

G - TESTS W/CODES - 2.5L & 4.0L

1993 Jeep Cherokee

1993 ENGINE PERFORMANCE
Chrysler Corp 2.5L & 4.0L Self-Diagnostics

Jeep; Cherokee, Grand Cherokee, Wrangler

NOTE: For Grand Cherokee with 5.2L engine, see G - 5.2L TESTS W/
CODES article in the ENGINE PERFORMANCE Section.

INTRODUCTION

If no faults were found while performing F - 2.5L & 4.0L BASIC TESTING, proceed with self-diagnostics. If no fault codes or only pass codes are present after entering self-diagnostics, proceed to H - TESTS W/O CODES article in the ENGINE PERFORMANCE Section for diagnosis by symptom (i.e. ROUGH IDLE, NO START, etc.).

SYSTEM DIAGNOSTICS

NOTE: Malfunction Indicator Light (MIL) may also be referred to as CHECK ENGINE light.

The self-diagnostic capabilities of this system, if properly utilized, can simplify testing. The Powertrain Control Module (PCM) monitors several different engine control system circuits.

If a problem is sensed with a monitored circuit, PCM memory stores a fault, the MIL glows and PCM enters limp-in mode. In limp-in mode, PCM compensates for component failure by substituting information from other sources. This allows vehicle operation until repairs can be made.

Test circuits and repair or replace components as required. If problem is repaired or ceases to exist, the PCM cancels fault after 50 ignition on/off cycles.

A specific fault results from a particular system failure. A fault does not condemn a specific component; component is not necessarily the reason for failure. Faults only call out a probable malfunction area.

Hard Failures

Hard failures cause MIL to glow and remain on until the malfunction is repaired. If light comes on and remains on (light may flash) during vehicle operation, cause of malfunction must be determined using self-diagnostic tests. If a sensor fails, PCM will use a substitute value in its calculations, allowing engine to operate in limp-in mode. In this condition, vehicle will run, but driveability may be poor.

Intermittent Failures

Intermittent failures may cause MIL to flicker or stay on until the intermittent fault goes away. However, the corresponding fault will be retained in PCM memory. If related fault does not reoccur within a certain time frame, related fault will be erased from PCM memory. Intermittent failures can be caused by a faulty sensor, bad connector or wiring related problems.

MODEL IDENTIFICATION

VEHICLE BODY IDENTIFICATION TABLE

| Model Name | Body Type |
|------------|-----------|
|------------|-----------|

| | |
|----------------------|----|
| Cherokee | XJ |
| Grand Cherokee | ZJ |
| Wrangler | YJ |

SELF-DIAGNOSTIC SYSTEM

SERVICE PRECAUTIONS

Before proceeding with diagnosis, the following precautions must be followed:

- * ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components. See FUEL PRESSURE RELEASE.
- * When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in the GENERAL INFORMATION Section before disconnecting battery.
- * Vehicle must have a fully charged battery and functional charging system.
- * Probe PCM 60-pin connector from pin side. DO NOT backprobe PCM connector.
- * DO NOT cause short circuits when performing electrical tests. This will set additional faults, making diagnosis of original problem more difficult.
- * DO NOT use a test light instead of a voltmeter.
- * When checking for spark, ensure coil wire is NO more than 1/4" from ground. If coil wire is more than 1/4" from ground, damage to vehicle electronics and/or PCM may result.
- * DO NOT prolong testing of fuel injectors or engine may hydrostatically (liquid) lock.
- * Always repair lowest fault code number (MIL) or first fault displayed (DRB-II) first.
- * Always perform verification test after repairs are made.
- * Always disconnect DRB-II after use.
- * Always disconnect DRB-II before charging battery.

FUEL PRESSURE RELEASE

WARNING: Always relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

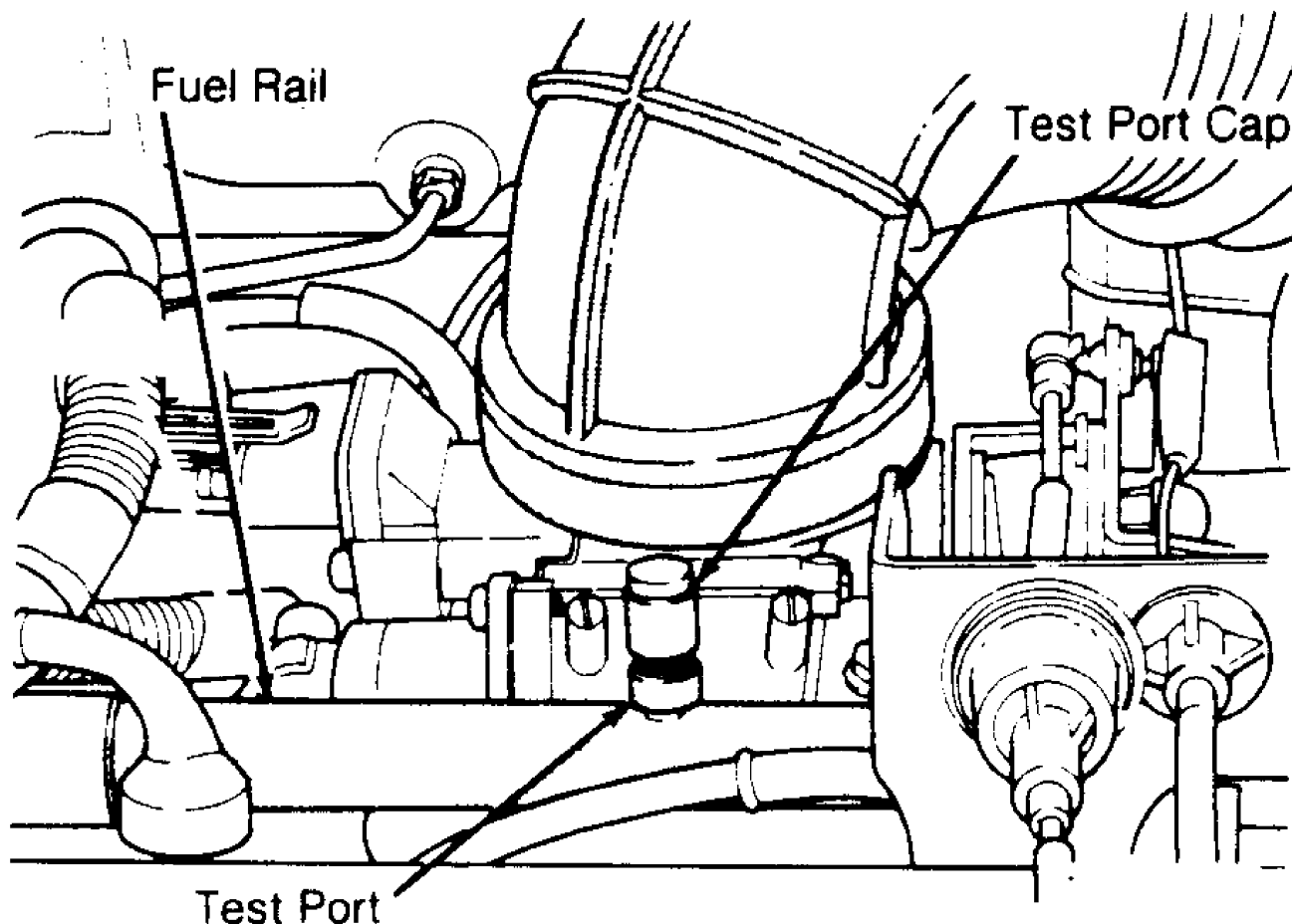
CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in the GENERAL INFORMATION Section before disconnecting battery.

1) Disconnect negative battery cable. Slowly open fuel tank cap to release fuel tank pressure. Remove protective cap from pressure test port on fuel rail. See Fig. 1.

2) Using Fuel Pressure Gauge Tool Set (5069), obtain fuel pressure gauge and hose assembly. Remove gauge from hose. Place gauge end of hose in approved gasoline container. Place shop towel under test port. Screw other end of hose onto fuel pressure test port. Release fuel pressure. After pressure is released, remove hose from test port. Install protective cap on pressure test port.

3) If gauge tool set is not available, perform step 1). Using

a small screwdriver, wrapped in shop towels, push test port valve in to relieve fuel pressure. Absorb spilled fuel with shop towels. Remove shop towels and dispose of properly. Install protective cap on pressure test port.



92A22483

Fig. 1: Releasing Fuel Pressure
Courtesy of Chrysler Corp.

VISUAL INSPECTION

Most driveability problems in the engine control system result from faulty wiring, poor electrical connections or leaking air and vacuum hose connections. To avoid unnecessary component testing, perform a visual inspection before beginning self-diagnostic tests.

DIAGNOSTIC PROCEDURE

NOTE: DO NOT skip any steps in self-diagnostic tests or incorrect diagnosis may result.

Always perform a visual inspection before attempting to diagnose engine control system problems. See VISUAL INSPECTION. Enter on-board diagnostics, and retrieve fault code(s). See ENTERING ON-BOARD DIAGNOSTICS. If fault codes are not present and/or DRB-II (Diagnostic Readout Box II) is used, proceed to one of the following

tests:

- * Go to TEST NS-1A (QUALIFYING NO START CONDITION) if a no start condition exists or engine stalls after start-up. Perform indicated VERIFICATION TEST after repairs have been made.
- * Go to TEST FC-1A (CHECKING FOR FAULTS) if engine runs but has performance problems. Perform indicated VERIFICATION TEST after repairs have been made.
- * Go to TEST NF-1A (NO FAULT TEST CODE MENU) if a driveability problem exists and no fault codes are present. Perform indicated VERIFICATION TEST after repairs have been made.

ENTERING ON-BOARD DIAGNOSTICS

NOTE: Although other scan testers are available, manufacturer recommends using DRB-II (Diagnostic Readout Box II) to diagnose the system. MIL function can be used but has limited diagnostic capability.

DRB-II Diagnostic Mode

1) Ensure ignition is off. Attach DRB-II to engine diagnostic connector. Connector is located on left side (right side on Grand Cherokee) of engine compartment, near PCM. See Figs. 2 and 3. Start engine (if possible). Turn A/C system on, then off (if equipped).

2) Turn engine off. Without starting engine, turn ignition on and access READ FAULTS function of DRB-II FUEL/IGN MENU.

3) Record all fault messages displayed by DRB-II, and observe MIL on instrument cluster. MIL should come on for 3 seconds and then go out (bulb check).

MIL Diagnostic Mode

1) Start engine (if possible). Move transmission shift lever through all positions, ending in Park. Turn A/C switch on and then off (if equipped).

2) Turn engine off. Without starting engine again, turn ignition on, off, on, off and on within 5 seconds. Record 2-digit fault codes as displayed by flashing MIL.

3) For example, fault code 23 is displayed as flash, flash, 4-second pause, flash, flash, flash. After a slightly longer pause, other codes stored are displayed in numerical order. When MIL begins to flash fault codes, it cannot be stopped. Start over if count is lost. Code 55 indicates end of fault code display.

4) Refer to FAULT CODES/MESSAGE table to translate trouble code number to a DRB-II fault message. Once trouble area is identified, refer to TEST FC-1A. Use DRB-II fault messages to find appropriate test.

5) As an example, a 2.5L engine starts and runs but has a driveability problem. MIL indicates Code 14. Refer to FAULT CODES/MESSAGES to translate trouble code number to DRB-II fault message. When DRB-II fault message is obtained, refer to appropriate test number. To clear fault codes, see CLEARING FAULTS.

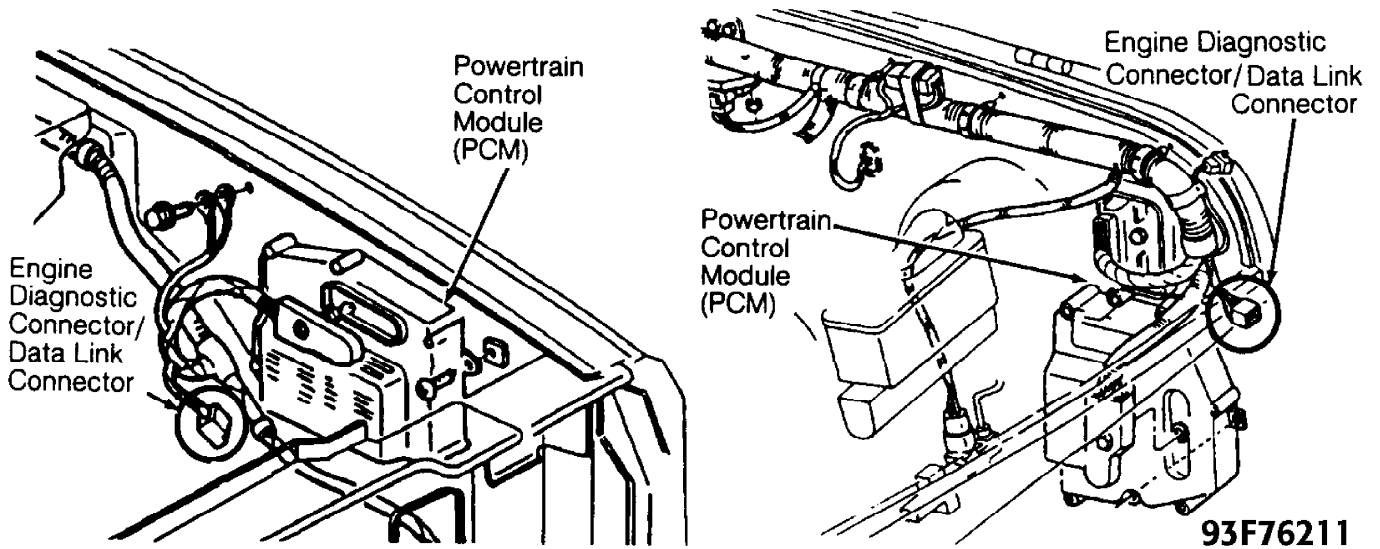


Fig. 2: Locating Diagnostic Connector (Cherokee & Wrangler)
 Courtesy of Chrysler Corp.

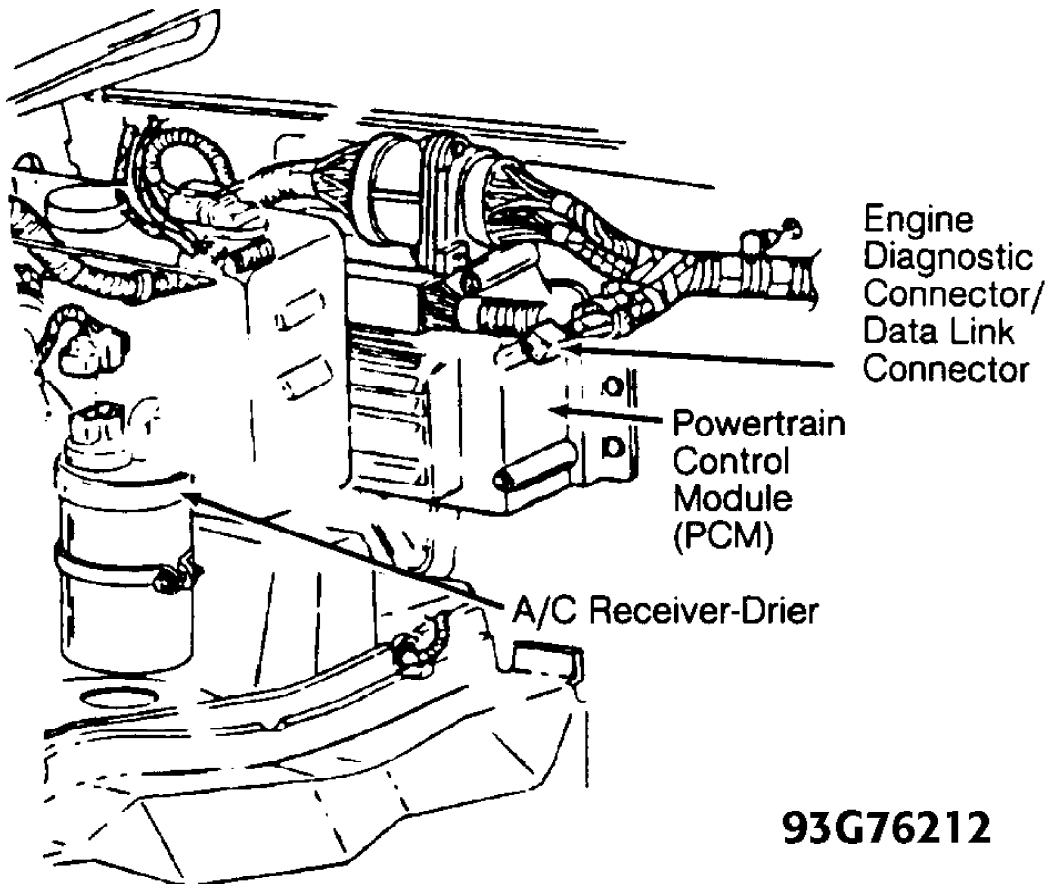


Fig. 3: Locating Diagnostic Connector (Grand Cherokee)
 Courtesy of Chrysler Corp.

CLEARING FAULTS

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in the GENERAL INFORMATION Section before disconnecting battery.

1) If DRB-II is not available, go to step 3). If DRB-II is available, press "1" key selecting FUEL/IGNITION. Press "2" key selecting READ FAULTS. Press down arrow key selecting next screen. Press "2" key selecting ERASE.

2) DRB-II will display ERASE FAULTS ARE YOU SURE? (ENTER TO ERASE). Press ENTER key. When DRB-II is finished erasing faults, screen will display FAULTS ERASED.

3) Fault codes may be cleared by disconnecting negative battery cable for at least 15 seconds, allowing PCM to clear faults.

INACTIVE FAULT CONDITION

This procedure applies if you have been sent here from diagnostic tests and have just attempted to simulate the condition that initially set the fault message. The following additional checks may assist in identifying a possible intermittent problem:

- * Visually inspect related wiring harness connectors for broken, bent, pushed out or corroded terminals.
- * Visually inspect related wiring harnesses for chafed, pierced or partially broken wires.
- * Check all pertinent MITCHELL(R) TECH SERVICE BULLETINS (TSBs).

USING DRB-II

NOTE: Although other scan testers are available, manufacturer recommends using DRB-II (Diagnostic Readout Box II) to diagnose the system.

Ensure DRB-II is connected to engine diagnostic connector located in engine compartment. Ensure correct cartridge is installed in DRB-II for vehicle and system being diagnosed. Menu selections will vary depending on vehicle and system being diagnosed. Follow DRB-II screen prompts to actuate, adjust, monitor, reset, test and diagnose system as necessary.

DRB-II is grounded through engine diagnostic connector. Only one volt-ohmmeter test lead is required when using volt-ohmmeter option. DRB-II volt-ohmmeter should only be used when self-diagnostic tests require the use of this option.

If DRB-II has a blank screen or displays RAM TEST FAILURE, CARTRIDGE ERROR, KEY PAD TEST FAILURE or LOW BATTERY OR HIGH BATTERY, this indicates a DRB-II failure. To diagnose and correct these conditions, see G - BODY TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

SERVICE REMINDER INDICATOR (SRI) MEMORY TEST

NOTE: Perform SRI memory test only if referred here by diagnostic tests.

1) To perform SRI memory check, ensure ignition is off. Attach DRB-II to engine diagnostic connector. Connector is located on left side (right side on Grand Cherokee) of engine compartment, near PCM. See Figs. 2 and 3. Turn ignition switch to RUN position.

2) Copyright information and diagnostic program version will appear on screen for a few seconds. After a few seconds DRB-II menu will appear. At FUEL/IGN MENU, press "5" (ADJUSTMENTS) key. Press ENTER key. At ADJUSTMENTS menu, press "4" (SRI MEMORY CHK) key. Press ENTER key. The DRB-II display will read SRI MEMORY CHECK ARE YOU SURE? (ENTER TO CONTINUE).

3) Press ENTER key. The DRB-II will display SRI MEMORY TEST WRITE TEST [————] and after a few seconds IS INSTRUMENT PANEL MILEAGE BETWEEN XXXXX AND XXXXX? (PRESS YES OR NO). If vehicle mileage is within specification, SRI memory check is complete. Press YES key. If vehicle mileage is not within specification, go to next step.

4) Press NO key. DRB-II will display ENTER MILEAGE SHOWN ON INSTRUMENT PANEL (USE ENTER TO END) XXXXXXX. Enter vehicle mileage. DO NOT enter tenths. When correct vehicle mileage is entered, press ENTER key.

5) DRB-II will ask for verification of mileage entry. If mileage entry was accurate, press ENTER key. DRB-II will display SRI MEMORY CHECK COMPLETE. Vehicle must travel at least 8 miles for reset to occur.

SERVICE REMINDER INDICATOR (SRI) LIGHT RESET PROCEDURE

Service Reminder Indicator (SRI) light is designed to be a reminder to service vehicle emissions control system. It is not an emissions warning system, only a reminder to perform necessary emissions servicing.

Components to be serviced include PCV valve, oxygen sensor and some vacuum-operated components. SRI light will illuminate after a predetermined mileage.

1) To reset SRI light, ensure ignition is off. Connect DRB-II to engine diagnostic connector. Connector is located on left side (right side on Grand Cherokee) of engine compartment, near PCM. See Figs. 2 and 3. Turn ignition switch to RUN position.

2) Copyright information and diagnostic program version will appear on screen for a few seconds. After a few seconds, DRB-II menu will appear. At FUEL/IGN MENU, press "5" (ADJUSTMENTS) key. Press ENTER key.

3) At ADJUSTMENTS menu, press "3" (RESET SRI LIGHT) key. Press ENTER key. Display will read RESET SRI LIGHT ARE YOUR SURE? (ENTER TO RESET). Press ENTER key.

SERVICE REMINDER INDICATOR (SRI) MILEAGE TRANSFER

NOTE: Perform mileage transfer procedure only if PCM is being replaced.

1) When PCM is replaced, vehicle mileage must be copied from odometer to replacement PCM memory. Transfer of vehicle mileage will enable new PCM to operate SRI light properly.

2) To transfer mileage to new PCM, ensure ignition is off. Connect DRB-II to engine diagnostic connector. Connector is located on left side (right side on Grand Cherokee) of engine compartment, near PCM. See Figs. 2 and 3. Turn ignition switch to RUN position.

3) Copyright information and diagnostic program version will appear on screen for a few seconds. After a few seconds DRB-II menu will appear. At FUEL/IGN MENU, press "5" (ADJUSTMENTS) key. Press ENTER key. At ADJUSTMENTS menu, press "4" (SRI MEMORY CHK) key. Press ENTER key. The DRB-II display will read SRI MEMORY CHECK ARE YOU SURE? (ENTER TO CONTINUE).

4) Press ENTER key. The DRB-II will display SRI MEMORY TEST WRITE TEST [————] and after a few seconds IS INSTRUMENT PANEL MILEAGE BETWEEN XXXXX AND XXXXX? (PRESS YES OR NO). If vehicle mileage is within specification, SRI memory check is complete. Press YES key.

If vehicle mileage is not within specification, go to next step.

5) Press NO key. DRB-II will display ENTER MILEAGE SHOWN ON INSTRUMENT PANEL (USE ENTER TO END) XXXXXXXX. Enter vehicle mileage. DO NOT enter tenths. When correct vehicle mileage is entered, press ENTER key.

6) DRB-II will ask for verification of mileage entry. If mileage entry was accurate, press ENTER key. DRB-II will display SRI MEMORY CHECK COMPLETE. Vehicle must travel at least 8 miles for reset to occur.

THEFT ALARM SYSTEM

NOTE: If SECURITY light comes on and remains on with ignition on, Chrysler Collision Detection (CCD) bus communication with PCM has been lost. After servicing vehicle, ensure system operates properly. A malfunctioning anti-theft alarm system may keep engine from starting. For anti-theft alarm diagnosis, see appropriate ANTI-THEFT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT Section.

FAULT CODES/MESSAGES

NOTE: Not all fault codes apply to all vehicles. Some fault codes have more than one meaning. When a fault code has more than one meaning, MIL is unable to distinguish between different failures.

Code 11

DRB-II displays NO CRANK REFERENCE SIGNAL AT PCM. Condition is: no crankshaft reference signal picked up during cranking.

Code 13

DRB-II displays SLOW CHANGE IN IDLE MAP SENSOR SIGNAL. Condition is: Manifold Absolute Pressure (MAP) sensor output change slower and/or smaller than expected.

Code 13

DRB-II displays NO CHANGE IN MAP FROM START TO RUN. Condition is: no difference recognized between Manifold Absolute Pressure (MAP) reading and barometric (atmospheric) pressure reading at start-up.

Code 14

DRB-II displays MAP VOLTAGE TOO LOW. Condition is: Manifold Absolute Pressure (MAP) sensor input less than minimum acceptable voltage.

Code 14

DRB-II displays MAP VOLTAGE TOO HIGH. Condition is: Manifold Absolute Pressure (MAP) sensor input more than maximum acceptable voltage.

Code 15

DRB-II displays NO VEHICLE SPEED SENSOR SIGNAL. Condition is: no Vehicle Speed Sensor (VSS) signal detected with road load conditions.

Code 17

DRB-II displays ENGINE IS COLD TOO LONG. Condition is: coolant temperature stays less than normal operating temperature during vehicle operation.

Code 21

DRB-II displays O2S STAYS AT CENTER. Condition is: no rich or lean signal detected from oxygen sensor input.

Code 21

DRB-II displays O2S SHORTED TO VOLTAGE. Condition is: oxygen sensor input voltage maintained at more than normal operating range.

Code 22

DRB-II displays ECT SENSOR VOLTAGE TOO LOW. Condition is: Engine Coolant Temperature (ECT) sensor input less than minimum acceptable voltage.

Code 22

DRB-II displays ECT SENSOR VOLTAGE TOO HIGH. Condition is: Engine Coolant Temperature (ECT) sensor input more than maximum acceptable voltage.

Code 23

DRB-II displays INTAKE AIR TEMPERATURE SENSOR VOLTAGE LOW. Condition is: Intake Air Temperature (IAT) sensor input less than minimum acceptable voltage.

Code 23

DRB-II displays INTAKE AIR TEMPERATURE SENSOR VOLTAGE HIGH. Condition is: Intake Air Temperature (IAT) sensor input more than maximum acceptable voltage.

Code 24

DRB-II displays THROTTLE POSITION SENSOR VOLTAGE LOW. Condition is: Throttle Position Sensor (TPS) input less than minimum acceptable voltage.

Code 24

DRB-II displays THROTTLE POSITION SENSOR VOLTAGE HIGH. Condition is: Throttle Position Sensor (TPS) input more than maximum acceptable voltage.

Code 25

DRB-II displays IDLE AIR CONTROL MOTOR CIRCUITS. Condition is: open or shorted condition detected in one or more Idle Air Control (IAC) motor circuits.

Code 27

DRB-II displays INJECTOR #1-6 CONTROL CIRCUIT. Condition is: injector output driver does not respond properly to Powertrain Control Module (PCM) control signal.

Code 33

DRB-II displays A/C CLUTCH RELAY CIRCUIT. Condition is: open or shorted condition detected in A/C clutch relay circuit.

Code 34

DRB-II displays SPEED CONTROL SOLENOID CIRCUITS. Condition is: open or shorted condition detected in Speed Control (S/C) vacuum or vent solenoid circuits.

Code 35

DRB-II displays RADIATOR FAN RELAY CIRCUIT. Condition is: open or shorted condition detected in radiator fan relay circuit.

Code 41

DRB-II displays GENERATOR FIELD NOT SWITCHING PROPERLY. Condition is: open or shorted condition detected in alternator field

circuit.

Code 42

DRB-II displays AUTO SHUTDOWN RELAY CONTROL CIRCUIT.
Condition is: open or shorted condition detected in Auto Shutdown (ASD) relay circuit.

Code 42

DRB-II displays NO ASD RELAY VOLTAGE SENSE AT PCM. Condition is: Powertrain Control Module (PCM) did not receive message in Auto Shutdown (ASD) relay circuit.

Code 44

DRB-II displays BATTERY TEMP SENSOR VOLTS OUT OF LIMIT.
Condition is: Powertrain Control Module (PCM) failure.

Code 46

DRB-II displays CHARGING SYSTEM VOLTAGE TOO HIGH. Condition is: battery voltage sense input more than target charging voltage during engine operation.

Code 47

DRB-II displays CHARGING SYSTEM VOLTAGE TOO LOW. Condition is: battery voltage sense input less than target charging voltage during engine operation.

Code 51

DRB-II displays O2S STAYS BELOW CENTER (LEAN). Condition is: oxygen sensor input indicates lean air/fuel ratio during engine operation.

Code 52

DRB-II displays O2S STAYS ABOVE CENTER (RICH). Condition is: oxygen sensor input indicates rich air/fuel ratio during engine operation.

Code 53

DRB-II displays INTERNAL PCM FAILURE. Condition is: Powertrain Control Module (PCM) detects internal failure.

Code 53

DRB-II displays PCM FAILURE SPI COMMUNICATION. Condition is: No CCD bus communication.

Code 54

DRB-II displays NO CAM SYNC SIGNAL AT PCM. Condition is: open or shorted condition detected in cam sync signal circuit.

Code 55

DRB-II display will be blank. Completion of fault code display by CHECK ENGINE light.

Code 62

DRB-II displays PCM FAILURE SRI MILE NOT STORED. Condition is: Powertrain Control Module (PCM) detects internal failure.

Code 63

DRB-II displays PCM FAILURE EEPROM WRITE DENIED. Condition is: unsuccessful attempt to write to an EEPROM location by PCM.

Code 76

DRB-II displays FUEL PUMP RESISTOR BY-PASS RELAY CIRCUIT.
Condition is: open or shorted condition detected in ballast resistor

by-pass relay circuit.

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in the GENERAL INFORMATION Section before disconnecting battery.

CONNECTOR IDENTIFICATION

CONNECTOR IDENTIFICATION DIRECTORY TABLE

| Connector | See Fig. |
|---|----------|
| Idle Air Control (IAC) Motor | 4 |
| Coolant Temperature Sensor | 5 |
| Camshaft & Crankshaft Position Sensor | 6 |
| Engine Controller | 7 |
| Engine Diagnostic | 8 |
| Fuel Injector | 9 |
| Ignition Coil | 10 |
| Manifold Absolute Pressure (MAP) Sensor | 11 |
| Oxygen (O2) Sensor | 12 |
| Relays | 13 |
| Throttle Position Sensor | 14 |
| Fuel Pump Relay Test | 15 |

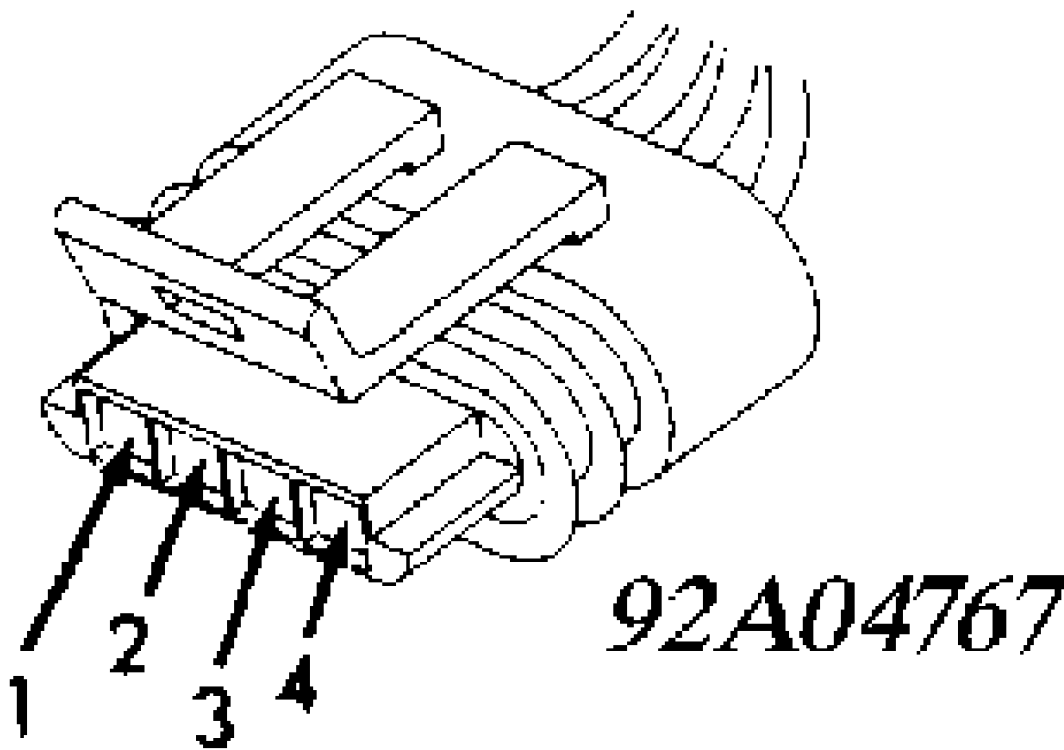


Fig. 4: Identifying Idle Air Control (IAC) Motor Connector Terminals
Courtesy of Chrysler Corp.

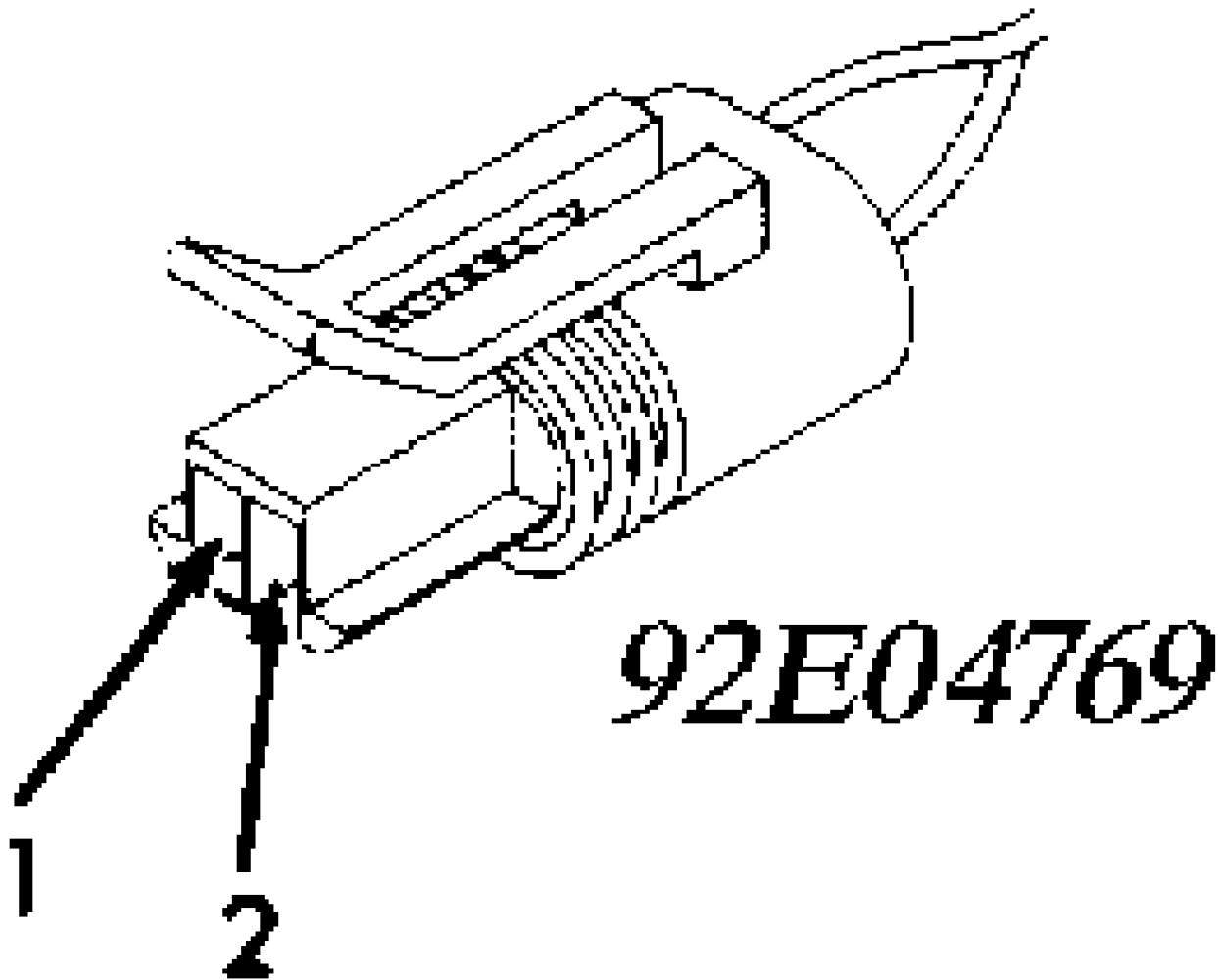


Fig. 5: Identifying Coolant Temperature Sensor Connector Terminals
Courtesy of Chrysler Corp.

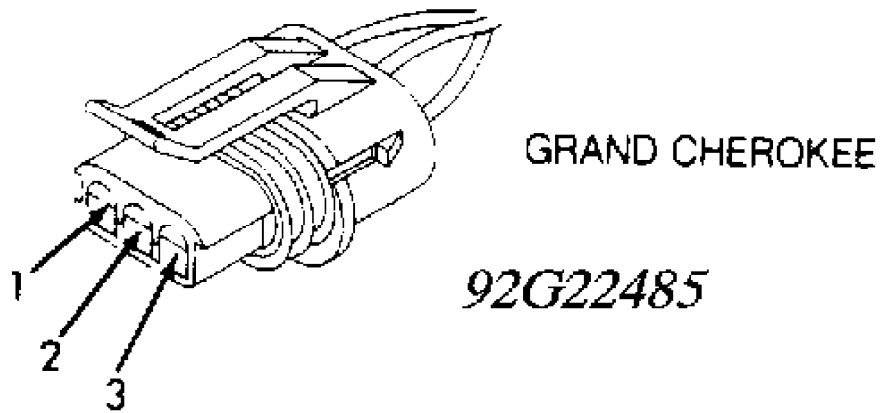
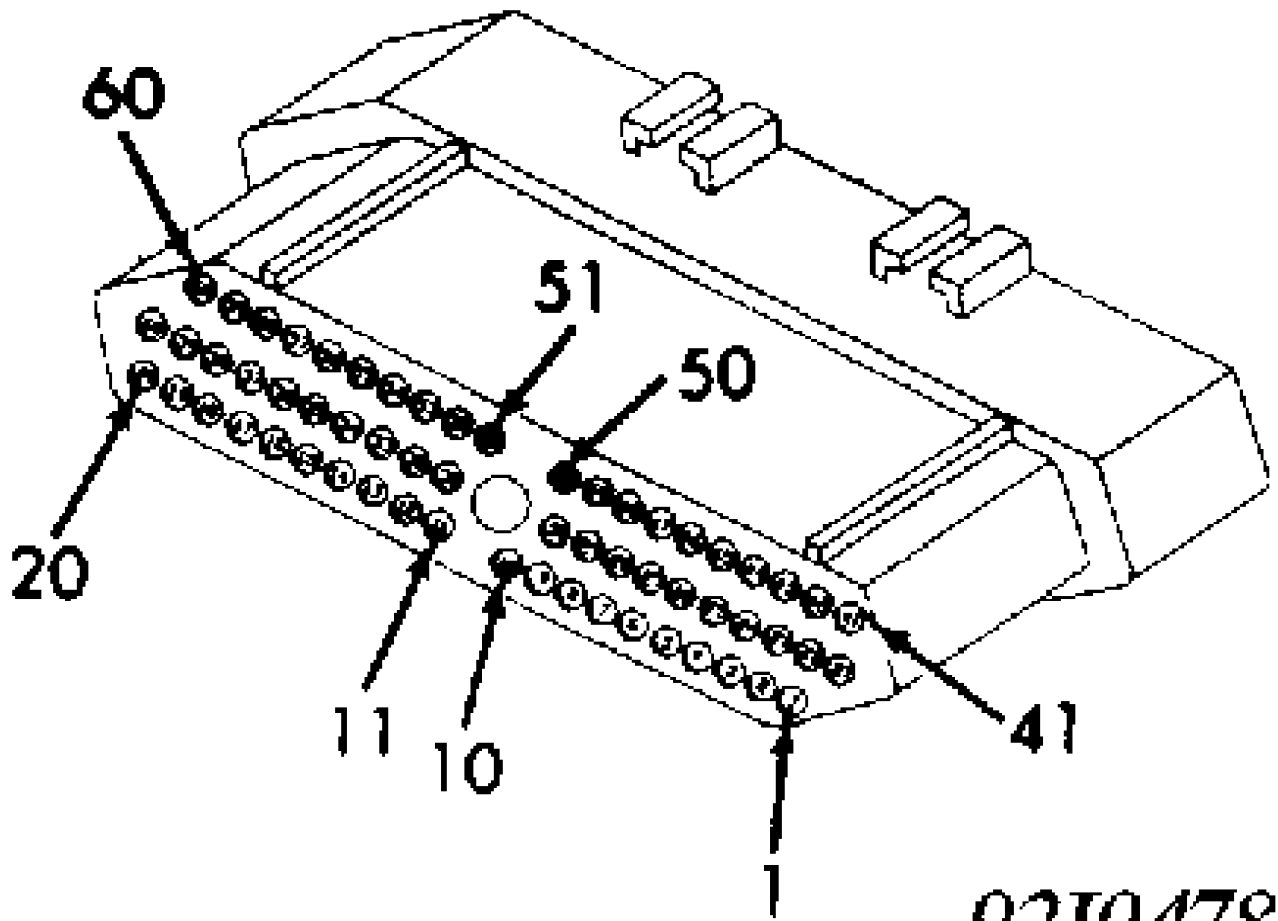
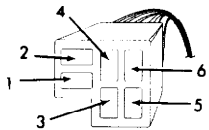


Fig. 6: Camshaft & Crankshaft Position Sensor Connector Terminal ID
Courtesy of Chrysler Corp.



92104785

Fig. 7: Identifying Engine Controller Connector Terminals
 Courtesy of Chrysler Corp.



ENGINE DIAGNOSTIC CONNECTOR TERMINAL IDENTIFICATION

| Cavity & Model | Wire Color |
|---------------------------|-----------------|
| No. 1 | |
| Cherokee (XJ) | Black/White |
| Grand Cherokee (ZJ) | Black/Tan |
| Wrangler (YJ) | Black/White |
| No. 2 | Not Used |
| No. 3 | |
| Cherokee (XJ) | Pink |
| Grand Cherokee (ZJ) | Black |
| Wrangler (YJ) | Pink |
| No. 4 | |
| Cherokee (XJ) | Light Green |
| Grand Cherokee (ZJ) | Black/Yellow |
| Wrangler (YJ) | Light Green |
| No. 5 | |
| Cherokee (XJ) | Dark Blue/White |
| Grand Cherokee (ZJ) | Light Blue/Red |
| Wrangler (YJ) | White/Yellow |
| No. 6 | Not Used |

93A76216

Fig. 8: Identifying Engine Diagnostic Connector Terminals
 Courtesy of Chrysler Corp.

| Cavity & Model | Wire Color |
|---------------------------|-----------------|
| No. 1 | |
| Cherokee (XJ) | Black/White |
| Grand Cherokee (ZJ) | Black/Tan |
| Wrangler (YJ) | Black/White |
| No. 2 | Not Used |
| No. 3 | |
| Cherokee (XJ) | Pink |
| Grand Cherokee (ZJ) | Black |
| Wrangler (YJ) | Pink |
| No. 4 | |
| Cherokee (XJ) | Light Green |
| Grand Cherokee (ZJ) | Black/Yellow |
| Wrangler (YJ) | Light Green |
| No. 5 | |
| Cherokee (XJ) | Dark Blue/White |
| Grand Cherokee (ZJ) | Light Blue/Red |
| Wrangler (YJ) | White/Yellow |
| No. 6 | Not Used |

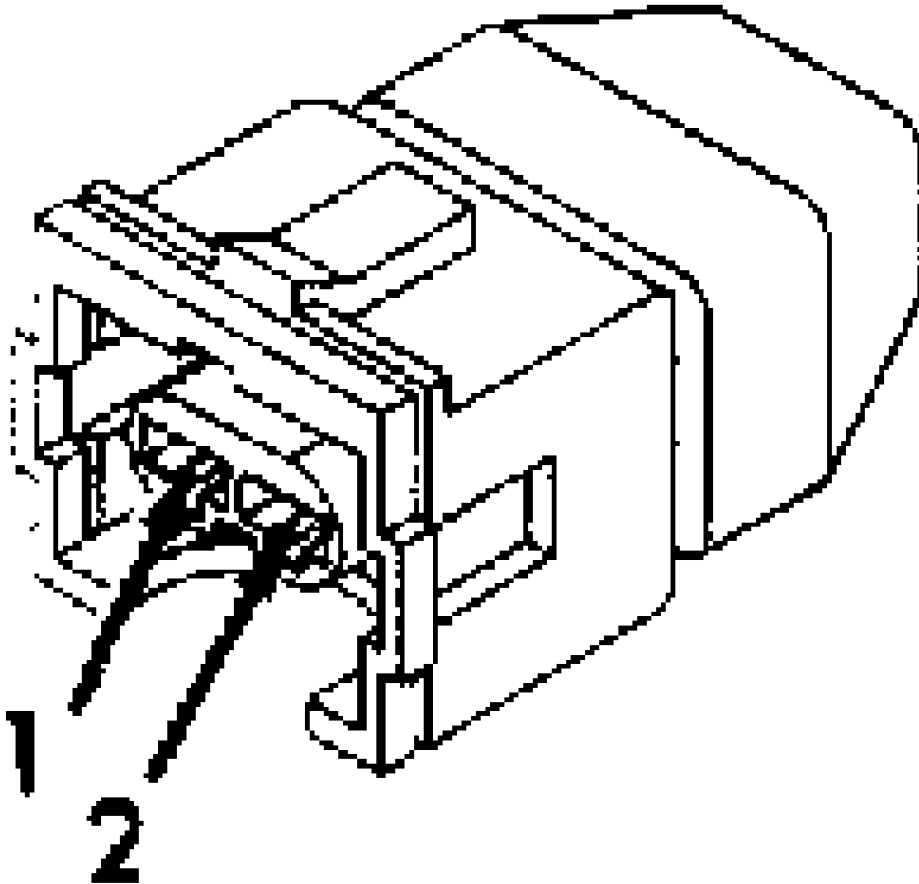


Fig. 9: Identifying Fuel Injector Connector Terminals
 Courtesy of Chrysler Corp.

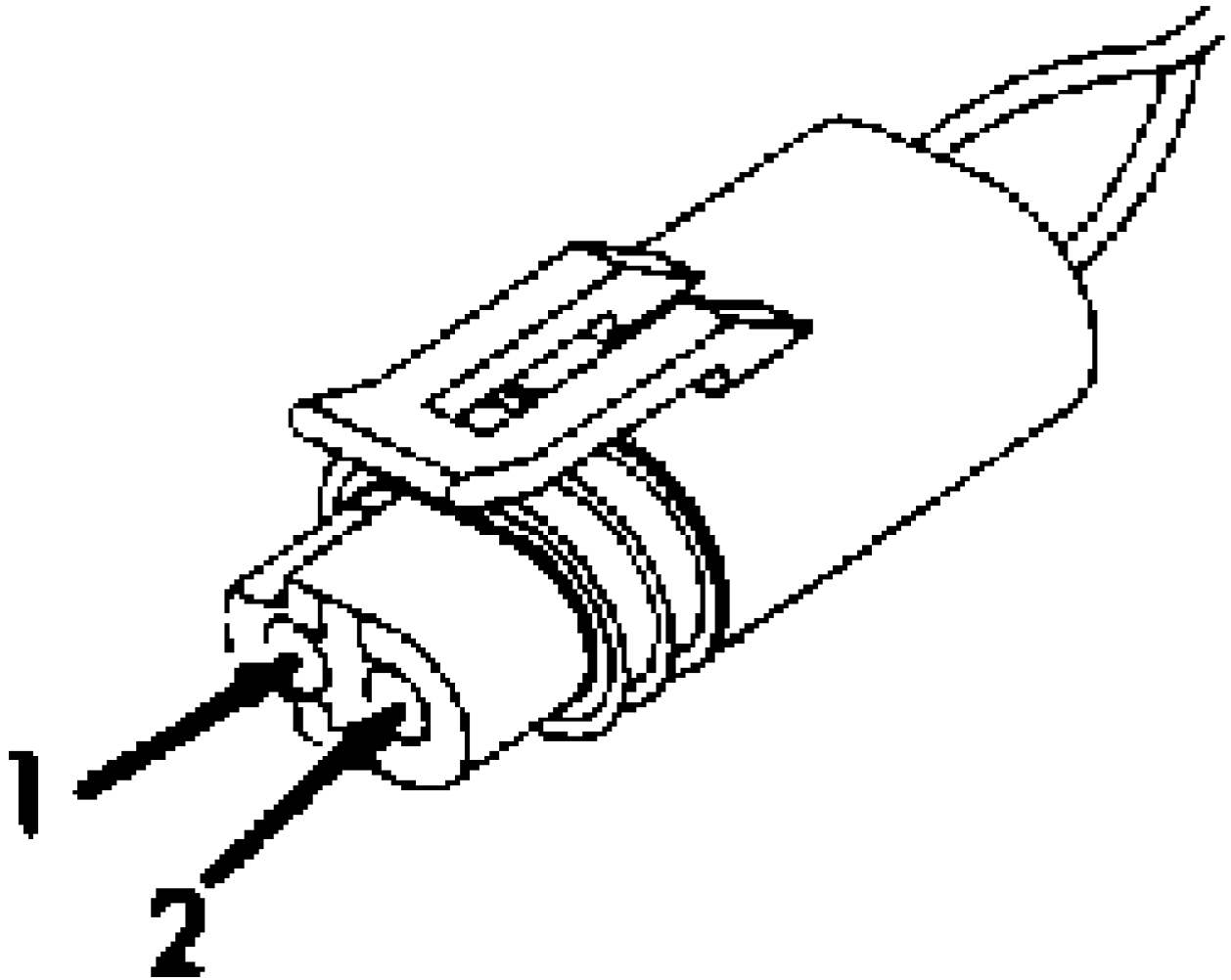
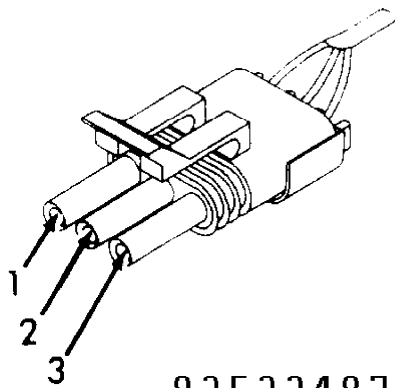
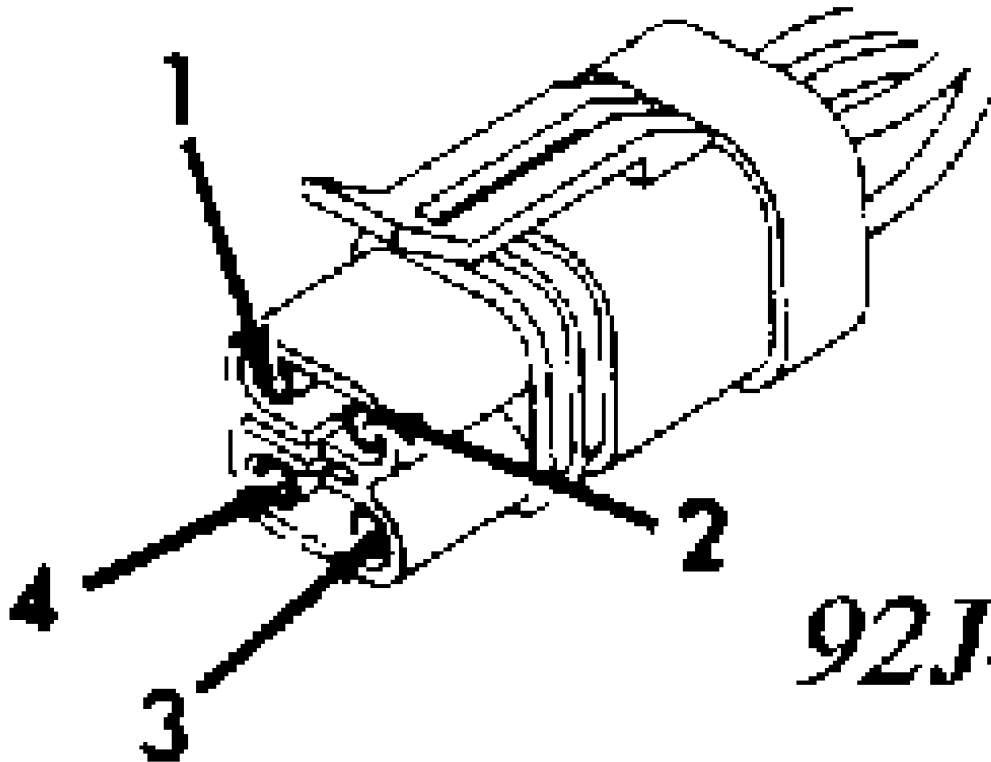


Fig. 10: Identifying Ignition Coil Connector Terminals
Courtesy of Chrysler Corp.



92E22487

Fig. 11: Manifold Absolute Pressure (MAP) Sensor Connector Term. ID
Courtesy of Chrysler Corp.



92J04781

Fig. 12: Identifying Oxygen (O2) Sensor Connector Terminals
 Courtesy of Chrysler Corp.

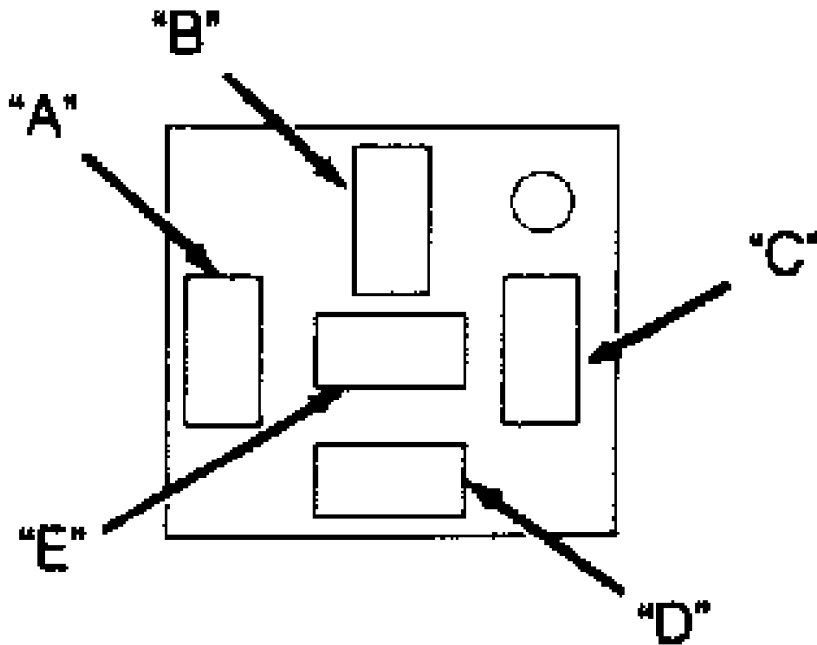
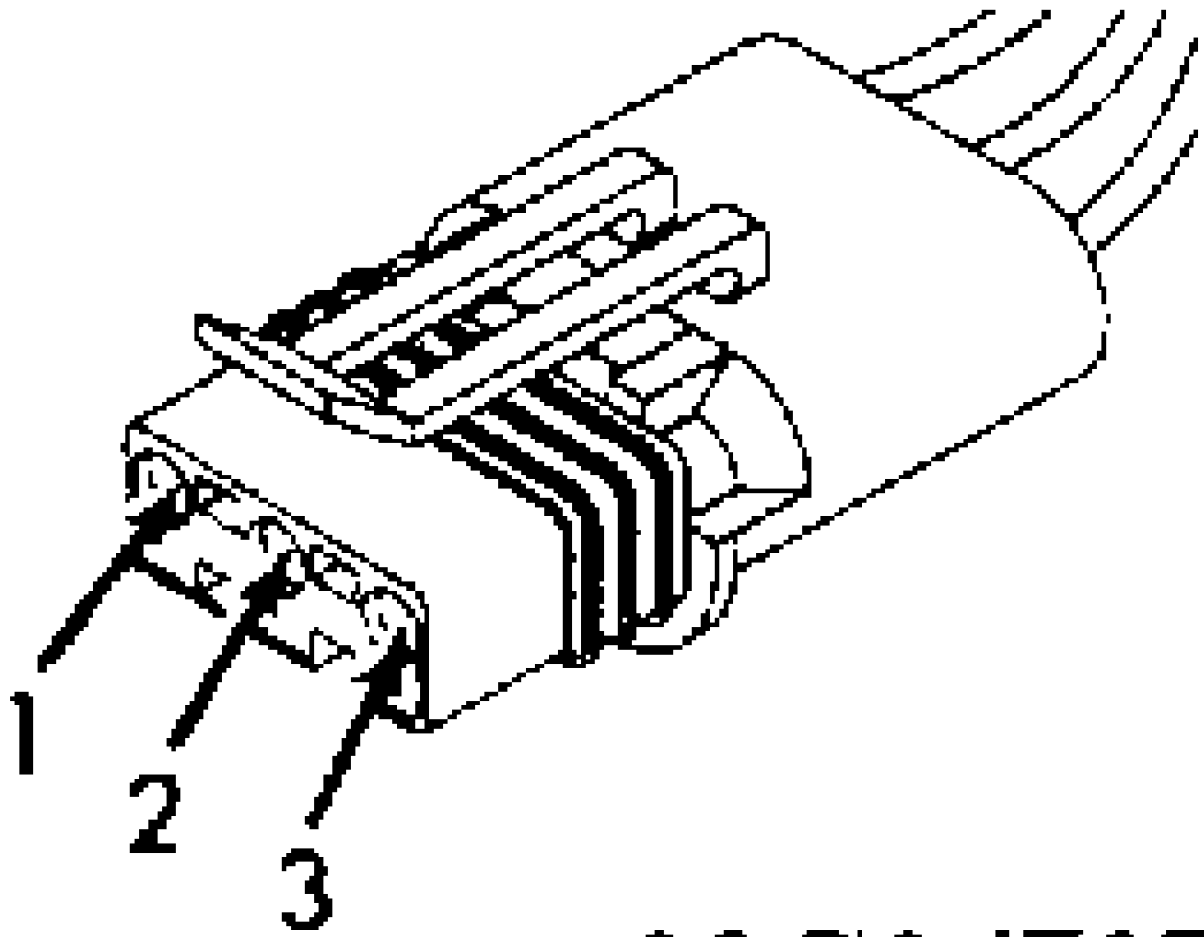


Fig. 13: Identifying Relay Connector Terminals
 Courtesy of Chrysler Corp.



92C04787

Fig. 14: Identifying Throttle Position Sensor Connector Terminals
Courtesy of Chrysler Corp.

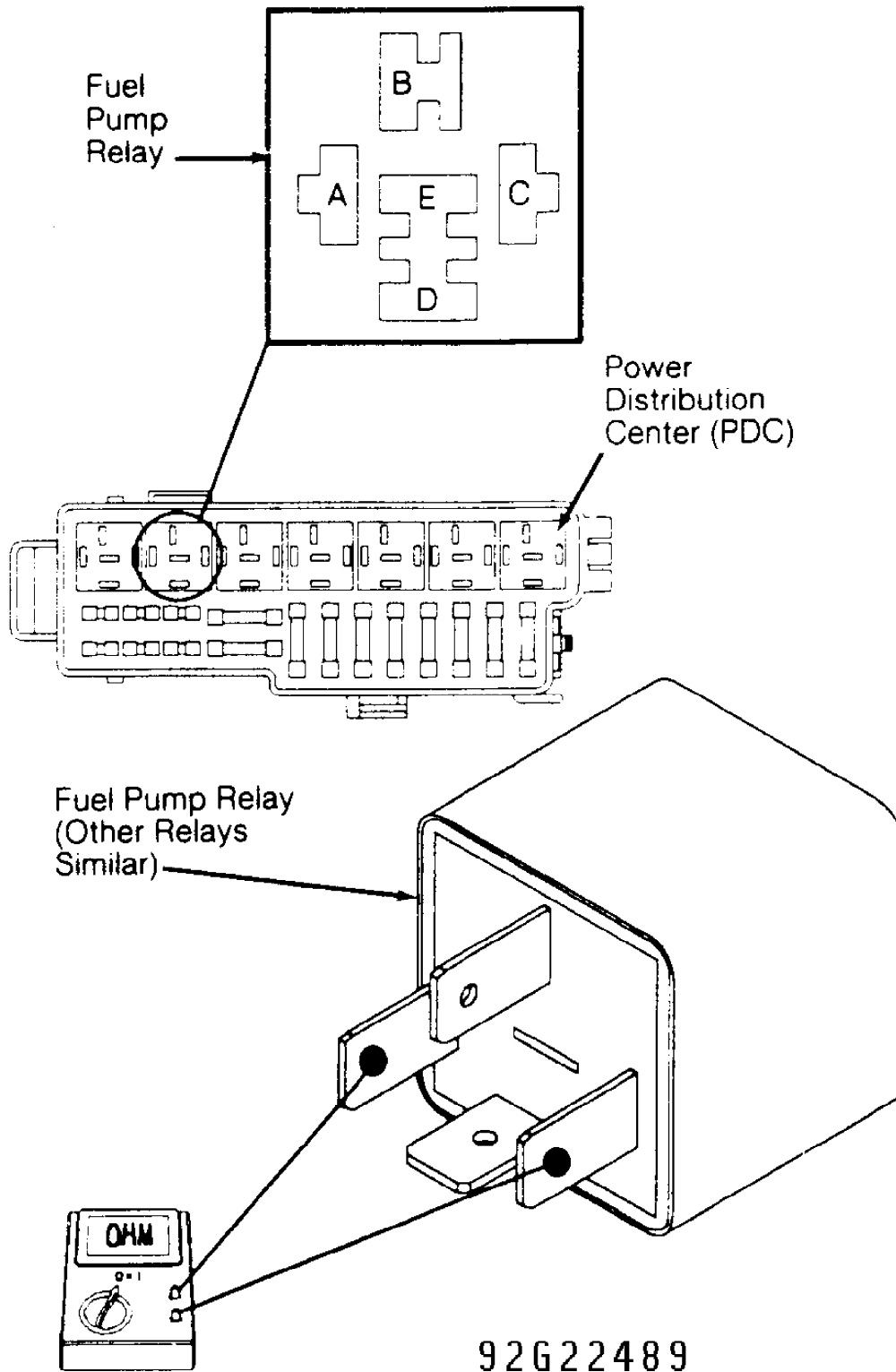


Fig. 15: Testing Fuel Pump Relay
 Courtesy of Chrysler Corp.

SELF-DIAGNOSTIC TESTS

NOTE: For Grand Cherokee with 5.2L engine, see G - 5.2L TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

TEST FC-1A - CHECKING FOR FAULTS

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Battery must be fully charged before proceeding. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds. Connect DRB-II to engine diagnostic connector. Record DRB-II fault messages.

2) If DRB-II has a blank screen or displays RAM TEST FAILURE, CARTRIDGE ERROR, KEY PAD TEST FAILURE, or LOW OR HIGH BATTERY, DRB-II failure is indicated. To diagnose and correct, see G - BODY TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

3) If DRB-II displays NO RESPONSE, go to TEST NS-6A. If fault messages are displayed, see DRB-II FAULT MESSAGES table. If no fault messages are displayed and a driveability problem is present, go to TEST NF-1A. If no fault messages are displayed and a no-start problem is present, go to TEST NS-1A.

DRB-II FAULT MESSAGES TABLE

| DRB-II Message | Test No. |
|---|----------|
| NO CRANK REFERENCE SIGNAL AT PCM | FC-2A |
| NO CAM SYNC SIGNAL AT PCM | FC-3A |
| NO CHANGE IN MAP FROM START TO RUN | FC-4A |
| MAP SENSOR VOLTAGE TOO LOW | FC-5A |
| MAP SENSOR VOLTAGE TOO HIGH | FC-6A |
| NO VEHICLE SPEED SENSOR SIGNAL | FC-7A |
| O2S STAYS AT CENTER | FC-8A |
| O2S SHORTED TO VOLTAGE | FC-9A |
| O2S STAYS ABOVE CENTER (RICH) | FC-10A |
| O2S STAYS BELOW CENTER (LEAN) | FC-11A |
| ECT SENSOR VOLTAGE TOO HIGH | FC-12A |
| ECT SENSOR VOLTAGE TOO LOW | FC-13A |
| INTAKE AIR TEMP SENSOR VOLTAGE LOW | FC-14A |
| INTAKE AIR TEMP SENSOR VOLTAGE HIGH | FC-15A |
| THROTTLE POSITION SENSOR VOLTAGE HIGH | FC-16A |
| THROTTLE POSITION SENSOR VOLTAGE LOW | FC-17A |
| IDLE AIR CONTROL MOTOR CIRCUITS | FC-18A |
| INJECTOR #1 CONTROL CIRCUIT | FC-19A |
| INJECTOR #2 CONTROL CIRCUIT | FC-20A |
| INJECTOR #3 CONTROL CIRCUIT | FC-21A |
| INJECTOR #4 CONTROL CIRCUIT | FC-22A |
| INJECTOR #5 CONTROL CIRCUIT | FC-23A |
| INJECTOR #6 CONTROL CIRCUIT | FC-24A |
| A/C CLUTCH RELAY CIRCUIT | FC-25A |
| RAD FAN CONTROL RELAY CIRCUIT | FC-26A |
| AUTO SHUTDOWN RELAY CONTROL CIRCUIT | FC-27A |
| NO ASD RELAY VOLT SENSE AT PCM | FC-28A |
| PCM FAILURE SRI MILE NOT STORED | FC-29A |
| PCM FAILURE EEPROM WRITE DENIED | FC-30A |
| FUEL PUMP RESISTOR BYPASS RELAY CIRCUIT | FC-31A |
| CHARGING SYSTEM VOLTAGE TOO LOW | (1) |
| CHARGING SYSTEM VOLTAGE TOO HIGH | (1) |
| GENERATOR FIELD NOT SWITCHING PROPERLY | (1) |
| ENGINE IS COLD TOO LONG | (2) |

| | |
|---------------------------------------|-----|
| INTERNAL PCM FAILURE | (3) |
| SPEED CONTROL SOLENOID CIRCUITS | (4) |

- (1) - See ALTERNATORS article in the ELECTRICAL Section.
- (2) - Check cooling system if engine temperature does not reach 176°F (80°C) after driving 20 minutes. This code may set in error during very cold slow speed driving.
- (3) - Replace PCM and perform TEST VER-1.
- (4) - See CRUISE CONTROL SYSTEMS article the in ACCESSORIES/SAFETY EQUIPMENT Section.

TEST FC-2A - NO CRANK REFERENCE SIGNAL AT PCM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of this article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

- 1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.
- 2) Using DRB-II, read fault messages. If DRB-II does not display NO CRANK REFERENCE SIGNAL AT PCM, condition required to set fault is not present at this time. Go to next step. If DRB-II displays NO CRANK REFERENCE SIGNAL AT PCM, go to step 6).
- 3) NO CRANK REFERENCE SIGNAL AT PCM fault sets if Powertrain Control Module (PCM) does not see a Crankshaft Position (CKP) sensor signal with Camshaft Position (CMP) sensor signal present. Possible causes are: failed CKP sensor, open or shorted CKP sensor signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body), open or shorted CKP sensor 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body), open CKP sensor ground circuit (Black/Light Blue wire), improperly adjusted CKP sensor or failed Powertrain Control Module (PCM). Go to next step.
- 4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.
- 5) Start engine. Wiggle wiring harness from CKP sensor to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.
- 6) Turn ignition off. Disconnect Crankshaft Position (CKP) sensor connector. Using DRB-II in ohmmeter mode, check resistance of CKP sensor connector, 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Orange wire on XJ and YJ bodies or White/Black wire on ZJ body.
- 7) If resistance is more than 5 ohms, turn ignition on. Using DRB-II in voltmeter mode, check voltage on CKP sensor connector, 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body). If voltage is less than 7 volts, go to TEST FC-2B. If voltage is more than 7 volts, turn ignition off.
- 8) Connect a jumper wire between signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body) and ground circuit (Black/Light Blue wire) on CKP sensor connector harness side. Using DRB-II, read fault messages. Make and break connection at CKP sensor connector several times while observing DRB-II.
- 9) If DRB-II displays NO CAM SYNC SIGNAL AT PCM, replace CKP sensor. Perform TEST VER-1. If DRB-II does not display NO CAM SYNC SIGNAL AT PCM, turn ignition off.
- 10) Using DRB-II in ohmmeter mode, check resistance on CKP sensor connector, ground circuit (Black/Light Blue wire). If

resistance is more than 5 ohms, repair open in Black/Light Blue wire. Perform TEST VER-1.

11) If resistance is less than 5 ohms, disconnect PCM connector. Inspect PCM sensor connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If PCM connector terminals are okay, go to next step.

12) Using an external ohmmeter, check resistance of signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body) between CKP sensor connector harness side and PCM connector terminal No. 24. If resistance is more than 5 ohms, repair open in Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body. Perform TEST VER-1.

13) If resistance is less than 5 ohms, put DRB-II in ohmmeter mode. Using DRB-II, check resistance of CKP signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body) on PCM connector terminal No. 24. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

14) If resistance is less than 5 ohms, disconnect Camshaft Position (CMP) sensor connector. Using DRB-II, check resistance of CKP signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body) on PCM connector terminal No. 24. If resistance is less more than 5 ohms, replace CMP sensor. Perform TEST VER-1.

15) If resistance is less than 5 ohms, disconnect Vehicle Speed Sensor (VSS) connector. Using DRB-II, check resistance of CKP signal circuit (Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body) on PCM connector terminal No. 24. If resistance is more than 5 ohms, replace Vehicle Speed Sensor (VSS). Perform TEST VER-1. If resistance is less than 5 ohms, repair short to ground in Gray/Black wire on XJ and YJ bodies or Red/Light Green wire on ZJ body. Perform TEST VER-1.

TEST FC-2B - NO CRANK REFERENCE SIGNAL AT PCM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect PCM connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If PCM connector terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body) between CKP sensor connector harness side and PCM connector terminal No. 7. If resistance is more than 5 ohms, repair open in Orange wire on XJ and YJ bodies or White/Black wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-3A - NO CAM SYNC SIGNAL AT PCM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If DRB-II does not display NO CAM SYNC SIGNAL AT PCM, condition required to set fault is not present at this time. Go to next step. If DRB-II displays NO CAM

SYCN SIGNAL AT PCM, go to step 5).

3) NO CAM SYNC SIGNAL AT PCM fault sets if Powertrain Control Module does not see Camshaft Position (CMP) sensor signal with Crankshaft Position (CKP) signal present. Possible causes are: failed CMP sensor, open or shorted CMP sensor signal circuit (Tan/Yellow wire on XJ and YJ bodies or Gray/Black wire on ZL body), open CMP sensor 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body), open CMP sensor ground circuit (Black/Light Blue wire), improperly adjusted CMP sensor or failed Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring or connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1. Go to next step.

5) Turn ignition off. Disconnect Camshaft Position (CMP) sensor connector. Using DRB-II in ohmmeter mode, check resistance of CMP sensor connector, 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Orange wire on XJ and YJ bodies or White/Black wire on ZJ body. Perform TEST VER-1.

6) If resistance is more than 5 ohms, turn ignition on. Using DRB-II in voltmeter mode, check voltage on CMP sensor connector, 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body). If voltage is less than 7 volts, go to TEST FC-3B.

7) If voltage is more than 7 volts, turn ignition off. Connect a jumper wire between signal circuit (Tan/Yellow wire on XJ and YJ bodies or Gray/Black wire on ZJ body) and ground circuit (Black/Light Blue wire) on CKP sensor connector harness side. Make and break connection at CKP sensor connector several times.

8) Attempt to start engine. If engine starts, replace CMP sensor. Perform TEST VER-1. If engine does not start, turn ignition off.

9) Using DRB-II in ohmmeter mode, check resistance on CMP sensor connector, ground circuit (Black/Light Blue wire). If resistance is more than 5 ohms, repair open in Black/Light Blue wire. Perform TEST VER-1.

10) If resistance is less than 5 ohms, disconnect Powertrain Control Module (PCM) connector. Inspect PCM connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If PCM connector terminals are okay, go to next step.

11) Using an external ohmmeter, check resistance of signal circuit (Tan/Yellow wire on XJ and YJ bodies or Gray/Black on ZJ body) between CMP sensor connector harness side and PCM connector terminal No. 44. If resistance is more than 5 ohms, repair open in Tan/Yellow wire on XJ and YJ bodies or Gray/Black on ZJ body. Perform TEST VER-1.

12) If resistance is less than 5 ohms, using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 44. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is less than 5 ohms, repair short to ground in Tan/Yellow wire on XJ and YJ bodies or Gray/Black wire on ZJ body. Perform TEST VER-1.

TEST FC-3B - NO CAM SYNC SIGNAL AT PCM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect PCM connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If PCM connector terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body) between CMP sensor connector harness side and PCM connector terminal No. 7. If resistance is more than 5 ohms, repair open in Orange wire on XJ and YJ bodies or White/Black wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-4A - NO CHANGE IN MAP FROM START TO RUN

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition on. Using DRB-II, erase fault messages. Start engine. Allow engine to idle for 30 seconds. With engine running, read fault messages using DRB-II. If DRB-II does not display NO CHANGE IN MAP FROM START TO RUN, go to step 4).

2) If DRB-II displays NO CHANGE IN MAP FROM START TO RUN, turn ignition off. Disconnect Manifold Absolute Pressure (MAP) sensor connector. Turn ignition on. Using DRB-II in voltmeter mode, check voltage on MAP sensor connector, 5-volt supply circuit (Violet/White wire).

3) If voltage is less than 4 volts, repair open or short in Violet/White wire. Perform TEST VER-1. If voltage is more than 4 volts, remove MAP sensor vacuum hose. Inspect condition of MAP sensor vacuum hose. If MAP sensor vacuum hose is restricted or open, replace vacuum hose as necessary. Perform TEST VER-1. If MAP sensor vacuum hose is okay, replace MAP sensor. Perform TEST VER-1.

4) Using DRB-II, set engine speed to 1500 RPM. With engine running at 1500 RPM, read DRB-II MAP sensor voltage. While monitoring MAP sensor voltage, wiggle MAP sensor connector and wiring harness.

5) If engine stalls or MAP sensor voltage becomes erratic, inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If engine does not stall and MAP sensor voltage does not become erratic, snap throttle open and closed while monitoring DRB-II.

6) If engine vacuum does not rapidly drop to less than one in. Hg, go to step 8). If engine vacuum rapidly drops to less than one in. Hg, condition required to set fault is not present at this time. Go to next step.

7) NO CHANGE IN MAP FROM START TO RUN fault sets if too small a difference is seen between barometric pressure at key on and manifold vacuum after engine start. Possible causes are: restricted or leaking vacuum/pressure hose to MAP sensor, ice in MAP sensor or passage, or MAP sensor failure. Perform TEST VER-1.

8) Remove MAP sensor vacuum hose. Inspect condition of MAP sensor vacuum hose. If MAP sensor vacuum hose is restricted or open, replace vacuum hose as necessary. Perform TEST VER-1. If MAP sensor vacuum hose is okay, replace MAP sensor. Perform TEST VER-1.

TEST FC-5A - MAP SENSOR VOLTAGE TOO LOW

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Start engine. Using DRB-II, read Manifold Absolute Pressure (MAP) sensor voltage. If MAP sensor voltage is less than .2 volt, go to step 5). If MAP sensor voltage is more than .2 volt, turn engine off. Turn ignition on.

2) Using DRB-II, read MAP sensor voltage. If voltage is less than 1.2 volts, go to step 5). If voltage is more than 1.2 volts, wiggle MAP sensor connector and wiring harness while watching DRB-II display. If MAP sensor voltage changes, repair connector or wiring harness as necessary. Perform TEST VER-1.

3) If MAP sensor voltage does not change, condition required to set fault is not present at this time. MAP SENSOR VOLTAGE TOO LOW fault sets if MAP sensor output is less than 1.2 volts at start or less than .2 volt with engine running. Engine speed must be more than 400 RPM, but less than 1500 RPM, and Throttle Position Sensor (TPS) voltage must be less than one volt. Possible causes are: short to ground in MAP sensor signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body), MAP sensor shorted internally or loss of MAP sensor 5-volt supply circuit (Violet/White wire). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Turn ignition on. Ensure engine is off. Disconnect MAP sensor connector. Using DRB-II, read MAP sensor voltage. If MAP sensor voltage is more than 4 volts, replace MAP sensor. Perform TEST VER-1.

6) If MAP sensor voltage is less than 4 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance between signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body) and ground circuit (Black/Light Blue wire) on MAP sensor connector. If resistance is less than 5 ohms, repair short to ground in Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-6A - MAP SENSOR VOLTAGE TOO HIGH

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Start engine. Using DRB-II, read Manifold Absolute Pressure (MAP) sensor voltage. If MAP sensor voltage is more than 4.6 volts, go to step 4). If MAP sensor voltage is less than 4.6 volts, wiggle MAP sensor connector and wiring harness while watching DRB-II display. If MAP sensor voltage changes, repair connector or wiring harness as necessary. Perform TEST VER-1.

2) If MAP sensor voltage does not change, condition required to set fault is not present at this time. MAP SENSOR VOLTAGE TOO HIGH fault sets if MAP sensor output is more than 4.6 volts at start or with engine running. Engine speed must be more than 400 RPM but less than 1500 RPM, and Throttle Position Sensor (TPS) voltage must be less than one volt. Possible causes are: open MAP sensor signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body), MAP sensor open internally, open MAP sensor ground circuit (Black/Light Blue wire) or short to voltage in MAP sensor signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition on. Ensure engine is off. Disconnect MAP sensor connector. Connect a jumper wire between signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body) and ground circuit (Black/Light Blue wire) on MAP sensor connector. Using DRB-II, read MAP sensor voltage. If voltage is less than one volt,

replace MAP sensor. Perform TEST VER-1.

5) If MAP sensor voltage is more than one volt, move jumper wire from MAP sensor connector, ground circuit (Black/Light Blue wire) to an engine ground. Using DRB-II, read MAP sensor voltage.

6) If MAP sensor voltage is less than one volt, repair open in Black/Light Blue wire. Perform TEST VER-1. If MAP sensor voltage is more than one volt, turn ignition off. Disconnect Powertrain Control Module (PCM) connector.

7) Using an external ohmmeter, check resistance of signal circuit (Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body) between MAP sensor connector and PCM connector terminal No. 1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Dark Green/Red wire on XJ and YJ bodies or Red/White wire on ZJ body. Perform TEST VER-1.

TEST FC-7A - NO VEHICLE SPEED SENSOR SIGNAL

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Raise vehicle so drive wheels are free to spin. Start engine. Using DRB-II, read Vehicle Speed Sensor (VSS) signal. Put transmission in any forward gear. If DRB-II displays more than zero MPH, go to next step. If DRB-II does not display more than zero MPH, go to step 4).

2) Condition required to set fault is not present at this time. NO VEHICLE SPEED SENSOR SIGNAL fault sets if Powertrain Control Module (PCM) does not see a VSS signal at PCM terminal No. 47 (White/Orange wire) under road load conditions. Possible causes are: open or shorted VSS signal circuit (White/Orange wire), open VSS sensor 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body), open VSS sensor ground circuit (Black/Light Blue wire), failed VSS sensor, failed Daytime Running Light (DRL) module (if equipped) or failed Powertrain Control Module (PCM). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition off. Disconnect Vehicle Speed Sensor (VSS) connector. Turn ignition on. Using DRB-II in voltmeter mode, check voltage on VSS sensor connector, 8-volt supply circuit (Orange wire on XJ and YJ bodies or White/Black wire on ZJ body). If voltage is more than 7 volts, go to next step. If voltage is less than 7 volts, repair open in Orange wire on XJ and YJ bodies or White/Black wire on ZJ body. Perform TEST VER-1.

5) Using DRB-II, check voltage on VSS sensor connector, signal circuit (White/Orange wire). If voltage is less than 4 volts, go to TEST FC-7B. If voltage is more than 4 volts, turn ignition off. Connect a jumper wire between VSS signal circuit (White/Orange wire) and ground circuit (Black/Light Blue wire) on VSS sensor connector.

6) Turn ignition on. Using DRB-II, read vehicle speed. Make and break connection at VSS sensor connector several times while observing DRB-II display. If DRB-II displays vehicle speed as more than zero MPH, replace VSS. Perform TEST VER-1. If DRB-II does not display more than zero MPH, turn ignition off. Using DRB-II in ohmmeter mode, check resistance on VSS sensor connector, ground circuit (Black/Light Blue wire). If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Black/Light Blue wire. Perform TEST VER-1.

7) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of

signal circuit (White/Orange wire) between VSS connector harness side and PCM connector terminal No. 47. If resistance is more than 5 ohms, repair open in White/Orange wire. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-7B - NO VEHICLE SPEED SENSOR SIGNAL

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect PCM connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If no problems were found with wiring or connectors, go to next step.

2) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 47 (White/Orange wire). If resistance is more than 5 ohms, go to step 4). If resistance is less than 5 ohms, disconnect Daytime Running Lights (DRL) module connector (if equipped). If vehicle is not equipped with DRL, repair short to ground in White/Orange wire. DRL module is located near blower motor on XJ body, near coolant overflow reservoir on YJ body or under Power Distribution Center on ZJ body. Using DRB-II, check resistance of PCM connector terminal No. 47 (White/Orange wire).

3) If resistance is more than 5 ohms, replace DRL module. Perform TEST VER-1. If resistance is less than 5 ohms, repair short to ground in White/Orange wire. Perform TEST VER-1.

4) Using an external ohmmeter, check resistance of signal circuit (White/Orange wire) between VSS sensor connector and PCM connector terminal No. 47. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in White/Orange wire. Perform TEST VER-1.

TEST FC-8A - OXYGEN (O2) SENSOR STAYS AT CENTER

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Start engine. Allow engine to run until normal operating temperature is reached. Using DRB-II, set engine speed to 1500 RPM. Using DRB-II, read oxygen sensor state. If oxygen sensor is not switching from rich to lean, go to step 4). If oxygen sensor is switching from rich to lean, wiggle sensor connector and wiring harness while watching DRB-II display.

2) If oxygen sensor was locked at center at any time, inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If oxygen sensor was not locked at center at any time, condition required to set fault is not present at this time. O2S STAYS AT CENTER fault sets if oxygen sensor output voltage stays at .5 volt for 1.5 minutes with engine temperature more than 170°F (77°C) and engine running for 2 minutes. Possible causes are: open oxygen sensor circuit or oxygen sensor failure. Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition off. Disconnect oxygen sensor connector. Using DRB-II in ohmmeter mode, check resistance of ground circuit (Black/Light Blue wire) at oxygen sensor connector harness side. If resistance is more than 5 ohms, repair open in Black/Light Blue wire. Perform TEST VER-1.

5) If resistance is less than 5 ohms, connect a jumper wire between oxygen sensor signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body) and battery positive terminal. Using DRB-II, read oxygen sensor voltage. If oxygen sensor voltage is more than one volt, replace oxygen sensor. Perform TEST VER-1.

6) If oxygen sensor voltage is less than one volt, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Disconnect jumper wire between oxygen sensor signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body) and battery positive terminal.

7) Using an external ohmmeter, check resistance of signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body) between oxygen sensor connector harness side and PCM connector terminal No. 41. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body. Perform TEST VER-1.

TEST FC-9A - OXYGEN (O2) SENSOR SHORTED TO VOLTAGE

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read oxygen sensor voltage. If oxygen sensor voltage is more than 1.2 volts, go to step 4). If oxygen sensor voltage is less than 1.2 volts, wiggle oxygen sensor connector and wiring harness while watching DRB-II display. If voltage goes to more than 1.2 volts at any time, repair wiring and connectors as necessary. Perform TEST VER-1.

2) If voltage does not go to more than 1.2 volts at any time, condition required to set fault is not present at this time. O2S SHORTED TO VOLTAGE fault sets if oxygen sensor signal circuit voltage goes to more than 1.2 volts. Possible causes are: oxygen sensor signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body) shorted to another circuit, oxygen sensor connector has excessive dirt, grease and/or water build-up, or oxygen sensor failure. Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition off. Disconnect oxygen sensor connector. Using DRB-II in voltmeter mode, read oxygen sensor voltage. If voltage is more than 1.2 volts, repair short to voltage in Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body, on oxygen sensor connector harness side. Perform TEST VER-1. If voltage is less than 1.2 volts, replace oxygen sensor. Perform TEST VER-1.

TEST FC-10A - OXYGEN (O2) SENSOR STAYS ABOVE CENTER (RICH)

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Start engine. Allow engine to run until normal operating temperature is reached. Using DRB-II, set engine speed to 1500 RPM. Using DRB-II, read oxygen sensor voltage. If oxygen sensor voltage is not always more than .5 volt, condition required to set fault is not present at this time. Go to next step. If oxygen sensor voltage is always more than .5 volt, go to step 3).

2) O2S STAYS ABOVE CENTER (RICH) fault sets if oxygen sensor output voltage stays at more than .5 volt, but less than 1.2 volts, without changing for more than 8 minutes. Possible causes are: high fuel pressure, other engine sensor calibration failures, ignition system failure, oxygen sensor failure or fuel contamination. Go to TEST NF-1A.

3) Using DRB-II, stop all actuation tests. Turn ignition off. Inspect air cleaner filter and inlet ducts for restrictions. If restrictions are present, repair as necessary. Perform TEST VER-1. If restrictions are not present, remove fuel injector rail assembly.

4) Turn ignition on. Using DRB-II, actuate ASD fuel system test. Inspect all injectors for leakage. If injectors are leaking, stop ASD fuel system test. Replace leaking fuel injectors as necessary. Perform TEST VER-1.

5) If injectors are not leaking, using DRB-II, stop ASD fuel system test. A condition causing engine to run rich is present. Return to step 2).

TEST FC-11A - OXYGEN (O2) SENSOR STAYS BELOW CENTER (LEAN)

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Start engine. Allow engine to run until normal operating temperature is reached. Using DRB-II, set engine speed to 1500 RPM. Using DRB-II, read oxygen sensor voltage. If oxygen sensor voltage is not always less than .5 volt, condition required to set fault is not present at this time. Go to next step. If oxygen sensor voltage is always less than .5 volt, go to step 3).

2) O2S STAYS BELOW CENTER (LEAN) fault sets if oxygen sensor output voltage stays at less than .5 volt without changing for more than 8 minutes. Possible causes are: large vacuum leak, low fuel pressure, other engine sensor calibration failures, ignition system failure, oxygen sensor failure or fuel contamination. Go to TEST NF-1A.

3) Using DRB-II, check if oxygen sensor voltage is always zero volts. If oxygen sensor voltage is always zero volts, go to next step. If oxygen sensor voltage is not always zero volts, a condition causing engine to run lean is present. Go to TEST NF-1A.

4) Using DRB-II, stop all actuation tests. Turn ignition on with engine off. Disconnect oxygen sensor connector. Using DRB-II, read oxygen sensor state. If oxygen sensor state is at center, replace oxygen sensor. Perform TEST VER-1.

5) If oxygen sensor state is not at center, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance of oxygen sensor connector (harness side), signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body).

6) If resistance is less than 5 ohms, repair short to ground in Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-12A - ECT SENSOR VOLTAGE TOO HIGH

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Engine Coolant Temperature (ECT) sensor

voltage. If voltage is more than 4.5 volts, go to step 4). If voltage is less than 4.5 volts, while observing DRB-II, wiggle wiring harness from ECT sensor to Powertrain Control Module (PCM). If voltage changes, repair wiring harness as necessary. Perform TEST VER-1.

2) If voltage does not change, condition required to set fault is not present at this time. ECT SENSOR VOLTAGE TOO HIGH fault sets if ECT sensor signal circuit (Tan/Black wire) is more than 4.9 volts. Possible causes are: open ECT sensor signal circuit (Tan/Black wire), ECT sensor open internally or open ECT sensor ground circuit (Black/Light Blue wire). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Disconnect ECT sensor connector. Connect a jumper wire between signal circuit (Tan/Black wire) and ground circuit (Black/Light Blue wire) on ECT sensor connector. Using DRB-II, read ECT sensor voltage.

5) If voltage is less than one volt, replace ECT sensor. Perform TEST VER-1. If voltage is more than one volt, move jumper wire from ECT sensor connector, ground circuit (Black/Light Blue wire) to an engine ground.

6) Using DRB-II, read ECT sensor voltage. If voltage is less than one volt, repair open in Black/Light Blue wire. Perform TEST VER-1. If voltage is more than one volt, turn ignition off. Disconnect Powertrain Control Module (PCM) connector.

7) Using an external ohmmeter, check resistance of signal circuit (Tan/Black wire) between ECT sensor connector and PCM connector terminal No. 2. If resistance is more than 5 ohms, repair open in Tan/Black wire. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-13A - ECT SENSOR VOLTAGE TOO LOW

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Engine Coolant Temperature (ECT) sensor voltage. If voltage is less than .5 volt, go to step 4). If voltage is more than .5 volt, wiggle wiring harness from ECT sensor to Powertrain Control Module (PCM) while observing DRB-II. If voltage changes, repair wiring harness as necessary. Perform TEST VER-1.

2) If voltage does not change, condition required to set fault is not present at this time. ECT SENSOR VOLTAGE TOO LOW fault sets if ECT sensor signal circuit (Tan/Black wire) is less than .5 volt. Possible causes are: short to ground in ECT sensor signal circuit (Tan/Black wire) or ECT sensor shorted internally. Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-2.

4) Disconnect ECT sensor connector. Using DRB-II, read ECT sensor voltage. If voltage is more than 4 volts, replace ECT sensor. Perform TEST VER-1. If voltage is less than 4 volts, turn ignition off. Disconnect PCM connector.

5) Put DRB-II in ohmmeter mode. Using DRB-II, check resistance of ECT sensor connector, signal circuit (Tan/Black wire). If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is less than 5 ohms, repair short to ground in Tan/Black wire. Perform TEST VER-1.

TEST FC-14A - INTAKE AIR TEMP SENSOR VOLTAGE LOW

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Intake Air Temperature Sensor (IAT) voltage. If IAT voltage is less than .5 volt, go to step 4). If IAT voltage is more than .5 volt, wiggle wiring harness from IAT sensor to Powertrain Control Module (PCM) while observing DRB-II. If voltage changed, repair wiring harness as necessary.

2) If voltage does not change, condition required to set fault is not present at this time. INTAKE AIR TEMP SENSOR VOLTAGE LOW fault sets if IAT signal circuit (Black/Red wire), is less than .5 volt. Possible causes are: short to ground in IAT signal circuit (Black/Red wire) or IAT sensor shorted internally. Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Disconnect IAT sensor connector. Using DRB-II, read IAT sensor voltage. If voltage is more than 4 volts, replace IAT sensor. Perform TEST VER-1. If voltage is less than 4 volts, turn ignition off. Disconnect PCM connector.

5) Using DRB-II in ohmmeter mode, check resistance of IAT sensor connector, signal circuit (Black/Red wire). If resistance is less than 5 ohms, repair short to ground in Black/Red wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-15A - INTAKE AIR TEMP SENSOR VOLTAGE HIGH

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Intake Air Temperature Sensor (IAT) voltage. If IAT voltage is more than 4.5 volts, go to step 4). If IAT voltage is less than 4.5 volts, while observing DRB-II display, wiggle wiring harness from IAT sensor to Powertrain Control Module (PCM). If voltage changed, repair wiring harness as necessary.

2) If voltage does not change, condition required to set fault is not present at this time. INTAKE AIR TEMP SENSOR VOLTAGE HIGH fault sets if IAT signal circuit (Black/Red wire), is more than 4.9 volts. Possible causes are: open IAT signal circuit (Black/Red wire), IAT sensor open internally or open IAT sensor ground circuit (Black/Light Blue wire). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Disconnect IAT sensor connector. Connect jumper wire between signal circuit (Black/Red wire) and ground circuit (Black/Light Blue wire) on IAT sensor connector. Using DRB-II, read IAT sensor voltage. If voltage is less than one volt, replace IAT sensor. Perform TEST VER-1.

5) If voltage is more than one volt, move jumper wire from IAT sensor connector, ground circuit (Black/Light Blue wire) to an engine ground. Using DRB-II, read IAT sensor voltage. If voltage is less than one volt, repair open in Black/Light Blue wire. If voltage is more than one volt, turn ignition off. Disconnect PCM connector.

6) Using an external ohmmeter, check resistance of signal circuit (Black/Red wire) between IAT sensor connector and PCM connector terminal No. 21. If resistance is more than 5 ohms, repair open in

Black/Red wire. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-16A - THROTTLE POSITION SENSOR VOLTAGE HIGH

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Throttle Position Sensor (TPS) voltage. If TPS voltage is more than 4.5 volts, go to step 5). If TPS voltage is less than 4.5 volts, while observing DRB-II, slowly open and close throttle.

2) If voltage change is not smooth, replace TPS. Perform TEST VER-1. If voltage change is smooth, while observing DRB-II, wiggle wiring harness from TPS to Powertrain Control Module (PCM). If voltage changes, repair wiring harness as necessary. Perform TEST VER-1.

3) If voltage does not change, condition required to set fault is not present at this time. THROTTLE POSITION SENSOR VOLTAGE HIGH fault sets if TPS signal circuit (Orange/Dark Blue wire) is more than 4.5 volts. Possible causes are: open TPS signal circuit (Orange/Dark Blue wire), open TPS ground circuit (Black/Light Blue wire) or TPS sensor failure. Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Disconnect TPS connector. Connect a jumper wire between TPS signal circuit (Orange/Dark Blue wire) and TPS ground circuit (Black/Light Blue wire) on TPS connector. Using DRB-II, read TPS voltage. If voltage is less than one volt, replace TPS. Perform TEST VER-1.

6) If voltage is more than one volt, move jumper wire from TPS connector, ground circuit (Black/Light Blue wire), to an engine ground. Using DRB-II, read TPS sensor voltage.

7) If TPS sensor voltage is less than one volt, repair open in Black/Light Blue wire. Perform TEST VER-1. If TPS voltage is more than one volt, turn ignition off. Disconnect Powertrain Control Module (PCM) connector.

8) Using an external ohmmeter, check resistance of TPS signal circuit (Orange/Dark Blue wire) between TPS connector and PCM connector terminal No. 22. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Orange/Dark Blue wire. Perform TEST VER-1.

TEST FC-17A - THROTTLE POSITION SENSOR VOLTAGE LOW

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read Throttle Position Sensor (TPS) voltage. If TPS voltage is less than .2 volt, go to step 5). If TPS voltage is more than .2 volt, while observing DRB-II, slowly open and close throttle.

2) If voltage change is not smooth, replace TPS. Perform TEST VER-1. If voltage change is smooth, while observing DRB-II, wiggle wiring harness from TPS to Powertrain Control Module (PCM). If voltage changes, repair wiring harness as necessary. Perform TEST VER-1.

3) If voltage does not change, condition required to set fault is not present at this time. THROTTLE POSITION SENSOR VOLTAGE LOW fault sets if TPS signal circuit (Orange/Dark Blue wire) is less

than .2 volt or if vehicle speed is more than 20 MPH, engine speed is more than 1500 RPM and vacuum is less than 2 in. Hg with TPS signal circuit (Orange/Dark Blue wire) less than .5 volt. Possible causes are: short to ground in TPS signal circuit (Orange/Dark Blue wire), TPS sensor failure or open TPS 5-volt supply circuit (Violet/White wire). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Disconnect TPS connector. Using DRB-II, read TPS voltage. If voltage is more than one volt, replace TPS. Perform TEST VER-1. If voltage is less than one volt, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance of TPS connector, signal circuit (Orange/Dark Blue wire).

6) If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is less than 5 ohms, disconnect Transmission Control Module (TCM) connector (if equipped). If vehicle is not equipped with TCM, repair short to ground in Orange/Dark Blue wire. Perform TEST VER-1. On vehicles with TCM, using DRB-II, check resistance of TPS connector, signal circuit (Orange/Dark Blue wire).

7) If resistance is less than 5 ohms, repair short to ground in Orange/Dark Blue wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace TCM. Perform TEST VER-1.

TEST FC-18A - IDLE AIR CONTROL MOTOR CIRCUITS

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Turn ignition off. Start engine. Allow engine to reach normal operating temperature. Using DRB-II, read fault messages. If DRB-II displays IDLE AIR CONTROL MOTOR CIRCUITS, go to step 4).

2) If DRB-II does not display IDLE AIR CONTROL MOTOR CIRCUITS, condition required to set fault is not present at this time. IDLE AIR CONTROL MOTOR CIRCUITS fault sets if any of 4 Idle Air Control (IAC) motor wires are shorted to ground or battery voltage. Possible causes are: IAC motor internally shorted or IAC motor wires shorted together. Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition off. Disconnect Idle Air Control (IAC) motor connector. Turn ignition on. Using DRB-II, actuate IAC motor. Using DRB-II in voltmeter mode, check voltage on each IAC motor connector wire at IAC motor connector. Normal voltage reading will switch from less than one volt to more than 10 volts.

5) If voltage is less than one volt on any IAC motor wire, repair appropriate wire for short to ground. Perform TEST VER-1. If voltage is more than 10 volts on any IAC motor wire, repair appropriate wire for short to voltage. Perform TEST VER-1.

6) Turn ignition off. Reconnect IAC motor connector. Disconnect PCM. Using an external ohmmeter, check resistance between terminals No. 39 and 59 at PCM connector. If resistance is more than 35 ohms, go to next step. If resistance is less than 35 ohms, replace IAC motor. Perform TEST VER-1.

7) Using an external ohmmeter, check resistance between terminals No. 40 and 60 at PCM connector. If resistance is less than 35 ohms, replace IAC motor. Perform TEST VER-1. If resistance is more than 35 ohms, check resistance between terminals No. 39 and 60 at PCM

connector using DRB-II.

8) If resistance is more than 10 ohms, but less than 75 ohms, go to step 10). If resistance is less than 10 ohms, repair IAC driver circuits No. 1 and 2 for shorting together. See appropriate PCM TERMINAL IDENTIFICATION table for wire color identification. Perform TEST VER-1.

9) If resistance is 75-120 ohms, repair IAC driver circuits No. 3 and 4 for shorting together. See appropriate PCM TERMINAL IDENTIFICATION table for wire color identification. Perform TEST VER-1. If resistance is more than 120 ohms, replace PCM. Perform TEST VER-1.

10) If resistance is less than 75 ohms, check resistance between terminals No. 59 and 60 at PCM connector. If resistance is less than 10 ohms, repair IAC driver circuits No. 2 and 4 for shorting together. See appropriate PCM TERMINAL IDENTIFICATION table for wire color identification. Perform TEST VER-1.

11) If resistance is more than 10 ohms, repair IAC driver circuits No. 1 and 4 for shorting together. See appropriate PCM TERMINAL IDENTIFICATION table for wire color identification. Perform TEST VER-1.

PCM TERMINAL IDENTIFICATION TABLE (1) (XJ & YJ BODIES)

| Wire Color & (PCM Terminal No.) | IAC Driver No. | Connector Terminal No. |
|------------------------------------|-------------------|---------------------------|
| Gray/Red (39) | 3 | 1 |
| Brown/White (40) | 1 | 3 |
| Violet/Black (59) | 4 | 4 |
| Yellow/Black (60) | 2 | 2 |

(1) - For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article.

PCM TERMINAL IDENTIFICATION TABLE (1) (ZJ BODY)

| Wire Color & (PCM Terminal No.) | IAC Driver No. | Connector Terminal No. |
|------------------------------------|-------------------|---------------------------|
| Yellow/Black (39) | 3 | 1 |
| Brown/White (40) | 1 | 3 |
| Gray/Red (59) | 4 | 4 |
| Violet/Black (60) | 2 | 2 |

(1) - For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article.

TEST FC-19A - INJECTOR #1 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #1 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays

INJECTOR #1 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #1 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (White/Dark Blue wire), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 1 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 1 connector. Using an external ohmmeter, check resistance of injector No. 1. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 1.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (White/Dark Blue wire), between PCM connector terminal No. 16 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in White/Dark Blue wire. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 16, injector driver circuit (White/Dark Blue wire). If resistance is less than 5 ohms, repair short to ground in White/Dark Blue wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-20A - INJECTOR #2 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #2 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays INJECTOR #2 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #2 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (Tan wire), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 2 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 2 connector. Using an external ohmmeter, check resistance of injector No. 2. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 2.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (Tan wire) between PCM connector terminal No. 15 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Tan wire. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 15, injector driver circuit (Tan wire). If resistance is less than 5 ohms, repair short to ground in Tan wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-21A - INJECTOR #3 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #3 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays INJECTOR #3 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #3 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (Yellow/White wire), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 3 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION in SELF-DIAGNOSTICS. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 3 connector. Using an external ohmmeter, check resistance of injector No. 3. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 3.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or

Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (Yellow/White wire) between PCM connector terminal No. 14 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Yellow/White wire. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 14, injector driver circuit (Yellow/White wire). If resistance is less than 5 ohms, repair short to ground in Yellow/White wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-22A - INJECTOR #4 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #4 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays INJECTOR #4 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #4 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (Light Blue/Brown wire), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 4 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 4 connector. Using an external ohmmeter, check resistance of injector No. 4. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 4.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (Light Blue/Brown wire), between PCM connector terminal No. 13 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Light Blue/Brown wire. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM

connector terminal No. 13, injector driver circuit (Light Blue/Brown wire). If resistance is less than 5 ohms, repair short to ground in Light Blue/Brown wire. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-23A - INJECTOR #5 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #5 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays INJECTOR #5 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #5 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (Pink/Black wire on XJ and YJ bodies or Gray wire on ZJ body), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 5 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 5 connector. Using an external ohmmeter, check resistance of injector No. 5. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 5.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (Pink/Black wire on XJ and YJ bodies or Gray wire on ZJ body) between PCM connector terminal No. 38 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Pink/Black wire on XJ and YJ bodies or Gray wire on ZJ body. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 38, injector driver circuit (Pink/Black wire on XJ and YJ bodies or Gray wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Pink/Black wire on XJ and YJ bodies or Gray wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-24A - INJECTOR #6 CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams,

see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Attempt to start engine. If engine will not start, crank engine for at least 10 seconds.

2) Using DRB-II, read fault messages. If engine started, allow engine to idle for at least 20 seconds. If DRB-II does not display INJECTOR #6 CONTROL CIRCUIT, condition required to set fault is not present at this time. Go to next step. If DRB-II displays INJECTOR #6 CONTROL CIRCUIT, go to step 6).

3) INJECTOR #6 CONTROL CIRCUIT fault sets if Powertrain Control Module (PCM) does not detect injector "turn off edge" when expected. Possible causes are: open or shorted injector ground circuit (Light Green/Black wire on XJ and YJ bodies or Brown/Yellow wire on ZJ body), open injector power supply circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open injector, or failed driver in Powertrain Control Module (PCM). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

5) Start engine. Wiggle wiring harness from injector No. 6 to Powertrain Control Module (PCM). If engine misfires or stalls, repair wiring harness as necessary. Perform TEST VER-1. If engine does not misfire or stall, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

6) Turn ignition off. Disconnect injector No. 6 connector. Using an external ohmmeter, check resistance of injector No. 6. If resistance is not 10-16 ohms, replace injector. Perform TEST VER-1. If resistance is 10-16 ohms, turn ignition on. Using DRB-II, actuate injector No. 6.

7) Using DRB-II in voltmeter mode, check voltage on injector connector (harness side) Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

8) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of injector driver circuit (Light Green/Black wire on XJ and YJ bodies or Brown/Yellow wire on ZJ body), between PCM connector terminal No. 58 and injector connector. If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, repair open in Light Green/Black wire on XJ and YJ bodies or Brown/Yellow wire on ZJ body. Perform TEST VER-1.

9) Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 58, injector driver circuit (Light Green/Black wire on XJ and YJ bodies or Brown/Yellow wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Light Green/Black wire on XJ and YJ bodies or Brown/Yellow wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-25A - A/C CLUTCH RELAY CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Turn ignition on. On XJ and YJ bodies, actuate A/C clutch relay using DRB-II. On ZJ body, actuate A/C clutch relay and Auto Shutdown (ASD) relay using DRB-II. On all bodies, if A/C clutch relay is clicking, go to next step. If A/C clutch relay is not clicking, go to step 5).

2) Condition required to set fault is not present at this time. A/C CLUTCH RELAY CIRCUIT fault sets if A/C clutch relay control circuit (Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body) is not in its proper state when monitored by Powertrain Control Module (PCM). Possible causes are: open or short in A/C clutch relay coil windings, open or short in A/C clutch relay control circuit (Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body), open or short in A/C clutch relay ignition feed circuit (Dark Blue/White wire on XJ and YJ bodies or Yellow/Dark Green wire on ZJ body), or failed driver in Powertrain Control Module (PCM). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

4) While still actuating A/C clutch and ASD relay, wiggle wiring harness from A/C clutch relay to Powertrain Control Module (PCM). Stop actuation of relays. Using DRB-II, read fault messages. If A/C CLUTCH RELAY CIRCUIT fault returns, repair wiring harness as necessary. Perform TEST VER-1. If A/C CLUTCH RELAY CIRCUIT fault does not return, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Remove A/C clutch relay. Install a known good A/C clutch relay. If known good A/C clutch relay is clicking, replace original A/C clutch relay. Perform TEST VER-1. If known good A/C clutch relay is not clicking, remove known good A/C clutch relay.

6) Ensure A/C clutch relay actuation test is still running. Using DRB-II in voltmeter mode, check voltage on A/C clutch relay connector, ignition feed circuit (Dark Blue/White wire on XJ and YJ bodies or Yellow/Dark Green wire on ZJ body). If voltage is less than 10 volts, repair open in Dark Blue/White wire on XJ and YJ bodies or Yellow/Dark Green wire on ZJ body. Perform TEST VER-1.

7) If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance of A/C clutch relay connector, control circuit (Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body. Perform TEST VER-1.

8) If resistance is more than 5 ohms, check resistance of control circuit (Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body) between A/C clutch relay connector and PCM connector terminal No. 34 using an external ohmmeter. If resistance is more than 5 ohms, repair open in Dark Blue/Orange wire on XJ and YJ bodies or Dark Blue/Red wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-26A - RAD FAN CONTROL RELAY CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Turn ignition on. Using DRB-II, actuate radiator fan relay. If radiator fan relay is clicking, condition required to set fault is not present at this time. Go to next step. If radiator fan relay is not clicking, go to step 5).

2) RAD FAN CONTROL RELAY CIRCUIT fault sets if radiator fan relay control circuit (Dark Blue/Pink wire) is not in its proper state when monitored by Powertrain Control Module (PCM). Possible causes are: open or short in radiator fan relay coil windings, open or short in radiator fan relay control circuit (Dark Blue/Pink wire), open or short in radiator fan relay ignition feed circuit (Dark Blue/White wire), or failed driver in Powertrain Control Module (PCM). Go to next

step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

4) While still actuating radiator fan relay, wiggle wiring harness from radiator fan relay to Powertrain Control Module (PCM). Stop actuation of radiator fan relay. Using DRB-II, read fault messages. If RAD FAN CONTROL RELAY CIRCUIT fault returns, repair wiring harness as necessary. Perform TEST VER-1. If RAD FAN CONTROL RELAY CIRCUIT fault does not return, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Remove radiator fan relay. Install a known good radiator fan relay. If known good radiator fan relay is clicking, replace original radiator fan relay. Perform TEST VER-1. If known good radiator fan relay is not clicking, remove known good radiator fan relay.

6) DRB-II should still be actuating radiator fan relay. Using DRB-II in voltmeter mode, check voltage on radiator fan relay connector, ignition feed circuit (Dark Blue/White wire). If voltage is less than 10 volts, repair open in Dark Blue/White wire. Perform TEST VER-1. If voltage is more than 10 volts, turn ignition off.

7) Disconnect PCM connector. Using DRB-II in ohmmeter mode, check resistance of radiator fan relay connector, control circuit (Dark Blue/Pink wire). If resistance is less than 5 ohms, repair short to ground in Dark Blue/Pink wire. Perform TEST VER-1.

8) If resistance is more than 5 ohms, check resistance of control circuit (Dark Blue/Pink wire) between radiator fan relay connector and PCM connector terminal No. 31 using an external ohmmeter. If resistance is more than 5 ohms, repair open in Dark Blue/Pink wire. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-27A - AUTO SHUTDOWN RELAY CONTROL CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages and actuate Auto Shutdown (ASD) relay. If ASD relay is clicking, condition required to set fault is not present at this time. Go to next step. If ASD relay is not clicking, go to step 5).

2) AUTO SHUTDOWN RELAY CONTROL CIRCUIT fault sets if Auto Shutdown (ASD) relay and fuel pump relay control circuit (Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body) are not in proper state when monitored by Powertrain Control Module (PCM) during cranking. Possible causes are: open or short in ASD relay and fuel pump relay control circuits (Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body), open or short in ASD relay ignition feed circuit (Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body), or failed driver in Powertrain Control Module (PCM). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, go to next step.

4) While still actuating ASD relay, wiggle wiring harness from ASD relay to Powertrain Control Module (PCM). Stop actuation of ASD relay. Using DRB-II, read fault messages. If AUTO SHUTDOWN RELAY CONTROL CIRCUIT fault returns, repair wiring harness as necessary. Perform TEST VER-1. If AUTO SHUTDOWN RELAY CONTROL CIRCUIT fault does not return, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

5) Remove ASD relay. Install a known good ASD relay. If known

good ASD relay is clicking, replace original ASD relay. Perform TEST VER-1. If known good ASD relay is not clicking, remove known good ASD relay.

6) DRB-II should still be actuating ASD relay. Using DRB-II in voltmeter mode, check voltage on ASD relay connector, ignition feed circuit (Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body). If voltage is less than 10 volts, repair open in Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body. Perform TEST VER-1. If voltage is more than 10 volts, turn ignition off.

7) Disconnect PCM connector. Using DRB-II in ohmmeter mode, check resistance of ASD relay connector, control circuit (Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body. Perform TEST VER-1.

8) If resistance is more than 5 ohms, check resistance of control circuit (Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body) between ASD relay connector and PCM connector terminal No. 51 using an external ohmmeter. If resistance is more than 5 ohms, repair open in Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST FC-28A - NO ASD RELAY VOLT SENSE AT PCM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Attempt to start engine. If engine does not start, go to step 5). If engine starts, run engine for 5 minutes.

2) Using DRB-II, read fault messages. If DRB-II displays NO ASD RELAY VOLT SENSE AT PCM, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body, between Auto Shutdown (ASD) relay connector and Powertrain Control Module (PCM) connector terminal No. 57. Perform TEST VER-1.

3) If DRB-II does not display NO ASD RELAY VOLT SENSE AT PCM, condition required to set fault is not present at this time. NO ASD RELAY VOLT SENSE AT PCM fault sets if ASD output voltage is not sensed when ASD relay is energized. Possible causes are: open ASD relay output wire (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body), open ASD relay control circuit wire (Dark Blue/Yellow on XJ and YJ bodies or Pink on ZJ body), failed ASD and fuel pump relays or open battery feed circuit to ASD relay (Red/Black wire on XJ body, Red/White wire on YJ body or Red wire on ZJ body). Go to next step.

4) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1. Go to next step.

5) If engine does not start, disconnect ASD relay. Using DRB-II in voltmeter mode, check voltage on ASD relay connector, battery feed circuit (Red/Black wire on XJ body, Red/White wire on YJ body or Red wire on ZJ body). If voltage is less than 12 volts, repair open in Red/Black wire on XJ body, Red/White wire on YJ body or Red wire on ZJ body. Perform TEST VER-1.

6) If voltage is more than 12 volts, turn ignition off. Disconnect PCM connector. Using DRB-II in ohmmeter mode, check resistance of output circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body) between ASD relay connector and PCM connector terminal No. 57.

7) If resistance is more than 5 ohms, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, reconnect PCM connector. Install a known good ASD relay. Attempt to start engine. If engine starts, replace original ASD relay. Perform TEST VER-1. If engine does not start, replace PCM. Perform TEST VER-1.

TEST FC-29A OR FC-30A - PCM FAILURE SRI MILE NOT STORED OR PCM FAILURE EEPROM WRITE DENIED

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition on. Using DRB-II, perform SRI memory test. If DRB-II displays WRITE FAILURE, replace Powertrain Control Module (PCM). Perform TEST VER-1. If DRB-II does not display WRITE FAILURE, go to next step.

2) If DRB-II displays WRITE REFUSED, go to step 3). If DRB-II does not display WRITE REFUSED, go to next step. If DRB-II displays SRI MILEAGE INVALID, update mileage and retest SRI memory. Perform TEST VER-1. If DRB-II does not display SRI MILEAGE INVALID, compare SRI mileage stored with instrument panel odometer. If mileage is same, retest SRI memory. Perform TEST VER-1. If mileage is not same, update mileage and retest SRI memory. Perform TEST VER-1.

3) When DRB-II displays WRITE REFUSED, Powertrain Control Module (PCM) was busy. Using DRB-II, perform SRI memory test. Retest SRI memory 2 more times if necessary. If DRB-II displays WRITE REFUSED, replace PCM. Perform TEST VER-1. If DRB-II does not display WRITE REFUSED, vehicle is functioning properly. Perform TEST VER-1.

TEST FC-31A - FUEL PUMP RESISTOR BY-PASS RELAY CIRCUIT

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, erase fault messages. Start engine. Using DRB-II, read fault messages. If DRB-II displays FUEL PUMP RESISTOR BY-PASS RELAY CIRCUIT, go to step 4). If DRB-II does not display FUEL PUMP RESISTOR BY-PASS RELAY CIRCUIT, condition required to set fault is not present at this time. Go to next step.

2) FUEL PUMP RESISTOR BY-PASS RELAY CIRCUIT fault sets if by-pass relay control circuit (Red/Dark Blue wire) is not in its proper state when monitored by Powertrain Control Module (PCM). Possible causes are: open or shorted relay coil windings, open or shorted relay control circuit (Red/Dark Blue wire), open ignition feed circuit (Dark Blue/White wire) or failed Powertrain Control Module (PCM). Go to next step.

3) Inspect all related wiring and connectors and repair as necessary. Perform TEST VER-1. If no problems were found with wiring and connectors, see INACTIVE FAULT CONDITION. Perform TEST VER-1.

4) Turn ignition off. Disconnect fuel pump resistor by-pass relay connector (located forward of power distribution center, underhood). Inspect connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If connector is okay, go to next step.

5) Using an external ohmmeter, check resistance of by-pass relay (Dark Blue/White wire and Red/Dark Blue wire terminals). If resistance is more than 80 ohms, replace by-pass relay. Perform TEST VER-1. If resistance is less than 80 ohms, turn ignition on.

6) Using DRB-II in voltmeter mode, check voltage of ignition feed circuit (Dark Blue/White wire). If voltage is less than 10 volts, repair open in Dark Blue/White wire. Perform TEST VER-1. If voltage is more than 10 volts, turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Go to next step.

7) Using DRB-II in ohmmeter mode, check resistance at PCM connector terminal No. 37. If resistance is less than 5 ohms, repair short to ground in Red/Dark Blue wire. Perform TEST VER-1. If resistance is more than 5 ohms, check resistance between by-pass relay connector and PCM connector terminal No. 37 (Red/Dark Blue wire) using an external ohmmeter. If resistance is more than 5 ohms, repair open in Red/Dark Blue wire. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST NF-1A - NO FAULT CODE TEST MENU

No Fault Complete Test

Check MITCHELL(R) TECH SERVICE BULLETINS (TSBs) for any pertinent information. If a TSB exists, perform corrective action. If TSB does not exist or if driveability problem still exists, perform tests NF-2A through NF-12A in sequence until driveability problem is found. See NO FAULT CODE TEST MENU table.

NO FAULT CODE TEST MENU TABLE

| Application | Test |
|---|--------|
| Checking Secondary Ignition & Timing | NF-2A |
| Checking Fuel Pressure | NF-3A |
| Checking Coolant Sensor Calibration | NF-4A |
| Checking TPS Calibration | NF-5A |
| Checking MAP Sensor Calibration | NF-6A |
| Checking Oxygen (O2) Sensor Switching | NF-7A |
| Checking Idle Air Control Motor | NF-8A |
| Checking Park/Neutral Switch | NF-9A |
| Checking PCM Grounds & Power Circuits | NF-10A |
| Checking Engine Vacuum | NF-11A |
| No Fault Code Mechanical Test | NF-12A |

No Fault Quick Individual Test

If it is suspected that any item listed in NO FAULT CODE TEST MENU table is cause of a vehicle's driveability problem, perform associated test(s) individually. Return to NO FAULT CODE TEST MENU table if driveability problem still exists, or perform NO FAULT COMPLETE TEST.

No Fault Quick Symptom Test

Symptom checks cannot be used properly unless driveability problem characteristic actually happens while vehicle is being tested. To reduce diagnostic time, ensure that TEST FC-1A is reviewed before attempting to diagnose a symptom.

Select symptom that most accurately describes vehicle's driveability problem and then perform test pertaining to this symptom. Perform each test in sequence until problem is found. See NO FAULT QUICK SYMPTOM TEST MENU table.

NO FAULT QUICK SYMPTOM TEST MENU TABLE

| Application | Test |
|---------------------|-----------------------------|
| Hard Start | NF-2A, 3A-8A, 10A, 11A, 12A |
| Start & Stall | NF-2A, 3A-6A, 8A, 10A, 12A |

| | |
|--|----------------------------------|
| Hesitation/Sag/Stumble | (1) |
| Surge | NF-2A, 3A-8A, 10A, 12A |
| Lack Of Power/Sluggish | NF-2A, 3A-8A, 10A, 11A, 12A |
| Spark Knock/Detonation | NF-2A, 3A-7A, 11A, 12A |
| Cuts Out/Misses | NF-2A, 3A, 7A, 10A, 11A, 12A |
| Backfire/Popback | NF-2A, 3A, 6A, 7A, 10A, 11A, 12A |
| Runs Rough/Unstable/Erratic Idle | (1) |
| Poor Fuel Economy | (1) |

(1) - Perform tests NF-2A through NF-12A in sequence. See NO FAULT CODE TEST MENU table.

TEST NF-2A - CHECKING SECONDARY IGNITION & TIMING

1) Turn engine off. Connect engine analyzer to engine. Start engine and let idle. If engine will not idle, maintain engine speed for reading scope pattern. Set scope to read display or parade pattern. Follow equipment manufacturer's procedure for pattern analysis.

2) If secondary ignition pattern is not okay, repair indicated component in secondary ignition system. Perform TEST VER-1. If secondary ignition pattern is okay, disconnect any spark plug wire. Observe secondary kilovolt line.

3) If open circuit secondary voltage is not at least 25 kilovolts, replace electronic ignition coil. Perform TEST VER-1. If open circuit secondary voltage is at least 25 kilovolts, reinstall spark plug wire.

4) Ensure engine temperature is more than 180°F (82°C) before proceeding. Using DRB-II, read total spark advance. Increase engine speed to 2000 RPM. If spark advance does not change with increase in RPM, replace Powertrain Control Module (PCM). Perform TEST VER-1. If spark advance changes with increase in RPM, ignition timing is functioning properly. Test is complete.

TEST NF-3A - CHECKING FUEL PRESSURE

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Release fuel pressure. Connect fuel pressure gauge to fuel rail. Turn ignition on. Using DRB-II, actuate fuel system. If fuel pressure is 34-43 psi (2.3-3.0 kg/cm²), fuel pressure is normal. Test is complete. If fuel pressure is not 34-43 psi (2.3-3.0 kg/cm²), record fuel pressure reading. If fuel pressure is more than 43 psi (3.0 kg/cm²), go to TEST NF-3B.

2) If fuel pressure is less than 43 psi (3.0 kg/cm²), stop fuel system actuation. Turn ignition off. Inspect fuel lines for kinked or restricted lines. Repair fuel lines as necessary. Perform TEST VER-1.

3) If no kinked or restricted lines exist, release fuel pressure. Remove fuel pressure gauge. Install fuel pressure gauge between fuel tank and fuel filter. Turn ignition on. Using DRB-II, actuate fuel system. If fuel pressure is at least 5 psi (.4 kg/cm²) more than previously recorded pressure, replace fuel filter. Perform TEST VER-1.

CAUTION: DO NOT allow fuel pressure to exceed 60 psi (4.2 kg/cm²) when squeezing fuel return hose.

4) If fuel pressure is not at least 5 psi (.4 kg/cm²) more than previous reading, gently squeeze fuel return hose while observing fuel pressure gauge, ensuring fuel pressure does not exceed 60 psi (4.

2 kg/cm²). If fuel pressure increases, replace fuel pressure regulator. Perform TEST VER-1. If fuel pressure does not increase, replace fuel pump and sock assembly. Perform TEST VER-1.

TEST NF-3B - CHECKING FUEL PRESSURE

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Using DRB-II, stop fuel system actuation. Release fuel pressure. Ensure fuel tank is at least 1/4 full before performing following test. Install fuel pressure gauge and adapter between fuel tank and filter at rear of vehicle.

2) Remove fuel return line from fuel pump at fuel tank. Connect Fuel Pressure Test Adapter (6541) to fuel return line. Place other end of adapter hose into an approved 2-gallon gasoline can. Turn ignition on.

3) Using DRB-II, actuate fuel system. Observe fuel pressure gauge. If fuel pressure is 34-43 psi (2.3-3.0 kg/cm²), repair fuel return line for a restriction at fuel tank. Perform TEST VER-1.

4) If fuel pressure is not 34-43 psi (2.3-3.0 kg/cm²), stop fuel system actuation. Release fuel pressure. Reconnect fuel return line to fuel tank. Disconnect fuel return line from fuel rail.

5) Attach Fuel Pressure Test Adapter (6541) to fuel return line nipple at fuel rail. Place other end of adapter hose into an approved 2-gallon gasoline can. Turn ignition on. Using DRB-II, actuate fuel system. Observe fuel pressure gauge.

6) If fuel pressure is 34-43 psi (2.3-3.0 kg/cm²), repair fuel return line for a restriction to fuel tank. Perform TEST VER-1. If fuel pressure is not 34-43 psi (2.3-3.0 kg/cm²), replace fuel pressure regulator. Perform TEST VER-1.

TEST NF-4A - CHECKING COOLANT SENSOR CALIBRATION

1) Start engine. Using DRB-II, read Engine Coolant Temperature (ECT) sensor value. If ECT sensor temperature is more than 180°F (82°C), stop engine. Allow engine coolant to cool to 150°F (66°C). Start engine. Allow engine to reach normal operating temperature of 180°F (82°C). If ECT sensor value does not increase smoothly, inspect cooling system for mechanical failure. If cooling system is okay, replace ECT sensor. Perform TEST VER-1. If ECT sensor value increases smoothly, go to next step.

2) If ECT sensor value does not reach 180°F (82°C) or more, inspect cooling system for mechanical failure. If system is okay, replace ECT sensor. Perform TEST VER-1. If ECT sensor value reaches 180°F (82°C) or more, ECT sensor is functioning properly. Test is complete.

TEST NF-5A - CHECKING TPS CALIBRATION

1) Turn engine off. Turn ignition on. Using DRB-II, read Throttle Position Sensor (TPS) voltage. Ensure throttle is fully closed and against throttle stop.

2) If voltage is not one volt or less with throttle closed, replace TPS. Perform TEST VER-1. If voltage is one volt or less with throttle closed, watch voltage while slowly opening throttle wide open. If voltage change is not smooth, replace TPS. Perform TEST VER-1. If voltage change is smooth, go to next step.

3) If maximum voltage is not at least 3.6 volts at wide open throttle, replace TPS. Perform TEST VER-1. If maximum voltage is at least 3.6 volts at wide open throttle, using DRB-II in voltmeter mode, check minimum throttle voltage. If voltage is not 0 to 1 volt, replace TPS. Perform TEST VER-1. If voltage is 0 to 1 volt, TPS is functioning

properly. Test is complete.

TEST NF-6A - CHECKING MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR CALIBRATION

1) Turn engine off. Install vacuum "T" in MAP sensor vacuum hose. Install vacuum gauge. Start engine and let idle. If engine will not idle, maintain a constant RPM above idle. Using DRB-II, read MAP value. If reading is within one in. Hg of vacuum gauge reading, MAP sensor is functioning properly. Test is complete. If reading is not within one in. Hg of vacuum gauge reading, turn engine off.

2) Disconnect vacuum gauge. Connect vacuum pump to MAP sensor. Apply 5 in. Hg of vacuum to MAP sensor. Turn ignition on. Using DRB-II, read and record MAP sensor voltage. Increase vacuum to 20 in. Hg. Using DRB-II, read and record MAP sensor voltage. Subtract 20 in. Hg voltage reading from 5 in. Hg voltage reading. If difference in voltage is 2.3-2.9 volts, repair restriction in MAP sensor vacuum hose. Perform TEST VER-1. If difference in voltage is not 2.3-2.9 volts, replace MAP sensor. Perform TEST VER-1.

TEST NF-7A - CHECKING OXYGEN (O2) SENSOR SWITCHING

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Allow engine to reach normal operating temperature. Using DRB-II, read O2 sensor state. If O2 sensor state is switching, system is functioning properly. Test is complete. If O2 sensor state is not switching, check if O2 sensor is locked on lean. If O2 sensor is locked on lean, go to TEST NF-7B. If O2 sensor is not locked on lean, turn engine off.

2) Connect fuel pressure gauge to fuel rail. Turn ignition on. Using DRB-II, actuate fuel system. Allow fuel pressure gauge to stabilize to normal fuel pressure of 34-43 psi (2.3-3.0 kg/cm²). Stop fuel system actuation. Monitor fuel pressure gauge for one minute. Go to next step.

3) If gauge pressure decreased more than 10 psi (.8 kg/cm²), replace leaking fuel injectors or "O" rings as necessary. Perform TEST VER-1. If gauge pressure decreased less than 10 psi (.8 kg/cm²), inspect air cleaner and inlet ducts for restrictions. Repair as necessary. Perform TEST VER-1. If no restrictions are observed, go to TEST NF-12A.

TEST NF-7B - CHECKING OXYGEN (O2) SENSOR SWITCHING

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Allow engine to idle. Inspect engine for vacuum leaks. Repair vacuum leaks as necessary. Perform TEST VER-1. If no vacuum leaks exist, read O2 sensor signal voltage using DRB-II.

2) If voltage is more than 0.1 volt, go to step 4). If voltage is less than 0.1 volt, turn ignition off. Disconnect O2 sensor connector. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance of O2 sensor connector (harness side), signal circuit (Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body).

3) If resistance is less than 10 ohms, repair short to ground in Black/Dark Green wire on XJ and YJ bodies or Black/Orange wire on ZJ body. Perform TEST VER-1. If resistance is more than 10 ohms, replace O2 sensor. Perform TEST VER-1.

4) Turn engine off. Replace O2 sensor. Turn ignition on. Using DRB-II, reset adaptive fuel memory. Start engine. Allow engine to reach normal operating temperature.

5) Using DRB-II, read O2 sensor state. If O2 sensor state is switching, repair is complete. Perform TEST VER-1. If O2 sensor state is not switching, go to TEST NF-12A.

TEST NF-8A - CHECKING IDLE AIR CONTROL MOTOR

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, set engine speed to 1100 RPM. If engine speed set at 1050-1150 RPM, idle speed motor is operating properly. Test is complete. If engine speed did not set at 1050-1150 RPM, return engine to normal idle speed. Disconnect idle air control motor connector.

2) Using DRB-II in voltmeter mode, check voltage on idle air control motor connector, No. 1 driver circuit (Brown/White wire) while momentarily opening and closing throttle. If voltage is less than one volt, go to TEST NF-8B. If voltage is more than one volt, go to next step.

3) Using DRB-II, check voltage on idle air control motor connector, No. 2 driver circuit (Yellow/Black wire on XJ and YJ bodies or Violet/Black wire on ZJ body) while momentarily opening and closing throttle. If voltage is less than one volt, go to TEST NF-8B. If voltage is more than one volt, go to next step.

4) Using DRB-II, check voltage on idle air control motor connector, No. 3 driver circuit (Gray/Red wire on XJ and YJ bodies or Yellow/Black wire on ZJ body) while momentarily opening and closing throttle. If voltage is less than one volt, go to TEST NF-8B. If voltage is more than one volt, go to next step.

5) Using DRB-II, check voltage on idle air control motor connector, No. 4 driver circuit (Violet/Black wire on XJ and YJ bodies or Gray/Red wire on ZJ body) while momentarily opening and closing throttle. If voltage is less than one volt, go to TEST NF-8B. If voltage is more than one volt, go to next step.

6) Check engine for vacuum leaks. Repair as necessary. Perform TEST VER-1. If no vacuum leaks are observed, replace idle air control motor. Perform TEST VER-1.

TEST NF-8B - CHECKING IDLE AIR CONTROL MOTOR

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

Turn engine off. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance of each wire between Idle Air Control (IAC) motor connector and PCM connector. See appropriate PCM TERMINAL IDENTIFICATION table. If resistance for any wire is more than 10 ohms, repair open on necessary wire. Perform TEST VER-1. If resistance for any wire is less than 10 ohms, replace PCM. Perform TEST VER-1.

PCM TERMINAL IDENTIFICATION TABLE (XJ & YJ BODIES)

| Wire Color | Terminal No. |
|----------------|--------------|
| Gray/Red | 39 |

| | |
|--------------------|----|
| Brown/White | 40 |
| Violet/Black | 59 |
| Yellow/Black | 60 |

PCM TERMINAL IDENTIFICATION TABLE (ZJ BODY)

| Wire Color | Terminal No. |
|--------------------|--------------|
| Yellow/Black | 39 |
| Brown/White | 40 |
| Gray/Red | 59 |
| Violet/Black | 60 |

TEST NF-9A - CHECKING PARK/NEUTRAL SWITCH

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, read park/neutral switch input state. While watching DRB-II display, move gear selector in and out of Park and Reverse positions. If display shows P/N and D/R, system is functioning properly. Test is complete. If display does not show P/N and D/R, go to next step.

2) Turn ignition off. Place gear selector in Park position. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance on PCM connector terminal No. 30, park/neutral switch sense circuit (Brown/Yellow wire). Observe DRB-II display while moving gear selector in and out of Park and Reverse positions.

3) If display switches from less than 5 ohms to more than 5 ohms, replace PCM. Perform TEST VER-1. If display does not switch from less than 5 ohms to more than 5 ohms, check if display always stays less than 5 ohms. If display always stays less than 5 ohms, repair short to ground in Brown/Yellow wire. Perform TEST VER-1. If display does not always stay less than 5 ohms, go to next step.

4) Disconnect park/neutral switch connector. Using an external ohmmeter, check resistance of sense circuit (Brown/Yellow wire) between park/neutral switch connector and PCM connector terminal No. 30. If resistance is less than 10 ohms, replace park/neutral switch. Perform TEST VER-1. If resistance is more than 10 ohms, repair open in Brown/Yellow wire. Perform TEST VER-1.

TEST NF-10A - CHECKING PCM GROUND & POWER CIRCUITS

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 5, signal ground circuit (Black/White wire on XJ and YJ bodies or Black/Tan wire on ZJ body). If resistance is more than 5 ohms, repair open in Black/White wire on XJ and YJ bodies or Black/Tan wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, go to next step.

2) Using DRB-II, check resistance of PCM connector terminal No. 11, power ground circuit (Black/Tan wire on XJ and ZJ bodies or Black wire on YJ body). If resistance is more than 5 ohms, repair open

in Black/Tan wire on XJ and ZJ bodies or Black wire on YJ body. Perform TEST VER-1. If resistance is less than 5 ohms, go to next step.

3) Using DRB-II, check resistance of PCM connector terminal No. 12, power ground circuit (Black/Tan wire on XJ and ZJ bodies or Black wire on YJ body). If resistance is more than 5 ohms, repair open in Black/Tan wire on XJ and ZJ bodies or Black wire on YJ body. Perform TEST VER-1. If resistance is less than 5 ohms, reconnect PCM connector. PCM grounds and power circuits are okay.

TEST NF-11A - CHECKING ENGINE VACUUM

Connect a vacuum gauge to engine. Start engine, and let it idle. Normal vacuum reading will vary depending on altitude. Observe vacuum gauge at idle. If vacuum gauge reading is not steady 13-22 in. Hg, perform TEST NF-12A. If vacuum gauge reading is steady 13-22 in. Hg, engine vacuum is normal. Test is complete.

TEST NF-12A - NO FAULT CODE MECHANICAL TEST

NOTE: If coming to this test from O2 sensor test and rich or lean condition is not corrected after checking items listed below, replace Powertrain Control Module (PCM).

At this point in diagnostic test procedure, all engine control systems have been determined to be operating as designed and not causing a driveability problem. Following additional items should be checked as possible causes:

- * Check if any MITCHELL(R) TECH SERVICE BULLETINS (TSBs) apply to vehicle.
- * Check engine compression.
- * Check for exhaust system restriction.
- * Check camshaft and crankshaft sprockets.
- * Check valve timing.
- * Check torque converter stall speed.
- * Check engine vacuum. It must be at least 13 in. Hg in Neutral.
- * Check for fuel contamination.
- * Ensure PCV system is functioning properly.
- * Ensure injector control circuit is connected to correct fuel injector and injector is not plugged or restricted.
- * Check power booster for internal vacuum leak.

TEST NS-1A - QUALIFYING NO-START CONDITION

CAUTION: When checking for spark, Powertrain Control Module (PCM) damage may occur if spark plug cable is held more than 1/4" away from ground.

1) Turn ignition off. Disconnect any spark plug cable at spark plug. Insert an insulated screwdriver in spark plug cable terminal. Hold screwdriver within 1/4" of ground.

NOTE: When checking for spark, consider one or 2 sparks as a no-spark condition.

2) While cranking engine for 10 seconds, watch for spark. If a good spark occurs, go to TEST NS-2A. If a good spark does not occur, reconnect spark plug cable. Disconnect another spark plug cable at spark plug, and repeat test.

3) If a good spark occurs, go to TEST NS-2A. If a good spark does not occur, turn ignition off. Remove coil cable from distributor

cap. Hold cable within 1/4" of ground. While cranking engine for 10 seconds, watch for spark. If good spark does not occur, go to next step. If good spark occurs, repair distributor cap, rotor or spark plug cables as necessary. Perform TEST VER-1.

4) Turn ignition off. Remove coil cable from coil. Using an external ohmmeter, check resistance of coil cable. If resistance is more than 15,000 ohms, replace coil cable. If resistance is less than 15,000 ohms, remove distributor cap. While cranking engine, watch distributor rotor. If distributor rotor turns, go to next step. If distributor rotor does not turn, repair distributor drive system as necessary. Perform TEST VER-1.

5) Install distributor cap and coil cable. Disconnect ignition coil connector. Inspect ignition coil connector for damaged or pushed-out terminals. Repair as necessary. Perform TEST VER-1. If ignition coil connector terminals are okay, go to next step.

6) Turn ignition on. Using DRB-II, actuate ASD fuel system. While actuating ASD fuel system, put DRB-II in voltmeter mode. Using DRB-II, check voltage on ASD relay connector output circuit (Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body). If voltage is more than 10 volts, go to next step. If voltage is less than 10 volts, repair open in Dark Green/Orange wire on XJ and YJ bodies or Dark Green/Black wire on ZJ body. Perform TEST VER-1.

7) Using DRB-II, check voltage on ASD relay connector ignition coil driver circuit (Gray wire on XJ and YJ bodies or Gray/White wire on ZJ body). If voltage is more than 10 volts, replace ignition coil. Perform TEST VER-1. If voltage is less than 10 volts, turn ignition off. Go to next step.

8) Disconnect Powertrain Control Module (PCM) connector. Using DRB-II in ohmmeter mode, check resistance at terminal No. 19 of PCM connector (Gray wire on XJ and YJ bodies or Gray/White wire on ZJ body). If resistance is more than 5 ohms, go to next step. If resistance is less than 5 ohms, repair short to ground in Gray wire on XJ and YJ bodies or Gray/White wire on ZJ body. Perform TEST VER-1.

9) Using an external ohmmeter, check resistance between ignition coil connector (Gray wire on XJ and YJ bodies or Gray/White wire on ZJ body), and PCM connector terminal No. 19. If resistance is more than 5 ohms, repair open in Gray wire on XJ and YJ bodies or Gray/White wire on ZJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1.

TEST NS-2A - INSPECTING FUEL SYSTEM

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Ensure throttle cables are not holding throttle open. If throttle is held open, repair as necessary. Perform TEST VER-1. If throttle is not held open, using DRB-II, read Throttle Position Sensor (TPS) voltage.

2) If voltage is less than 1.5 volts, go to next step. If voltage is more than 1.5 volts, disconnect TPS connector. Inspect terminals. Repair as necessary. Perform TEST VER-1. If terminals are okay, replace TPS. Perform TEST VER-1.

3) If vehicle is not equipped with a factory vehicle theft alarm, go to next step. If vehicle is equipped with factory vehicle theft alarm, using DRB-II, read theft alarm status. If DRB-II displays FUEL ON, go to next step. If DRB-II does not display FUEL ON, see G - BODY TESTS W/ CODES article in the ENGINE PERFORMANCE Section.

4) Using DRB-II, actuate fuel system. Listen for fuel pump operation at fuel tank. If fuel pump operation cannot be heard, go to TEST NS-5A. If fuel pump operation can be heard, turn ignition off.

5) Ensure fuel tank is at least 1/4 full. Release fuel pressure. Install a fuel pressure gauge in fuel supply line. Turn

ignition on. Using DRB-II, actuate fuel system. Read fuel pressure gauge reading.

6) If fuel pressure is more than 43 psi (3.0 kg/cm²), go to TEST NS-4B. If fuel pressure is not more than 43 psi (3.0 kg/cm²), go to next step.

7) If pressure is less than 34 psi (2.3 kg/cm²), go to TEST NS-4A. If pressure is more than 34 psi (2.3 kg/cm²), go to next step.

8) If vehicle initially started and stalled repeatedly, go to TEST NS-7A. If vehicle did not initially start and stall repeatedly, go to TEST NS-3A.

TEST NS-3A - INSPECTING MECHANICAL SYSTEM

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Disconnect Manifold Absolute Pressure (MAP) sensor connector. Turn ignition on. Using DRB-II in voltmeter mode, check voltage on MAP sensor connector, 5-volt supply circuit (Violet/White wire). If voltage is less than 4.5 volts, repair open in Violet/White wire. Perform TEST VER-1.

2) If voltage is more than 4.5 volts, reconnect MAP sensor connector. Remove all spark plugs. Inspect spark plug tips for wet fuel. If spark plug tips are wet, clean and reinstall spark plugs. If spark plug tips are not wet, reinstall spark plugs. Turn ignition on.

3) Using DRB-II, read total spark advance while cranking engine. If spark advance is not 0-25 degrees BTDC, replace Powertrain Control Module (PCM). Perform TEST VER-1.

4) If spark advance is 0-25 degrees BTDC, inspect spark plug cables for correct placement. Reposition cables as necessary. Perform TEST VER-1. If spark plug cables are okay, turn ignition off. Check valve timing. Correct valve timing as necessary. Perform TEST VER-1.

5) If valve timing is okay, check engine compression. Repair as necessary. Perform TEST VER-1. If engine compression is okay, replace MAP sensor. Perform TEST VER-1.

TEST NS-4A - CORRECTING FUEL DELIVERY

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Record fuel pressure gauge reading. Turn ignition off. Release fuel pressure. Remove fuel pressure gauge. Install fuel pressure gauge between fuel tank and fuel filter. Turn ignition on.

2) Using DRB-II, actuate Auto Shutdown (ASD) fuel system. Record fuel pressure gauge reading. Compare fuel pressure gauge reading with previous reading. If fuel pressure gauge reading is not at least 10 psi more than previous reading, go to step 4). If fuel pressure gauge reading is at least 10 psi more than previous reading, turn ignition off.

3) Inspect fuel lines between fuel filter and fuel rail for restriction. Repair as necessary. Perform TEST VER-1. If no restrictions are observed, replace fuel filter. Perform TEST VER-1.

4) Disconnect fuel return hose at fuel rail. Connect a 6-foot fuel hose to fuel rail. Put other end of 6-foot hose into an approved 2-gallon or more capacity gasoline container. Turn ignition on. Using DRB-II, actuate fuel system.

CAUTION: DO NOT allow fuel pressure to exceed 70 psi (4.9 kg/cm²) when squeezing fuel return hose.

5) Gently squeeze fuel return hose. Read fuel pressure gauge. Using DRB-II, stop fuel system actuator test. If pressure is more than 34 psi (2.3 kg/cm²), replace fuel pressure regulator. Perform TEST VER-1. If it is less than 34 psi (2.3 kg/cm²), replace fuel pump and sock filter. Perform TEST VER-1.

TEST NS-4B - CORRECTING FUEL DELIVERY

WARNING: High fuel pressure may be present in fuel lines. Open fuel system with caution. See FUEL PRESSURE RELEASE procedure.

1) Ensure fuel tank is at least 1/4 full. Release fuel pressure. Turn ignition off. Disconnect fuel return hose from fuel rail. Connect a 6-foot fuel hose to fuel rail. Put other end of 6-foot hose into an approved 2-gallon or more capacity gasoline container.

2) Turn ignition on. Using DRB-II, actuate fuel system. If pressure is less than 43 psi (3.0 kg/cm²), go to next step. If pressure is more than 43 psi (3.0 kg/cm²), replace fuel pressure regulator. Perform TEST VER-1.

3) Stop fuel system actuation. Turn ignition off. Reconnect fuel return hose. Remove fuel return hose from fuel tank. Connect Fuel Pressure Test Adapter (C-6541) to disconnected return hose.

4) Put other end of adapter hose into an approved 2-gallon or more capacity gasoline container. Turn ignition on. Using DRB-II, actuate fuel system. Read fuel pressure gauge. Using DRB-II stop actuation test.

5) If pressure is less than 43 psi (3.0 kg/cm²), repair restricted fuel pump. Perform TEST VER-1. If pressure is more than 43 psi (3.0 kg/cm²), repair restricted fuel return line between fuel rail and fuel tank. Perform TEST VER-1.

TEST NS-5A - INSPECTING FUEL PUMP

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Using DRB-II, stop actuation test. Using DRB-II, actuate Auto Shutdown (ASD) relay. Touch fuel pump relay. If fuel pump relay does not pulsate when actuated, go to TEST NS-5B. If fuel pump relay pulsates when actuated, turn ignition off.

2) Disconnect fuel pump relay. Using DRB-II in voltmeter mode, check voltage on fuel pump relay connector, battery voltage circuit (Red wire on XJ and ZJ bodies or Red/White wire on YJ body). If voltage is less than 10 volts, repair open circuit in Red wire on XJ and ZJ bodies or Red/White wire on YJ body. Perform TEST VER-1. If voltage is more than 10 volts, reconnect fuel pump relay.

3) Disconnect fuel pump harness connector. Ensure fuel pump connector has clean and tight connections. Turn ignition on. Using DRB-II, actuate fuel system. While still actuating, put DRB-II in voltmeter mode. Using DRB-II, check voltage on fuel pump connector, output wire (Dark Green/Orange wire on XJ body, Dark Green/Black wire on YJ body or Orange/Black wire on ZJ body). If voltage is less than 10 volts, go to step 5). If voltage is more than 10 volts, stop actuation test.

4) Using DRB-II in ohmmeter mode, check resistance of fuel pump connector, ground circuit (Black wire on XJ and ZJ bodies or Black/Orange wire on YJ body). If resistance is more than 5 ohms, repair open in Black wire on XJ and ZJ bodies or Black/Orange wire on YJ body. Perform TEST VER-1. If resistance is less than 5 ohms, replace fuel pump. Perform TEST VER-1.

5) Turn ignition off. Disconnect fuel pump relay. Connect a

jumper wire between fuel pump relay connector, output circuit (Dark Green/Orange wire on XJ body, Dark Green/Black wire on YJ body or Orange/Black wire on ZJ body) and ground.

6) Using DRB-II in ohmmeter mode, check resistance of fuel pump connector, output circuit (Dark Green/Black wire on XJ and YJ bodies or Orange/Dark Blue wire on ZJ body). If resistance is less than 5 ohms, replace fuel pump relay. Perform TEST VER-1. On YJ and ZJ bodies, if resistance is more than 5 ohms, repair open in Dark Green/Black wire on YJ body or Orange/Dark Blue wire on ZJ body. Perform TEST VER-1.

7) On XJ body, disconnect ballast resistor. Using an external ohmmeter, check resistance of ballast resistor. If resistance is more than 5 ohms, replace ballast resistor. Perform TEST VER-1. If resistance is less than 5 ohms, repair open in Dark Green/Orange wire. Perform TEST VER-1.

TEST NS-5B - INSPECTING FUEL PUMP

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Stop actuation test. Turn ignition off. Disconnect fuel pump relay. Turn ignition on. Using DRB-II, check voltage on fuel pump relay connector, ignition 12-volt supply circuit (Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body).

2) If voltage is less than 10 volts, repair open in Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body. Perform TEST VER-1. If voltage is more than 10 volts, go to next step.

3) Using an external ohmmeter, check resistance across fuel pump relay terminals. See CONNECTOR IDENTIFICATION at beginning of article. If resistance is more than 100 ohms, replace fuel pump relay. Perform TEST VER-1. If resistance is less than 100 ohm, repair open in Dark Blue/Yellow wire on XJ and YJ bodies or Pink wire on ZJ body. Perform TEST VER-1.

TEST NS-6A - CORRECTING NO RESPONSE CONDITION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) If vehicle starts, go to TEST NS-6B. If vehicle does not start, turn ignition off. Disconnect Throttle Position Sensor (TPS) connector. Turn ignition on.

2) Using DRB-II in voltmeter mode, check voltage on TPS connector, 5-volt supply circuit (Violet/White wire). If voltage is more than 6 volts, repair open ground circuits at Powertrain Control Module (PCM) connector terminals No. 5 (Black/White wire on XJ and YJ bodies or Black/Tan wire on ZJ body), No. 11 and No. 12 (Black/Tan wire on XJ and ZJ bodies or Black wire on YJ body). Perform TEST VER-1. If voltage is less than 6 volts, go to next step.

3) If voltage is less than 4.4 volts, go to step 5). If voltage is more than 4.4 volts, reconnect TPS connector. Disconnect Manifold Absolute Pressure (MAP) sensor connector.

4) Using DRB-II, check voltage on MAP sensor connector, 5-volt supply circuit (Violet/White wire). If voltage is more than 4.4 volts, go to TEST NS-6B. If voltage is less than 4.4 volts, replace TPS. Perform TEST VER-1.

5) Disconnect MAP sensor electrical connector. Using DRB-II,

check voltage on TPS connector, 5-volt supply circuit (Violet/White wire). If voltage is more than 4.4 volts, replace MAP sensor. Perform TEST VER-1.

6) If voltage is less than 4.4 volts, turn ignition off. Disconnect PCM connector. Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 6, 5-volt supply circuit (Violet/White wire).

7) If resistance is less than 5 ohms, repair short to ground in Violet/White wire. Perform TEST VER-1. If resistance is more than 5 ohms, turn ignition on. Using DRB-II in voltmeter mode, check voltage on PCM connector terminal No. 9, ignition 12-volt feed circuit (Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body).

8) If voltage is more than 10 volts, go to next step. If voltage is less than 10 volts, repair open in Dark Blue wire on XJ body, White/Yellow wire on YJ body or Light Blue/Red wire on ZJ body between PCM connector and ignition switch. Perform TEST VER-1.

9) Using DRB-II, check voltage on PCM connector terminal No. 3, battery voltage circuit (Red wire on XJ and ZJ bodies or Red/White wire on YJ body). If voltage is less than 10 volts, go to next step. If voltage is more than 10 volts, replace PCM. Perform TEST VER-1.

10) Remove engine control fuse from Power Distribution Center (PDC). Inspect fuse. If fuse is okay, go to next step. If fuse is blown, go to step 12). Using DRB-II in voltmeter mode, check voltage on battery voltage side of PDC engine control fuse socket.

11) If voltage is more than 10 volts, repair open in Red wire on XJ and ZJ bodies or Red/White wire on YJ body between PDC engine control fuse socket and PCM connector terminal No. 3. Perform TEST VER-1. If voltage is less than 10 volts, repair open in battery voltage side of PDC engine control fuse socket. Perform TEST VER-1.

12) Turn ignition off. Disconnect Auto Shutdown (ASD) and fuel pump relays. Using DRB-II in ohmmeter mode, check resistance of PCM connector terminal No. 3, fused battery voltage circuit (Red wire on XJ and ZJ bodies or Red/White wire on YJ body). If resistance is less than 5 ohms, repair short to ground in Red wire on XJ and ZJ bodies or Red/White wire on YJ body. Perform TEST VER-1.

13) If resistance is more than 5 ohms, check resistance of ASD relay connector, output circuit (Dark Green/Orange wire). If resistance is less than 5 ohms, go to next step. If resistance is more than 5 ohms, perform TEST NS-6C.

14) Disconnect ignition coil connector. Using DRB-II, check resistance of ASD relay connector, output circuit (Dark Green/Orange wire). If resistance is more than 5 ohms, replace ignition coil. Perform TEST VER-1.

15) If resistance is less than 5 ohms, disconnect generator field connector. Using DRB-II, check resistance of ASD relay connector, output circuit (Dark Green/Orange wire). If resistance is more than 5 ohms, repair short to ground in generator. Perform TEST VER-1.

16) If resistance is less than 5 ohms, disconnect No. 1 fuel injector harness connector. Using DRB-II, check resistance of ASD relay connector, output circuit (Dark Green/Orange wire). If resistance is more than 5 ohms, replace No. 1 fuel injector. Perform TEST VER-1.

17) If resistance is less than 5 ohms, perform previous step for each additional fuel injector in order. After all injectors have been tested, if resistance is less than 5 ohms, repair short to ground in Dark Green/Orange wire. Perform TEST VER-1.

TEST NS-6B - CORRECTING NO RESPONSE CONDITION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams,

see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) If ignition was not on when NO RESPONSE message was displayed, turn ignition on to get a response. If ignition was on when NO RESPONSE message was displayed, turn ignition off.

2) Disconnect DRB-II from engine diagnostic connector. Disconnect Powertrain Control Module (PCM) connector. Using an external ohmmeter, check resistance between engine diagnostic connector, SCI transmit circuit (Pink wire on XJ and YJ bodies or Black wire on ZJ body) and ground.

3) If resistance is less than 5 ohms, repair short to ground in Pink wire on XJ and YJ bodies or Black wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, using an external ohmmeter, check resistance between engine diagnostic connector, SCI receive circuit (Light Green wire on XJ and YJ bodies or Black/Yellow wire on ZJ body), and ground.

4) If resistance is less than 5 ohms, repair short to ground in Light Green wire on XJ and YJ bodies or Black/Yellow wire on ZJ body. Perform TEST VER-1. If resistance is more than 5 ohms, go to next step.

5) Using an external ohmmeter, check resistance of SCI transmit circuit (Pink wire on XJ and YJ bodies or Black wire on ZJ body) between engine diagnostic connector and PCM connector terminal No. 25. If resistance is more than 5 ohms, repair open in Pink wire on XJ and YJ bodies or Black wire on ZJ body. Perform TEST VER-1.

6) If resistance is less than 5 ohms, using an external ohmmeter, check resistance of SCI receive circuit (Light Green wire on XJ and YJ bodies or Black/Yellow wire on ZJ body) between engine diagnostic connector and PCM connector terminal No. 45. If resistance is more than 5 ohms, repair open in Light Green wire on XJ and YJ bodies or Black/Yellow wire on ZJ body. Perform TEST VER-1.

7) If resistance is less than 5 ohms, connect DRB-II to a functional engine diagnostic connector on another vehicle. Turn ignition on. Using DRB-II, attempt to read fault messages. If DRB-II does not display NO RESPONSE, replace PCM on initial vehicle. Perform TEST VER-1.

8) If DRB-II displays NO RESPONSE, substitute another DRB-II cartridge. Using DRB-II, attempt to read fault messages. If DRB-II does not display NO RESPONSE, replace DRB-II cartridge. If DRB-II displays NO RESPONSE, substitute another DRB-II adapter cable. Using DRB-II, attempt to read fault messages. If DRB-II does not display NO RESPONSE, replace DRB-II adapter cable. If DRB-II displays NO RESPONSE, replace DRB-II or cartridge.

TEST NS-6C - CORRECTING NO RESPONSE CONDITION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Disconnect fuel pump connector and oxygen sensor connector. Using DRB-II, check resistance of fuel pump connector, output circuit (Dark Green/Black wire on XJ and YJ bodies or Orange/Dark Blue wire on ZJ body). If resistance is less than 5 ohms, repair short to ground in Dark Green/Black wire on XJ and YJ bodies or Orange/Dark Blue wire on ZJ body. Perform TEST VER-1.

2) If resistance is more than 5 ohms, using DRB-II, check resistance of oxygen sensor connector, relay output circuit (White wire). If resistance is more than 5 ohms, replace fuel pump. Perform TEST VER-1. If resistance is less than 5 ohms, replace oxygen sensor. Perform TEST VER-1.

TEST NS-7A - INSPECTING IDLE AIR CONTROL MOTOR OPERATION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Disconnect Idle Air Control (IAC) motor connector. Turn ignition on. Using DRB-II, actuate IAC motor. Using DRB-II in voltmeter mode, check voltage on IAC motor connector, No. 3 driver circuit (Gray/Red wire on XJ and YJ bodies or Yellow/Black wire on ZJ body). If voltage is less than one volt, go to TEST NS-7B.

2) If voltage is more than one volt, check voltage on IAC motor connector, No. 1 driver circuit (Brown/White wire). If voltage is less than one volt, go to TEST NS-7C. If voltage is more than one volt, check voltage on IAC motor connector, No. 4 driver circuit (Violet/Black wire on XJ and YJ bodies or Gray/Red wire on ZJ body). If voltage is less than one volt, go to TEST NS-7D.

3) If voltage is more than one volt, check voltage on IAC motor connector, No. 2 driver circuit (Yellow/Black wire on XJ and YJ bodies or Violet/Black wire on ZJ body). If voltage is less than one volt, go to TEST NS-7E. If voltage is more than one volt, turn ignition off.

4) Remove IAC motor from throttle body. Reconnect IAC motor connector. Using DRB-II, actuate IAC motor. If IAC motor tip moves in and out, go to TEST NS-8A. If IAC motor tip does not move in and out, replace IAC motor. Perform TEST VER-1.

TEST NS-7B - INSPECTING IDLE AIR CONTROL MOTOR OPERATION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect all terminals. Repair as necessary. Perform TEST VER-1. If PCM terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of No. 3 driver circuit (Gray/Red wire on XJ and YJ bodies or Yellow/Black wire on ZJ body) between IAC motor connector and PCM connector terminal No. 39. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Gray/Red wire on XJ and YJ bodies or Yellow/Black wire on ZJ body. Perform TEST VER-1.

TEST NS-7C - INSPECTING IDLE AIR CONTROL MOTOR OPERATION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect all terminals. Repair as necessary. Perform TEST VER-1. If PCM terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of No. 1 driver circuit (Brown/White wire) between IAC motor connector and PCM connector terminal No. 40. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Brown/White wire. Perform TEST VER-1.

TEST NS-7D - INSPECTING IDLE AIR CONTROL MOTOR OPERATION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect all terminals. Repair as necessary. Perform TEST VER-1. If PCM terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of No. 4 driver circuit (Violet/Black wire on XJ and YJ bodies or Gray/Red wire on ZJ body) between IAC motor connector and PCM connector terminal No. 59. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Violet/Black wire on XJ and YJ bodies or Gray/Red wire on ZJ body. Perform TEST VER-1.

TEST NS-7E - INSPECTING IDLE AIR CONTROL MOTOR OPERATION

NOTE: For connector terminal identification, see CONNECTOR IDENTIFICATION at beginning of article. For wiring diagrams, see L - WIRING DIAGRAMS article in the ENGINE PERFORMANCE Section.

1) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Inspect all terminals. Repair as necessary. Perform TEST VER-1. If PCM terminals are okay, go to next step.

2) Using an external ohmmeter, check resistance of No. 2 driver circuit (Yellow/Black wire on XJ and YJ bodies or Violet/Black wire on ZJ body) between IAC motor connector and PCM connector terminal No. 60. If resistance is less than 5 ohms, replace PCM. Perform TEST VER-1. If resistance is more than 5 ohms, repair open in Yellow/Black wire on XJ and YJ bodies or Violet/Black wire on ZJ body. Perform TEST VER-1.

TEST NS-8A - CORRECTING START & STALL CONDITION

At this point in diagnostic test procedure, all engine control systems have been determined to be operating as designed and not causing a start and stall problem. Check following items as possible causes:

- * Check if any MITCHELL(R) TECH SERVICE BULLETINS (TSBs) apply to vehicle.
- * Check engine compression.
- * Check for exhaust system restriction.
- * Check camshaft and crankshaft sprockets.
- * Check valve timing.
- * Check for fuel contamination.
- * Check secondary ignition system.
- * Ensure PCV system is functioning properly.

TEST VER-1 - VERIFICATION TEST VER-1

1) Inspect vehicle to ensure all engine components are connected. Reassemble and reconnect components as necessary. Inspect engine oil for fuel contamination. Change oil and filter if necessary. Attempt to start engine.

2) If engine does not start, check if any MITCHELL(R) TECH SERVICE BULLETINS (TSBs) apply to vehicle and return to TEST FC-1A, if necessary.

3) If engine starts and Powertrain Control Module (PCM) was

changed, repair is complete.

4) If engine starts and PCM was not changed, connect DRB-II to engine diagnostic connector and erase fault messages. Repair is complete.

TEST VER-2 - VERIFICATION TEST VER-2

Inspect vehicle to ensure all engine components are connected. Reassemble and reconnect components as necessary. If another fault was read previously and not corrected, return to TEST FC-1A and follow path specified by other fault. If Powertrain Control Module (PCM) has not been replaced, perform following:

- * Connect DRB-II to engine diagnostic connector, and erase faults.
- * Using DRB-II, reset all values in adaptive memory.
- * Disconnect DRB-II.

To ensure no other fault remains, perform following:

1) If vehicle is equipped with A/C, turn on A/C and blower motor. Drive vehicle for at least 5 minutes and attain a speed of at least 40 MPH. Ensure transmission shifts through all gears.

2) Upon completion of road test, turn engine off. Restart engine and let idle for at least 2 minutes. Turn engine off. Connect DRB-II to engine diagnostic connector.

3) Read all fault messages. If repaired fault has reset, repair is not complete. Check all pertinent MITCHELL(R) TECH SERVICE BULLETINS (TSBs), and return to TEST FC-1A if necessary. If another fault exists, return to TEST FC-1A and follow path specified by other fault. If no other faults exist, repair is now complete.