB/WT	GLOW PLUG RELAY CONTROL
3	K342 16BR/WT	ECM/PCM RELAY OUTPUT
4	K154 10BR/OR	GLOW PLUG RELAY OUTPUT


INTEGRATED POWER MODULE (DIESEL)
(FRONT VIEW)
HEADLAMP WASHER RELAY
PARK LAMP RELAY
SPARE
HORN RELAY
FRONT FOG LAMP RELAY
A/C COMPRESSOR CLUTCH RELAY
DEFOGGER RELAY
FUEL HEATER RELAY
REAR BLOWER MOTOR RELAY
FRONT BLOWER MOTOR RELAY
ACCESSORY RELAY
LIFT PUMP RELAY
FRONT WIPER HI/LOW RELAY
NAME BRAND SPEAKER RELAY
STARTER MOTOR RELAY
FRONT WIPER ON/OFF RELAY
ECM/PCM RELAY
IGN
BAT
FUSE / RELAY BLOCK
FRONT CONTROL MODULE

FUSES (IPM)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	INTERNAL	FUSED B(+)
2	15A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
3	15A	INTERNAL	FUSED PARK LAMP RELAY OUTPUT
4	30A	INTERNAL	FUSED B(+)
5	20A	F306 16DB/PK	FUSED ACCESSORY RELAY OUTPUT
6	20A	F307 16LB/PK (BATTERY POSITION)	FUSED B(+)
6	20A	F307 16LB/PK (ACCESSORY RELAY POSITION)	FUSED ACCESSORY RELAY OUTPUT
8	20A	INTERNAL	FUSED B(+)
9	40A	INTERNAL	FUSED B(+)
10	40A	C7 12DB	FUSED FRONT BLOWER MOTOR RELAY OUTPUT
11	20A	F302 18GY/PK	FUSED ACCESSORY RELAY OUTPUT
12	25A	C51 12LB/BR	FUSED REAR BLOWER MOTOR RELAY OUTPUT
13	40A	C15 12DB/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
14	15A	INTERNAL	FUSED B(+) (I.O.D.)
15	20A	INTERNAL (DIESEL)	FUSED B(+)
15	20A	INTERNAL (EATX)	FUSED B(+)
16	25A	INTERNAL	FUSED B(+)
17	20A	INTERNAL	FUSED B(+)
18	15A	INTERNAL	FUSED B(+)
19	40A	A101 12VT/RD	FUSED B(+)
20	40A	A102 12WT/RD	FUSED B(+)
21	25A	A111 12DG/RD	FUSED B(+)
22	40A	A110 12OR/RD	FUSED B(+)
23	10A	A106 20LB/RD	FUSED B(+)
24	20A	A701 16BR/RD	FUSED B(+) (HAZARD)
26	20A	A103 18GY/RD	FUSED B(+)
27	40A	A112 12OR/RD	FUSED B(+)
28	40A	F30 12PK/YL	FUSED ACCESSORY RELAY OUTPUT
30	40A	INTERNAL (BUILT-UP-EXPORT)	FUSED B(+)
31	40A	A113 12WT/RD	FUSED B(+)
32	40A	A115 12YL/RD	FUSED B(+)
33	15A	INTERNAL	FUSED ACCESSORY RELAY OUTPUT

A/C COMPRESSOR CLUTCH RELAY

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	C13 20LB/OR (DIESEL)	A/C COMPRESSOR CLUTCH RELAY CONTROL
85	C13 18LB/OR (GAS)	A/C COMPRESSOR CLUTCH RELAY CONTROL
86	K342 16BR/WT (DIESEL)	ECM/PCM RELAY OUTPUT
86	F202 18PK/GY (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87A	-	-
87	C3 18DB/YL	A/C COMPRESSOR CLUTCH RELAY OUTPUT

ECM/PCM RELAY (DIESEL)

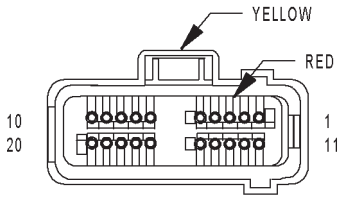
CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	K51 20BR/WT	ECM/PCM RELAY CONTROL
86	INTERNAL	FUSED B(+)
87A	-	-
87	K342 16BR/WT	ECM/PCM RELAY OUTPUT

FUEL HEATER RELAY (DIESEL)

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	Z114 18BK/LG	GROUND
86	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87A	-	-
87	N1 16DB/OR	FUEL HEATER RELAY OUTPUT

LIFT PUMP RELAY (DIESEL)

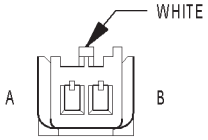
CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	N21 20DB/TN	LIFT PUMP RELAY CONTROL
86	F202 18PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87A	-	-
87	N2 18DB/YL	LIFT PUMP RELAY OUTPUT



INTEGRATED POWER MODULE C3 (DIESEL)

INTEGRATED POWER MODULE C3 (DIESEL) - YELLOW/RED 20 WAY

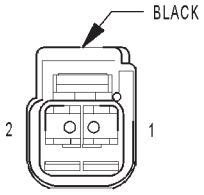
CAV	CIRCUIT	FUNCTION
1	N21 20DB/TN	LIFT PUMP RELAY CONTROL
2	-	-
3	T751 20YL	FUSED IGNITION SWITCH OUTPUT (START)
4	T2 18DG/WT	TRS REVERSE SENSE
5	N2 18DB/YL	LIFT PUMP RELAY OUTPUT
6	F202 18PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
7	C3 18DB/YL	A/C COMPRESSOR CLUTCH RELAY OUTPUT
8	Z114 18BK/LG	GROUND
9	C13 20LB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
10	A119 16RD/OR	FUSED B(+)
11	C41 20LB/DG	CABIN HEATER ASSIST CONTROL
12	T753 20DG/YL	FUSED IGNITION SWITCH OUTPUT (START)
13	-	-
14	T752 20DG/OR	ENGINE STARTER MOTOR RELAY CONTROL
15	Z116 18BK/VT	GROUND
16	K51 20BR/WT	ECM/PCM RELAY CONTROL
17	F202 18PK/GY	FUSED IGNITION SWITCH OUTPUT (RUN-START)
18	-	-
19	K342 16BR/WT	ECM/PCM RELAY OUTPUT
20	-	-



LEFT SPEED CONTROL SWITCH

LEFT SPEED CONTROL SWITCH - WHITE 2 WAY

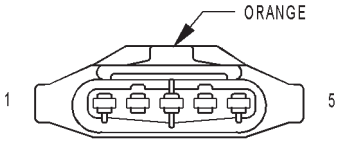
CAV	CIRCUIT	FUNCTION
A	V37 20DG/VT (EXCEPT BUILT-UP-EXPORT)	SPEED CONTROL SWITCH SIGNAL
A	V37 20VT/TN (BUILT-UP-EXPORT)	SPEED CONTROL SWITCH SIGNAL
B	Z23 20BK/VT	LEFT SPEED CONTROL SWITCH GROUND



LIFT PUMP
MOTOR
(DIESEL)

LIFT PUMP MOTOR (DIESEL) - BLACK 2 WAY

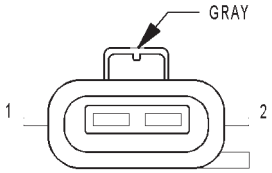
CAV	CIRCUIT	FUNCTION
1	N2 18OR	LIFT PUMP RELAY OUTPUT
2	Z201 18OR	GROUND



MASS
AIR FLOW
SENSOR
(DIESEL)

MASS AIR FLOW SENSOR (DIESEL) - ORANGE 5 WAY

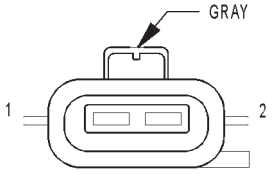
CAV	CIRCUIT	FUNCTION
1	-	-
2	K342 16BR/WT	ECM/PCM RELAY OUTPUT
3	K957 20BK/OR	MASS AIR FLOW SENSOR GROUND
4	F855 20PK/YL	SENSOR REFERENCE VOLTAGE A
5	K55 20DB/OR	MASS AIR FLOW SENSOR SIGNAL



RADIATOR
FAN NO. 1
(DIESEL)

RADIATOR FAN NO. 1 (DIESEL) - GRAY 2 WAY

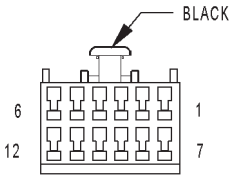
CAV	CIRCUIT	FUNCTION
1	N202 12DB/OR	RADIATOR FAN NO. 1 CONTROL
2	N201 12DB/LG	RADIATOR FAN RELAY NO. 1 OUTPUT



RADIATOR
FAN NO. 2
(DIESEL)

RADIATOR FAN NO. 2 (DIESEL) - GRAY 2 WAY

CAV	CIRCUIT	FUNCTION
1	Z823 12BK	GROUND
2	N112 12DB/OR	RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT



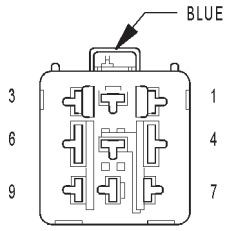
OVERHEAD CONSOLE (EXCEPT BASE)

OVERHEAD CONSOLE (EXCEPT BASE) - BLACK 12 WAY

CAV	CIRCUIT	FUNCTION
1	G23 20VT/DB	SLIDING DOORS OVERHEAD SWITCH MUX
2	G25 20VT/TN	LIFTGATE SWITCH MUX
3	D25 20WT/VT	PCI BUS
4	Z113 20BK/DB	GROUND
5	A114 20GY/RD	FUSED B(+) (I.O.D.)
6	F503 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
7	Z13 20BK/WT	GROUND
8	E15 20OR/DB	ASH/RECEIVER LAMP FEED
9	-	-
10	-	-
11	L24 20BK/GY (EXCEPT BUILT-UP-EXPORT) (PREMIUM/LUXURY)	AUTOMATIC HEADLAMP SWITCH SENSOR
12	L1 20BK/WT (PREMIUM/ LUXURY)	BACK-UP LAMP FEED

RADIATOR FAN RELAY NO. 1 (DIESEL) - BLUE 9 WAY

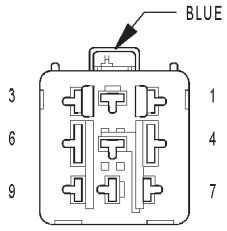
CAV	CIRCUIT	FUNCTION
1	-	-
2	N201 12DB/LG	RADIATOR FAN RELAY NO. 1 OUTPUT
3	-	-
4	K342 16BR/WT	ECM/PCM RELAY OUTPUT
5	-	-
6	N210 18DB/DG	LOW SPEED RADIATOR FAN RELAY CONTROL
7	-	-
8	A201 12RD/LG	FUSED B(+)
9	-	-



RADIATOR FAN RELAY NO. 2 (DIESEL)

RADIATOR FAN RELAY NO. 2 (DIESEL) - BLUE 9 WAY

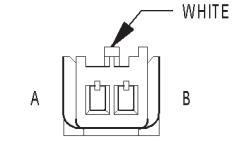
CAV	CIRCUIT	FUNCTION
1	-	-
2	N112 12DB/OR	RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT
3	-	-
4	K342 16BR/WT	ECM/PCM RELAY OUTPUT
5	-	-
6	N122 18DB/YL	HIGH SPEED RADIATOR FAN DUAL RELAY CONTROL
7	-	-
8	A112 12OR/RD	FUSED B(+)
9	-	-



RADIATOR FAN RELAY NO. 3 (DIESEL)

RADIATOR FAN RELAY NO. 3 (DIESEL) - BLUE 9 WAY

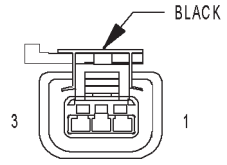
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z823 12BK	GROUND
3	-	-
4	K342 16BR/WT	ECM/PCM RELAY OUTPUT
5	N112 12DB/OR	RADIATOR FAN RELAY NO. 2 AND NO. 3 COMMON OUTPUT
6	N122 18DB/YL	HIGH SPEED RADIATOR FAN DUAL RELAY CONTROL
7	-	-
8	N202 12DB/OR	RADIATOR FAN NO. 1 CONTROL
9	-	-



RIGHT SPEED CONTROL SWITCH

RIGHT SPEED CONTROL SWITCH - WHITE 2 WAY

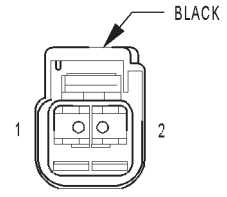
CAV	CIRCUIT	FUNCTION
A	V37 20DG/VT (EXCEPT BUILT-UP-EXPORT)	SPEED CONTROL SWITCH SIGNAL
A	V37 20VT/TN (BUILT UP EXPORT)	SPEED CONTROL SWITCH SIGNAL
B	Z23 20BK/VT	RIGHT SPEED CONTROL SWITCH GROUND



VEHICLE SPEED SENSOR (MTX/ATX)

VEHICLE SPEED SENSOR (MTX/ATX) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	F202 18PK/GY (DIESEL)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
1	F888 18BR/PK (2.4L)	8 VOLT SUPPLY
2	K900 20DB/DG (DIESEL)	SENSOR GROUND
2	K900 18DB/DG (2.4L)	SENSOR GROUND
3	N7 20DB/OR (DIESEL)	VEHICLE SPEED SENSOR SIGNAL
3	N7 18DB/OR (2.4L)	VEHICLE SPEED SENSOR SIGNAL



WATER IN FUEL SENSOR (DIESEL)

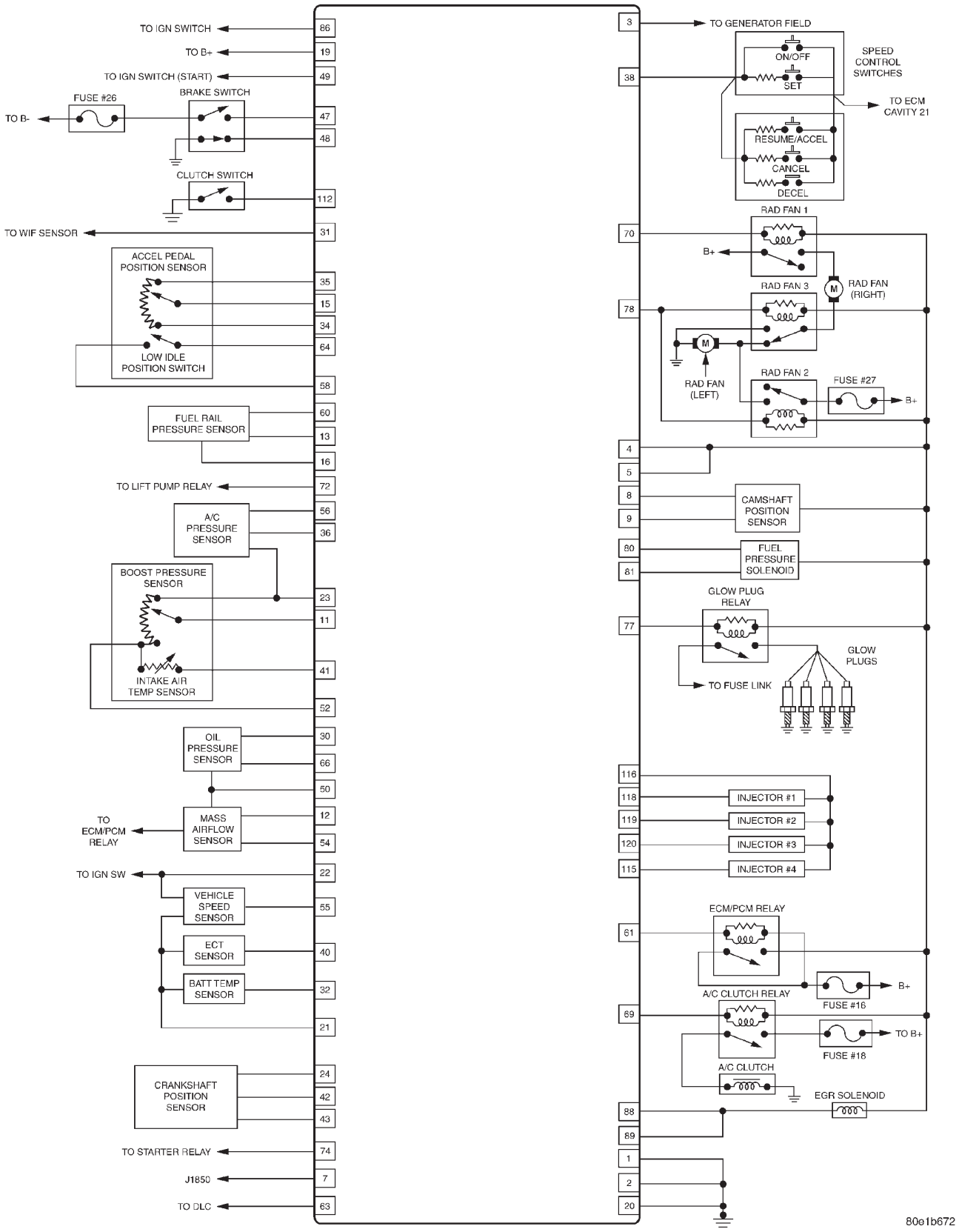
WATER IN FUEL SENSOR (DIESEL) - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	F853 20RD	WATER IN FUEL SENSOR SIGNAL
2	K900 18RD	SENSOR GROUND

NOTES

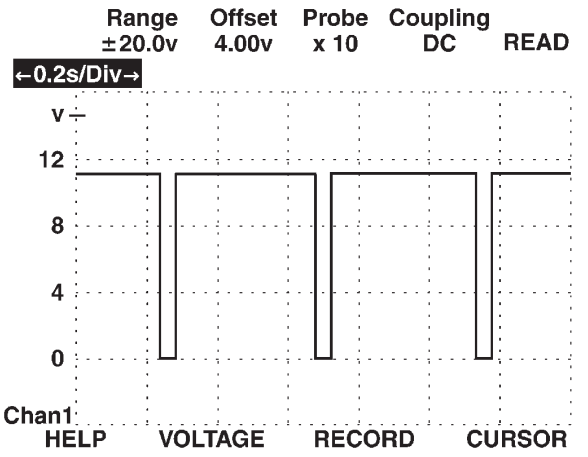
10.0 SCHEMATIC DIAGRAMS

10.1 2002 RG 2.5L TURBO DIESEL



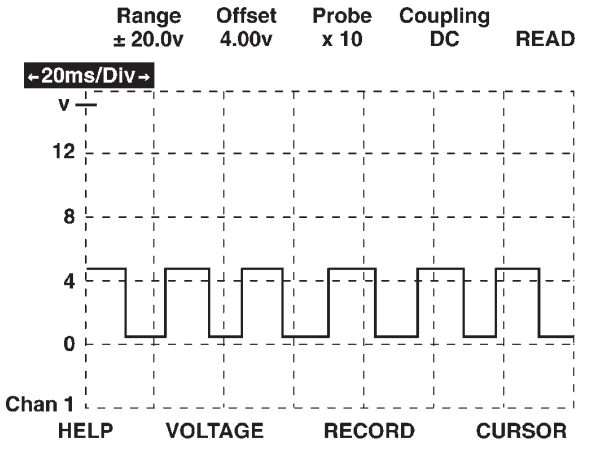
NOTES

11.0 CHARTS AND GRAPHS



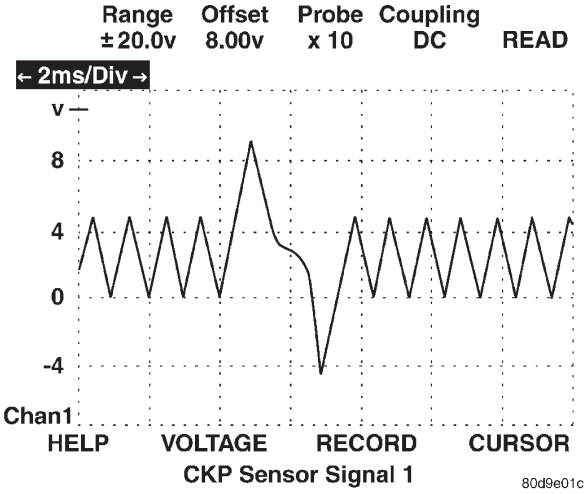
Camshaft Position Sensor Signal - During Engine Cranking

80c7708b



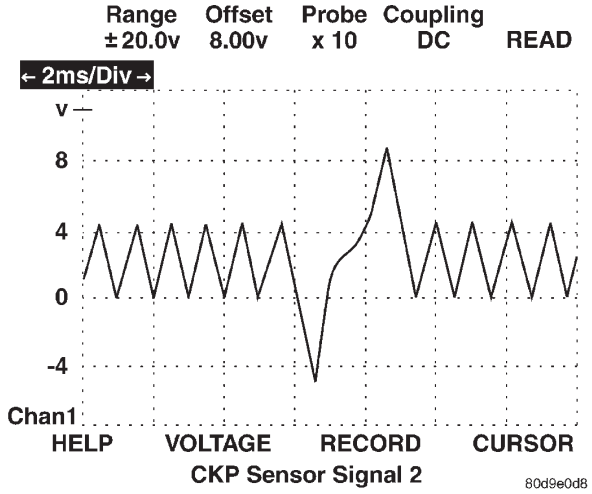
Vehicle Speed Signal - Driving in 3rd gear at 1100-1200 RPM

80bc7ab4



CKP Sensor Signal 1

80d9e01c



CKP Sensor Signal 2

80d9e0d8

NOTES