# Computers and Control Systems: Pinpoint Tests

## Test Notes

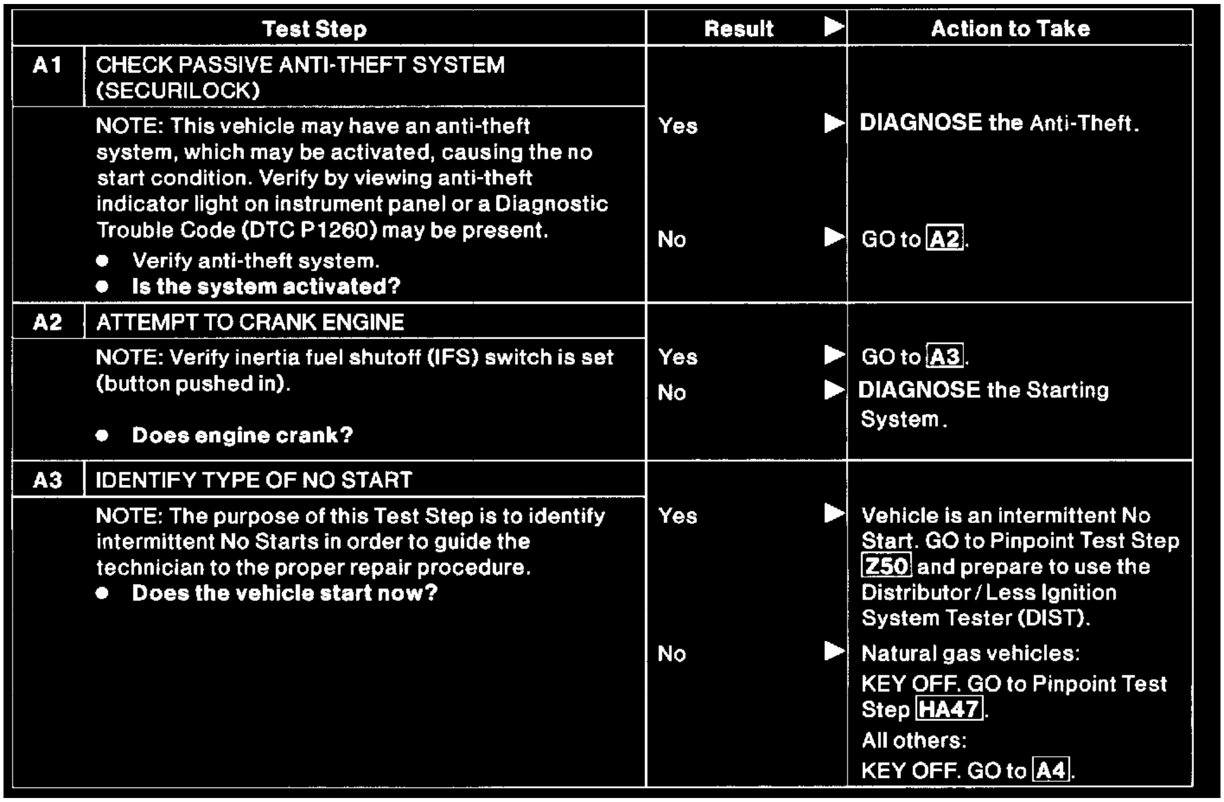
Enter this pinpoint test only when directed here.

This Pinpoint Test is intended to diagnose the following:

- Spark (as related to Electronic Engine Control)
- Powertrain Control Module **(PCM)**

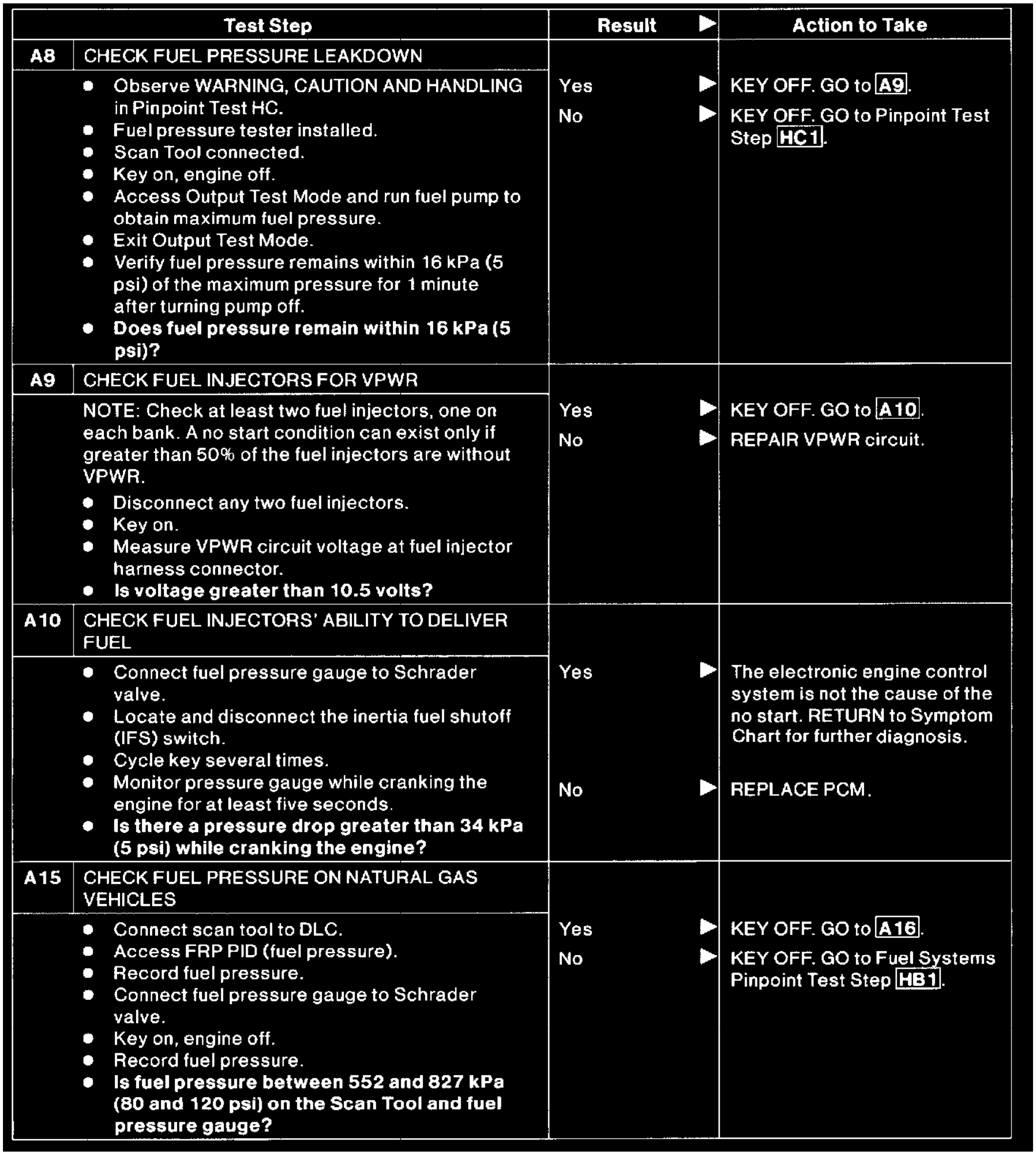
**WARNING: STOP THIS TEST AT THE FIRST SIGN OF A FUEL LEAK AND SERVICE AS REQUIRED.**

No open flame or smoking during fuel delivery checks.

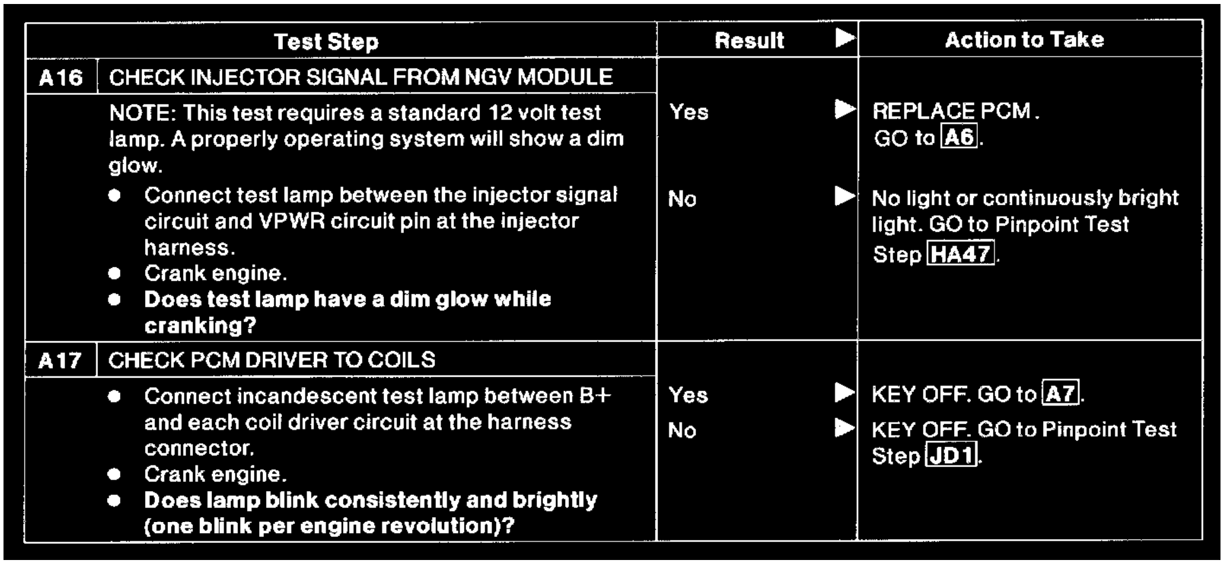


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **A1** | CHECK PASSIVE ANTI-THEFT SYSTEM (SECURILOCK) | | |
| | NOTE: This vehicle may have an anti-theft system, which may be activated, causing the no start condition. Verify by viewing anti-theft indicator light on instrument panel or a Diagnostic Trouble Code (DTC P1260) may be present.<br>● Verify anti-theft system.<br>● **Is the system activated?** | Yes ▶ | **DIAGNOSE** the Anti-Theft. |
| | | No ▶ | GO to A2. |
| **A2** | ATTEMPT TO CRANK ENGINE | | |
| | NOTE: Verify inertia fuel shutoff (IFS) switch is set (button pushed in).<br>● **Does engine crank?** | Yes ▶ | GO to A3. |
| | | No ▶ | **DIAGNOSE** the Starting System. |
| **A3** | IDENTIFY TYPE OF NO START | | |
| | NOTE: The purpose of this Test Step is to identify intermittent No Starts in order to guide the technician to the proper repair procedure.<br>● **Does the vehicle start now?** | Yes ▶ | Vehicle is an intermittent No Start. GO to Pinpoint Test Step Z50 and prepare to use the Distributor / Less Ignition System Tester (DIST). |
| | | No ▶ | Natural gas vehicles:<br>KEY OFF. GO to Pinpoint Test Step HA47.<br>All others:<br>KEY OFF. GO to A4. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **A4** | CHECK VREF VOLTAGE TO THROTTLE POSITION (TP) SENSOR | | |
| | - Disconnect TP sensor.<br>- Key on, engine off.<br>- Measure voltage between VREF and SIG RTN circuit at the TP sensor harness connector. Refer to the schematic in Pinpoint Test DH.<br>- **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. RECONNECT TP sensor. GO to A5. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step C1. |
| **A5** | CHECK FEPS CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | - Key on, engine off.<br>- Measure voltage between Pin 13 at the data link connector and battery negative post.<br>- **Is voltage greater than 9.0 volts?** | Yes ▶ | REPAIR short to power. |
| | | No ▶ | For coil-on-plug vehicles:<br>KEY OFF. GO to A17.<br>All others:<br>KEY OFF. GO to A6. |
| **A6** | CHECK PIP IN THE PCM | | |
| | NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged.<br>- Access PIP PID.<br>- While viewing the PIP PID, crank engine.<br>- **Is the PIP PID switching on and off?** | Yes ▶ | KEY OFF. GO to Pinpoint Test Step JB1 to check ignition coils, plugs and wires. If OK:<br>**Natural gas vehicles:**<br>GO to A15.<br>**All others:**<br>GO to A7. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step JD1. |
| **A7** | CHECK FUEL PRESSURE | | |
| | **WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTIONS IN PINPOINT TEST HC WARNING, CAUTION, AND HANDLING.**<br>- Release the fuel pressure.<br>- Install fuel pressure tester.<br>- Scan Tool connected.<br>- Key on, engine off.<br>- Enter Output Test Mode and run the fuel pump to obtain maximum fuel pressure.<br>- **Is fuel pressure between 240 and 280 kPa (35 and 40 psi)?** | Yes ▶ | GO to A8. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step HC1. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| A8 | CHECK FUEL PRESSURE LEAKDOWN | | |
| | • Observe WARNING, CAUTION AND HANDLING in Pinpoint Test HC.<br>• Fuel pressure tester installed.<br>• Scan Tool connected.<br>• Key on, engine off.<br>• Access Output Test Mode and run fuel pump to obtain maximum fuel pressure.<br>• Exit Output Test Mode.<br>• Verify fuel pressure remains within 16 kPa (5 psi) of the maximum pressure for 1 minute after turning pump off.<br>• **Does fuel pressure remain within 16 kPa (5 psi)?** | Yes ▶<br>No ▶ | KEY OFF. GO to A9.<br>KEY OFF. GO to Pinpoint Test Step HC1. |
| A9 | CHECK FUEL INJECTORS FOR VPWR | | |
| | NOTE: Check at least two fuel injectors, one on each bank. A no start condition can exist only if greater than 50% of the fuel injectors are without VPWR.<br>• Disconnect any two fuel injectors.<br>• Key on.<br>• Measure VPWR circuit voltage at fuel injector harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to A10.<br>REPAIR VPWR circuit. |
| A10 | CHECK FUEL INJECTORS' ABILITY TO DELIVER FUEL | | |
| | • Connect fuel pressure gauge to Schrader valve.<br>• Locate and disconnect the inertia fuel shutoff (IFS) switch.<br>• Cycle key several times.<br>• Monitor pressure gauge while cranking the engine for at least five seconds.<br>• **Is there a pressure drop greater than 34 kPa (5 psi) while cranking the engine?** | Yes ▶<br>No ▶ | The electronic engine control system is not the cause of the no start. RETURN to Symptom Chart for further diagnosis.<br>REPLACE PCM. |
| A15 | CHECK FUEL PRESSURE ON NATURAL GAS VEHICLES | | |
| | • Connect scan tool to DLC.<br>• Access FRP PID (fuel pressure).<br>• Record fuel pressure.<br>• Connect fuel pressure gauge to Schrader valve.<br>• Key on, engine off.<br>• Record fuel pressure.<br>• **Is fuel pressure between 552 and 827 kPa (80 and 120 psi) on the Scan Tool and fuel pressure gauge?** | Yes ▶<br>No ▶ | KEY OFF. GO to A16.<br>KEY OFF. GO to Fuel Systems Pinpoint Test Step HB1. |

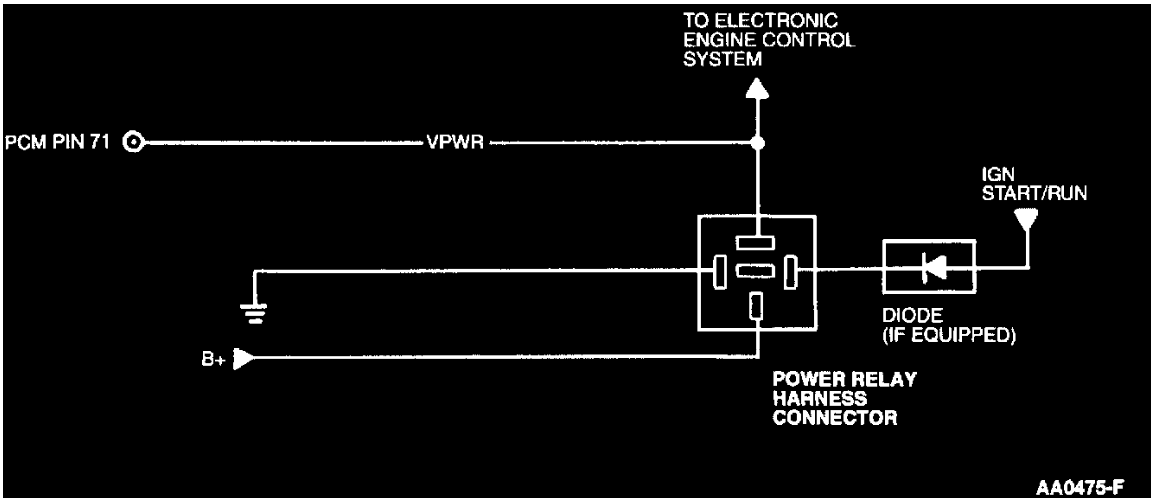


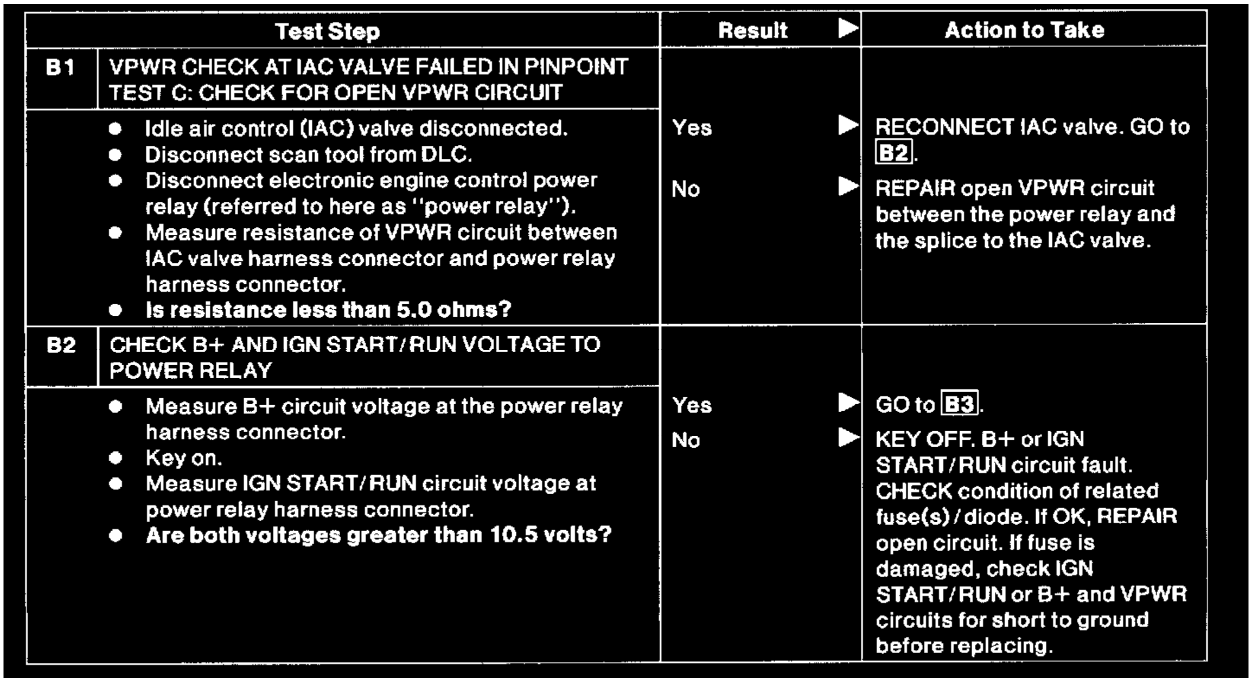
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| A16 | CHECK INJECTOR SIGNAL FROM NGV MODULE | | |
| | NOTE: This test requires a standard 12 volt test lamp. A properly operating system will show a dim glow.<br>• Connect test lamp between the injector signal circuit and VPWR circuit pin at the injector harness.<br>• Crank engine.<br>• **Does test lamp have a dim glow while cranking?** | Yes ▶<br>No ▶ | REPLACE PCM. GO to A6.<br>No light or continuously bright light. GO to Pinpoint Test Step HA47. |
| A17 | CHECK PCM DRIVER TO COILS | | |
| | • Connect incandescent test lamp between B+ and each coil driver circuit at the harness connector.<br>• Crank engine.<br>• **Does lamp blink consistently and brightly (one blink per engine revolution)?** | Yes ▶<br>No ▶ | KEY OFF. GO to A7.<br>KEY OFF. GO to Pinpoint Test Step JD1. |

# Test Notes

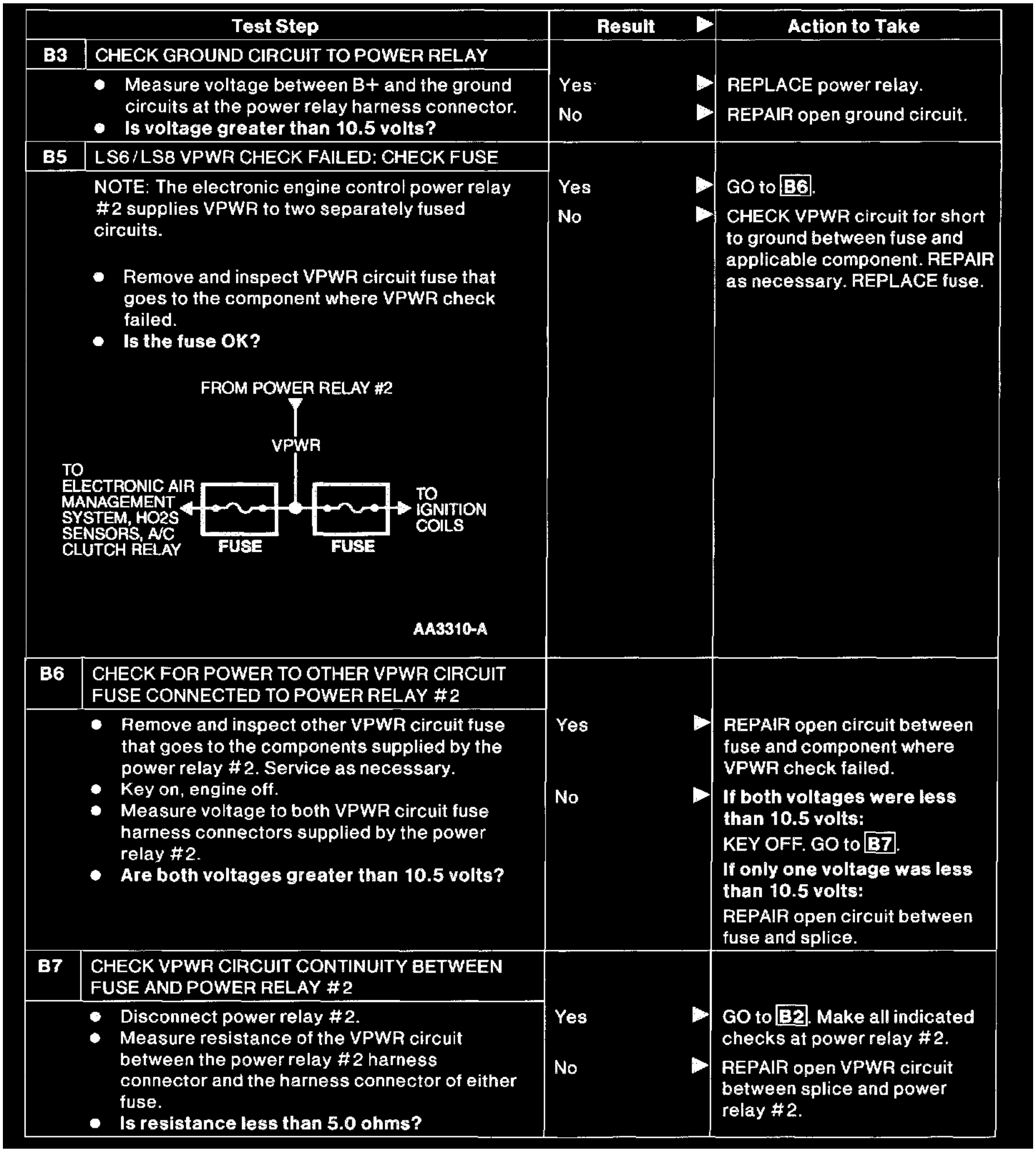
This Pinpoint Test is intended to diagnose the following:

- Harness Circuits: Vehicle Power (VPWR), Ignition Start/Run, Power Relay Ground, Battery Positive Voltage (B+)
- Power Relay





| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **B1** | VPWR CHECK AT IAC VALVE FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT | | |
| | • Idle air control (IAC) valve disconnected.<br>• Disconnect scan tool from DLC.<br>• Disconnect electronic engine control power relay (referred to here as "power relay").<br>• Measure resistance of VPWR circuit between IAC valve harness connector and power relay harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | RECONNECT IAC valve. GO to B2. |
| | | No ▶ | REPAIR open VPWR circuit between the power relay and the splice to the IAC valve. |
| **B2** | CHECK B+ AND IGN START/RUN VOLTAGE TO POWER RELAY | | |
| | • Measure B+ circuit voltage at the power relay harness connector.<br>• Key on.<br>• Measure IGN START/RUN circuit voltage at power relay harness connector.<br>• **Are both voltages greater than 10.5 volts?** | Yes ▶ | GO to B3. |
| | | No ▶ | KEY OFF. B+ or IGN START/RUN circuit fault. CHECK condition of related fuse(s)/diode. If OK, REPAIR open circuit. If fuse is damaged, check IGN START/RUN or B+ and VPWR circuits for short to ground before replacing. |

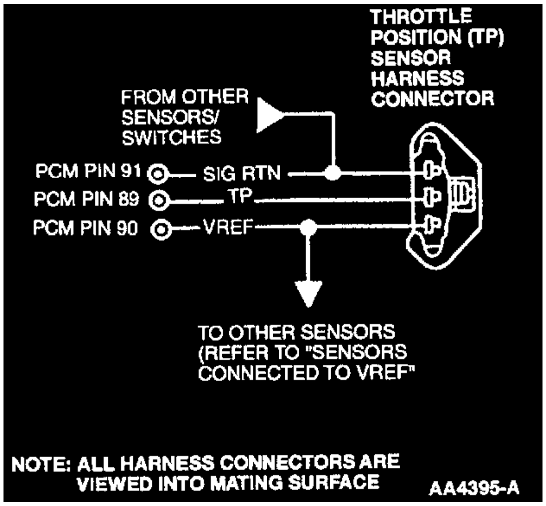


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **B3** | CHECK GROUND CIRCUIT TO POWER RELAY | | |
| | ● Measure voltage between B+ and the ground circuits at the power relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | REPLACE power relay. |
| | | No ▶ | REPAIR open ground circuit. |
| **B5** | LS6/LS8 VPWR CHECK FAILED: CHECK FUSE | | |
| | NOTE: The electronic engine control power relay #2 supplies VPWR to two separately fused circuits.<br>● Remove and inspect VPWR circuit fuse that goes to the component where VPWR check failed.<br>● **Is the fuse OK?**<br>AA3310-A | Yes ▶ | GO to B6. |
| | | No ▶ | CHECK VPWR circuit for short to ground between fuse and applicable component. REPAIR as necessary. REPLACE fuse. |
| **B6** | CHECK FOR POWER TO OTHER VPWR CIRCUIT FUSE CONNECTED TO POWER RELAY #2 | | |
| | ● Remove and inspect other VPWR circuit fuse that goes to the components supplied by the power relay #2. Service as necessary.<br>● Key on, engine off.<br>● Measure voltage to both VPWR circuit fuse harness connectors supplied by the power relay #2.<br>● **Are both voltages greater than 10.5 volts?** | Yes ▶ | REPAIR open circuit between fuse and component where VPWR check failed. |
| | | No ▶ | **If both voltages were less than 10.5 volts:**<br>KEY OFF. GO to B7.<br>**If only one voltage was less than 10.5 volts:**<br>REPAIR open circuit between fuse and splice. |
| **B7** | CHECK VPWR CIRCUIT CONTINUITY BETWEEN FUSE AND POWER RELAY #2 | | |
| | ● Disconnect power relay #2.<br>● Measure resistance of the VPWR circuit between the power relay #2 harness connector and the harness connector of either fuse.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to B2. Make all indicated checks at power relay #2. |
| | | No ▶ | REPAIR open VPWR circuit between splice and power relay #2. |

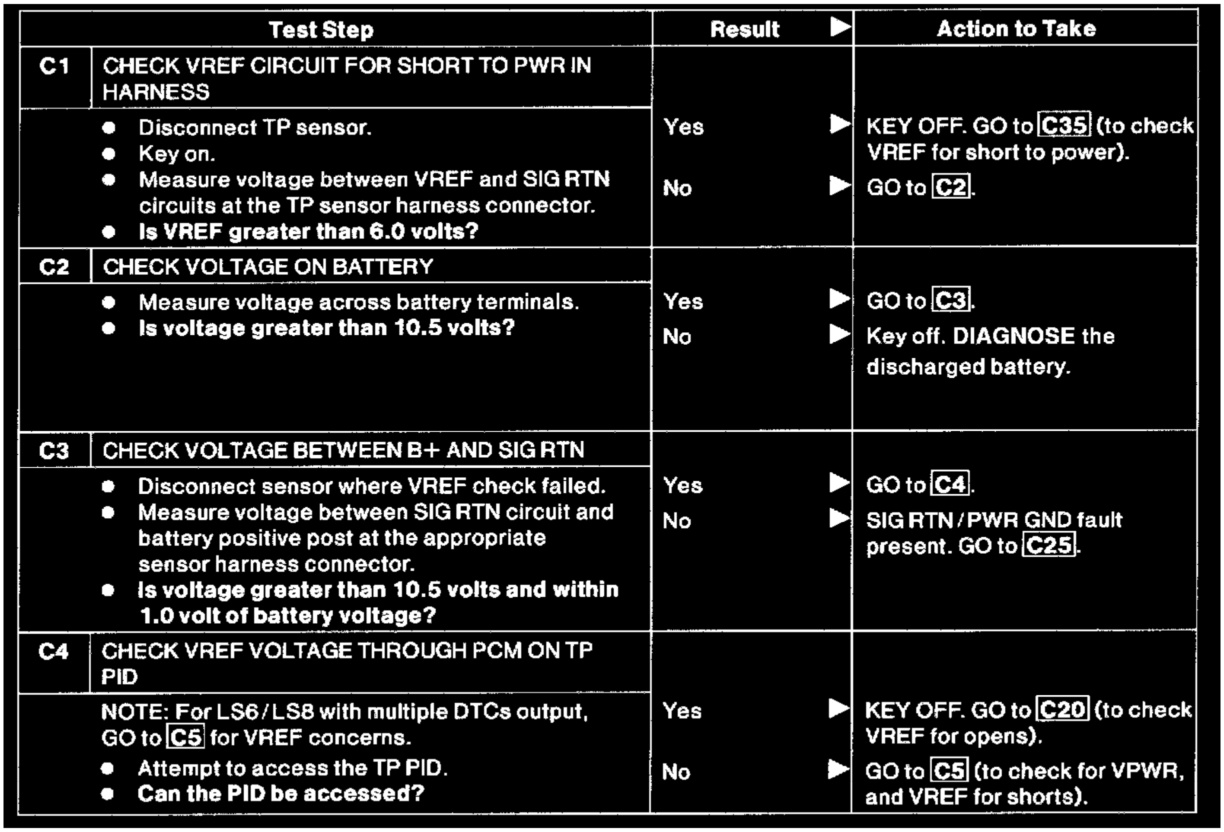
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Sensor harness circuits: SIGN RTN, VREF
- 3-wire sensors: Throttle Position **(TP)** sensor, differential pressure feedback EGR sensor, A/C Pressure **(ACP)** sensor, Fuel Tank Pressure **(FTP)** sensor, Power Steering Pressure **(PSP)** sensor, Fuel Rail Pressure **(FRP)** sensor, and Barometric **(BARO)** pressure sensor.
- Powertrain Control Module **(PCM)**

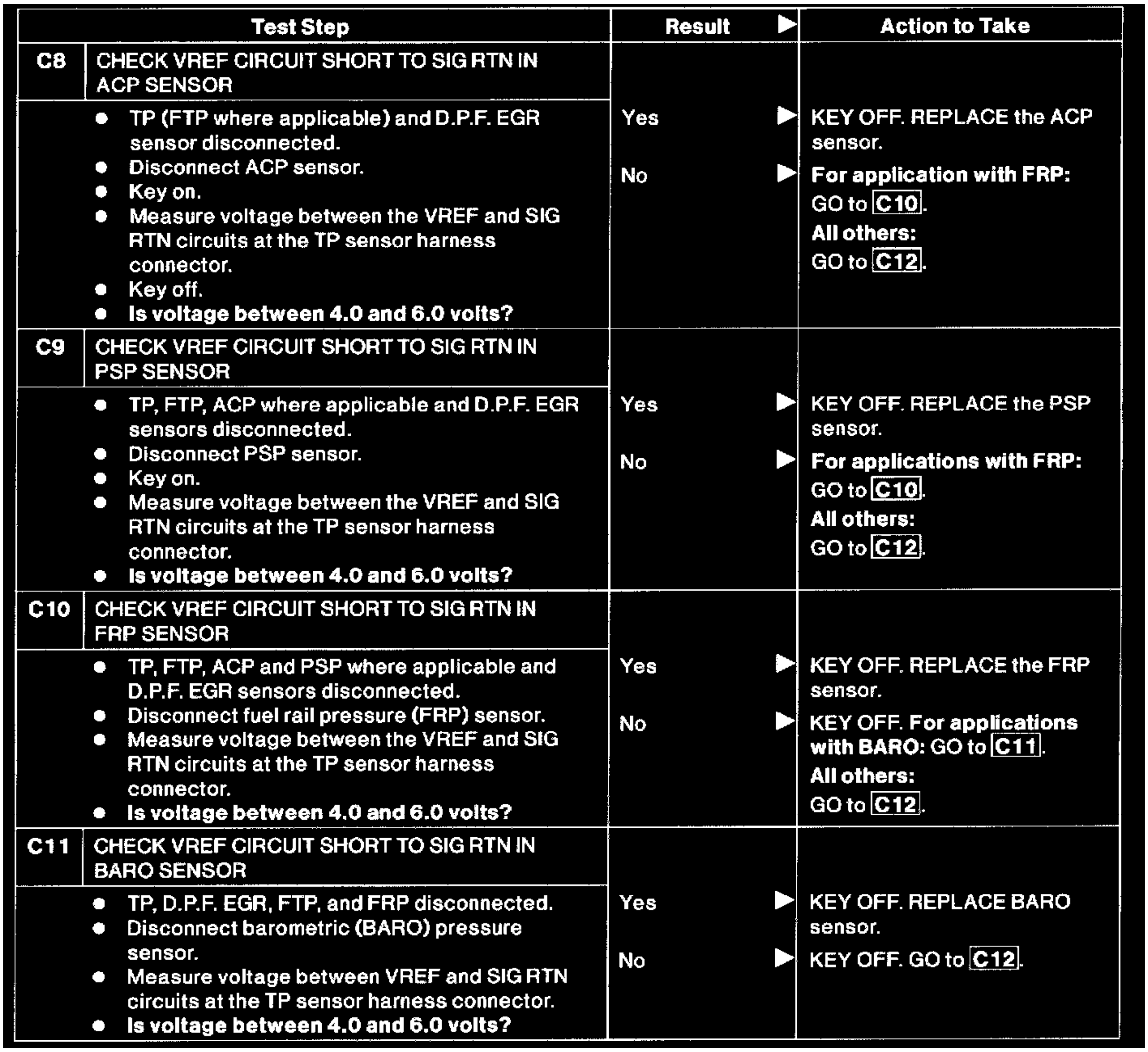


| Applications | TP | EGR | FTP | ACP | PSP | FRP | BARO |
|---|---|---|---|---|---|---|---|
| 3.0L FFV Taurus | X | D.P.F. EGR | | | | | |
| 2.5L Contour / Mystique, Cougar | X | D.P.F. EGR | X | | | | |
| Mustang, Ranger | X | D.P.F. EGR | X | | | X | |
| Taurus / Sable, Taurus SHO | X | D.P.F. EGR | X | | | | |
| Town Car | X | D.P.F. EGR | X | | | | |
| Explorer / Mountaineer | X | D.P.F. EGR | X | | | | |
| Crown Victoria (except NGV) | X | D.P.F. EGR | X | | | | |
| Grand Marquis, | X | D.P.F. EGR | X | | | | |
| Lightning | X | X | X | | | X | X |
| E / F-Series (except NGV), | X | D.P.F. EGR | X | | | X | |
| Expedition / Navigator | X | D.P.F. EGR | X | | | | |
| Continental, LS6 / LS8 | X | D.P.F. EGR | X | X | | X | |
| Windstar | X | D.P.F. EGR | X | X | | | |
| 2.0L 4V Escort | X | | X | X | X | X | |
| 2.0L 2V Escort / Tracer | X | D.P.F. EGR | X | | X | X | |
| 2.0L Contour / Mystique, Cougar | X | | X | | X | | |
| Crown Victoria w / NGV | X | D.P.F. EGR | X | | | X | |
| 5.4L E / F Series w / NGV | X | | X | | | X | |



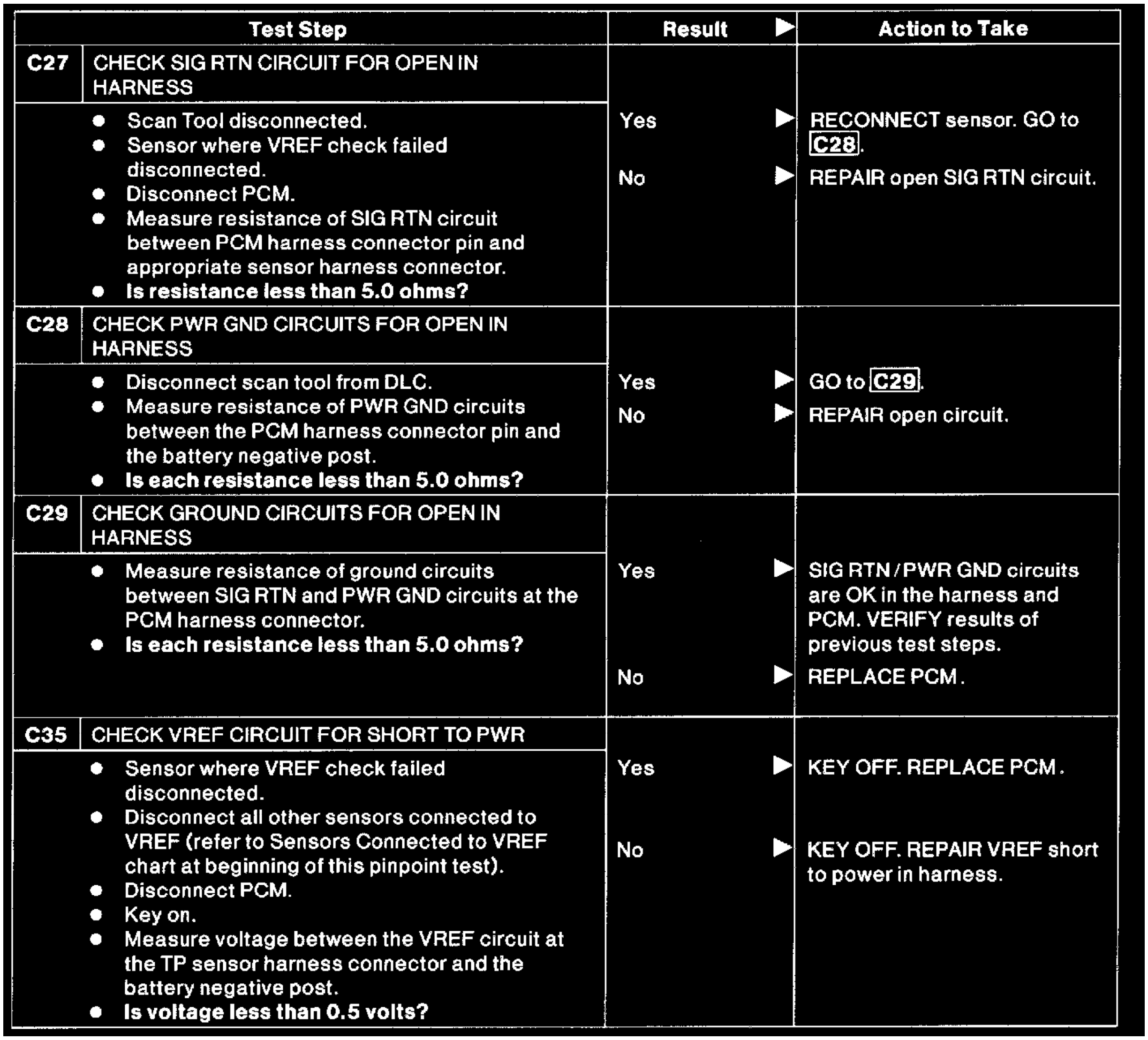
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **C1** | CHECK VREF CIRCUIT FOR SHORT TO PWR IN HARNESS | | |
| | ● Disconnect TP sensor.<br>● Key on.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is VREF greater than 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to C35 (to check VREF for short to power).<br>GO to C2. |
| **C2** | CHECK VOLTAGE ON BATTERY | | |
| | ● Measure voltage across battery terminals.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to C3.<br>Key off. DIAGNOSE the discharged battery. |
| **C3** | CHECK VOLTAGE BETWEEN B+ AND SIG RTN | | |
| | ● Disconnect sensor where VREF check failed.<br>● Measure voltage between SIG RTN circuit and battery positive post at the appropriate sensor harness connector.<br>● **Is voltage greater than 10.5 volts and within 1.0 volt of battery voltage?** | Yes ▶<br>No ▶ | GO to C4.<br>SIG RTN/PWR GND fault present. GO to C25. |
| **C4** | CHECK VREF VOLTAGE THROUGH PCM ON TP PID | | |
| | NOTE: For LS6/LS8 with multiple DTCs output, GO to C5 for VREF concerns.<br>● Attempt to access the TP PID.<br>● **Can the PID be accessed?** | Yes ▶<br>No ▶ | KEY OFF. GO to C20 (to check VREF for opens).<br>GO to C5 (to check for VPWR, and VREF for shorts). |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **C5** | CHECK VPWR VOLTAGE TO IAC VALVE | | |
| | - Disconnect TP sensor.<br>- Disconnect idle air control (IAC) valve.<br>- Key on.<br>- Measure voltage between the VPWR circuit at the IAC valve harness connector and the battery negative post.<br>- **Is voltage greater than 10.5 volts?** | Yes ▶ | RECONNECT IAC valve.<br>**For 2.0L Escort/Tracer, 2.0L Contour/Mystique, Cougar, 5.4L E/F-Series with NGV:**<br>GO to C7.<br>**All Others:**<br>GO to C6. |
| | | No ▶ | VPWR is not present. RECONNECT TP sensor.<br>**For application with Power Relay inside CCRM:**<br>GO to Pinpoint Test X1.<br>**All others:**<br>GO to Pinpoint Test Step B1. |
| **C6** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN THE D.P.F. EGR OR EGR VALVE POSITION SENSOR | | |
| | - TP sensor disconnected.<br>- Disconnect FTP sensor.<br>- Key on.<br>- Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>- **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. REPLACE D.P.F. EGR sensor or EGR valve position sensor. |
| | | No ▶ | **For 3.0L FFV Taurus:**<br>GO to C12.<br>**For all others:**<br>GO to C7. |
| **C7** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN FTP SENSOR | | |
| | - TP and D.P.F. EGR sensors disconnected.<br>- Disconnect FTP sensor.<br>- Key on.<br>- Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector.<br>- **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. REPLACE the FTP sensor. |
| | | No ▶ | **For applications with an A/C Pressure (ACP) sensor:**<br>GO to C8.<br>**For applications with PSP:**<br>GO to C9.<br>**For applications with FRP only:**<br>GO to C10.<br>**All Others:**<br>GO to C12. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **C8** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN ACP SENSOR | | |
| | ● TP (FTP where applicable) and D.P.F. EGR sensor disconnected.<br>● Disconnect ACP sensor.<br>● Key on.<br>● Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector.<br>● Key off.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE the ACP sensor.<br>**For application with FRP:** GO to C10.<br>**All others:** GO to C12. |
| **C9** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN PSP SENSOR | | |
| | ● TP, FTP, ACP where applicable and D.P.F. EGR sensors disconnected.<br>● Disconnect PSP sensor.<br>● Key on.<br>● Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE the PSP sensor.<br>**For applications with FRP:** GO to C10.<br>**All others:** GO to C12. |
| **C10** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN FRP SENSOR | | |
| | ● TP, FTP, ACP and PSP where applicable and D.P.F. EGR sensors disconnected.<br>● Disconnect fuel rail pressure (FRP) sensor.<br>● Measure voltage between the VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE the FRP sensor.<br>KEY OFF. **For applications with BARO:** GO to C11.<br>**All others:** GO to C12. |
| **C11** | CHECK VREF CIRCUIT SHORT TO SIG RTN IN BARO SENSOR | | |
| | ● TP, D.P.F. EGR, FTP, and FRP disconnected.<br>● Disconnect barometric (BARO) pressure sensor.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE BARO sensor.<br>KEY OFF. GO to C12. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **C12** | CHECK VPWR VOLTAGE TO PCM | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● TP sensor disconnected.<br>● All other sensors wired to VREF disconnected from previous test steps (if necessary, refer to Sensors Connected To VREF chart at the beginning of this pinpoint test).<br>● PCM disconnected.<br>● Key on.<br>● Measure voltage between VPWR and PWR GND circuits at the PCM harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | GO to C13. |
| | | No ▶ | KEY OFF. REPAIR open VPWR circuit between PCM and splice to IAC valve. |
| **C13** | CHECK VREF VOLTAGE FOR SHORT TO GROUND OR SIG RTN | | |
| | ● TP sensor disconnected.<br>● All other sensors wired to VREF disconnected.<br>● Disconnect PCM.<br>● Disconnect Scan Tool from DLC.<br>● Measure resistance between VREF and SIG RTN, PWR GND circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR VREF short to ground. |
| **C20** | CHECK VREF CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Sensor where VREF check failed disconnected.<br>● Disconnect PCM.<br>● Measure resistance of VREF circuit between PCM harness connector pin and appropriate sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | KEY OFF. REPLACE PCM. |
| | | No ▶ | REPAIR open VREF circuit. |
| **C25** | CHECK SIG RTN/PWR GND THROUGH PCM ON TP PID | | |
| | ● Key on.<br>● Attempt to access the TP PID.<br>● **Can the PID be accessed?** | Yes ▶ | GO to C26. |
| | | No ▶ | GO to C28. |
| **C26** | ARE KOEO DTCs PRESENT FOR TWO OR MORE SENSORS/SWITCHES CONNECTED TO THE SIG RTN CIRCUIT? | | |
| | ● **Are KOEO DTCs present for two or more sensors/switches connected to the SIG RTN circuit?** | Yes ▶ | KEY OFF. GO to C27. |
| | | No ▶ | KEY OFF. REPAIR open SIG RTN circuit to the sensor where the VREF check failed. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **C27** | CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS | | |
| | • Scan Tool disconnected.<br>• Sensor where VREF check failed disconnected.<br>• Disconnect PCM.<br>• Measure resistance of SIG RTN circuit between PCM harness connector pin and appropriate sensor harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | RECONNECT sensor. GO to C28. |
| | | No ▶ | REPAIR open SIG RTN circuit. |
| **C28** | CHECK PWR GND CIRCUITS FOR OPEN IN HARNESS | | |
| | • Disconnect scan tool from DLC.<br>• Measure resistance of PWR GND circuits between the PCM harness connector pin and the battery negative post.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶ | GO to C29. |
| | | No ▶ | REPAIR open circuit. |
| **C29** | CHECK GROUND CIRCUITS FOR OPEN IN HARNESS | | |
| | • Measure resistance of ground circuits between SIG RTN and PWR GND circuits at the PCM harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶ | SIG RTN / PWR GND circuits are OK in the harness and PCM. VERIFY results of previous test steps. |
| | | No ▶ | REPLACE PCM. |
| **C35** | CHECK VREF CIRCUIT FOR SHORT TO PWR | | |
| | • Sensor where VREF check failed disconnected.<br>• Disconnect all other sensors connected to VREF (refer to Sensors Connected to VREF chart at beginning of this pinpoint test).<br>• Disconnect PCM.<br>• Key on.<br>• Measure voltage between the VREF circuit at the TP sensor harness connector and the battery negative post.<br>• **Is voltage less than 0.5 volts?** | Yes ▶ | KEY OFF. REPLACE PCM. |
| | | No ▶ | KEY OFF. REPAIR VREF short to power in harness. |

## Test Notes

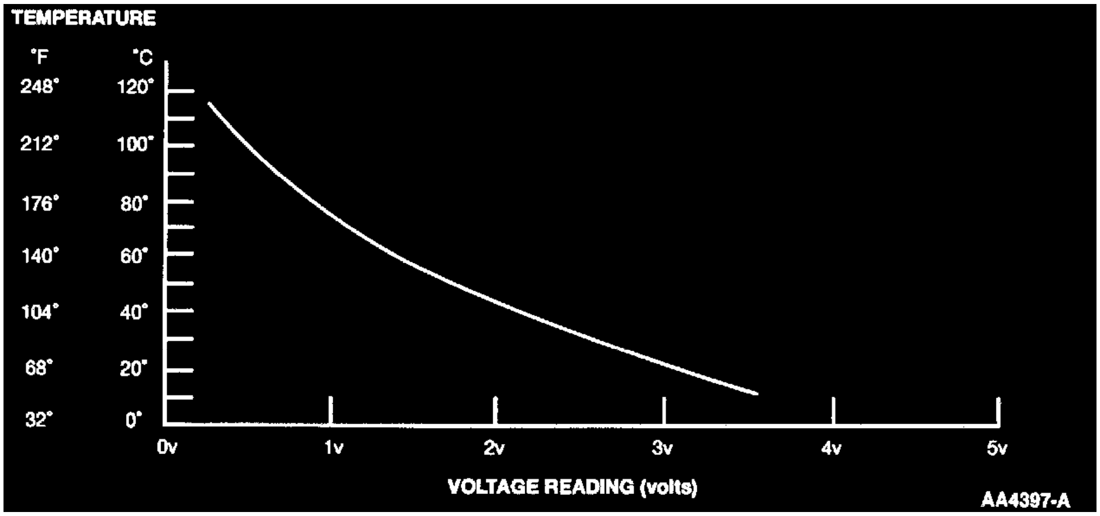
This Pinpoint Test is intended to diagnose the following:

- Intake Air Temperature **(IAT)** sensor
- Intake Air Temperature 2 **(IAT2)** sensor
- Integrated intake air temperature sensor
- Engine Coolant Temperature **(ECT)** sensor
- Engine Oil Temperature **(EOT)** sensor
- Harness circuits: IAT, IAT2, ECT, EOT, and SIG RTN
- Powertrain Control Module **(PCM)**

The term "applicable" is used in this pinpoint test and refers to the temperature sensor indicated by the DTC.

Example: ECTV, IATV, IAT2V, EOTV.

## Tables and Graphs



| Temperature | | Temperature Sensor Values | |
|---|---|---|---|
| °C | °F | Voltage (volts) | Resistance (K ohms) |
| 120 | 248 | 0.27 | 1.18 |
| 110 | 230 | 0.35 | 1.55 |
| 100 | 212 | 0.46 | 2.07 |
| 90 | 194 | 0.60 | 2.80 |
| 80 | 176 | 0.78 | 3.84 |
| 70 | 158 | 1.02 | 5.37 |
| 60 | 140 | 1.33 | 7.70 |
| 50 | 122 | 1.70 | 10.97 |
| 40 | 104 | 2.13 | 16.15 |
| 30 | 86 | 2.60 | 24.27 |
| 20 | 68 | 3.07 | 37.30 |
| 10 | 50 | 3.51 | 58.75 |

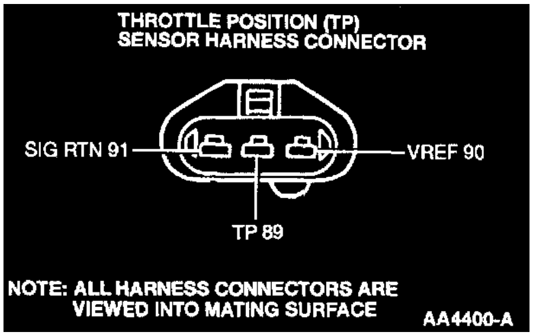
**NOTE:** Engine coolant temperature must be greater than **10°C (50°F)** to pass the KOEO Self-Test and greater than **82°C (180°F)** to pass the KOER Self-Test. To accomplish this, the engine must be at normal operating temperature.

Ambient temperature must be above **10°C (50°F)** to receive acceptable input from the Intake Air Temperature **(IAT)** sensor.

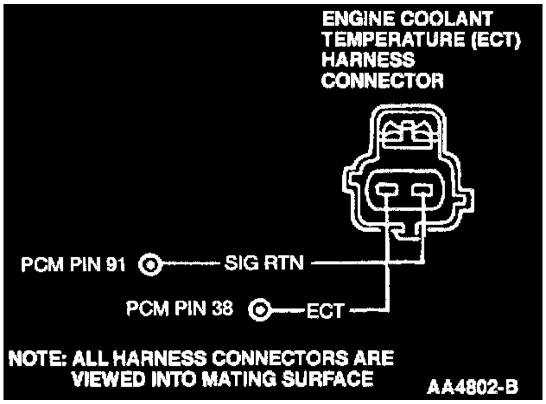
Engine oil temperature must be greater than **10°C (50°F)** to pass the KOEO Self-Test and greater than **66°C (150°F)** to pass the KOER Self-Test.

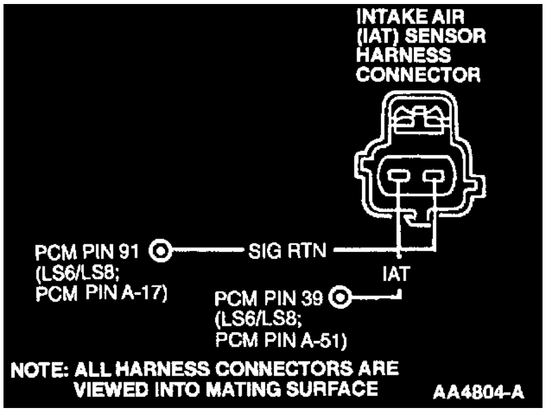
Voltage values were calculated for VREF = **5.0 volts**. These values can vary 15 percent due to sensor and VREF variations.

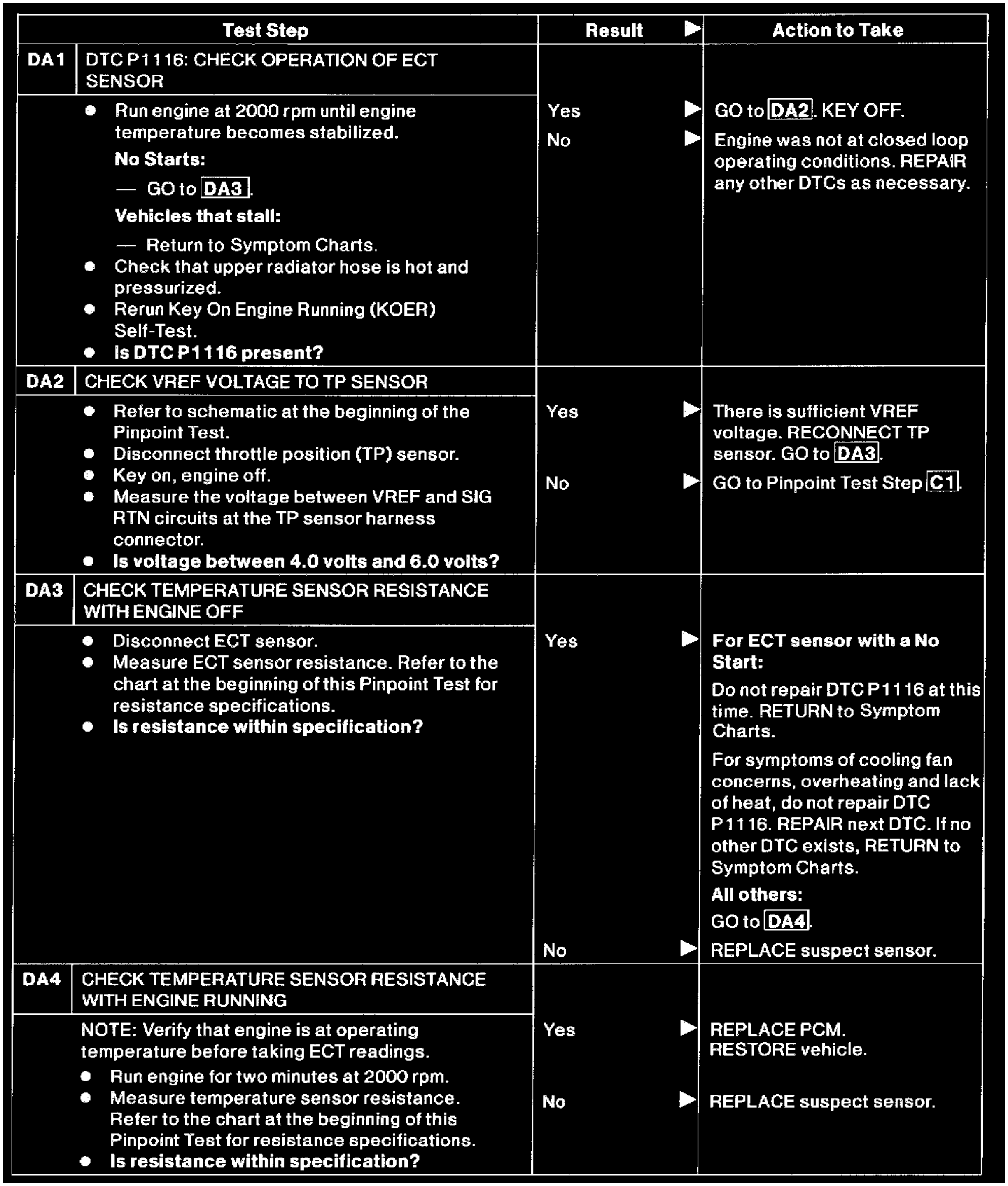
## Pinpoint Test Schematics and Connectors



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

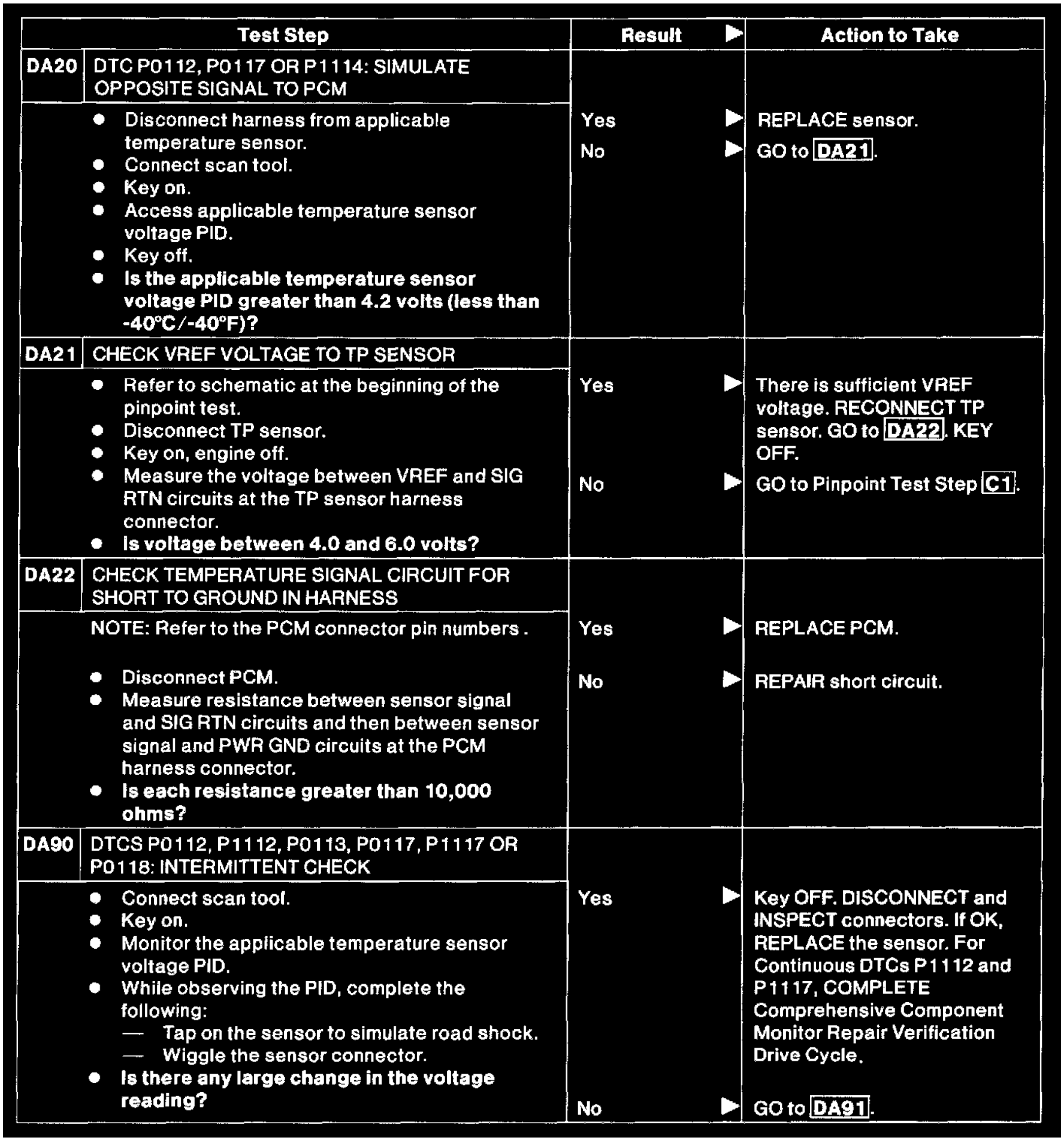

ENGINE COOLANT TEMPERATURE (ECT) HARNESS CONNECTOR
PCM PIN 91
SIG RTN
PCM PIN 38
ECT
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4802-B


INTAKE AIR (IAT) SENSOR HARNESS CONNECTOR
PCM PIN 91 (LS6/LS8; PCM PIN A-17)
SIG RTN
IAT
PCM PIN 39 (LS6/LS8; PCM PIN A-51)
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4804-A



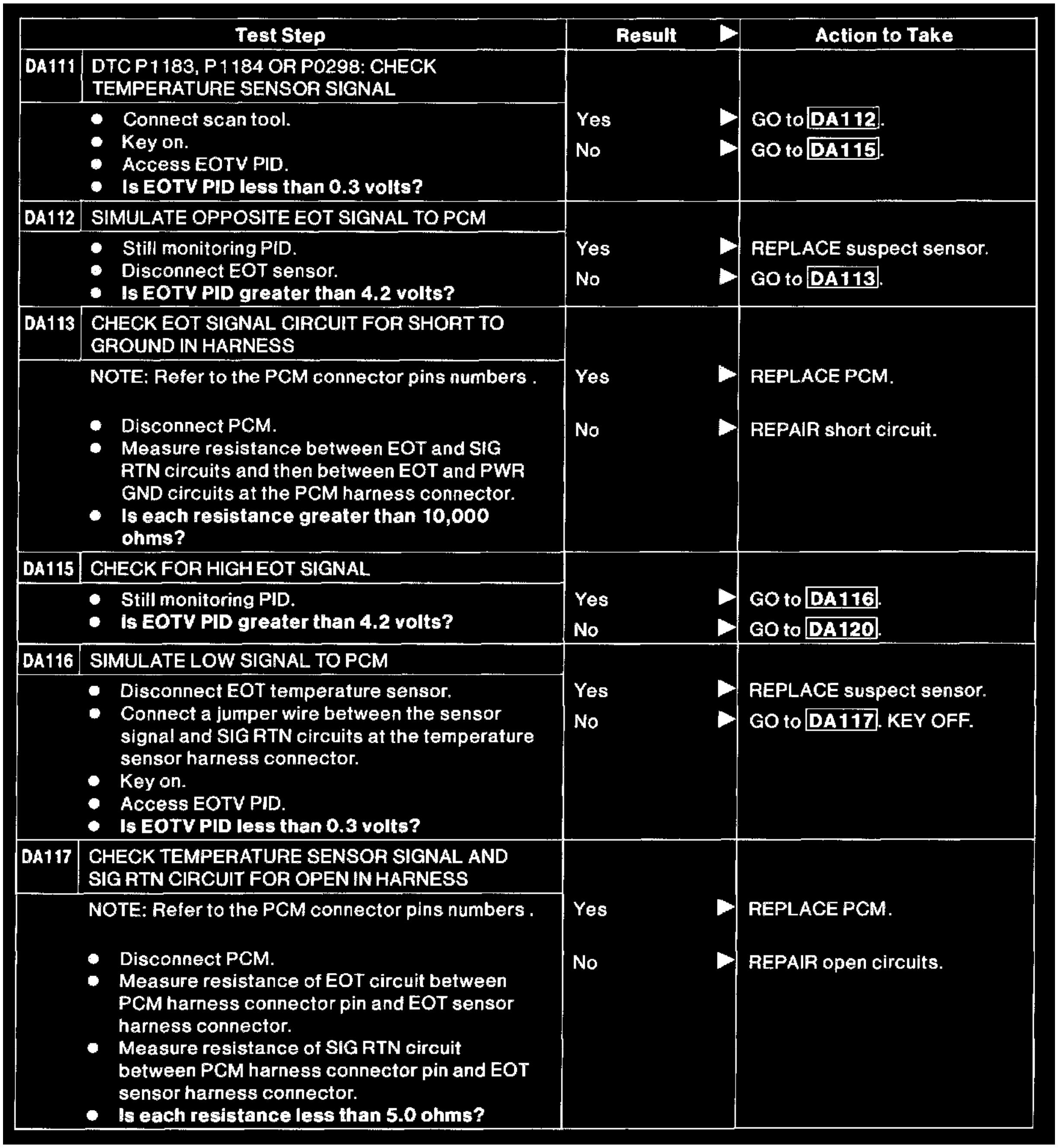
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DA1** | DTC P1116: CHECK OPERATION OF ECT SENSOR | | |
| | • Run engine at 2000 rpm until engine temperature becomes stabilized.<br>**No Starts:**<br>— GO to DA3.<br>**Vehicles that stall:**<br>— Return to Symptom Charts.<br>• Check that upper radiator hose is hot and pressurized.<br>• Rerun Key On Engine Running (KOER) Self-Test.<br>• **Is DTC P1116 present?** | Yes ▶<br>No ▶ | GO to DA2. KEY OFF.<br>Engine was not at closed loop operating conditions. REPAIR any other DTCs as necessary. |
| **DA2** | CHECK VREF VOLTAGE TO TP SENSOR | | |
| | • Refer to schematic at the beginning of the Pinpoint Test.<br>• Disconnect throttle position (TP) sensor.<br>• Key on, engine off.<br>• Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>• **Is voltage between 4.0 volts and 6.0 volts?** | Yes ▶<br>No ▶ | There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA3.<br>GO to Pinpoint Test Step C1. |
| **DA3** | CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE OFF | | |
| | • Disconnect ECT sensor.<br>• Measure ECT sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications.<br>• **Is resistance within specification?** | Yes ▶<br>No ▶ | **For ECT sensor with a No Start:**<br>Do not repair DTC P1116 at this time. RETURN to Symptom Charts.<br>For symptoms of cooling fan concerns, overheating and lack of heat, do not repair DTC P1116. REPAIR next DTC. If no other DTC exists, RETURN to Symptom Charts.<br>**All others:**<br>GO to DA4.<br>REPLACE suspect sensor. |
| **DA4** | CHECK TEMPERATURE SENSOR RESISTANCE WITH ENGINE RUNNING | | |
| | NOTE: Verify that engine is at operating temperature before taking ECT readings.<br>• Run engine for two minutes at 2000 rpm.<br>• Measure temperature sensor resistance. Refer to the chart at the beginning of this Pinpoint Test for resistance specifications.<br>• **Is resistance within specification?** | Yes ▶<br>No ▶ | REPLACE PCM. RESTORE vehicle.<br>REPLACE suspect sensor. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DA10** | DTC P0118, P0113 OR P1115: CHECK FOR SHORT TO VPWR OR VREF | | |
| | • Key off.<br>• Disconnect harness from applicable temperature sensor.<br>• Key on.<br>• **Is the applicable temperature sensor voltage PID greater than 4.8 volts?** | Yes ▶<br>No ▶ | GO to DA13.<br>GO to DA11. KEY OFF. |
| **DA11** | SIMULATE OPPOSITE SIGNAL TO PCM | | |
| | • With applicable temperature sensor disconnected, connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector.<br>• Key on.<br>NOTE: If a scan tool communication concern exists, remove jumper wire immediately and GO to DA13.<br>• Access applicable temperature sensor voltage PID.<br>• **Is the applicable temperature sensor voltage PID less than 0.2 volts (greater than 120°C/248°F)?** | Yes ▶<br>No ▶ | REPLACE suspect sensor.<br>REMOVE jumper wire. GO to DA12. KEY OFF. |
| **DA12** | CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers.<br>• Disconnect PCM.<br>• Measure resistance of sensor signal circuit between PCM harness connector pin and applicable sensor harness connector.<br>• Measure resistance of SIG RTN circuit between PCM harness connector pin and applicable temperature sensor harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuits. |
| **DA13** | CHECK TEMPERATURE SIGNAL FOR SHORT TO VPWR OR VREF | | |
| | • Key on.<br>• Measure voltage between applicable temperature signal circuit at the sensor harness connector and chassis ground.<br>• **Is voltage greater than 4.8 volts?** | Yes ▶<br>No ▶ | REPAIR short to VREF or VPWR in harness. If harness is OK, REPLACE PCM.<br>GO to C5. |

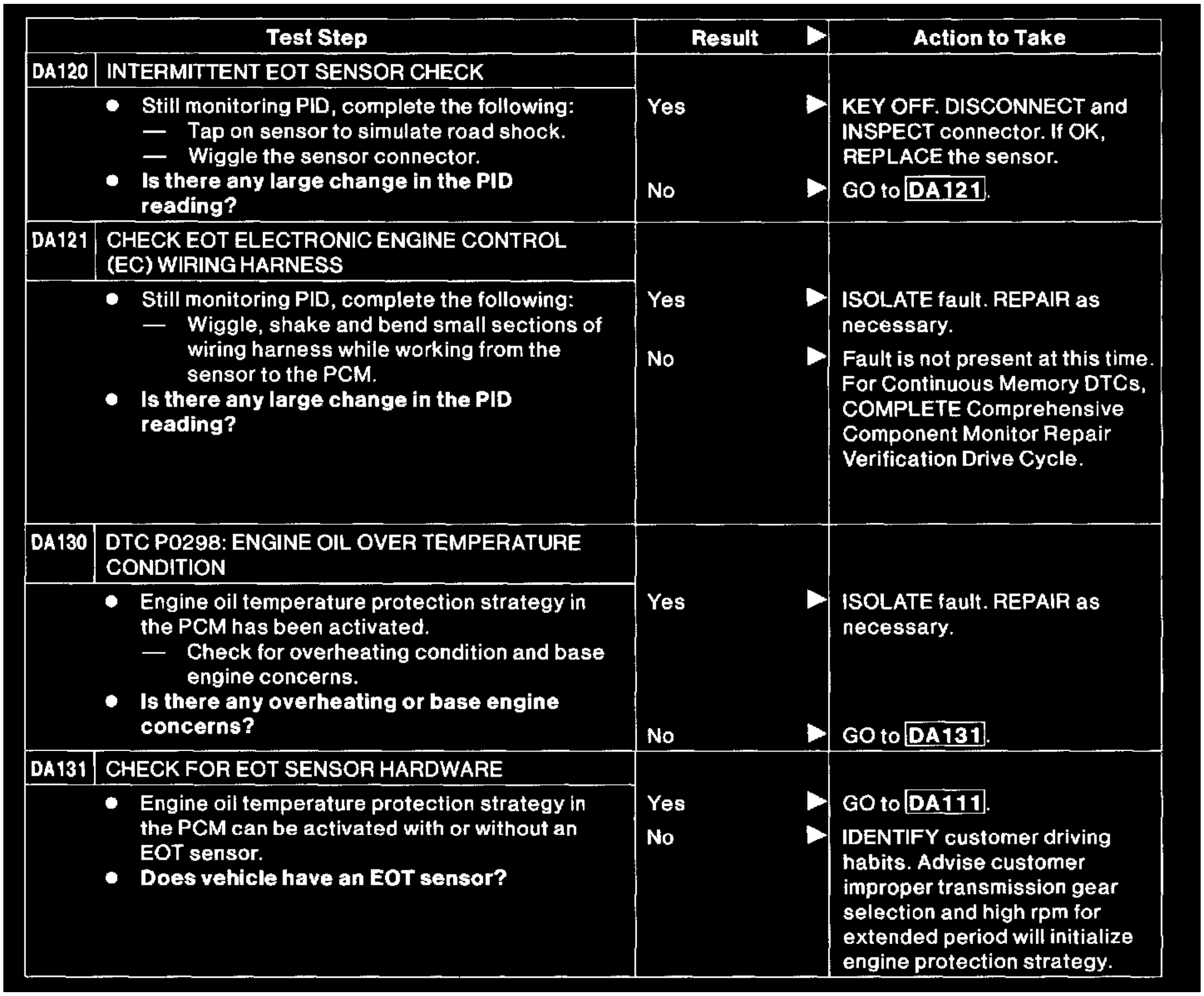


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DA20** | DTC P0112, P0117 OR P1114: SIMULATE OPPOSITE SIGNAL TO PCM | | |
| | ● Disconnect harness from applicable temperature sensor.<br>● Connect scan tool.<br>● Key on.<br>● Access applicable temperature sensor voltage PID.<br>● Key off.<br>● **Is the applicable temperature sensor voltage PID greater than 4.2 volts (less than -40°C/-40°F)?** | Yes ▶<br>No ▶ | REPLACE sensor.<br>GO to DA21. |
| **DA21** | CHECK VREF VOLTAGE TO TP SENSOR | | |
| | ● Refer to schematic at the beginning of the pinpoint test.<br>● Disconnect TP sensor.<br>● Key on, engine off.<br>● Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | There is sufficient VREF voltage. RECONNECT TP sensor. GO to DA22. KEY OFF.<br>GO to Pinpoint Test Step C1. |
| **DA22** | CHECK TEMPERATURE SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers .<br>● Disconnect PCM.<br>● Measure resistance between sensor signal and SIG RTN circuits and then between sensor signal and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DA90** | DTCS P0112, P1112, P0113, P0117, P1117 OR P0118: INTERMITTENT CHECK | | |
| | ● Connect scan tool.<br>● Key on.<br>● Monitor the applicable temperature sensor voltage PID.<br>● While observing the PID, complete the following:<br>— Tap on the sensor to simulate road shock.<br>— Wiggle the sensor connector.<br>● **Is there any large change in the voltage reading?** | Yes ▶<br>No ▶ | Key OFF. DISCONNECT and INSPECT connectors. If OK, REPLACE the sensor. For Continuous DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle.<br>GO to DA91. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DA91** | CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS<br>● Still monitoring PID.<br>● While observing the appropriate PID, complete the following:<br>— Hold the sensor harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM.<br>● **Is there any change in the voltage reading?** | Yes ▶ | ISOLATE fault. REPAIR as necessary. For Continuous DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to DA92. |
| **DA92** | CHECK PCM AND VEHICLE HARNESS CONNECTOR<br>● Disconnect PCM.<br>● Disconnect sensor connector.<br>● **Are connectors and terminals OK?** | Yes ▶ | Fault is not present at this time. For Continuous Memory DTCs P1112 and P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REPAIR as necessary. For Continuous Memory DTCs P1112 or P1117, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| **DA100** | DTC P0125: CHECK ENGINE COOLANT LEVEL<br>● Check engine coolant level.<br>● **Is the engine coolant level fill correct?** | Yes ▶ | DIAGNOSE Engine Cooling. |
| | | No ▶ | FILL engine coolant to proper level. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| **DA110** | DTC P1184: CHECK OPERATION OF EOT TEMP SENSOR<br>● Connect scan tool.<br>● Run engine at 2000 rpm until engine temperature becomes stabilized.<br>● Run Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P1184 present?** | Yes ▶ | GO to DA111. |
| | | No ▶ | Engine oil temperature was not at operating temperature. REPAIR any other DTCs as necessary. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DA111** | DTC P1183, P1184 OR P0298: CHECK TEMPERATURE SENSOR SIGNAL | | |
| | ● Connect scan tool.<br>● Key on.<br>● Access EOTV PID.<br>● **Is EOTV PID less than 0.3 volts?** | Yes ▶<br>No ▶ | GO to DA112.<br>GO to DA115. |
| **DA112** | SIMULATE OPPOSITE EOT SIGNAL TO PCM | | |
| | ● Still monitoring PID.<br>● Disconnect EOT sensor.<br>● **Is EOTV PID greater than 4.2 volts?** | Yes ▶<br>No ▶ | REPLACE suspect sensor.<br>GO to DA113. |
| **DA113** | CHECK EOT SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pins numbers .<br>● Disconnect PCM.<br>● Measure resistance between EOT and SIG RTN circuits and then between EOT and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DA115** | CHECK FOR HIGH EOT SIGNAL | | |
| | ● Still monitoring PID.<br>● **Is EOTV PID greater than 4.2 volts?** | Yes ▶<br>No ▶ | GO to DA116.<br>GO to DA120. |
| **DA116** | SIMULATE LOW SIGNAL TO PCM | | |
| | ● Disconnect EOT temperature sensor.<br>● Connect a jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector.<br>● Key on.<br>● Access EOTV PID.<br>● **Is EOTV PID less than 0.3 volts?** | Yes ▶<br>No ▶ | REPLACE suspect sensor.<br>GO to DA117. KEY OFF. |
| **DA117** | CHECK TEMPERATURE SENSOR SIGNAL AND SIG RTN CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pins numbers .<br>● Disconnect PCM.<br>● Measure resistance of EOT circuit between PCM harness connector pin and EOT sensor harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector pin and EOT sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuits. |



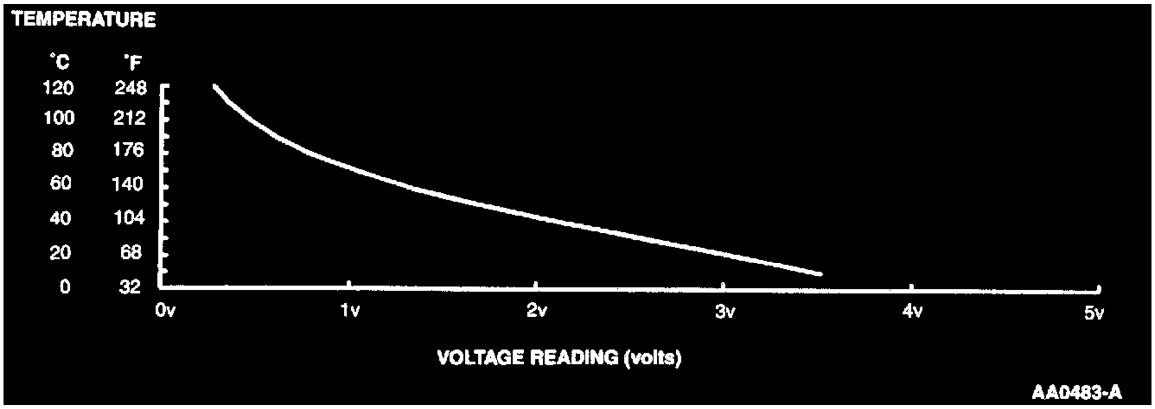
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DA120 | INTERMITTENT EOT SENSOR CHECK | | |
| | ● Still monitoring PID, complete the following:<br>— Tap on sensor to simulate road shock.<br>— Wiggle the sensor connector.<br>● **Is there any large change in the PID reading?** | Yes ▶ | KEY OFF. DISCONNECT and INSPECT connector. If OK, REPLACE the sensor. |
| | | No ▶ | GO to DA121. |
| DA121 | CHECK EOT ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS | | |
| | ● Still monitoring PID, complete the following:<br>— Wiggle, shake and bend small sections of wiring harness while working from the sensor to the PCM.<br>● **Is there any large change in the PID reading?** | Yes ▶ | ISOLATE fault. REPAIR as necessary. |
| | | No ▶ | Fault is not present at this time. For Continuous Memory DTCs, COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| DA130 | DTC P0298: ENGINE OIL OVER TEMPERATURE CONDITION | | |
| | ● Engine oil temperature protection strategy in the PCM has been activated.<br>— Check for overheating condition and base engine concerns.<br>● **Is there any overheating or base engine concerns?** | Yes ▶ | ISOLATE fault. REPAIR as necessary. |
| | | No ▶ | GO to DA131. |
| DA131 | CHECK FOR EOT SENSOR HARDWARE | | |
| | ● Engine oil temperature protection strategy in the PCM can be activated with or without an EOT sensor.<br>● **Does vehicle have an EOT sensor?** | Yes ▶ | GO to DA111. |
| | | No ▶ | IDENTIFY customer driving habits. Advise customer improper transmission gear selection and high rpm for extended period will initialize engine protection strategy. |

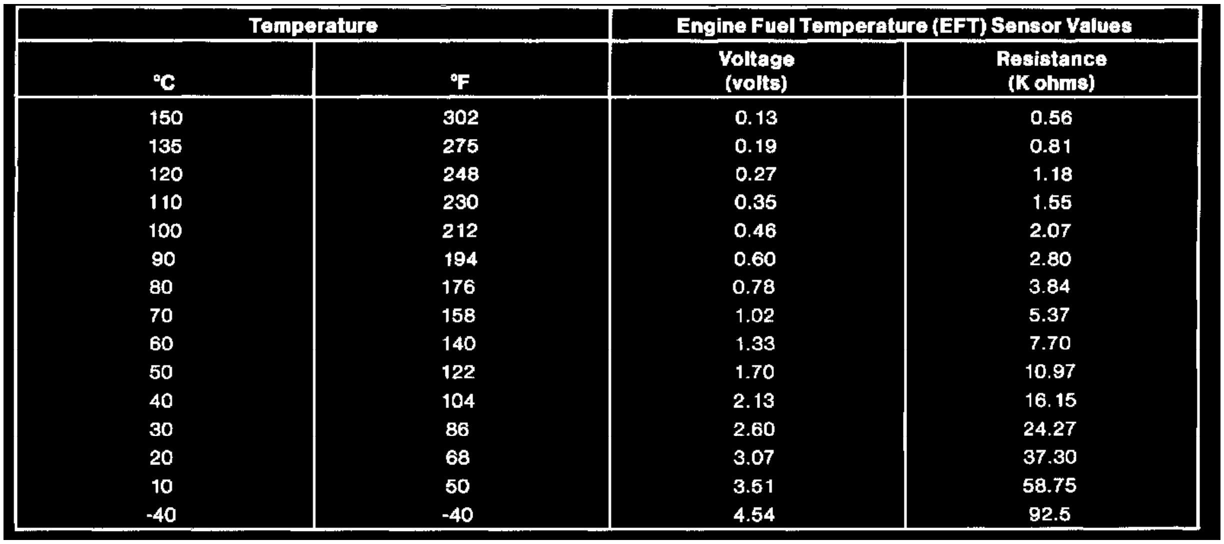
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Engine Fuel Temperature **(EFT)** Sensor
- Harness Circuits: EFT and SIG RTN
- Powertrain Control Module **(PCM)**

# Tables and Graphs

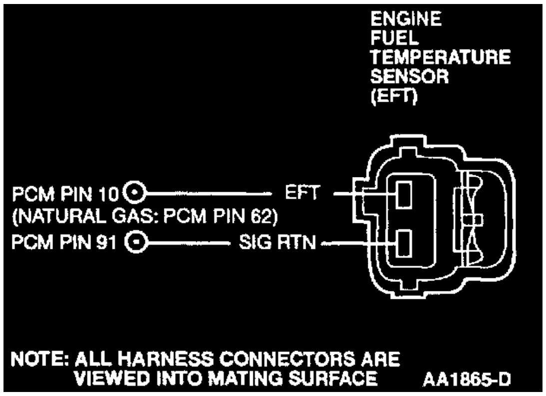




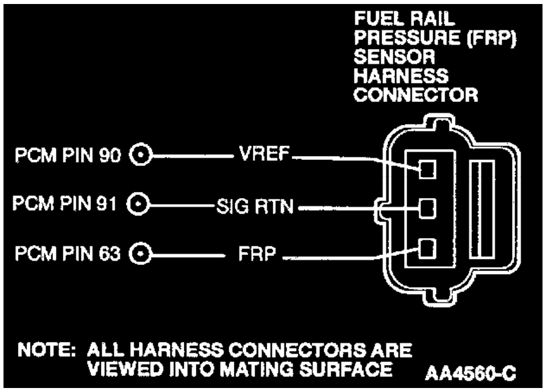
| Temperature | | Engine Fuel Temperature (EFT) Sensor Values | |
|---|---|---|---|
| °C | °F | Voltage (volts) | Resistance (K ohms) |
| 150 | 302 | 0.13 | 0.56 |
| 135 | 275 | 0.19 | 0.81 |
| 120 | 248 | 0.27 | 1.18 |
| 110 | 230 | 0.35 | 1.55 |
| 100 | 212 | 0.46 | 2.07 |
| 90 | 194 | 0.60 | 2.80 |
| 80 | 176 | 0.78 | 3.84 |
| 70 | 158 | 1.02 | 5.37 |
| 60 | 140 | 1.33 | 7.70 |
| 50 | 122 | 1.70 | 10.97 |
| 40 | 104 | 2.13 | 16.15 |
| 30 | 86 | 2.60 | 24.27 |
| 20 | 68 | 3.07 | 37.30 |
| 10 | 50 | 3.51 | 58.75 |
| -40 | -40 | 4.54 | 92.5 |

**NOTE:** The Engine Fuel Temperature **(EFT)** sensor will operate within the range of **-40°C** to **135°C (-40°F** to **275°F)**.

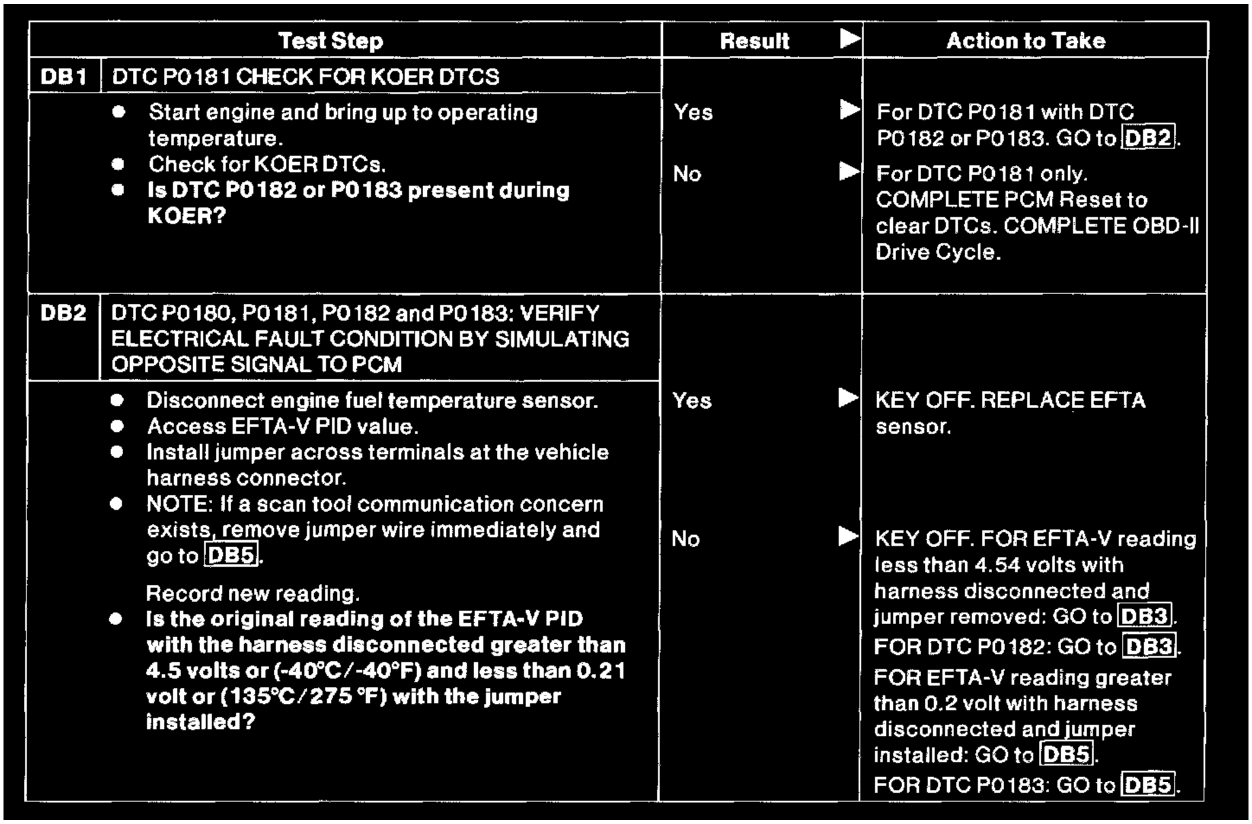
Voltage values were calculated for VREF=**5.0 volts**. These values may vary 15% due to sensor and VREF variations.



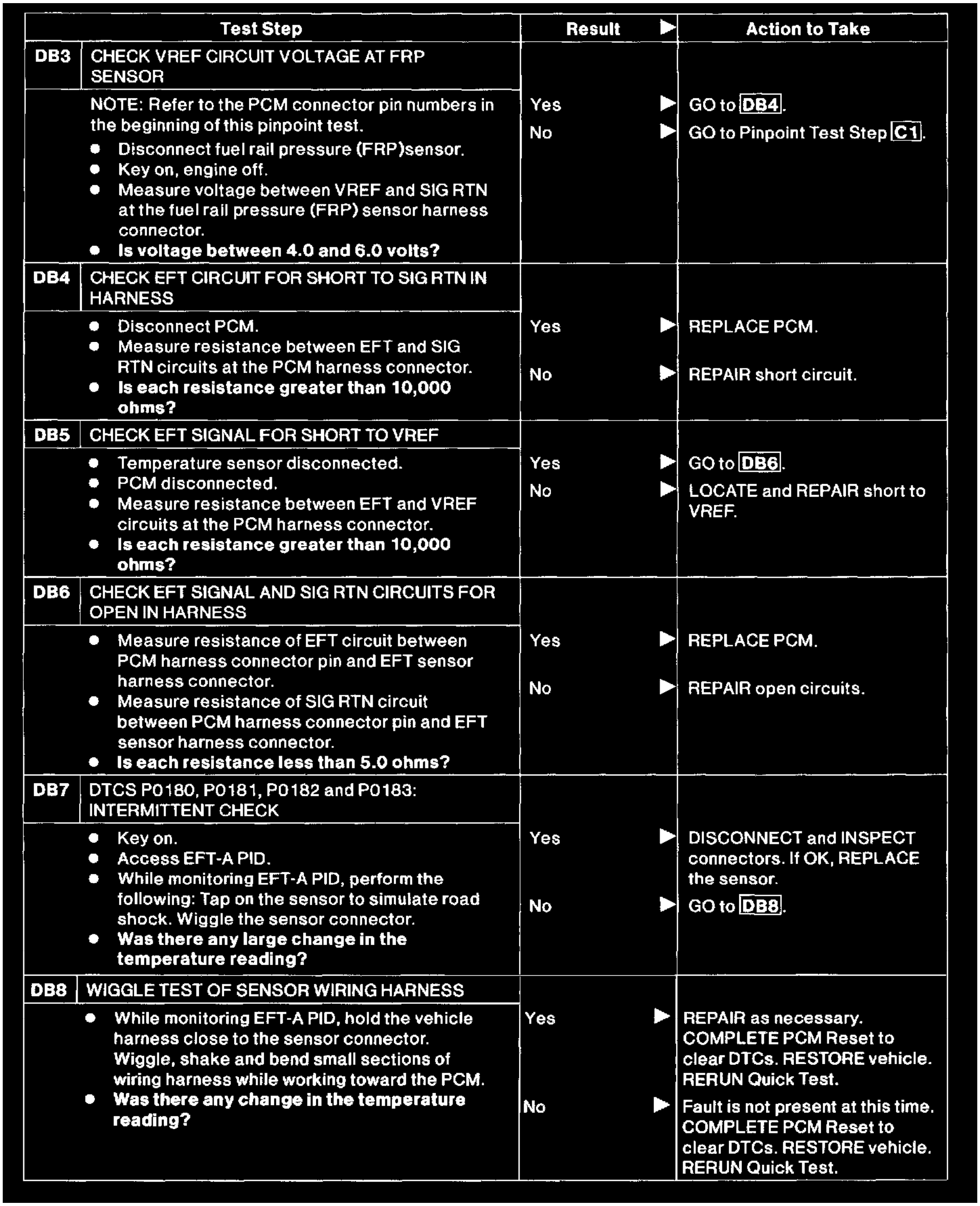
**Engine Fuel Temperature Sensor Harness Connector**



**Fuel Rail Pressure Sensor Harness Connector**



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DB1** | DTC P0181 CHECK FOR KOER DTCS | | |
| | • Start engine and bring up to operating temperature.<br>• Check for KOER DTCs.<br>• **Is DTC P0182 or P0183 present during KOER?** | Yes ▶ | For DTC P0181 with DTC P0182 or P0183. GO to DB2. |
| | | No ▶ | For DTC P0181 only. COMPLETE PCM Reset to clear DTCs. COMPLETE OBD-II Drive Cycle. |
| **DB2** | DTC P0180, P0181, P0182 and P0183: VERIFY ELECTRICAL FAULT CONDITION BY SIMULATING OPPOSITE SIGNAL TO PCM | | |
| | • Disconnect engine fuel temperature sensor.<br>• Access EFTA-V PID value.<br>• Install jumper across terminals at the vehicle harness connector.<br>• NOTE: If a scan tool communication concern exists, remove jumper wire immediately and go to DB5.<br>Record new reading.<br>• **Is the original reading of the EFTA-V PID with the harness disconnected greater than 4.5 volts or (-40°C/-40°F) and less than 0.21 volt or (135°C/275 °F) with the jumper installed?** | Yes ▶ | KEY OFF. REPLACE EFTA sensor. |
| | | No ▶ | KEY OFF. FOR EFTA-V reading less than 4.54 volts with harness disconnected and jumper removed: GO to DB3.<br>FOR DTC P0182: GO to DB3.<br>FOR EFTA-V reading greater than 0.2 volt with harness disconnected and jumper installed: GO to DB5.<br>FOR DTC P0183: GO to DB5. |

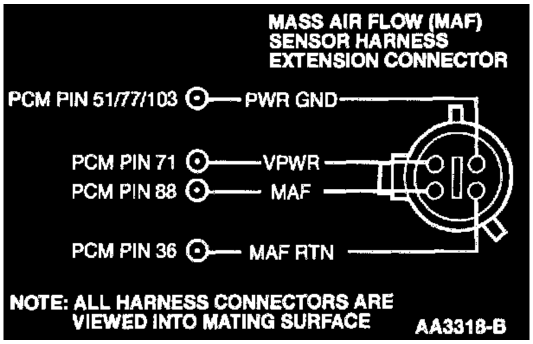


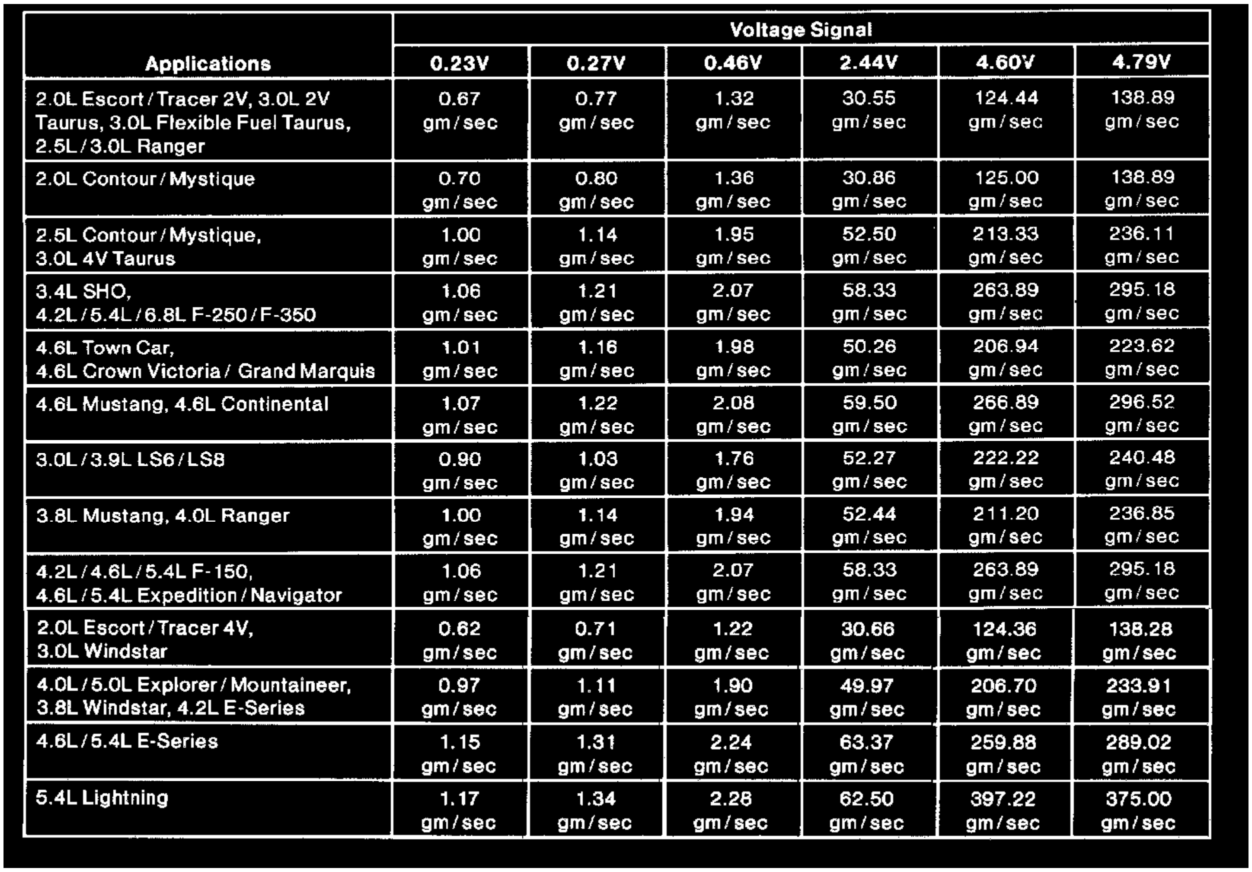
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DB3** | CHECK VREF CIRCUIT VOLTAGE AT FRP SENSOR | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect fuel rail pressure (FRP)sensor.<br>● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN at the fuel rail pressure (FRP) sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | GO to DB4.<br>GO to Pinpoint Test Step C1. |
| **DB4** | CHECK EFT CIRCUIT FOR SHORT TO SIG RTN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance between EFT and SIG RTN circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DB5** | CHECK EFT SIGNAL FOR SHORT TO VREF | | |
| | ● Temperature sensor disconnected.<br>● PCM disconnected.<br>● Measure resistance between EFT and VREF circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DB6.<br>LOCATE and REPAIR short to VREF. |
| **DB6** | CHECK EFT SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS | | |
| | ● Measure resistance of EFT circuit between PCM harness connector pin and EFT sensor harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector pin and EFT sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuits. |
| **DB7** | DTCS P0180, P0181, P0182 and P0183: INTERMITTENT CHECK | | |
| | ● Key on.<br>● Access EFT-A PID.<br>● While monitoring EFT-A PID, perform the following: Tap on the sensor to simulate road shock. Wiggle the sensor connector.<br>● **Was there any large change in the temperature reading?** | Yes ▶<br>No ▶ | DISCONNECT and INSPECT connectors. If OK, REPLACE the sensor.<br>GO to DB8. |
| **DB8** | WIGGLE TEST OF SENSOR WIRING HARNESS | | |
| | ● While monitoring EFT-A PID, hold the vehicle harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM.<br>● **Was there any change in the temperature reading?** | Yes ▶<br>No ▶ | REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test.<br>Fault is not present at this time. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. |

# Test Notes

This Pinpoint Test is intended to diagnose the following:

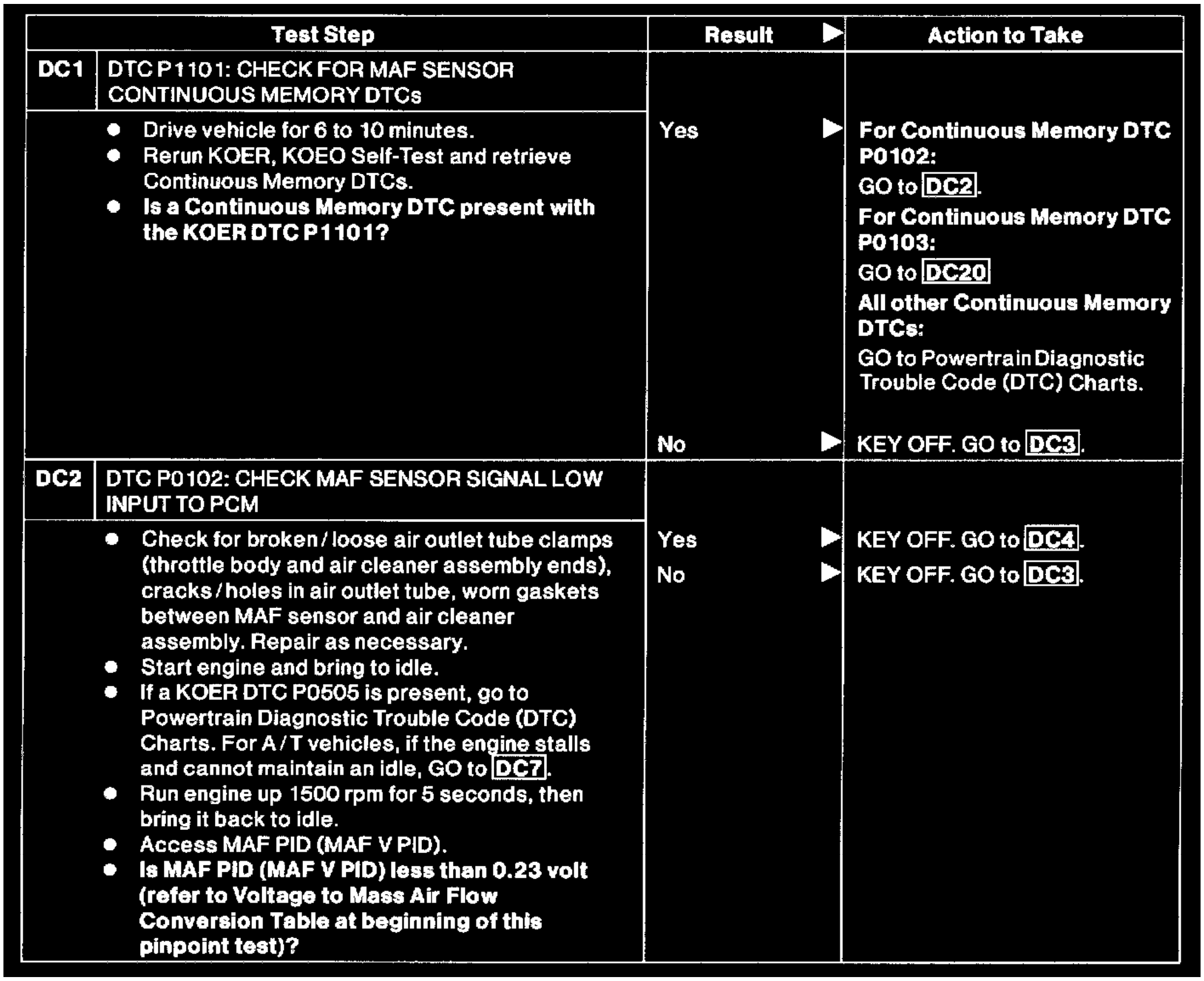
- Mass Air Flow **(MAF)** Sensor
- Harness Circuits: MAF SIG, MAF RTN, Vehicle Power **(VPWR)**, and Power Ground **(PWR GND)**
- Powertrain Control Module **(PCM)**



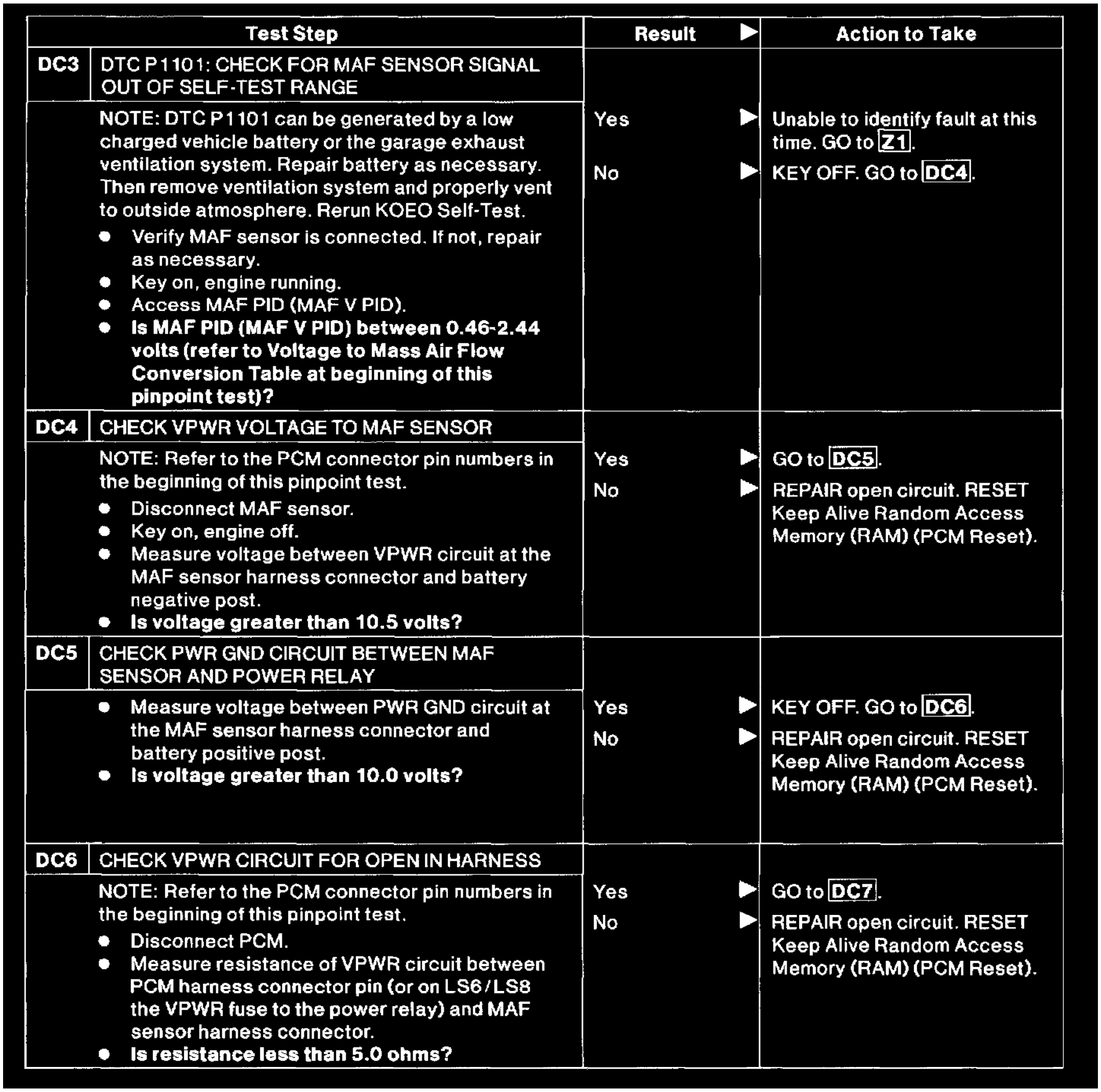


| Applications | Voltage Signal | | | | | |
|---|---|---|---|---|---|---|
| | 0.23V | 0.27V | 0.46V | 2.44V | 4.60V | 4.79V |
| 2.0L Escort/Tracer 2V, 3.0L 2V Taurus, 3.0L Flexible Fuel Taurus, 2.5L/3.0L Ranger | 0.67 gm/sec | 0.77 gm/sec | 1.32 gm/sec | 30.55 gm/sec | 124.44 gm/sec | 138.89 gm/sec |
| 2.0L Contour/Mystique | 0.70 gm/sec | 0.80 gm/sec | 1.36 gm/sec | 30.86 gm/sec | 125.00 gm/sec | 138.89 gm/sec |
| 2.5L Contour/Mystique, 3.0L 4V Taurus | 1.00 gm/sec | 1.14 gm/sec | 1.95 gm/sec | 52.50 gm/sec | 213.33 gm/sec | 236.11 gm/sec |
| 3.4L SHO, 4.2L/5.4L/6.8L F-250/F-350 | 1.06 gm/sec | 1.21 gm/sec | 2.07 gm/sec | 58.33 gm/sec | 263.89 gm/sec | 295.18 gm/sec |
| 4.6L Town Car, 4.6L Crown Victoria/ Grand Marquis | 1.01 gm/sec | 1.16 gm/sec | 1.98 gm/sec | 50.26 gm/sec | 206.94 gm/sec | 223.62 gm/sec |
| 4.6L Mustang, 4.6L Continental | 1.07 gm/sec | 1.22 gm/sec | 2.08 gm/sec | 59.50 gm/sec | 266.89 gm/sec | 296.52 gm/sec |
| 3.0L/3.9L LS6/LS8 | 0.90 gm/sec | 1.03 gm/sec | 1.76 gm/sec | 52.27 gm/sec | 222.22 gm/sec | 240.48 gm/sec |
| 3.8L Mustang, 4.0L Ranger | 1.00 gm/sec | 1.14 gm/sec | 1.94 gm/sec | 52.44 gm/sec | 211.20 gm/sec | 236.85 gm/sec |
| 4.2L/4.6L/5.4L F-150, 4.6L/5.4L Expedition/Navigator | 1.06 gm/sec | 1.21 gm/sec | 2.07 gm/sec | 58.33 gm/sec | 263.89 gm/sec | 295.18 gm/sec |
| 2.0L Escort/Tracer 4V, 3.0L Windstar | 0.62 gm/sec | 0.71 gm/sec | 1.22 gm/sec | 30.66 gm/sec | 124.36 gm/sec | 138.28 gm/sec |
| 4.0L/5.0L Explorer/Mountaineer, 3.8L Windstar, 4.2L E-Series | 0.97 gm/sec | 1.11 gm/sec | 1.90 gm/sec | 49.97 gm/sec | 206.70 gm/sec | 233.91 gm/sec |
| 4.6L/5.4L E-Series | 1.15 gm/sec | 1.31 gm/sec | 2.24 gm/sec | 63.37 gm/sec | 259.88 gm/sec | 289.02 gm/sec |
| 5.4L Lightning | 1.17 gm/sec | 1.34 gm/sec | 2.28 gm/sec | 62.50 gm/sec | 397.22 gm/sec | 375.00 gm/sec |

Voltage To Mass Air Flow

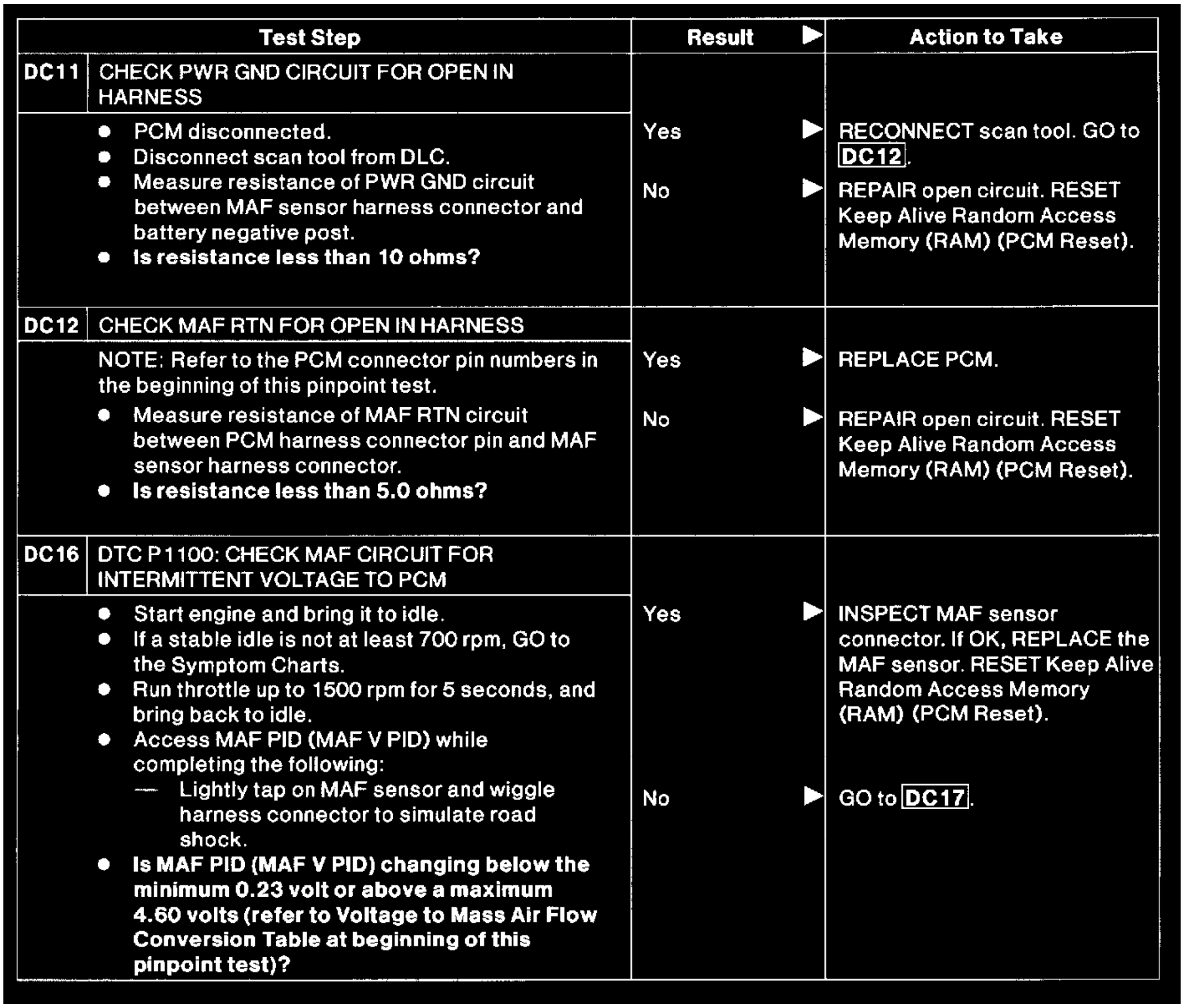


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DC1** | DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCs | | |
| | ● Drive vehicle for 6 to 10 minutes.<br>● Rerun KOER, KOEO Self-Test and retrieve Continuous Memory DTCs.<br>● **Is a Continuous Memory DTC present with the KOER DTC P1101?** | Yes ▶ | **For Continuous Memory DTC P0102:**<br>GO to DC2.<br>**For Continuous Memory DTC P0103:**<br>GO to DC20<br>**All other Continuous Memory DTCs:**<br>GO to Powertrain Diagnostic Trouble Code (DTC) Charts. |
| | | No ▶ | KEY OFF. GO to DC3. |
| **DC2** | DTC P0102: CHECK MAF SENSOR SIGNAL LOW INPUT TO PCM | | |
| | ● Check for broken/loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks/holes in air outlet tube, worn gaskets between MAF sensor and air cleaner assembly. Repair as necessary.<br>● Start engine and bring to idle.<br>● If a KOER DTC P0505 is present, go to Powertrain Diagnostic Trouble Code (DTC) Charts. For A/T vehicles, if the engine stalls and cannot maintain an idle, GO to DC7.<br>● Run engine up 1500 rpm for 5 seconds, then bring it back to idle.<br>● Access MAF PID (MAF V PID).<br>● **Is MAF PID (MAF V PID) less than 0.23 volt (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?** | Yes ▶ | KEY OFF. GO to DC4. |
| | | No ▶ | KEY OFF. GO to DC3. |



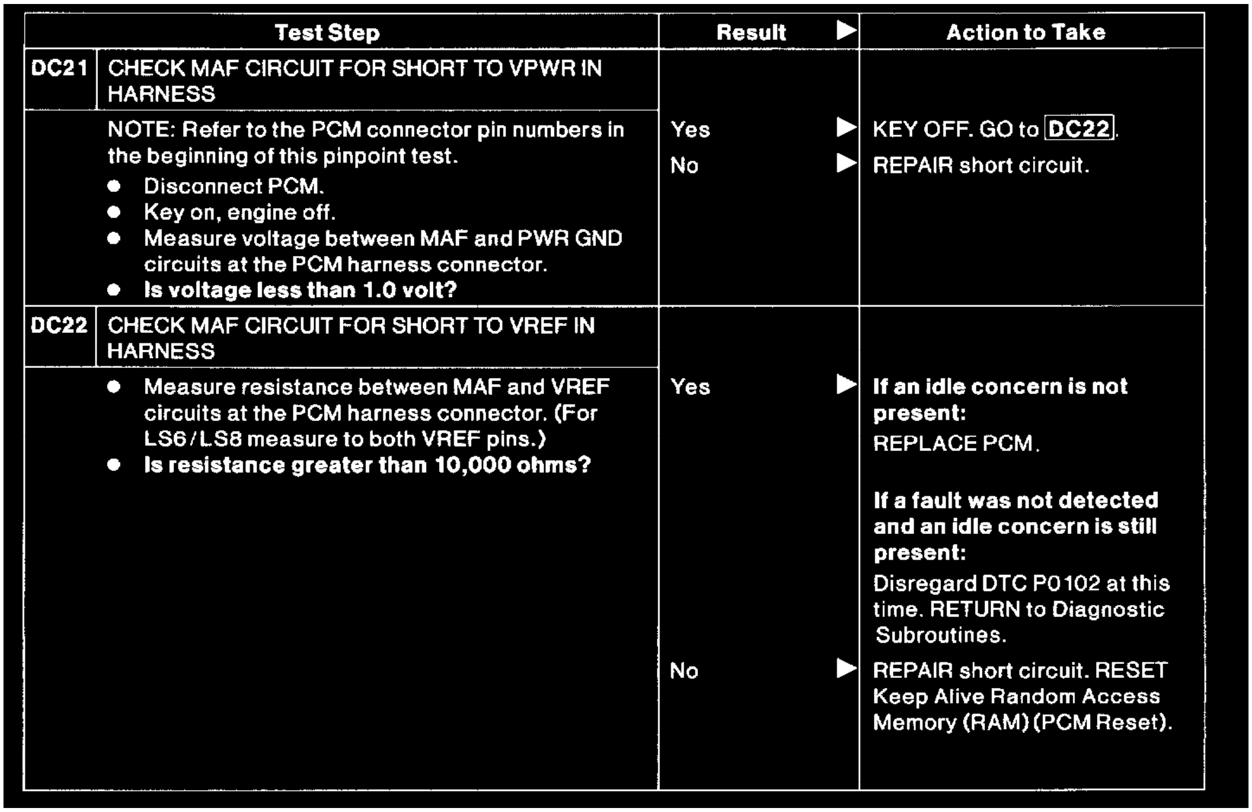
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DC3** | DTC P1101: CHECK FOR MAF SENSOR SIGNAL OUT OF SELF-TEST RANGE | | |
| | NOTE: DTC P1101 can be generated by a low charged vehicle battery or the garage exhaust ventilation system. Repair battery as necessary. Then remove ventilation system and properly vent to outside atmosphere. Rerun KOEO Self-Test.<br>● Verify MAF sensor is connected. If not, repair as necessary.<br>● Key on, engine running.<br>● Access MAF PID (MAF V PID).<br>● **Is MAF PID (MAF V PID) between 0.46-2.44 volts (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?** | Yes ▶<br>No ▶ | Unable to identify fault at this time. GO to Z1.<br>KEY OFF. GO to DC4. |
| **DC4** | CHECK VPWR VOLTAGE TO MAF SENSOR | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect MAF sensor.<br>● Key on, engine off.<br>● Measure voltage between VPWR circuit at the MAF sensor harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to DC5.<br>REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC5** | CHECK PWR GND CIRCUIT BETWEEN MAF SENSOR AND POWER RELAY | | |
| | ● Measure voltage between PWR GND circuit at the MAF sensor harness connector and battery positive post.<br>● **Is voltage greater than 10.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DC6.<br>REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC6** | CHECK VPWR CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of VPWR circuit between PCM harness connector pin (or on LS6/LS8 the VPWR fuse to the power relay) and MAF sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DC7.<br>REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DC7** | CHECK MAF CIRCUIT SHORT TO PWR GND OR MAF RTN IN THE HARNESS | | |
| | ● PCM disconnected.<br>● Disconnect scan tool from DLC.<br>● Measure resistance between MAF and PWR GND circuits at the MAF sensor harness connector.<br>● Measure resistance between MAF and MAF RTN circuits at the MAF sensor harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DC8.<br>REPAIR short circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC8** | CHECK MAF RTN CIRCUIT SHORT TO PWR GND IN THE HARNESS | | |
| | ● Measure resistance between MAF RTN and PWR GND circuits at the MAF sensor harness connector.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | RECONNECT scan tool to DLC. GO to DC9.<br>REPAIR short circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC9** | CHECK MAF CIRCUIT VOLTAGE CYCLING INTEGRITY | | |
| | ● Reconnect PCM.<br>● Key on, engine off.<br>● Access MAF PID (MAF V PID).<br>● Record the MAF PID (MAF V PID) reading.<br>● Jumper MAF RTN and PWR GND circuits at the MAF sensor harness connector.<br>● Jumper MAF and VPWR circuits at the MAF sensor harness connector.<br>● **Does the MAF PID (MAF V PID) change from less than 0.23 volt (closer to zero volts) to greater than 4.50 volts (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?** | Yes ▶<br>No ▶ | REPLACE MAF sensor. RESET Keep Alive Random Access Memory (RAM) (PCM Reset).<br>**For DTC P1101 without P0102 present:**<br>KEY OFF. GO to DC11.<br>**For DTC P0102:**<br>KEY OFF. GO to DC10. |
| **DC10** | CHECK MAF CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of MAF circuit between PCM harness connector pin and MAF sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DC11.<br>REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DC11** | CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS | | |
| | ● PCM disconnected.<br>● Disconnect scan tool from DLC.<br>● Measure resistance of PWR GND circuit between MAF sensor harness connector and battery negative post.<br>● **Is resistance less than 10 ohms?** | Yes ▶ | RECONNECT scan tool. GO to DC12. |
| | | No ▶ | REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC12** | CHECK MAF RTN FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Measure resistance of MAF RTN circuit between PCM harness connector pin and MAF sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR open circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| **DC16** | DTC P1100: CHECK MAF CIRCUIT FOR INTERMITTENT VOLTAGE TO PCM | | |
| | ● Start engine and bring it to idle.<br>● If a stable idle is not at least 700 rpm, GO to the Symptom Charts.<br>● Run throttle up to 1500 rpm for 5 seconds, and bring back to idle.<br>● Access MAF PID (MAF V PID) while completing the following:<br>— Lightly tap on MAF sensor and wiggle harness connector to simulate road shock.<br>● **Is MAF PID (MAF V PID) changing below the minimum 0.23 volt or above a maximum 4.60 volts (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?** | Yes ▶ | INSPECT MAF sensor connector. If OK, REPLACE the MAF sensor. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| | | No ▶ | GO to DC17. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DC17 | DTC P1101: CHECK FOR MAF SENSOR CIRCUIT FOR INTERMITTENT OPENS OR SHORTS | | |
| | ● Again access the MAF PID (MAF V PID).<br>● Key on, engine off.<br>● Complete the following:<br>— Grasp the MAF sensor harness and MAF sensor harness connector.<br>— Shake and bend a small section of the harness all the way to the dash panel.<br>— Wiggle, shake and bend the harness from the dash panel to the PCM.<br>● **Is the MAF PID (MAF V PID) reading changing below the minimum 0.23 volt or above the maximum 4.60 volts (refer to Voltage to Mass Air Flow Conversion Table at the beginning of this pinpoint test)?** | Yes ▶ | REPAIR as necessary. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| DC20 | DTC P0103: CHECK MAF SENSOR SIGNAL HIGH INPUT TO PCM | | |
| | NOTE: DTC P0103 can be generated by foreign material blocking the MAF sensor screen causing an air flow restriction. If contaminants are found on the screen, check air cleaner element installation in air cleaner housing and proper sealing of air cleaner and air tubes before proceeding. Rerun Quick Test after service.<br>● Start engine and bring to idle.<br>● If a KOER DTC P0505 is present, GO to the Powertrain Diagnostic Trouble Code (DTC) Charts. For 2.5L A/T Ranger that stalls and cannot maintain an idle, REPLACE PCM.<br>● Run throttle up to 1500 rpm for 5 seconds, and bring it back to idle.<br>● NOTE: MAF PID (MAF V PID) is greater than 4.60 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test).<br>Access MAF PID (MAF V PID).<br>● Key off.<br>● Disconnect MAF sensor.<br>● Jumper PWR GND and MAF RTN circuits at the MAF sensor harness connector.<br>● Key on, engine running.<br>● Again access MAF PID (MAF V PID).<br>● **Did MAF PID (MAF V PID) drop from the previous reading to below 0.23 volt (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test)?** | Yes ▶ | REMOVE jumper. REPLACE MAF sensor. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |
| | | No ▶ | KEY OFF. REMOVE jumper. GO to DC21. |



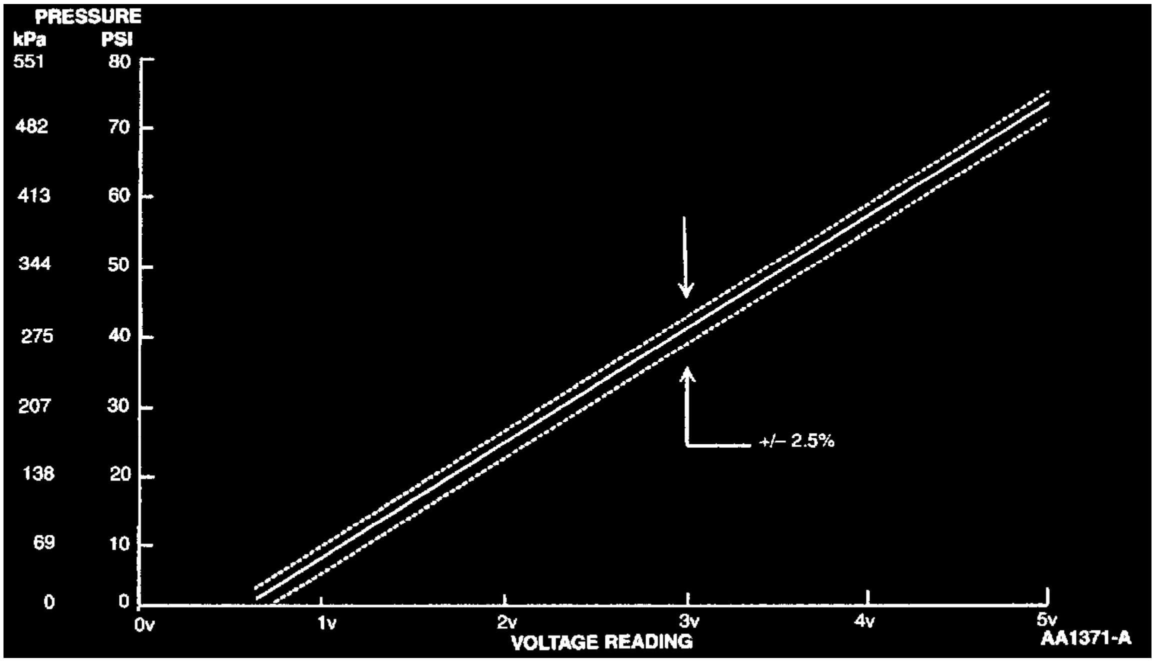
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DC21** | CHECK MAF CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between MAF and PWR GND circuits at the PCM harness connector.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to DC22.<br>REPAIR short circuit. |
| **DC22** | CHECK MAF CIRCUIT FOR SHORT TO VREF IN HARNESS | | |
| | ● Measure resistance between MAF and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | **If an idle concern is not present:**<br>REPLACE PCM.<br>**If a fault was not detected and an idle concern is still present:**<br>Disregard DTC P0102 at this time. RETURN to Diagnostic Subroutines. |
| | | No ▶ | REPAIR short circuit. RESET Keep Alive Random Access Memory (RAM) (PCM Reset). |

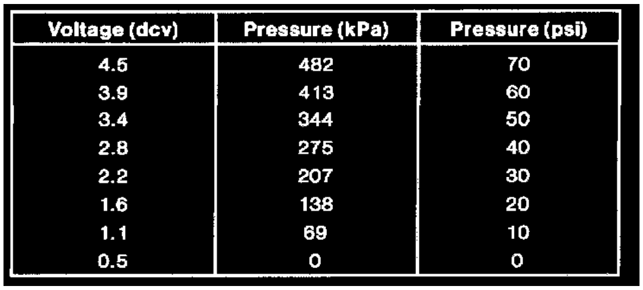
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Fuel Rail Pressure **(FRP)** Sensor
- Harness Circuits: FRP and SIG RTN
- Powertrain Control Module **(PCM)**

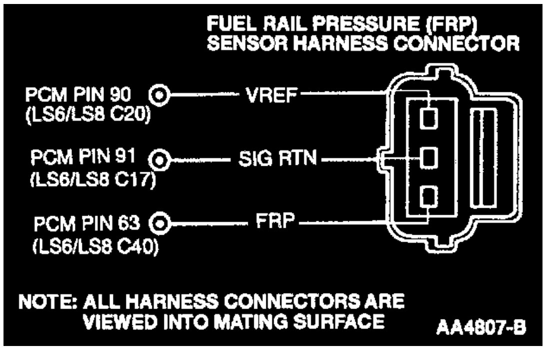
# Tables and Graphs

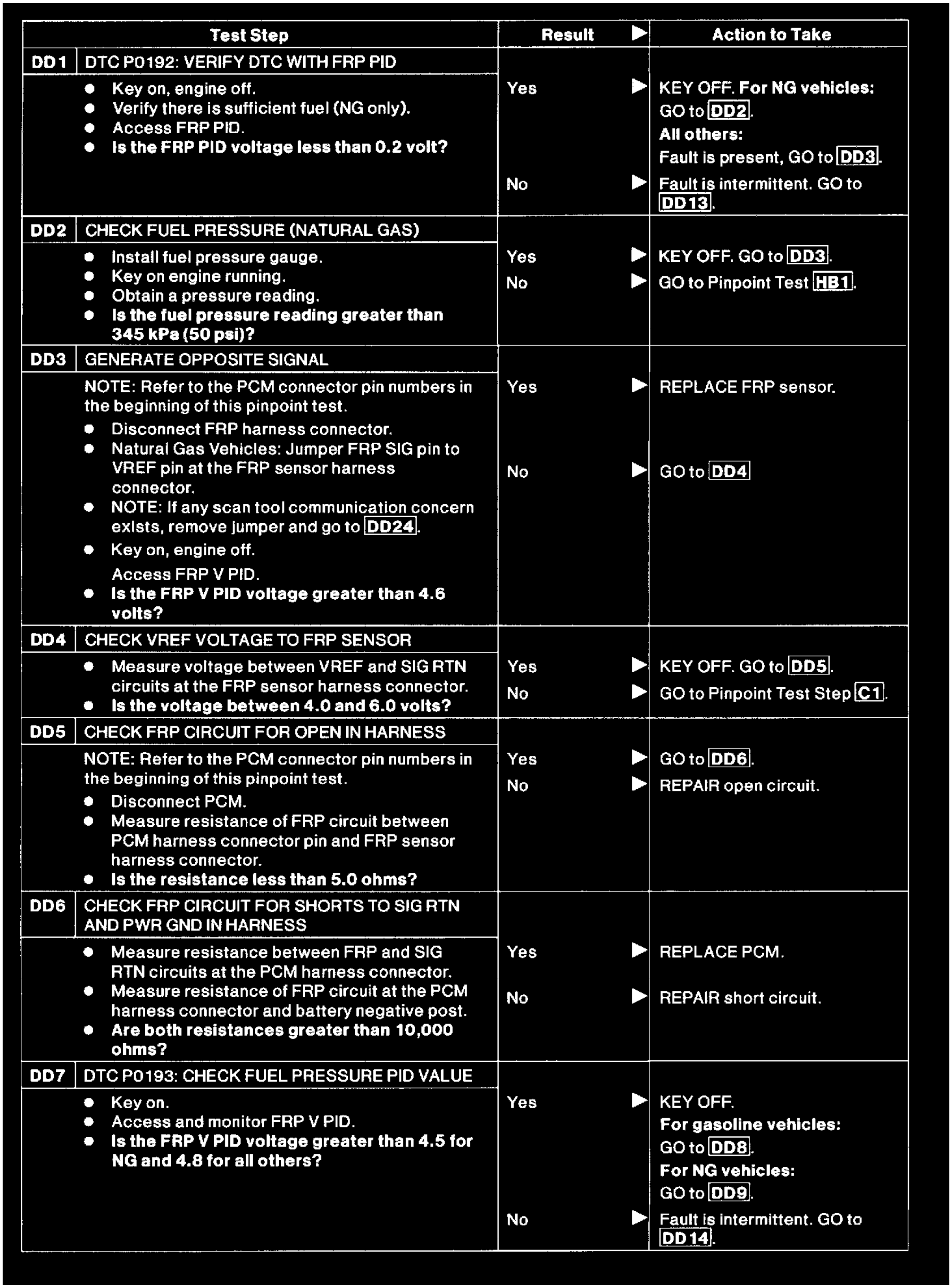




| Voltage (dcv) | Pressure (kPa) | Pressure (psi) |
|---|---|---|
| 4.5 | 482 | 70 |
| 3.9 | 413 | 60 |
| 3.4 | 344 | 50 |
| 2.8 | 275 | 40 |
| 2.2 | 207 | 30 |
| 1.6 | 138 | 20 |
| 1.1 | 69 | 10 |
| 0.5 | 0 | 0 |

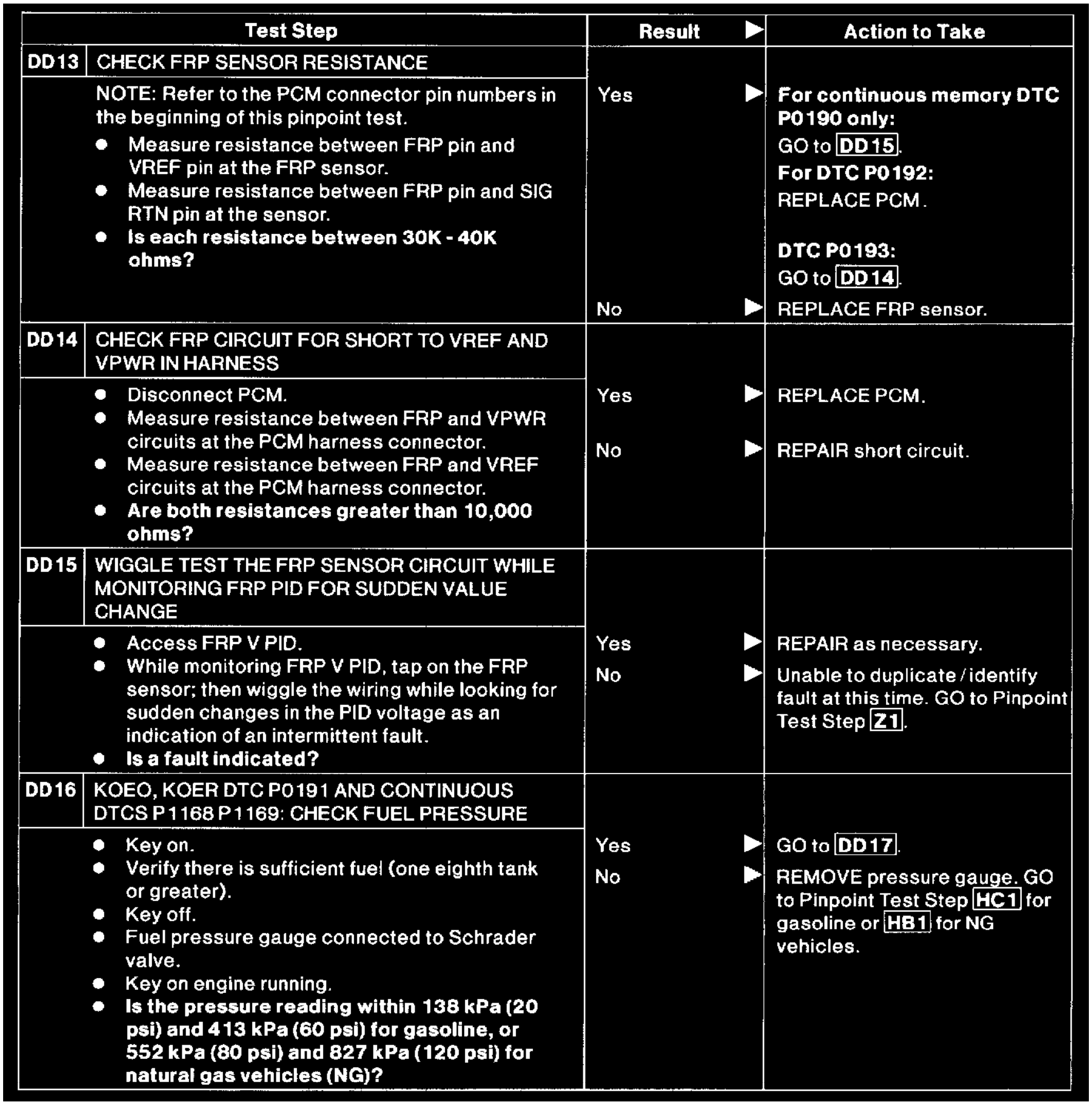
Voltage values were calculated for VREF = **5.0 volts**. These values may vary 15 percent due to sensor and VREF variations.



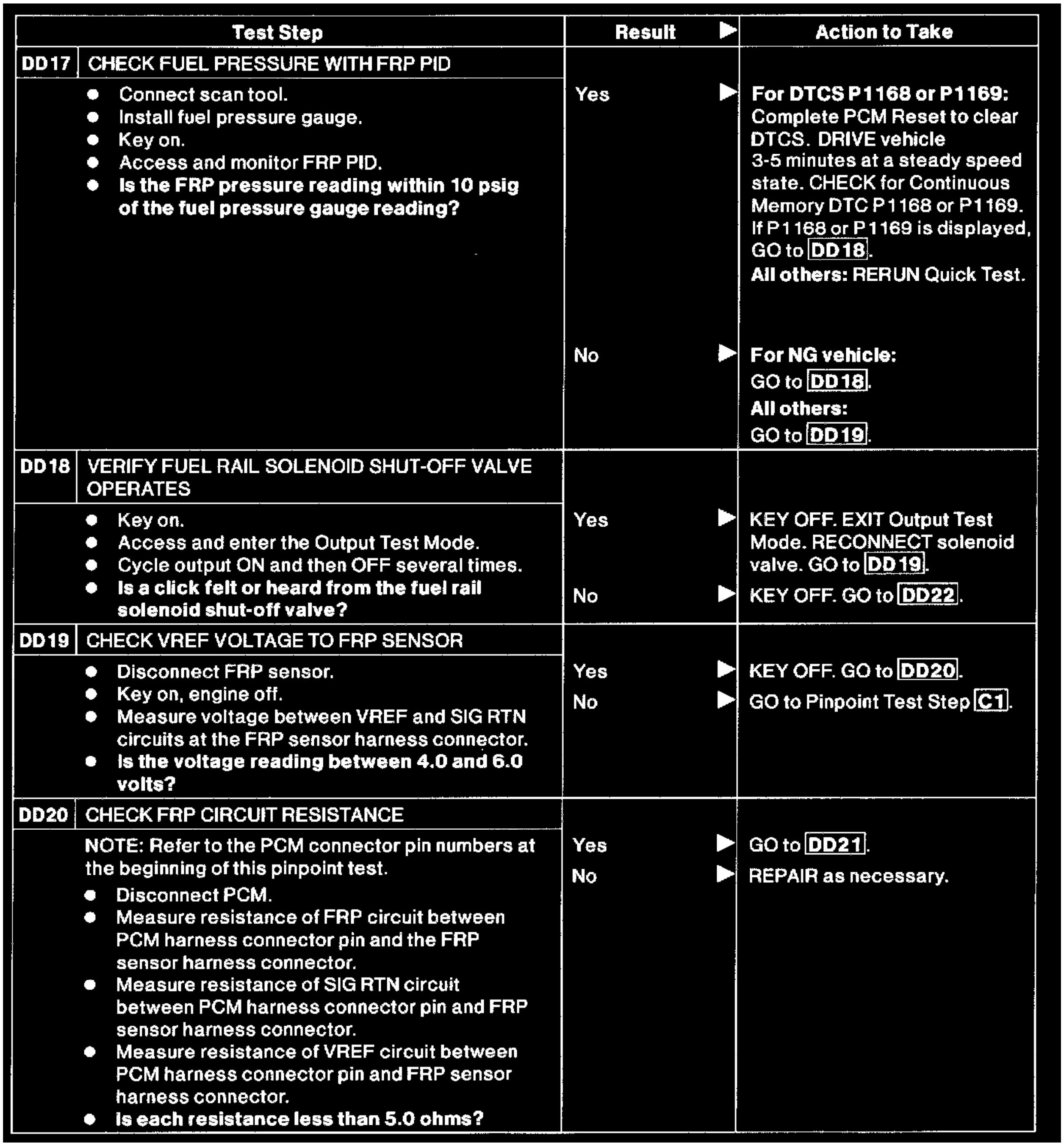


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DD1** | DTC P0192: VERIFY DTC WITH FRP PID | | |
| | ● Key on, engine off.<br>● Verify there is sufficient fuel (NG only).<br>● Access FRP PID.<br>● **Is the FRP PID voltage less than 0.2 volt?** | Yes ▶<br>No ▶ | KEY OFF. **For NG vehicles:** GO to DD2. **All others:** Fault is present, GO to DD3.<br>Fault is intermittent. GO to DD13. |
| **DD2** | CHECK FUEL PRESSURE (NATURAL GAS) | | |
| | ● Install fuel pressure gauge.<br>● Key on engine running.<br>● Obtain a pressure reading.<br>● **Is the fuel pressure reading greater than 345 kPa (50 psi)?** | Yes ▶<br>No ▶ | KEY OFF. GO to DD3.<br>GO to Pinpoint Test HB1. |
| **DD3** | GENERATE OPPOSITE SIGNAL | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect FRP harness connector.<br>● Natural Gas Vehicles: Jumper FRP SIG pin to VREF pin at the FRP sensor harness connector.<br>● NOTE: If any scan tool communication concern exists, remove jumper and go to DD24.<br>● Key on, engine off.<br>Access FRP V PID.<br>● **Is the FRP V PID voltage greater than 4.6 volts?** | Yes ▶<br>No ▶ | REPLACE FRP sensor.<br>GO to DD4 |
| **DD4** | CHECK VREF VOLTAGE TO FRP SENSOR | | |
| | ● Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.<br>● **Is the voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DD5.<br>GO to Pinpoint Test Step C1. |
| **DD5** | CHECK FRP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of FRP circuit between PCM harness connector pin and FRP sensor harness connector.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DD6.<br>REPAIR open circuit. |
| **DD6** | CHECK FRP CIRCUIT FOR SHORTS TO SIG RTN AND PWR GND IN HARNESS | | |
| | ● Measure resistance between FRP and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance of FRP circuit at the PCM harness connector and battery negative post.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DD7** | DTC P0193: CHECK FUEL PRESSURE PID VALUE | | |
| | ● Key on.<br>● Access and monitor FRP V PID.<br>● **Is the FRP V PID voltage greater than 4.5 for NG and 4.8 for all others?** | Yes ▶<br>No ▶ | KEY OFF. **For gasoline vehicles:** GO to DD8. **For NG vehicles:** GO to DD9.<br>Fault is intermittent. GO to DD14. |

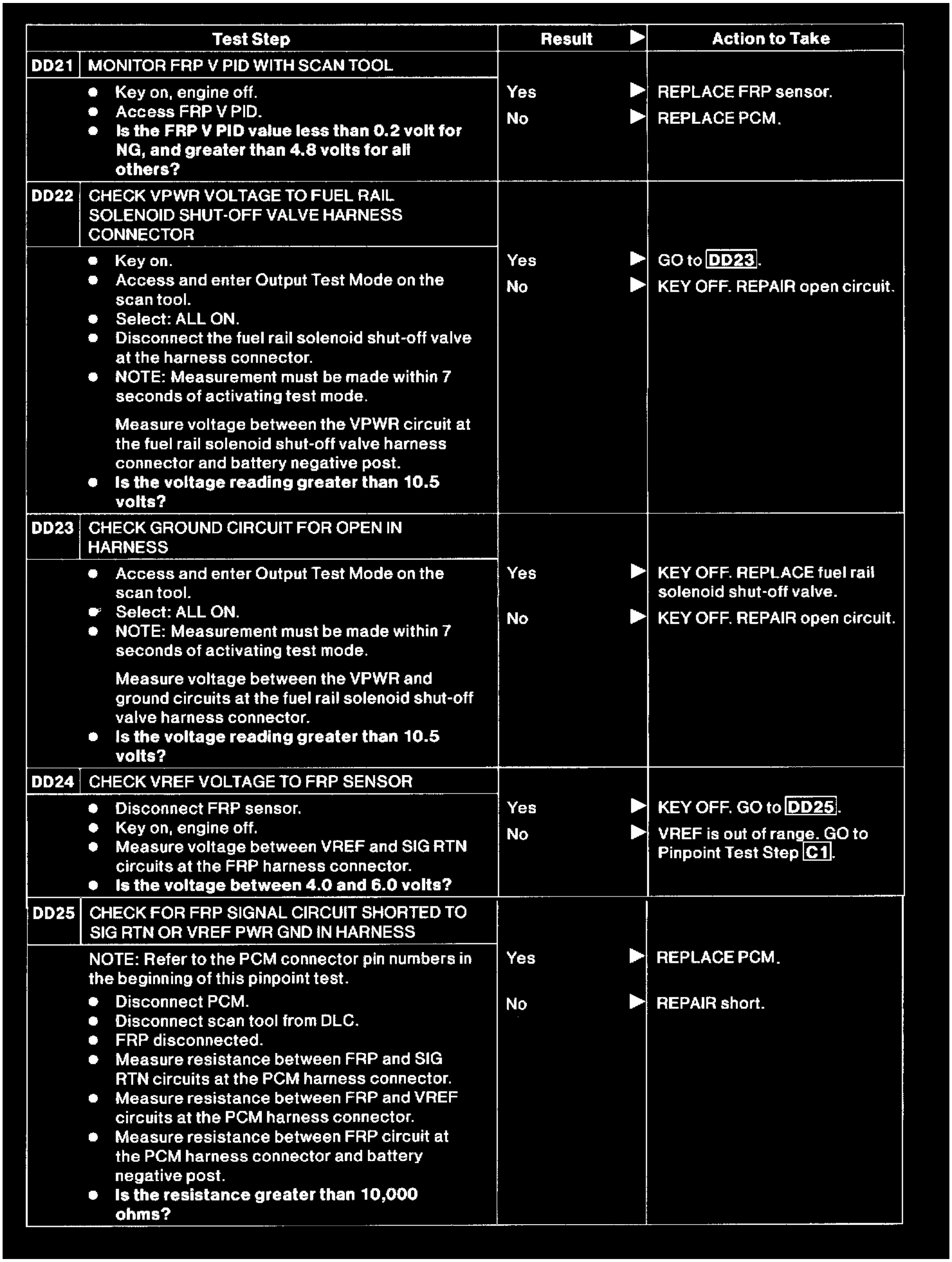
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DD8** | CHECK FUEL RAIL PRESSURE SENSOR FOR FUEL LEAKS | | |
| | • Remove vacuum hose from fuel rail pressure sensor.<br>• Inspect sensor and hose for fuel.<br>• **Is fuel present?** | Yes ▶<br>No ▶ | REPLACE fuel rail pressure sensor.<br>GO to DD10. |
| **DD9** | CHECK FUEL PRESSURE (NATURAL GAS) | | |
| | • Install fuel pressure gauge.<br>• Key on, engine running.<br>• Obtain a pressure reading.<br>• **Is the fuel pressure reading greater than 1034 kPa (150 psi)?** | Yes ▶<br>No ▶ | KEY OFF. GO to Pinpoint Test HB1.<br>KEY OFF. GO to DD10. |
| **DD10** | ATTEMPT TO INDUCE OPPOSITE FRP SIGNAL | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Disconnect FRP sensor.<br>• Jumper FRP pin to SIG RTN pin at the FRP sensor harness connector.<br>• Key on, engine off.<br>• Access FRP V PID.<br>• NOTE: If any scan tool communication concern exists, remove jumper and go to DD24.<br>• **Is the FRP V PID voltage less than 0.2 volt?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE fuel rail pressure (FRP) sensor.<br>KEY OFF. GO to DD12. |
| **DD11** | DTC P0190: CHECK VREF TO FRP SENSOR | | |
| | NOTE: Before proceeding to the following test step, a complete inspection of the fuel system for external leaks must be completed. Repair any leaks before continuing. Verify fuel level before beginning test steps.<br>• Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.<br>• **Is the voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DD13.<br>KEY OFF. GO to DD12. |
| **DD12** | CHECK FRP, SIG RTN AND VREF CIRCUITS FOR OPEN IN HARNESS | | |
| | • Disconnect PCM.<br>• Measure resistance of FRP circuit between PCM pin and FRP sensor harness connector.<br>• Measure resistance of SIG RTN circuit between PCM harness connector pin and FRP sensor harness connector.<br>• Measure resistance of VREF circuit between PCM harness connector pin and FRP sensor harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DD13.<br>REPAIR open circuit. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DD13** | CHECK FRP SENSOR RESISTANCE | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Measure resistance between FRP pin and VREF pin at the FRP sensor.<br>● Measure resistance between FRP pin and SIG RTN pin at the sensor.<br>● **Is each resistance between 30K - 40K ohms?** | Yes ▶ | **For continuous memory DTC P0190 only:**<br>GO to DD15.<br>**For DTC P0192:**<br>REPLACE PCM.<br>**DTC P0193:**<br>GO to DD14. |
| | | No ▶ | REPLACE FRP sensor. |
| **DD14** | CHECK FRP CIRCUIT FOR SHORT TO VREF AND VPWR IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance between FRP and VPWR circuits at the PCM harness connector.<br>● Measure resistance between FRP and VREF circuits at the PCM harness connector.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |
| **DD15** | WIGGLE TEST THE FRP SENSOR CIRCUIT WHILE MONITORING FRP PID FOR SUDDEN VALUE CHANGE | | |
| | ● Access FRP V PID.<br>● While monitoring FRP V PID, tap on the FRP sensor; then wiggle the wiring while looking for sudden changes in the PID voltage as an indication of an intermittent fault.<br>● **Is a fault indicated?** | Yes ▶ | REPAIR as necessary. |
| | | No ▶ | Unable to duplicate / identify fault at this time. GO to Pinpoint Test Step Z1. |
| **DD16** | KOEO, KOER DTC P0191 AND CONTINUOUS DTCS P1168 P1169: CHECK FUEL PRESSURE | | |
| | ● Key on.<br>● Verify there is sufficient fuel (one eighth tank or greater).<br>● Key off.<br>● Fuel pressure gauge connected to Schrader valve.<br>● Key on engine running.<br>● **Is the pressure reading within 138 kPa (20 psi) and 413 kPa (60 psi) for gasoline, or 552 kPa (80 psi) and 827 kPa (120 psi) for natural gas vehicles (NG)?** | Yes ▶ | GO to DD17. |
| | | No ▶ | REMOVE pressure gauge. GO to Pinpoint Test Step HC1 for gasoline or HB1 for NG vehicles. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DD17** | CHECK FUEL PRESSURE WITH FRP PID | | |
| | • Connect scan tool.<br>• Install fuel pressure gauge.<br>• Key on.<br>• Access and monitor FRP PID.<br>• **Is the FRP pressure reading within 10 psig of the fuel pressure gauge reading?** | Yes ▶ | **For DTCS P1168 or P1169:** Complete PCM Reset to clear DTCS. DRIVE vehicle 3-5 minutes at a steady speed state. CHECK for Continuous Memory DTC P1168 or P1169. If P1168 or P1169 is displayed, GO to DD18.<br>**All others:** RERUN Quick Test. |
| | | No ▶ | **For NG vehicle:**<br>GO to DD18.<br>**All others:**<br>GO to DD19. |
| **DD18** | VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE OPERATES | | |
| | • Key on.<br>• Access and enter the Output Test Mode.<br>• Cycle output ON and then OFF several times.<br>• **Is a click felt or heard from the fuel rail solenoid shut-off valve?** | Yes ▶ | KEY OFF. EXIT Output Test Mode. RECONNECT solenoid valve. GO to DD19. |
| | | No ▶ | KEY OFF. GO to DD22. |
| **DD19** | CHECK VREF VOLTAGE TO FRP SENSOR | | |
| | • Disconnect FRP sensor.<br>• Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the FRP sensor harness connector.<br>• **Is the voltage reading between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. GO to DD20. |
| | | No ▶ | GO to Pinpoint Test Step C1. |
| **DD20** | CHECK FRP CIRCUIT RESISTANCE | | |
| | NOTE: Refer to the PCM connector pin numbers at the beginning of this pinpoint test.<br>• Disconnect PCM.<br>• Measure resistance of FRP circuit between PCM harness connector pin and the FRP sensor harness connector.<br>• Measure resistance of SIG RTN circuit between PCM harness connector pin and FRP sensor harness connector.<br>• Measure resistance of VREF circuit between PCM harness connector pin and FRP sensor harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶ | GO to DD21. |
| | | No ▶ | REPAIR as necessary. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DD21** MONITOR FRP V PID WITH SCAN TOOL<br>● Key on, engine off.<br>● Access FRP V PID.<br>● **Is the FRP V PID value less than 0.2 volt for NG, and greater than 4.8 volts for all others?** | Yes ▶<br>No ▶ | REPLACE FRP sensor.<br>REPLACE PCM. |
| **DD22** CHECK VPWR VOLTAGE TO FUEL RAIL SOLENOID SHUT-OFF VALVE HARNESS CONNECTOR<br>● Key on.<br>● Access and enter Output Test Mode on the scan tool.<br>● Select: ALL ON.<br>● Disconnect the fuel rail solenoid shut-off valve at the harness connector.<br>● NOTE: Measurement must be made within 7 seconds of activating test mode.<br>Measure voltage between the VPWR circuit at the fuel rail solenoid shut-off valve harness connector and battery negative post.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to DD23.<br>KEY OFF. REPAIR open circuit. |
| **DD23** CHECK GROUND CIRCUIT FOR OPEN IN HARNESS<br>● Access and enter Output Test Mode on the scan tool.<br>● Select: ALL ON.<br>● NOTE: Measurement must be made within 7 seconds of activating test mode.<br>Measure voltage between the VPWR and ground circuits at the fuel rail solenoid shut-off valve harness connector.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE fuel rail solenoid shut-off valve.<br>KEY OFF. REPAIR open circuit. |
| **DD24** CHECK VREF VOLTAGE TO FRP SENSOR<br>● Disconnect FRP sensor.<br>● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the FRP harness connector.<br>● **Is the voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DD25.<br>VREF is out of range. GO to Pinpoint Test Step C1. |
| **DD25** CHECK FOR FRP SIGNAL CIRCUIT SHORTED TO SIG RTN OR VREF PWR GND IN HARNESS<br>NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Disconnect scan tool from DLC.<br>● FRP disconnected.<br>● Measure resistance between FRP and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance between FRP and VREF circuits at the PCM harness connector.<br>● Measure resistance between FRP circuit at the PCM harness connector and battery negative post.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short. |

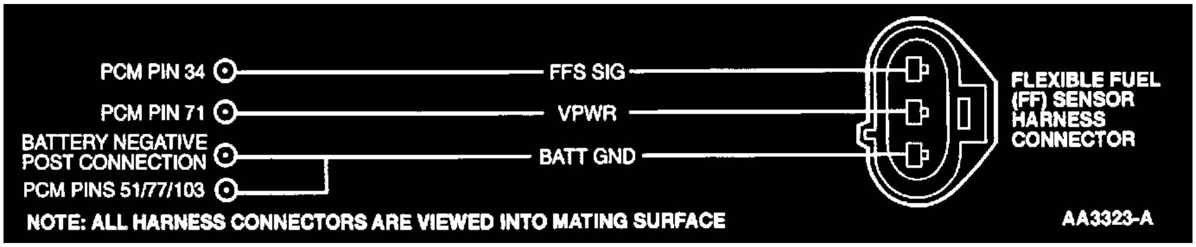
## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Flexible Fuel **(FF)** sensor.
- Harness circuits: FF SIG, Vehicle Power **(VPWR)** and Power Ground **(PWR GND)**.
- Powertrain Control Module **(PCM)**.

**WARNING: THE FUEL SYSTEM IS PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM. BECOME FAMILIAR WITH THE WARNING AND SAFE FUEL HANDLING**

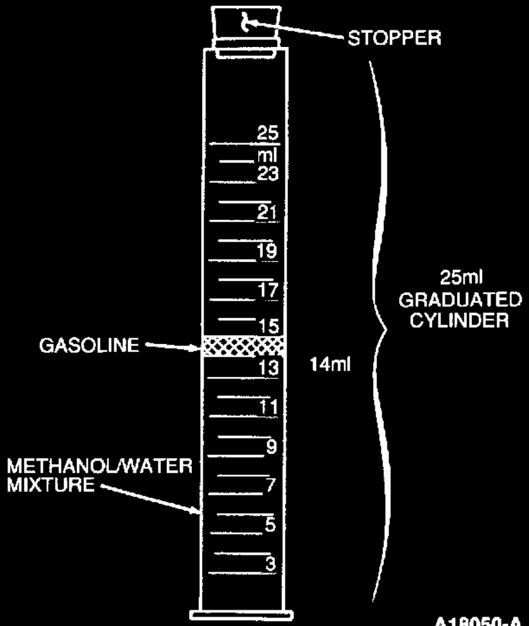
PRACTICES IN PINPOINT TEST HB BEFORE SERVICING.



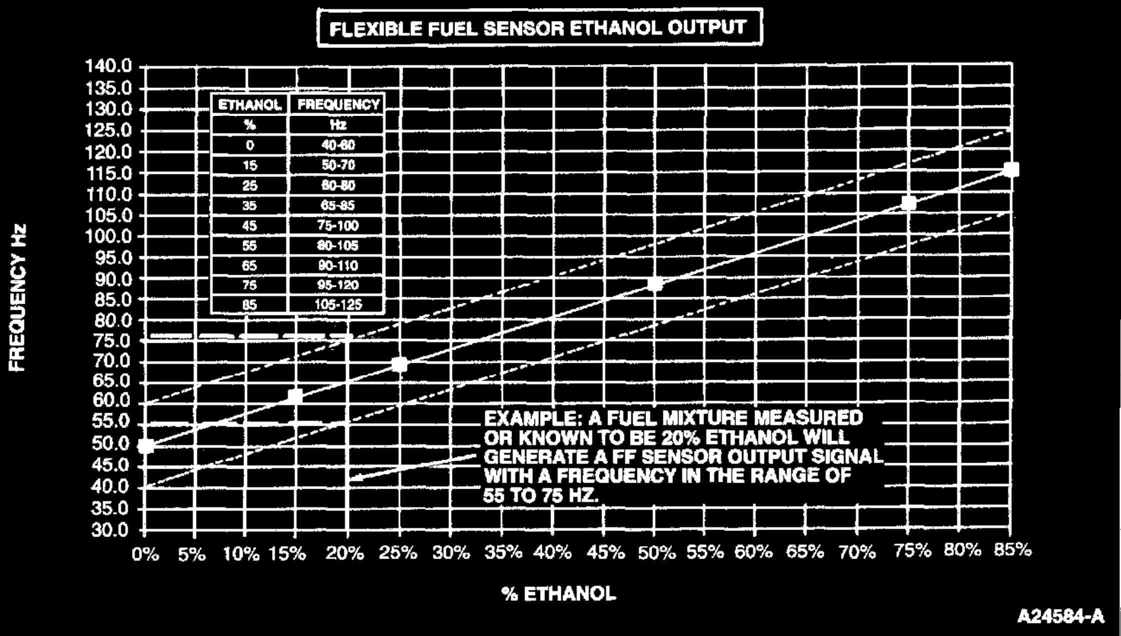
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DE1** | DTC P0176: CHECK VPWR VOLTAGE TO FF SENSOR | | |
| | NOTE: To determine whether the vehicle being serviced is an ethanol or methanol application, look at the calibration sticker on the door jamb. A prefix of 610 C indicates an ethanol vehicle. A prefix of 610 G indicates a methanol vehicle. Another method is to refer to the fuel filler door; it will read either METHANOL or ETHANOL.<br>● Disconnect FF sensor.<br>● Key on.<br>● Measure VPWR circuit voltage between the VPWR circuit at the FF sensor harness connector and battery negative post.<br>● **Is the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DE2.<br>VPWR circuit fault. KEY OFF. CHECK condition of related fuses/fuse links. If OK, REPAIR open circuit. If fuse/fuse link is damaged, CHECK VPWR circuit for short to ground. REPAIR as necessary. |
| **DE2** | CHECK BATTERY GROUND CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance between battery ground circuit at the FF sensor harness connector and battery negative post.<br>● **Is resistance less than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DE3.<br>REPAIR open circuit. |
| **DE3** | CHECK FF SENSOR SIGNAL CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance between PCM harness connector pin 34 and FF sensor signal circuit at the FF sensor harness connector.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to DE4.<br>REPAIR open circuit. |
| **DE4** | CHECK FF SENSOR SIGNAL CIRCUIT FOR SHORT TO POWER | | |
| | ● Disconnect scan tool.<br>● Disconnect PCM.<br>● Measure resistance between PCM harness connector pin 34 and pin 71.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DE5.<br>REPAIR short circuit. |
| **DE5** | CHECK FF SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND | | |
| | ● Measure resistance between PCM harness connector pin 34 and pins 51, 77 and 103.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DE6.<br>REPAIR short circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DE6** | CHECK FF SENSOR DEDICATED FAILURE MODE PID | | |
| | ● Flex fuel sensor connected.<br>● Connect scan tool.<br>● Connect PCM.<br>● Key on, engine running.<br>● **Is the FFFM PID indicating an ON condition?** | Yes ▶ | Possible FF sensor damage. GO to DE7. |
| | | No ▶ | KEY OFF. **For Ethanol Vehicles:**<br>If you know the percentage of ethanol in the fuel of the vehicle, GO to DE10.<br>**For Methanol Vehicles:**<br>If you know the percentage of methanol in the fuel of the vehicle, GO to DE11.<br>**If you do not know the percentage of ethanol or methanol in the fuel, GO to DE8.** |
| **DE7** | CHECK FF SENSOR FREQUENCY | | |
| | ● Access the FF PID and record the PID frequency value.<br>● **Is the FF PID indicating a value within 40-160 Hz?** | Yes ▶ | KEY OFF. The FF sensor output does not indicate a failure.<br>**For Ethanol Vehicles:**<br>If you know the percentage of ethanol in the fuel of the vehicle, GO to DE10.<br>**For Methanol Vehicles:**<br>If you know the percentage of methanol in the fuel of the vehicle, GO to DE11.<br>If you do not know the percentage of ethanol or methanol in the fuel, GO to DE8. |
| | | No ▶ | KEY OFF. GO to DE12. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DE8** | DETERMINE SEPARATION POINT OF WATER / METHANOL (OR WATER / ETHANOL) AND GASOLINE IN THE FUEL | | |
| | NOTE: This step requires the Rotunda Fuel Composition Test Kit 014-00770 or equivalent.<br>● Fill beaker with 5 ml of clean water.<br>● Place the hose end of the fuel drain hose assembly in gas can.<br>● Connect fuel drain hose assembly to fuel pressure relief valve. Turn connector clockwise to tighten. Turn ON / OFF valve clockwise to open.<br>● Key on.<br>● Allow 22 ml of fuel to drain into the gas can.<br>● Pour 20 ml of the fuel into 25 ml graduated cylinder.<br>● Pour enough water from the beaker into the 25 ml graduated cylinder to bring total volume to 24 ml.<br>● Insert stopper plug in opening of 25 ml graduated cylinder. Hold it in place as you shake cylinder to mix water and fuel. Allow liquid to stand and separate.<br>NOTE: After about three minutes, the methanol and water (or ethanol and water) will mix together and settle to the bottom of the cylinder. The gasoline will rise to the top.<br>● Record the level on the graduated cylinder where the methanol / water (or ethanol / water) mixture and gasoline meet.<br>● **Have all of the steps been completed?** | Yes ▶ | KEY OFF. RECONNECT fuel pressure relief valve. GO to DE9. |
| | | No ▶ | KEY OFF. COMPLETE all steps before continuing. Gasoline and water will separate. However, if the fuel does not appear to separate, then the fuel is either 100% methanol or a mixture of methanol and water. |

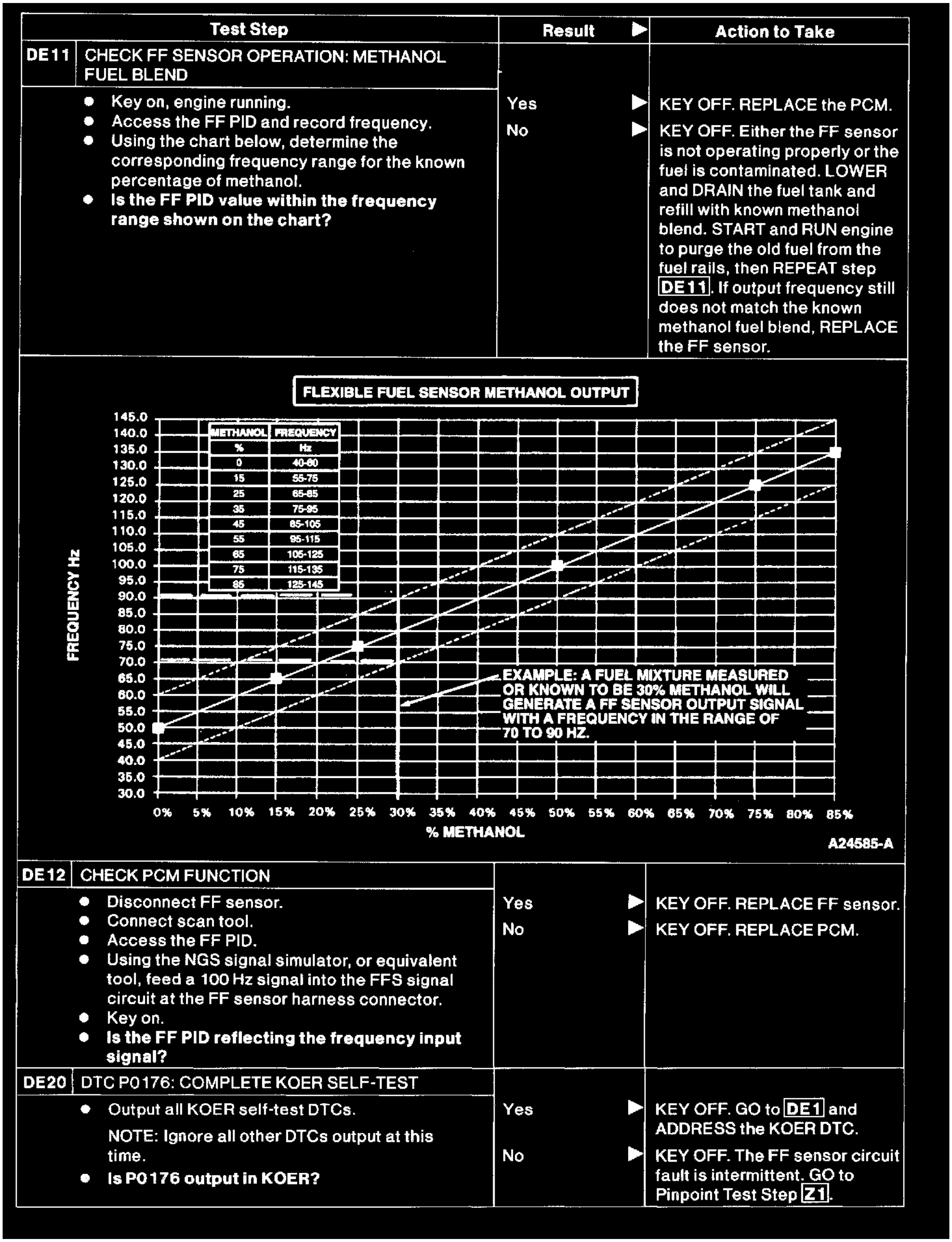
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DE9** | CALCULATE PERCENTAGE OF METHANOL (OR ETHANOL) IN THE FUEL | | |
| | ● Use the following equation to calculate and record the percentage of methanol (or ethanol) in the fuel sample collected in step DE8:<br>Percent methanol (or ethanol) = (A - 4) x 5<br>NOTE: The letter A in the above equation equals the level on the graduated cylinder recorded from step DE8 where the methanol / water (or ethanol / water) mixture and gasoline meet; see illustration below.<br>EXAMPLE: If the reading from step DE8 is 14 ml then the percentage of methanol (or ethanol) in the fuel mixture is (14 - 4) x 5, which equals 50. Therefore, the percentage of methanol (or ethanol) in the fuel mixture is 50.<br> <br>A18050-A<br>● **Has the percentage of methanol (or ethanol) in the fuel mixture been determined?** | Yes ▶ | The results are accurate to +/- 10%. POUR any remaining fuel back into the vehicle via the fuel filler.<br>**For ethanol vehicles:** GO to DE10.<br>**For methanol vehicles:** GO to DE11. |
| | | No ▶ | COMPLETE the determination of the methanol (or ethanol) percentage before continuing. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DE10** | CHECK FF SENSOR OPERATION: ETHANOL BLEND FUEL | | |
| | • Key on, engine running.<br>• Access the FF PID and record frequency.<br>• Using chart below, determine the corresponding frequency range for the known percentage of ethanol.<br>• **Is the FF PID value within the frequency range shown on the chart?** | Yes ▶ | KEY OFF. REPLACE the PCM. |
| | | No ▶ | KEY OFF. Either the FF sensor is not operating properly or the fuel is contaminated. LOWER and DRAIN the fuel tank and refill with known ethanol blend. START and RUN engine to purge the old fuel from the rails, then REPEAT step DE10. If output frequency still does not match the known ethanol fuel blend, REPLACE the FF sensor. |



| ETHANOL | FREQUENCY |
|---|---|
| % | Hz |
| 0 | 40-60 |
| 15 | 50-70 |
| 25 | 60-80 |
| 35 | 65-85 |
| 45 | 75-100 |
| 55 | 80-105 |
| 65 | 90-110 |
| 75 | 95-120 |
| 85 | 105-125 |

EXAMPLE: A FUEL MIXTURE MEASURED OR KNOWN TO BE 20% ETHANOL WILL GENERATE A FF SENSOR OUTPUT SIGNAL WITH A FREQUENCY IN THE RANGE OF 55 TO 75 HZ.



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DE11** CHECK FF SENSOR OPERATION: METHANOL FUEL BLEND | | |
| ● Key on, engine running.<br>● Access the FF PID and record frequency.<br>● Using the chart below, determine the corresponding frequency range for the known percentage of methanol.<br>● **Is the FF PID value within the frequency range shown on the chart?** | Yes ▶ | KEY OFF. REPLACE the PCM. |
| | No ▶ | KEY OFF. Either the FF sensor is not operating properly or the fuel is contaminated. LOWER and DRAIN the fuel tank and refill with known methanol blend. START and RUN engine to purge the old fuel from the fuel rails, then REPEAT step DE11. If output frequency still does not match the known methanol fuel blend, REPLACE the FF sensor. |

**FLEXIBLE FUEL SENSOR METHANOL OUTPUT**

| METHANOL % | FREQUENCY Hz |
|---|---|
| 0 | 40-60 |
| 15 | 55-75 |
| 25 | 65-85 |
| 35 | 75-95 |
| 45 | 85-105 |
| 55 | 95-115 |
| 65 | 105-125 |
| 75 | 115-135 |
| 85 | 125-145 |

EXAMPLE: A FUEL MIXTURE MEASURED OR KNOWN TO BE 30% METHANOL WILL GENERATE A FF SENSOR OUTPUT SIGNAL WITH A FREQUENCY IN THE RANGE OF 70 TO 90 HZ.

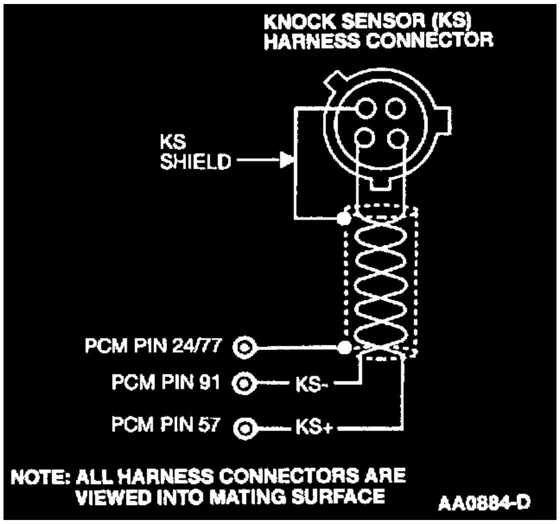
A24585-A

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DE12** CHECK PCM FUNCTION | | |
| ● Disconnect FF sensor.<br>● Connect scan tool.<br>● Access the FF PID.<br>● Using the NGS signal simulator, or equivalent tool, feed a 100 Hz signal into the FFS signal circuit at the FF sensor harness connector.<br>● Key on.<br>● **Is the FF PID reflecting the frequency input signal?** | Yes ▶ | KEY OFF. REPLACE FF sensor. |
| | No ▶ | KEY OFF. REPLACE PCM. |
| **DE20** DTC P0176: COMPLETE KOER SELF-TEST | | |
| ● Output all KOER self-test DTCs.<br>NOTE: Ignore all other DTCs output at this time.<br>● **Is P0176 output in KOER?** | Yes ▶ | KEY OFF. GO to DE1 and ADDRESS the KOER DTC. |
| | No ▶ | KEY OFF. The FF sensor circuit fault is intermittent. GO to Pinpoint Test Step Z1. |

# Test Notes

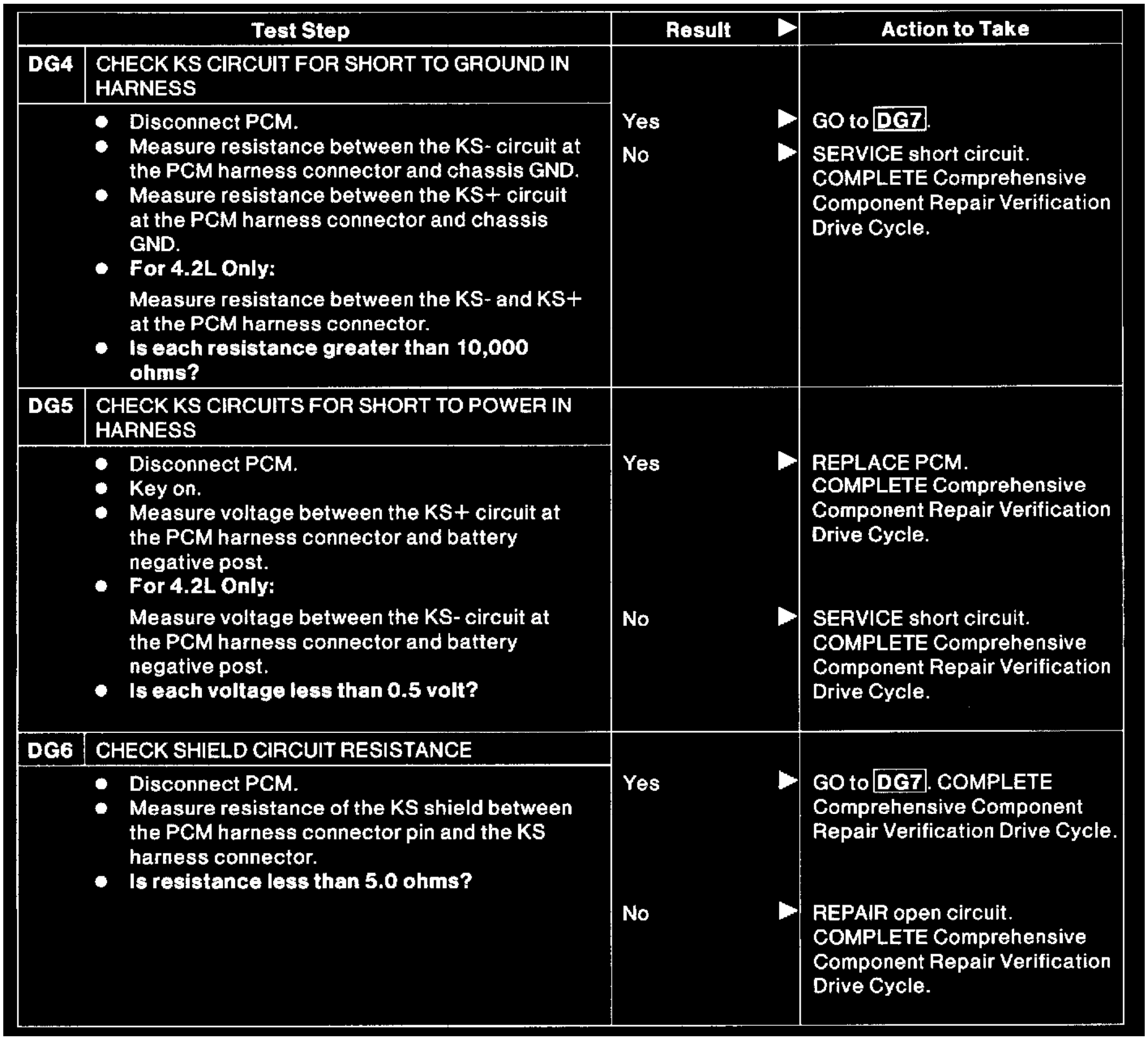
This Pinpoint Test is intended to diagnose the following:

- Knock sensor
- Harness circuits: KS and SIG RTN
- Powertrain Control Module **(PCM)**

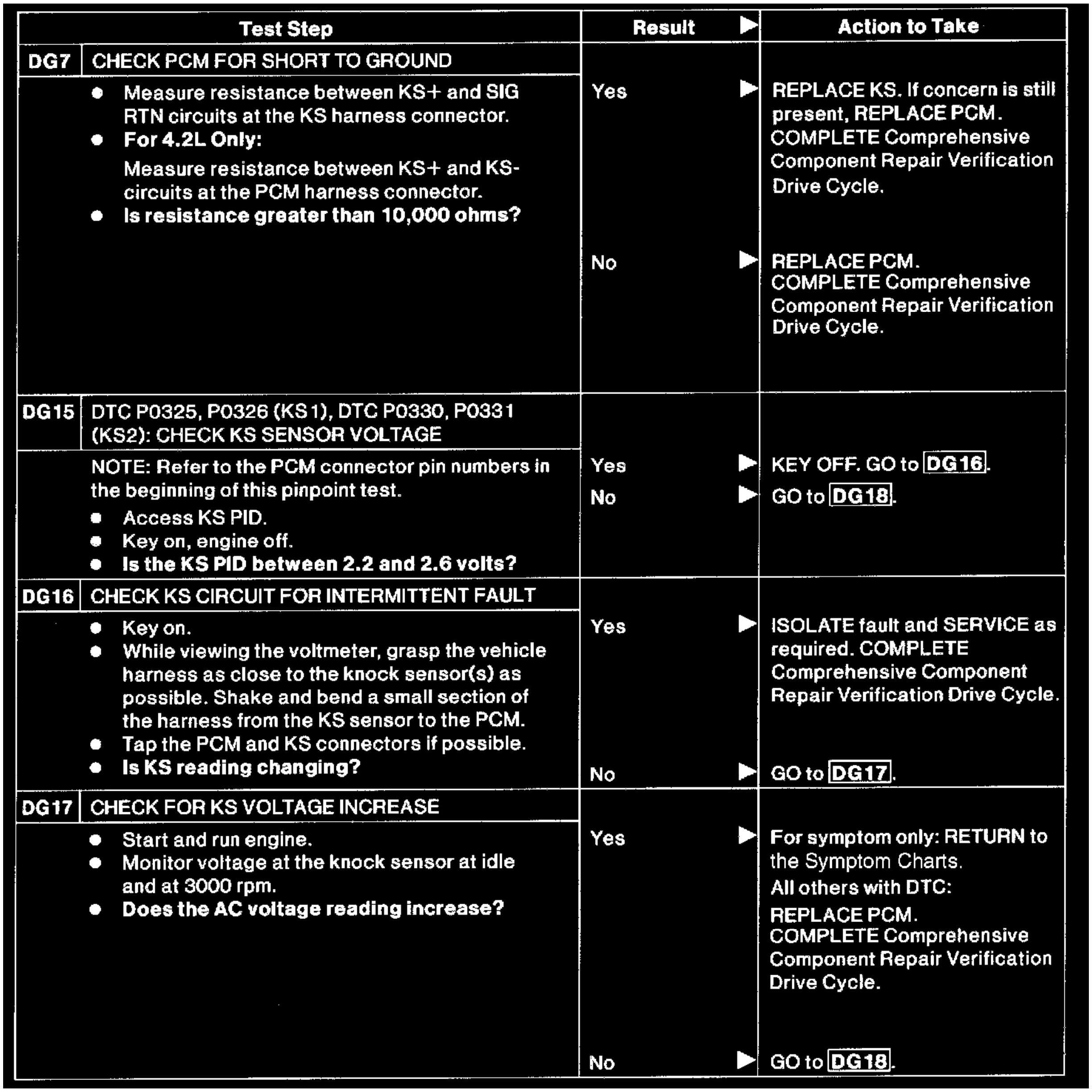


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

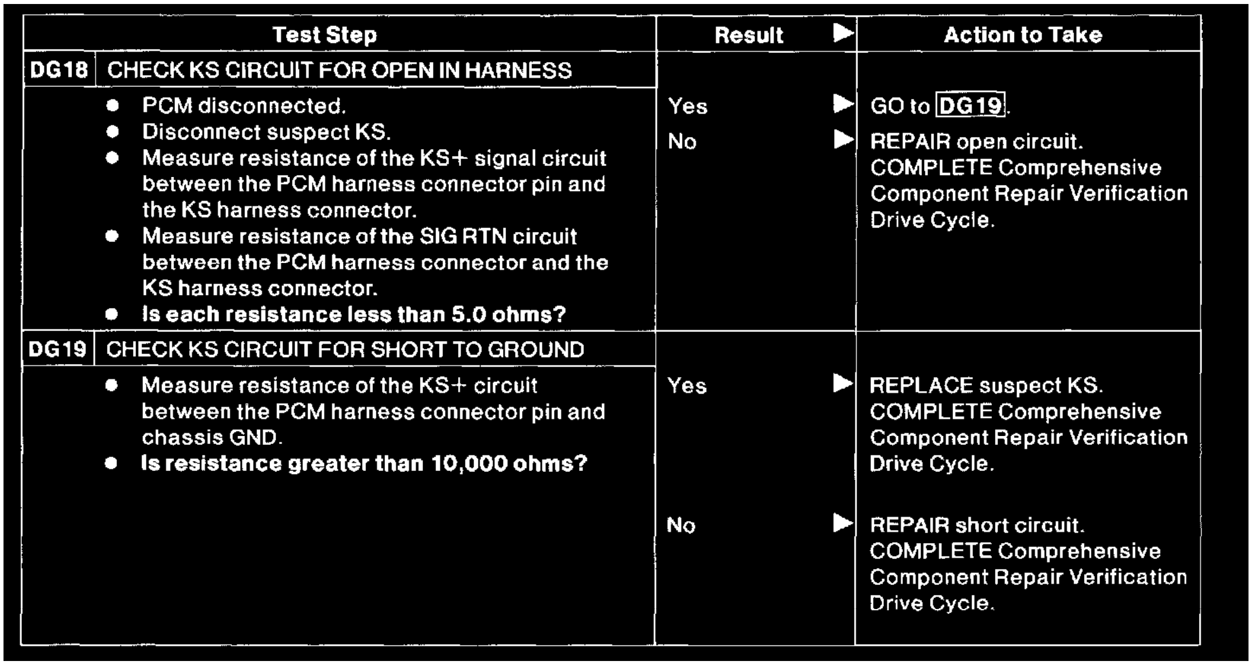
| | Test Step | Result ▶ | Action to Take |
|---|---|---|---|
| **DG1** | DTC P0330, P0331 (KS2), DTC P0325, P0326 (KS1): CHECK VOLTAGE BETWEEN SENSOR AND SIG RTN | | |
| | ● Verify that KS is connected and installed properly. Then complete comprehensive repair verification drive cycle.<br>● Key on, engine off.<br>● Access KS PID.<br>● Read dc voltage.<br>● **Is the KS PID less than 0.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DG2.<br>GO to DG5. |
| **DG2** | CHECK KS SENSOR RESISTANCE | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect KS.<br>● **For 4.2L:** Measure resistance between (KS+) and (KS-) at the knock sensor.<br>● **Is resistance between 4.39 and 5.35 megohm?** | Yes ▶<br>No ▶ | **All others:**<br>GO to DG7.<br>**For Town Car, 5.4L E/F-Series (HD), and 6.8L E/F-Series:**<br>GO to DG6.<br>**For resistance greater than 5.35 megohm:**<br>GO to DG3.<br>**For resistance less than 4.39 megohm:**<br>GO to DG4. |
| **DG3** | CHECK FOR OPEN OF KS CIRCUIT BETWEEN KS SIGRTN AND SHIELD IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance of the KS+ circuit between the PCM harness connector pin and the KS harness connector.<br>● **For 4.2L:**<br>Measure resistance of KS- circuit between the PCM harness connector pin and the KS connector.<br>● Where applicable, measure resistance of shield between the PCM harness connector and the shield pin at the KS connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE KS.<br>REPAIR open circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DG4** CHECK KS CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| • Disconnect PCM.<br>• Measure resistance between the KS- circuit at the PCM harness connector and chassis GND.<br>• Measure resistance between the KS+ circuit at the PCM harness connector and chassis GND.<br>• **For 4.2L Only:**<br>Measure resistance between the KS- and KS+ at the PCM harness connector.<br>• **Is each resistance greater than 10,000 ohms?** | Yes ▶ | GO to DG7. |
| | No ▶ | SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| **DG5** CHECK KS CIRCUITS FOR SHORT TO POWER IN HARNESS | | |
| • Disconnect PCM.<br>• Key on.<br>• Measure voltage between the KS+ circuit at the PCM harness connector and battery negative post.<br>• **For 4.2L Only:**<br>Measure voltage between the KS- circuit at the PCM harness connector and battery negative post.<br>• **Is each voltage less than 0.5 volt?** | Yes ▶ | REPLACE PCM. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | No ▶ | SERVICE short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| **DG6** CHECK SHIELD CIRCUIT RESISTANCE | | |
| • Disconnect PCM.<br>• Measure resistance of the KS shield between the PCM harness connector pin and the KS harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to DG7. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | No ▶ | REPAIR open circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DG7 | CHECK PCM FOR SHORT TO GROUND | | |
| | • Measure resistance between KS+ and SIG RTN circuits at the KS harness connector.<br>• **For 4.2L Only:**<br>Measure resistance between KS+ and KS- circuits at the PCM harness connector.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE KS. If concern is still present, REPLACE PCM. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | | No ▶ | REPLACE PCM. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| DG15 | DTC P0325, P0326 (KS1), DTC P0330, P0331 (KS2): CHECK KS SENSOR VOLTAGE | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Access KS PID.<br>• Key on, engine off.<br>• **Is the KS PID between 2.2 and 2.6 volts?** | Yes ▶ | KEY OFF. GO to DG16. |
| | | No ▶ | GO to DG18. |
| DG16 | CHECK KS CIRCUIT FOR INTERMITTENT FAULT | | |
| | • Key on.<br>• While viewing the voltmeter, grasp the vehicle harness as close to the knock sensor(s) as possible. Shake and bend a small section of the harness from the KS sensor to the PCM.<br>• Tap the PCM and KS connectors if possible.<br>• **Is KS reading changing?** | Yes ▶ | ISOLATE fault and SERVICE as required. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | | No ▶ | GO to DG17. |
| DG17 | CHECK FOR KS VOLTAGE INCREASE | | |
| | • Start and run engine.<br>• Monitor voltage at the knock sensor at idle and at 3000 rpm.<br>• **Does the AC voltage reading increase?** | Yes ▶ | For symptom only: RETURN to the Symptom Charts.<br>All others with DTC:<br>REPLACE PCM. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | | No ▶ | GO to DG18. |



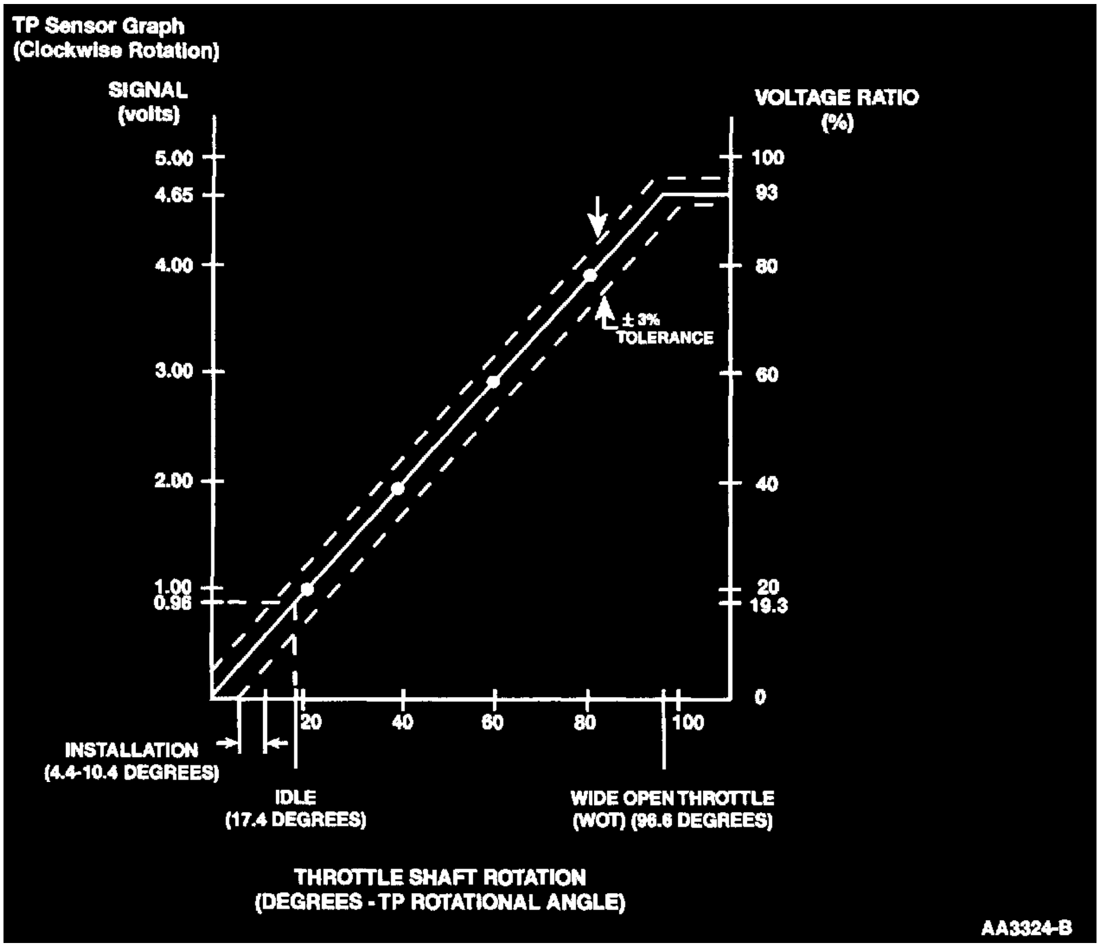
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DG18 | CHECK KS CIRCUIT FOR OPEN IN HARNESS | | |
| | • PCM disconnected.<br>• Disconnect suspect KS.<br>• Measure resistance of the KS+ signal circuit between the PCM harness connector pin and the KS harness connector.<br>• Measure resistance of the SIG RTN circuit between the PCM harness connector and the KS harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶ | GO to DG19. |
| | | No ▶ | REPAIR open circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| DG19 | CHECK KS CIRCUIT FOR SHORT TO GROUND | | |
| | • Measure resistance of the KS+ circuit between the PCM harness connector pin and chassis GND.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE suspect KS. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |
| | | No ▶ | REPAIR short circuit. COMPLETE Comprehensive Component Repair Verification Drive Cycle. |

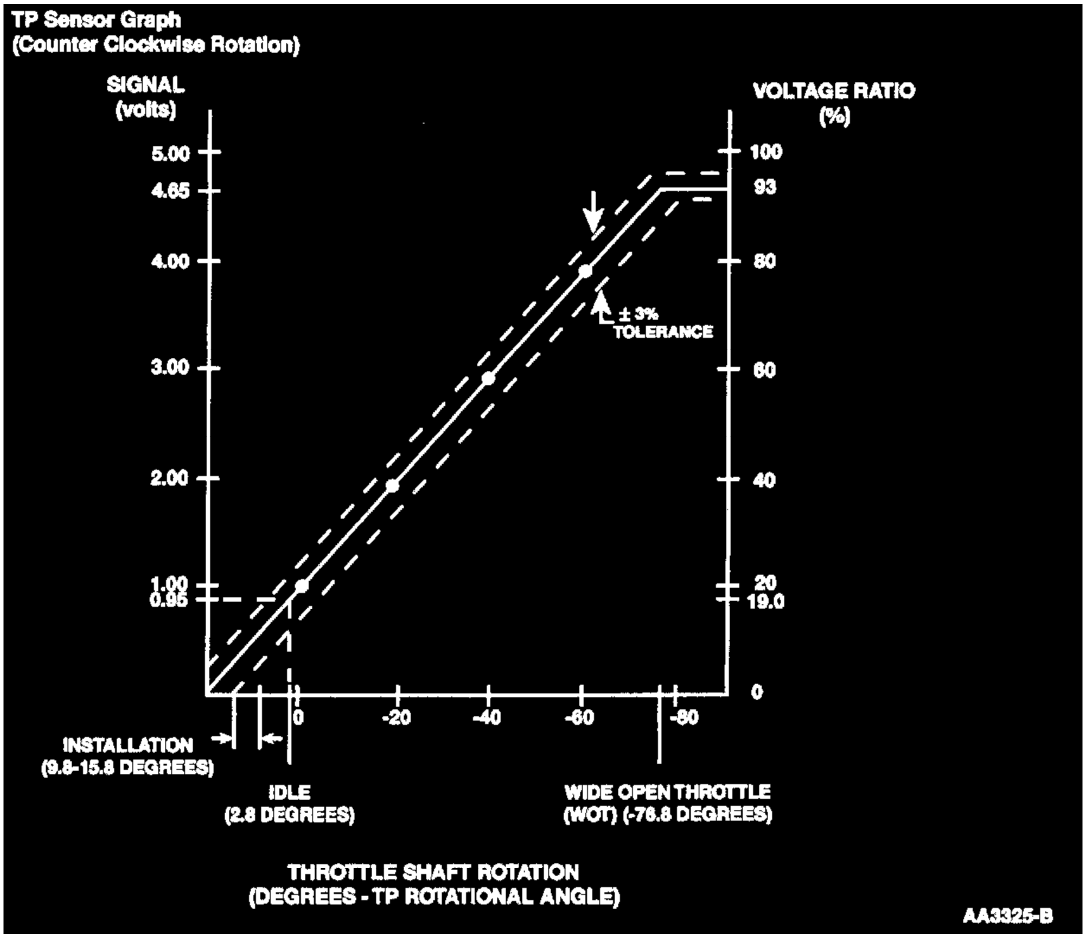
## Test Notes

This Pinpoint Test is intended to diagnose the following:

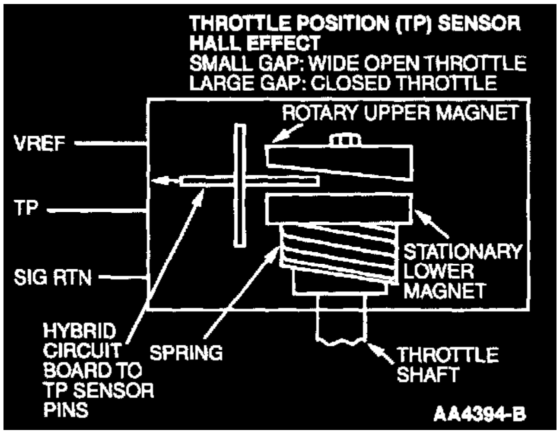
- Throttle Position **(TP)** Sensor
- Binding and sticking Throttle Linkage
- Harness Circuits: TP, SIG RTN, VREF, Vehicle Power **(VPWR)**, Power Ground **(PWR GND)**
- Powertrain Control Module **(PCM)**

# Tables and Graphs

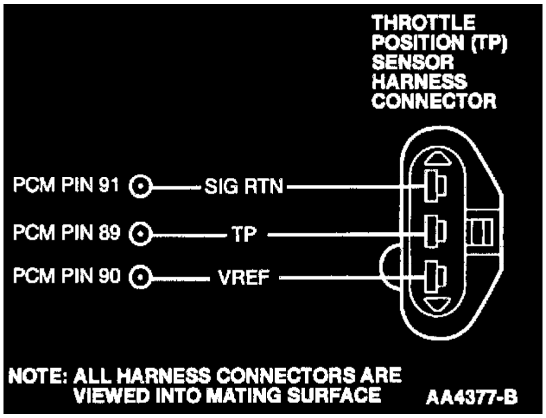




**NOTE:** The normal range of the throttle angle measurement for the Throttle Position **(TP)** sensor is **0** to **96.6 degrees**.

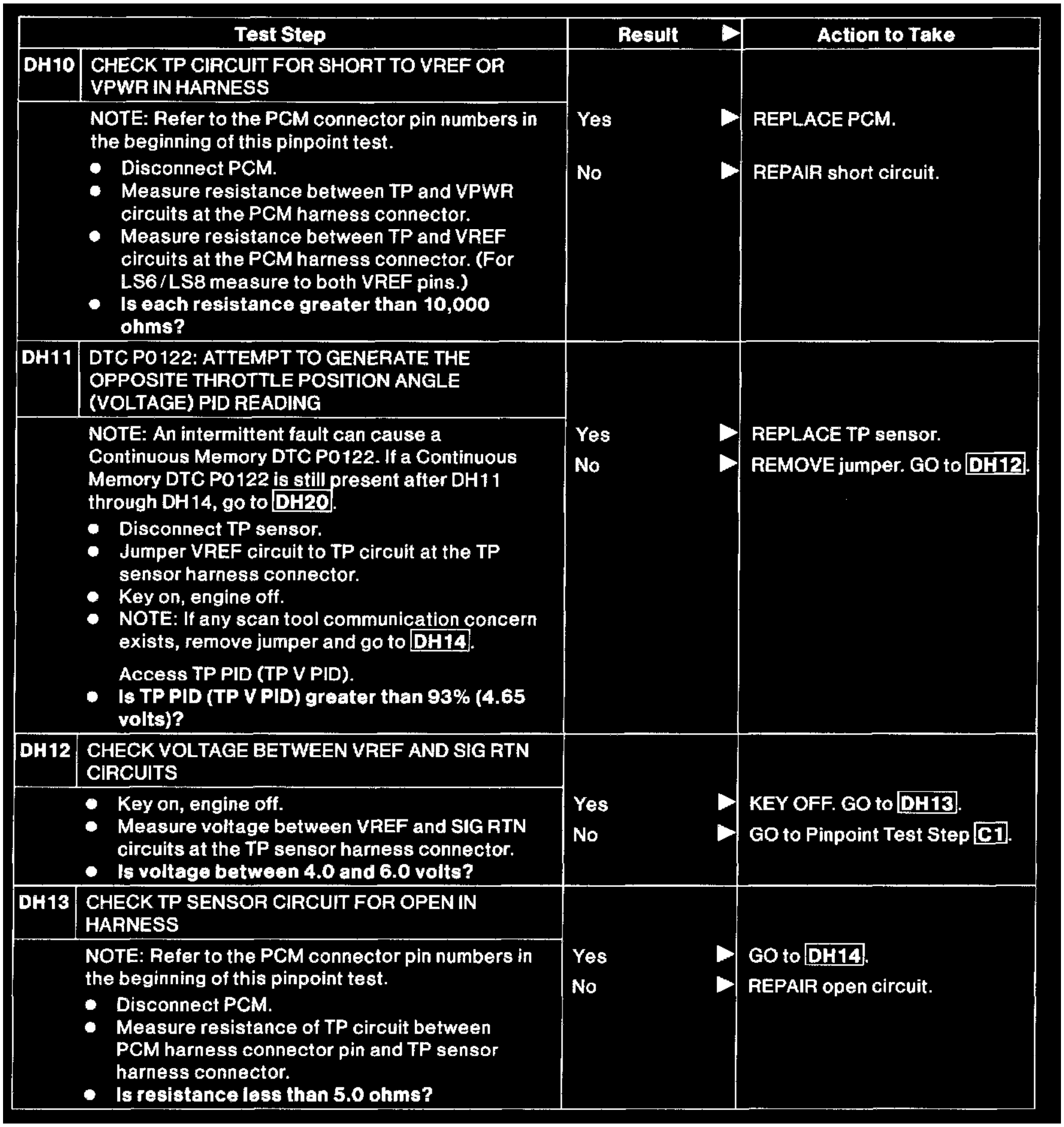


Non-Contacting TPS

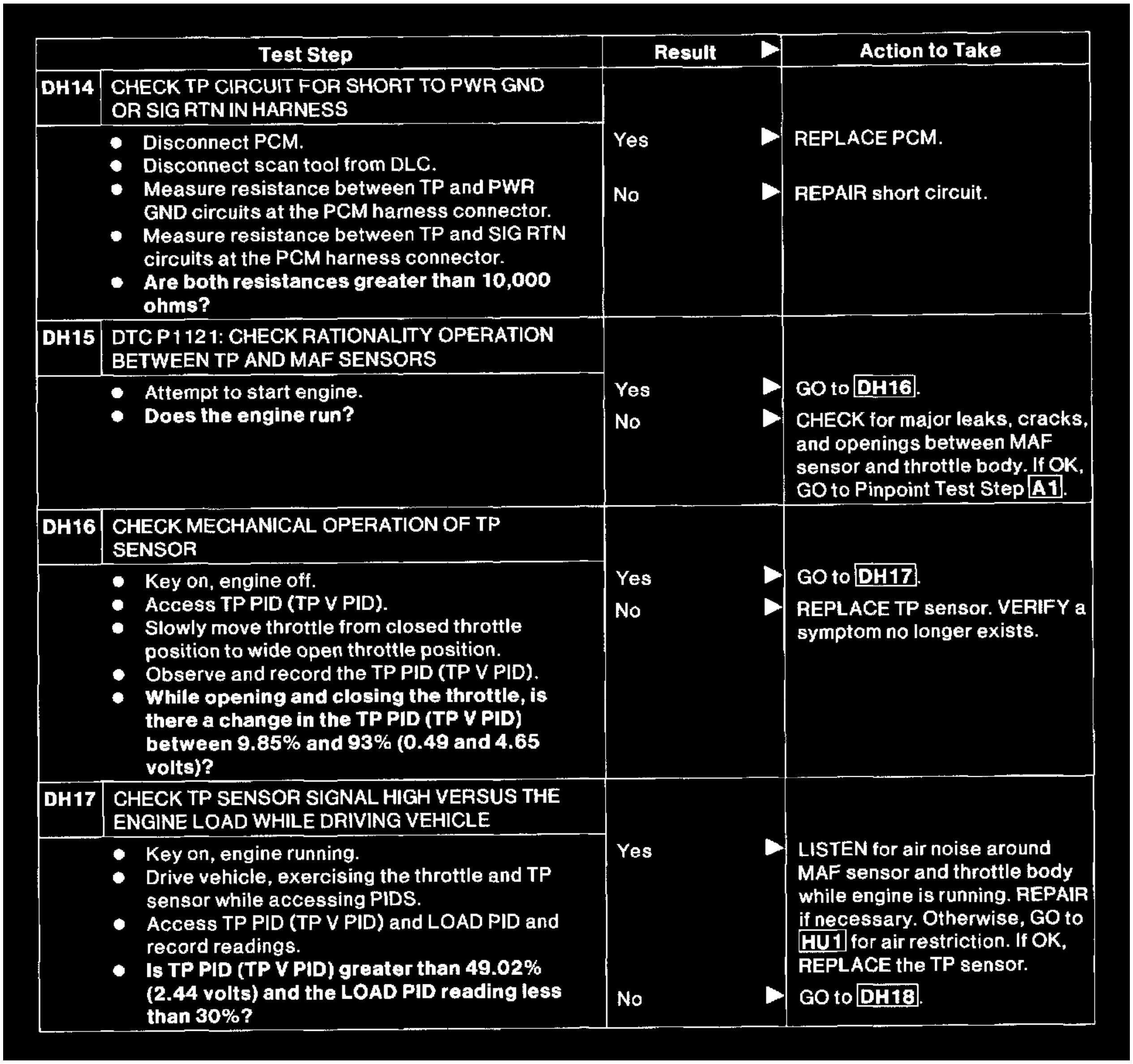


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DH1** | KOEO AND KOER DTC P1124: CHECK FOR OTHER DTCS | | |
| | - Check for DTC P1400 in KOEO or KOER Self-Test.<br>- **Is KOEO or KOER DTC P1400 present with KOEO DTC P1124?** | Yes ▶ | RETURN to Diagnostic Trouble Code Charts for DTC P1400. FOLLOW diagnostics for the DTC P1400. |
| | | No ▶ | KEY OFF. GO to DH2. |
| **DH2** | CHECK FOR STUCK THROTTLE PLATE OR LINKAGE | | |
| | - Visually inspect the throttle linkage and throttle plate for binding or sticking.<br>- Verify the throttle plate and linkage is at closed throttle position.<br>- **Does the throttle move freely and return to closed throttle position?** | Yes ▶ | Throttle plate and linkage are OK. GO to DH8. |
| | | No ▶ | REPAIR as necessary. |
| **DH3** | DTC P1120: CHECK TP CIRCUIT FOR FRAYED WIRES OR CORROSION ON CONNECTORS | | |
| | - Key off.<br>- Complete a visual inspection of pins on harness connector at the TP sensor for corrosion.<br>- Complete a visual inspection of the harness wires between the TP sensor and the PCM for insulation fraying and corrosion.<br>- **Is a fault present?** | Yes ▶ | REPAIR as necessary. |
| | | No ▶ | GO to DH4. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DH4** | CHECK FOR STUCK TP SENSOR | | |
| | ● Key on, engine off.<br>● Access TP PID (TP V PID).<br>● Slowly move throttle from closed throttle position to wide open throttle position and observe the TP PID (TP V PID).<br>● **While opening the throttle, is the TP PID (TPV PID) reading below 9.85% (0.49 volt)?** | Yes ▶<br>No ▶ | KEY OFF. GO to DH5.<br>GO to DH20. |
| **DH5** | CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO TP SENSOR | | |
| | ● Disconnect TP sensor.<br>● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DH6.<br>GO to Pinpoint Test Step C1. |
| **DH6** | CHECK TP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of TP circuit between PCM harness connector pin and TP harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DH7.<br>REPAIR open circuit. |
| **DH7** | CHECK TP SENSOR VOLTAGE TO PCM | | |
| | ● Reconnect PCM and TP sensor.<br>● Start engine and idle for 2 minutes.<br>● Access TP PID (TP V PID).<br>● Slowly open the throttle from closed position and observe PID(s).<br>● **Is TP PID (TP V PID) reading at any time between 3.42-9.85% (0.17-0.49 volt)?** | Yes ▶<br>No ▶ | REPLACE TP sensor.<br>If DTC P1120 is still present, GO to DH20. |
| **DH8** | DTC P0123 OR P1124: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING | | |
| | ● Disconnect TP sensor.<br>● Key on, engine off.<br>● Access TP PID (TP V PID).<br>● **Is TP PID (TP V PID) less than 3.42% (0.17 volt)?** | Yes ▶<br>No ▶ | GO to DH9.<br>KEY OFF. GO to DH10. |
| **DH9** | CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO TP SENSOR | | |
| | ● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | REPLACE TP sensor.<br>GO to Pinpoint Test Step C1. |

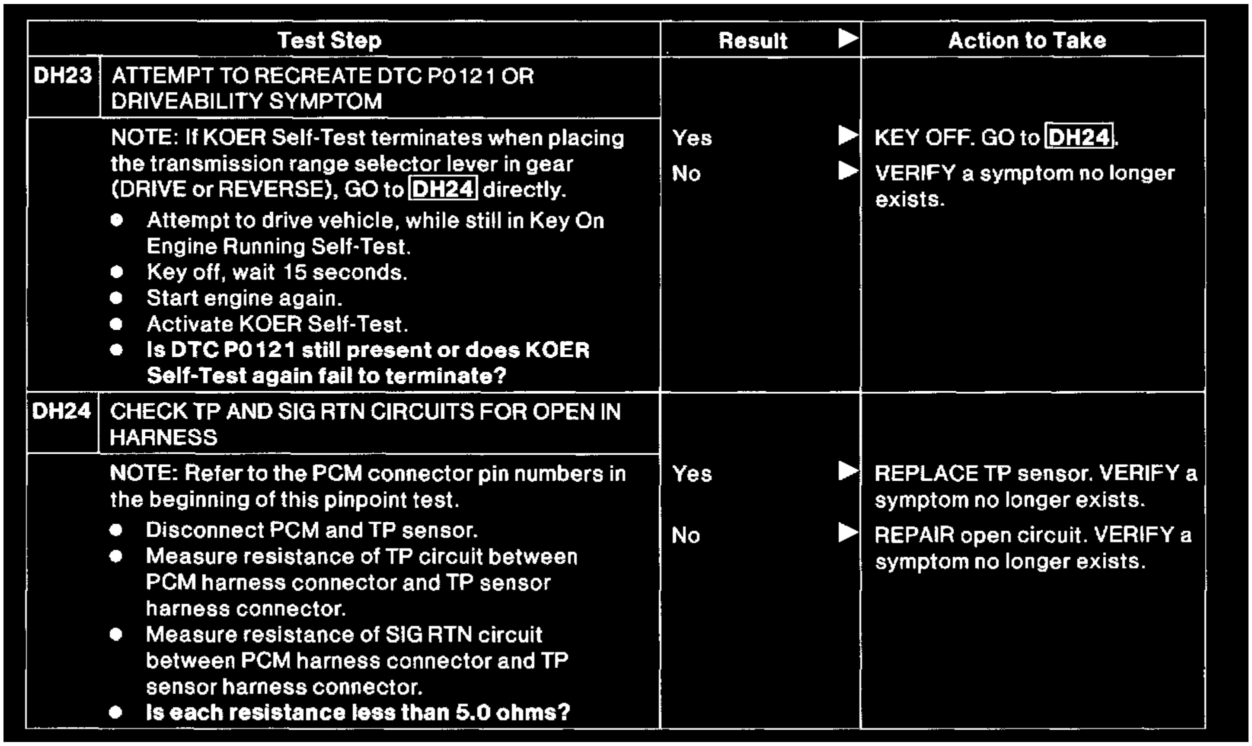


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DH10** | CHECK TP CIRCUIT FOR SHORT TO VREF OR VPWR IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance between TP and VPWR circuits at the PCM harness connector.<br>● Measure resistance between TP and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DH11** | DTC P0122: ATTEMPT TO GENERATE THE OPPOSITE THROTTLE POSITION ANGLE (VOLTAGE) PID READING | | |
| | NOTE: An intermittent fault can cause a Continuous Memory DTC P0122. If a Continuous Memory DTC P0122 is still present after DH11 through DH14, go to DH20.<br>● Disconnect TP sensor.<br>● Jumper VREF circuit to TP circuit at the TP sensor harness connector.<br>● Key on, engine off.<br>● NOTE: If any scan tool communication concern exists, remove jumper and go to DH14.<br>Access TP PID (TP V PID).<br>● **Is TP PID (TP V PID) greater than 93% (4.65 volts)?** | Yes ▶<br>No ▶ | REPLACE TP sensor.<br>REMOVE jumper. GO to DH12. |
| **DH12** | CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS | | |
| | ● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to DH13.<br>GO to Pinpoint Test Step C1. |
| **DH13** | CHECK TP SENSOR CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of TP circuit between PCM harness connector pin and TP sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DH14.<br>REPAIR open circuit. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DH14** | CHECK TP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS | | |
| | • Disconnect PCM.<br>• Disconnect scan tool from DLC.<br>• Measure resistance between TP and PWR GND circuits at the PCM harness connector.<br>• Measure resistance between TP and SIG RTN circuits at the PCM harness connector.<br>• **Are both resistances greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **DH15** | DTC P1121: CHECK RATIONALITY OPERATION BETWEEN TP AND MAF SENSORS | | |
| | • Attempt to start engine.<br>• **Does the engine run?** | Yes ▶<br>No ▶ | GO to DH16.<br>CHECK for major leaks, cracks, and openings between MAF sensor and throttle body. If OK, GO to Pinpoint Test Step A1. |
| **DH16** | CHECK MECHANICAL OPERATION OF TP SENSOR | | |
| | • Key on, engine off.<br>• Access TP PID (TP V PID).<br>• Slowly move throttle from closed throttle position to wide open throttle position.<br>• Observe and record the TP PID (TP V PID).<br>• **While opening and closing the throttle, is there a change in the TP PID (TP V PID) between 9.85% and 93% (0.49 and 4.65 volts)?** | Yes ▶<br>No ▶ | GO to DH17.<br>REPLACE TP sensor. VERIFY a symptom no longer exists. |
| **DH17** | CHECK TP SENSOR SIGNAL HIGH VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE | | |
| | • Key on, engine running.<br>• Drive vehicle, exercising the throttle and TP sensor while accessing PIDS.<br>• Access TP PID (TP V PID) and LOAD PID and record readings.<br>• **Is TP PID (TP V PID) greater than 49.02% (2.44 volts) and the LOAD PID reading less than 30%?** | Yes ▶<br>No ▶ | LISTEN for air noise around MAF sensor and throttle body while engine is running. REPAIR if necessary. Otherwise, GO to HU1 for air restriction. If OK, REPLACE the TP sensor.<br>GO to DH18. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DH18** | CHECK TP SENSOR SIGNAL LOW VERSUS THE ENGINE LOAD WHILE DRIVING VEHICLE | | |
| | NOTE: If the vehicle is a no start, go to Pinpoint Test Step A1.<br>● Drive vehicle exercising the throttle and TP sensor near higher gears (preferably overdrive) while accessing PIDS.<br>● Access TP PID (TP V PID) and LOAD PID.<br>● **Is TP PID (TP V PID) reading less than 4.82% (0.24 volts) and the LOAD PID reading greater than 55%?** | Yes ▶ | TIGHTEN TP sensor to throttle body if necessary. CLEAR Continuous Memory DTCs. DRIVE vehicle exercising the throttle. If Continuous Memory P1121 is now present, REPLACE MAF sensor. |
| | | No ▶ | Unable to identify the fault at this time. If vehicle is still a No Start, GO to Pinpoint Test Step A1. |
| **DH20** | CONTINUOUS MEMORY DTCS P1120 OR P1125: CHECK FOR TP CIRCUIT INTERMITTENT SIGNAL | | |
| | ● Start engine and bring to idle.<br>● Run throttle up to 1500 rpm for 5 seconds.<br>● Access TP PID (TP V PID) for a fault indication while completing the following:<br>— Lightly tap on TP sensor and wiggle harness connector to simulate road shock.<br>● **Is TP PID (TP V PID) changing below the minimum 9.85% (0.49 volt) or above the maximum 93% (4.65 volts)?** | Yes ▶ | INSPECT the TP sensor connector. If OK, REPLACE the TP sensor. |
| | | No ▶ | KEY OFF. GO to DH21. |
| **DH21** | CHECK TP SENSOR HARNESS FOR INTERMITTENT OPENS OR SHORTS | | |
| | ● Again access the TP PID (TP V PID).<br>● Key on, engine off.<br>● Complete the following:<br>— Grasp the vehicle harness closest to the TP sensor connector.<br>— Shake and bend a small section of the harness all the way to the dash panel.<br>— Wiggle, shake and bend the harness from the dash panel to the PCM.<br>● **Is TP PID (TP V PID) reading changing below the minimum 9.85% (0.49 volt) or above the maximum 93% (4.65 volts)?** | Yes ▶ | ISOLATE and REPAIR as necessary. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **DH22** | DTC P0121: CHECK FOR KOER SELF-TEST COMPLETION | | |
| | ● Start engine, bring to idle (throttle closed).<br>● Activate Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P0121 present or does KOER Self-Test fail to terminate?** | Yes ▶ | GO to DH23. |
| | | No ▶ | VERIFY a symptom no longer exists. |



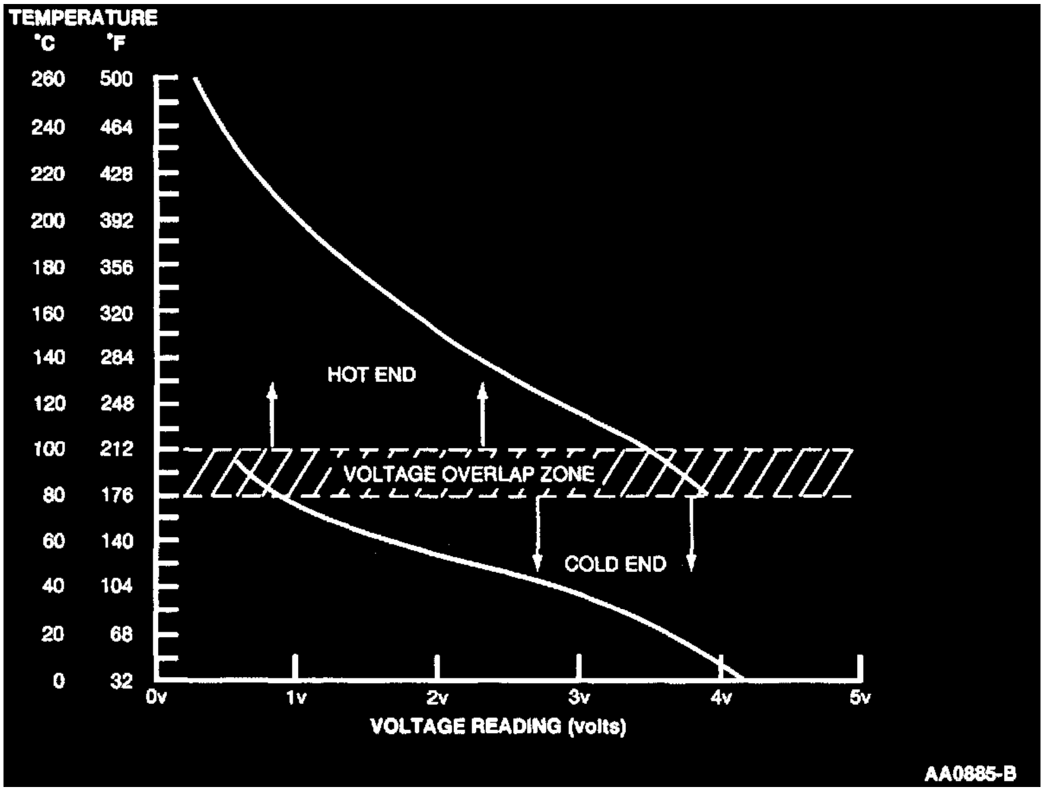
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DH23 | ATTEMPT TO RECREATE DTC P0121 OR DRIVEABILITY SYMPTOM | | |
| | NOTE: If KOER Self-Test terminates when placing the transmission range selector lever in gear (DRIVE or REVERSE), GO to DH24 directly.<br>● Attempt to drive vehicle, while still in Key On Engine Running Self-Test.<br>● Key off, wait 15 seconds.<br>● Start engine again.<br>● Activate KOER Self-Test.<br>● **Is DTC P0121 still present or does KOER Self-Test again fail to terminate?** | Yes ▶<br>No ▶ | KEY OFF. GO to DH24.<br>VERIFY a symptom no longer exists. |
| DH24 | CHECK TP AND SIG RTN CIRCUITS FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM and TP sensor.<br>● Measure resistance of TP circuit between PCM harness connector and TP sensor harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector and TP sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE TP sensor. VERIFY a symptom no longer exists.<br>REPAIR open circuit. VERIFY a symptom no longer exists. |

# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Cylinder Head Temperature **(CHT)** sensor
- Harness circuits: CHT, VREF, and SIG RTN
- Powertrain control module **(PCM)**

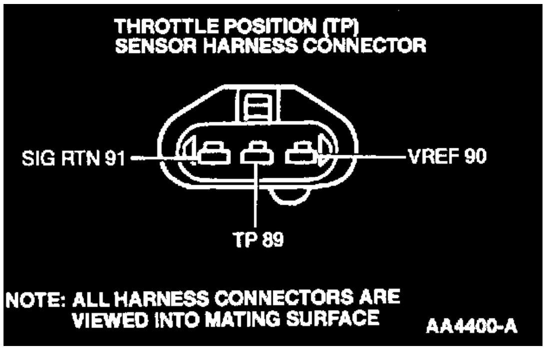
# Tables and Graphs

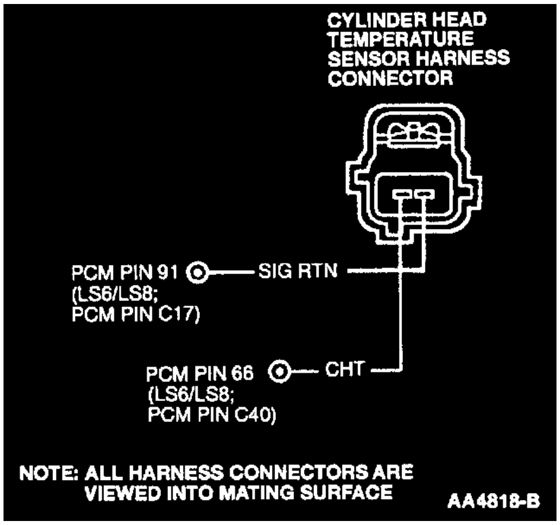


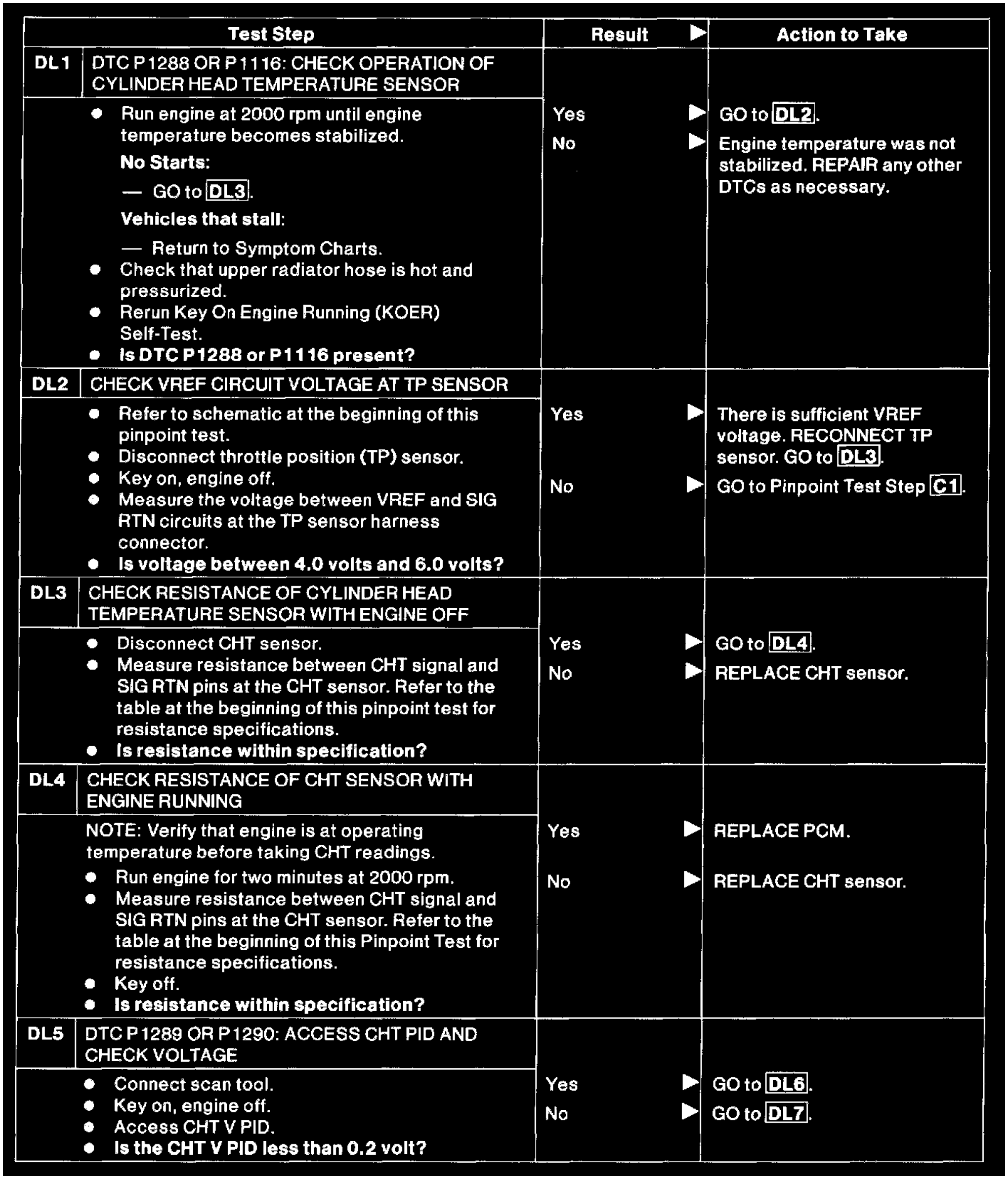
| Temperature | | CHT Sensor Values | | |
|---|---|---|---|---|
| °C | °F | COLD END | HOT END | Resistance (K ohms) |
| -40 | -40 | 4.89 | — | 965.808 |
| -30 | -22 | 4.81 | — | 513.019 |
| -20 | -4 | 4.67 | — | 283.664 |
| -10 | 14 | 4.45 | — | 162.584 |
| 0 | 32 | 4.14 | — | 96.255 |
| 10 | 50 | 3.73 | — | 59.175 |
| 20 | 68 | 3.26 | — | 37.387 |
| 30 | 86 | 2.74 | — | 24.215 |
| 40 | 104 | 2.23 | — | 16.043 |
| 50 | 122 | 1.76 | — | 10.85 |
| 60 | 140 | 1.36 | — | 7.487 |
| 70 | 158 | 1.04 | — | 5.268 |
| 80 | 176 | 0.79 | 3.99 | 3.775 |
| 85 | 185 | 0.69 | 3.86 | 3.215 |
| 90 | 194 | 0.60 | 3.71 | 2.75 |
| 95 | 203 | 0.53 | 3.56 | 2.361 |
| 100 | 212 | 0.46 | 3.41 | 2.034 |
| 110 | 230 | — | 3.07 | 1.523 |
| 120 | 248 | — | 2.74 | 1.155 |
| 130 | 266 | — | 2.41 | 0.8866 |
| 140 | 284 | — | 2.10 | 0.6891 |
| 150 | 302 | — | 1.81 | 0.5417 |
| 160 | 320 | — | 1.55 | 0.4301 |
| 170 | 338 | — | 1.33 | 0.3449 |
| 180 | 356 | — | 1.13 | 0.2791 |
| 190 | 374 | — | 0.96 | 0.2278 |
| 200 | 392 | — | 0.82 | 0.1875 |
| 210 | 410 | — | 0.70 | 0.155 |
| 220 | 428 | — | 0.60 | 0.130 |
| 230 | 446 | — | 0.51 | 0.109 |
| 240 | 464 | — | 0.44 | 0.092 |
| 250 | 482 | — | 0.35 | 0.078 |
| 260 | 500 | — | 0.33 | 0.067 |

On applications that do not use a ECT sensor, the CHT sensor is used to determine the engine coolant temperature in place of the ECT sensor. In this case the PCM may store both CHT and ECT Diagnostic Trouble Codes (DTCs). To cover the entire temperature range of both the CHT and ECT sensors, the PCM has a dual switching resistor circuit on the CHT input. A graph showing the temperature switching from the COLD END line to the HOT END line with increasing temperature and back with decreasing temperature is included. Note the temperature to voltage overlap zone. Within this zone it is possible to have either a COLD END or HOT END voltage at the same temperature. For example, at **90°C (194°F)** the voltage could read either **0.60 volt** or **3.71 volts**. Refer to the table for the temperature to voltage expected values.

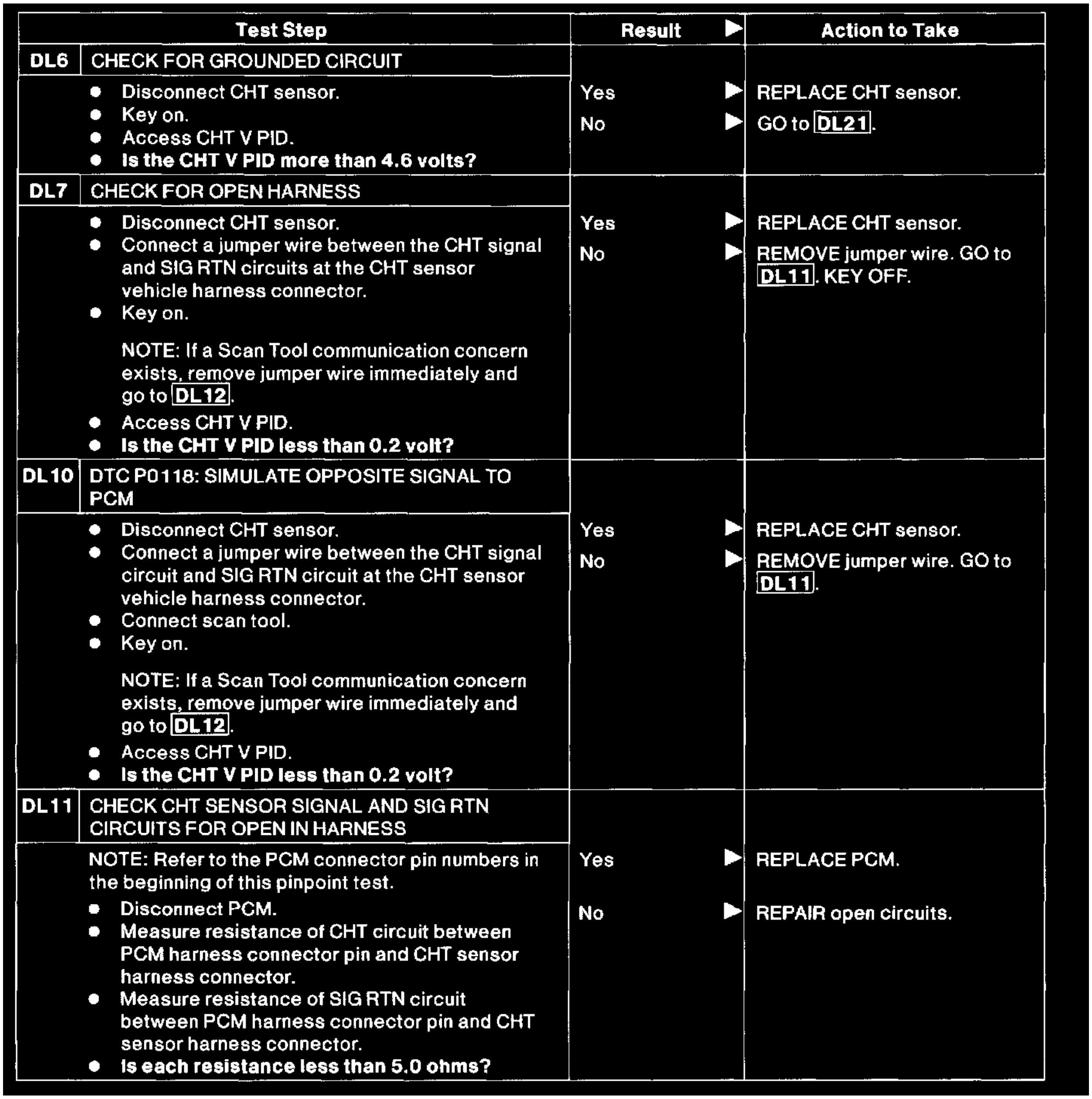
Voltage values were calculated for VREF = **5.0 volts**. These values can vary 15 percent due to sensor and VREF variations.



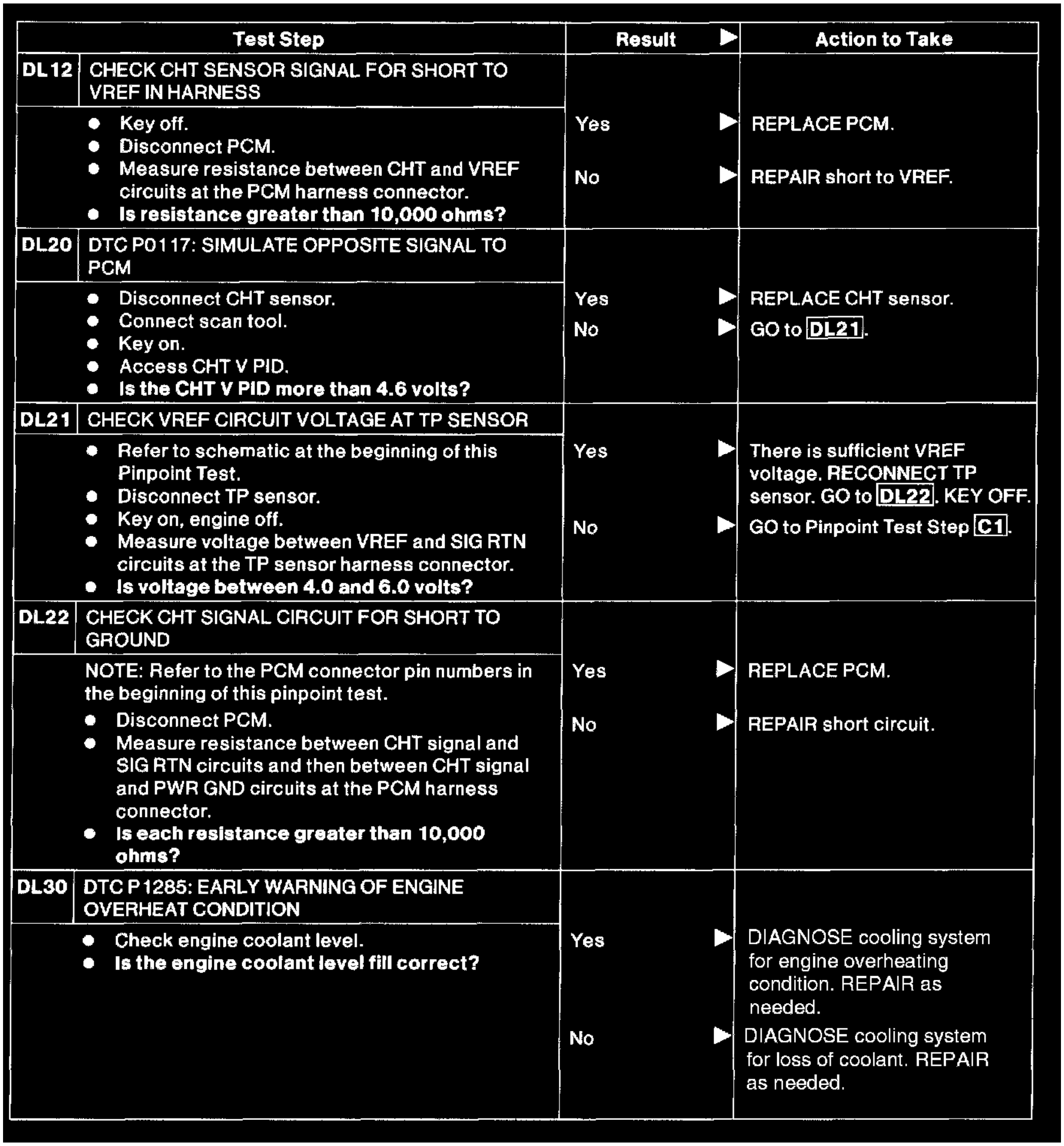

CYLINDER HEAD TEMPERATURE SENSOR HARNESS CONNECTOR
PCM PIN 91 (LS6/LS8; PCM PIN C17)
SIG RTN
PCM PIN 66 (LS6/LS8; PCM PIN C40)
CHT
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4818-B



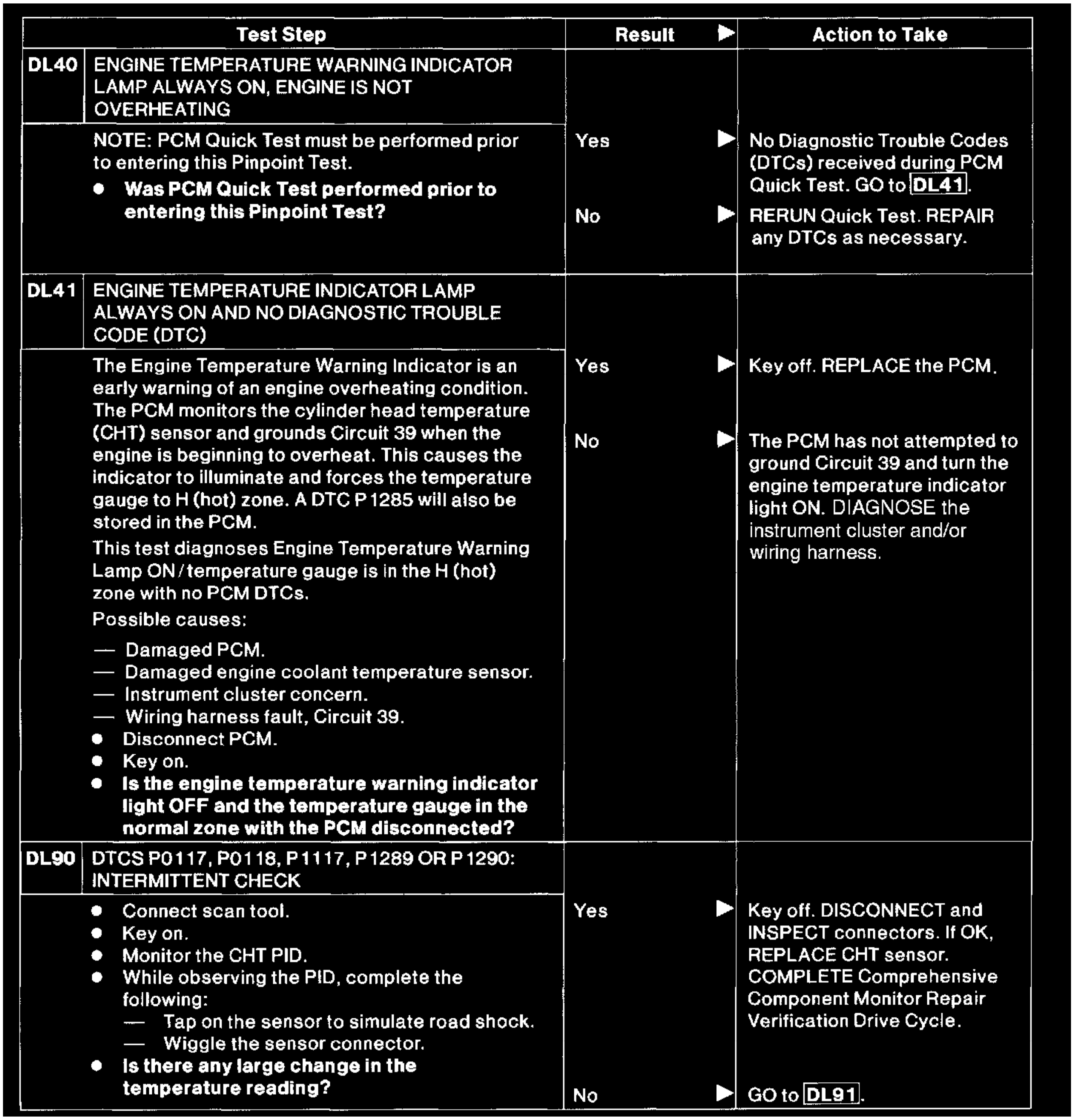
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DL1** | DTC P1288 OR P1116: CHECK OPERATION OF CYLINDER HEAD TEMPERATURE SENSOR | | |
| | ● Run engine at 2000 rpm until engine temperature becomes stabilized.<br>**No Starts:**<br>— GO to DL3.<br>**Vehicles that stall:**<br>— Return to Symptom Charts.<br>● Check that upper radiator hose is hot and pressurized.<br>● Rerun Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P1288 or P1116 present?** | Yes ▶<br>No ▶ | GO to DL2.<br>Engine temperature was not stabilized. REPAIR any other DTCs as necessary. |
| **DL2** | CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR | | |
| | ● Refer to schematic at the beginning of this pinpoint test.<br>● Disconnect throttle position (TP) sensor.<br>● Key on, engine off.<br>● Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is voltage between 4.0 volts and 6.0 volts?** | Yes ▶<br>No ▶ | There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL3.<br>GO to Pinpoint Test Step C1. |
| **DL3** | CHECK RESISTANCE OF CYLINDER HEAD TEMPERATURE SENSOR WITH ENGINE OFF | | |
| | ● Disconnect CHT sensor.<br>● Measure resistance between CHT signal and SIG RTN pins at the CHT sensor. Refer to the table at the beginning of this pinpoint test for resistance specifications.<br>● **Is resistance within specification?** | Yes ▶<br>No ▶ | GO to DL4.<br>REPLACE CHT sensor. |
| **DL4** | CHECK RESISTANCE OF CHT SENSOR WITH ENGINE RUNNING | | |
| | NOTE: Verify that engine is at operating temperature before taking CHT readings.<br>● Run engine for two minutes at 2000 rpm.<br>● Measure resistance between CHT signal and SIG RTN pins at the CHT sensor. Refer to the table at the beginning of this Pinpoint Test for resistance specifications.<br>● Key off.<br>● **Is resistance within specification?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE CHT sensor. |
| **DL5** | DTC P1289 OR P1290: ACCESS CHT PID AND CHECK VOLTAGE | | |
| | ● Connect scan tool.<br>● Key on, engine off.<br>● Access CHT V PID.<br>● **Is the CHT V PID less than 0.2 volt?** | Yes ▶<br>No ▶ | GO to DL6.<br>GO to DL7. |



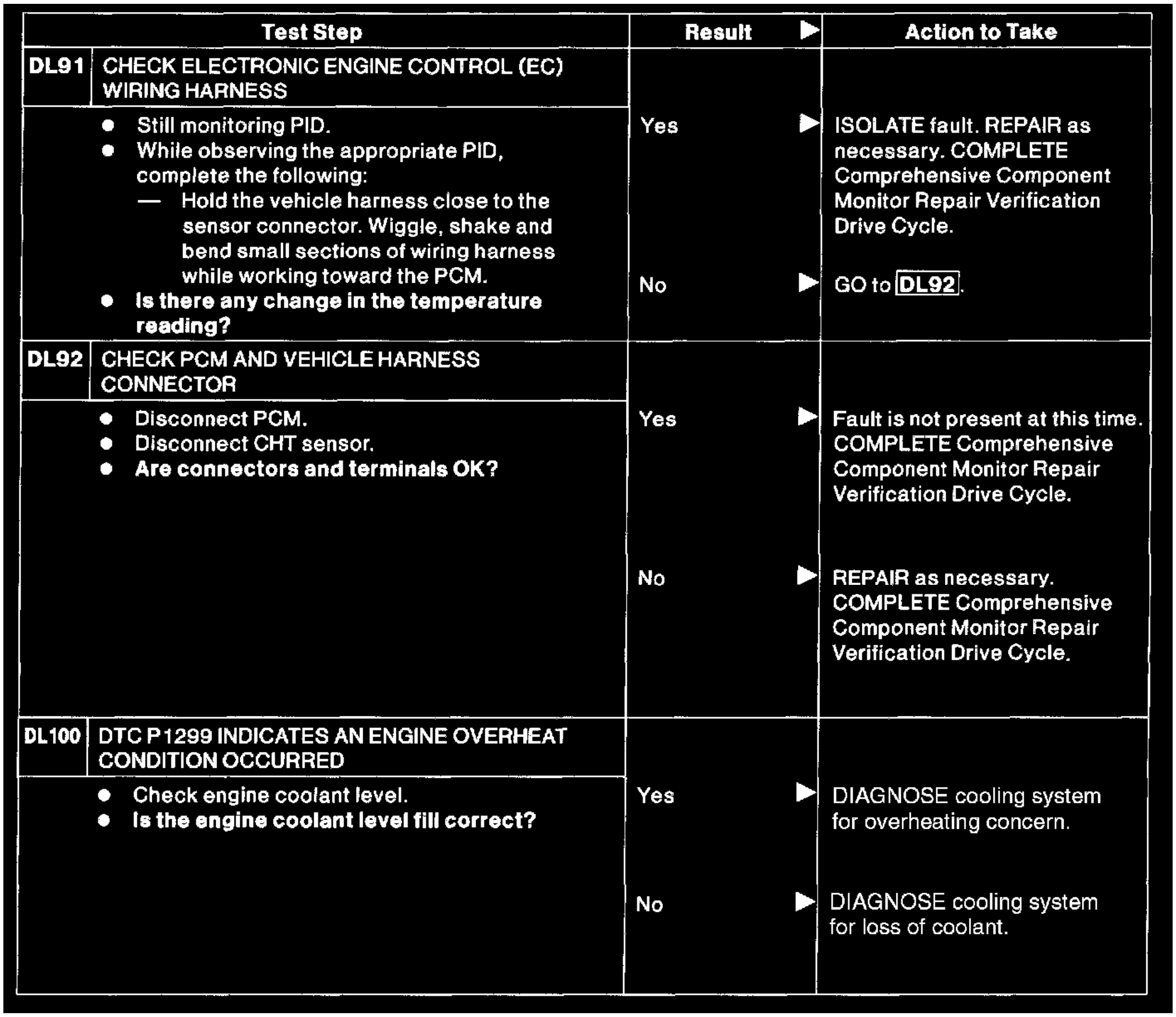
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DL6** | CHECK FOR GROUNDED CIRCUIT | | |
| | ● Disconnect CHT sensor.<br>● Key on.<br>● Access CHT V PID.<br>● **Is the CHT V PID more than 4.6 volts?** | Yes ▶<br>No ▶ | REPLACE CHT sensor.<br>GO to DL21. |
| **DL7** | CHECK FOR OPEN HARNESS | | |
| | ● Disconnect CHT sensor.<br>● Connect a jumper wire between the CHT signal and SIG RTN circuits at the CHT sensor vehicle harness connector.<br>● Key on.<br>NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12.<br>● Access CHT V PID.<br>● **Is the CHT V PID less than 0.2 volt?** | Yes ▶<br>No ▶ | REPLACE CHT sensor.<br>REMOVE jumper wire. GO to DL11. KEY OFF. |
| **DL10** | DTC P0118: SIMULATE OPPOSITE SIGNAL TO PCM | | |
| | ● Disconnect CHT sensor.<br>● Connect a jumper wire between the CHT signal circuit and SIG RTN circuit at the CHT sensor vehicle harness connector.<br>● Connect scan tool.<br>● Key on.<br>NOTE: If a Scan Tool communication concern exists, remove jumper wire immediately and go to DL12.<br>● Access CHT V PID.<br>● **Is the CHT V PID less than 0.2 volt?** | Yes ▶<br>No ▶ | REPLACE CHT sensor.<br>REMOVE jumper wire. GO to DL11. |
| **DL11** | CHECK CHT SENSOR SIGNAL AND SIG RTN CIRCUITS FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of CHT circuit between PCM harness connector pin and CHT sensor harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector pin and CHT sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuits. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DL12** | CHECK CHT SENSOR SIGNAL FOR SHORT TO VREF IN HARNESS<br>• Key off.<br>• Disconnect PCM.<br>• Measure resistance between CHT and VREF circuits at the PCM harness connector.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short to VREF. |
| **DL20** | DTC P0117: SIMULATE OPPOSITE SIGNAL TO PCM<br>• Disconnect CHT sensor.<br>• Connect scan tool.<br>• Key on.<br>• Access CHT V PID.<br>• **Is the CHT V PID more than 4.6 volts?** | Yes ▶ | REPLACE CHT sensor. |
| | | No ▶ | GO to DL21. |
| **DL21** | CHECK VREF CIRCUIT VOLTAGE AT TP SENSOR<br>• Refer to schematic at the beginning of this Pinpoint Test.<br>• Disconnect TP sensor.<br>• Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>• **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | There is sufficient VREF voltage. RECONNECT TP sensor. GO to DL22. KEY OFF. |
| | | No ▶ | GO to Pinpoint Test Step C1. |
| **DL22** | CHECK CHT SIGNAL CIRCUIT FOR SHORT TO GROUND<br>NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Disconnect PCM.<br>• Measure resistance between CHT signal and SIG RTN circuits and then between CHT signal and PWR GND circuits at the PCM harness connector.<br>• **Is each resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |
| **DL30** | DTC P1285: EARLY WARNING OF ENGINE OVERHEAT CONDITION<br>• Check engine coolant level.<br>• **Is the engine coolant level fill correct?** | Yes ▶ | DIAGNOSE cooling system for engine overheating condition. REPAIR as needed. |
| | | No ▶ | DIAGNOSE cooling system for loss of coolant. REPAIR as needed. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DL40** | ENGINE TEMPERATURE WARNING INDICATOR LAMP ALWAYS ON, ENGINE IS NOT OVERHEATING | | |
| | NOTE: PCM Quick Test must be performed prior to entering this Pinpoint Test.<br>● **Was PCM Quick Test performed prior to entering this Pinpoint Test?** | Yes ▶ | No Diagnostic Trouble Codes (DTCs) received during PCM Quick Test. GO to DL41. |
| | | No ▶ | RERUN Quick Test. REPAIR any DTCs as necessary. |
| **DL41** | ENGINE TEMPERATURE INDICATOR LAMP ALWAYS ON AND NO DIAGNOSTIC TROUBLE CODE (DTC) | | |
| | The Engine Temperature Warning Indicator is an early warning of an engine overheating condition. The PCM monitors the cylinder head temperature (CHT) sensor and grounds Circuit 39 when the engine is beginning to overheat. This causes the indicator to illuminate and forces the temperature gauge to H (hot) zone. A DTC P1285 will also be stored in the PCM.<br>This test diagnoses Engine Temperature Warning Lamp ON/temperature gauge is in the H (hot) zone with no PCM DTCs.<br>Possible causes:<br>— Damaged PCM.<br>— Damaged engine coolant temperature sensor.<br>— Instrument cluster concern.<br>— Wiring harness fault, Circuit 39.<br>● Disconnect PCM.<br>● Key on.<br>● **Is the engine temperature warning indicator light OFF and the temperature gauge in the normal zone with the PCM disconnected?** | Yes ▶ | Key off. REPLACE the PCM. |
| | | No ▶ | The PCM has not attempted to ground Circuit 39 and turn the engine temperature indicator light ON. DIAGNOSE the instrument cluster and/or wiring harness. |
| **DL90** | DTCS P0117, P0118, P1117, P1289 OR P1290: INTERMITTENT CHECK | | |
| | ● Connect scan tool.<br>● Key on.<br>● Monitor the CHT PID.<br>● While observing the PID, complete the following:<br>— Tap on the sensor to simulate road shock.<br>— Wiggle the sensor connector.<br>● **Is there any large change in the temperature reading?** | Yes ▶ | Key off. DISCONNECT and INSPECT connectors. If OK, REPLACE CHT sensor. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to DL91. |

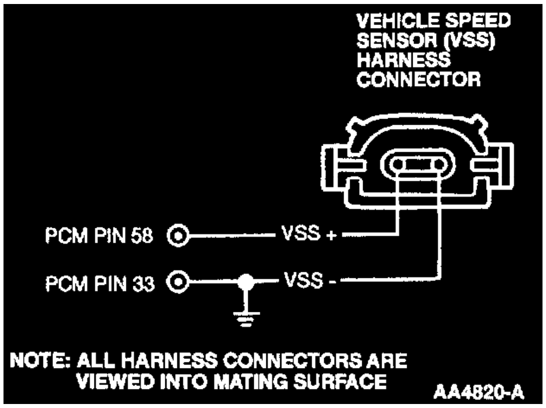


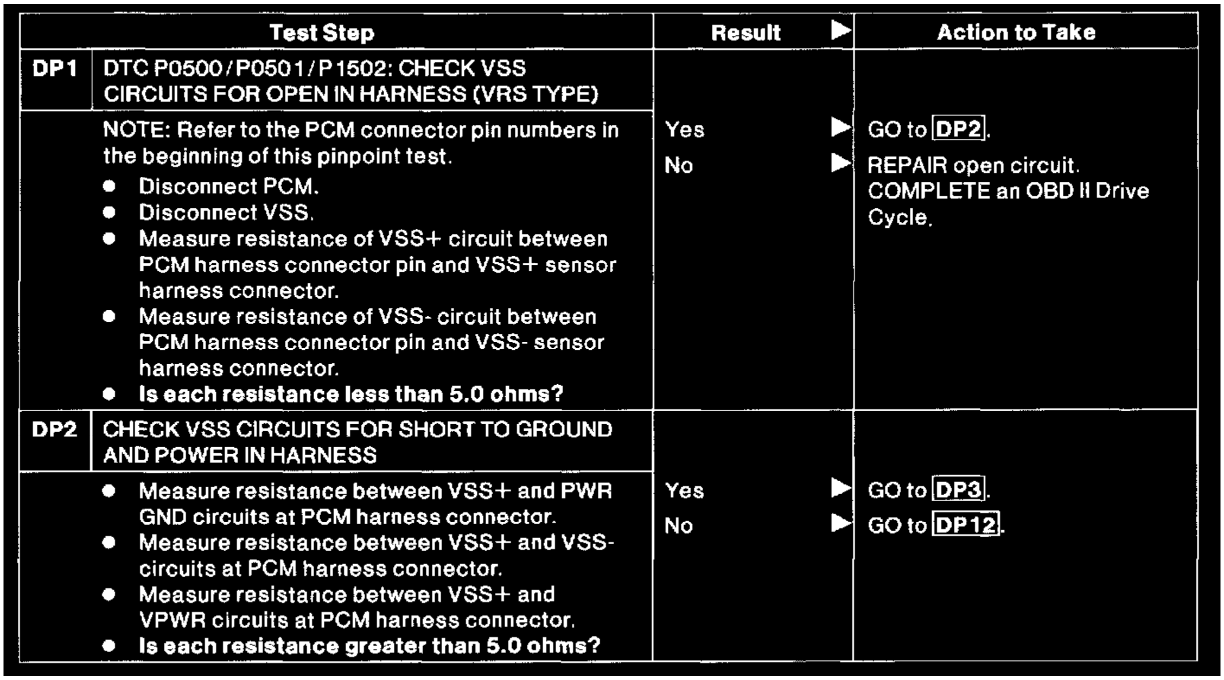
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DL91** | CHECK ELECTRONIC ENGINE CONTROL (EC) WIRING HARNESS | | |
| | • Still monitoring PID.<br>• While observing the appropriate PID, complete the following:<br>— Hold the vehicle harness close to the sensor connector. Wiggle, shake and bend small sections of wiring harness while working toward the PCM.<br>• **Is there any change in the temperature reading?** | Yes ▶ | ISOLATE fault. REPAIR as necessary. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to DL92. |
| **DL92** | CHECK PCM AND VEHICLE HARNESS CONNECTOR | | |
| | • Disconnect PCM.<br>• Disconnect CHT sensor.<br>• **Are connectors and terminals OK?** | Yes ▶ | Fault is not present at this time. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REPAIR as necessary. COMPLETE Comprehensive Component Monitor Repair Verification Drive Cycle. |
| **DL100** | DTC P1299 INDICATES AN ENGINE OVERHEAT CONDITION OCCURRED | | |
| | • Check engine coolant level.<br>• **Is the engine coolant level fill correct?** | Yes ▶ | DIAGNOSE cooling system for overheating concern. |
| | | No ▶ | DIAGNOSE cooling system for loss of coolant. |

# Test Notes

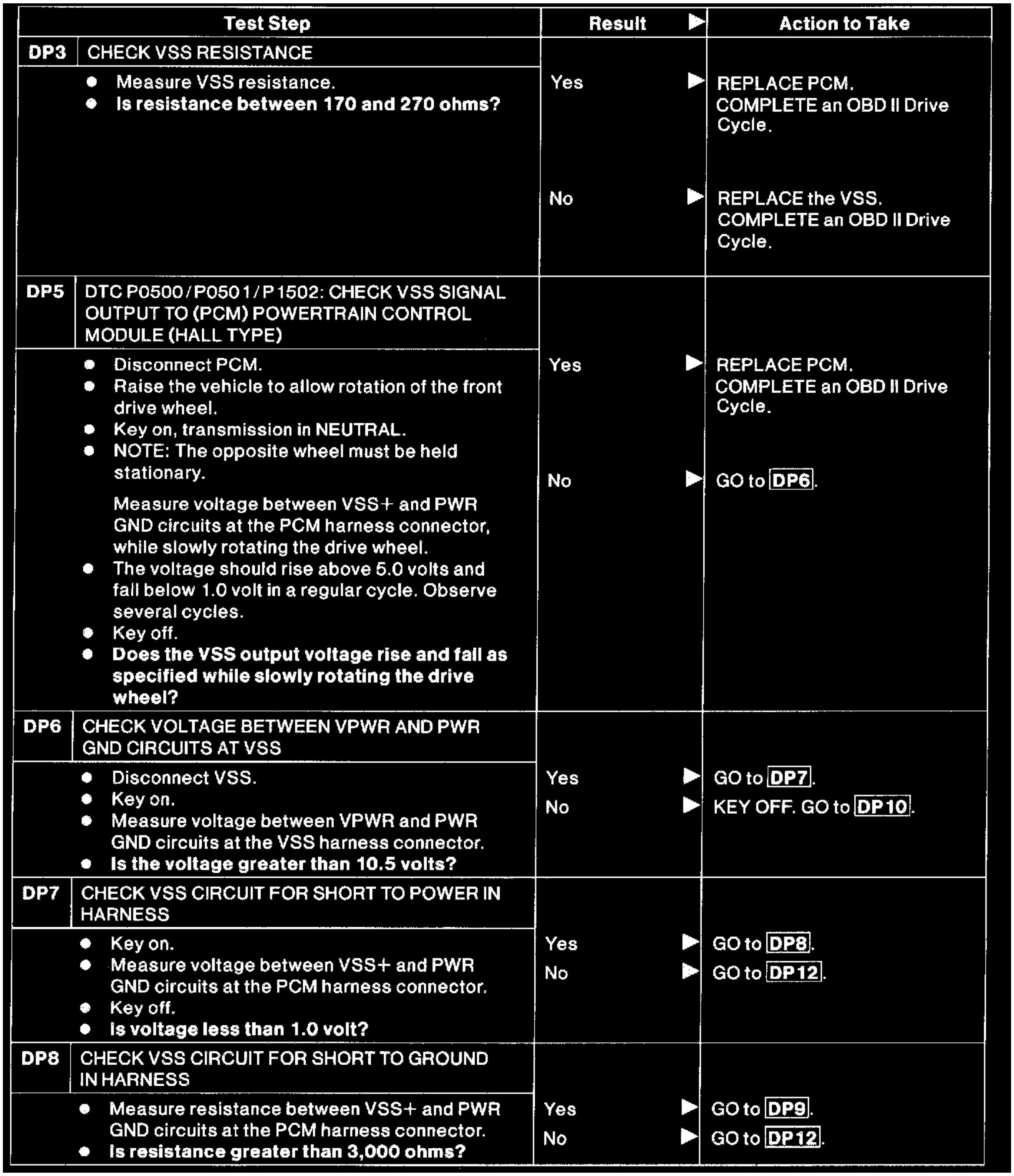
This Pinpoint Test is intended to diagnose the following:

- Vehicle Speed Sensor **(VSS)**
- Transfer Case Speed Sensor **(TCSS)**
- Harness circuits: VSS + and VSS -
- Harness circuits: TCSS and SIGRTN
- Powertrain Control Module **(PCM)**



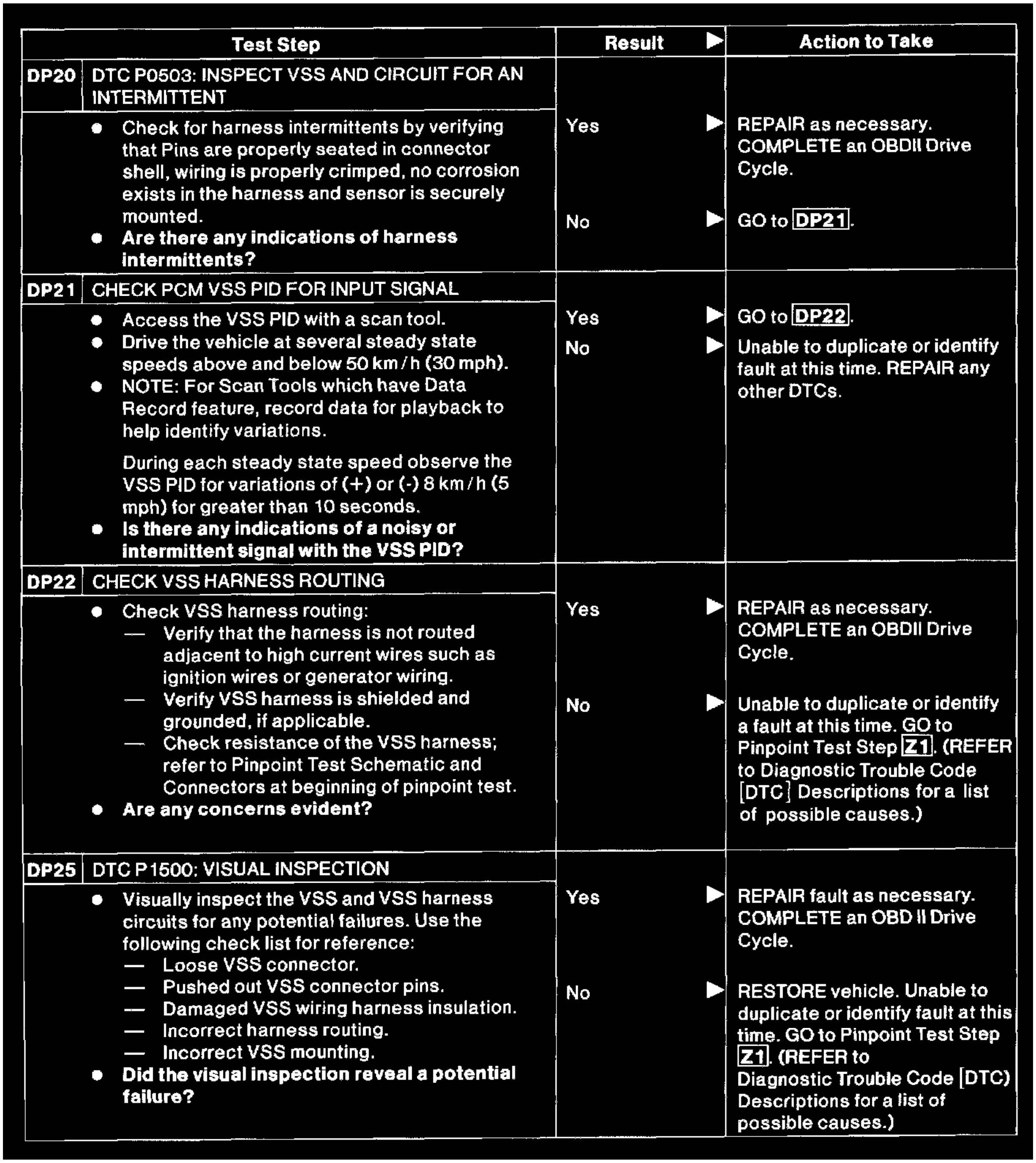


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DP1** | DTC P0500/P0501/P1502: CHECK VSS CIRCUITS FOR OPEN IN HARNESS (VRS TYPE) | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Disconnect VSS.<br>● Measure resistance of VSS+ circuit between PCM harness connector pin and VSS+ sensor harness connector.<br>● Measure resistance of VSS- circuit between PCM harness connector pin and VSS- sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DP2.<br>REPAIR open circuit. COMPLETE an OBD II Drive Cycle. |
| **DP2** | CHECK VSS CIRCUITS FOR SHORT TO GROUND AND POWER IN HARNESS | | |
| | ● Measure resistance between VSS+ and PWR GND circuits at PCM harness connector.<br>● Measure resistance between VSS+ and VSS- circuits at PCM harness connector.<br>● Measure resistance between VSS+ and VPWR circuits at PCM harness connector.<br>● **Is each resistance greater than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DP3.<br>GO to DP12. |



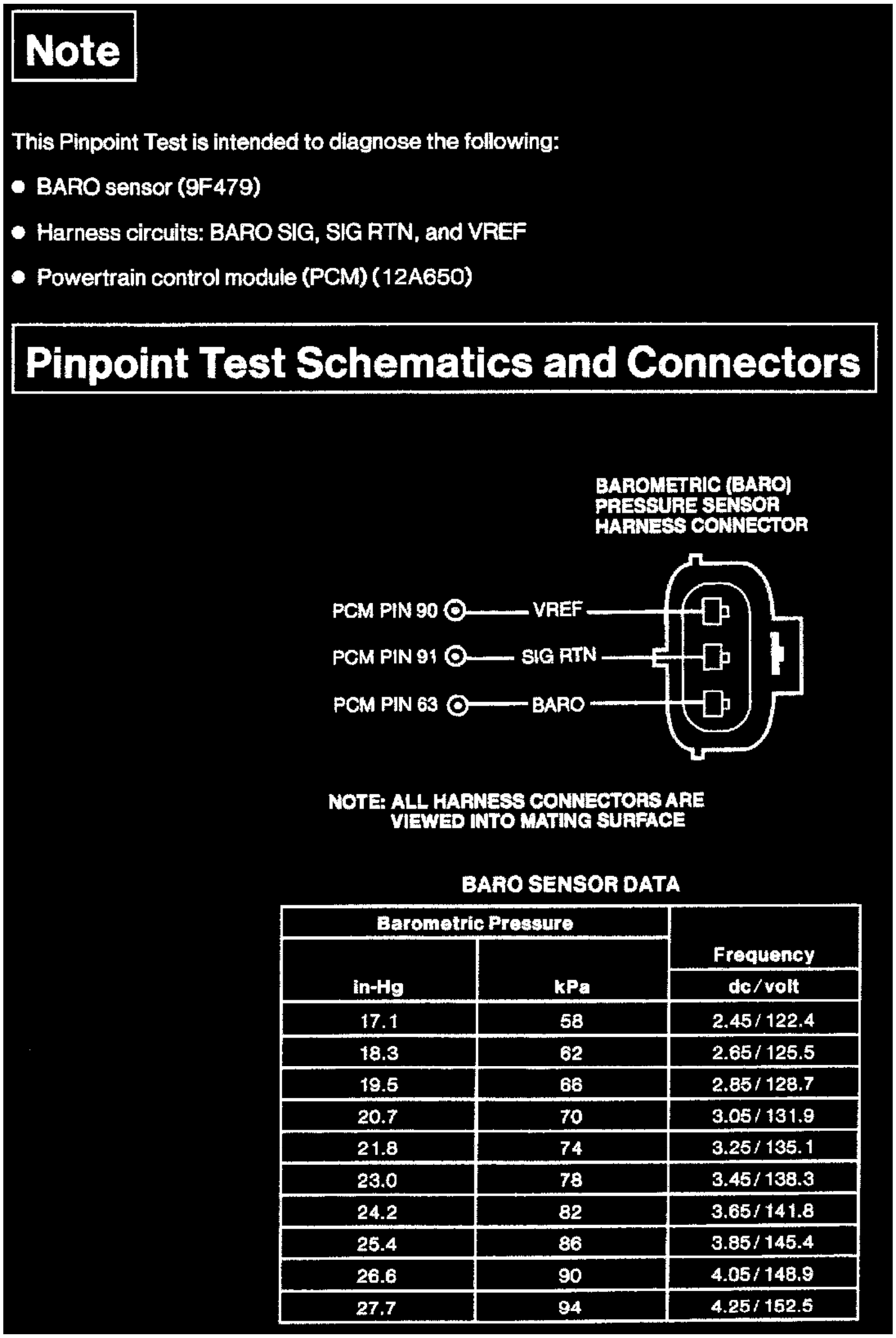
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DP3** | CHECK VSS RESISTANCE | | |
| | - Measure VSS resistance.<br>- **Is resistance between 170 and 270 ohms?** | Yes ▶ | REPLACE PCM. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | REPLACE the VSS. COMPLETE an OBD II Drive Cycle. |
| **DP5** | DTC P0500/P0501/P1502: CHECK VSS SIGNAL OUTPUT TO (PCM) POWERTRAIN CONTROL MODULE (HALL TYPE) | | |
| | - Disconnect PCM.<br>- Raise the vehicle to allow rotation of the front drive wheel.<br>- Key on, transmission in NEUTRAL.<br>- NOTE: The opposite wheel must be held stationary.<br>Measure voltage between VSS+ and PWR GND circuits at the PCM harness connector, while slowly rotating the drive wheel.<br>- The voltage should rise above 5.0 volts and fall below 1.0 volt in a regular cycle. Observe several cycles.<br>- Key off.<br>- **Does the VSS output voltage rise and fall as specified while slowly rotating the drive wheel?** | Yes ▶ | REPLACE PCM. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | GO to **DP6**. |
| **DP6** | CHECK VOLTAGE BETWEEN VPWR AND PWR GND CIRCUITS AT VSS | | |
| | - Disconnect VSS.<br>- Key on.<br>- Measure voltage between VPWR and PWR GND circuits at the VSS harness connector.<br>- **Is the voltage greater than 10.5 volts?** | Yes ▶ | GO to **DP7**. |
| | | No ▶ | KEY OFF. GO to **DP10**. |
| **DP7** | CHECK VSS CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | - Key on.<br>- Measure voltage between VSS+ and PWR GND circuits at the PCM harness connector.<br>- Key off.<br>- **Is voltage less than 1.0 volt?** | Yes ▶ | GO to **DP8**. |
| | | No ▶ | GO to **DP12**. |
| **DP8** | CHECK VSS CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | - Measure resistance between VSS+ and PWR GND circuits at the PCM harness connector.<br>- **Is resistance greater than 3,000 ohms?** | Yes ▶ | GO to **DP9**. |
| | | No ▶ | GO to **DP12**. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DP9** | CHECK VSS SIGNAL CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of VSS+ signal circuit between PCM harness connector pin and VSS+ sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE VSS. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | REPAIR open circuit. COMPLETE an OBD II Drive Cycle. |
| **DP10** | CHECK VSS GROUND CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of PWR GND circuit between VSS harness connector and chassis ground.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPAIR open VPWR to VSS. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | REPAIR open VSS PWR GND circuit. COMPLETE an OBD II Drive Cycle. |
| **DP12** | VERIFY IF VSS CIRCUIT IS SHORTED IN HARNESS OR ANOTHER MODULE | | |
| | ● Determine which, if any, modules are connected to the VSS circuit (Refer to Wiring Diagrams). If no other modules are connected to the VSS circuit, GO to the "YES" Action To Take.<br>● One at a time, disconnect the modules associated with the VSS circuit. After disconnecting each module, again test for short circuit (Refer to test step that sent you here). Repeat until each associated module has been disconnected or the short circuit has been eliminated.<br>● **Does the short circuit remain after all associated modules were disconnected?** | Yes ▶ | REPAIR short circuit. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | DIAGNOSE the appropriate module. |
| **DP15** | KOER DTC P1501: CHECK PCM VSS PID FOR INPUT SIGNAL | | |
| | ● Start the engine and idle in NEUTRAL.<br>● Access the VSS PID with a scan tool and observe for vehicle speed input to the PCM.<br>● Increase the engine speed, not greater than 2000 rpm, several times while observing the VSS PID.<br>● **Is the reading on the VSS PID less than 5 km/h (3 mph)?** | Yes ▶ | Unable to duplicate or identify fault at this time. If DTC P1501 still exists, GO to Pinpoint Test Step, Z1. (REFER to Diagnostic Trouble Code [DTC] Descriptions for a list of possible causes.) |
| | | No ▶ | GO to DP22. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DP20** | DTC P0503: INSPECT VSS AND CIRCUIT FOR AN INTERMITTENT | | |
| | • Check for harness intermittents by verifying that Pins are properly seated in connector shell, wiring is properly crimped, no corrosion exists in the harness and sensor is securely mounted.<br>• **Are there any indications of harness intermittents?** | Yes ▶ | REPAIR as necessary. COMPLETE an OBDII Drive Cycle. |
| | | No ▶ | GO to DP21. |
| **DP21** | CHECK PCM VSS PID FOR INPUT SIGNAL | | |
| | • Access the VSS PID with a scan tool.<br>• Drive the vehicle at several steady state speeds above and below 50 km/h (30 mph).<br>• NOTE: For Scan Tools which have Data Record feature, record data for playback to help identify variations.<br>During each steady state speed observe the VSS PID for variations of (+) or (-) 8 km/h (5 mph) for greater than 10 seconds.<br>• **Is there any indications of a noisy or intermittent signal with the VSS PID?** | Yes ▶ | GO to DP22. |
| | | No ▶ | Unable to duplicate or identify fault at this time. REPAIR any other DTCs. |
| **DP22** | CHECK VSS HARNESS ROUTING | | |
| | • Check VSS harness routing:<br>— Verify that the harness is not routed adjacent to high current wires such as ignition wires or generator wiring.<br>— Verify VSS harness is shielded and grounded, if applicable.<br>— Check resistance of the VSS harness; refer to Pinpoint Test Schematic and Connectors at beginning of pinpoint test.<br>• **Are any concerns evident?** | Yes ▶ | REPAIR as necessary. COMPLETE an OBDII Drive Cycle. |
| | | No ▶ | Unable to duplicate or identify a fault at this time. GO to Pinpoint Test Step Z1. (REFER to Diagnostic Trouble Code [DTC] Descriptions for a list of possible causes.) |
| **DP25** | DTC P1500: VISUAL INSPECTION | | |
| | • Visually inspect the VSS and VSS harness circuits for any potential failures. Use the following check list for reference:<br>— Loose VSS connector.<br>— Pushed out VSS connector pins.<br>— Damaged VSS wiring harness insulation.<br>— Incorrect harness routing.<br>— Incorrect VSS mounting.<br>• **Did the visual inspection reveal a potential failure?** | Yes ▶ | REPAIR fault as necessary. COMPLETE an OBD II Drive Cycle. |
| | | No ▶ | RESTORE vehicle. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. (REFER to Diagnostic Trouble Code [DTC) Descriptions for a list of possible causes.) |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DP30** | DTC P0500, P0503 VISUAL INSPECTION | | |
| | NOTE: The transfer case speed sensor (TCSS) provides rotational speed of output shaft of the transfer case. The PCM use this information to control powertrain behavior and on some applications is used as the source of vehicle speed information (if not equipped with OSS).<br>● Disconnect TCSS sensor.<br>● Inspect TCSS vehicle harness connector for damage and proper seating.<br>● **Have any problems been found?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to DP31. |
| **DP31** | CHECK RESISTANCE OF TCSS SENSOR | | |
| | ● Measure resistance between TCSS signal and TCSS SIGTRN circuits at the TCSS sensor.<br>● **Is resistance between 1,000 and 1,250 ohms?** | Yes ▶<br>No ▶ | GO to DP32.<br>REPLACE TCSS sensor. |
| **DP32** | TCSS OUTPUT CHECK | | |
| | ● Measure frequency between TCSS signal and TCSS SIGRTN circuits at the TCSS sensor.<br>● Drive vehicle between 0 and 48 km/h (0 and 30 mph).<br>● Refer to Reference Values for freuqency ranges.<br>● **Does frequency reading increase and decrease with vehicle speed?** | Yes ▶<br>No ▶ | GO to DP33.<br>REMOVE the TCSS and inspect target wheel. REPAIR as necessary. IF OK REPLACE TCSS. |
| **DP33** | CHECK HARNESS FOR SHORT TO PWR | | |
| | ● Key on.<br>● TCSS sensor disconnected.<br>● Measure voltage between the TCSS signal circuit at the TCSS harness connector and ground.<br>● **If voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to DP34.<br>REPAIR short circuit. |
| **DP34** | CHECK HARNESS FOR OPEN | | |
| | ● Disconnect PCM.<br>● Measure resistance of TCSS signal circuit between PCM harness connector pin and TCSS sensor harness connector.<br>● Measure resistance of TCSS SIGRTN circuit between PCM harness connector pin and TCSS sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to DP35.<br>REPAIR open circuit. |
| **DP35** | CHECK HARNESS FOR SHORT TO GROUND | | |
| | ● Measure resistance between TCSS signal and SIGRTN circuits at the TCSS harness connector.<br>● Measure resistance between TCSS signal and GND circuits at the TCSS harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |



## Note

This Pinpoint Test is intended to diagnose the following:

- BARO sensor (9F479)
- Harness circuits: BARO SIG, SIG RTN, and VREF
- Powertrain control module (PCM) (12A650)

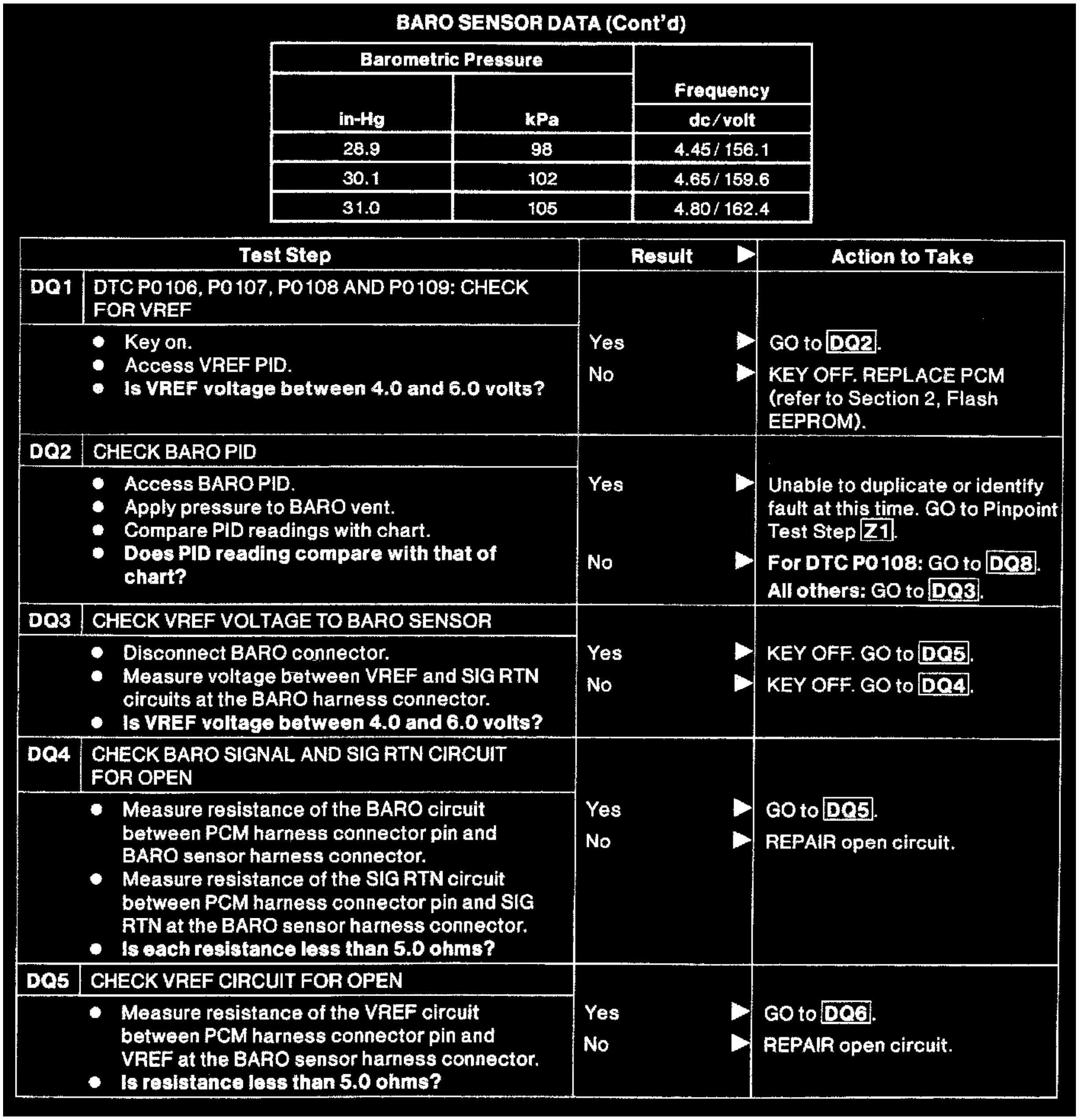
## Pinpoint Test Schematics and Connectors

NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE

**BARO SENSOR DATA**

| Barometric Pressure | | Frequency |
|---|---|---|
| in-Hg | kPa | dc/volt |
| 17.1 | 58 | 2.45/122.4 |
| 18.3 | 62 | 2.65/125.5 |
| 19.5 | 66 | 2.85/128.7 |
| 20.7 | 70 | 3.05/131.9 |
| 21.8 | 74 | 3.25/135.1 |
| 23.0 | 78 | 3.45/138.3 |
| 24.2 | 82 | 3.65/141.8 |
| 25.4 | 86 | 3.85/145.4 |
| 26.6 | 90 | 4.05/148.9 |
| 27.7 | 94 | 4.25/152.5 |

Harness Connector

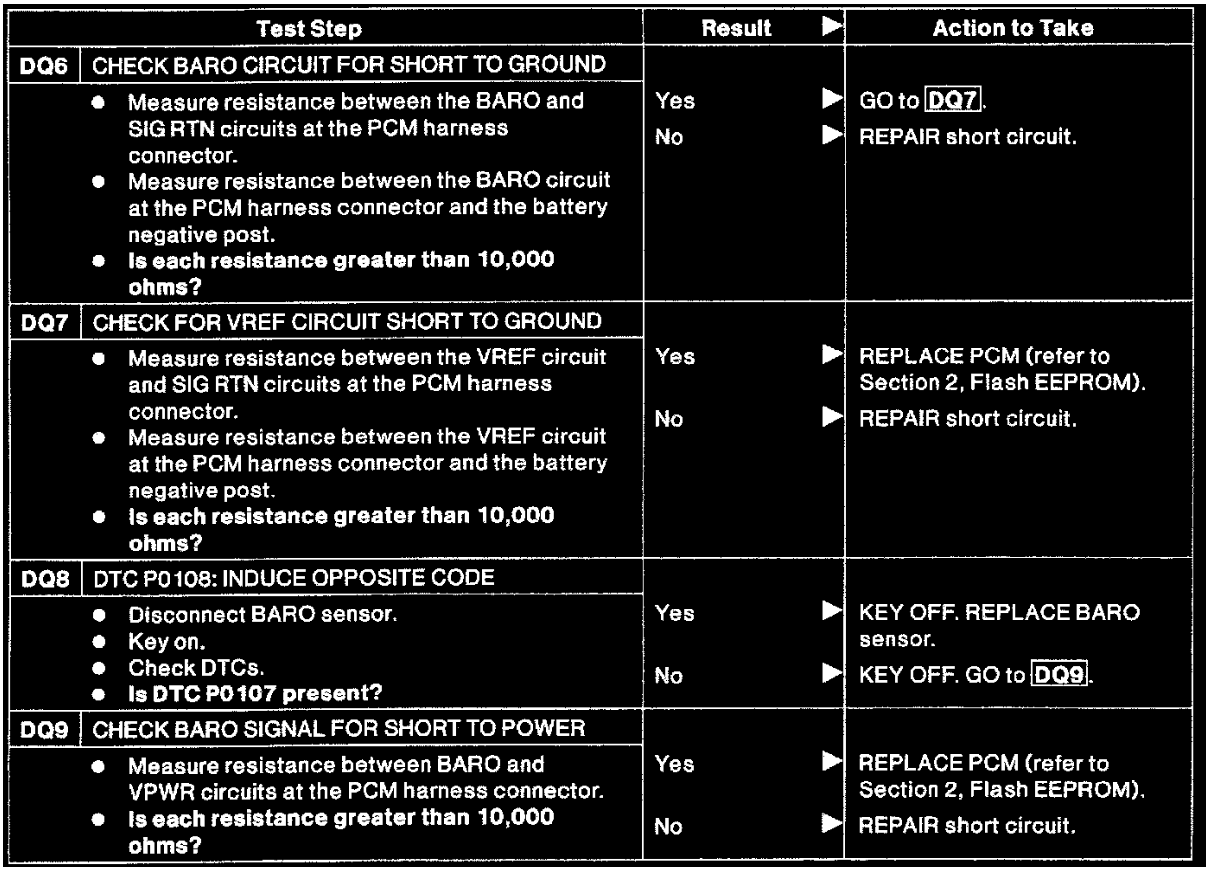


**BARO SENSOR DATA (Cont'd)**

| Barometric Pressure | | Frequency |
|---|---|---|
| in-Hg | kPa | dc/volt |
| 28.9 | 98 | 4.45 / 156.1 |
| 30.1 | 102 | 4.65 / 159.6 |
| 31.0 | 105 | 4.80 / 162.4 |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DQ1** | DTC P0106, P0107, P0108 AND P0109: CHECK FOR VREF | | |
| | ● Key on.<br>● Access VREF PID.<br>● **Is VREF voltage between 4.0 and 6.0 volts?** | Yes ▶ | GO to DQ2. |
| | | No ▶ | KEY OFF. REPLACE PCM (refer to Section 2, Flash EEPROM). |
| **DQ2** | CHECK BARO PID | | |
| | ● Access BARO PID.<br>● Apply pressure to BARO vent.<br>● Compare PID readings with chart.<br>● **Does PID reading compare with that of chart?** | Yes ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| | | No ▶ | **For DTC P0108:** GO to DQ8.<br>**All others:** GO to DQ3. |
| **DQ3** | CHECK VREF VOLTAGE TO BARO SENSOR | | |
| | ● Disconnect BARO connector.<br>● Measure voltage between VREF and SIG RTN circuits at the BARO harness connector.<br>● **Is VREF voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. GO to DQ5. |
| | | No ▶ | KEY OFF. GO to DQ4. |
| **DQ4** | CHECK BARO SIGNAL AND SIG RTN CIRCUIT FOR OPEN | | |
| | ● Measure resistance of the BARO circuit between PCM harness connector pin and BARO sensor harness connector.<br>● Measure resistance of the SIG RTN circuit between PCM harness connector pin and SIG RTN at the BARO sensor harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶ | GO to DQ5. |
| | | No ▶ | REPAIR open circuit. |
| **DQ5** | CHECK VREF CIRCUIT FOR OPEN | | |
| | ● Measure resistance of the VREF circuit between PCM harness connector pin and VREF at the BARO sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to DQ6. |
| | | No ▶ | REPAIR open circuit. |

DQ1-DQ5



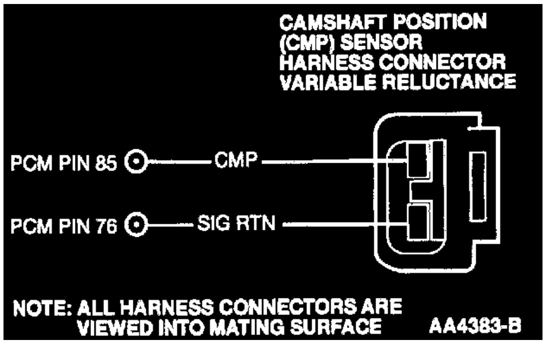
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DQ6** | CHECK BARO CIRCUIT FOR SHORT TO GROUND<br>● Measure resistance between the BARO and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance between the BARO circuit at the PCM harness connector and the battery negative post.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to DQ7.<br>REPAIR short circuit. |
| **DQ7** | CHECK FOR VREF CIRCUIT SHORT TO GROUND<br>● Measure resistance between the VREF circuit and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance between the VREF circuit at the PCM harness connector and the battery negative post.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM (refer to Section 2, Flash EEPROM).<br>REPAIR short circuit. |
| **DQ8** | DTC P0108: INDUCE OPPOSITE CODE<br>● Disconnect BARO sensor.<br>● Key on.<br>● Check DTCs.<br>● **Is DTC P0107 present?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE BARO sensor.<br>KEY OFF. GO to DQ9. |
| **DQ9** | CHECK BARO SIGNAL FOR SHORT TO POWER<br>● Measure resistance between BARO and VPWR circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM (refer to Section 2, Flash EEPROM).<br>REPAIR short circuit. |

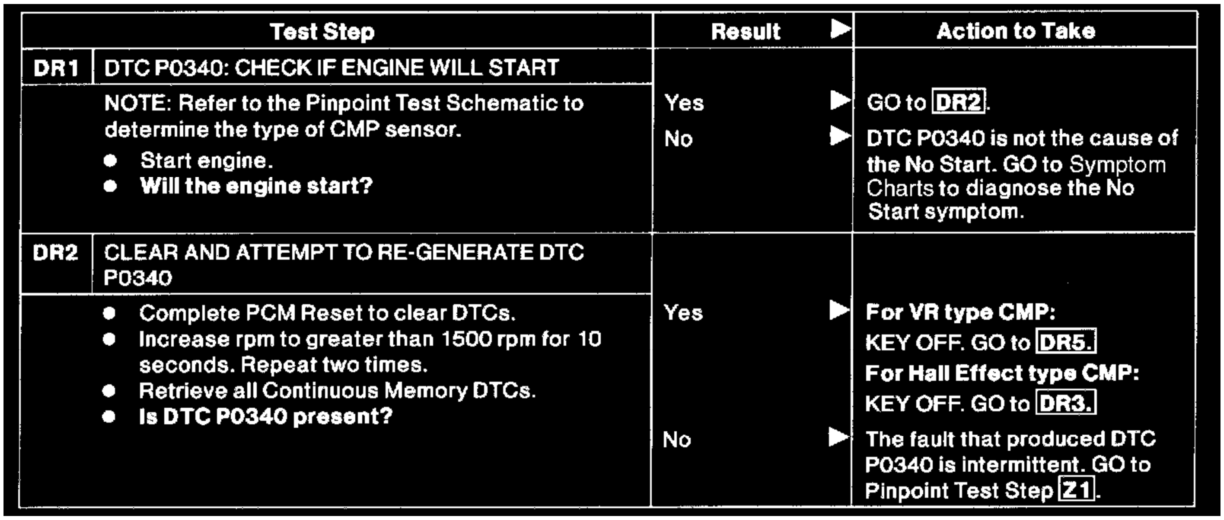
**DQ6-DQ9**

# Test Notes

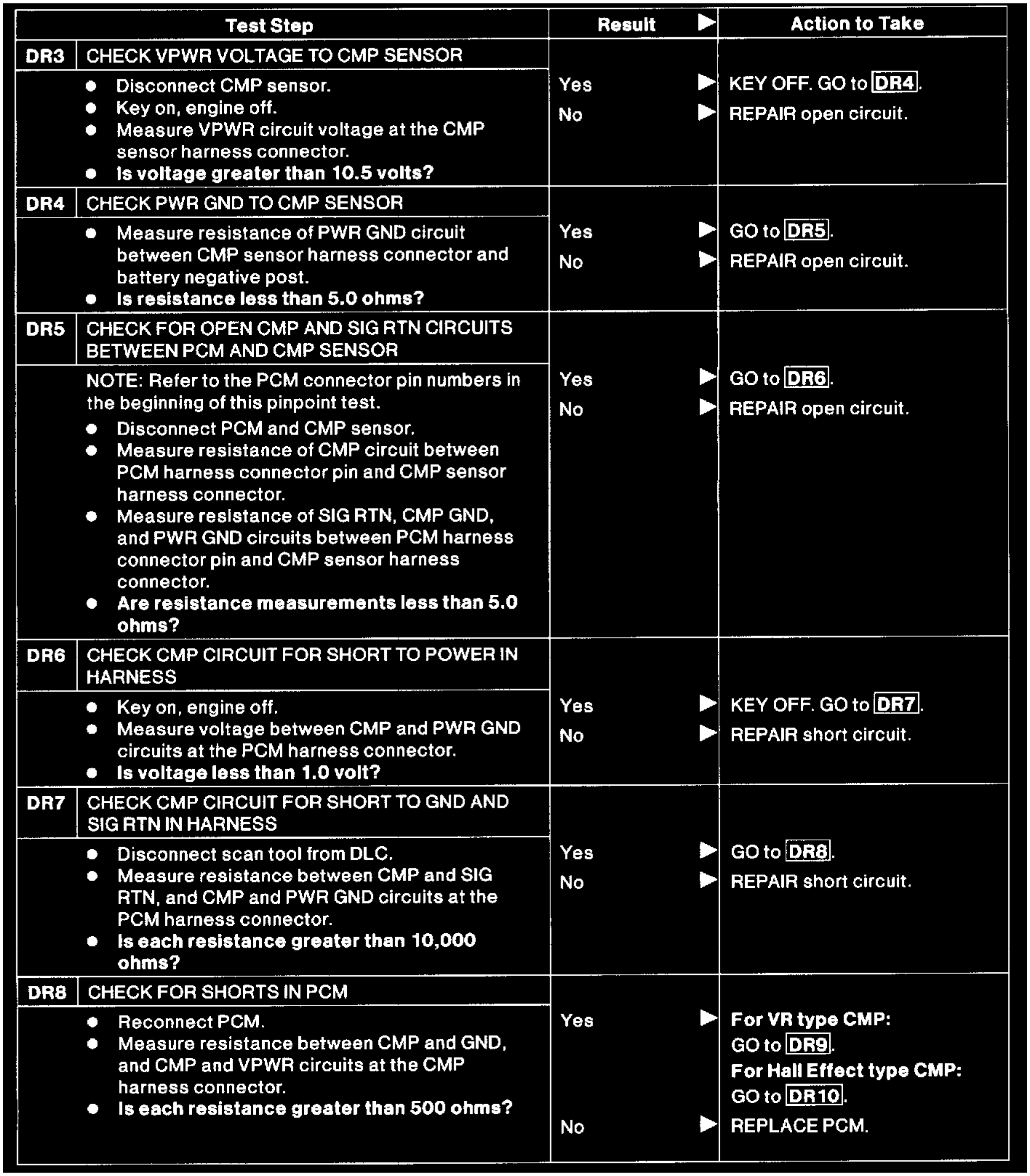
This Pinpoint Test is intended to diagnose the following:

- Camshaft Position **(CMP)** Sensor
- Harness Circuits: CMP, VPWR, SIG RTN, PWR GND, CMP/TSS GND
- Powertrain Control Module **(PCM)**

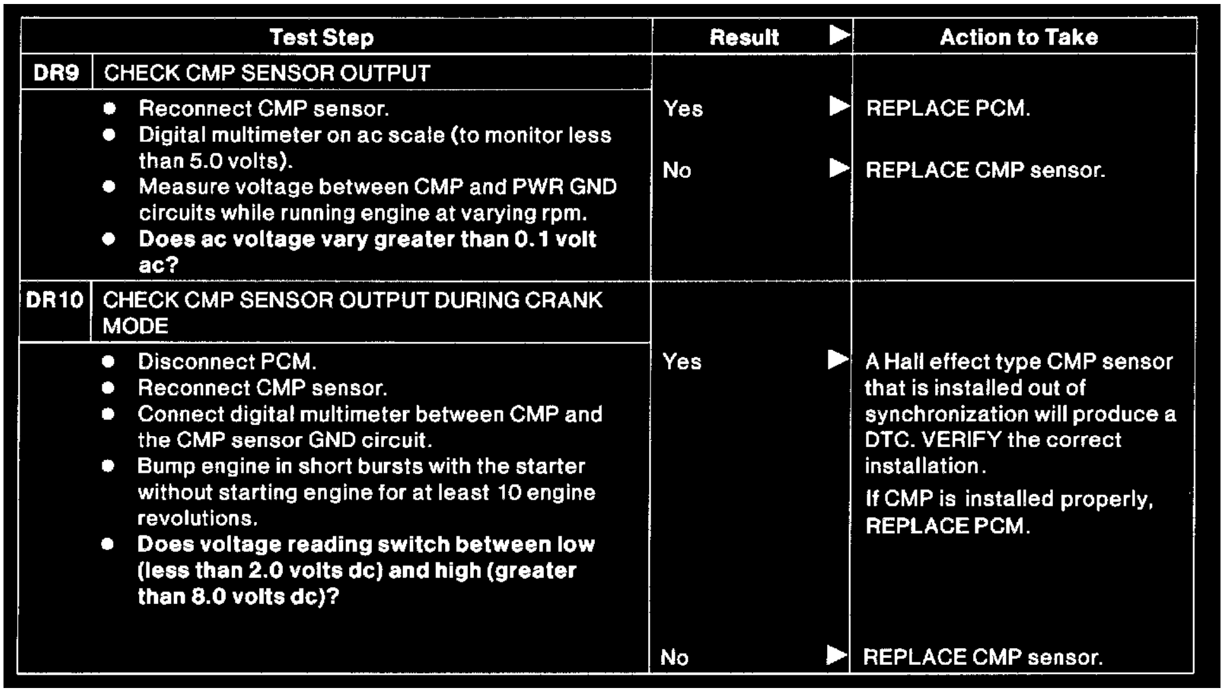




| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DR1 | DTC P0340: CHECK IF ENGINE WILL START | | |
| | NOTE: Refer to the Pinpoint Test Schematic to determine the type of CMP sensor.<br>● Start engine.<br>● **Will the engine start?** | Yes ▶ | GO to DR2. |
| | | No ▶ | DTC P0340 is not the cause of the No Start. GO to Symptom Charts to diagnose the No Start symptom. |
| DR2 | CLEAR AND ATTEMPT TO RE-GENERATE DTC P0340 | | |
| | ● Complete PCM Reset to clear DTCs.<br>● Increase rpm to greater than 1500 rpm for 10 seconds. Repeat two times.<br>● Retrieve all Continuous Memory DTCs.<br>● **Is DTC P0340 present?** | Yes ▶ | **For VR type CMP:**<br>KEY OFF. GO to DR5.<br>**For Hall Effect type CMP:**<br>KEY OFF. GO to DR3. |
| | | No ▶ | The fault that produced DTC P0340 is intermittent. GO to Pinpoint Test Step Z1. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| DR3 | CHECK VPWR VOLTAGE TO CMP SENSOR | | |
| | ● Disconnect CMP sensor.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the CMP sensor harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | KEY OFF. GO to DR4. |
| | | No ▶ | REPAIR open circuit. |
| DR4 | CHECK PWR GND TO CMP SENSOR | | |
| | ● Measure resistance of PWR GND circuit between CMP sensor harness connector and battery negative post.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to DR5. |
| | | No ▶ | REPAIR open circuit. |
| DR5 | CHECK FOR OPEN CMP AND SIG RTN CIRCUITS BETWEEN PCM AND CMP SENSOR | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM and CMP sensor.<br>● Measure resistance of CMP circuit between PCM harness connector pin and CMP sensor harness connector.<br>● Measure resistance of SIG RTN, CMP GND, and PWR GND circuits between PCM harness connector pin and CMP sensor harness connector.<br>● **Are resistance measurements less than 5.0 ohms?** | Yes ▶ | GO to DR6. |
| | | No ▶ | REPAIR open circuit. |
| DR6 | CHECK CMP CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure voltage between CMP and PWR GND circuits at the PCM harness connector.<br>● **Is voltage less than 1.0 volt?** | Yes ▶ | KEY OFF. GO to DR7. |
| | | No ▶ | REPAIR short circuit. |
| DR7 | CHECK CMP CIRCUIT FOR SHORT TO GND AND SIG RTN IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between CMP and SIG RTN, and CMP and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶ | GO to DR8. |
| | | No ▶ | REPAIR short circuit. |
| DR8 | CHECK FOR SHORTS IN PCM | | |
| | ● Reconnect PCM.<br>● Measure resistance between CMP and GND, and CMP and VPWR circuits at the CMP harness connector.<br>● **Is each resistance greater than 500 ohms?** | Yes ▶ | **For VR type CMP:**<br>GO to DR9.<br>**For Hall Effect type CMP:**<br>GO to DR10. |
| | | No ▶ | REPLACE PCM. |

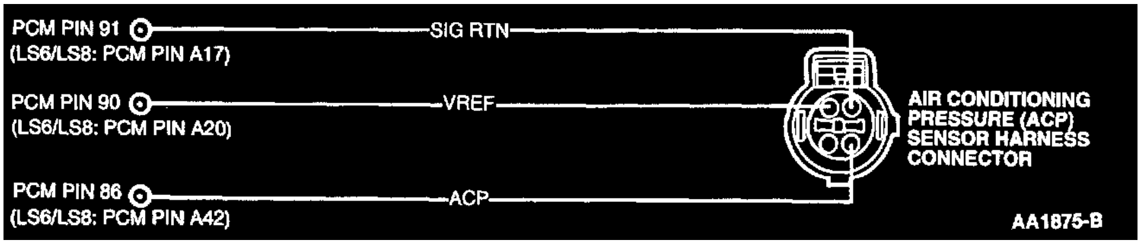


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DR9** | CHECK CMP SENSOR OUTPUT | | |
| | ● Reconnect CMP sensor.<br>● Digital multimeter on ac scale (to monitor less than 5.0 volts).<br>● Measure voltage between CMP and PWR GND circuits while running engine at varying rpm.<br>● **Does ac voltage vary greater than 0.1 volt ac?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE CMP sensor. |
| **DR10** | CHECK CMP SENSOR OUTPUT DURING CRANK MODE | | |
| | ● Disconnect PCM.<br>● Reconnect CMP sensor.<br>● Connect digital multimeter between CMP and the CMP sensor GND circuit.<br>● Bump engine in short bursts with the starter without starting engine for at least 10 engine revolutions.<br>● **Does voltage reading switch between low (less than 2.0 volts dc) and high (greater than 8.0 volts dc)?** | Yes ▶ | A Hall effect type CMP sensor that is installed out of synchronization will produce a DTC. VERIFY the correct installation.<br>If CMP is installed properly, REPLACE PCM. |
| | | No ▶ | REPLACE CMP sensor. |

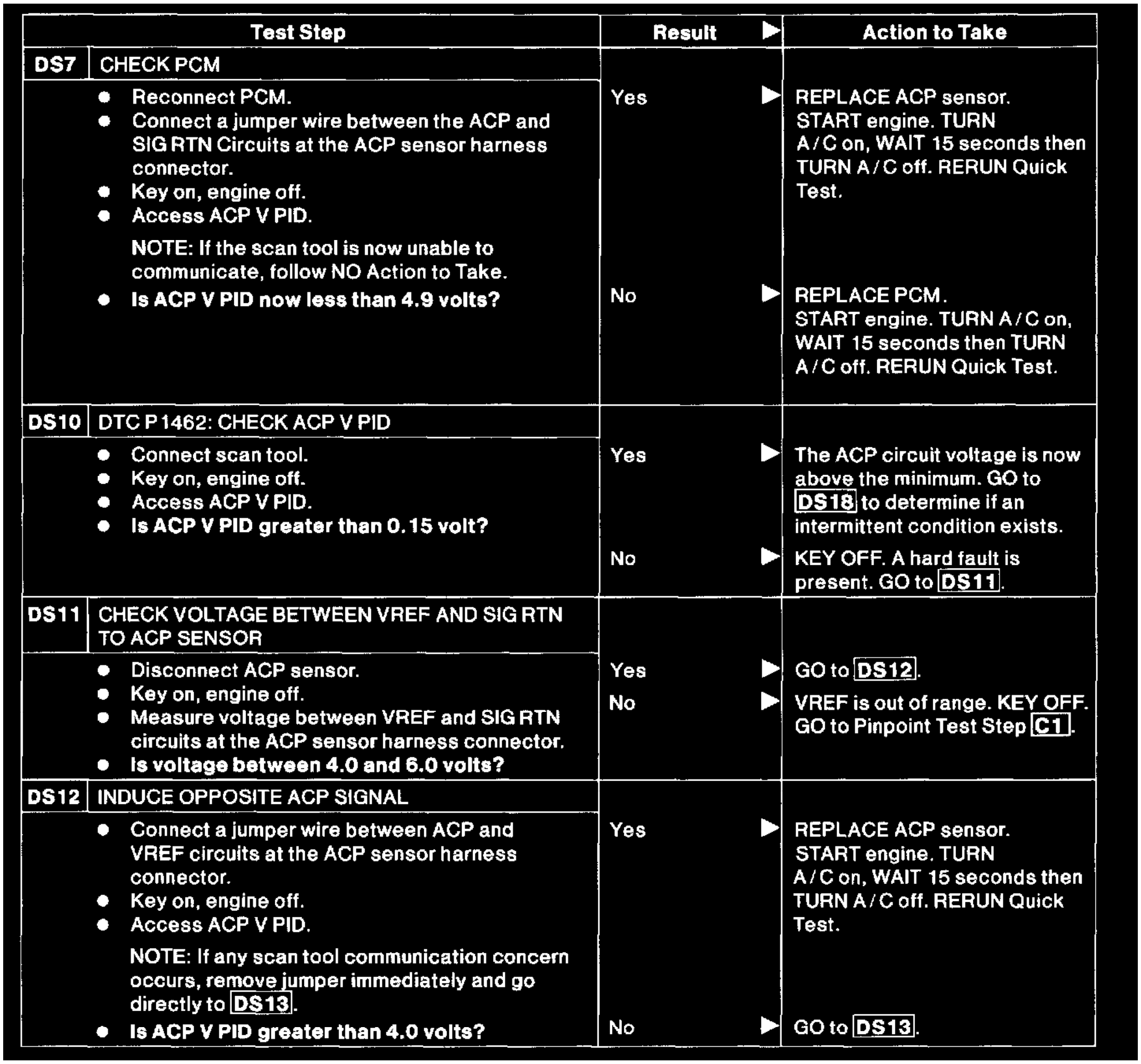
## Test Notes

This Pinpoint Test is intended to diagnose the following

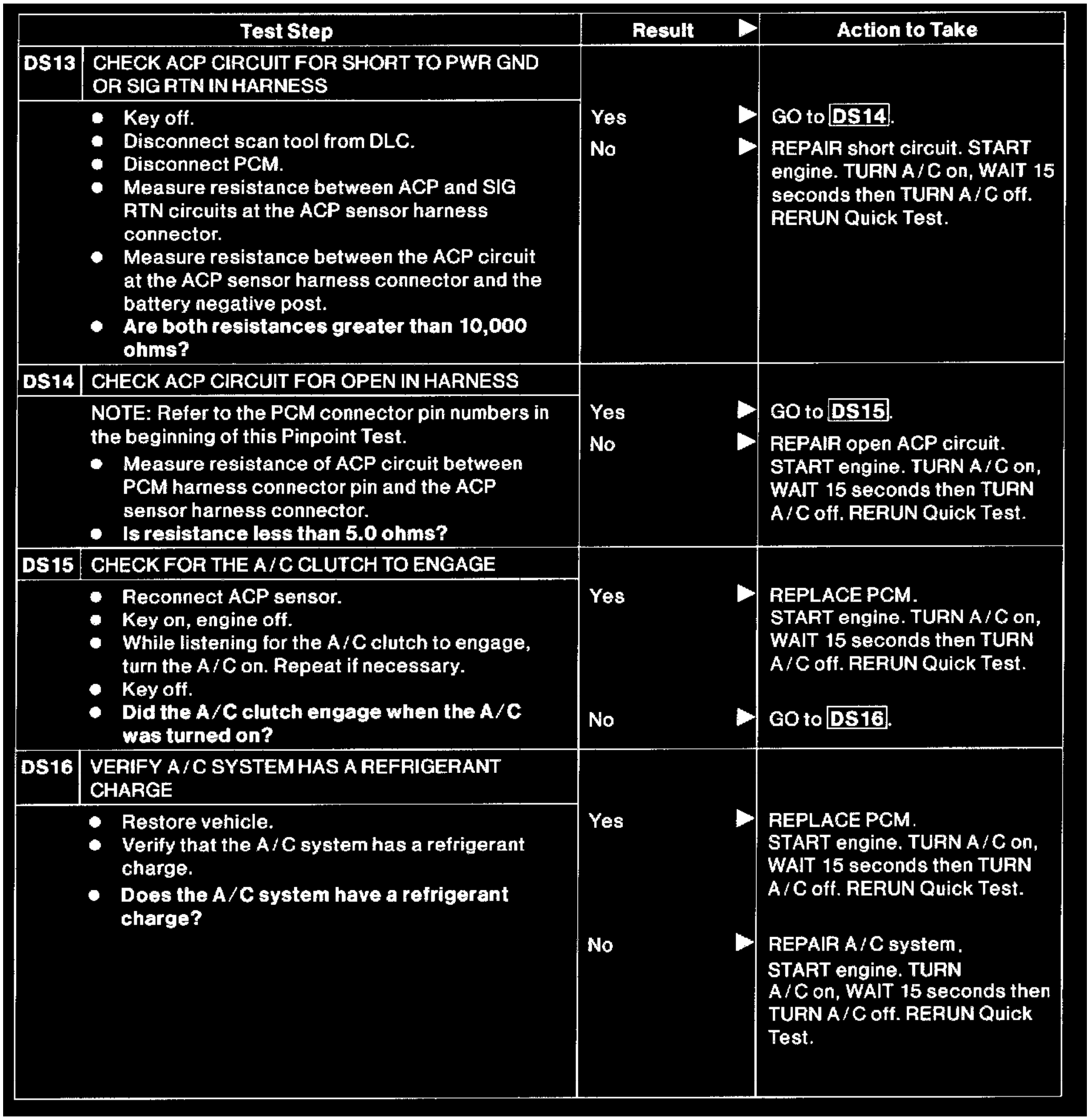
- Harness circuits: ACP, VREF, SIG RTN
- Air Conditioning Pressure **(ACP)** Sensor
- Powertrain Control Module **(PCM)**



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DS1** DTC P1461: CHECK ACP V PID<br>• Connect scan tool.<br>• Key on, engine off.<br>• Access ACP V PID.<br>• **Is ACP V PID less than 4.9 volts?** | Yes ▶ | The ACP circuit voltage is now below the maximum. GO to DS18 to determine if an intermittent condition exists. |
| | No ▶ | KEY OFF. A hard fault is present. GO to DS2. |
| **DS2** CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS TO ACP SENSOR<br>• Disconnect ACP sensor.<br>• Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector.<br>• **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | GO to DS3. |
| | No ▶ | VREF is out of range, or SIG RTN circuit to ACP sensor is open. KEY OFF. GO to Pinpoint Test Step C1. |
| **DS3** INDUCE OPPOSITE ACP SIGNAL<br>• Key on, engine off.<br>• Again access ACP V PID.<br>• **Is ACP V PID now less than 4.9 volts?** | Yes ▶ | KEY OFF. REPLACE ACP sensor. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | No ▶ | KEY OFF. GO to DS4. |
| **DS4** CHECK ACP CIRCUIT FOR SHORT TO VREF IN HARNESS<br>• Disconnect scan tool from DLC.<br>• Disconnect PCM.<br>• Measure resistance between ACP and VREF circuits at the ACP sensor harness connector.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | GO to DS5. |
| | No ▶ | REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS5** CHECK ACP CIRCUIT FOR SHORT TO POWER IN HARNESS<br>• Key on, engine off.<br>• Measure voltage between ACP circuit at the ACP sensor vehicle harness connector and chassis ground.<br>• **Is voltage less than 1.0 volt?** | Yes ▶ | **For Escort/Tracer:**<br>KEY OFF. GO to DS6.<br>**All others:**<br>REPLACE PCM. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | No ▶ | REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS6** CHECK FOR OPEN ACP CIRCUIT IN HARNESS<br>NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to DS7. |
| | No ▶ | REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |

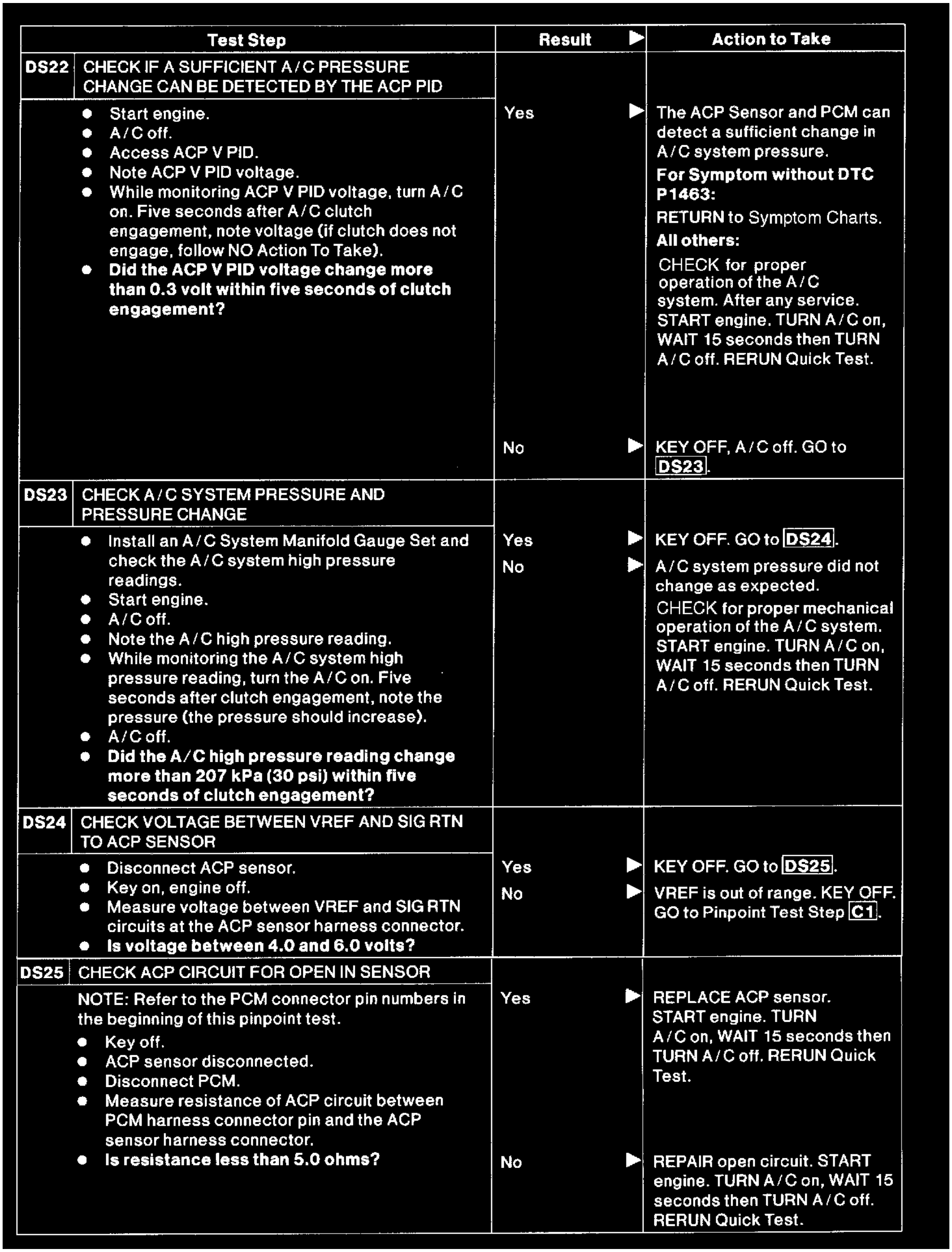


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DS7** | CHECK PCM | | |
| | - Reconnect PCM.<br>- Connect a jumper wire between the ACP and SIG RTN Circuits at the ACP sensor harness connector.<br>- Key on, engine off.<br>- Access ACP V PID.<br>NOTE: If the scan tool is now unable to communicate, follow NO Action to Take.<br>- **Is ACP V PID now less than 4.9 volts?** | Yes ▶ | REPLACE ACP sensor. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | | No ▶ | REPLACE PCM. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS10** | DTC P1462: CHECK ACP V PID | | |
| | - Connect scan tool.<br>- Key on, engine off.<br>- Access ACP V PID.<br>- **Is ACP V PID greater than 0.15 volt?** | Yes ▶ | The ACP circuit voltage is now above the minimum. GO to DS18 to determine if an intermittent condition exists. |
| | | No ▶ | KEY OFF. A hard fault is present. GO to DS11. |
| **DS11** | CHECK VOLTAGE BETWEEN VREF AND SIG RTN TO ACP SENSOR | | |
| | - Disconnect ACP sensor.<br>- Key on, engine off.<br>- Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector.<br>- **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | GO to DS12. |
| | | No ▶ | VREF is out of range. KEY OFF. GO to Pinpoint Test Step C1. |
| **DS12** | INDUCE OPPOSITE ACP SIGNAL | | |
| | - Connect a jumper wire between ACP and VREF circuits at the ACP sensor harness connector.<br>- Key on, engine off.<br>- Access ACP V PID.<br>NOTE: If any scan tool communication concern occurs, remove jumper immediately and go directly to DS13.<br>- **Is ACP V PID greater than 4.0 volts?** | Yes ▶ | REPLACE ACP sensor. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | | No ▶ | GO to DS13. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DS13** | CHECK ACP CIRCUIT FOR SHORT TO PWR GND OR SIG RTN IN HARNESS | | |
| | ● Key off.<br>● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Measure resistance between ACP and SIG RTN circuits at the ACP sensor harness connector.<br>● Measure resistance between the ACP circuit at the ACP sensor harness connector and the battery negative post.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to **DS14**.<br>REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS14** | CHECK ACP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.<br>● Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to **DS15**.<br>REPAIR open ACP circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS15** | CHECK FOR THE A/C CLUTCH TO ENGAGE | | |
| | ● Reconnect ACP sensor.<br>● Key on, engine off.<br>● While listening for the A/C clutch to engage, turn the A/C on. Repeat if necessary.<br>● Key off.<br>● **Did the A/C clutch engage when the A/C was turned on?** | Yes ▶<br>No ▶ | REPLACE PCM. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.<br>GO to **DS16**. |
| **DS16** | VERIFY A/C SYSTEM HAS A REFRIGERANT CHARGE | | |
| | ● Restore vehicle.<br>● Verify that the A/C system has a refrigerant charge.<br>● **Does the A/C system have a refrigerant charge?** | Yes ▶<br>No ▶ | REPLACE PCM. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test.<br>REPAIR A/C system. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **DS18** | CHECK FOR INTERMITTENT ACP CIRCUIT FAULT | | |
| | • Key on, engine off.<br>• Access ACP V PID.<br>• Observe ACP V PID for an indication of a fault while completing the following (a fault will be indicated by a sudden change in ACP V PID voltage):<br>— Shake, wiggle, bend the ACP, SIG RTN and VREF circuits between the ACP sensor and the PCM.<br>— Lightly tap on the ACP sensor (to simulate road shock).<br>• **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. PERFORM PCM Reset to clear DTC(s). START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **DS20** | DTC P1463: VERIFY A/C CLUTCH CAN DISENGAGE | | |
| | • A/C and defroster off.<br>• Start engine.<br>• Verify that the A/C clutch disengages.<br>• **Is the A/C clutch disengaged?** | Yes ▶ | KEY OFF. GO to DS21. |
| | | No ▶ | GO to Symptom Chart 21 (A/C Compressor Runs Continuously, A/C Always On) to diagnose the always engaged A/C clutch. |
| **DS21** | CHECK FOR VOLTAGE AND GROUND TO A/C CLUTCH (USING NON POWERED TEST LAMP) | | |
| | NOTE: If voltage and ground to A/C clutch has already been checked in the Symptom Charts, or the A/C clutch can be heard clicking on when the A/C is turned on, go to the question at the end of this test step.<br>• Disconnect A/C cycling switch. Install a jumper wire in the A/C cycling switch vehicle harness connector (to complete the circuit).<br>• Disconnect the A/C clutch.<br>• Connect a non-powered test lamp between the power pin and ground pin at the A/C clutch vehicle harness connector.<br>• Start engine.<br>• Turn A/C on, wait 15 seconds.<br>• Monitor test lamp.<br>• After testing turn key off, remove jumper and reconnect A/C clutch and A/C cycling switch.<br>• **Does test lamp light (or can A/C clutch be heard clicking on)?** | Yes ▶ | GO to DS22. |
| | | No ▶ | **For Escort/Tracer:**<br>KEY OFF. GO to Pinpoint Test Step X110.<br>**For All Others:**<br>KEY OFF. GO to Pinpoint Test Step KM15. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **DS22** CHECK IF A SUFFICIENT A/C PRESSURE CHANGE CAN BE DETECTED BY THE ACP PID | | |
| • Start engine.<br>• A/C off.<br>• Access ACP V PID.<br>• Note ACP V PID voltage.<br>• While monitoring ACP V PID voltage, turn A/C on. Five seconds after A/C clutch engagement, note voltage (if clutch does not engage, follow NO Action To Take).<br>• **Did the ACP V PID voltage change more than 0.3 volt within five seconds of clutch engagement?** | Yes ▶ | The ACP Sensor and PCM can detect a sufficient change in A/C system pressure.<br>**For Symptom without DTC P1463:**<br>RETURN to Symptom Charts.<br>**All others:**<br>CHECK for proper operation of the A/C system. After any service. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | No ▶ | KEY OFF, A/C off. GO to DS23. |
| **DS23** CHECK A/C SYSTEM PRESSURE AND PRESSURE CHANGE | | |
| • Install an A/C System Manifold Gauge Set and check the A/C system high pressure readings.<br>• Start engine.<br>• A/C off.<br>• Note the A/C high pressure reading.<br>• While monitoring the A/C system high pressure reading, turn the A/C on. Five seconds after clutch engagement, note the pressure (the pressure should increase).<br>• A/C off.<br>• **Did the A/C high pressure reading change more than 207 kPa (30 psi) within five seconds of clutch engagement?** | Yes ▶ | KEY OFF. GO to DS24. |
| | No ▶ | A/C system pressure did not change as expected.<br>CHECK for proper mechanical operation of the A/C system. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| **DS24** CHECK VOLTAGE BETWEEN VREF AND SIG RTN TO ACP SENSOR | | |
| • Disconnect ACP sensor.<br>• Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the ACP sensor harness connector.<br>• **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. GO to DS25. |
| | No ▶ | VREF is out of range. KEY OFF. GO to Pinpoint Test Step C1. |
| **DS25** CHECK ACP CIRCUIT FOR OPEN IN SENSOR | | |
| NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Key off.<br>• ACP sensor disconnected.<br>• Disconnect PCM.<br>• Measure resistance of ACP circuit between PCM harness connector pin and the ACP sensor harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE ACP sensor. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |
| | No ▶ | REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds then TURN A/C off. RERUN Quick Test. |

# DU - Intake Air Temperature 2 (IAT2) Sensor

## DU: INTAKE AIR TEMPERATURE 2 (IAT2) SENSOR

### DU10 - DTC P1115 Check Circuit For Short To VPWR Or VREF

Key off.

Disconnect IAT2 sensor.

Key on.

Is the IAT2 temperature sensor voltage PID greater than 4.8 volts?

**YES** GO to DU13.

**NO** GO to DU11. KEY OFF.

### DU11 - Simulate Opposite Signal To PCM

With IAT2 sensor disconnected, connect a fused jumper wire between the sensor signal and SIG RTN circuits at the temperature sensor harness connector.

Key on.

**NOTE:** If a scan tool communication concern exists, remove jumper wire immediately and go to DU13.

Access IAT2 sensor voltage PID.

Is the IAT2 sensor voltage PID less than 0.2 volts?

**YES** REPLACE IAT2 sensor.

**NO** REMOVE jumper wire. GO to DU12. KEY OFF.

### DU12 - Check IAT2 Sensor Signal And SIG RTN Circuits For Open In Harness

**NOTE:** Refer to the PCM connector pin numbers on this pinpoint test cover page.

Disconnect PCM.

Measure resistance of sensor signal circuit between PCM harness connector pin and IAT2 sensor harness connector.

Measure resistance of SIG RTN circuit between PCM harness connector pin and IAT2 sensor harness connector.

Is each resistance less than 5.0 ohms?

**YES** REPLACE PCM.

**NO** REPAIR open circuits.

### DU13 - Check Temperature Signal For Short To VPWR Or VREF

Key on.

Measure voltage between IAT2 signal circuit at the sensor harness connector and chassis ground.

Is voltage greater than 4.8 volts?

**YES** REPAIR short to VREF or VPWR in harness. If harness is OK, REPLACE PCM.

**NO** GO to C5. See: C - Reference Voltage (VREF)

### DU2O - P1114 Simulate Opposite Signal To PCM

Disconnect IAT2 sensor.

Connect scan tool.

Key on.

Access IAT2 sensor voltage PID.

Key off.

Is the IAT2 sensor voltage PID greater than 4.2 volts?

**YES** REPLACE IAT2 sensor.

**NO** GO to DU21.

### DU21 - Check VREF Voltage To TP Sensor

Refer to schematic at the beginning of the pinpoint test.

Disconnect TP sensor.

Key on, engine off.

Measure the voltage between VREF and SIG RTN circuits at the TP sensor harness connector.

Is voltage between 4.0 and 6.0 volts?

**YES** There is sufficient VREF voltage. RECONNECT TP sensor. GO to DU22.

**YES** GO to Pinpoint Test C1. See: C - Reference Voltage (VREF)

### DU22 - Check Temperature Signal Circuit For Short To Ground In Harness

**NOTE:** Refer to the PCM connector pin numbers on this pinpoint test cover page.

Disconnect PCM.

Measure resistance between sensor signal and SIG RTN circuits and then between sensor signal and PWR GND circuits at the PCM harness connector.

Is each resistance greater than 10,000 ohms?

**YES** REPLACE PCM.

**NO** REPAIR short circuit.

### DU3O - P0127 IAT2 Too High. Check Supercharger Intercooler Pump Operation

Connect scan tool.

Access Output Test Mode.

Select Mode: ALL ON

Command pump to run.

Does supercharger intercooler pump run?

**YES** GO to DU31.

**NO** KEY OFF GO to KP1. See: KP - Charge Air Cooler Pump (CAC)

### DU31 - Check Intercooler System

Check intercooler system for:

- Low fluid level.
- Cracked coolant lines.
- Blocked heat exchanger or coolant lines.
- Crossed coolant lines.

Is intercooler system OK?

**YES** KEY OFF. GO to DU32.

**NO** REPAIR as necessary.

**DU32 - Simulate High IAT2 Signal**

Connect scan tool.

Key on.

Access IAT2 V PID.

Observe PID while disconnecting IAT2 sensor.

Is PID greater than 4.0V?

**YES** GO to DU33.

**NO** REPLACE PCM.

**DU33 - Simulate Low IAT2 Signal**

Access IAT2 V PID.

Observe PID while connecting a jumper wire between the sensor signal and SIG RTN circuit at the temperature sensor harness connector.

Is PID less than 1.0V?

**YES** RECONNECT sensor. Compare IAT2 PID to reference values under the given road test conditions. If sensor is not in range, REPLACE IAT2 sensor.

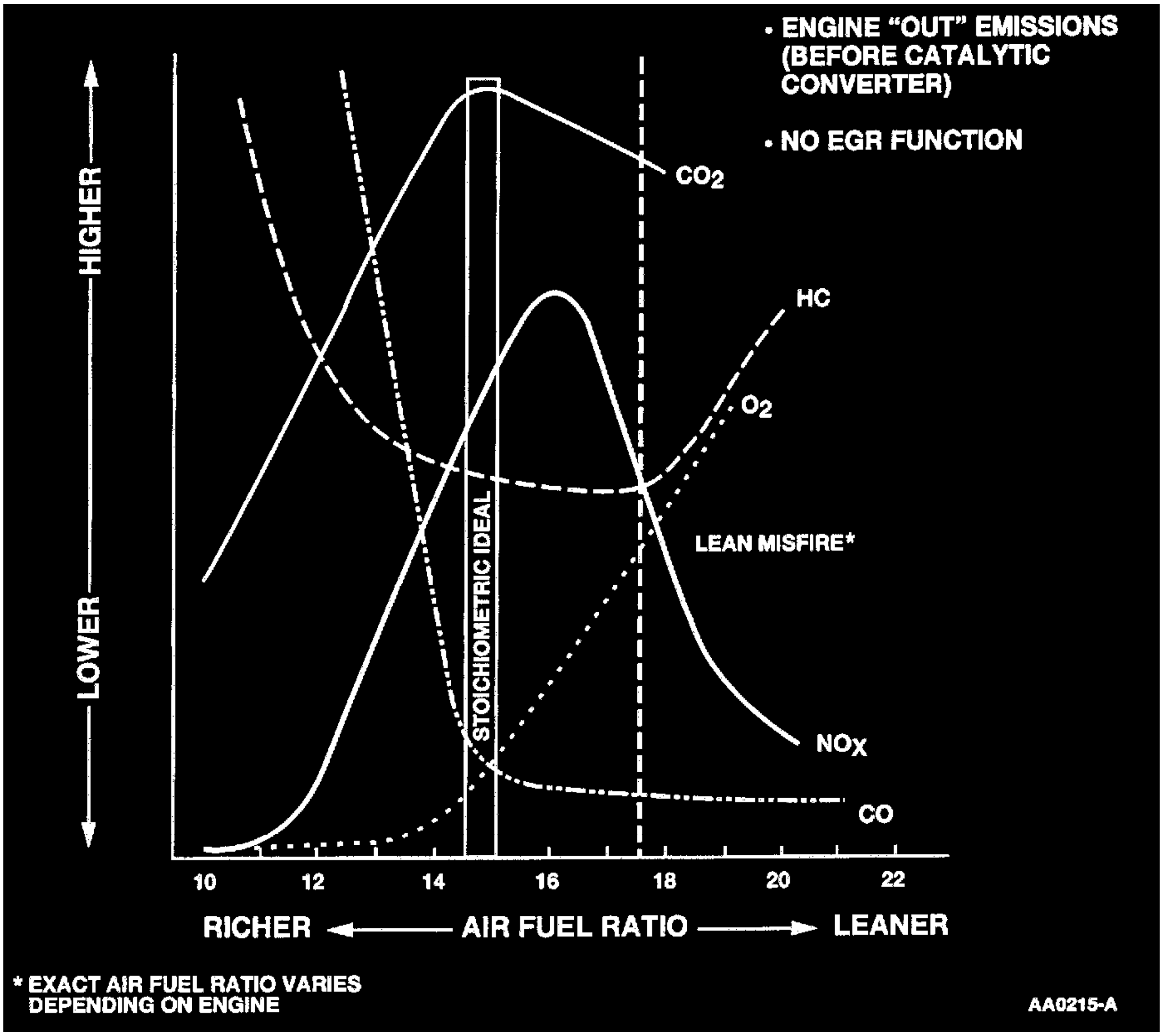
**NO** REPLACE PCM.

## Test Notes

Canada and some states or metropolitan areas in the United States require periodic Emission, or Inspection and Maintenance **(I/M)** Tests. All Ford products have been designed to pass these tests. If a Ford product fails an I/M Test, it is probable that 1) the engine or catalyst temperature was not warm and stabilized before the test, or 2) the vehicle had idled excessively before the test.

- If any emission components are replaced, perform the following before repeating the I/M Test procedure:
  (1) Clear keep Alive Random Access Memory **(RAM)** (Powertrain Control Module Reset).
  (2) To relearn some basic Adaptive Learning (trim) values, run engine at **2500 rpm** for **one minute** and idle engine for **two minutes**.

## Graphs

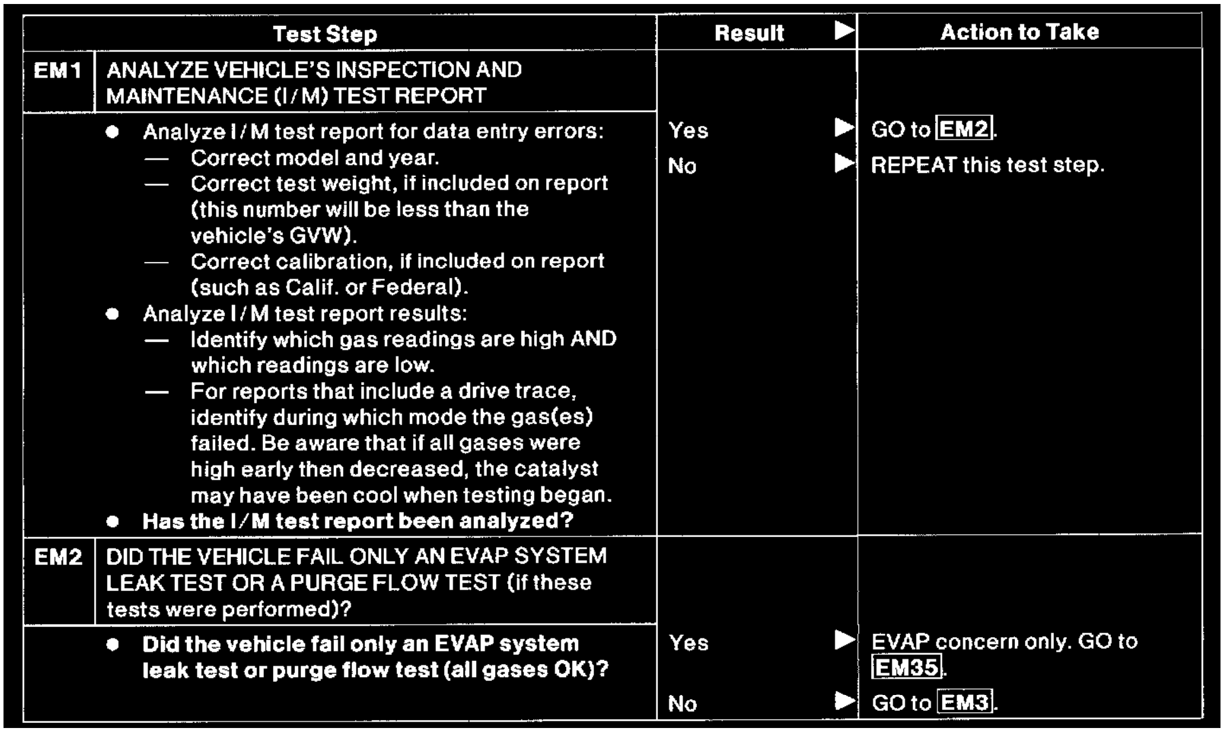


**Verifying an Excessive Grams Per Mile (GPM) Indication Using a Parts Per Million (PPM) Reading**

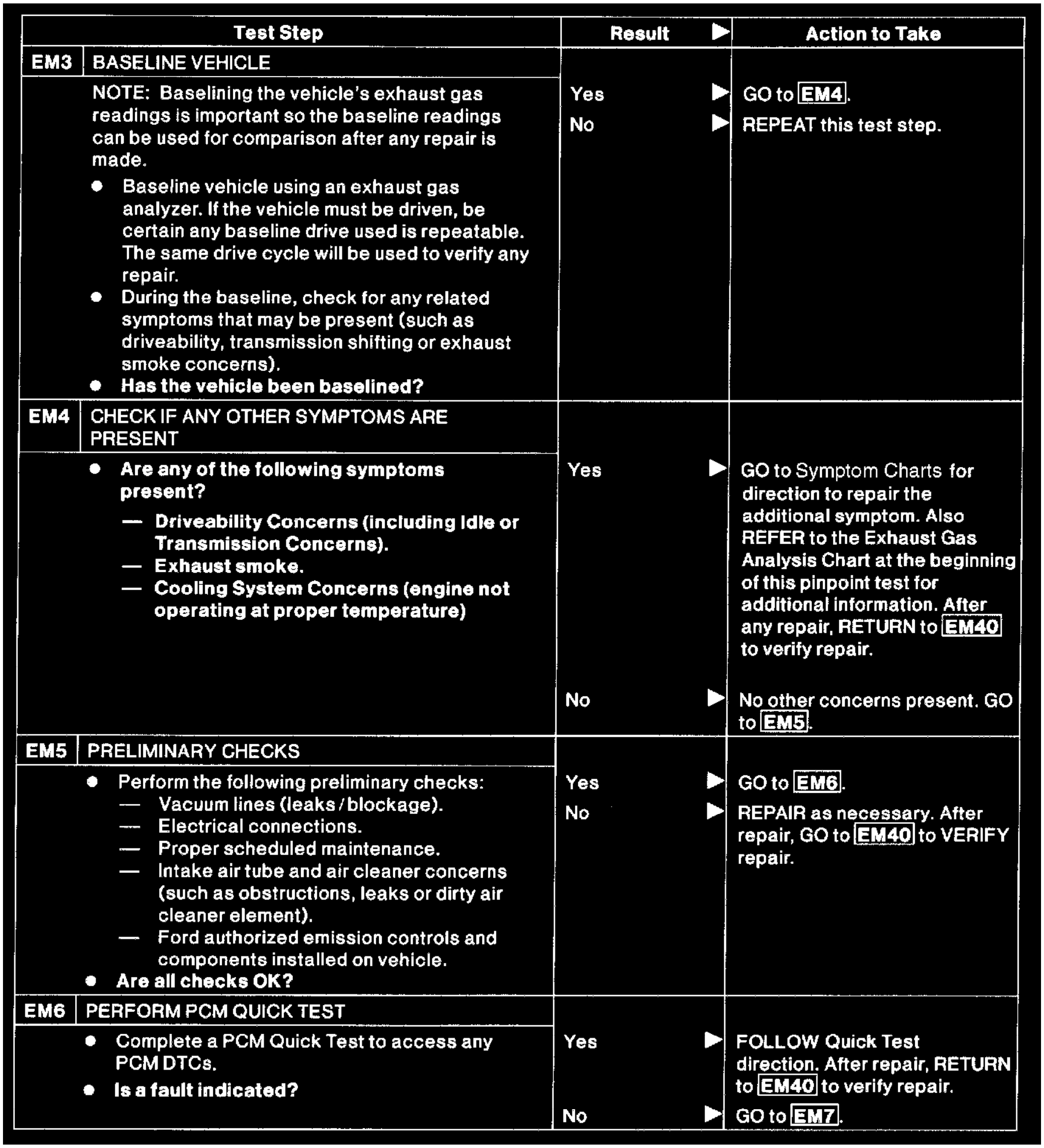
For the vehicle's gas reading(s) that is excessive, compare the actual GPM reading to the gas cutpoint level needed to pass testing. Determine how much the actual GPM reading is over the cutpoint. This will give an indication of how much the PPM reading will have to be reduced (if the actual reading is twice the cutpoint, the baseline reading will have to be cut in half or more). See following example:

Example:

- The actual HC produced by a vehicle was **1.6 GPM**. The cutpoint for HC in this example is **0.8 GPM**. The actual reading is twice the cutpoint.
- The HC reading obtained for the same vehicle during the baseline drive averages **440 PPM**. In order for this vehicle to pass the I/M test, the HC reading from the verification trip must be at least half of the baseline reading, or an average of **220 PPM** or less.
- This method only gives a general idea of how much the PPM reading needs to be reduced in order for the vehicle to pass an I/M test that calculates GPM. This test is not exact. Experience will still have to be used to determine if the emission readings have been reduced enough for the vehicle to pass the I/M test.

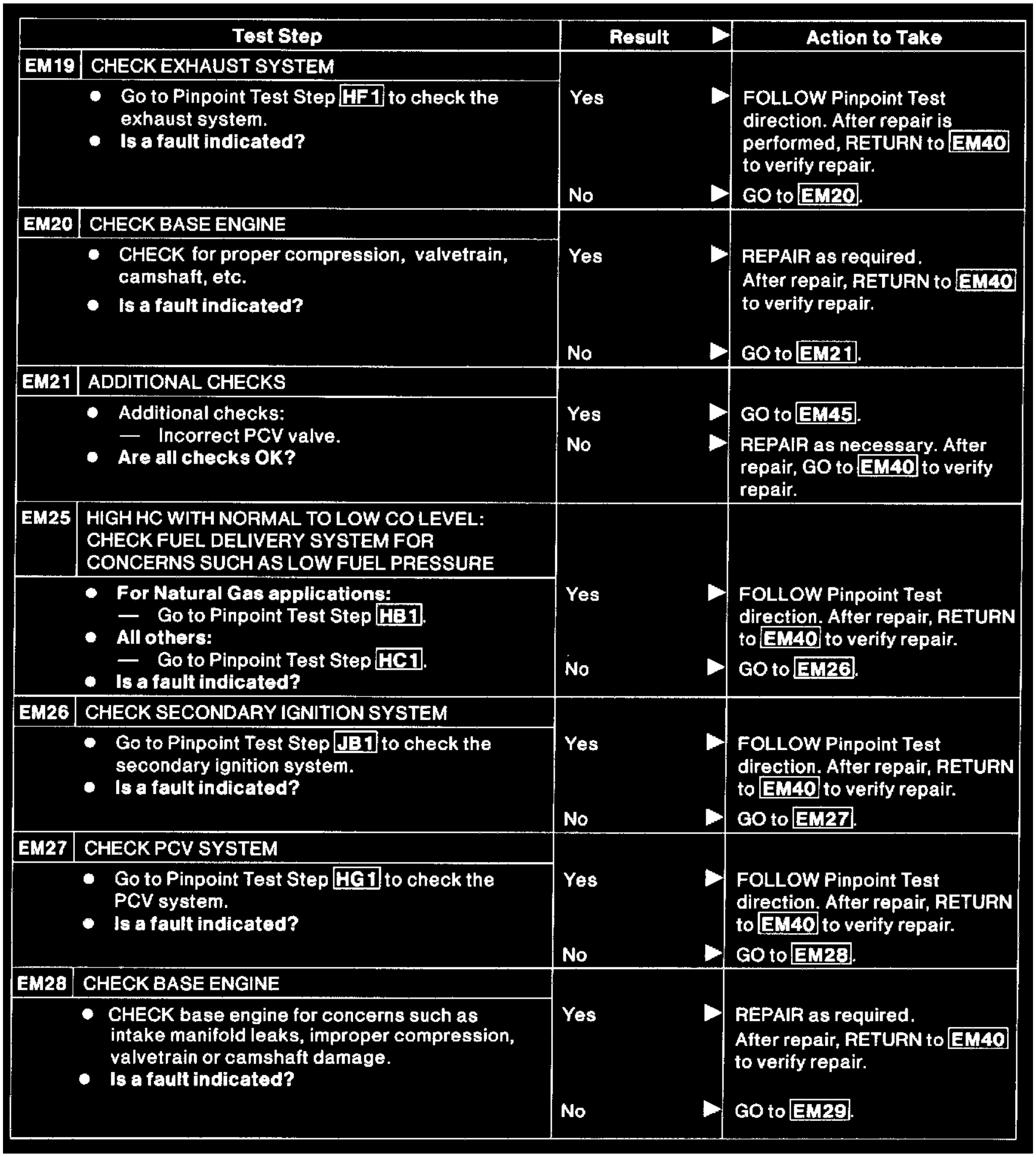


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **EM1** | ANALYZE VEHICLE'S INSPECTION AND MAINTENANCE (I/M) TEST REPORT | | |
| | ● Analyze I/M test report for data entry errors:<br>— Correct model and year.<br>— Correct test weight, if included on report (this number will be less than the vehicle's GVW).<br>— Correct calibration, if included on report (such as Calif. or Federal).<br>● Analyze I/M test report results:<br>— Identify which gas readings are high AND which readings are low.<br>— For reports that include a drive trace, identify during which mode the gas(es) failed. Be aware that if all gases were high early then decreased, the catalyst may have been cool when testing began.<br>● **Has the I/M test report been analyzed?** | Yes ▶<br>No ▶ | GO to EM2.<br>REPEAT this test step. |
| **EM2** | DID THE VEHICLE FAIL ONLY AN EVAP SYSTEM LEAK TEST OR A PURGE FLOW TEST (if these tests were performed)? | | |
| | ● **Did the vehicle fail only an EVAP system leak test or purge flow test (all gases OK)?** | Yes ▶<br>No ▶ | EVAP concern only. GO to EM35.<br>GO to EM3. |



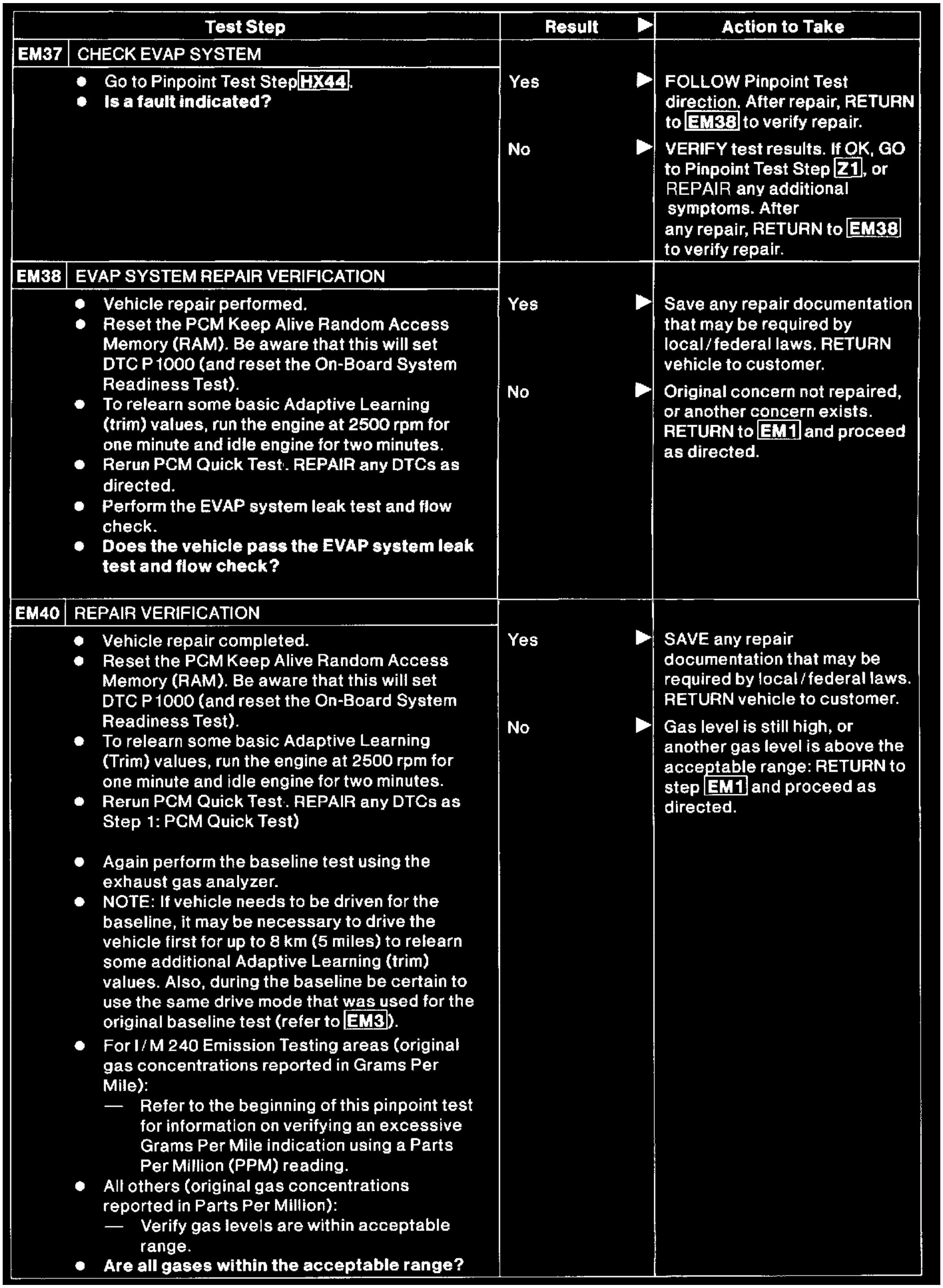
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **EM3** | BASELINE VEHICLE | | |
| | NOTE: Baselining the vehicle's exhaust gas readings is important so the baseline readings can be used for comparison after any repair is made.<br>● Baseline vehicle using an exhaust gas analyzer. If the vehicle must be driven, be certain any baseline drive used is repeatable. The same drive cycle will be used to verify any repair.<br>● During the baseline, check for any related symptoms that may be present (such as driveability, transmission shifting or exhaust smoke concerns).<br>● **Has the vehicle been baselined?** | Yes ▶<br>No ▶ | GO to EM4.<br>REPEAT this test step. |
| **EM4** | CHECK IF ANY OTHER SYMPTOMS ARE PRESENT | | |
| | ● **Are any of the following symptoms present?**<br>— **Driveability Concerns (including Idle or Transmission Concerns).**<br>— **Exhaust smoke.**<br>— **Cooling System Concerns (engine not operating at proper temperature)** | Yes ▶ | GO to Symptom Charts for direction to repair the additional symptom. Also REFER to the Exhaust Gas Analysis Chart at the beginning of this pinpoint test for additional information. After any repair, RETURN to EM40 to verify repair. |
| | | No ▶ | No other concerns present. GO to EM5. |
| **EM5** | PRELIMINARY CHECKS | | |
| | ● Perform the following preliminary checks:<br>— Vacuum lines (leaks / blockage).<br>— Electrical connections.<br>— Proper scheduled maintenance.<br>— Intake air tube and air cleaner concerns (such as obstructions, leaks or dirty air cleaner element).<br>— Ford authorized emission controls and components installed on vehicle.<br>● **Are all checks OK?** | Yes ▶<br>No ▶ | GO to EM6.<br>REPAIR as necessary. After repair, GO to EM40 to VERIFY repair. |
| **EM6** | PERFORM PCM QUICK TEST | | |
| | ● Complete a PCM Quick Test to access any PCM DTCs.<br>● **Is a fault indicated?** | Yes ▶ | FOLLOW Quick Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM7. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **EM7** | CHECK CARBON MONOXIDE (CO) LEVELS | | |
| | • **Did the vehicle have excessive CO levels?** | Yes ▶ | Excessive CO levels indicate that the engine is running rich. GO to EM15. |
| | | No ▶ | GO to EM8. |
| **EM8** | CHECK HYDROCARBON (HC) LEVELS | | |
| | • **Did the vehicle have excessive HC levels?** | Yes ▶ | Excessive HC levels with low to normal CO levels indicate that the engine is running lean. GO to EM25. |
| | | No ▶ | GO to EM9. |
| **EM9** | CHECK OXIDES OF NITROGEN (NOx) LEVELS | | |
| | • **Did the vehicle have excessive NOx levels?** | Yes ▶ | GO to EM30. |
| | | No ▶ | VERIFY all previous testing. |
| **EM15** | HIGH CO LEVELS: CHECK HC LEVELS | | |
| | • **Did the vehicle have excessive HC levels?** | Yes ▶ | GO to EM16 (to check for incomplete combustion / running rich). |
| | | No ▶ | GO to EM17 (to check for running rich). |
| **EM16** | CHECK SECONDARY IGNITION SYSTEM | | |
| | • Go to Pinpoint Test Step JB1 to check the secondary ignition system.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM17. |
| **EM17** | CHECK FUEL DELIVERY SYSTEM FOR CONCERNS SUCH AS HIGH FUEL PRESSURE AND ABILITY TO HOLD PRESSURE | | |
| | • **For Natural Gas applications:**<br>— Go to Pinpoint Test Step HB1.<br>• **All others:**<br>— Go to Pinpoint Test Step HC1.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM18. |
| **EM18** | CHECK PCV SYSTEM FOR LEAKS, STUCK VALVE, ETC. | | |
| | • Go to Pinpoint Test Step HG1 to check the PCV System.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM19. |

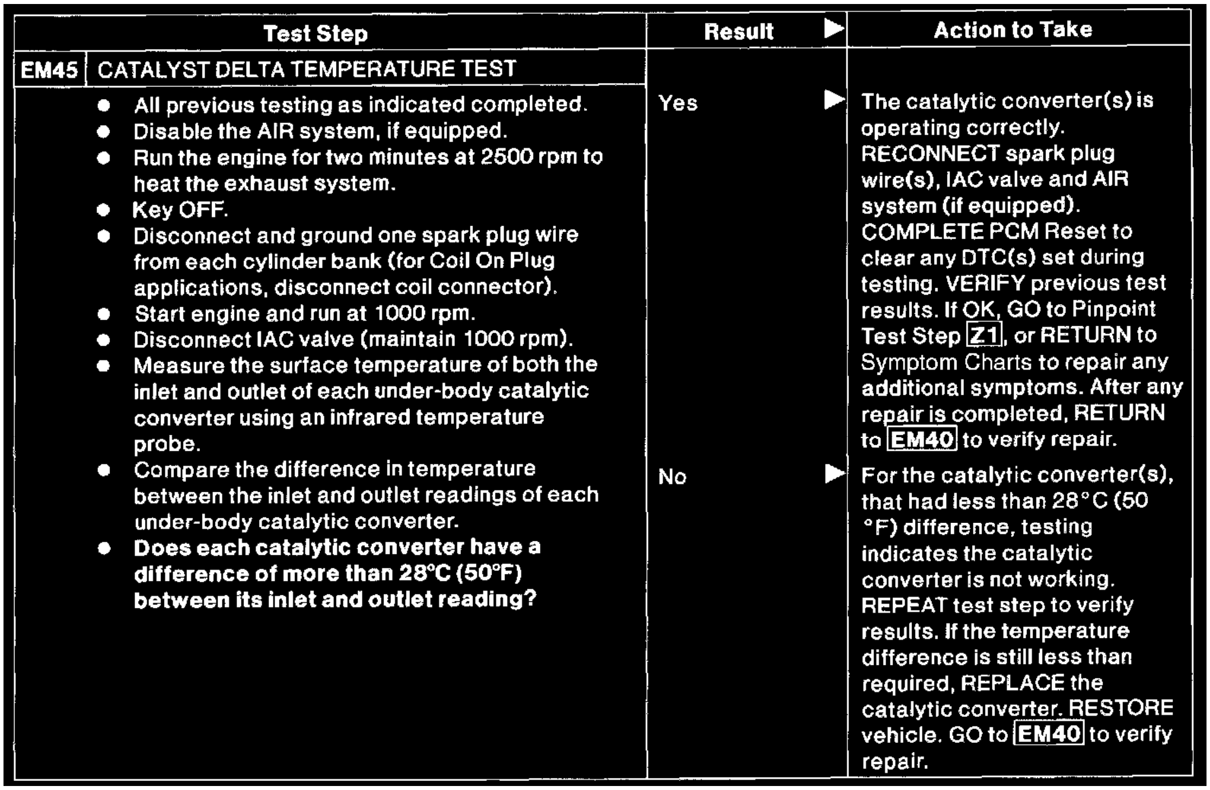


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **EM19** | CHECK EXHAUST SYSTEM | | |
| | • Go to Pinpoint Test Step HF1 to check the exhaust system.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair is performed, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM20. |
| **EM20** | CHECK BASE ENGINE | | |
| | • CHECK for proper compression, valvetrain, camshaft, etc.<br>• **Is a fault indicated?** | Yes ▶ | REPAIR as required. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM21. |
| **EM21** | ADDITIONAL CHECKS | | |
| | • Additional checks:<br>— Incorrect PCV valve.<br>• **Are all checks OK?** | Yes ▶ | GO to EM45. |
| | | No ▶ | REPAIR as necessary. After repair, GO to EM40 to verify repair. |
| **EM25** | HIGH HC WITH NORMAL TO LOW CO LEVEL: CHECK FUEL DELIVERY SYSTEM FOR CONCERNS SUCH AS LOW FUEL PRESSURE | | |
| | • **For Natural Gas applications:**<br>— Go to Pinpoint Test Step HB1.<br>• **All others:**<br>— Go to Pinpoint Test Step HC1.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM26. |
| **EM26** | CHECK SECONDARY IGNITION SYSTEM | | |
| | • Go to Pinpoint Test Step JB1 to check the secondary ignition system.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM27. |
| **EM27** | CHECK PCV SYSTEM | | |
| | • Go to Pinpoint Test Step HG1 to check the PCV system.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM28. |
| **EM28** | CHECK BASE ENGINE | | |
| | • CHECK base engine for concerns such as intake manifold leaks, improper compression, valvetrain or camshaft damage.<br>• **Is a fault indicated?** | Yes ▶ | REPAIR as required. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM29. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **EM29** | ADDITIONAL CHECKS | | |
| | • Additional checks:<br>— Incorrect PCV valve.<br>• **Are all checks OK?** | Yes ▶ | GO to EM45. |
| | | No ▶ | REPAIR as necessary. After repair, GO to EM40 to verify repair. |
| **EM30** | HIGH NOx WITH NORMAL TO LOW HC AND CO LEVELS: CHECK BASE ENGINE FOR CONCERNS SUCH AS EXCESSIVE CARBON BUILD UP IN COMBUSTION CHAMBER | | |
| | • CHECK for base engine concerns such as excessive carbon build up in the combustion chamber.<br>• **Is a fault indicated?** | Yes ▶ | REPAIR as required. After repair, RETURN to EM40 to verify repair. |
| | | No ▶ | GO to EM31. |
| **EM31** | ADDITIONAL CHECKS | | |
| | • Additional checks:<br>— Transmission torque converter clutch operation.<br>— Cooling System concerns (such as aftermarket front fascia covering intake air, intake air system modifications).<br>— Engine running lean (concerns such as vacuum leaks, low fuel pressure [refer to steps starting at EM25]).<br>• **Are all checks OK?** | Yes ▶ | GO to EM45. |
| | | No ▶ | REPAIR as necessary. After repair, GO to EM40 to verify repair. |
| **EM35** | EVAP SYSTEM CONCERN: PRELIMINARY CHECKS | | |
| | • Analyze I / M Test Report to determine when concern is present. Attempt to verify concern.<br>• Make the following preliminary checks:<br>— Fuel filler cap (check for proper installation, physical damage or contamination).<br>— EVAP system lines / hoses (check for proper connections, damage or blockage).<br>— Fuel vapor storage canister damage.<br>• **Are all checks OK?** | Yes ▶ | GO to EM36. |
| | | No ▶ | REPAIR as necessary. After repair, GO to EM38 to verify repair. |
| **EM36** | PERFORM PCM QUICK TEST | | |
| | • Complete PCM Quick Test to access any PCM DTCs.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Quick Test direction. After repair, RETURN to EM38 to verify repair. |
| | | No ▶ | GO to EM37. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **EM37** CHECK EVAP SYSTEM | | |
| • Go to Pinpoint Test Step HX44.<br>• **Is a fault indicated?** | Yes ▶ | FOLLOW Pinpoint Test direction. After repair, RETURN to EM38 to verify repair. |
| | No ▶ | VERIFY test results. If OK, GO to Pinpoint Test Step Z1, or REPAIR any additional symptoms. After any repair, RETURN to EM38 to verify repair. |
| **EM38** EVAP SYSTEM REPAIR VERIFICATION | | |
| • Vehicle repair performed.<br>• Reset the PCM Keep Alive Random Access Memory (RAM). Be aware that this will set DTC P1000 (and reset the On-Board System Readiness Test).<br>• To relearn some basic Adaptive Learning (trim) values, run the engine at 2500 rpm for one minute and idle engine for two minutes.<br>• Rerun PCM Quick Test. REPAIR any DTCs as directed.<br>• Perform the EVAP system leak test and flow check.<br>• **Does the vehicle pass the EVAP system leak test and flow check?** | Yes ▶ | Save any repair documentation that may be required by local/federal laws. RETURN vehicle to customer. |
| | No ▶ | Original concern not repaired, or another concern exists. RETURN to EM1 and proceed as directed. |
| **EM40** REPAIR VERIFICATION | | |
| • Vehicle repair completed.<br>• Reset the PCM Keep Alive Random Access Memory (RAM). Be aware that this will set DTC P1000 (and reset the On-Board System Readiness Test).<br>• To relearn some basic Adaptive Learning (Trim) values, run the engine at 2500 rpm for one minute and idle engine for two minutes.<br>• Rerun PCM Quick Test. REPAIR any DTCs as Step 1: PCM Quick Test)<br>• Again perform the baseline test using the exhaust gas analyzer.<br>• NOTE: If vehicle needs to be driven for the baseline, it may be necessary to drive the vehicle first for up to 8 km (5 miles) to relearn some additional Adaptive Learning (trim) values. Also, during the baseline be certain to use the same drive mode that was used for the original baseline test (refer to EM3).<br>• For I/M 240 Emission Testing areas (original gas concentrations reported in Grams Per Mile):<br>— Refer to the beginning of this pinpoint test for information on verifying an excessive Grams Per Mile indication using a Parts Per Million (PPM) reading.<br>• All others (original gas concentrations reported in Parts Per Million):<br>— Verify gas levels are within acceptable range.<br>• **Are all gases within the acceptable range?** | Yes ▶ | SAVE any repair documentation that may be required by local/federal laws. RETURN vehicle to customer. |
| | No ▶ | Gas level is still high, or another gas level is above the acceptable range: RETURN to step EM1 and proceed as directed. |

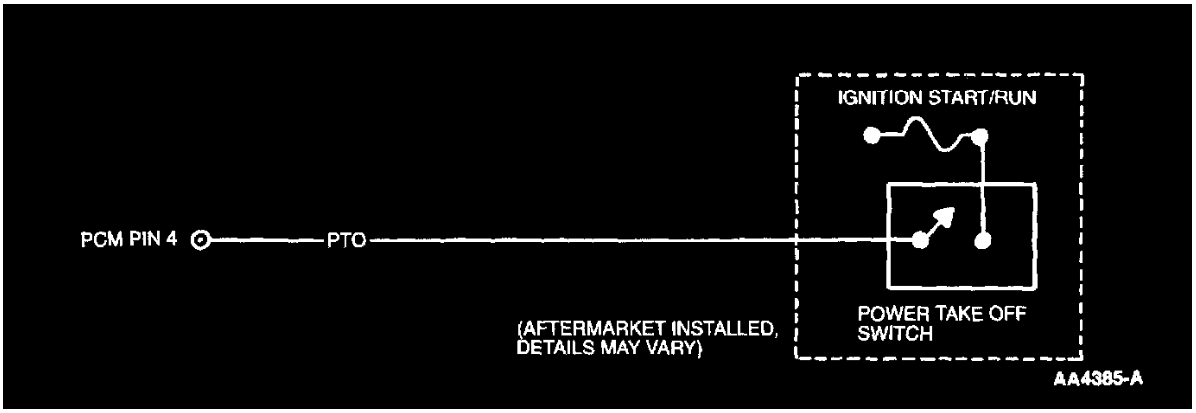


| Test Step | Result ► | Action to Take |
|---|---|---|
| **EM45** CATALYST DELTA TEMPERATURE TEST | | |
| ● All previous testing as indicated completed.<br>● Disable the AIR system, if equipped.<br>● Run the engine for two minutes at 2500 rpm to heat the exhaust system.<br>● Key OFF.<br>● Disconnect and ground one spark plug wire from each cylinder bank (for Coil On Plug applications, disconnect coil connector).<br>● Start engine and run at 1000 rpm.<br>● Disconnect IAC valve (maintain 1000 rpm).<br>● Measure the surface temperature of both the inlet and outlet of each under-body catalytic converter using an infrared temperature probe.<br>● Compare the difference in temperature between the inlet and outlet readings of each under-body catalytic converter.<br>● **Does each catalytic converter have a difference of more than 28°C (50°F) between its inlet and outlet reading?** | Yes ► | The catalytic converter(s) is operating correctly. RECONNECT spark plug wire(s), IAC valve and AIR system (if equipped). COMPLETE PCM Reset to clear any DTC(s) set during testing. VERIFY previous test results. If OK, GO to Pinpoint Test Step Z1, or RETURN to Symptom Charts to repair any additional symptoms. After any repair is completed, RETURN to EM40 to verify repair. |
| | No ► | For the catalytic converter(s), that had less than 28°C (50 °F) difference, testing indicates the catalytic converter is not working. REPEAT test step to verify results. If the temperature difference is still less than required, REPLACE the catalytic converter. RESTORE vehicle. GO to EM40 to verify repair. |

# Test Notes

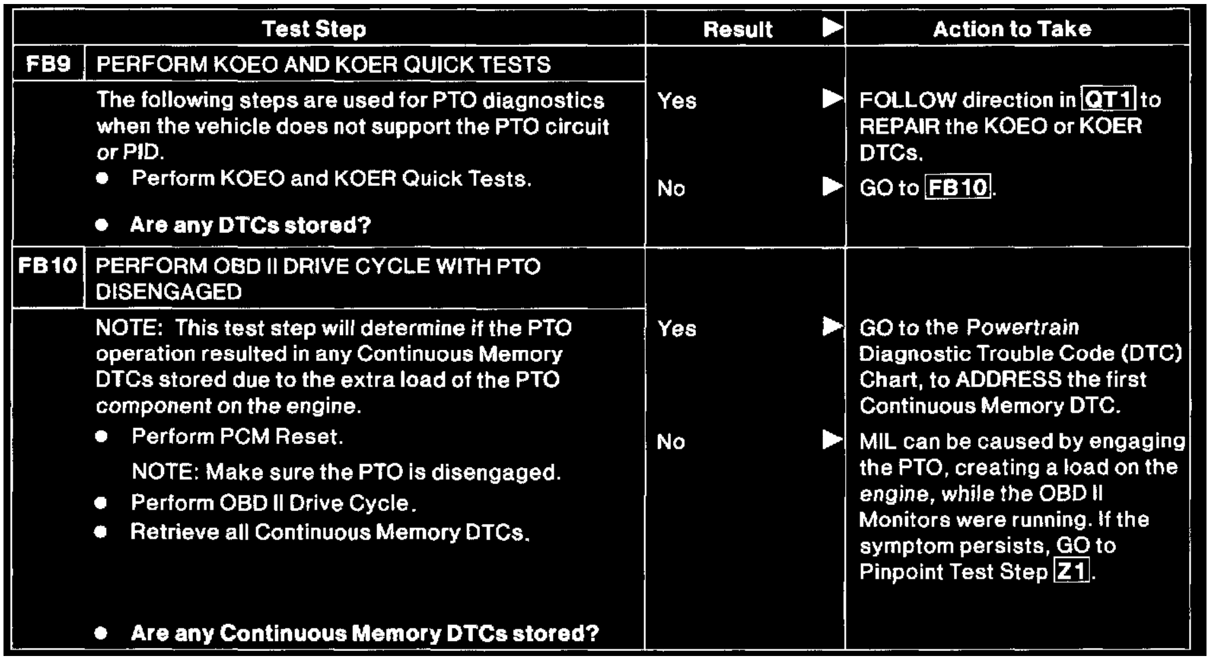
This Pinpoint Test is intended to diagnose the following:

- PTO Harness circuit
- Powertrain Control Module **(PCM)**



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FB1** | PTO PID DOES NOT CYCLE: CHECK FOR DEFECTIVE PTO SWITCH | | |
| | NOTE: Causes of concern:<br>— PTO circuit short to power in aftermarket switch / input to the PTO harness connector.<br>— PTO circuit short to VPWR.<br>— Damaged PCM.<br>● Disconnect PTO switch harness connector.<br>● Measure resistance across PTO switch while in on then off position.<br>● **Is resistance less than 5.0 ohms then greater than 10,000 ohms when cycling switch?** | Yes ▶<br>No ▶ | GO to FB2.<br>REPAIR or REPLACE PTO switch. REFER to aftermarket component manufacturer for service information. RECONNECT PTO switch harness connector. PERFORM OBD II Drive Cycle. |
| **FB2** | CHECK PTO CIRCUIT FOR SHORT TO VPWR | | |
| | ● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage of PTO circuit between PCM harness connector pin 4 and battery negative post.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | RECONNECT PCM and PTO switch harness connector. GO to FB4.<br>REPAIR short circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FB3** | MIL ON: CHECK PTO PID | | |
| | NOTE: Causes of concern:<br>— Open in PTO circuit.<br>— Short to chassis ground in PTO circuit.<br>● Connect scan tool to DLC.<br>● Key on, engine off.<br>Access the PTO PID.<br>● **Is the PTO PID available and displaying on or off?** | Yes ▶<br>No ▶ | GO to FB1.<br>GO to FB9. |
| **FB4** | CHECK PTO CIRCUIT WITH SCAN TOOL | | |
| | NOTE: This step requires operating the PTO component. Refer to aftermarket manufacturer for PTO operating instructions. Follow all safety precautions.<br>● Key on (may need to start engine to engage PTO).<br>● Cycle PTO switch / handle while viewing PTO PID.<br>● **Does PTO PID cycle ON, delay, then turn OFF?** | Yes ▶<br>No ▶ | RETURN to Symptom Charts.<br>KEY OFF. GO to FB5. |
| **FB5** | CHECK PTO CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect PCM.<br>● Disconnect scan tool from DLC.<br>● Disconnect PTO switch harness connector.<br>● Measure resistance of PTO circuit between PCM harness connector pin 4 and battery negative post.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | RECONNECT PCM. GO to FB7.<br>REPAIR short circuit. |
| **FB7** | CHECK PTO CIRCUIT FROM PTO SWITCH HARNESS CONNECTOR TO PCM | | |
| | ● Connect scan tool.<br>● Connect Jumper wire between B+ and PTO circuit at the PTO switch harness connector.<br>● Key on, engine off.<br>● Access PTO PID.<br>● **Is PTO PID on with jumper inserted and off with jumper removed?** | Yes ▶<br>No ▶ | RETURN to Symptom Charts.<br>KEY OFF. GO to FB8. |
| **FB8** | CHECK PTO CIRCUIT RESISTANCE | | |
| | ● Disconnect PCM.<br>● Measure resistance of PTO circuit between PCM harness connector pin 4 and PTO switch harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open PTO circuit. |

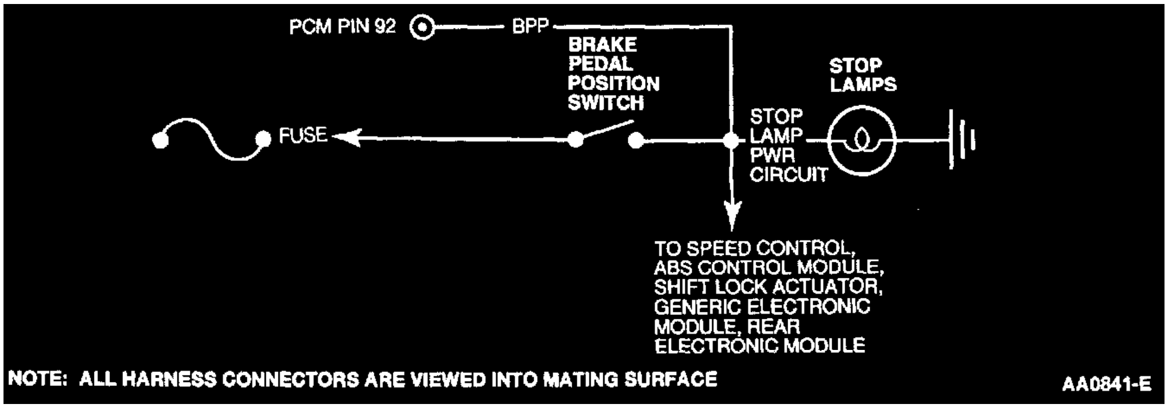


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FB9** | PERFORM KOEO AND KOER QUICK TESTS | | |
| | The following steps are used for PTO diagnostics when the vehicle does not support the PTO circuit or PID.<br>● Perform KOEO and KOER Quick Tests.<br>● **Are any DTCs stored?** | Yes ▶ | FOLLOW direction in QT1 to REPAIR the KOEO or KOER DTCs. |
| | | No ▶ | GO to FB10. |
| **FB10** | PERFORM OBD II DRIVE CYCLE WITH PTO DISENGAGED | | |
| | NOTE: This test step will determine if the PTO operation resulted in any Continuous Memory DTCs stored due to the extra load of the PTO component on the engine.<br>● Perform PCM Reset.<br>NOTE: Make sure the PTO is disengaged.<br>● Perform OBD II Drive Cycle.<br>● Retrieve all Continuous Memory DTCs.<br>● **Are any Continuous Memory DTCs stored?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Chart, to ADDRESS the first Continuous Memory DTC. |
| | | No ▶ | MIL can be caused by engaging the PTO, creating a load on the engine, while the OBD II Monitors were running. If the symptom persists, GO to Pinpoint Test Step Z1. |

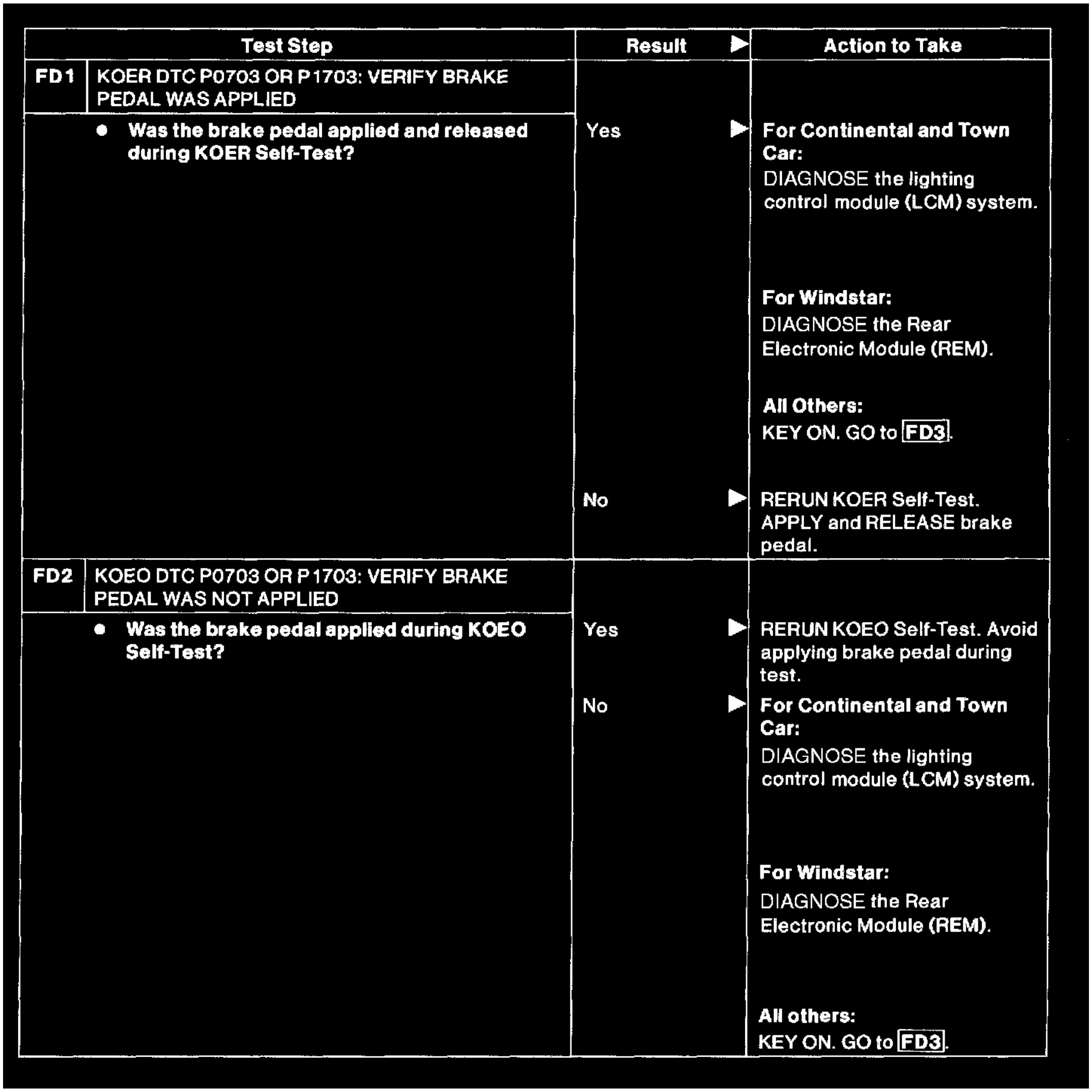
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Brake Pedal Position **(BPP)** switch
- Harness circuits: B+, BPP, GND and stoplamp PWR
- Powertrain Control Module **(PCM)**

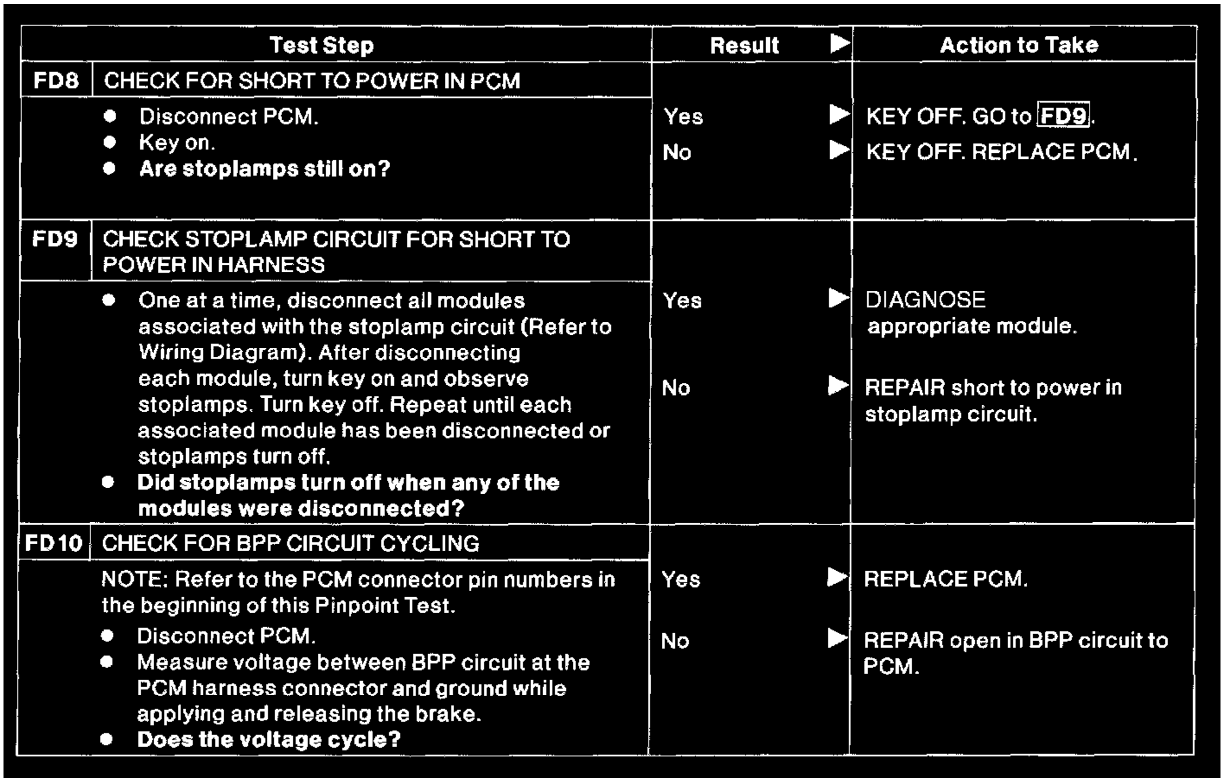


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FD1** | KOER DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS APPLIED | | |
| | • **Was the brake pedal applied and released during KOER Self-Test?** | Yes ▶ | **For Continental and Town Car:**<br>DIAGNOSE the lighting control module (LCM) system.<br>**For Windstar:**<br>DIAGNOSE the Rear Electronic Module (REM).<br>**All Others:**<br>KEY ON. GO to FD3. |
| | | No ▶ | RERUN KOER Self-Test. APPLY and RELEASE brake pedal. |
| **FD2** | KOEO DTC P0703 OR P1703: VERIFY BRAKE PEDAL WAS NOT APPLIED | | |
| | • **Was the brake pedal applied during KOEO Self-Test?** | Yes ▶ | RERUN KOEO Self-Test. Avoid applying brake pedal during test. |
| | | No ▶ | **For Continental and Town Car:**<br>DIAGNOSE the lighting control module (LCM) system.<br>**For Windstar:**<br>DIAGNOSE the Rear Electronic Module (REM).<br>**All others:**<br>KEY ON. GO to FD3. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FD3** | DTCS P0703 AND P1703: CHECK OPERATION OF STOPLAMPS | | |
| | ● Apply and release the brake pedal several times and observe stoplamp operation.<br>● **Do the stoplamps operate normally?** | Yes ▶<br>No ▶ | GO to FD4.<br>**For LS6/LS8:**<br>DIAGNOSE the rear electrical module (REM).<br>**For all others:**<br>GO to FD5 for stoplamps never on.<br>GO to FD7 for stoplamps always on. |
| **FD4** | CHECK FOR PCM BPP PID CYCLING | | |
| | ● Key on, engine off.<br>● Access BPP PID.<br>● NOTE: If BPP PID is not accessible, GO to FD10.<br>● Apply and release the brake pedal several times while viewing the BPP PID.<br>● **Does the BPP PID cycle ON/OFF?** | Yes ▶<br>No ▶ | KEY OFF. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1.<br>KEY OFF. GO to FD10. |
| **FD5** | CHECK B+ VOLTAGE TO BRAKE PEDAL POSITION SWITCH | | |
| | NOTE: Check the condition of the stoplamp bulbs before starting this test.<br>● Disconnect BPP switch.<br>● Measure B+ input voltage between BPP switch harness connector and chassis ground.<br>● **Is voltage greater than 10 volts?** | Yes ▶<br>No ▶ | GO to FD6.<br>VERIFY integrity of fuse for B+ to brake pedal position switch. If OK, REPAIR open in B+ circuit. If fuse is damaged, check B+ circuit, BPP circuit, stop lamp PWR circuit and any other associated circuits (REFER to Wiring Diagrams) for short to ground. REPAIR as necessary. |
| **FD6** | VERIFY INTEGRITY OF BRAKE PEDAL POSITION SWITCH | | |
| | ● Connect digital multimeter test probes to BPP switch terminals at the BPP switch.<br>● Apply brake pedal while monitoring reading.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPAIR open circuit between BPP switch and stoplamp ground.<br>REPLACE BPP switch. |
| **FD7** | VERIFY BRAKE PEDAL POSITION SWITCH IS NOT ALWAYS CLOSED | | |
| | ● Disconnect BPP switch.<br>● Key on, engine off.<br>● **Are stoplamps still on?** | Yes ▶<br>No ▶ | KEY OFF. GO to FD8.<br>VERIFY proper installation of BPP switch. If OK, REPLACE switch. |

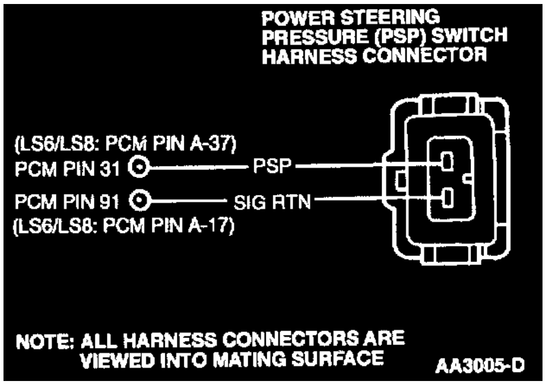


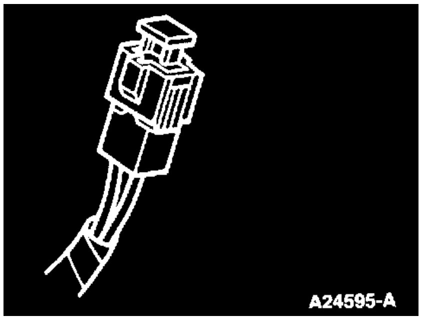
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **FD8** | CHECK FOR SHORT TO POWER IN PCM | | |
| | ● Disconnect PCM.<br>● Key on.<br>● **Are stoplamps still on?** | Yes ▶<br>No ▶ | KEY OFF. GO to FD9.<br>KEY OFF. REPLACE PCM. |
| **FD9** | CHECK STOPLAMP CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● One at a time, disconnect all modules associated with the stoplamp circuit (Refer to Wiring Diagram). After disconnecting each module, turn key on and observe stoplamps. Turn key off. Repeat until each associated module has been disconnected or stoplamps turn off.<br>● **Did stoplamps turn off when any of the modules were disconnected?** | Yes ▶<br>No ▶ | DIAGNOSE appropriate module.<br>REPAIR short to power in stoplamp circuit. |
| **FD10** | CHECK FOR BPP CIRCUIT CYCLING | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.<br>● Disconnect PCM.<br>● Measure voltage between BPP circuit at the PCM harness connector and ground while applying and releasing the brake.<br>● **Does the voltage cycle?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open in BPP circuit to PCM. |

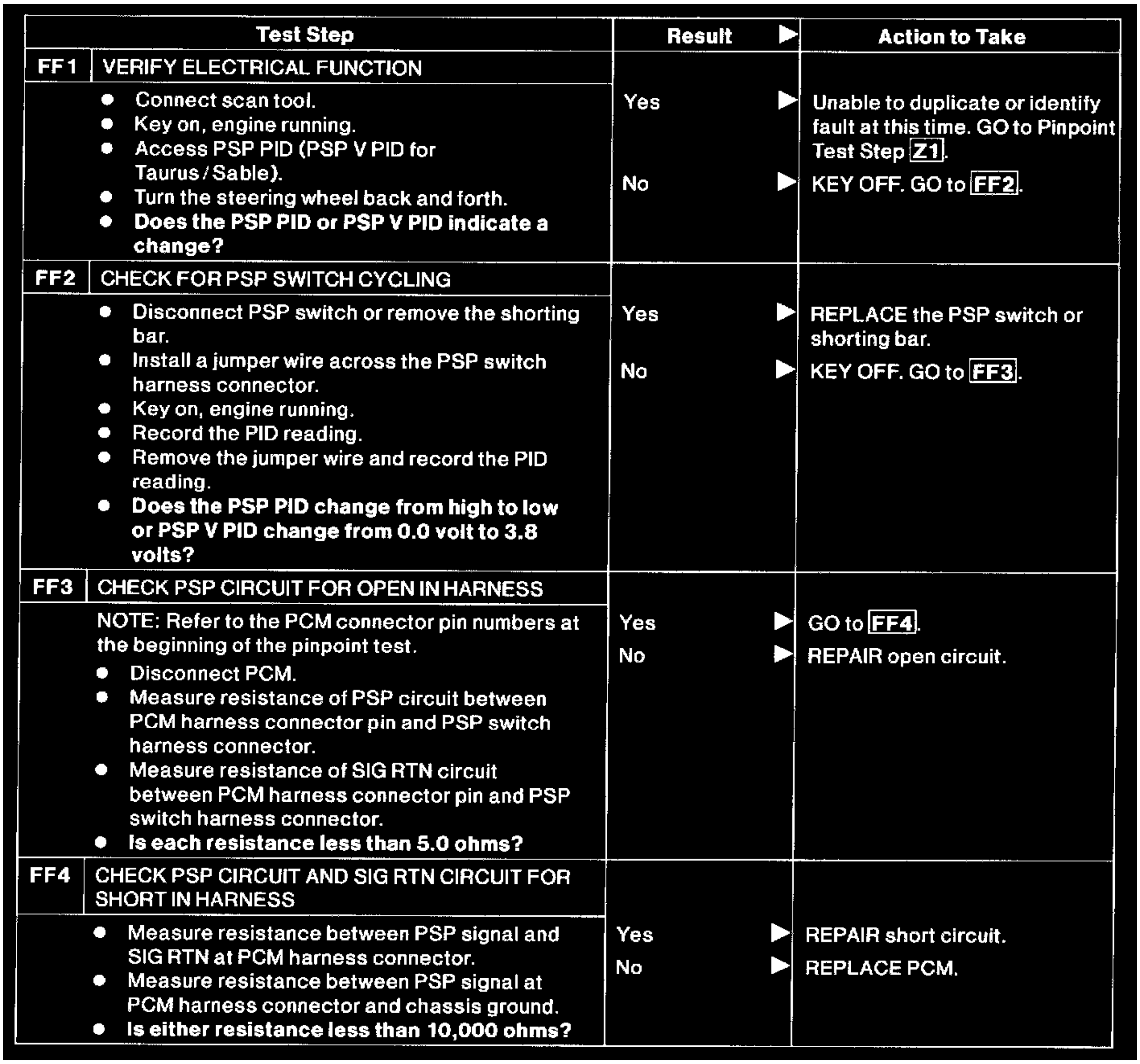
## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Power Steering Pressure **(PSP)** switch
- Harness circuits: PSP and SIG RTN
- Powertrain Control Module **(PCM)**





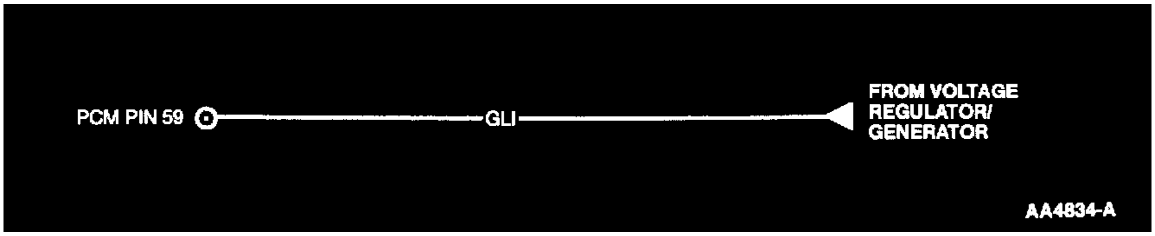


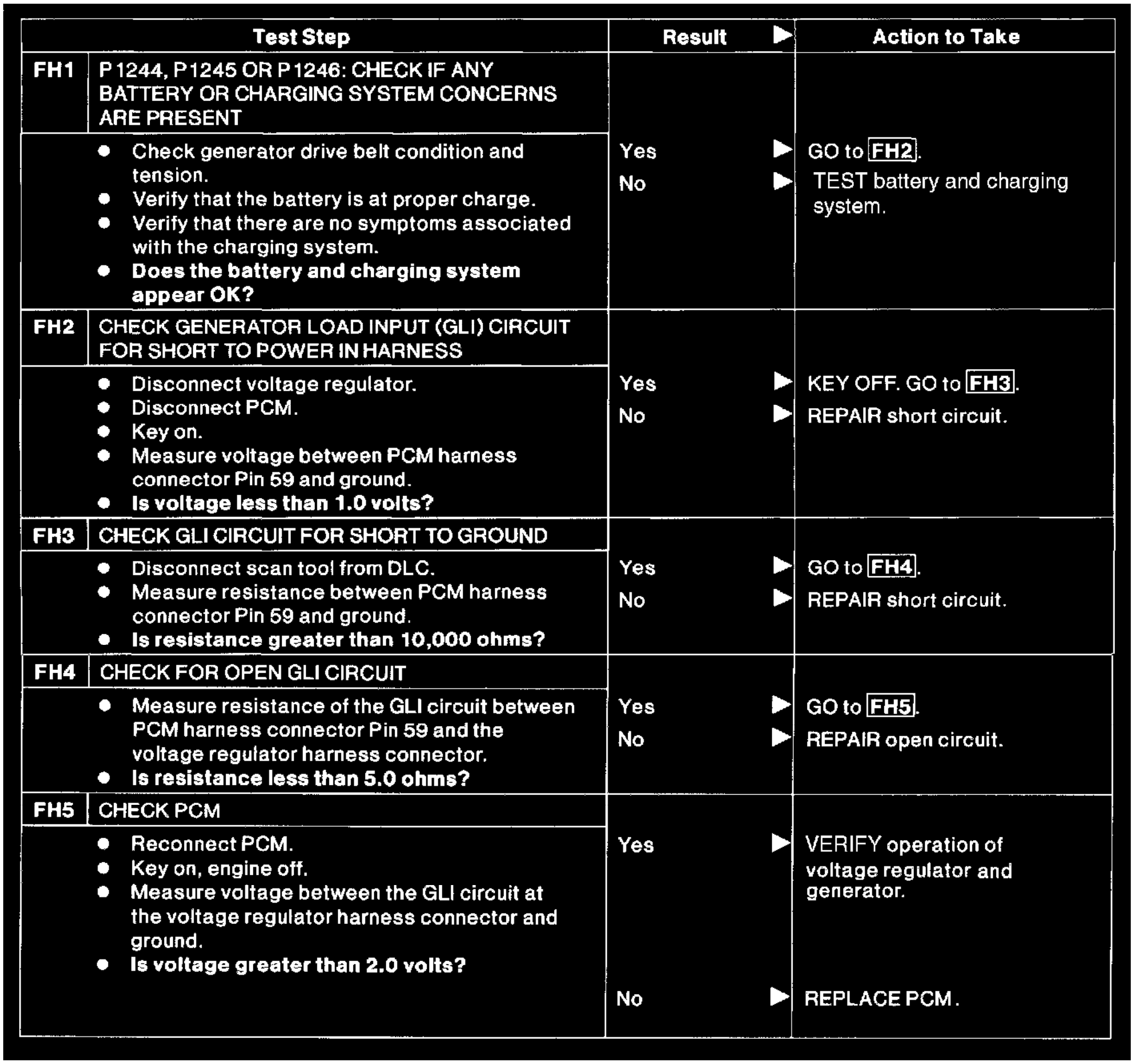
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| FF1 | VERIFY ELECTRICAL FUNCTION | | |
| | ● Connect scan tool.<br>● Key on, engine running.<br>● Access PSP PID (PSP V PID for Taurus / Sable).<br>● Turn the steering wheel back and forth.<br>● **Does the PSP PID or PSP V PID indicate a change?** | Yes ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| | | No ▶ | KEY OFF. GO to FF2. |
| FF2 | CHECK FOR PSP SWITCH CYCLING | | |
| | ● Disconnect PSP switch or remove the shorting bar.<br>● Install a jumper wire across the PSP switch harness connector.<br>● Key on, engine running.<br>● Record the PID reading.<br>● Remove the jumper wire and record the PID reading.<br>● **Does the PSP PID change from high to low or PSP V PID change from 0.0 volt to 3.8 volts?** | Yes ▶ | REPLACE the PSP switch or shorting bar. |
| | | No ▶ | KEY OFF. GO to FF3. |
| FF3 | CHECK PSP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers at the beginning of the pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of PSP circuit between PCM harness connector pin and PSP switch harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector pin and PSP switch harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶ | GO to FF4. |
| | | No ▶ | REPAIR open circuit. |
| FF4 | CHECK PSP CIRCUIT AND SIG RTN CIRCUIT FOR SHORT IN HARNESS | | |
| | ● Measure resistance between PSP signal and SIG RTN at PCM harness connector.<br>● Measure resistance between PSP signal at PCM harness connector and chassis ground.<br>● **Is either resistance less than 10,000 ohms?** | Yes ▶ | REPAIR short circuit. |
| | | No ▶ | REPLACE PCM. |

## Test Notes

This Pinpoint Test is intended to diagnose the following:

- GLI circuit
- Powertrain Control Module **(PCM)**



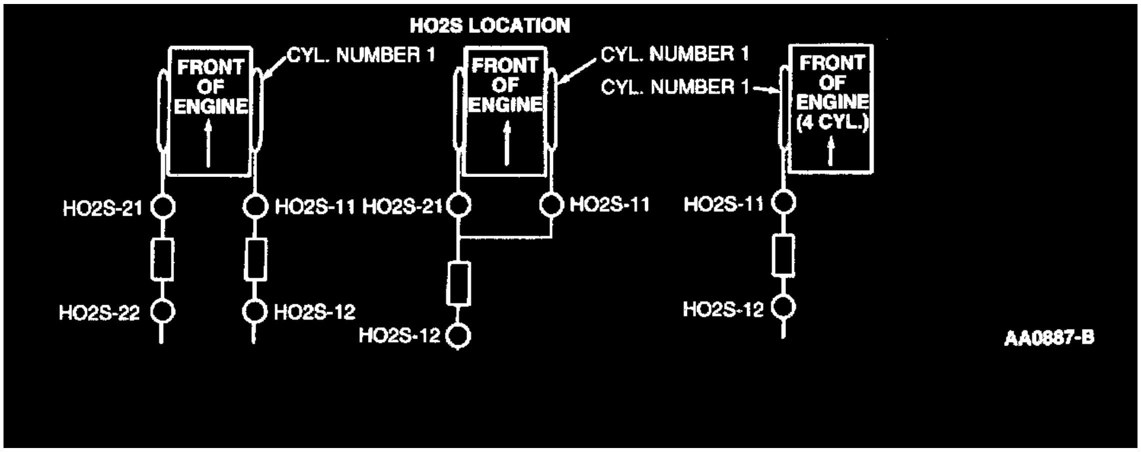


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| FH1 | P1244, P1245 OR P1246: CHECK IF ANY BATTERY OR CHARGING SYSTEM CONCERNS ARE PRESENT | | |
| | ● Check generator drive belt condition and tension.<br>● Verify that the battery is at proper charge.<br>● Verify that there are no symptoms associated with the charging system.<br>● **Does the battery and charging system appear OK?** | Yes ▶<br>No ▶ | GO to FH2.<br>TEST battery and charging system. |
| FH2 | CHECK GENERATOR LOAD INPUT (GLI) CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect voltage regulator.<br>● Disconnect PCM.<br>● Key on.<br>● Measure voltage between PCM harness connector Pin 59 and ground.<br>● **Is voltage less than 1.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to FH3.<br>REPAIR short circuit. |
| FH3 | CHECK GLI CIRCUIT FOR SHORT TO GROUND | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between PCM harness connector Pin 59 and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to FH4.<br>REPAIR short circuit. |
| FH4 | CHECK FOR OPEN GLI CIRCUIT | | |
| | ● Measure resistance of the GLI circuit between PCM harness connector Pin 59 and the voltage regulator harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to FH5.<br>REPAIR open circuit. |
| FH5 | CHECK PCM | | |
| | ● Reconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between the GLI circuit at the voltage regulator harness connector and ground.<br>● **Is voltage greater than 2.0 volts?** | Yes ▶<br>No ▶ | VERIFY operation of voltage regulator and generator.<br>REPLACE PCM. |

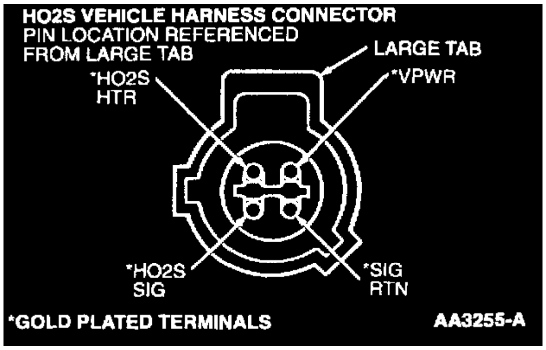
## Test Notes

This Pinpoint Test is intended to diagnose the following:

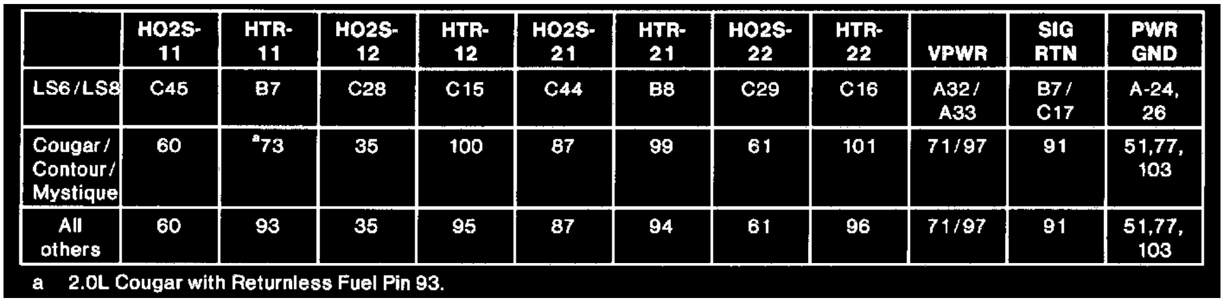
- HO2S/Heater
- HO2S Connections
- Vacuum Systems
- Fuel Injector(s)
- Harness Circuits: HO2S GND, HO2S, INJ 1-8, VPWR and SIG RTN
- Powertrain Control Module **(PCM)**



## Pinpoint Test Schematic



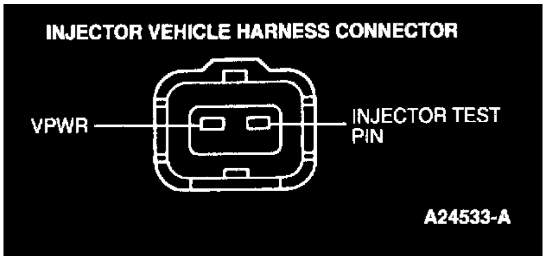
Oxygen Sensor Vehicle Harness Connector



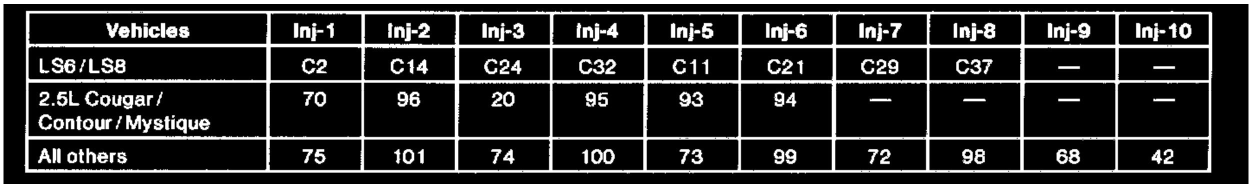
| | HO2S-11 | HTR-11 | HO2S-12 | HTR-12 | HO2S-21 | HTR-21 | HO2S-22 | HTR-22 | VPWR | SIG RTN | PWR GND |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LS6/LS8 | C45 | B7 | C28 | C15 | C44 | B8 | C29 | C16 | A32/<br>A33 | B7/<br>C17 | A-24,<br>26 |
| Cougar/Contour/Mystique | 60 | [a]73 | 35 | 100 | 87 | 99 | 61 | 101 | 71/97 | 91 | 51,77,<br>103 |
| All others | 60 | 93 | 35 | 95 | 87 | 94 | 61 | 96 | 71/97 | 91 | 51,77,<br>103 |

a 2.0L Cougar with Returnless Fuel Pin 93.

PCM Connector Pin Numbers

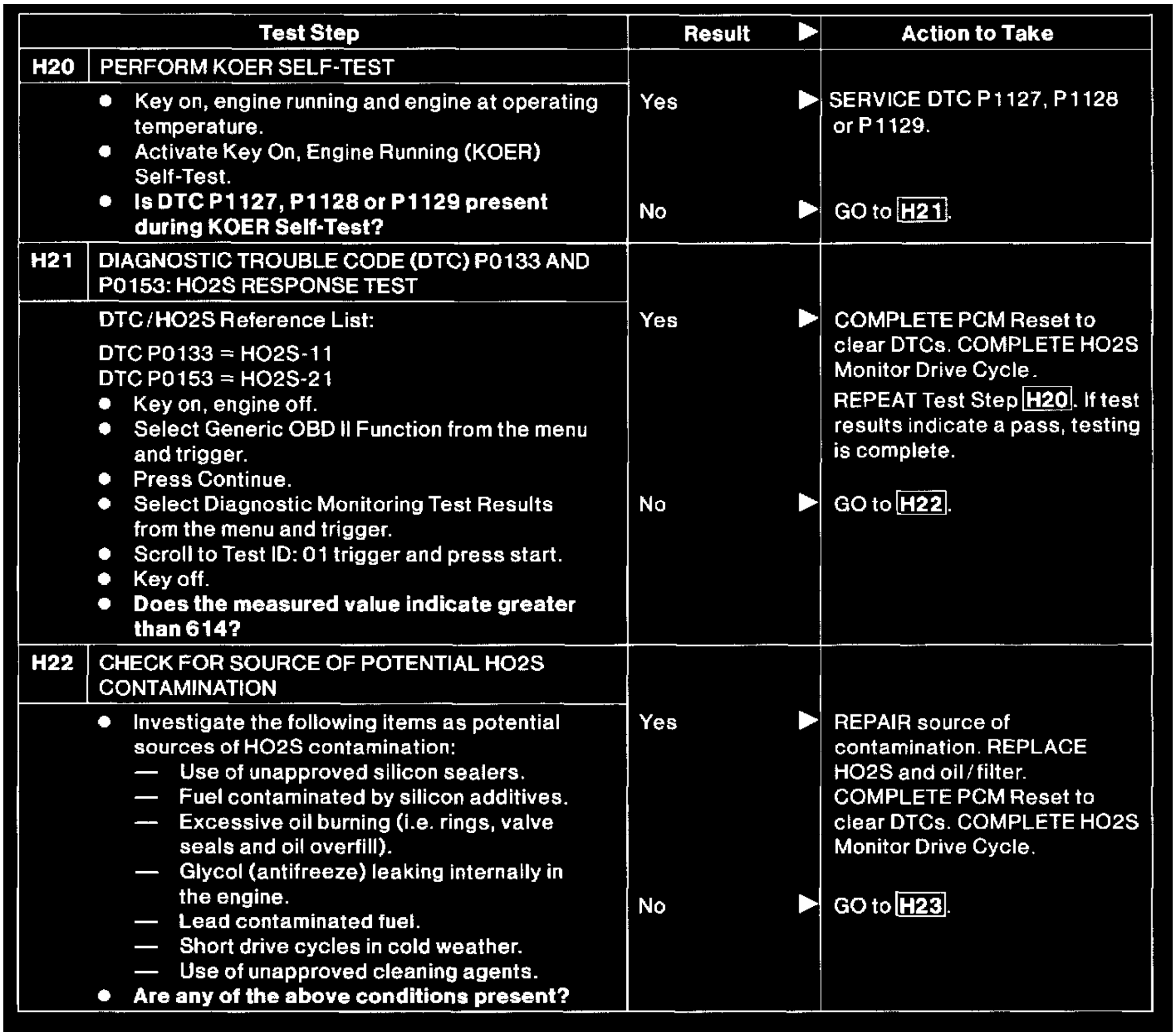


Injector Vehicle Harness Connector

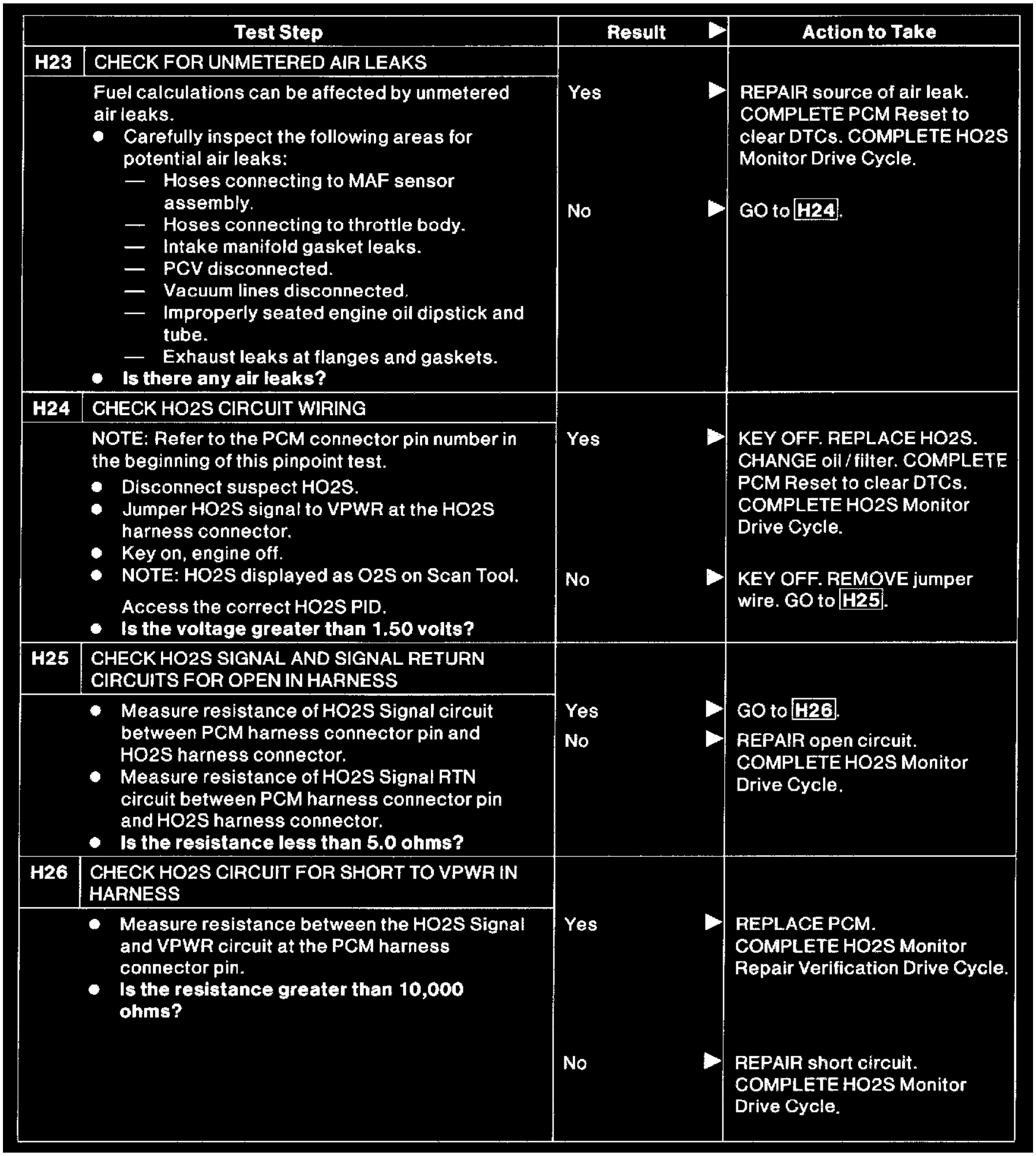


| Vehicles | Inj-1 | Inj-2 | Inj-3 | Inj-4 | Inj-5 | Inj-6 | Inj-7 | Inj-8 | Inj-9 | Inj-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| LS6/LS8 | C2 | C14 | C24 | C32 | C11 | C21 | C29 | C37 | — | — |
| 2.5L Cougar/Contour/Mystique | 70 | 96 | 20 | 95 | 93 | 94 | — | — | — | — |
| All others | 75 | 101 | 74 | 100 | 73 | 99 | 72 | 98 | 68 | 42 |

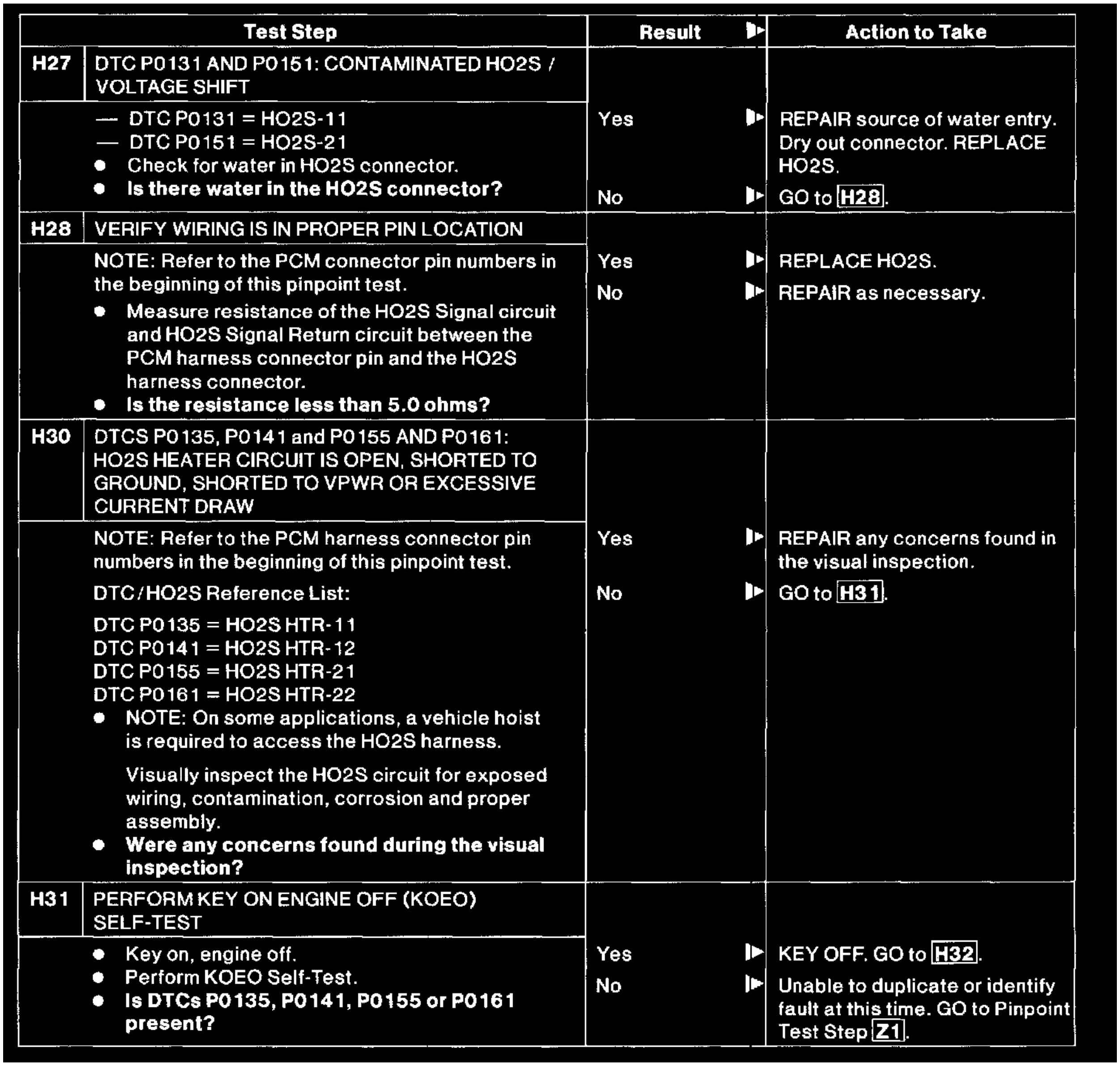
Injector PCM Connector Pin Numbers



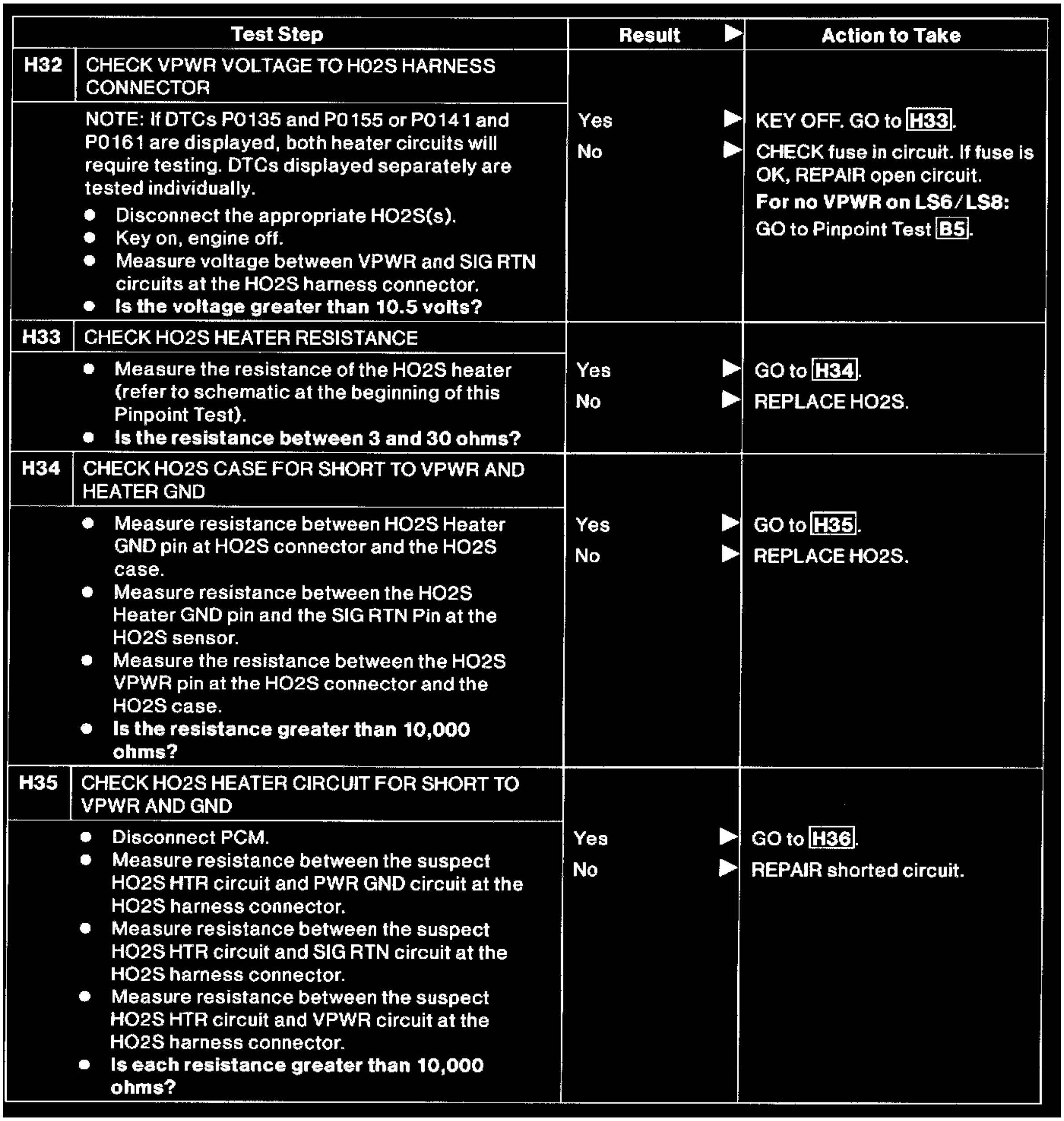
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H20** | PERFORM KOER SELF-TEST | | |
| | ● Key on, engine running and engine at operating temperature.<br>● Activate Key On, Engine Running (KOER) Self-Test.<br>● **Is DTC P1127, P1128 or P1129 present during KOER Self-Test?** | Yes ▶ | SERVICE DTC P1127, P1128 or P1129. |
| | | No ▶ | GO to H21. |
| **H21** | DIAGNOSTIC TROUBLE CODE (DTC) P0133 AND P0153: HO2S RESPONSE TEST | | |
| | DTC/HO2S Reference List:<br>DTC P0133 = HO2S-11<br>DTC P0153 = HO2S-21<br>● Key on, engine off.<br>● Select Generic OBD II Function from the menu and trigger.<br>● Press Continue.<br>● Select Diagnostic Monitoring Test Results from the menu and trigger.<br>● Scroll to Test ID: 01 trigger and press start.<br>● Key off.<br>● **Does the measured value indicate greater than 614?** | Yes ▶ | COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle.<br>REPEAT Test Step H20. If test results indicate a pass, testing is complete. |
| | | No ▶ | GO to H22. |
| **H22** | CHECK FOR SOURCE OF POTENTIAL HO2S CONTAMINATION | | |
| | ● Investigate the following items as potential sources of HO2S contamination:<br>— Use of unapproved silicon sealers.<br>— Fuel contaminated by silicon additives.<br>— Excessive oil burning (i.e. rings, valve seals and oil overfill).<br>— Glycol (antifreeze) leaking internally in the engine.<br>— Lead contaminated fuel.<br>— Short drive cycles in cold weather.<br>— Use of unapproved cleaning agents.<br>● **Are any of the above conditions present?** | Yes ▶ | REPAIR source of contamination. REPLACE HO2S and oil/filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. |
| | | No ▶ | GO to H23. |



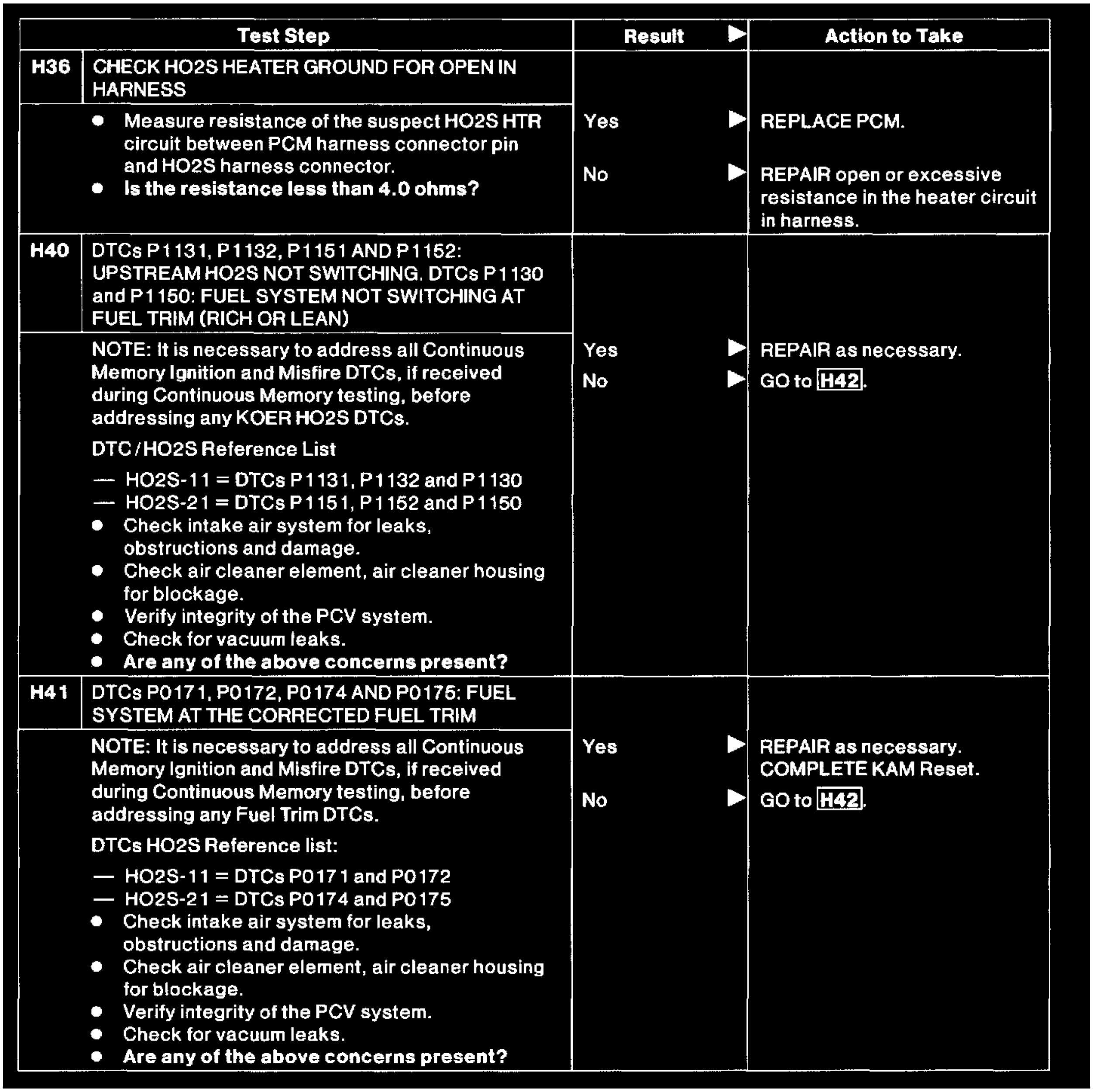
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H23** | CHECK FOR UNMETERED AIR LEAKS<br>Fuel calculations can be affected by unmetered air leaks.<br>● Carefully inspect the following areas for potential air leaks:<br>— Hoses connecting to MAF sensor assembly.<br>— Hoses connecting to throttle body.<br>— Intake manifold gasket leaks.<br>— PCV disconnected.<br>— Vacuum lines disconnected.<br>— Improperly seated engine oil dipstick and tube.<br>— Exhaust leaks at flanges and gaskets.<br>● **Is there any air leaks?** | Yes ▶ | REPAIR source of air leak. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. |
| | | No ▶ | GO to H24. |
| **H24** | CHECK HO2S CIRCUIT WIRING<br>NOTE: Refer to the PCM connector pin number in the beginning of this pinpoint test.<br>● Disconnect suspect HO2S.<br>● Jumper HO2S signal to VPWR at the HO2S harness connector.<br>● Key on, engine off.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access the correct HO2S PID.<br>● **Is the voltage greater than 1.50 volts?** | Yes ▶ | KEY OFF. REPLACE HO2S. CHANGE oil / filter. COMPLETE PCM Reset to clear DTCs. COMPLETE HO2S Monitor Drive Cycle. |
| | | No ▶ | KEY OFF. REMOVE jumper wire. GO to H25. |
| **H25** | CHECK HO2S SIGNAL AND SIGNAL RETURN CIRCUITS FOR OPEN IN HARNESS<br>● Measure resistance of HO2S Signal circuit between PCM harness connector pin and HO2S harness connector.<br>● Measure resistance of HO2S Signal RTN circuit between PCM harness connector pin and HO2S harness connector.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶ | GO to H26. |
| | | No ▶ | REPAIR open circuit. COMPLETE HO2S Monitor Drive Cycle. |
| **H26** | CHECK HO2S CIRCUIT FOR SHORT TO VPWR IN HARNESS<br>● Measure resistance between the HO2S Signal and VPWR circuit at the PCM harness connector pin.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. COMPLETE HO2S Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REPAIR short circuit. COMPLETE HO2S Monitor Drive Cycle. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H27** | DTC P0131 AND P0151: CONTAMINATED HO2S / VOLTAGE SHIFT | | |
| | — DTC P0131 = HO2S-11<br>— DTC P0151 = HO2S-21<br>● Check for water in HO2S connector.<br>● **Is there water in the HO2S connector?** | Yes ▶<br>No ▶ | REPAIR source of water entry. Dry out connector. REPLACE HO2S.<br>GO to H28. |
| **H28** | VERIFY WIRING IS IN PROPER PIN LOCATION | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Measure resistance of the HO2S Signal circuit and HO2S Signal Return circuit between the PCM harness connector pin and the HO2S harness connector.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE HO2S.<br>REPAIR as necessary. |
| **H30** | DTCS P0135, P0141 and P0155 AND P0161: HO2S HEATER CIRCUIT IS OPEN, SHORTED TO GROUND, SHORTED TO VPWR OR EXCESSIVE CURRENT DRAW | | |
| | NOTE: Refer to the PCM harness connector pin numbers in the beginning of this pinpoint test.<br>DTC/HO2S Reference List:<br>DTC P0135 = HO2S HTR-11<br>DTC P0141 = HO2S HTR-12<br>DTC P0155 = HO2S HTR-21<br>DTC P0161 = HO2S HTR-22<br>● NOTE: On some applications, a vehicle hoist is required to access the HO2S harness.<br>Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and proper assembly.<br>● **Were any concerns found during the visual inspection?** | Yes ▶<br>No ▶ | REPAIR any concerns found in the visual inspection.<br>GO to H31. |
| **H31** | PERFORM KEY ON ENGINE OFF (KOEO) SELF-TEST | | |
| | ● Key on, engine off.<br>● Perform KOEO Self-Test.<br>● **Is DTCs P0135, P0141, P0155 or P0161 present?** | Yes ▶<br>No ▶ | KEY OFF. GO to H32.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

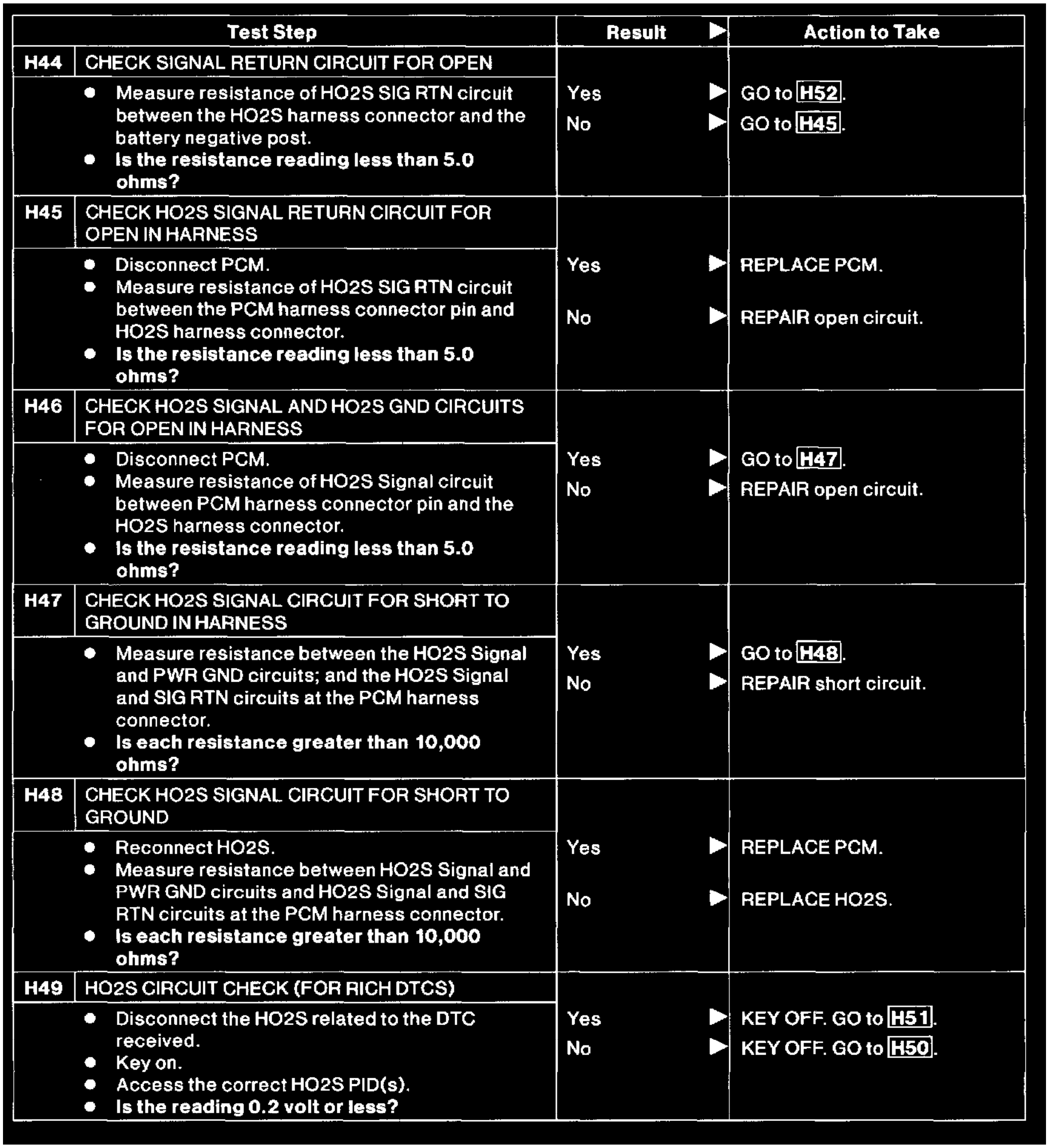


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H32** | CHECK VPWR VOLTAGE TO H02S HARNESS CONNECTOR | | |
| | NOTE: If DTCs P0135 and P0155 or P0141 and P0161 are displayed, both heater circuits will require testing. DTCs displayed separately are tested individually.<br>● Disconnect the appropriate HO2S(s).<br>● Key on, engine off.<br>● Measure voltage between VPWR and SIG RTN circuits at the HO2S harness connector.<br>● **Is the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to H33.<br>CHECK fuse in circuit. If fuse is OK, REPAIR open circuit.<br>**For no VPWR on LS6/LS8:**<br>GO to Pinpoint Test B5. |
| **H33** | CHECK HO2S HEATER RESISTANCE | | |
| | ● Measure the resistance of the HO2S heater (refer to schematic at the beginning of this Pinpoint Test).<br>● **Is the resistance between 3 and 30 ohms?** | Yes ▶<br>No ▶ | GO to H34.<br>REPLACE HO2S. |
| **H34** | CHECK HO2S CASE FOR SHORT TO VPWR AND HEATER GND | | |
| | ● Measure resistance between HO2S Heater GND pin at HO2S connector and the HO2S case.<br>● Measure resistance between the HO2S Heater GND pin and the SIG RTN Pin at the HO2S sensor.<br>● Measure the resistance between the HO2S VPWR pin at the HO2S connector and the HO2S case.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to H35.<br>REPLACE HO2S. |
| **H35** | CHECK HO2S HEATER CIRCUIT FOR SHORT TO VPWR AND GND | | |
| | ● Disconnect PCM.<br>● Measure resistance between the suspect HO2S HTR circuit and PWR GND circuit at the HO2S harness connector.<br>● Measure resistance between the suspect HO2S HTR circuit and SIG RTN circuit at the HO2S harness connector.<br>● Measure resistance between the suspect HO2S HTR circuit and VPWR circuit at the HO2S harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to H36.<br>REPAIR shorted circuit. |

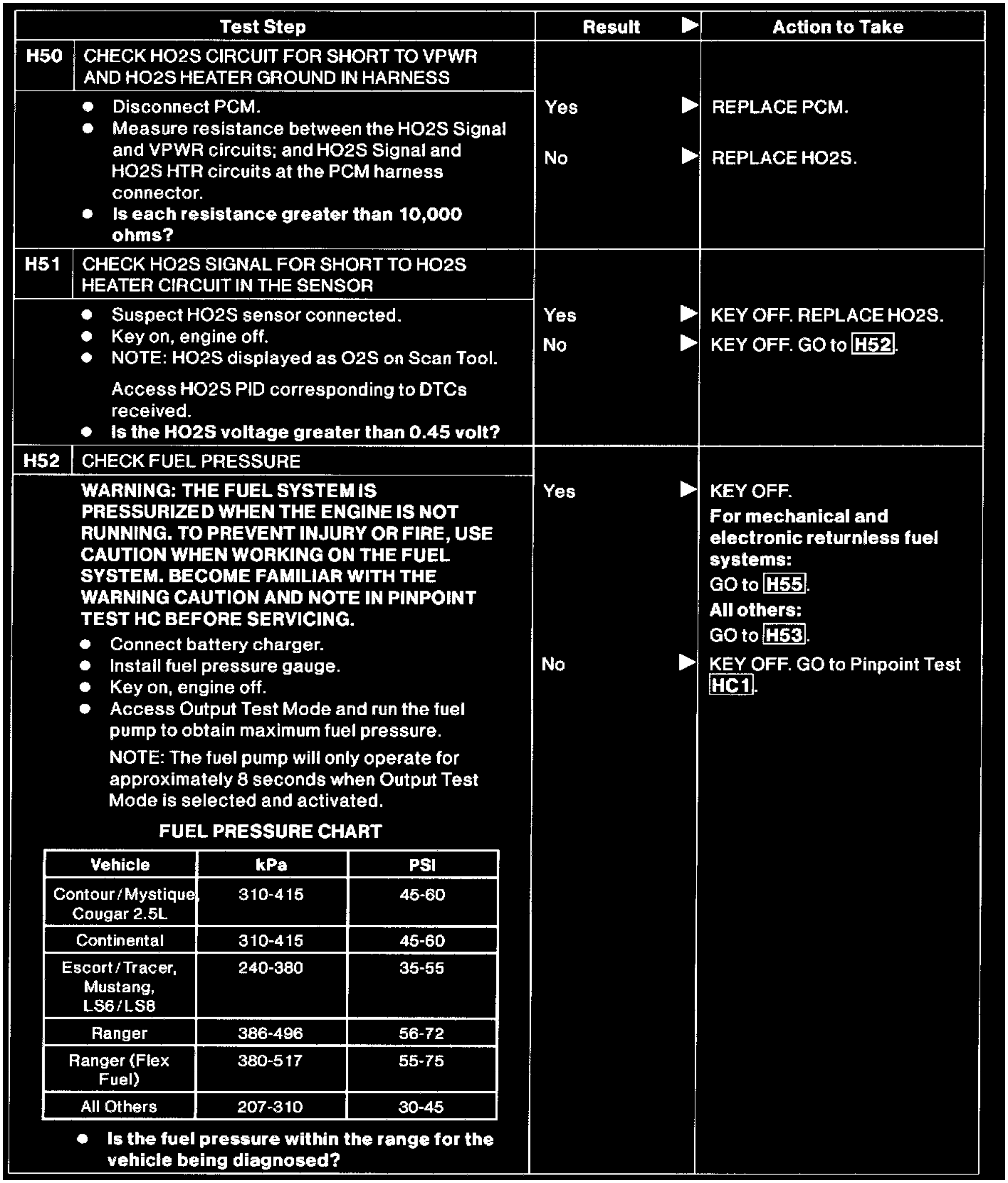


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H36** | CHECK HO2S HEATER GROUND FOR OPEN IN HARNESS | | |
| | • Measure resistance of the suspect HO2S HTR circuit between PCM harness connector pin and HO2S harness connector.<br>• **Is the resistance less than 4.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open or excessive resistance in the heater circuit in harness. |
| **H40** | DTCs P1131, P1132, P1151 AND P1152: UPSTREAM HO2S NOT SWITCHING. DTCs P1130 and P1150: FUEL SYSTEM NOT SWITCHING AT FUEL TRIM (RICH OR LEAN) | | |
| | NOTE: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any KOER HO2S DTCs.<br>DTC / HO2S Reference List<br>— HO2S-11 = DTCs P1131, P1132 and P1130<br>— HO2S-21 = DTCs P1151, P1152 and P1150<br>• Check intake air system for leaks, obstructions and damage.<br>• Check air cleaner element, air cleaner housing for blockage.<br>• Verify integrity of the PCV system.<br>• Check for vacuum leaks.<br>• **Are any of the above concerns present?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to H42. |
| **H41** | DTCs P0171, P0172, P0174 AND P0175: FUEL SYSTEM AT THE CORRECTED FUEL TRIM | | |
| | NOTE: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any Fuel Trim DTCs.<br>DTCs HO2S Reference list:<br>— HO2S-11 = DTCs P0171 and P0172<br>— HO2S-21 = DTCs P0174 and P0175<br>• Check intake air system for leaks, obstructions and damage.<br>• Check air cleaner element, air cleaner housing for blockage.<br>• Verify integrity of the PCV system.<br>• Check for vacuum leaks.<br>• **Are any of the above concerns present?** | Yes ▶<br>No ▶ | REPAIR as necessary. COMPLETE KAM Reset.<br>GO to H42. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H42** | PERFORM KOER SELF-TEST | | |
| | • Disconnect fuel vapor hose from intake manifold and plug fitting at intake manifold.<br>• Start engine and run at 2000 rpm for 5 minutes and return to idle.<br>• Complete Key On Engine Running (KOER) Self-Test.<br>• **Are any HO2S DTCs P1127, P1128, P1129, P1131, P1132, P1151 or P1152 present?** | Yes ▶ | KEY OFF. If DTC P1127, P1128 or P1129 is present, GO to Powertrain Diagnostic Trouble Code (DTC) Charts and REPAIR those DTCs first. If DTC P0131 or P0151 is present in Continuous Memory, GO to H27.<br>**DTCs (P1131, P1130) or (P1151, P1150):**<br>GO to H43.<br>**DTCs (P1132, P1130) or (P1152, P1150):**<br>GO to H49. |
| | | No ▶ | KEY OFF. **For Continuous Memory DTCs Only P1130, P1150, P0171, P0174, P0172 and P0175:**<br>GO to H52.<br>If DTC(s) P1132 and/or P1152 are no longer present, RECONNECT fuel vapor line.<br>**Vehicles experiencing KOER DTC 1132 or 1152:**<br>GO to HX22.<br>**Vehicles experiencing KOER DTC 1131 or 1151:**<br>GO to HX58.<br>**All others without recurring DTCs:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **H43** | HO2S CIRCUIT TEST (WITH LEAN DTCs) | | |
| | • Disconnect the HO2S related to the DTC.<br>• Key on, engine off.<br>• Access the correct HO2S PID.<br>• NOTE: If arcing occurs (indicating a short), remove jumper and go to Pinpoint Test Step H47 (check fuse in the heater circuit).<br>Jumper the HO2S Signal circuit to the VPWR circuit at the HO2S vehicle harness connector.<br>• **Is the reading 1.30 volts or greater?** | Yes ▶ | KEY OFF. CHECK SIG RTN circuit. GO to H44. |
| | | No ▶ | KEY OFF. GO to H46. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H44** | CHECK SIGNAL RETURN CIRCUIT FOR OPEN | | |
| | ● Measure resistance of HO2S SIG RTN circuit between the HO2S harness connector and the battery negative post.<br>● **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to H52.<br>GO to H45. |
| **H45** | CHECK HO2S SIGNAL RETURN CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance of HO2S SIG RTN circuit between the PCM harness connector pin and HO2S harness connector.<br>● **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuit. |
| **H46** | CHECK HO2S SIGNAL AND HO2S GND CIRCUITS FOR OPEN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance of HO2S Signal circuit between PCM harness connector pin and the HO2S harness connector.<br>● **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to H47.<br>REPAIR open circuit. |
| **H47** | CHECK HO2S SIGNAL CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Measure resistance between the HO2S Signal and PWR GND circuits; and the HO2S Signal and SIG RTN circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to H48.<br>REPAIR short circuit. |
| **H48** | CHECK HO2S SIGNAL CIRCUIT FOR SHORT TO GROUND | | |
| | ● Reconnect HO2S.<br>● Measure resistance between HO2S Signal and PWR GND circuits and HO2S Signal and SIG RTN circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE HO2S. |
| **H49** | HO2S CIRCUIT CHECK (FOR RICH DTCS) | | |
| | ● Disconnect the HO2S related to the DTC received.<br>● Key on.<br>● Access the correct HO2S PID(s).<br>● **Is the reading 0.2 volt or less?** | Yes ▶<br>No ▶ | KEY OFF. GO to H51.<br>KEY OFF. GO to H50. |



<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td>H50</td><td>CHECK HO2S CIRCUIT FOR SHORT TO VPWR AND HO2S HEATER GROUND IN HARNESS<br>● Disconnect PCM.<br>● Measure resistance between the HO2S Signal and VPWR circuits; and HO2S Signal and HO2S HTR circuits at the PCM harness connector.<br>● <b>Is each resistance greater than 10,000 ohms?</b></td><td>Yes ▶<br>No ▶</td><td>REPLACE PCM.<br>REPLACE HO2S.</td></tr>
<tr><td>H51</td><td>CHECK HO2S SIGNAL FOR SHORT TO HO2S HEATER CIRCUIT IN THE SENSOR<br>● Suspect HO2S sensor connected.<br>● Key on, engine off.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access HO2S PID corresponding to DTCs received.<br>● <b>Is the HO2S voltage greater than 0.45 volt?</b></td><td>Yes ▶<br>No ▶</td><td>KEY OFF. REPLACE HO2S.<br>KEY OFF. GO to H52.</td></tr>
<tr><td>H52</td><td>CHECK FUEL PRESSURE<br><b>WARNING: THE FUEL SYSTEM IS PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM. BECOME FAMILIAR WITH THE WARNING CAUTION AND NOTE IN PINPOINT TEST HC BEFORE SERVICING.</b><br>● Connect battery charger.<br>● Install fuel pressure gauge.<br>● Key on, engine off.<br>● Access Output Test Mode and run the fuel pump to obtain maximum fuel pressure.<br>NOTE: The fuel pump will only operate for approximately 8 seconds when Output Test Mode is selected and activated.<br><b>FUEL PRESSURE CHART</b>
<table>
<tr><th>Vehicle</th><th>kPa</th><th>PSI</th></tr>
<tr><td>Contour/Mystique, Cougar 2.5L</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Continental</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Escort/Tracer, Mustang, LS6/LS8</td><td>240-380</td><td>35-55</td></tr>
<tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr>
<tr><td>Ranger (Flex Fuel)</td><td>380-517</td><td>55-75</td></tr>
<tr><td>All Others</td><td>207-310</td><td>30-45</td></tr>
</table>
● <b>Is the fuel pressure within the range for the vehicle being diagnosed?</b></td><td>Yes ▶<br>No ▶</td><td>KEY OFF.<br><b>For mechanical and electronic returnless fuel systems:</b><br>GO to H55.<br><b>All others:</b><br>GO to H53.<br>KEY OFF. GO to Pinpoint Test HC1.</td></tr>
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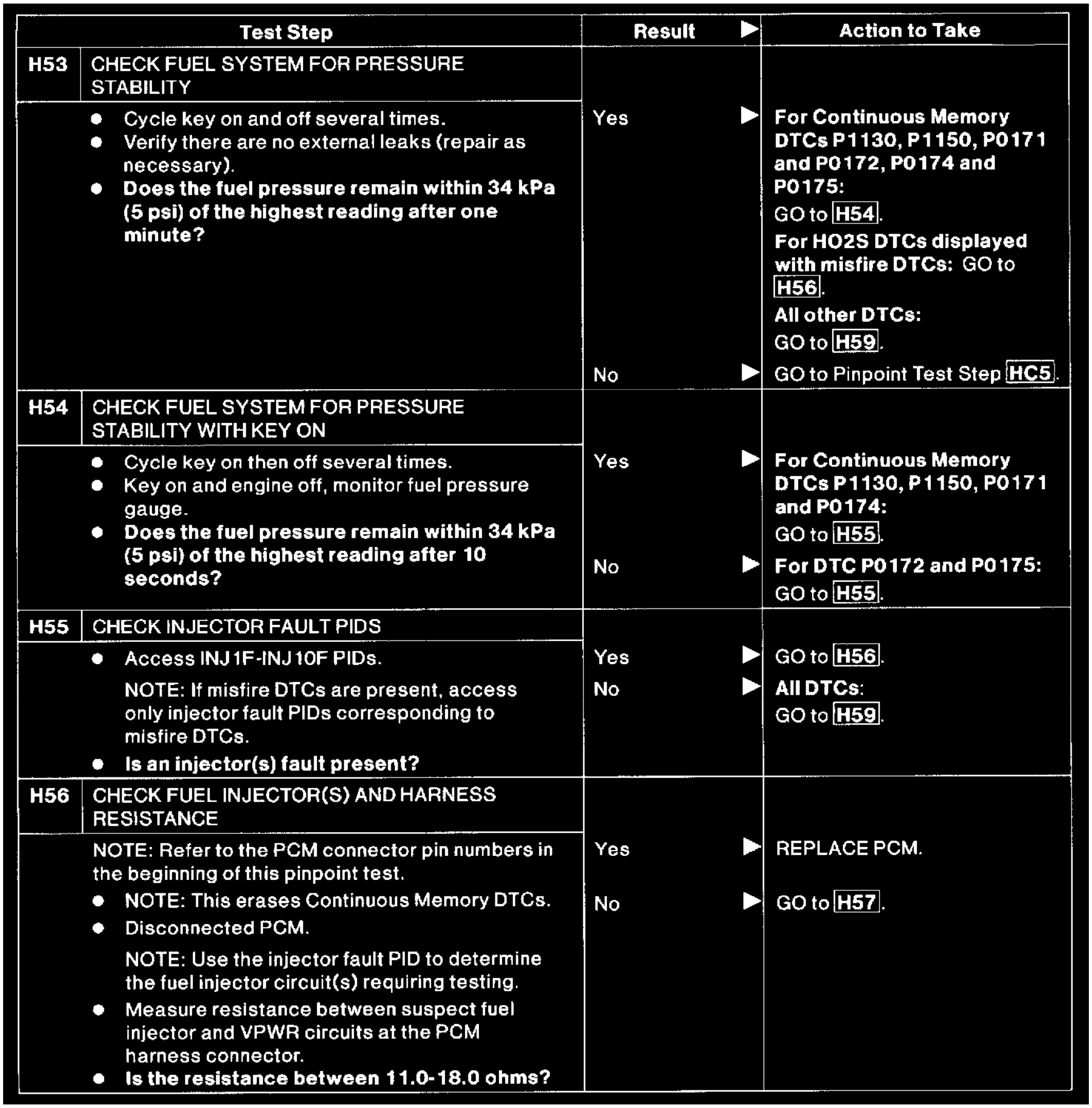
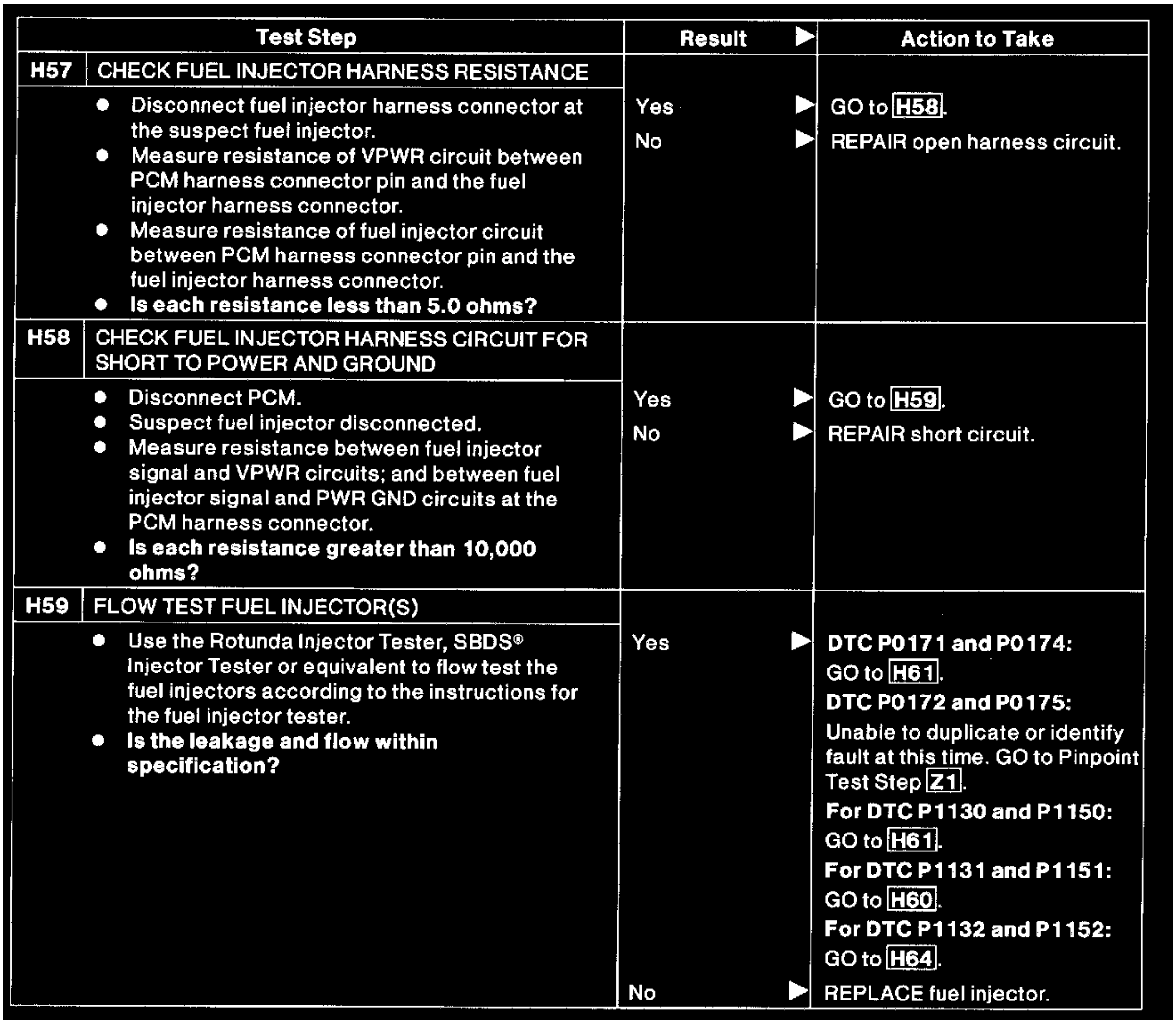
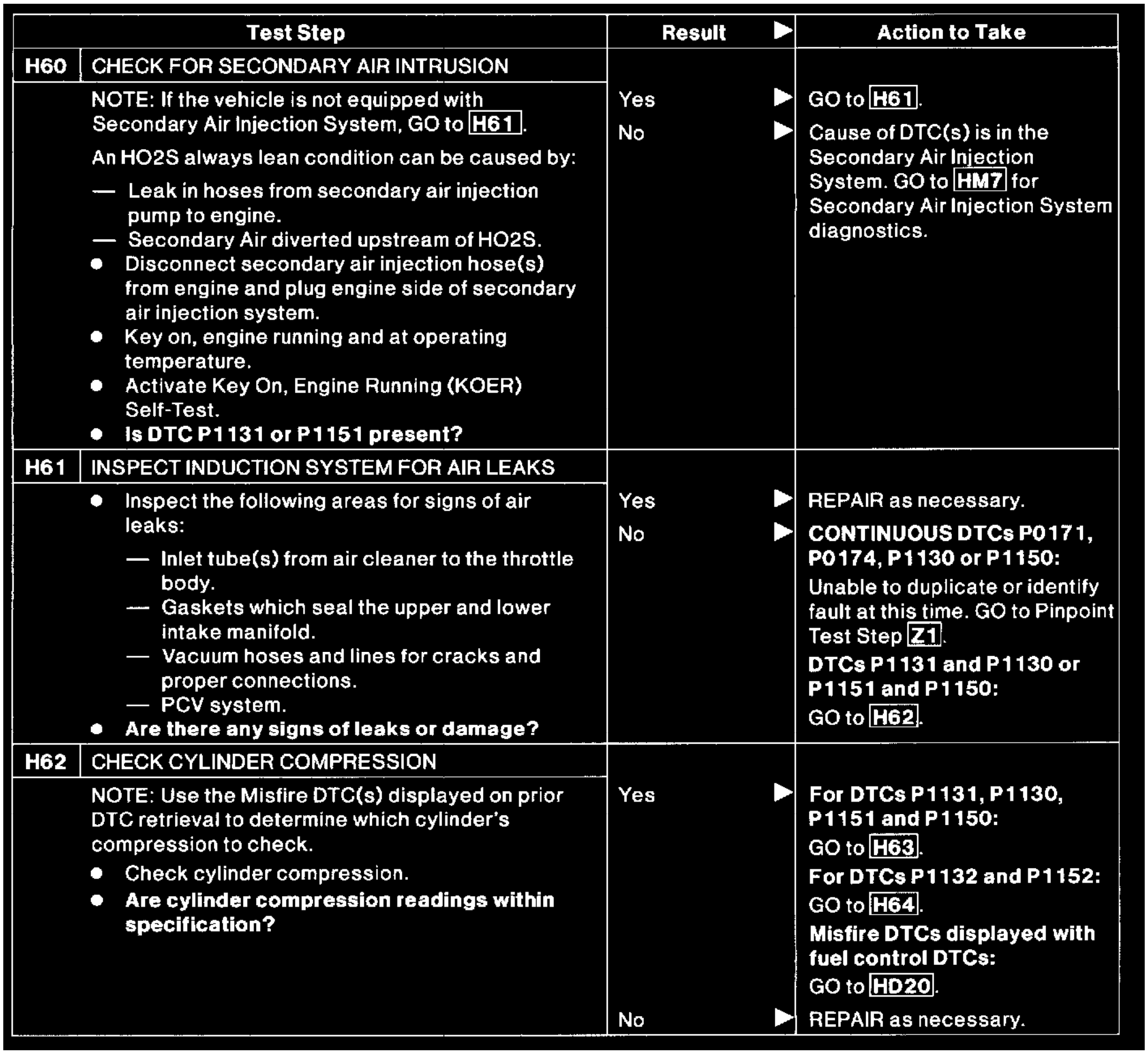


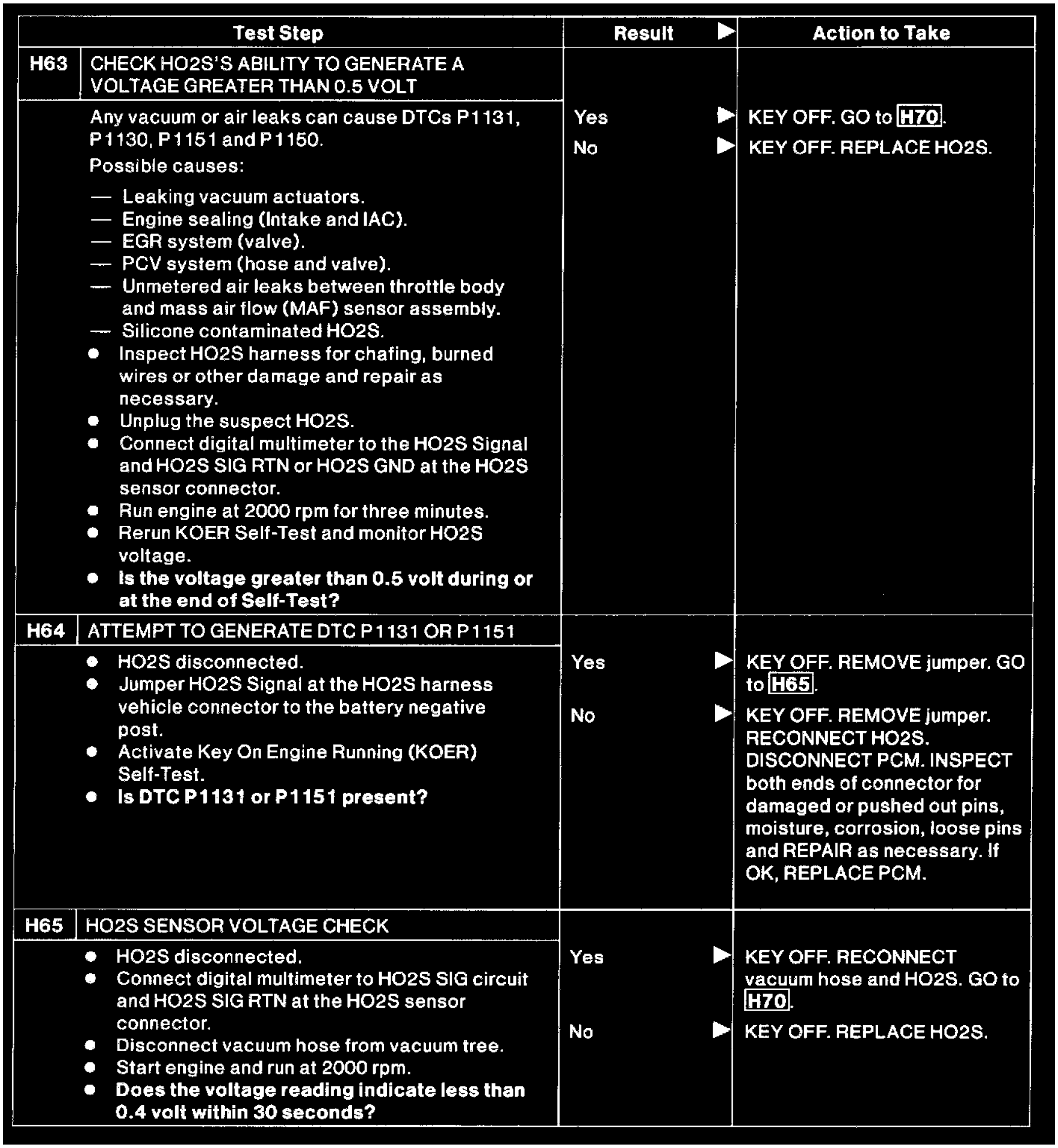
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H53** | CHECK FUEL SYSTEM FOR PRESSURE STABILITY | | |
| | - Cycle key on and off several times.<br>- Verify there are no external leaks (repair as necessary).<br>- **Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after one minute?** | Yes ▶ | **For Continuous Memory DTCs P1130, P1150, P0171 and P0172, P0174 and P0175:**<br>GO to H54.<br>**For HO2S DTCs displayed with misfire DTCs:** GO to H56.<br>**All other DTCs:**<br>GO to H59. |
| | | No ▶ | GO to Pinpoint Test Step HC5. |
| **H54** | CHECK FUEL SYSTEM FOR PRESSURE STABILITY WITH KEY ON | | |
| | - Cycle key on then off several times.<br>- Key on and engine off, monitor fuel pressure gauge.<br>- **Does the fuel pressure remain within 34 kPa (5 psi) of the highest reading after 10 seconds?** | Yes ▶ | **For Continuous Memory DTCs P1130, P1150, P0171 and P0174:**<br>GO to H55. |
| | | No ▶ | **For DTC P0172 and P0175:**<br>GO to H55. |
| **H55** | CHECK INJECTOR FAULT PIDS | | |
| | - Access INJ1F-INJ10F PIDs.<br>NOTE: If misfire DTCs are present, access only injector fault PIDs corresponding to misfire DTCs.<br>- **Is an injector(s) fault present?** | Yes ▶ | GO to H56. |
| | | No ▶ | **All DTCs:**<br>GO to H59. |
| **H56** | CHECK FUEL INJECTOR(S) AND HARNESS RESISTANCE | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>- NOTE: This erases Continuous Memory DTCs.<br>- Disconnected PCM.<br>NOTE: Use the injector fault PID to determine the fuel injector circuit(s) requiring testing.<br>- Measure resistance between suspect fuel injector and VPWR circuits at the PCM harness connector.<br>- **Is the resistance between 11.0-18.0 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | GO to H57. |



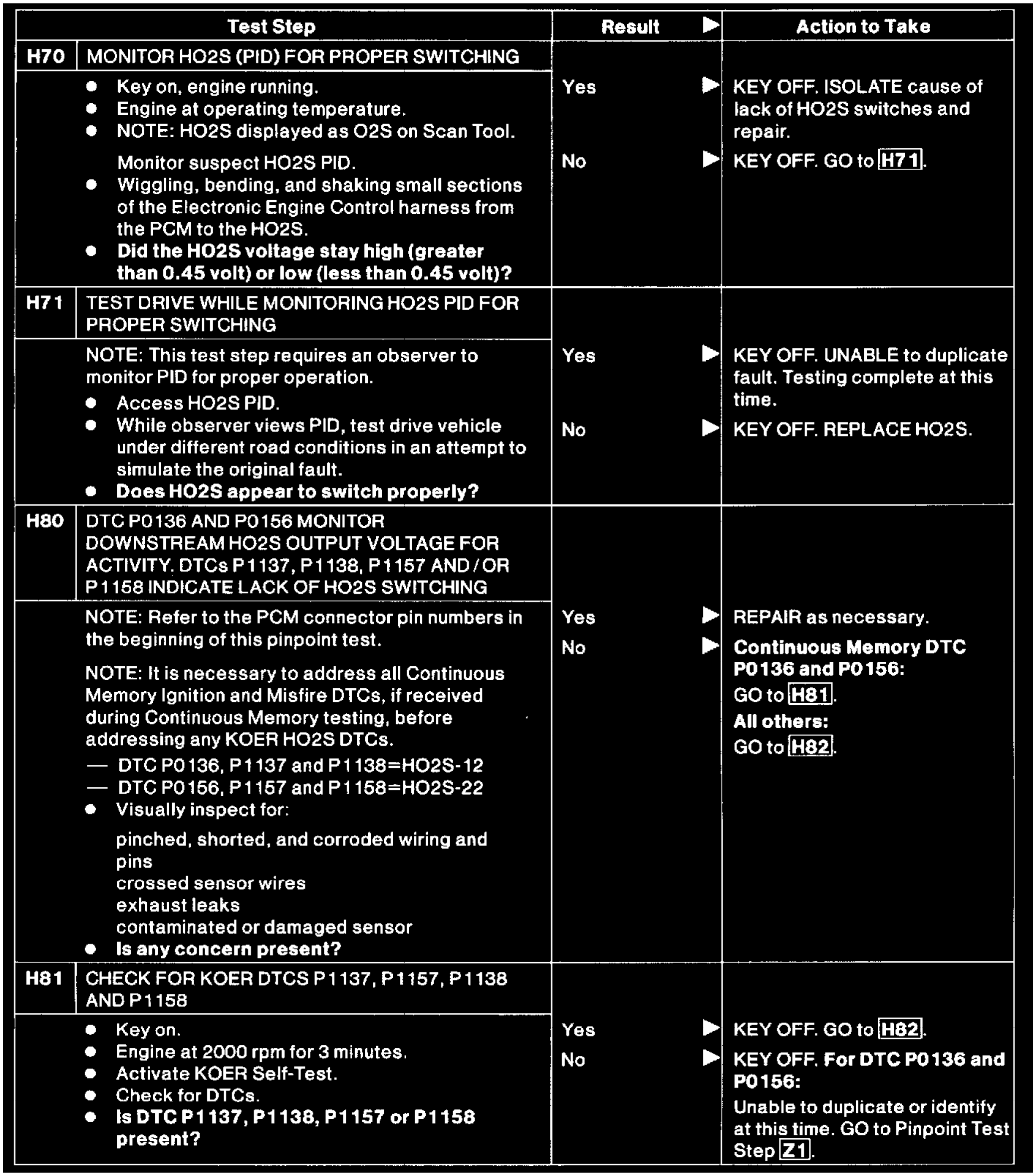
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H57** | CHECK FUEL INJECTOR HARNESS RESISTANCE | | |
| | ● Disconnect fuel injector harness connector at the suspect fuel injector.<br>● Measure resistance of VPWR circuit between PCM harness connector pin and the fuel injector harness connector.<br>● Measure resistance of fuel injector circuit between PCM harness connector pin and the fuel injector harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to H58.<br>REPAIR open harness circuit. |
| **H58** | CHECK FUEL INJECTOR HARNESS CIRCUIT FOR SHORT TO POWER AND GROUND | | |
| | ● Disconnect PCM.<br>● Suspect fuel injector disconnected.<br>● Measure resistance between fuel injector signal and VPWR circuits; and between fuel injector signal and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to H59.<br>REPAIR short circuit. |
| **H59** | FLOW TEST FUEL INJECTOR(S) | | |
| | ● Use the Rotunda Injector Tester, SBDS® Injector Tester or equivalent to flow test the fuel injectors according to the instructions for the fuel injector tester.<br>● **Is the leakage and flow within specification?** | Yes ▶ | **DTC P0171 and P0174:**<br>GO to H61.<br>**DTC P0172 and P0175:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1.<br>**For DTC P1130 and P1150:**<br>GO to H61.<br>**For DTC P1131 and P1151:**<br>GO to H60.<br>**For DTC P1132 and P1152:**<br>GO to H64. |
| | | No ▶ | REPLACE fuel injector. |



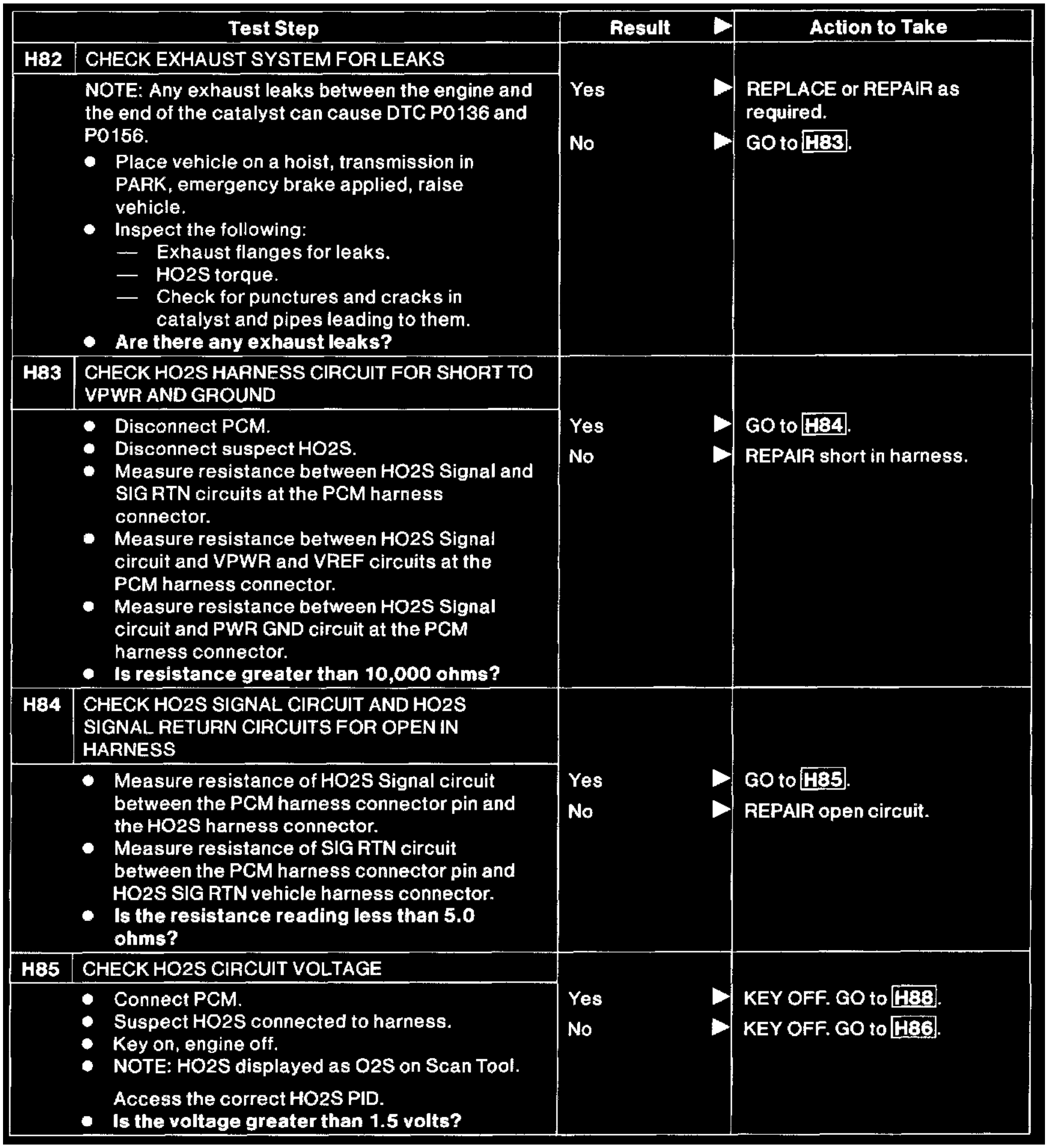
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H60** | CHECK FOR SECONDARY AIR INTRUSION | | |
| | NOTE: If the vehicle is not equipped with Secondary Air Injection System, GO to H61.<br>An HO2S always lean condition can be caused by:<br>— Leak in hoses from secondary air injection pump to engine.<br>— Secondary Air diverted upstream of HO2S.<br>● Disconnect secondary air injection hose(s) from engine and plug engine side of secondary air injection system.<br>● Key on, engine running and at operating temperature.<br>● Activate Key On, Engine Running (KOER) Self-Test.<br>● **Is DTC P1131 or P1151 present?** | Yes ▶ | GO to H61. |
| | | No ▶ | Cause of DTC(s) is in the Secondary Air Injection System. GO to HM7 for Secondary Air Injection System diagnostics. |
| **H61** | INSPECT INDUCTION SYSTEM FOR AIR LEAKS | | |
| | ● Inspect the following areas for signs of air leaks:<br>— Inlet tube(s) from air cleaner to the throttle body.<br>— Gaskets which seal the upper and lower intake manifold.<br>— Vacuum hoses and lines for cracks and proper connections.<br>— PCV system.<br>● **Are there any signs of leaks or damage?** | Yes ▶ | REPAIR as necessary. |
| | | No ▶ | **CONTINUOUS DTCs P0171, P0174, P1130 or P1150:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1.<br>**DTCs P1131 and P1130 or P1151 and P1150:**<br>GO to H62. |
| **H62** | CHECK CYLINDER COMPRESSION | | |
| | NOTE: Use the Misfire DTC(s) displayed on prior DTC retrieval to determine which cylinder's compression to check.<br>● Check cylinder compression.<br>● **Are cylinder compression readings within specification?** | Yes ▶ | **For DTCs P1131, P1130, P1151 and P1150:**<br>GO to H63.<br>**For DTCs P1132 and P1152:**<br>GO to H64.<br>**Misfire DTCs displayed with fuel control DTCs:**<br>GO to HD20. |
| | | No ▶ | REPAIR as necessary. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H63** | CHECK HO2S'S ABILITY TO GENERATE A VOLTAGE GREATER THAN 0.5 VOLT | | |
| | Any vacuum or air leaks can cause DTCs P1131, P1130, P1151 and P1150.<br>Possible causes:<br>— Leaking vacuum actuators.<br>— Engine sealing (Intake and IAC).<br>— EGR system (valve).<br>— PCV system (hose and valve).<br>— Unmetered air leaks between throttle body and mass air flow (MAF) sensor assembly.<br>— Silicone contaminated HO2S.<br>● Inspect HO2S harness for chafing, burned wires or other damage and repair as necessary.<br>● Unplug the suspect HO2S.<br>● Connect digital multimeter to the HO2S Signal and HO2S SIG RTN or HO2S GND at the HO2S sensor connector.<br>● Run engine at 2000 rpm for three minutes.<br>● Rerun KOER Self-Test and monitor HO2S voltage.<br>● **Is the voltage greater than 0.5 volt during or at the end of Self-Test?** | Yes ▶<br>No ▶ | KEY OFF. GO to H70.<br>KEY OFF. REPLACE HO2S. |
| **H64** | ATTEMPT TO GENERATE DTC P1131 OR P1151 | | |
| | ● HO2S disconnected.<br>● Jumper HO2S Signal at the HO2S harness vehicle connector to the battery negative post.<br>● Activate Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P1131 or P1151 present?** | Yes ▶<br>No ▶ | KEY OFF. REMOVE jumper. GO to H65.<br>KEY OFF. REMOVE jumper. RECONNECT HO2S. DISCONNECT PCM. INSPECT both ends of connector for damaged or pushed out pins, moisture, corrosion, loose pins and REPAIR as necessary. If OK, REPLACE PCM. |
| **H65** | HO2S SENSOR VOLTAGE CHECK | | |
| | ● HO2S disconnected.<br>● Connect digital multimeter to HO2S SIG circuit and HO2S SIG RTN at the HO2S sensor connector.<br>● Disconnect vacuum hose from vacuum tree.<br>● Start engine and run at 2000 rpm.<br>● **Does the voltage reading indicate less than 0.4 volt within 30 seconds?** | Yes ▶<br>No ▶ | KEY OFF. RECONNECT vacuum hose and HO2S. GO to H70.<br>KEY OFF. REPLACE HO2S. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H70** | MONITOR HO2S (PID) FOR PROPER SWITCHING | | |
| | ● Key on, engine running.<br>● Engine at operating temperature.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Monitor suspect HO2S PID.<br>● Wiggling, bending, and shaking small sections of the Electronic Engine Control harness from the PCM to the HO2S.<br>● **Did the HO2S voltage stay high (greater than 0.45 volt) or low (less than 0.45 volt)?** | Yes ▶<br>No ▶ | KEY OFF. ISOLATE cause of lack of HO2S switches and repair.<br>KEY OFF. GO to H71. |
| **H71** | TEST DRIVE WHILE MONITORING HO2S PID FOR PROPER SWITCHING | | |
| | NOTE: This test step requires an observer to monitor PID for proper operation.<br>● Access HO2S PID.<br>● While observer views PID, test drive vehicle under different road conditions in an attempt to simulate the original fault.<br>● **Does HO2S appear to switch properly?** | Yes ▶<br>No ▶ | KEY OFF. UNABLE to duplicate fault. Testing complete at this time.<br>KEY OFF. REPLACE HO2S. |
| **H80** | DTC P0136 AND P0156 MONITOR DOWNSTREAM HO2S OUTPUT VOLTAGE FOR ACTIVITY. DTCs P1137, P1138, P1157 AND/OR P1158 INDICATE LACK OF HO2S SWITCHING | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>NOTE: It is necessary to address all Continuous Memory Ignition and Misfire DTCs, if received during Continuous Memory testing, before addressing any KOER HO2S DTCs.<br>— DTC P0136, P1137 and P1138=HO2S-12<br>— DTC P0156, P1157 and P1158=HO2S-22<br>● Visually inspect for:<br>pinched, shorted, and corroded wiring and pins<br>crossed sensor wires<br>exhaust leaks<br>contaminated or damaged sensor<br>● **Is any concern present?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>**Continuous Memory DTC P0136 and P0156:**<br>GO to H81.<br>**All others:**<br>GO to H82. |
| **H81** | CHECK FOR KOER DTCS P1137, P1157, P1138 AND P1158 | | |
| | ● Key on.<br>● Engine at 2000 rpm for 3 minutes.<br>● Activate KOER Self-Test.<br>● Check for DTCs.<br>● **Is DTC P1137, P1138, P1157 or P1158 present?** | Yes ▶<br>No ▶ | KEY OFF. GO to H82.<br>KEY OFF. **For DTC P0136 and P0156:**<br>Unable to duplicate or identify at this time. GO to Pinpoint Test Step Z1. |

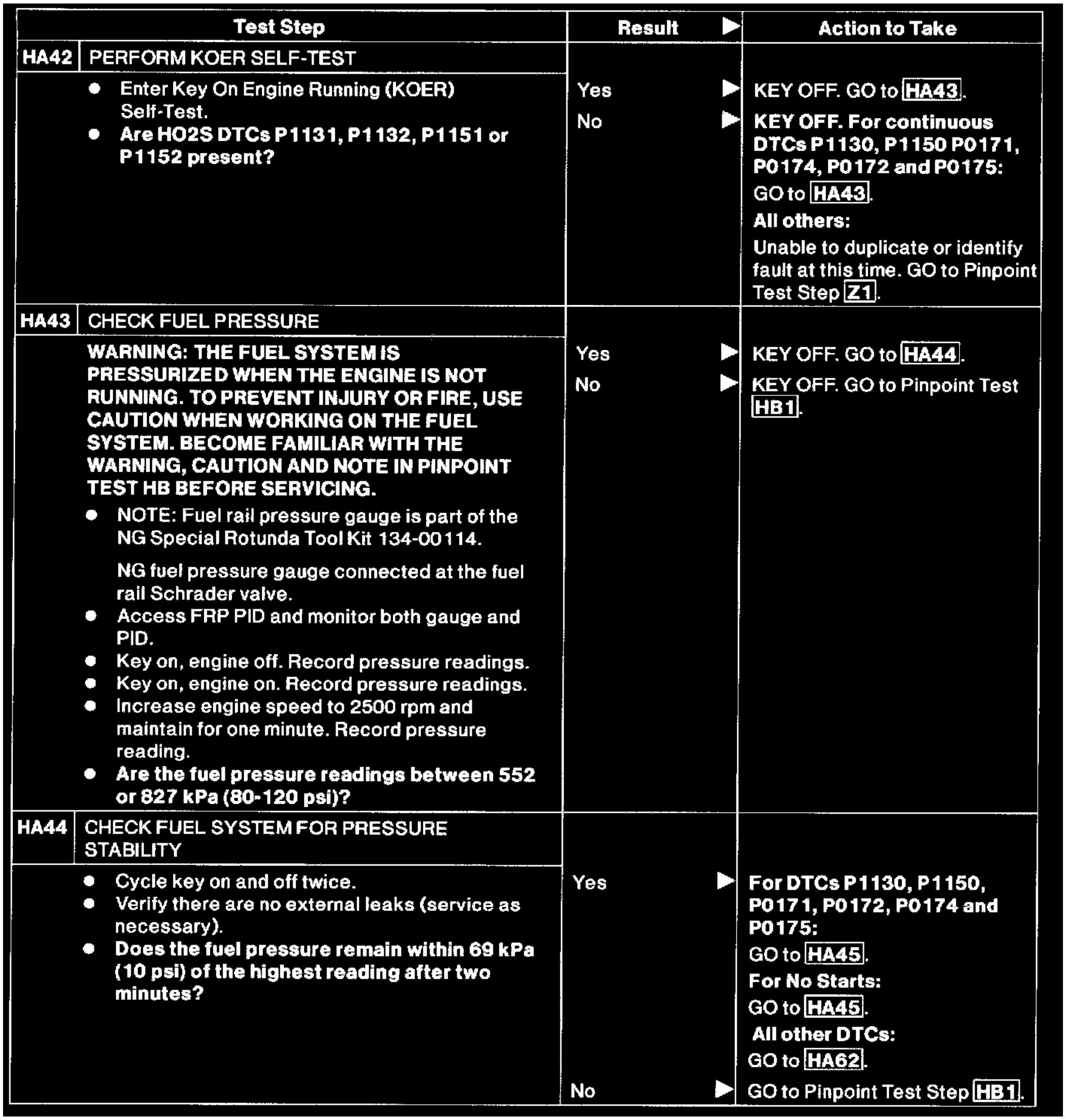


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H82** | CHECK EXHAUST SYSTEM FOR LEAKS | | |
| | NOTE: Any exhaust leaks between the engine and the end of the catalyst can cause DTC P0136 and P0156.<br>● Place vehicle on a hoist, transmission in PARK, emergency brake applied, raise vehicle.<br>● Inspect the following:<br>— Exhaust flanges for leaks.<br>— HO2S torque.<br>— Check for punctures and cracks in catalyst and pipes leading to them.<br>● **Are there any exhaust leaks?** | Yes ▶<br>No ▶ | REPLACE or REPAIR as required.<br>GO to H83. |
| **H83** | CHECK HO2S HARNESS CIRCUIT FOR SHORT TO VPWR AND GROUND | | |
| | ● Disconnect PCM.<br>● Disconnect suspect HO2S.<br>● Measure resistance between HO2S Signal and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance between HO2S Signal circuit and VPWR and VREF circuits at the PCM harness connector.<br>● Measure resistance between HO2S Signal circuit and PWR GND circuit at the PCM harness connector.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to H84.<br>REPAIR short in harness. |
| **H84** | CHECK HO2S SIGNAL CIRCUIT AND HO2S SIGNAL RETURN CIRCUITS FOR OPEN IN HARNESS | | |
| | ● Measure resistance of HO2S Signal circuit between the PCM harness connector pin and the HO2S harness connector.<br>● Measure resistance of SIG RTN circuit between the PCM harness connector pin and HO2S SIG RTN vehicle harness connector.<br>● **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to H85.<br>REPAIR open circuit. |
| **H85** | CHECK HO2S CIRCUIT VOLTAGE | | |
| | ● Connect PCM.<br>● Suspect HO2S connected to harness.<br>● Key on, engine off.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access the correct HO2S PID.<br>● **Is the voltage greater than 1.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to H88.<br>KEY OFF. GO to H86. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **H86** | CHECK HO2S GROUND CIRCUIT IN THE PCM | | |
| | • Disconnect PCM.<br>• Measure resistance between SIG RTN and PWR GND circuits at the PCM connector.<br>• **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to H87.<br>REPLACE PCM. |
| **H87** | HO2S CIRCUIT CHECK | | |
| | • PCM connected.<br>• Suspect HO2S disconnected.<br>• Jumper VPWR to HO2S signal circuit at the HO2S harness connector.<br>• Key on.<br>• Access HO2S PID.<br>• **Is the PID value greater than 1.5 volts?** | Yes ▶<br>No ▶ | REPLACE HO2S.<br>REPLACE PCM. |
| **H88** | CHECK FOR OVER VOLTAGE ON THE HO2S CIRCUIT IN THE PCM | | |
| | • Key on.<br>• HO2S disconnected.<br>• Measure voltage between SIG RTN circuit at the HO2S harness connector and battery negative post.<br>• Measure voltage between HO2S SIG circuit at the HO2S harness connector and battery negative post.<br>• **Are either voltage readings greater than 1.5 volts?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE HO2S. |
| **H100** | KOER DTC P1127 | | |
| | • Key on, engine on.<br>• Access all HO2S heaters and HO2S heater monitor PIDs.<br>• **Do all PIDs indicate ON?** | Yes ▶<br>No ▶ | Engine still operating. PERFORM KOER Self-Test.<br>Operate the engine until all PIDs indicate on. PERFORM KOER Self-Test. |
| **H110** | DTCS P1128 AND P1129 KOER | | |
| | NOTE: Refer to the PCM harness connector pin numbers in the beginning of this pinpoint test.<br>— P1128 refer to the upstream HO2S.<br>— P1129 refer to the downstream HO2S.<br>• Visually inspect vehicle HO2S harness connector(s) for any indication of being crossed (stretched wires, wire harnesses not mounted properly).<br>• **Are there crossed connections or wires?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to H111. |
| **H111** | VERIFY PROPER HO2S SIGNAL PIN LOCATION | | |
| | • PCM disconnected.<br>• Disconnect both of the suspect HO2S sensors from the vehicle harness connector.<br>— P1128 = HO2S 11/21 Upstream<br>— P1129 = HO2S 12/22 Downstream<br>• Measure resistance of HO2S signal circuits between PCM harness connector pins and HO2S harness connector.<br>• **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | Unable to duplicate or identify at this time. GO to Pinpoint Test Step Z1.<br>CONNECT HO2S connector to proper HO2S signal pins in the PCM harness connector or HO2S harness connectors. RERUN Quick Test. |

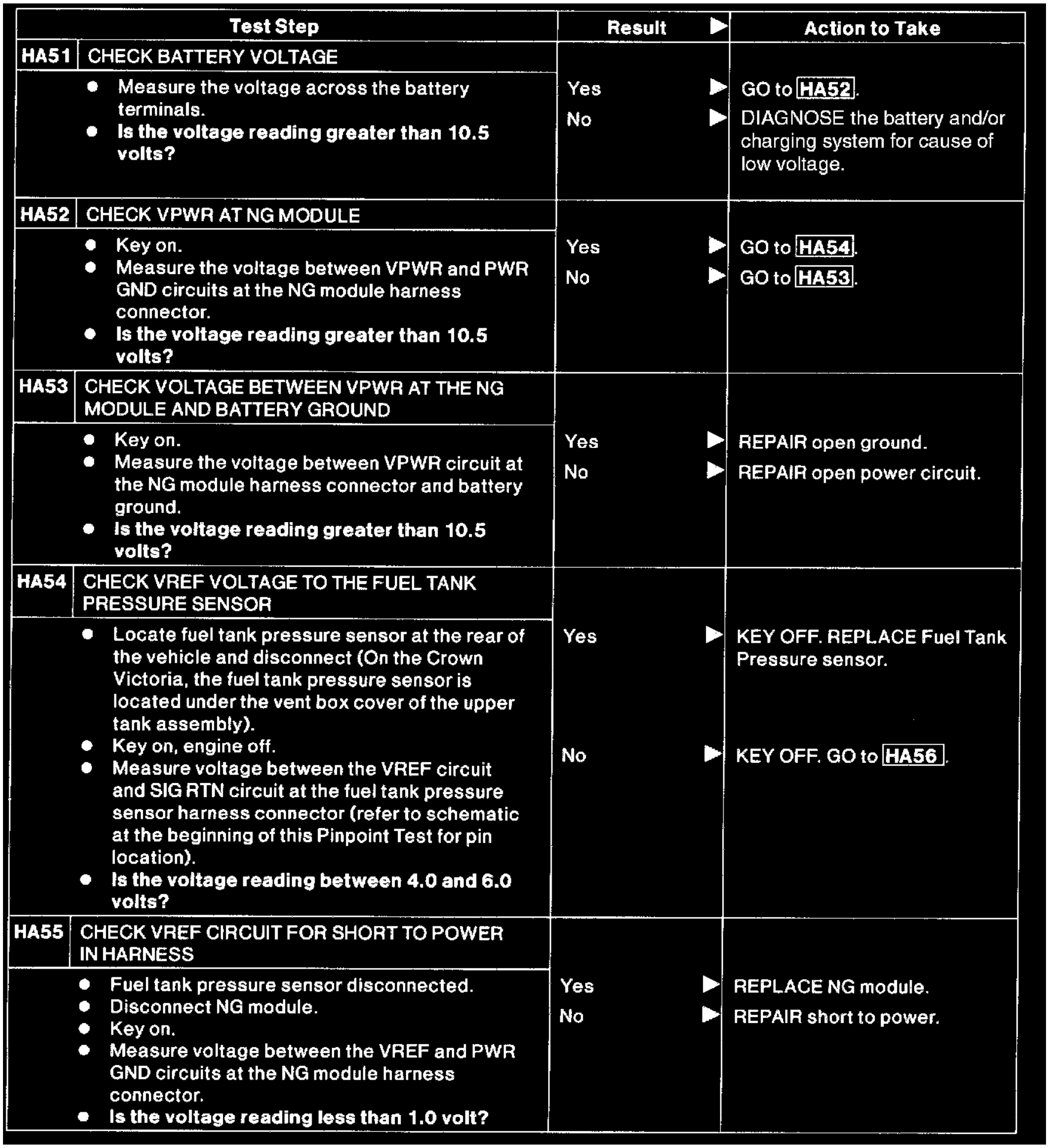
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA30** | DTCS P0135, P0141, P0155 AND P0161: HO2S HEATER SIGNAL CIRCUIT IS OPEN, SHORTED TO GROUND, SHORTED TO VPWR OR EXCESSIVE CURRENT DRAW | | |
| | DTC/HO2S Reference List<br>DTC P0135 = HO2S HTR-11<br>DTC P0141 = HO2S HTR-12<br>DTC P0155 = HO2S HTR-21<br>DTC P0161 = HO2S HTR-22<br>● NOTE: On some applications, a vehicle hoist is required to access the HO2S harness.<br>Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and proper installation.<br>● **Were any concerns found during the visual inspection?** | Yes ▶<br>No ▶ | REPAIR any concerns found in the visual inspection.<br>GO to HA31. |
| **HA31** | PERFORM KEY ON ENGINE OFF (KOEO) SELF-TEST | | |
| | ● Key on.<br>● Engine at 2000 rpm for 1 minute.<br>● Key off.<br>● Key on, engine off.<br>● Perform KOEO Self-Test.<br>● **Are DTCs P0135, P0141, P0155 and/or P0161 present?** | Yes ▶<br>No ▶ | KEY OFF. GO to HA32.<br>KEY OFF. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HA32** | CHECK VPWR VOLTAGE TO HO2S HARNESS CONNECTOR | | |
| | NOTE: If DTCs P0135 and P0155 or P0141 and P0161 are displayed, both heater circuits will require testing. DTCs displayed separately are tested individually.<br>NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect the appropriate HO2S(s).<br>● Key on, engine off.<br>● Measure voltage between VPWR and SIG RTN circuits at the HO2S harness connector.<br>● **Is the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HA34.<br>KEY OFF. GO to HA33. |
| **HA33** | CHECK VPWR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance of VPWR circuit between PCM harness connector pin and HO2S harness connector.<br>● **Is the resistance less than 4.0 ohms?** | Yes ▶<br>No ▶ | GO to HA34.<br>CHECK fuse in circuit. If fuse is OK, REPAIR open circuit. |
| **HA34** | CHECK HO2S HEATER RESISTANCE | | |
| | ● Measure the resistance of the HO2S heater.<br>● **Is the resistance between 3 and 30 ohms?** | Yes ▶<br>No ▶ | GO to HA35.<br>REPLACE HO2S. |
| **HA35** | CHECK HO2S CASE FOR SHORT TO VPWR AND HEATER GND | | |
| | ● Measure resistance between the HO2S Heater GND at the HO2S sensor connector and the HO2S sensor case.<br>● Measure resistance between the HO2S VPWR at the HO2S sensor connector and the HO2S sensor case.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HA36.<br>REPLACE HO2S. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA36** | CHECK FOR SHORTS TO OTHER GROUNDS AND VPWR IN THE HO2S HEATER GROUND HARNESS CIRCUITS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Measure resistance between the suspect HO2S HTR circuit and PWR GND, SIG RTN and VPWR circuits at the HO2S harness connector.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to **HA37**.<br>REPAIR shorted circuit. RESTORE vehicle. RERUN Quick Test. |
| **HA37** | CHECK HO2S HEATER GROUND FOR OPEN IN HARNESS | | |
| | ● Measure resistance of the suspect HO2S HTR circuit between PCM harness connector pin and HO2S harness connector.<br>● **Is the resistance less than 4.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open or excessive resistance in the heater circuit in harness. |
| **HA40** | DTC P1131, P1151, P1132 AND P1152: UPSTREAM HO2S(S) NOT SWITCHING. DTCs P1130 AND P1150: FUEL SYSTEM NOT SWITCHING AT THE FUEL TRIM (RICH OR LEAN) | | |
| | HO2S DTCs Reference list<br>— HO2S-11 = DTCs P1131, P1132 and P1130<br>— HO2S-21 = DTCs P1151, P1152 and P1150<br>● Check intake air system for leaks, obstructions, damage and blockage.<br>● Verify integrity of the PCV system.<br>● Check for disconnected spark plug wires.<br>● Check for vacuum leaks.<br>● **Are any of the above concerns present?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to **HA42**. |
| **HA41** | DTCs P0171, P0172, P0174 AND P0175: FUEL SYSTEM AT THE CORRECTED FUEL TRIM | | |
| | HO2S DTCs Reference list:<br>— HO2S-11 = DTCs P0171 and P0172<br>— HO2S-21 = DTCs P0174 and P0175<br>● Check intake air system for leaks, obstructions and damage.<br>● Check air cleaner element, air cleaner housing for blockage.<br>● Verify fuel level.<br>● Verify integrity of the PCV system.<br>● Check for disconnected spark plug wires.<br>● Check for vacuum leaks.<br>● Verify customer did not run out of fuel.<br>● **Are any of the above concerns present?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to **HA42**. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA42** | PERFORM KOER SELF-TEST | | |
| | • Enter Key On Engine Running (KOER) Self-Test.<br>• **Are HO2S DTCs P1131, P1132, P1151 or P1152 present?** | Yes ▶ | KEY OFF. GO to HA43. |
| | | No ▶ | **KEY OFF. For continuous DTCs P1130, P1150 P0171, P0174, P0172 and P0175:**<br>GO to HA43.<br>**All others:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HA43** | CHECK FUEL PRESSURE | | |
| | **WARNING: THE FUEL SYSTEM IS PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM. BECOME FAMILIAR WITH THE WARNING, CAUTION AND NOTE IN PINPOINT TEST HB BEFORE SERVICING.**<br>• NOTE: Fuel rail pressure gauge is part of the NG Special Rotunda Tool Kit 134-00114.<br>NG fuel pressure gauge connected at the fuel rail Schrader valve.<br>• Access FRP PID and monitor both gauge and PID.<br>• Key on, engine off. Record pressure readings.<br>• Key on, engine on. Record pressure readings.<br>• Increase engine speed to 2500 rpm and maintain for one minute. Record pressure reading.<br>• **Are the fuel pressure readings between 552 or 827 kPa (80-120 psi)?** | Yes ▶ | KEY OFF. GO to HA44. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test HB1. |
| **HA44** | CHECK FUEL SYSTEM FOR PRESSURE STABILITY | | |
| | • Cycle key on and off twice.<br>• Verify there are no external leaks (service as necessary).<br>• **Does the fuel pressure remain within 69 kPa (10 psi) of the highest reading after two minutes?** | Yes ▶ | **For DTCs P1130, P1150, P0171, P0172, P0174 and P0175:**<br>GO to HA45.<br>**For No Starts:**<br>GO to HA45.<br>**All other DTCs:**<br>GO to HA62. |
| | | No ▶ | GO to Pinpoint Test Step HB1. |

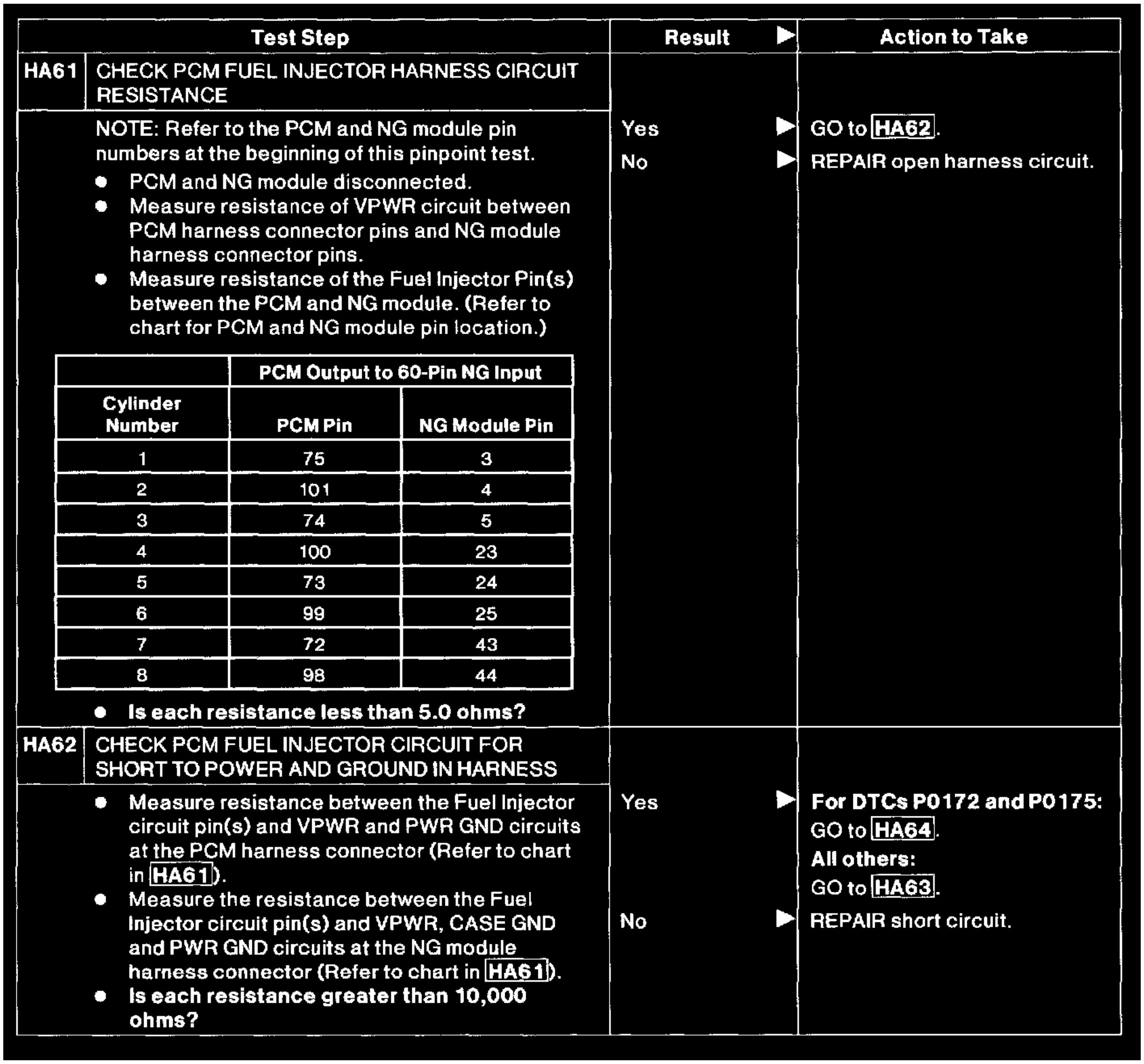
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA45** | CHECK FUEL SYSTEM FOR PRESSURE STABILITY WITH KEY ON | | |
| | • Access FRP PID.<br>• Key On, Engine Off. Monitor fuel pressure gauge.<br>• **Does the fuel pressure remain within 69 kPa (10 psi) of the highest reading after 10 seconds?** | Yes ▶ | **For No Starts:**<br>GO to HA46.<br>**For DTCs P1130, P1150, P0171 and P0174:**<br>GO to HA55. |
| | | No ▶ | **For DTCs P0172 and P0175:**<br>GO to HA56. |
| **HA46** | CHECK FUEL INJECTOR(S) ABILITY TO DELIVER FUEL | | |
| | • Access FRP PID.<br>• Cycle key twice.<br>• Locate and disconnect the inertia fuel shutoff (IFS) switch.<br>• Crank the engine for ten seconds and monitor FRP PID.<br>• **Was there a pressure drop greater than 34 kPa (20 psi)?** | Yes ▶ | The Electronic Engine Control System is not the cause of the no start. REFER to Symptom Chart for further diagnosis. |
| | | No ▶ | GO to HA47. |
| **HA47** | CHECK VREF VOLTAGE AT NATURAL GAS (NG) VEHICLE MODULE | | |
| | • Disconnect PCM.<br>• NG Module connected.<br>• Key on, engine off.<br>• Measure the voltage between VREF and SIG RTN circuits at the NG module harness connector.<br>• **Is the voltage reading between 4.0 and 6.0 volts?** | Yes ▶ | **KEY OFF. For NO START:**<br>GO to HA48.<br>**All others:**<br>GO to HA57. |
| | | No ▶ | KEY OFF. GO to HA50. |
| **HA48** | CHECK FOR OPEN IN POWER GROUND CIRCUITS | | |
| | • NG Module disconnected.<br>• Measure resistance of PWR GND circuit between NG module harness connector pin and battery negative post.<br>• **Is the resistance less than 5.0 ohms?** | Yes ▶ | GO to HA49. |
| | | No ▶ | REPAIR open circuit. |
| **HA49** | CHECK FOR OPEN IN POWER GROUND CIRCUIT IN NG MODULE | | |
| | • NG Module disconnected.<br>• Measure the resistance between PWR GND and SIG RTN circuits at the NG Module connector.<br>• **Is the resistance less than 5.0 ohms?** | Yes ▶ | RETURN to Pinpoint Test Step A6. |
| | | No ▶ | REPLACE NG Module. |
| **HA50** | IS VREF GREATER THAN 6.0 VOLTS | | |
| | • **Is the VREF reading greater than 6.0 volts from the previous test step?** | Yes ▶ | GO to HA55. |
| | | No ▶ | GO to HA51. |



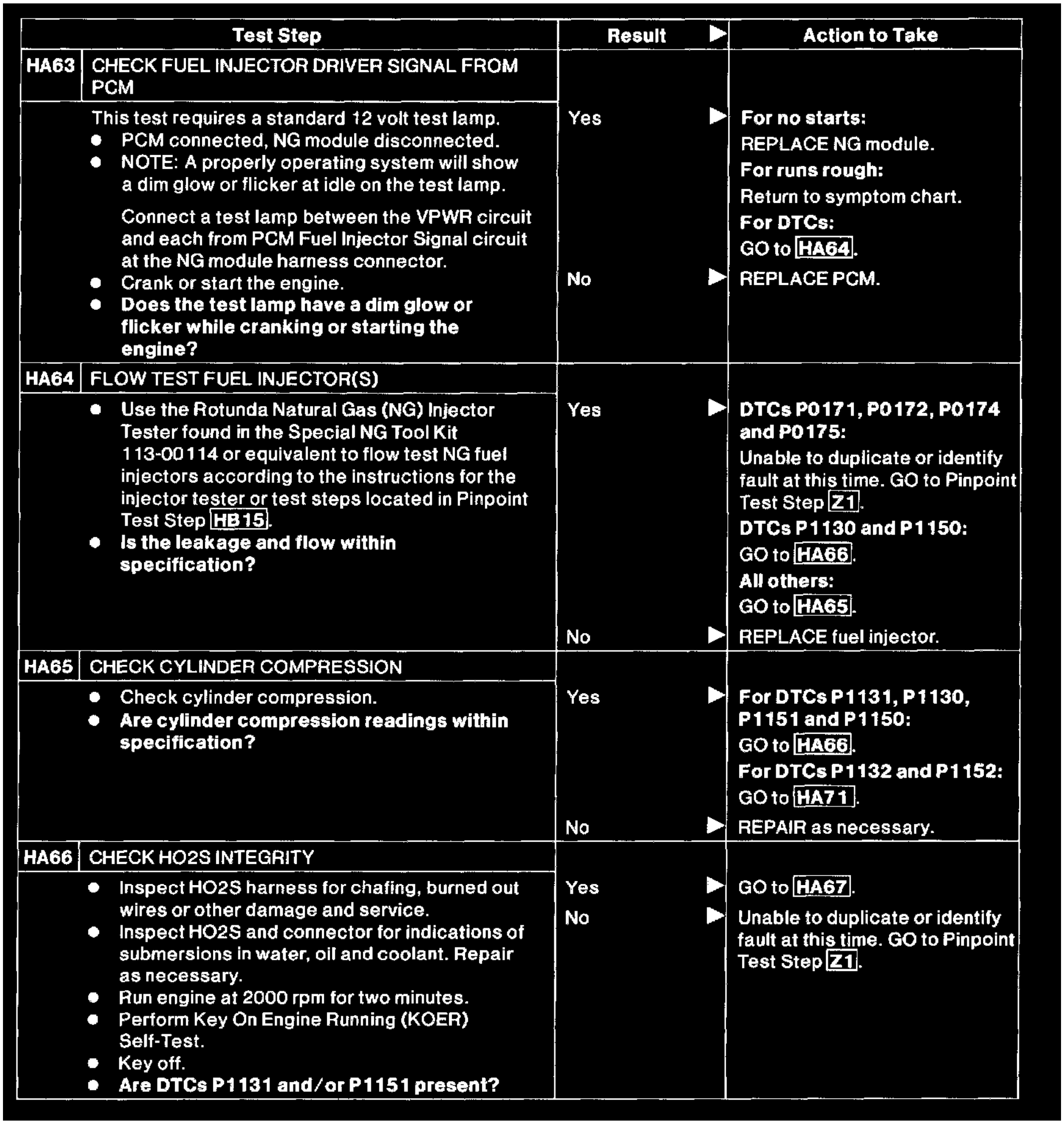
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA51** | CHECK BATTERY VOLTAGE | | |
| | ● Measure the voltage across the battery terminals.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HA52.<br>DIAGNOSE the battery and/or charging system for cause of low voltage. |
| **HA52** | CHECK VPWR AT NG MODULE | | |
| | ● Key on.<br>● Measure the voltage between VPWR and PWR GND circuits at the NG module harness connector.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HA54.<br>GO to HA53. |
| **HA53** | CHECK VOLTAGE BETWEEN VPWR AT THE NG MODULE AND BATTERY GROUND | | |
| | ● Key on.<br>● Measure the voltage between VPWR circuit at the NG module harness connector and battery ground.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR open ground.<br>REPAIR open power circuit. |
| **HA54** | CHECK VREF VOLTAGE TO THE FUEL TANK PRESSURE SENSOR | | |
| | ● Locate fuel tank pressure sensor at the rear of the vehicle and disconnect (On the Crown Victoria, the fuel tank pressure sensor is located under the vent box cover of the upper tank assembly).<br>● Key on, engine off.<br>● Measure voltage between the VREF circuit and SIG RTN circuit at the fuel tank pressure sensor harness connector (refer to schematic at the beginning of this Pinpoint Test for pin location).<br>● **Is the voltage reading between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE Fuel Tank Pressure sensor.<br>KEY OFF. GO to HA56. |
| **HA55** | CHECK VREF CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Fuel tank pressure sensor disconnected.<br>● Disconnect NG module.<br>● Key on.<br>● Measure voltage between the VREF and PWR GND circuits at the NG module harness connector.<br>● **Is the voltage reading less than 1.0 volt?** | Yes ▶<br>No ▶ | REPLACE NG module.<br>REPAIR short to power. |

<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td><b>HA56</b></td><td>CHECK VREF CIRCUIT FOR SHORTED TO PWR GND</td><td></td><td></td></tr>
<tr><td></td><td>NOTE: Refer to the NG module pin numbers at the beginning of this pinpoint test.<br>● NG module disconnected.<br>● Measure resistance between VREF circuit and the SIG RTN, PWR GND and CASE GND circuits at the NG module harness connector.<br>● <b>Is the resistance greater than 10,000 ohms?</b></td><td>Yes ▶<br>No ▶</td><td>REPLACE NG module.<br>REPAIR short to ground.</td></tr>
<tr><td><b>HA57</b></td><td>CHECK FUEL INJECTOR(S) AND HARNESS RESISTANCE FROM THE NATURAL GAS (NG) MODULE TO THE FUEL INJECTOR(S)</td><td></td><td></td></tr>
<tr><td></td><td>● NG module disconnected.<br>● Measure resistance between suspect fuel injector circuit Pin(s) and VPWR pins 37 / 57 at the NG module harness connector (use chart for injector pin location).
<table>
<tr><th>Cylinder Number</th><th>NG Module</th><th>Cylinder Number</th><th>NG Module</th></tr>
<tr><td>1</td><td>58</td><td>5</td><td>33</td></tr>
<tr><td>2</td><td>59</td><td>6</td><td>42</td></tr>
<tr><td>3</td><td>39</td><td>7</td><td>53</td></tr>
<tr><td>4</td><td>35</td><td>8</td><td>54</td></tr>
</table>
● <b>Is the resistance between 3.0 and 6.0 ohms?</b></td><td>Yes ▶<br>No ▶</td><td><b>For No Start and DTCs:</b> GO to HA60.<br>GO to HA58.</td></tr>
<tr><td><b>HA58</b></td><td>CHECK FUEL INJECTOR(S) HARNESS RESISTANCE BETWEEN NG MODULE AND FUEL INJECTOR</td><td></td><td></td></tr>
<tr><td></td><td>● Measure resistance of injector circuits between the NG module harness connector Pins and the fuel injector(s) harness connector (use chart from Test Step HA57 for fuel injector pin location).<br>● Measure resistance between the NG module harness connector VPWR Pins 37 / 57 and VPWR circuit at the fuel injector harness connector.<br>● <b>Is each resistance less than 5.0 ohms?</b></td><td>Yes ▶<br>No ▶</td><td>GO to HA59.<br>REPAIR open circuit.</td></tr>
</table>

<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td><b>HA59</b></td><td>CHECK FUEL INJECTOR HARNESS CIRCUIT FOR SHORTS TO POWER AND GROUND BETWEEN THE NG MODULE AND INJECTORS</td><td></td><td></td></tr>
<tr><td colspan="2">
<ul>
<li>Measure resistance between the NG module fuel injector Pin(s) and NG module Pins 37/57 and 40/60.</li>
</ul>
<table>
<tr><th>Cylinder Number</th><th>NG MODULE</th><th>Cylinder Number</th><th>NG Module</th></tr>
<tr><td>1</td><td>58</td><td>5</td><td>33</td></tr>
<tr><td>2</td><td>59</td><td>6</td><td>42</td></tr>
<tr><td>3</td><td>39</td><td>7</td><td>53</td></tr>
<tr><td>4</td><td>35</td><td>8</td><td>54</td></tr>
</table>
<ul>
<li><b>Is each resistance greater than 10,000 ohms?</b></li>
</ul>
</td><td>Yes ▶<br><br>No ▶</td><td>For DTCs P0172 and P0175, GO to HA61.<br><b>All Others:</b><br>REPLACE only damaged fuel injector(s).<br>REPAIR short circuit.</td></tr>
<tr><td><b>HA60</b></td><td>CHECK FUEL INJECTOR DRIVER SIGNAL</td><td></td><td></td></tr>
<tr><td colspan="2">This test requires a standard 12 volt test lamp.
<ul>
<li>NG module connected.</li>
<li>NOTE: A properly operating system will show a dim glow at idle on the test lamp.<br>Connect test lamp between the fuel injector signal circuit pin and VPWR circuit pin at the fuel injector harness connector.</li>
<li>Crank or start the engine.</li>
<li><b>Does the test lamp have a dim glow while cranking or running the engine?</b></li>
</ul>
</td><td>Yes ▶<br><br>No ▶</td><td>PCM and NG circuits are OK. For no starts and runs rough, RETURN to Symptom Charts.<br><b>All others:</b><br>GO to HA64.<br>No light/continuous bright light, GO to HA61.</td></tr>
</table>



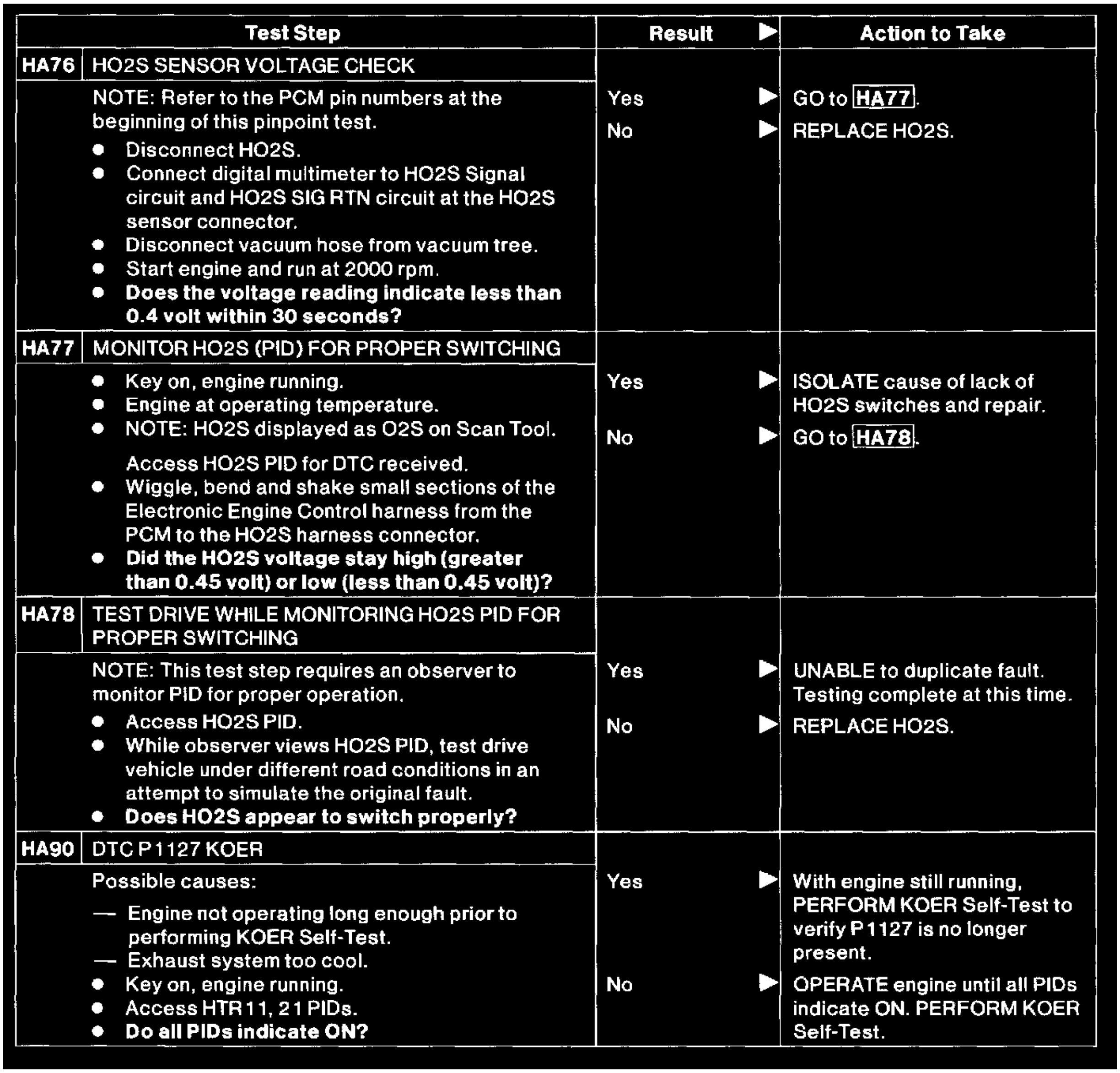
<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td>HA61</td><td>CHECK PCM FUEL INJECTOR HARNESS CIRCUIT RESISTANCE</td><td></td><td></td></tr>
<tr><td></td><td>NOTE: Refer to the PCM and NG module pin numbers at the beginning of this pinpoint test.<br>● PCM and NG module disconnected.<br>● Measure resistance of VPWR circuit between PCM harness connector pins and NG module harness connector pins.<br>● Measure resistance of the Fuel Injector Pin(s) between the PCM and NG module. (Refer to chart for PCM and NG module pin location.)
<table>
<tr><th></th><th colspan="2">PCM Output to 60-Pin NG Input</th></tr>
<tr><th>Cylinder Number</th><th>PCM Pin</th><th>NG Module Pin</th></tr>
<tr><td>1</td><td>75</td><td>3</td></tr>
<tr><td>2</td><td>101</td><td>4</td></tr>
<tr><td>3</td><td>74</td><td>5</td></tr>
<tr><td>4</td><td>100</td><td>23</td></tr>
<tr><td>5</td><td>73</td><td>24</td></tr>
<tr><td>6</td><td>99</td><td>25</td></tr>
<tr><td>7</td><td>72</td><td>43</td></tr>
<tr><td>8</td><td>98</td><td>44</td></tr>
</table>
● Is each resistance less than 5.0 ohms?</td><td>Yes ▶<br>No ▶</td><td>GO to HA62.<br>REPAIR open harness circuit.</td></tr>
<tr><td>HA62</td><td>CHECK PCM FUEL INJECTOR CIRCUIT FOR SHORT TO POWER AND GROUND IN HARNESS</td><td></td><td></td></tr>
<tr><td></td><td>● Measure resistance between the Fuel Injector circuit pin(s) and VPWR and PWR GND circuits at the PCM harness connector (Refer to chart in HA61).<br>● Measure the resistance between the Fuel Injector circuit pin(s) and VPWR, CASE GND and PWR GND circuits at the NG module harness connector (Refer to chart in HA61).<br>● Is each resistance greater than 10,000 ohms?</td><td>Yes ▶<br>No ▶</td><td>For DTCs P0172 and P0175: GO to HA64.<br>All others: GO to HA63.<br>REPAIR short circuit.</td></tr>
</table>



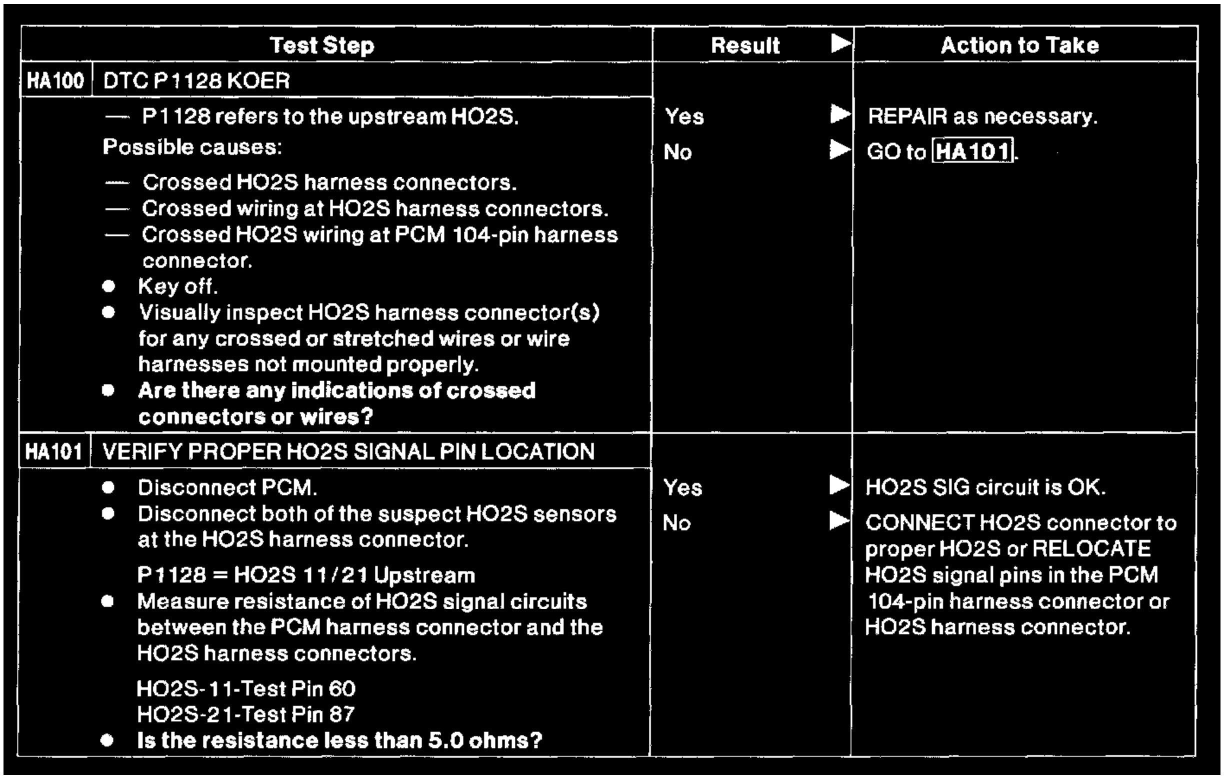
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA63** | CHECK FUEL INJECTOR DRIVER SIGNAL FROM PCM | | |
| | This test requires a standard 12 volt test lamp.<br>● PCM connected, NG module disconnected.<br>● NOTE: A properly operating system will show a dim glow or flicker at idle on the test lamp.<br>Connect a test lamp between the VPWR circuit and each from PCM Fuel Injector Signal circuit at the NG module harness connector.<br>● Crank or start the engine.<br>● **Does the test lamp have a dim glow or flicker while cranking or starting the engine?** | Yes ▶ | **For no starts:**<br>REPLACE NG module.<br>**For runs rough:**<br>Return to symptom chart.<br>**For DTCs:**<br>GO to HA64. |
| | | No ▶ | REPLACE PCM. |
| **HA64** | FLOW TEST FUEL INJECTOR(S) | | |
| | ● Use the Rotunda Natural Gas (NG) Injector Tester found in the Special NG Tool Kit 113-00114 or equivalent to flow test NG fuel injectors according to the instructions for the injector tester or test steps located in Pinpoint Test Step HB15.<br>● **Is the leakage and flow within specification?** | Yes ▶ | **DTCs P0171, P0172, P0174 and P0175:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1.<br>**DTCs P1130 and P1150:**<br>GO to HA66.<br>**All others:**<br>GO to HA65. |
| | | No ▶ | REPLACE fuel injector. |
| **HA65** | CHECK CYLINDER COMPRESSION | | |
| | ● Check cylinder compression.<br>● **Are cylinder compression readings within specification?** | Yes ▶ | **For DTCs P1131, P1130, P1151 and P1150:**<br>GO to HA66.<br>**For DTCs P1132 and P1152:**<br>GO to HA71. |
| | | No ▶ | REPAIR as necessary. |
| **HA66** | CHECK HO2S INTEGRITY | | |
| | ● Inspect HO2S harness for chafing, burned out wires or other damage and service.<br>● Inspect HO2S and connector for indications of submersions in water, oil and coolant. Repair as necessary.<br>● Run engine at 2000 rpm for two minutes.<br>● Perform Key On Engine Running (KOER) Self-Test.<br>● Key off.<br>● **Are DTCs P1131 and/or P1151 present?** | Yes ▶ | GO to HA67. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA67** | CHECK HO2S's ABILITY TO GENERATE A VOLTAGE GREATER THAN 0.5 VOLT | | |
| | NOTE: Refer to the PCM pin numbers at the beginning of this pinpoint test.<br>Any vacuum or air leaks can cause DTCs P1131, P1151, P1130 and P1150.<br>● Disconnect the suspect HO2S from vehicle harness.<br>● Connect digital multimeter to the HO2S Signal circuit and HO2S SIG RTN circuit or HO2S GND circuit at the HO2S sensor connector.<br>● Run engine at 2000 rpm for two minutes.<br>● Rerun KOER Self-Test and monitor HO2S voltage.<br>● **Does voltage reading indicate greater than 0.5 volt during or at the end of Self-Test?** | Yes ▶<br>No ▶ | GO to HA68.<br>REPLACE HO2S. |
| **HA68** | CHECK HO2S SIGNAL AND HO2S GROUND CIRCUITS FOR OPEN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Disconnect suspect HO2S from harness.<br>● Measure the resistance of HO2S Signal circuit between PCM harness connector and the HO2S harness connector.<br>● Measure resistance of SIG RTN circuit between PCM harness connector and HO2S SIG RTN harness connector.<br>● **Is the resistance reading less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to HA69.<br>REPAIR open circuit. |
| **HA69** | CHECK HO2S CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Measure resistance of HO2S Signal circuit between the PCM harness connector and battery negative post.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HA70.<br>REPAIR short circuit. |
| **HA70** | CHECK HO2S FOR SHORT TO GROUND | | |
| | ● Measure resistance between HO2S Signal and PWR GND / SIG RTN circuits at the PCM harness connector.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶ | **For DTCs P1130 and P1150:**<br>GO to HA71.<br>**For DTCs P1131C and P1151C:**<br>GO to HA76.<br>**For KOER DTCs P1131 and P1151:**<br>REPLACE PCM. |
| | | No ▶ | REPLACE HO2S. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA71** | CHECK FOR DTCS P1132 AND P1152 WITH P1130 AND P1150 | | |
| | ● Activate Key On Engine Running (KOER) Self-Test.<br>● **Are DTCs P1132 or P1152 present?** | Yes ▶<br>No ▶ | GO to HA72.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HA72** | CHECK HO2S SIGNAL FOR SHORT TO VPWR and VREF | | |
| | DTC P1130, P1132=H02S-11<br>DTC P1150, P1152=HO2S-21<br>● Key on, engine off.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access the HO2S PID for the DTC generated.<br>● **Is the voltage greater than 1.0 volt and less than 4.0 volts?** | Yes ▶<br>No ▶ | GO to HA73.<br>GO to HA75. |
| **HA73** | CHECK HO2S CIRCUIT FOR SHORT TO VPWR | | |
| | ● Disconnect sensor.<br>● Disconnect PCM.<br>● NOTE: Refer to the PCM pin numbers at the beginning of this pinpoint test.<br>Measure the resistance between the HO2S signal circuit pin(s) and VPWR circuit at the HO2S harness connector.<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HA74.<br>REPAIR short to power. |
| **HA74** | CHECK HO2S SIGNAL FOR SHORT TO HO2S HEATER CIRCUIT IN THE SENSOR | | |
| | ● HO2S sensor disconnected.<br>● Key on, engine off.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access HO2S PID for DTC(s) received.<br>● **Is the HO2S voltage less than 0.2 volt?** | Yes ▶<br>No ▶ | REPLACE HO2S.<br>REPLACE PCM. |
| **HA75** | ATTEMPT TO GENERATE DTCS P1131 AND P1151 | | |
| | ● Disconnect HO2S.<br>● Connect jumper between HO2S Signal at the HO2S harness connector and battery negative post.<br>● Activate Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P1131 or P1151 present?** | Yes ▶<br>No ▶ | GO to HA76.<br>DISCONNECT PCM. INSPECT both ends of connector for damaged or pushed out pins, moisture, corrosion, loose pins. REPAIR as necessary. If OK, REPLACE PCM. |

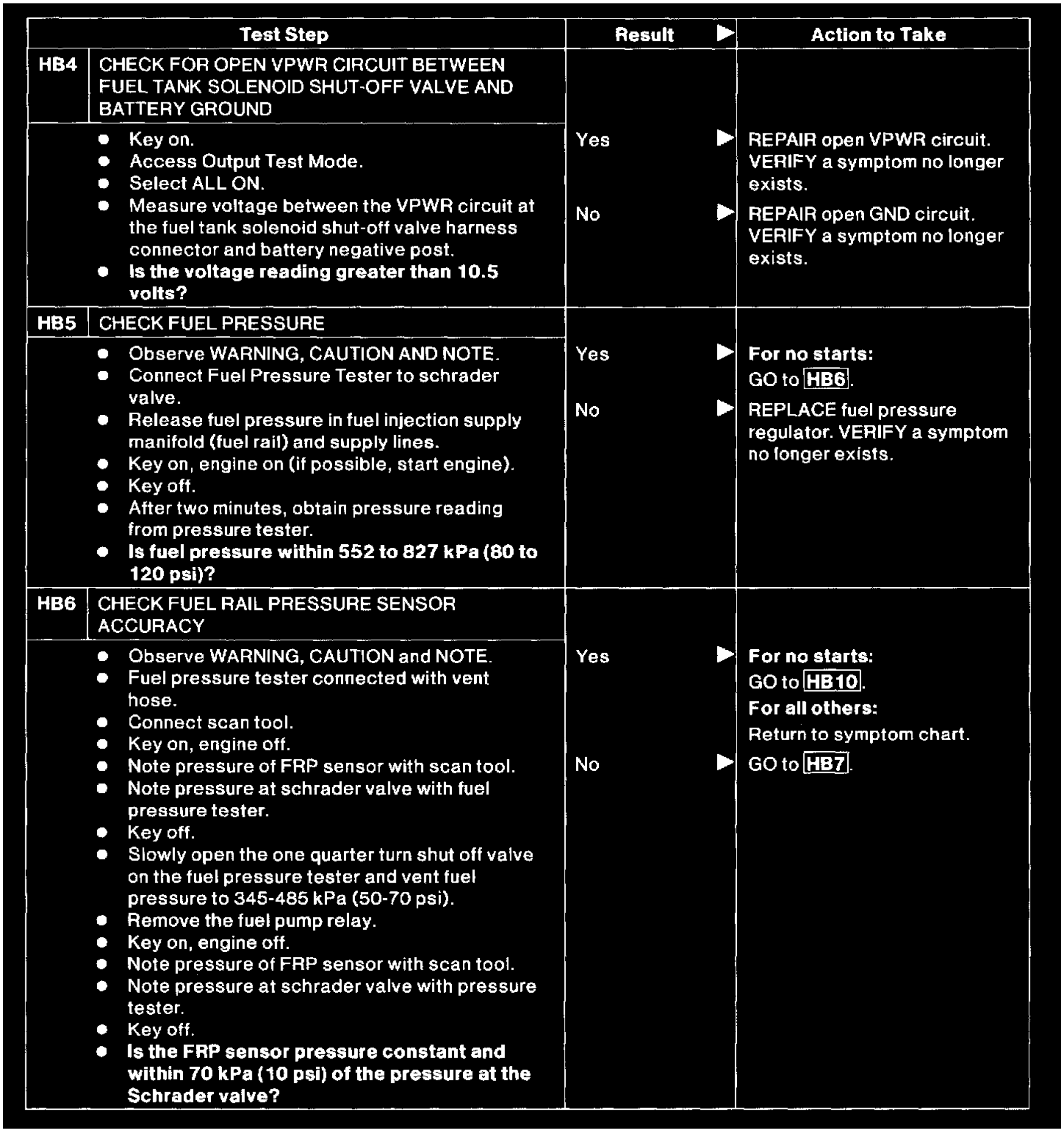


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA76** | HO2S SENSOR VOLTAGE CHECK | | |
| | NOTE: Refer to the PCM pin numbers at the beginning of this pinpoint test.<br>● Disconnect HO2S.<br>● Connect digital multimeter to HO2S Signal circuit and HO2S SIG RTN circuit at the HO2S sensor connector.<br>● Disconnect vacuum hose from vacuum tree.<br>● Start engine and run at 2000 rpm.<br>● **Does the voltage reading indicate less than 0.4 volt within 30 seconds?** | Yes ▶ | GO to HA77. |
| | | No ▶ | REPLACE HO2S. |
| **HA77** | MONITOR HO2S (PID) FOR PROPER SWITCHING | | |
| | ● Key on, engine running.<br>● Engine at operating temperature.<br>● NOTE: HO2S displayed as O2S on Scan Tool.<br>Access HO2S PID for DTC received.<br>● Wiggle, bend and shake small sections of the Electronic Engine Control harness from the PCM to the HO2S harness connector.<br>● **Did the HO2S voltage stay high (greater than 0.45 volt) or low (less than 0.45 volt)?** | Yes ▶ | ISOLATE cause of lack of HO2S switches and repair. |
| | | No ▶ | GO to HA78. |
| **HA78** | TEST DRIVE WHILE MONITORING HO2S PID FOR PROPER SWITCHING | | |
| | NOTE: This test step requires an observer to monitor PID for proper operation.<br>● Access HO2S PID.<br>● While observer views HO2S PID, test drive vehicle under different road conditions in an attempt to simulate the original fault.<br>● **Does HO2S appear to switch properly?** | Yes ▶ | UNABLE to duplicate fault. Testing complete at this time. |
| | | No ▶ | REPLACE HO2S. |
| **HA90** | DTC P1127 KOER | | |
| | Possible causes:<br>— Engine not operating long enough prior to performing KOER Self-Test.<br>— Exhaust system too cool.<br>● Key on, engine running.<br>● Access HTR11, 21 PIDs.<br>● **Do all PIDs indicate ON?** | Yes ▶ | With engine still running, PERFORM KOER Self-Test to verify P1127 is no longer present. |
| | | No ▶ | OPERATE engine until all PIDs indicate ON. PERFORM KOER Self-Test. |



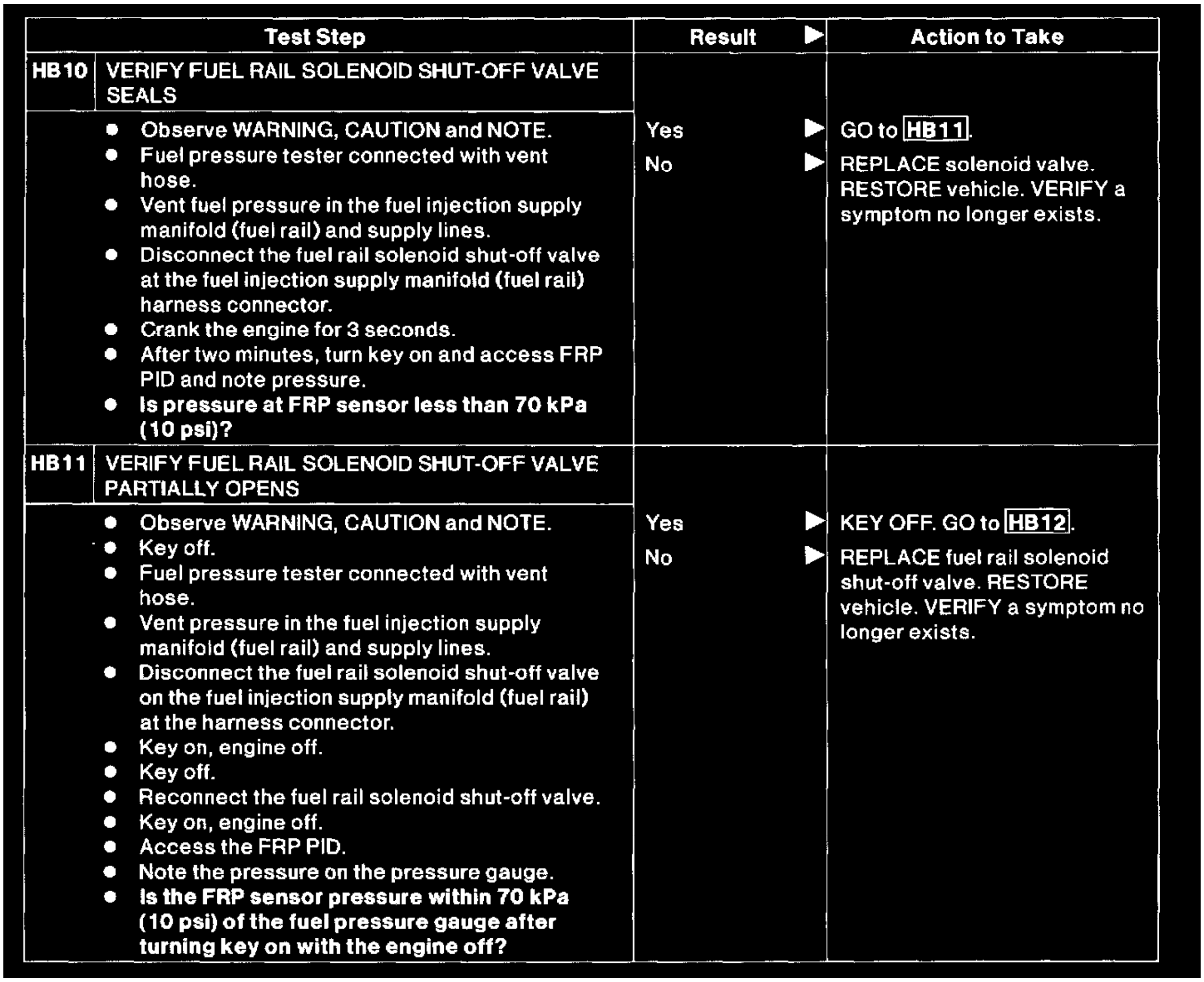
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HA100** | DTC P1128 KOER | | |
| | — P1128 refers to the upstream HO2S.<br>Possible causes:<br>— Crossed HO2S harness connectors.<br>— Crossed wiring at HO2S harness connectors.<br>— Crossed HO2S wiring at PCM 104-pin harness connector.<br>● Key off.<br>● Visually inspect HO2S harness connector(s) for any crossed or stretched wires or wire harnesses not mounted properly.<br>● **Are there any indications of crossed connectors or wires?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to HA101. |
| **HA101** | VERIFY PROPER HO2S SIGNAL PIN LOCATION | | |
| | ● Disconnect PCM.<br>● Disconnect both of the suspect HO2S sensors at the HO2S harness connector.<br>P1128 = HO2S 11/21 Upstream<br>● Measure resistance of HO2S signal circuits between the PCM harness connector and the HO2S harness connectors.<br>HO2S-11-Test Pin 60<br>HO2S-21-Test Pin 87<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | HO2S SIG circuit is OK.<br>CONNECT HO2S connector to proper HO2S or RELOCATE HO2S signal pins in the PCM 104-pin harness connector or HO2S harness connector. |

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HB1** CHECK SYSTEM INTEGRITY | | |
| **WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTIONS IN FUEL SYSTEM WARNING, CAUTION AND NOTE AT THE BEGINNING OF THIS PINPOINT TEST.**<br>● Key on, engine off for 5 seconds.<br>● Key off.<br>● Visually inspect the complete fuel delivery system, including fuel lines, connections, fuel rail, pressure regulator and fuel injector areas for leaks (hissing noise), looseness, cracks, kinks, pinching, or abrasion caused by a collision or mishandling.<br>● Visually inspect electrical harness and connectors for loose pins, corrosion, abrasion or other damage from collision or mishandling.<br>● Verify vehicle has followed maintenance schedule.<br>● Inspect fuel filter element for contamination and service as necessary.<br>● Verify Inertia Fuel Shutoff (IFS) switch is set.<br>● Verify vehicle battery is fully charged.<br>● Verify electrical / fuse integrity.<br>● **Have any concerns been identified?** | Yes ▶ | REPAIR as necessary. VERIFY a symptom no longer exists. |
| | No ▶ | **For symptom of poor fuel range:**<br>GO to Fuel Delivery and Air Induction testing.<br>**For symptom of fuel smell:**<br>GO to HB16.<br>**All other symptoms:**<br>GO to HB2. |
| **HB2** CHECK FUEL TANK PRESSURE | | |
| ● Install fuel tank venting tool (supplied in Tool Kit 134-00114) to vehicle fueling connector.<br>● Open bypass on fill valve.<br>● Key on.<br>● Record fuel tank pressure reading and fuel gauge reading.<br>● **Is the fuel pressure reading greater than 3,448 kPa (500 psi)?** | Yes ▶ | KEY OFF. CLOSE bypass and REMOVE tool. GO to HB5. |
| | No ▶ | VERIFY fuel level. If OK, CHECK for power at tank solenoid valve. GO to HB3. |
| **HB3** CHECK VPWR VOLTAGE TO THE FUEL TANK SOLENOID SHUT-OFF VALVE | | |
| ● Key on.<br>● Access Output Test Mode.<br>● Select ALL ON.<br>● Measure voltage between the VPWR and GND circuits at the fuel tank solenoid shut-off valve harness connector.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶ | DIAGNOSE the fuel tank solenoid shut-off valve. |
| | No ▶ | GO to HB4. |



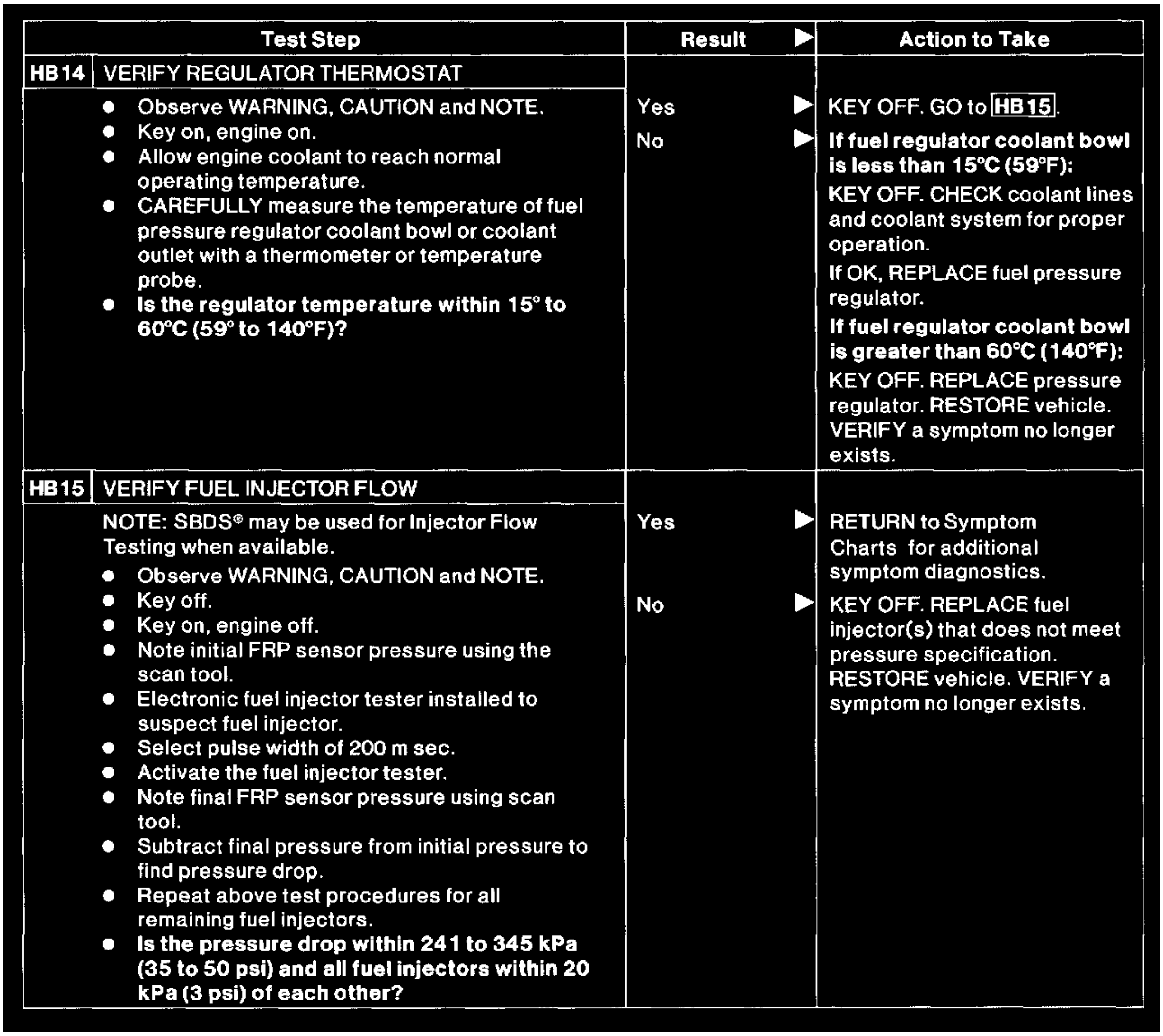
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HB4** | CHECK FOR OPEN VPWR CIRCUIT BETWEEN FUEL TANK SOLENOID SHUT-OFF VALVE AND BATTERY GROUND | | |
| | ● Key on.<br>● Access Output Test Mode.<br>● Select ALL ON.<br>● Measure voltage between the VPWR circuit at the fuel tank solenoid shut-off valve harness connector and battery negative post.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶ | REPAIR open VPWR circuit. VERIFY a symptom no longer exists. |
| | | No ▶ | REPAIR open GND circuit. VERIFY a symptom no longer exists. |
| **HB5** | CHECK FUEL PRESSURE | | |
| | ● Observe WARNING, CAUTION AND NOTE.<br>● Connect Fuel Pressure Tester to schrader valve.<br>● Release fuel pressure in fuel injection supply manifold (fuel rail) and supply lines.<br>● Key on, engine on (if possible, start engine).<br>● Key off.<br>● After two minutes, obtain pressure reading from pressure tester.<br>● **Is fuel pressure within 552 to 827 kPa (80 to 120 psi)?** | Yes ▶ | **For no starts:**<br>GO to HB6. |
| | | No ▶ | REPLACE fuel pressure regulator. VERIFY a symptom no longer exists. |
| **HB6** | CHECK FUEL RAIL PRESSURE SENSOR ACCURACY | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Fuel pressure tester connected with vent hose.<br>● Connect scan tool.<br>● Key on, engine off.<br>● Note pressure of FRP sensor with scan tool.<br>● Note pressure at schrader valve with fuel pressure tester.<br>● Key off.<br>● Slowly open the one quarter turn shut off valve on the fuel pressure tester and vent fuel pressure to 345-485 kPa (50-70 psi).<br>● Remove the fuel pump relay.<br>● Key on, engine off.<br>● Note pressure of FRP sensor with scan tool.<br>● Note pressure at schrader valve with pressure tester.<br>● Key off.<br>● **Is the FRP sensor pressure constant and within 70 kPa (10 psi) of the pressure at the Schrader valve?** | Yes ▶ | **For no starts:**<br>GO to HB10.<br>**For all others:**<br>Return to symptom chart. |
| | | No ▶ | GO to HB7. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HB7** | VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE OPENS | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Fuel pressure tester connected with vent hose.<br>● Key on, engine off.<br>● Access Output Test Mode.<br>● Select ALL ON and then START and STOP several times by toggling the START and STOP button on the scan tool and listening or feeling for a click at the fuel rail solenoid shut-off valve.<br>● Key off.<br>● **Was a click of the solenoid valve felt or heard?** | Yes ▶ | REPLACE fuel rail pressure sensor. RESTORE vehicle. VERIFY a symptom no longer exists. |
| | | No ▶ | GO to HB8. |
| **HB8** | CHECK VPWR VOLTAGE TO THE FUEL RAIL SOLENOID SHUT-OFF VALVE | | |
| | ● Key on, engine off.<br>● Access Output Test Mode.<br>● Select ALL ON, and START.<br>● Measure the voltage between the VPWR and GND circuit at the fuel rail solenoid shut-off valve harness connector.<br>NOTE: This circuit remains on for only 8 seconds.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶ | REPLACE fuel rail solenoid valve. RESTORE vehicle. VERIFY a symptom no longer exists. |
| | | No ▶ | GO to HB9. |
| **HB9** | CHECK FOR OPEN VPWR CIRCUIT BETWEEN FUEL TANK SOLENOID SHUT-OFF VALVE AND BATTERY GROUND | | |
| | ● Key on, engine off.<br>● Access Output Test Mode.<br>● Select ALL ON, and START.<br>● Measure the voltage between the VPWR circuit at the fuel rail solenoid shut-off valve harness connector and battery negative post.<br>NOTE: This circuit remains on for only 8 seconds.<br>● **Is the voltage reading greater than 10.5 volts?** | Yes ▶ | REPAIR open GND circuit. RESTORE vehicle. VERIFY a symptom no longer exists. |
| | | No ▶ | REPAIR open VPWR circuit. RESTORE vehicle. VERIFY a symptom no longer exists. |

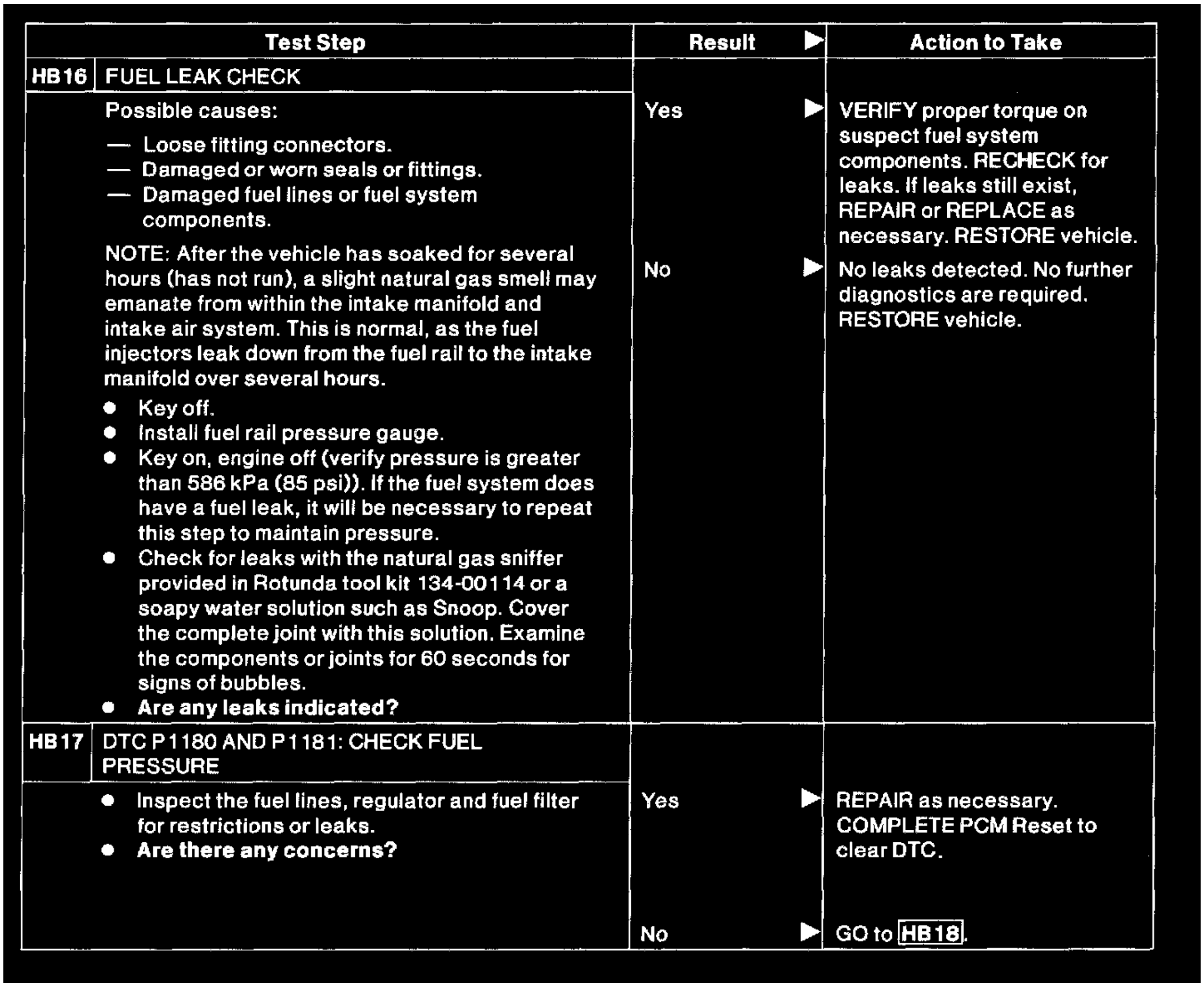


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HB10** | VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE SEALS | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Fuel pressure tester connected with vent hose.<br>● Vent fuel pressure in the fuel injection supply manifold (fuel rail) and supply lines.<br>● Disconnect the fuel rail solenoid shut-off valve at the fuel injection supply manifold (fuel rail) harness connector.<br>● Crank the engine for 3 seconds.<br>● After two minutes, turn key on and access FRP PID and note pressure.<br>● **Is pressure at FRP sensor less than 70 kPa (10 psi)?** | Yes ▶ | GO to HB11. |
| | | No ▶ | REPLACE solenoid valve. RESTORE vehicle. VERIFY a symptom no longer exists. |
| **HB11** | VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE PARTIALLY OPENS | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Key off.<br>● Fuel pressure tester connected with vent hose.<br>● Vent pressure in the fuel injection supply manifold (fuel rail) and supply lines.<br>● Disconnect the fuel rail solenoid shut-off valve on the fuel injection supply manifold (fuel rail) at the harness connector.<br>● Key on, engine off.<br>● Key off.<br>● Reconnect the fuel rail solenoid shut-off valve.<br>● Key on, engine off.<br>● Access the FRP PID.<br>● Note the pressure on the pressure gauge.<br>● **Is the FRP sensor pressure within 70 kPa (10 psi) of the fuel pressure gauge after turning key on with the engine off?** | Yes ▶ | KEY OFF. GO to HB12. |
| | | No ▶ | REPLACE fuel rail solenoid shut-off valve. RESTORE vehicle. VERIFY a symptom no longer exists. |

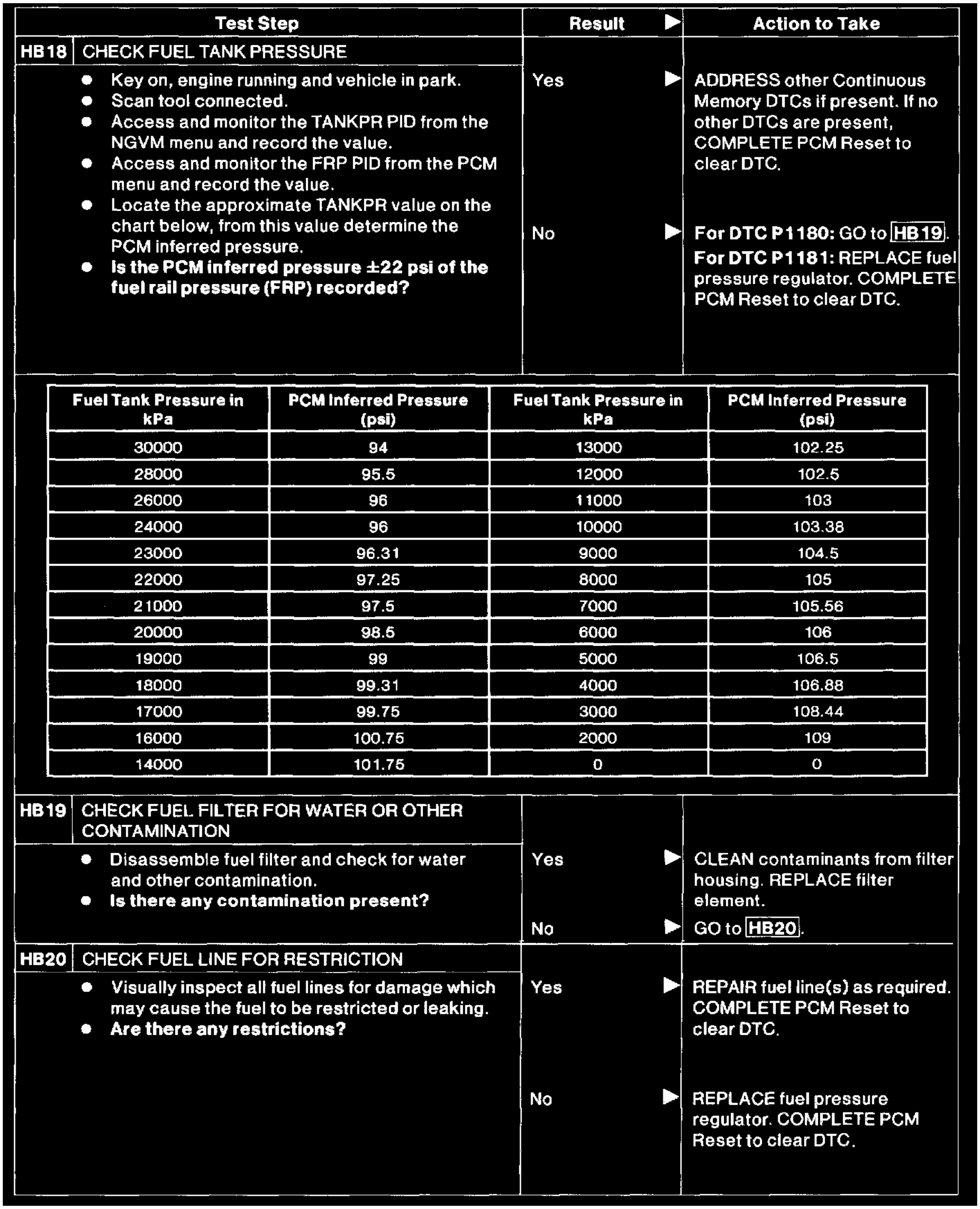
| **Test Step** | | **Result ▶** | **Action to Take** |
|---|---|---|---|
| **HB12** | VERIFY FUEL RAIL SOLENOID SHUT-OFF VALVE FULLY OPENS | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Fuel pressure tester connected with vent hose.<br>● Vent pressure in the fuel injection supply manifold (fuel rail) and supply lines.<br>● Disconnect the fuel rail solenoid shut-off valve on the fuel injection supply manifold (fuel rail) at the harness connector.<br>● Key on, engine off.<br>● Key off.<br>● Reconnect the fuel rail solenoid shut-off valve.<br>● Snap start the engine (Key on and immediately start the engine).<br>● Immediately increase the engine speed to approximately 2500 rpm while monitoring the FRP PID.<br>● Note the pressure on the pressure gauge.<br>● Note the FRP pressure.<br>● **Is the FRP sensor pressure within 70 kPa (10 psi) of the pressure at the schrader valve?** | Yes ▶<br>No ▶ | KEY OFF. GO to HB13.<br>REPLACE fuel rail solenoid shut-off valve. RESTORE vehicle. VERIFY a symptom no longer exists. |
| **HB13** | VERIFY FUEL PRESSURE WITH ENGINE ON | | |
| | ● Observe WARNING, CAUTION and NOTE.<br>● Key on, engine running.<br>● Note FRP sensor pressure at idle with scan tool.<br>● Increase engine speed to approximately 2500 rpm.<br>● Note FRP sensor pressure at 2500 rpm with scan tool.<br>● **Is idle fuel pressure between 552 and 827 kPa (80 and 120 psi) and is pressure at 2500 rpm greater than 552 kPa (80 psi)?** | Yes ▶<br>No ▶ | KEY OFF. GO to HB14.<br>VERIFY a blockage does not exist in fuel lines. REPLACE fuel pressure regulator. RESTORE vehicle. VERIFY a symptom no longer exists. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HB14** VERIFY REGULATOR THERMOSTAT | | |
| • Observe WARNING, CAUTION and NOTE.<br>• Key on, engine on.<br>• Allow engine coolant to reach normal operating temperature.<br>• CAREFULLY measure the temperature of fuel pressure regulator coolant bowl or coolant outlet with a thermometer or temperature probe.<br>• **Is the regulator temperature within 15° to 60°C (59° to 140°F)?** | Yes ▶ | KEY OFF. GO to HB15. |
| | No ▶ | **If fuel regulator coolant bowl is less than 15°C (59°F):**<br>KEY OFF. CHECK coolant lines and coolant system for proper operation.<br>If OK, REPLACE fuel pressure regulator.<br>**If fuel regulator coolant bowl is greater than 60°C (140°F):**<br>KEY OFF. REPLACE pressure regulator. RESTORE vehicle. VERIFY a symptom no longer exists. |
| **HB15** VERIFY FUEL INJECTOR FLOW | | |
| NOTE: SBDS® may be used for Injector Flow Testing when available.<br>• Observe WARNING, CAUTION and NOTE.<br>• Key off.<br>• Key on, engine off.<br>• Note initial FRP sensor pressure using the scan tool.<br>• Electronic fuel injector tester installed to suspect fuel injector.<br>• Select pulse width of 200 m sec.<br>• Activate the fuel injector tester.<br>• Note final FRP sensor pressure using scan tool.<br>• Subtract final pressure from initial pressure to find pressure drop.<br>• Repeat above test procedures for all remaining fuel injectors.<br>• **Is the pressure drop within 241 to 345 kPa (35 to 50 psi) and all fuel injectors within 20 kPa (3 psi) of each other?** | Yes ▶ | RETURN to Symptom Charts for additional symptom diagnostics. |
| | No ▶ | KEY OFF. REPLACE fuel injector(s) that does not meet pressure specification. RESTORE vehicle. VERIFY a symptom no longer exists. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HB16** | FUEL LEAK CHECK | | |
| | Possible causes:<br>— Loose fitting connectors.<br>— Damaged or worn seals or fittings.<br>— Damaged fuel lines or fuel system components.<br>NOTE: After the vehicle has soaked for several hours (has not run), a slight natural gas smell may emanate from within the intake manifold and intake air system. This is normal, as the fuel injectors leak down from the fuel rail to the intake manifold over several hours.<br>● Key off.<br>● Install fuel rail pressure gauge.<br>● Key on, engine off (verify pressure is greater than 586 kPa (85 psi)). If the fuel system does have a fuel leak, it will be necessary to repeat this step to maintain pressure.<br>● Check for leaks with the natural gas sniffer provided in Rotunda tool kit 134-00114 or a soapy water solution such as Snoop. Cover the complete joint with this solution. Examine the components or joints for 60 seconds for signs of bubbles.<br>● **Are any leaks indicated?** | Yes ▶ | VERIFY proper torque on suspect fuel system components. RECHECK for leaks. If leaks still exist, REPAIR or REPLACE as necessary. RESTORE vehicle. |
| | | No ▶ | No leaks detected. No further diagnostics are required. RESTORE vehicle. |
| **HB17** | DTC P1180 AND P1181: CHECK FUEL PRESSURE | | |
| | ● Inspect the fuel lines, regulator and fuel filter for restrictions or leaks.<br>● **Are there any concerns?** | Yes ▶ | REPAIR as necessary. COMPLETE PCM Reset to clear DTC. |
| | | No ▶ | GO to HB18. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HB18** CHECK FUEL TANK PRESSURE | | |
| ● Key on, engine running and vehicle in park.<br>● Scan tool connected.<br>● Access and monitor the TANKPR PID from the NGVM menu and record the value.<br>● Access and monitor the FRP PID from the PCM menu and record the value.<br>● Locate the approximate TANKPR value on the chart below, from this value determine the PCM inferred pressure.<br>● **Is the PCM inferred pressure ±22 psi of the fuel rail pressure (FRP) recorded?** | Yes ▶ | ADDRESS other Continuous Memory DTCs if present. If no other DTCs are present, COMPLETE PCM Reset to clear DTC. |
| | No ▶ | **For DTC P1180:** GO to HB19.<br>**For DTC P1181:** REPLACE fuel pressure regulator. COMPLETE PCM Reset to clear DTC. |

| Fuel Tank Pressure in kPa | PCM Inferred Pressure (psi) | Fuel Tank Pressure in kPa | PCM Inferred Pressure (psi) |
|---|---|---|---|
| 30000 | 94 | 13000 | 102.25 |
| 28000 | 95.5 | 12000 | 102.5 |
| 26000 | 96 | 11000 | 103 |
| 24000 | 96 | 10000 | 103.38 |
| 23000 | 96.31 | 9000 | 104.5 |
| 22000 | 97.25 | 8000 | 105 |
| 21000 | 97.5 | 7000 | 105.56 |
| 20000 | 98.5 | 6000 | 106 |
| 19000 | 99 | 5000 | 106.5 |
| 18000 | 99.31 | 4000 | 106.88 |
| 17000 | 99.75 | 3000 | 108.44 |
| 16000 | 100.75 | 2000 | 109 |
| 14000 | 101.75 | 0 | 0 |

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HB19** CHECK FUEL FILTER FOR WATER OR OTHER CONTAMINATION | | |
| ● Disassemble fuel filter and check for water and other contamination.<br>● **Is there any contamination present?** | Yes ▶ | CLEAN contaminants from filter housing. REPLACE filter element. |
| | No ▶ | GO to HB20. |
| **HB20** CHECK FUEL LINE FOR RESTRICTION | | |
| ● Visually inspect all fuel lines for damage which may cause the fuel to be restricted or leaking.<br>● **Are there any restrictions?** | Yes ▶ | REPAIR fuel line(s) as required. COMPLETE PCM Reset to clear DTC. |
| | No ▶ | REPLACE fuel pressure regulator. COMPLETE PCM Reset to clear DTC. |

## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Chassis Components
- Engine Vacuum
- Fuel Pressure
- Fuel Filter
- Fuel Return
- Fuel Supply
- Fuel Injector

## Safe Fuel Handling Practices

**WARNING**

FUEL IN THE FUEL SYSTEM REMAINS UNDER HIGH PRESSURE EVEN WHEN THE ENGINE IS NOT RUNNING. TO AVOID

INJURY OR FIRE, RELEASE THE FUEL PRESSURE FROM THE FUEL SYSTEM BEFORE DISCONNECTING ANY FUEL LINE. TO RELEASE THE PRESSURE FROM THE SYSTEM PERFORM THE FOLLOWING:

- CONNECT THE ROTUNDA FUEL PRESSURE GAUGE T80L-9974-B OR EQUIVALENT AT THE SCHRADER VALVE LOCATED ON THE FUEL RAIL. TESTING KIT VALVE MUST BE CLOSED.
- GRADUALLY OPEN THE TESTING KIT VALVE TO RELIEVE FUEL PRESSURE IN THE VEHICLE FUEL SYSTEM AND DRAIN THE FUEL INTO A SUITABLE CONTAINER OR RETURN IT TO THE FUEL TANK.
- TO AVOID UNNECESSARY FUEL SPILLAGE AND FIRE HAZARD, ANY TIME FUEL LINES ARE DISCONNECTED, THE IGNITION SWITCH MUST BE IN THE OFF POSITION UNLESS FUEL PUMP OPERATION IS REQUIRED FOR TEST PURPOSES.

**CAUTION**

Use care to prevent combustion from fuel spillage. No smoking, open flames or any kind of arcing.

**SAFE FUEL HANDLING PRACTICES**

Gasoline, Methanol and Methanol Blends

**FIRE**

- Report all fires to the appropriate authorities.
- Flames from methanol or methanol-gasoline blends can be invisible.
- Know the locations of portable fire extinguishers, fire blankets, fire alarms and eye/wash shower facilities. Learn how to use them.
- Use a B or AFFF (light water) type fire extinguisher to fight flammable liquid fires.

**FIRST AID**

- If swallowed:
  - If gasoline has been swallowed, do not induce vomiting. Seek medical attention immediately!
  - If methanol or a methanol/gasoline blend has been swallowed, induce vomiting under the direction of a physician or Poison Control Center. Seek medical attention immediately!
- When overcome by vapors, if safe, move victim to fresh air. If not breathing, give artificial respiration or CPR (Cardiopulmonary Resuscitation) as appropriate. Seek medical attention immediately!
- If splashed in eyes, flush with large amounts of water for 15 minutes. Remove contact lenses, if worn. Seek medical attention.
- If splashed on skin, remove contaminated clothing. Wash skin thoroughly with soap and water.

**HEALTH**

- All fuels can be harmful or fatal if swallowed.
- Be aware, if fuel is swallowed, onset of serious health effects can be delayed 12 to 24 hours.
- Fuels and products containing methanol (e.g. windshield washer fluid) can cause blindness if swallowed.
- All fuel vapors can be harmful if inhaled.
- All fuels can be harmful if absorbed through the skin.
- All fuels are irritating to the eyes and respiratory system.
- Some fuels made with gasoline contain benzene which is a cancer-causing agent.

**HANDLING**

- Use flammable liquid handling precautions.
- Wear chemical goggles and nitrile gloves (additional protective clothing and equipment may be necessary in some instances).
- Keep flammable liquids in approved, labeled, closed containers.
- Use in well-ventilated areas and control vapors. Be aware that vapors are not visible, are heavier than air, can travel along the floor, and will settle in lower areas.
- When transferring flammable liquids, bond the receiving container to the source and ground the source to the earth.
- Do not smoke or use heat/spark producing equipment near vapors.
- Do not eat, smoke or drink where these products are handled, processed or stored.
- Never siphon by mouth.
- Wash hands thoroughly after handling any fuel.

**SPILLS**

- Notify the proper authorities in the event of any spill you have not been trained to clean up.
- Stop, contain, and clean up small spills with an absorbent material.

**Inertia Fuel Shutoff (IFS) Switch - Reset Instructions**

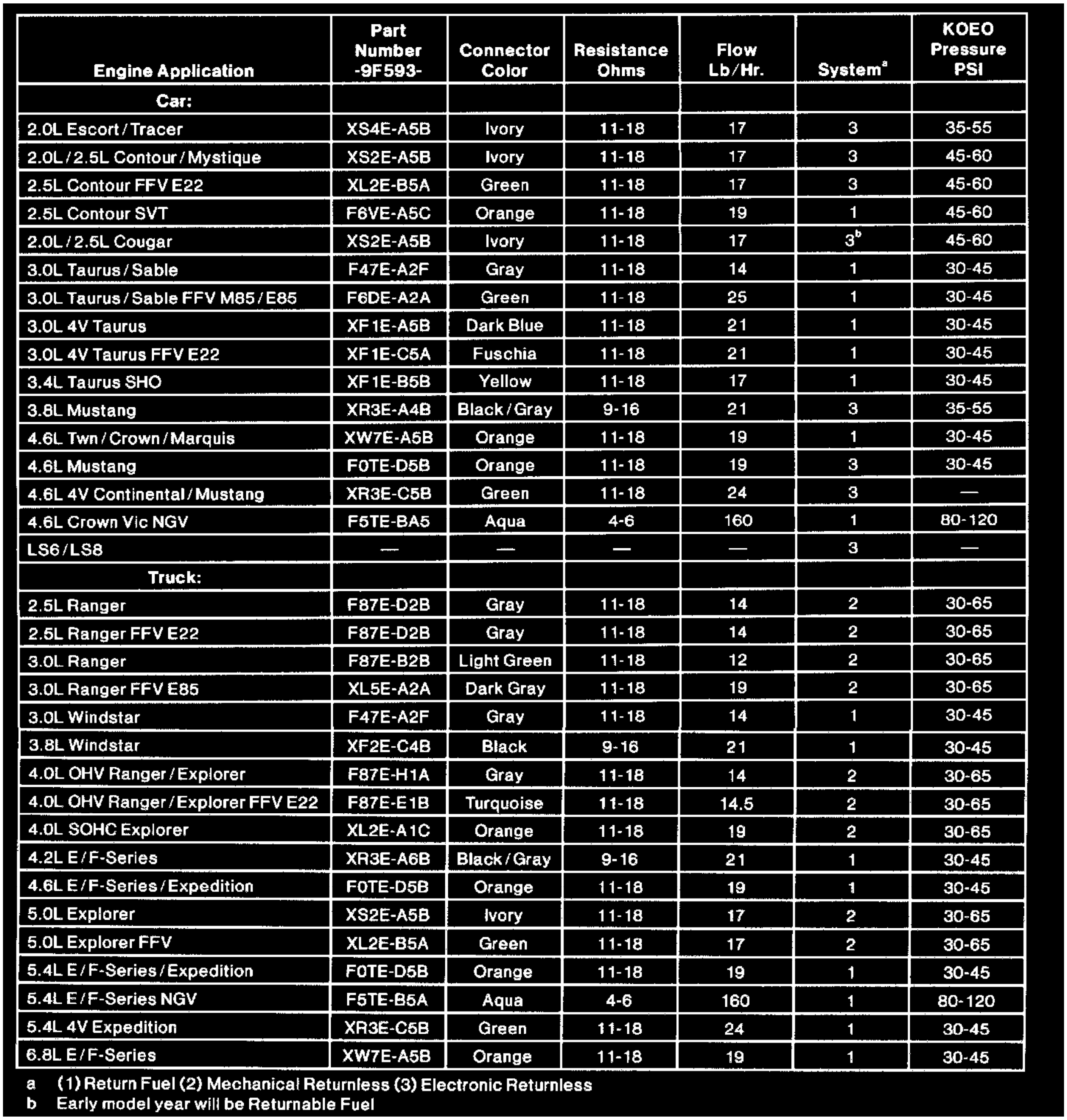
- **WARNING**

**IF YOU SEE OR SMELL GASOLINE AT ANY TIME OTHER THAN DURING FUELING, DO NOT RESET THE INERTIA FUEL SHUTOFF (IFS) SWITCH.**

- Turn key off.
- Check for fuel leaks in the engine compartment.

- If no leak is apparent, reset the IFS switch by pushing the reset button on the top of the switch (refer to Owner Guide for switch location). **NOTE:** In the closed position, the button can be depressed an additional **1.57 mm (1/16 inch)** against a spring.
- Turn key to on or start position for a few seconds, then off again.
- Again, check for leaking fuel.

# Tables and Charts

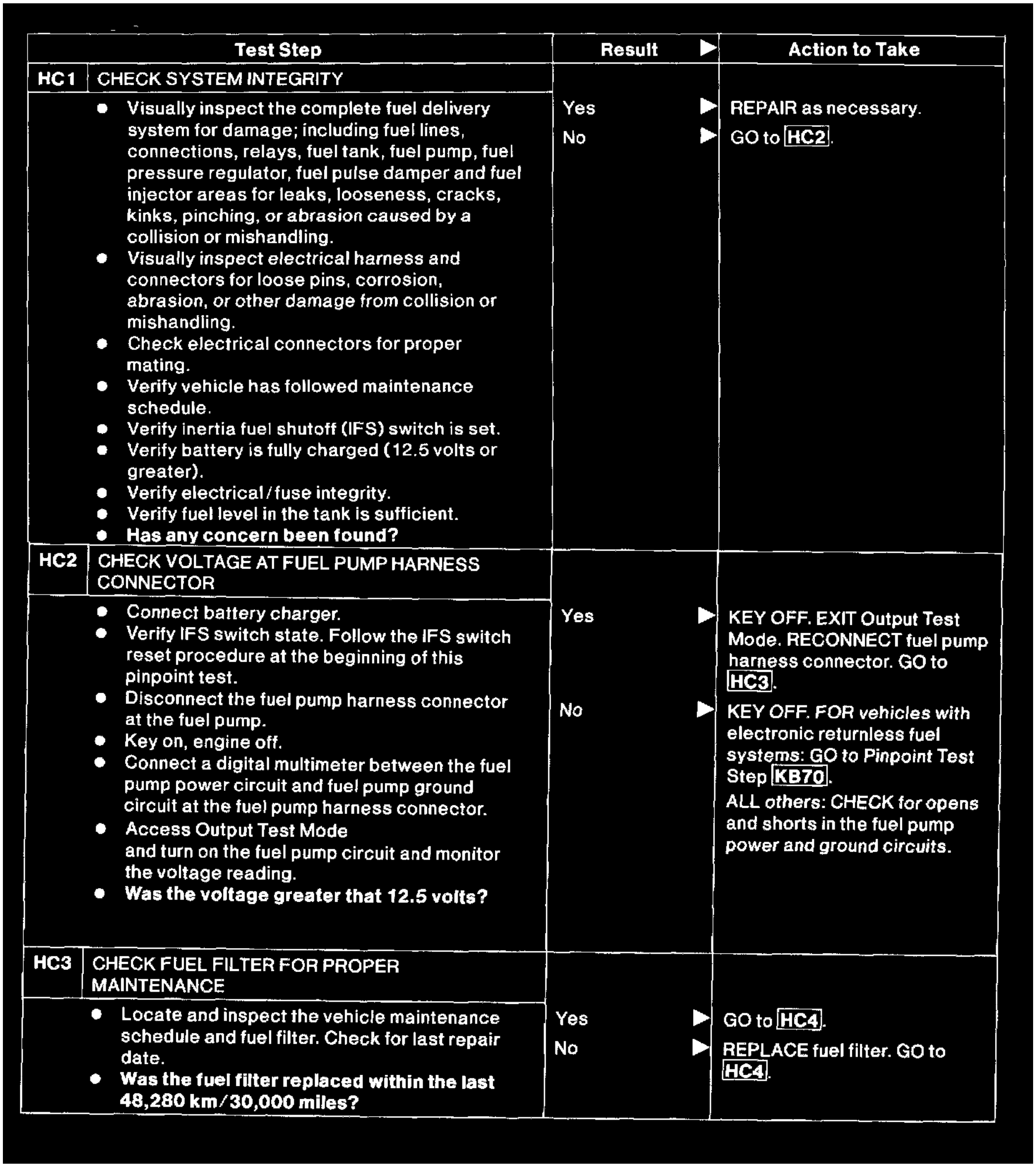


| Engine Application | Part Number -9F593- | Connector Color | Resistance Ohms | Flow Lb/Hr. | System[a] | KOEO Pressure PSI |
|---|---|---|---|---|---|---|
| **Car:** | | | | | | |
| 2.0L Escort/Tracer | XS4E-A5B | Ivory | 11-18 | 17 | 3 | 35-55 |
| 2.0L/2.5L Contour/Mystique | XS2E-A5B | Ivory | 11-18 | 17 | 3 | 45-60 |
| 2.5L Contour FFV E22 | XL2E-B5A | Green | 11-18 | 17 | 3 | 45-60 |
| 2.5L Contour SVT | F6VE-A5C | Orange | 11-18 | 19 | 1 | 45-60 |
| 2.0L/2.5L Cougar | XS2E-A5B | Ivory | 11-18 | 17 | 3[b] | 45-60 |
| 3.0L Taurus/Sable | F47E-A2F | Gray | 11-18 | 14 | 1 | 30-45 |
| 3.0L Taurus/Sable FFV M85/E85 | F6DE-A2A | Green | 11-18 | 25 | 1 | 30-45 |
| 3.0L 4V Taurus | XF1E-A5B | Dark Blue | 11-18 | 21 | 1 | 30-45 |
| 3.0L 4V Taurus FFV E22 | XF1E-C5A | Fuschia | 11-18 | 21 | 1 | 30-45 |
| 3.4L Taurus SHO | XF1E-B5B | Yellow | 11-18 | 17 | 1 | 30-45 |
| 3.8L Mustang | XR3E-A4B | Black/Gray | 9-16 | 21 | 3 | 35-55 |
| 4.6L Twn/Crown/Marquis | XW7E-A5B | Orange | 11-18 | 19 | 1 | 30-45 |
| 4.6L Mustang | F0TE-D5B | Orange | 11-18 | 19 | 3 | 30-45 |
| 4.6L 4V Continental/Mustang | XR3E-C5B | Green | 11-18 | 24 | 3 | — |
| 4.6L Crown Vic NGV | F5TE-BA5 | Aqua | 4-6 | 160 | 1 | 80-120 |
| LS6/LS8 | — | — | — | — | 3 | — |
| **Truck:** | | | | | | |
| 2.5L Ranger | F87E-D2B | Gray | 11-18 | 14 | 2 | 30-65 |
| 2.5L Ranger FFV E22 | F87E-D2B | Gray | 11-18 | 14 | 2 | 30-65 |
| 3.0L Ranger | F87E-B2B | Light Green | 11-18 | 12 | 2 | 30-65 |
| 3.0L Ranger FFV E85 | XL5E-A2A | Dark Gray | 11-18 | 19 | 2 | 30-65 |
| 3.0L Windstar | F47E-A2F | Gray | 11-18 | 14 | 1 | 30-45 |
| 3.8L Windstar | XF2E-C4B | Black | 9-16 | 21 | 1 | 30-45 |
| 4.0L OHV Ranger/Explorer | F87E-H1A | Gray | 11-18 | 14 | 2 | 30-65 |
| 4.0L OHV Ranger/Explorer FFV E22 | F87E-E1B | Turquoise | 11-18 | 14.5 | 2 | 30-65 |
| 4.0L SOHC Explorer | XL2E-A1C | Orange | 11-18 | 19 | 2 | 30-65 |
| 4.2L E/F-Series | XR3E-A6B | Black/Gray | 9-16 | 21 | 1 | 30-45 |
| 4.6L E/F-Series/Expedition | F0TE-D5B | Orange | 11-18 | 19 | 1 | 30-45 |
| 5.0L Explorer | XS2E-A5B | Ivory | 11-18 | 17 | 2 | 30-65 |
| 5.0L Explorer FFV | XL2E-B5A | Green | 11-18 | 17 | 2 | 30-65 |
| 5.4L E/F-Series/Expedition | F0TE-D5B | Orange | 11-18 | 19 | 1 | 30-45 |
| 5.4L E/F-Series NGV | F5TE-B5A | Aqua | 4-6 | 160 | 1 | 80-120 |
| 5.4L 4V Expedition | XR3E-C5B | Green | 11-18 | 24 | 1 | 30-45 |
| 6.8L E/F-Series | XW7E-A5B | Orange | 11-18 | 19 | 1 | 30-45 |

a (1) Return Fuel (2) Mechanical Returnless (3) Electronic Returnless
b Early model year will be Returnable Fuel

**Injector Application And Test Information**

(1) Return fuel systems return fuel to the fuel tank by means of a return line from the fuel rail.
(2) Mechanical returnless fuel systems do not return fuel to the fuel tank by means of a fuel return line. The pressure regulator is mounted on the Fuel Pump Module located in the fuel tank and excess fuel is returned at this point.
(3) Electronic fuel systems do not return fuel to the fuel tank by means of a fuel return line. There is no fuel pressure regulator and pressure is controlled by continuously varying the fuel pump speed through the Fuel Pump Driver Module **(FPDM)**.



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HC1 | CHECK SYSTEM INTEGRITY | | |
| | • Visually inspect the complete fuel delivery system for damage; including fuel lines, connections, relays, fuel tank, fuel pump, fuel pressure regulator, fuel pulse damper and fuel injector areas for leaks, looseness, cracks, kinks, pinching, or abrasion caused by a collision or mishandling.<br>• Visually inspect electrical harness and connectors for loose pins, corrosion, abrasion, or other damage from collision or mishandling.<br>• Check electrical connectors for proper mating.<br>• Verify vehicle has followed maintenance schedule.<br>• Verify inertia fuel shutoff (IFS) switch is set.<br>• Verify battery is fully charged (12.5 volts or greater).<br>• Verify electrical/fuse integrity.<br>• Verify fuel level in the tank is sufficient.<br>• **Has any concern been found?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to HC2. |
| HC2 | CHECK VOLTAGE AT FUEL PUMP HARNESS CONNECTOR | | |
| | • Connect battery charger.<br>• Verify IFS switch state. Follow the IFS switch reset procedure at the beginning of this pinpoint test.<br>• Disconnect the fuel pump harness connector at the fuel pump.<br>• Key on, engine off.<br>• Connect a digital multimeter between the fuel pump power circuit and fuel pump ground circuit at the fuel pump harness connector.<br>• Access Output Test Mode and turn on the fuel pump circuit and monitor the voltage reading.<br>• **Was the voltage greater that 12.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. EXIT Output Test Mode. RECONNECT fuel pump harness connector. GO to HC3.<br>KEY OFF. FOR vehicles with electronic returnless fuel systems: GO to Pinpoint Test Step KB70.<br>ALL others: CHECK for opens and shorts in the fuel pump power and ground circuits. |
| HC3 | CHECK FUEL FILTER FOR PROPER MAINTENANCE | | |
| | • Locate and inspect the vehicle maintenance schedule and fuel filter. Check for last repair date.<br>• **Was the fuel filter replaced within the last 48,280 km/30,000 miles?** | Yes ▶<br>No ▶ | GO to HC4.<br>REPLACE fuel filter. GO to HC4. |

<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td>HC4</td><td>CHECK FUEL PRESSURE</td><td></td><td></td></tr>
<tr><td colspan="2" rowspan="2">

**WARNING: BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE BY FOLLOWING DIRECTIONS IN FUEL SYSTEM CAUTION, HANDLING AND WARNING AT THE BEGINNING OF THIS PINPOINT TEST.**

- Install fuel pressure tester.
- Release fuel pressure.
- Key on, engine off.
- Access Output Test Mode and run the fuel pump to obtain maximum fuel pressure.

NOTE: The fuel pump will only operate for approximately 8 seconds when Output Test Mode is selected and activated.

<table>
<tr><th>Vehicle</th><th>kPa</th><th>psi</th></tr>
<tr><td>Contour/Mystique, Cougar 2.5L</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Continental</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Escort/Tracer, Mustang LS6/LS8</td><td>240-380</td><td>35-55</td></tr>
<tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr>
<tr><td>Ranger (Flex Fuel)</td><td>380-517</td><td>55-75</td></tr>
<tr><td>All Others</td><td>207-310</td><td>30-45</td></tr>
</table>

- **Is the fuel pressure at the specified pressure (use the fuel pressure chart)?**

</td><td>Yes ▶</td><td>

**KEY OFF. For Electronic/Mechanical Returnless Fuel Systems**: GO to HC12.

All others: GO to HC5.

</td></tr>
<tr><td>No ▶</td><td>

KEY OFF. **For Mechanical Returnless** Fuel System with fuel pressure greater that 448 kPa (65 psi). REPLACE fuel pressure regulator in fuel tank.

**For Mechanical Returnless** Fuel System with fuel pressure less than 310 kPa (45 psi): GO to HC6.

**For Electronic Returnless** systems with fuel pressure less than 517 kPa (75 psi). GO to HC13.

**For Electronic Returnless** systems with fuel pressure greater than 862 kPa (125 psi). Concern is elsewhere. RETURN to Symptom Charts for further direction.

**All others:**

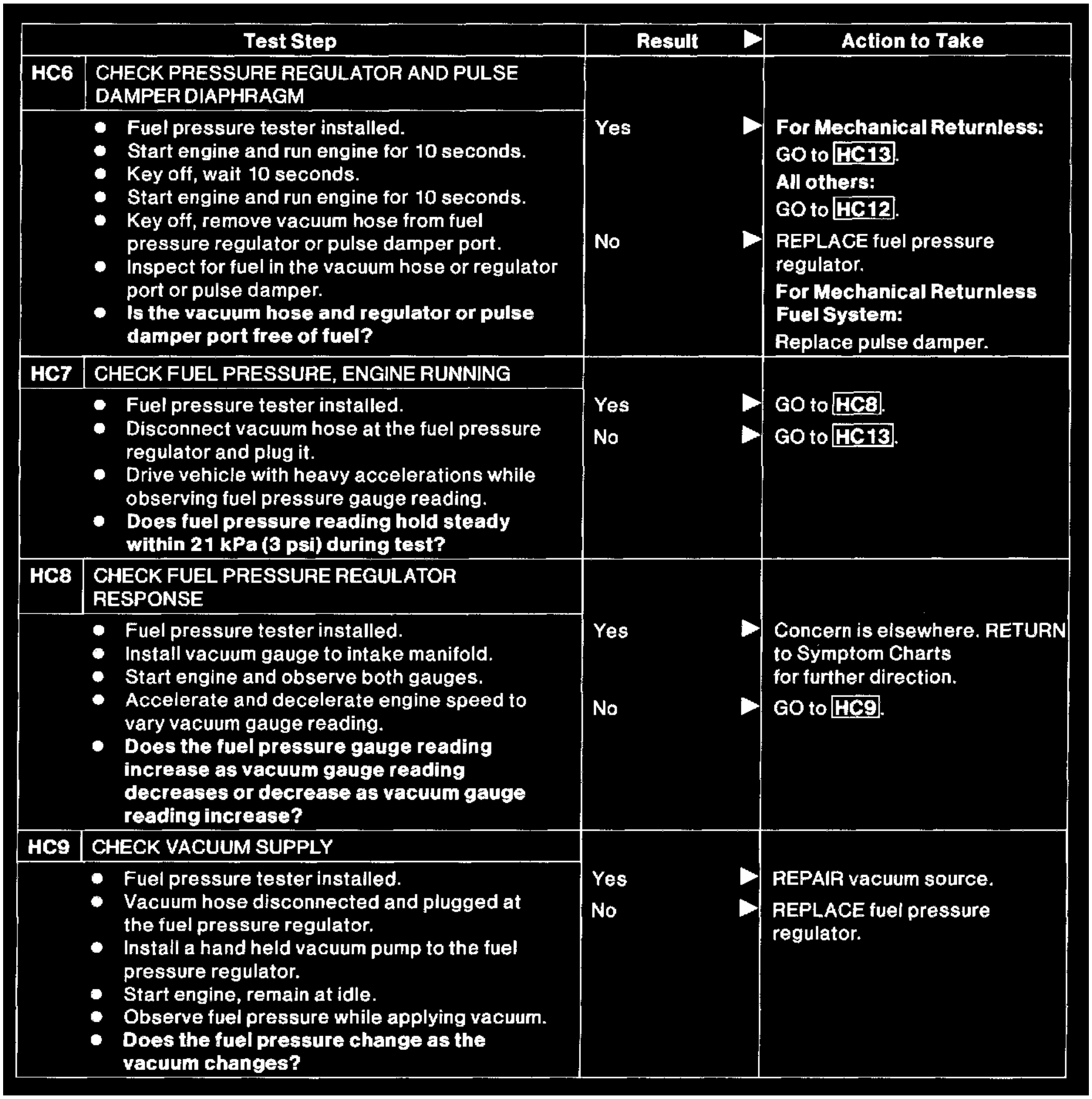
Fuel pressure greater than 280 kPa (40 psi) (Contour/Mystique, Cougar 415 kPa (60 psi) on **returnable fuel systems**, GO to HC10.

Fuel pressure less than 240 kPa (35 psi) (Contour/Mystique, Cougar 310 kPa (45 psi) on **returnable fuel systems**, GO to HC13.

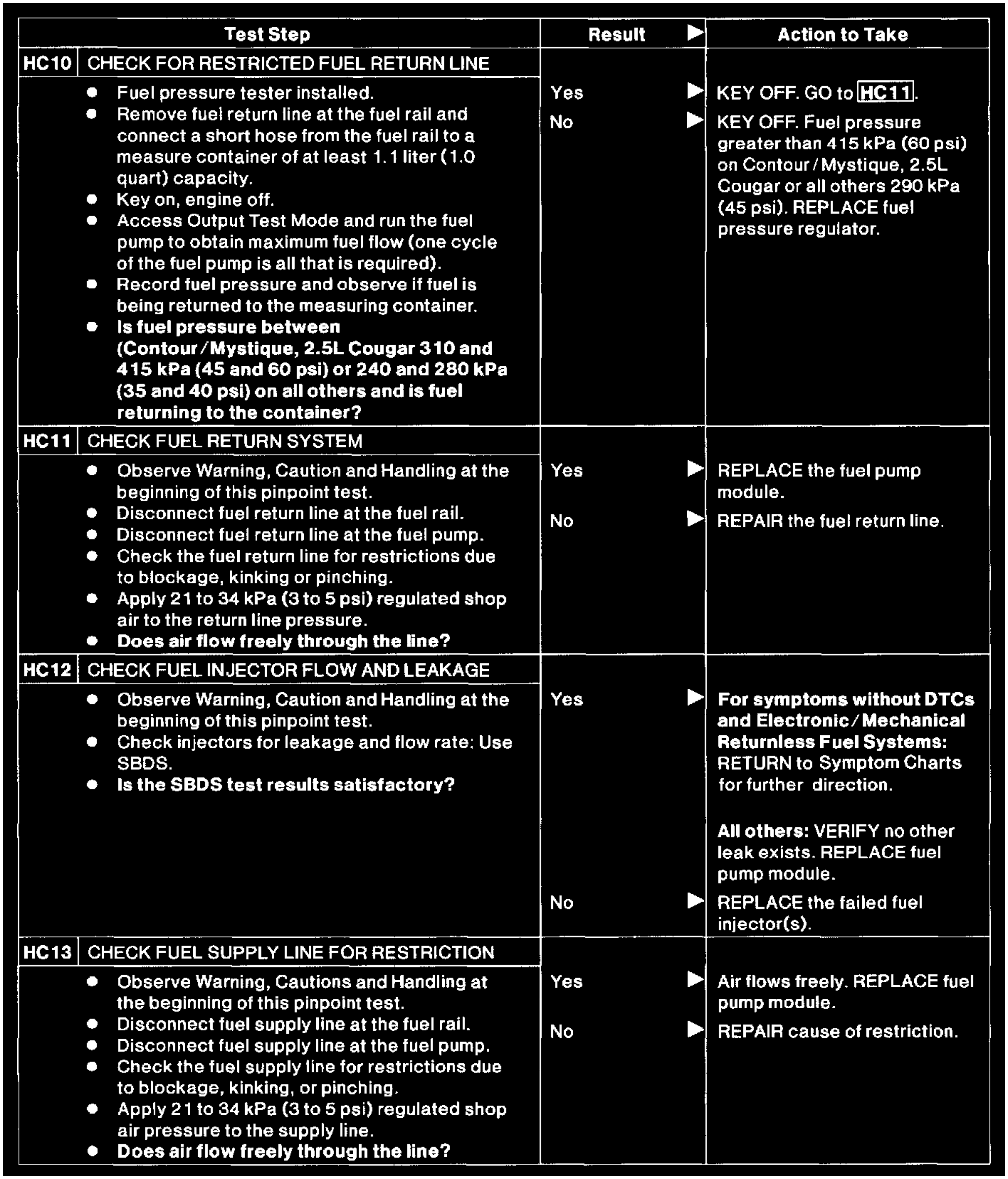
</td></tr>
<tr><td>HC5</td><td>CHECK FUEL PRESSURE LEAKDOWN</td><td></td><td></td></tr>
<tr><td colspan="2" rowspan="2">

- Observe Warning, Caution and Notes.
- Fuel pressure tester installed.
- Key on, engine off.
- Access Output Test Mode and run the fuel pump to obtain maximum fuel pressure.
- Key off.
- Verify fuel pressure remains within 34 kPa (5 psi) of the maximum fuel pressure for 1 minute after the fuel pump is turned off.
- **Does the fuel pressure remain within 34 kPa (5 psi)?**

</td><td>Yes ▶</td><td>GO to HC7.</td></tr>
<tr><td>No ▶</td><td>GO to HC6.</td></tr>
</table>



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HC6** | CHECK PRESSURE REGULATOR AND PULSE DAMPER DIAPHRAGM | | |
| | ● Fuel pressure tester installed.<br>● Start engine and run engine for 10 seconds.<br>● Key off, wait 10 seconds.<br>● Start engine and run engine for 10 seconds.<br>● Key off, remove vacuum hose from fuel pressure regulator or pulse damper port.<br>● Inspect for fuel in the vacuum hose or regulator port or pulse damper.<br>● **Is the vacuum hose and regulator or pulse damper port free of fuel?** | Yes ▶ | **For Mechanical Returnless:**<br>GO to HC13.<br>**All others:**<br>GO to HC12. |
| | | No ▶ | REPLACE fuel pressure regulator.<br>**For Mechanical Returnless Fuel System:**<br>Replace pulse damper. |
| **HC7** | CHECK FUEL PRESSURE, ENGINE RUNNING | | |
| | ● Fuel pressure tester installed.<br>● Disconnect vacuum hose at the fuel pressure regulator and plug it.<br>● Drive vehicle with heavy accelerations while observing fuel pressure gauge reading.<br>● **Does fuel pressure reading hold steady within 21 kPa (3 psi) during test?** | Yes ▶ | GO to HC8. |
| | | No ▶ | GO to HC13. |
| **HC8** | CHECK FUEL PRESSURE REGULATOR RESPONSE | | |
| | ● Fuel pressure tester installed.<br>● Install vacuum gauge to intake manifold.<br>● Start engine and observe both gauges.<br>● Accelerate and decelerate engine speed to vary vacuum gauge reading.<br>● **Does the fuel pressure gauge reading increase as vacuum gauge reading decreases or decrease as vacuum gauge reading increase?** | Yes ▶ | Concern is elsewhere. RETURN to Symptom Charts for further direction. |
| | | No ▶ | GO to HC9. |
| **HC9** | CHECK VACUUM SUPPLY | | |
| | ● Fuel pressure tester installed.<br>● Vacuum hose disconnected and plugged at the fuel pressure regulator.<br>● Install a hand held vacuum pump to the fuel pressure regulator.<br>● Start engine, remain at idle.<br>● Observe fuel pressure while applying vacuum.<br>● **Does the fuel pressure change as the vacuum changes?** | Yes ▶ | REPAIR vacuum source. |
| | | No ▶ | REPLACE fuel pressure regulator. |

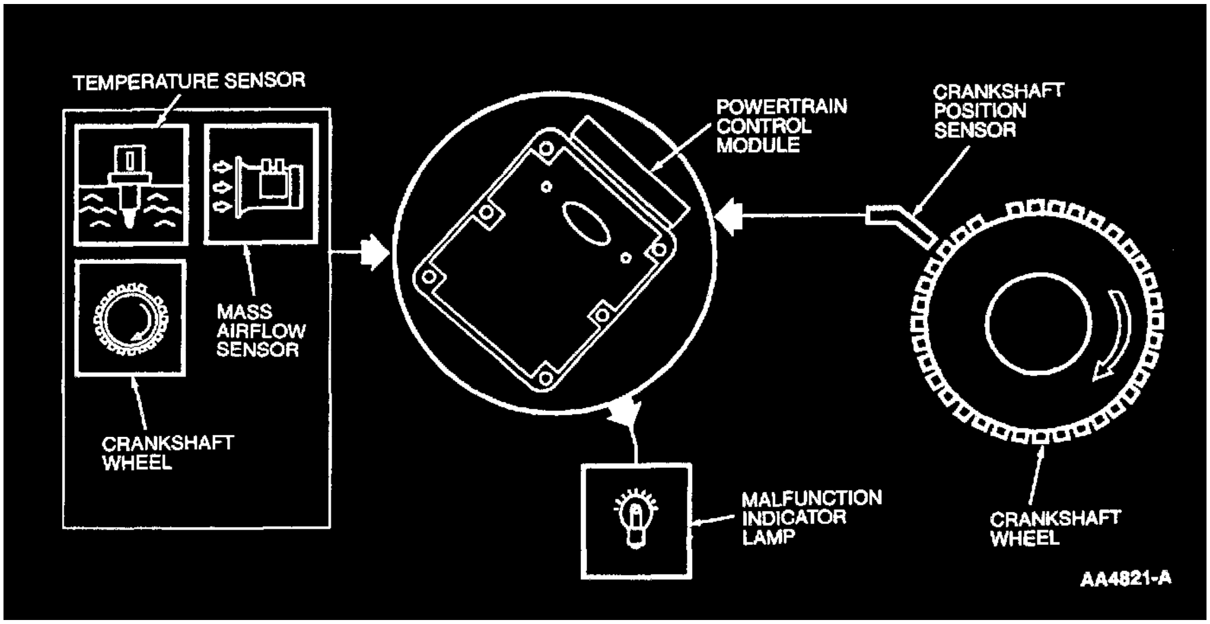


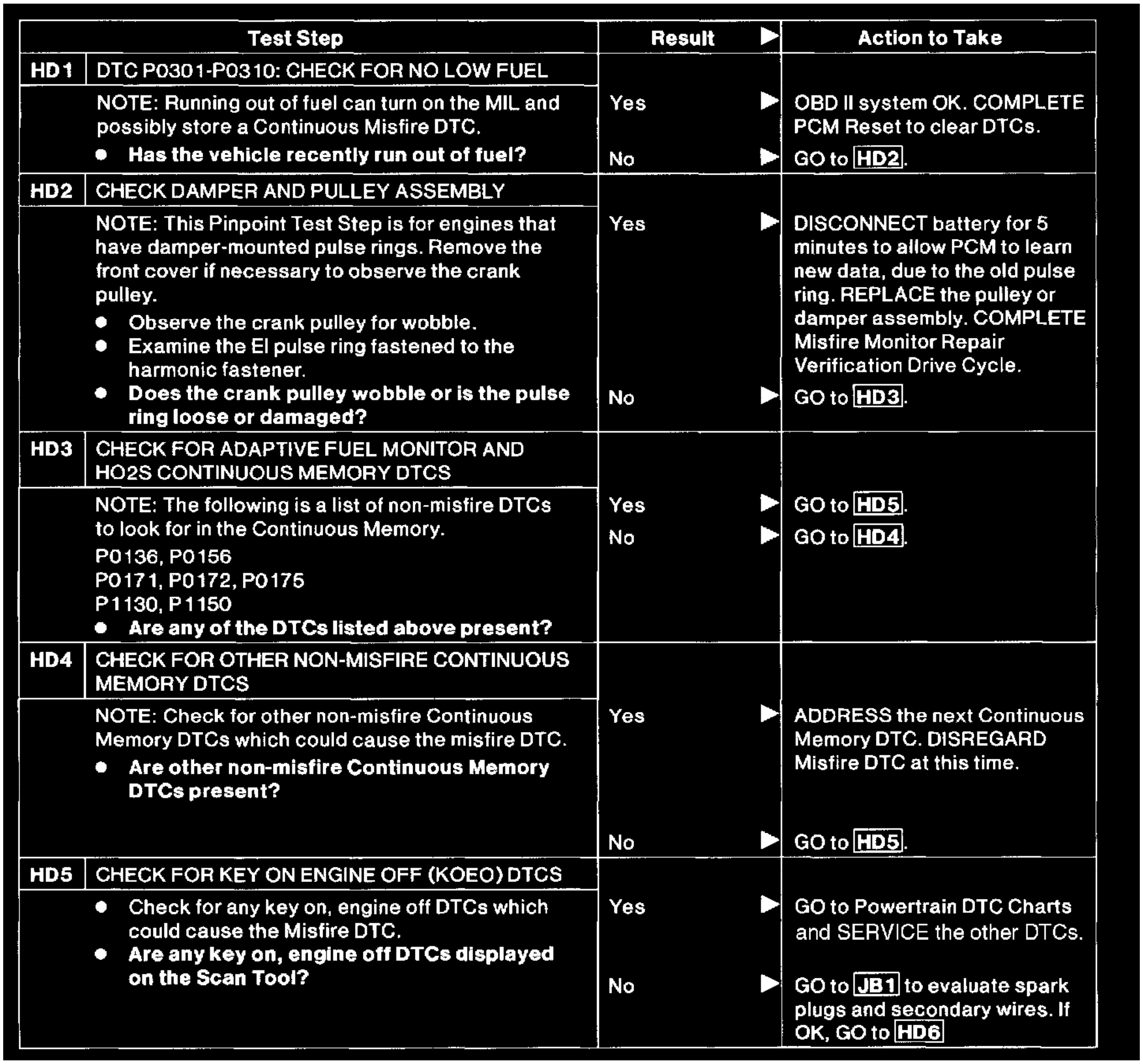
| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HC10** CHECK FOR RESTRICTED FUEL RETURN LINE | | |
| ● Fuel pressure tester installed.<br>● Remove fuel return line at the fuel rail and connect a short hose from the fuel rail to a measure container of at least 1.1 liter (1.0 quart) capacity.<br>● Key on, engine off.<br>● Access Output Test Mode and run the fuel pump to obtain maximum fuel flow (one cycle of the fuel pump is all that is required).<br>● Record fuel pressure and observe if fuel is being returned to the measuring container.<br>● **Is fuel pressure between (Contour/Mystique, 2.5L Cougar 310 and 415 kPa (45 and 60 psi) or 240 and 280 kPa (35 and 40 psi) on all others and is fuel returning to the container?** | Yes ▶ | KEY OFF. GO to HC11. |
| | No ▶ | KEY OFF. Fuel pressure greater than 415 kPa (60 psi) on Contour/Mystique, 2.5L Cougar or all others 290 kPa (45 psi). REPLACE fuel pressure regulator. |
| **HC11** CHECK FUEL RETURN SYSTEM | | |
| ● Observe Warning, Caution and Handling at the beginning of this pinpoint test.<br>● Disconnect fuel return line at the fuel rail.<br>● Disconnect fuel return line at the fuel pump.<br>● Check the fuel return line for restrictions due to blockage, kinking or pinching.<br>● Apply 21 to 34 kPa (3 to 5 psi) regulated shop air to the return line pressure.<br>● **Does air flow freely through the line?** | Yes ▶ | REPLACE the fuel pump module. |
| | No ▶ | REPAIR the fuel return line. |
| **HC12** CHECK FUEL INJECTOR FLOW AND LEAKAGE | | |
| ● Observe Warning, Caution and Handling at the beginning of this pinpoint test.<br>● Check injectors for leakage and flow rate: Use SBDS.<br>● **Is the SBDS test results satisfactory?** | Yes ▶ | **For symptoms without DTCs and Electronic/Mechanical Returnless Fuel Systems:** RETURN to Symptom Charts for further direction.<br>**All others:** VERIFY no other leak exists. REPLACE fuel pump module. |
| | No ▶ | REPLACE the failed fuel injector(s). |
| **HC13** CHECK FUEL SUPPLY LINE FOR RESTRICTION | | |
| ● Observe Warning, Cautions and Handling at the beginning of this pinpoint test.<br>● Disconnect fuel supply line at the fuel rail.<br>● Disconnect fuel supply line at the fuel pump.<br>● Check the fuel supply line for restrictions due to blockage, kinking, or pinching.<br>● Apply 21 to 34 kPa (3 to 5 psi) regulated shop air pressure to the supply line.<br>● **Does air flow freely through the line?** | Yes ▶ | Air flows freely. REPLACE fuel pump module. |
| | No ▶ | REPAIR cause of restriction. |

## Test Notes

This Pinpoint Test is intended to diagnose the following:

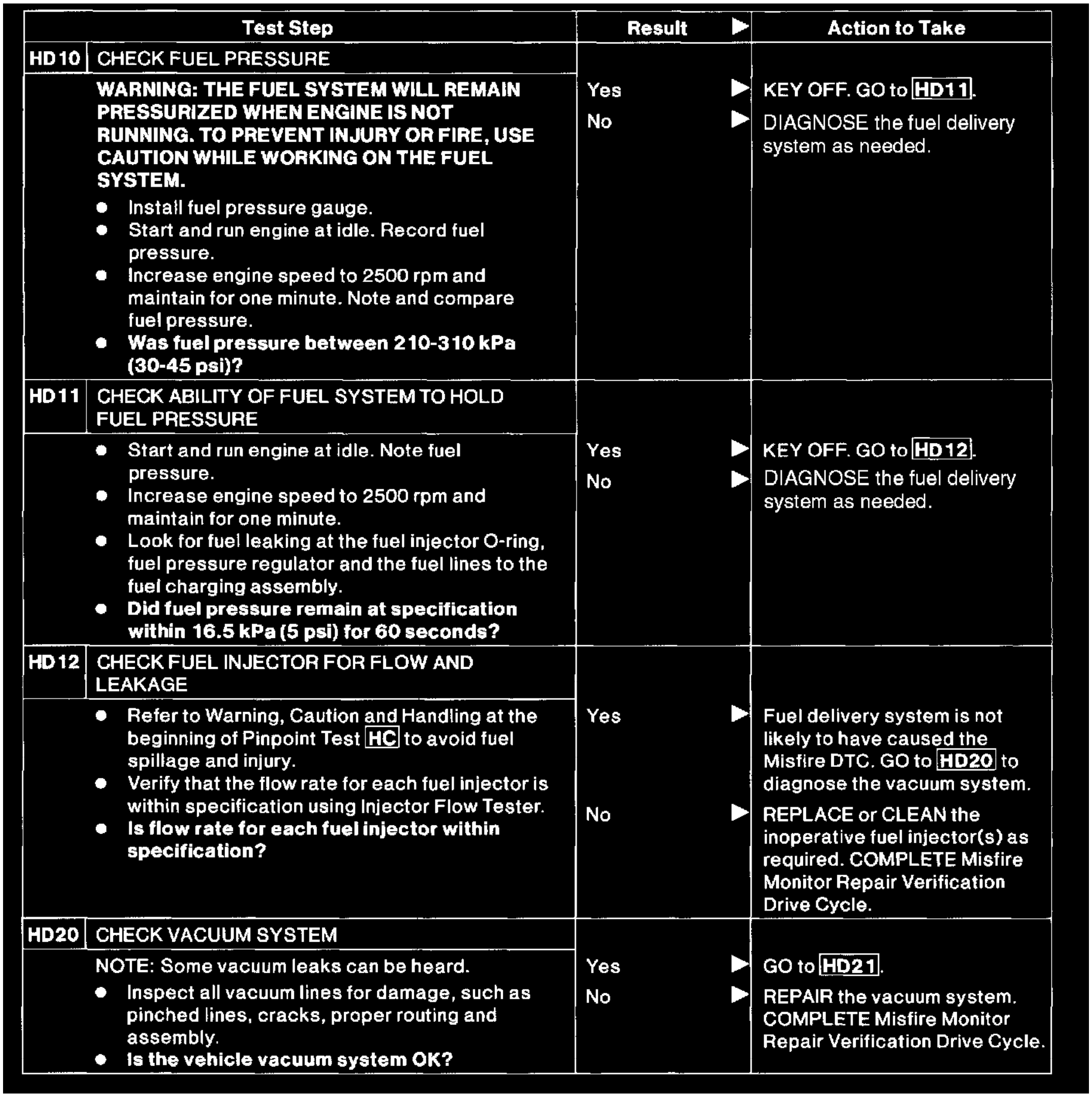
- Ignition System
- Fuel injectors
- Fuel pressure
- Vacuum system
- Evaporative emission system
- Fuel vapor storage canister
- EVAP canister purge valve
- Base engine
- Crankshaft Position **(CKP)** sensor
- Powertrain Control Module **(PCM)**



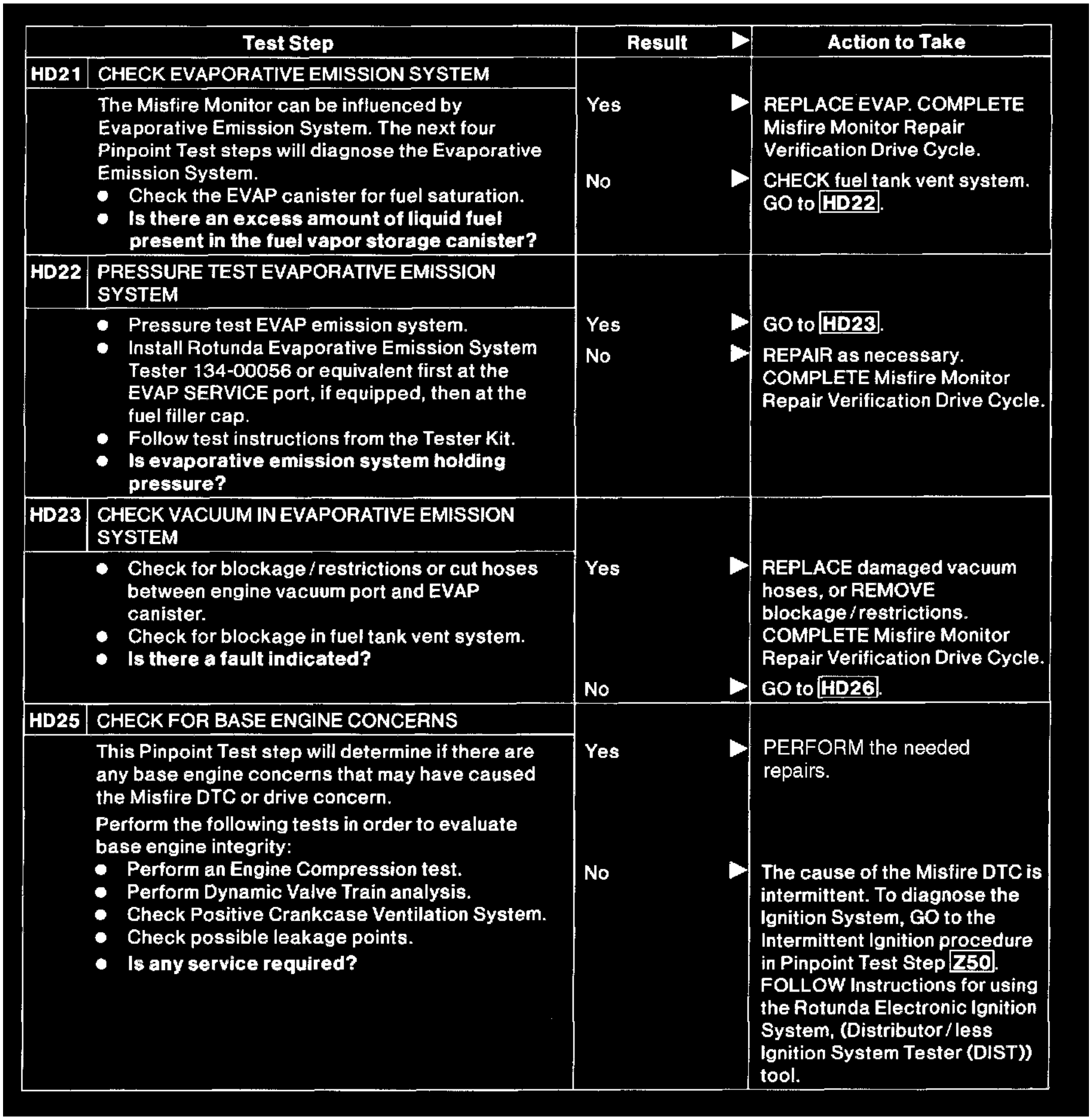


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HD1** | DTC P0301-P0310: CHECK FOR NO LOW FUEL | | |
| | NOTE: Running out of fuel can turn on the MIL and possibly store a Continuous Misfire DTC.<br>● **Has the vehicle recently run out of fuel?** | Yes ▶<br>No ▶ | OBD II system OK. COMPLETE PCM Reset to clear DTCs.<br>GO to HD2. |
| **HD2** | CHECK DAMPER AND PULLEY ASSEMBLY | | |
| | NOTE: This Pinpoint Test Step is for engines that have damper-mounted pulse rings. Remove the front cover if necessary to observe the crank pulley.<br>● Observe the crank pulley for wobble.<br>● Examine the EI pulse ring fastened to the harmonic fastener.<br>● **Does the crank pulley wobble or is the pulse ring loose or damaged?** | Yes ▶<br>No ▶ | DISCONNECT battery for 5 minutes to allow PCM to learn new data, due to the old pulse ring. REPLACE the pulley or damper assembly. COMPLETE Misfire Monitor Repair Verification Drive Cycle.<br>GO to HD3. |
| **HD3** | CHECK FOR ADAPTIVE FUEL MONITOR AND HO2S CONTINUOUS MEMORY DTCS | | |
| | NOTE: The following is a list of non-misfire DTCs to look for in the Continuous Memory.<br>P0136, P0156<br>P0171, P0172, P0175<br>P1130, P1150<br>● **Are any of the DTCs listed above present?** | Yes ▶<br>No ▶ | GO to HD5.<br>GO to HD4. |
| **HD4** | CHECK FOR OTHER NON-MISFIRE CONTINUOUS MEMORY DTCS | | |
| | NOTE: Check for other non-misfire Continuous Memory DTCs which could cause the misfire DTC.<br>● **Are other non-misfire Continuous Memory DTCs present?** | Yes ▶<br>No ▶ | ADDRESS the next Continuous Memory DTC. DISREGARD Misfire DTC at this time.<br>GO to HD5. |
| **HD5** | CHECK FOR KEY ON ENGINE OFF (KOEO) DTCS | | |
| | ● Check for any key on, engine off DTCs which could cause the Misfire DTC.<br>● **Are any key on, engine off DTCs displayed on the Scan Tool?** | Yes ▶<br>No ▶ | GO to Powertrain DTC Charts and SERVICE the other DTCs.<br>GO to JB1 to evaluate spark plugs and secondary wires. If OK, GO to HD6 |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HD6** | CHECK FOR OTHER KEY ON ENGINE RUNNING DTCS | | |
| | NOTE: Check for any other key on, engine running DTCs which can cause the Misfire DTC.<br>● **Are any additional key on, engine running DTCs displayed on the Scan Tool?** | Yes ▶ | If DTCs P1132, P1138, P1152, P1158, P1131, P1137, P1151 or P1157 are present, GO to HD8.<br>All others: GO to Powertrain DTC Charts and DIAGNOSE the DTC(s) as directed. |
| | | No ▶ | Vehicles with D.P.F. EGR Systems: GO to HD7.<br>All others: GO to HD8. |
| **HD7** | CHECK / COMPARE PID VALUES | | |
| | ● Start engine and warm to normal operating temperature.<br>● Access DPFEGR PID.<br>● Record DPFEGR PID value.<br>● Key off.<br>● Key on, engine off.<br>● Access DPFEGR.<br>● Compare key on, engine off and engine running PID values.<br>● **Was engine running PID value within 0.15 volt of key on, engine off value?** | Yes ▶ | KEY OFF. GO to HD8. |
| | | No ▶ | KEY OFF. Go to Pinpoint Test Step HE100. |
| **HD8** | CHECK INJECTOR DRIVER PIDS INJ1F THRU INJ10F | | |
| | ● Key on, engine off.<br>● Access appropriate PID(s) for the suspect fuel injector.<br>● **Is the PID status Yes?** | Yes ▶ | GO to HD9. |
| | | No ▶ | GO to HD10. |
| **HD9** | CHECK FUEL INJECTOR(S) AND HARNESS FOR OPEN | | |
| | ● Disconnect PCM.<br>● Measure resistance of fuel injector and harness circuit between the fuel injector and VPWR circuits at the fuel injector harness connector (Refer to the injector connector chart in Pinpoint Test H).<br>● **Is the resistance between 11.0-18.0 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | GO to Pinpoint Test Step H57 to diagnose fuel injectors. |

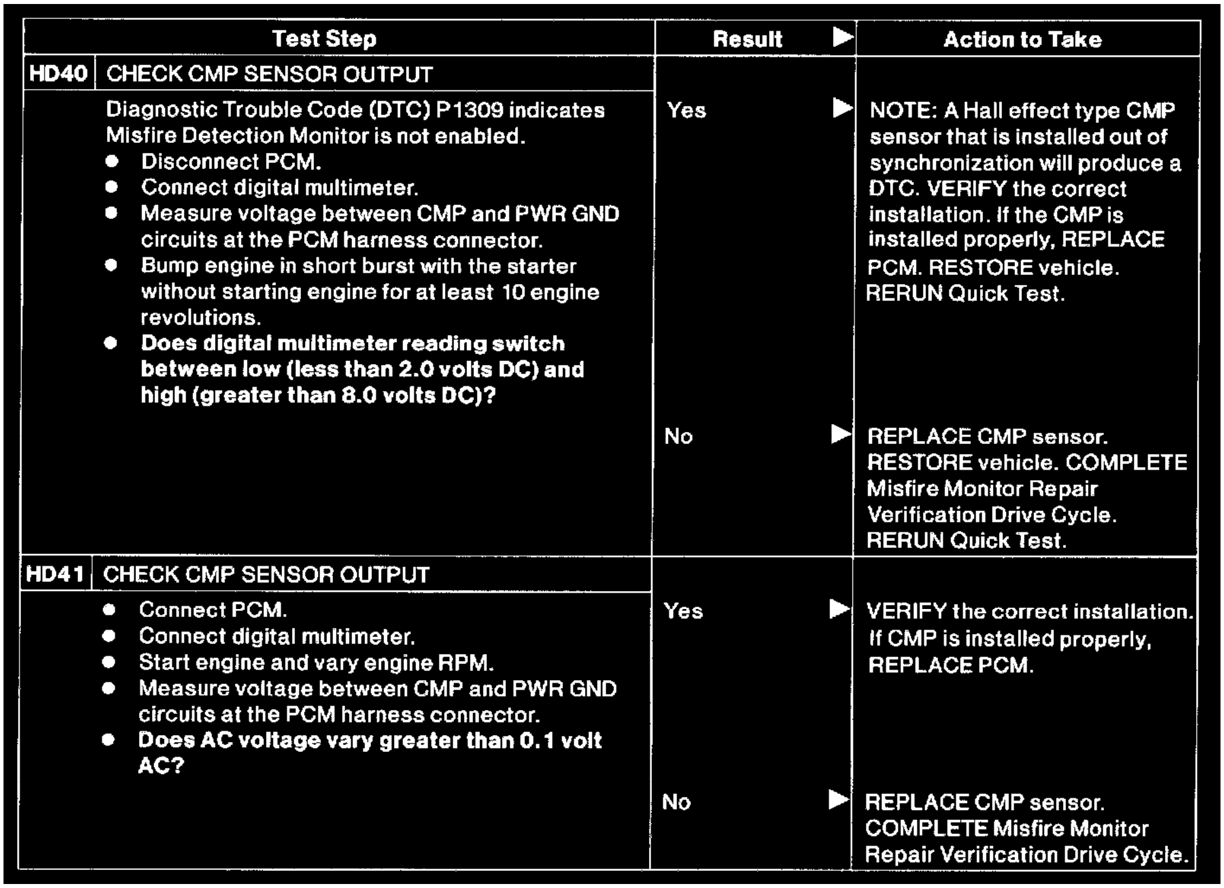


| | Test Step | Result ▶ | Action to Take |
|---|---|---|---|
| HD10 | CHECK FUEL PRESSURE | | |
| | **WARNING: THE FUEL SYSTEM WILL REMAIN PRESSURIZED WHEN ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHILE WORKING ON THE FUEL SYSTEM.**<br>● Install fuel pressure gauge.<br>● Start and run engine at idle. Record fuel pressure.<br>● Increase engine speed to 2500 rpm and maintain for one minute. Note and compare fuel pressure.<br>● **Was fuel pressure between 210-310 kPa (30-45 psi)?** | Yes ▶ | KEY OFF. GO to HD11. |
| | | No ▶ | DIAGNOSE the fuel delivery system as needed. |
| HD11 | CHECK ABILITY OF FUEL SYSTEM TO HOLD FUEL PRESSURE | | |
| | ● Start and run engine at idle. Note fuel pressure.<br>● Increase engine speed to 2500 rpm and maintain for one minute.<br>● Look for fuel leaking at the fuel injector O-ring, fuel pressure regulator and the fuel lines to the fuel charging assembly.<br>● **Did fuel pressure remain at specification within 16.5 kPa (5 psi) for 60 seconds?** | Yes ▶ | KEY OFF. GO to HD12. |
| | | No ▶ | DIAGNOSE the fuel delivery system as needed. |
| HD12 | CHECK FUEL INJECTOR FOR FLOW AND LEAKAGE | | |
| | ● Refer to Warning, Caution and Handling at the beginning of Pinpoint Test HC to avoid fuel spillage and injury.<br>● Verify that the flow rate for each fuel injector is within specification using Injector Flow Tester.<br>● **Is flow rate for each fuel injector within specification?** | Yes ▶ | Fuel delivery system is not likely to have caused the Misfire DTC. GO to HD20 to diagnose the vacuum system. |
| | | No ▶ | REPLACE or CLEAN the inoperative fuel injector(s) as required. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| HD20 | CHECK VACUUM SYSTEM | | |
| | NOTE: Some vacuum leaks can be heard.<br>● Inspect all vacuum lines for damage, such as pinched lines, cracks, proper routing and assembly.<br>● **Is the vehicle vacuum system OK?** | Yes ▶ | GO to HD21. |
| | | No ▶ | REPAIR the vacuum system. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HD21** | CHECK EVAPORATIVE EMISSION SYSTEM | | |
| | The Misfire Monitor can be influenced by Evaporative Emission System. The next four Pinpoint Test steps will diagnose the Evaporative Emission System.<br>● Check the EVAP canister for fuel saturation.<br>● **Is there an excess amount of liquid fuel present in the fuel vapor storage canister?** | Yes ▶ | REPLACE EVAP. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | CHECK fuel tank vent system. GO to HD22. |
| **HD22** | PRESSURE TEST EVAPORATIVE EMISSION SYSTEM | | |
| | ● Pressure test EVAP emission system.<br>● Install Rotunda Evaporative Emission System Tester 134-00056 or equivalent first at the EVAP SERVICE port, if equipped, then at the fuel filler cap.<br>● Follow test instructions from the Tester Kit.<br>● **Is evaporative emission system holding pressure?** | Yes ▶ | GO to HD23. |
| | | No ▶ | REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **HD23** | CHECK VACUUM IN EVAPORATIVE EMISSION SYSTEM | | |
| | ● Check for blockage / restrictions or cut hoses between engine vacuum port and EVAP canister.<br>● Check for blockage in fuel tank vent system.<br>● **Is there a fault indicated?** | Yes ▶ | REPLACE damaged vacuum hoses, or REMOVE blockage / restrictions. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to HD26. |
| **HD25** | CHECK FOR BASE ENGINE CONCERNS | | |
| | This Pinpoint Test step will determine if there are any base engine concerns that may have caused the Misfire DTC or drive concern.<br>Perform the following tests in order to evaluate base engine integrity:<br>● Perform an Engine Compression test.<br>● Perform Dynamic Valve Train analysis.<br>● Check Positive Crankcase Ventilation System.<br>● Check possible leakage points.<br>● **Is any service required?** | Yes ▶ | PERFORM the needed repairs. |
| | | No ▶ | The cause of the Misfire DTC is intermittent. To diagnose the Ignition System, GO to the Intermittent Ignition procedure in Pinpoint Test Step Z50. FOLLOW Instructions for using the Rotunda Electronic Ignition System, (Distributor / less Ignition System Tester (DIST)) tool. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HD26** | CHECK OF EVAP CANISTER PURGE VALVE HOUSING LEAKS | | |
| | - EVAP canister purge valve electrically connected.<br>- Install a hand vacuum pump to the fuel vapor port from EVAP canister on the EVAP canister purge valve vacuum at line.<br>- Apply 53 kPa (16 in-Hg) of vacuum with the vacuum pump.<br>- **Does the EVAP canister purge valve hold vacuum at room temperature?** | Yes ▶ | Go to HD27. |
| | | No ▶ | REMOVE vacuum pump. REPLACE damaged EVAP canister purge valve. COMPLETE PCM Reset to clear DTCs. |
| **HD27** | CHECK FOR FILTER CONTAMINATION ON DAMAGE EVAP CANISTER PURGE VALVE | | |
| | - Vacuum line from input vacuum port to intake manifold on the EVAP canister purge valve (control vacuum solenoid part of valve) is removed.<br>- Install a hand held vacuum pump to the open input vacuum port on the EVAP canister purge valve.<br>- Apply 48-52 kPa (10-15 in-Hg) of vacuum to the EVAP canister purge valve.<br>- **Does the EVAP canister purge valve hold vacuum or is the valve very slow to release vacuum to atmosphere?** | Yes ▶ | REPAIR EVAP canister purge valve filter. If unable to clean filter or REMOVE blockage to filter, REPLACE EVAP canister purge valve. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REMOVE vacuum pump. RECONNECT all components. GO to HD25. |
| **HD30** | CHECK FOR ADDITIONAL MISFIRE DTCS | | |
| | Diagnostic Trouble Code P0300 indicates multiple cylinders are misfiring or PCM cannot identify which cylinder is misfiring.<br>- **Are any other misfire DTCs present?** | Yes ▶ | GO to HD1. |
| | | No ▶ | GO to HD31. |
| **HD31** | CHECK FOR OTHER CONTINUOUS MEMORY DTCS | | |
| | - **Are other Continuous Memory DTCs present?** | Yes ▶ | SERVICE the other DTCs. |
| | | No ▶ | GO to HD32. |
| **HD32** | CHECK / COMPARE PID VALUES | | |
| | - Start engine and warm to normal operating temperature.<br>- Access DPFEGR PID.<br>- Record PID value.<br>- Key off.<br>- Key on, engine off.<br>- Access DPFEGR.<br>- Start engine, let idle.<br>- Compare key on, engine off and engine running PID values.<br>- **Is engine running DPFEGR PID value within 0.15 volt of key on, engine off value?** | Yes ▶ | KEY OFF. Vehicles with VRS type CMP, GO to HD41.<br>KEY OFF. Vehicles with hall effect type CMP, GO to HD40. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step HE100. |

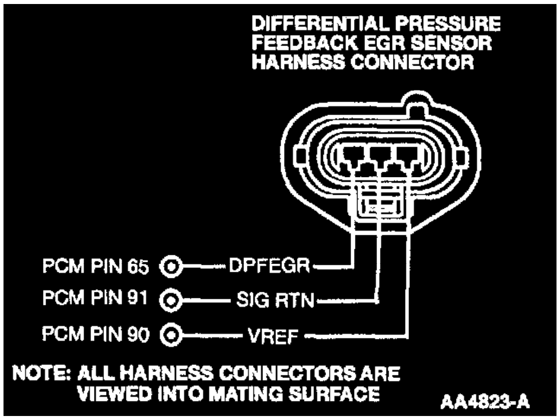


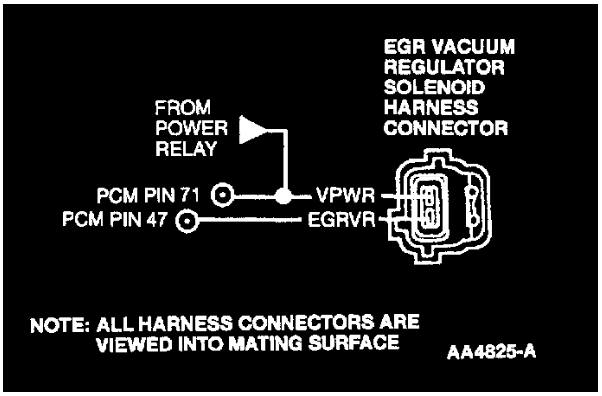
| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HD40** CHECK CMP SENSOR OUTPUT | | |
| Diagnostic Trouble Code (DTC) P1309 indicates Misfire Detection Monitor is not enabled.<br>● Disconnect PCM.<br>● Connect digital multimeter.<br>● Measure voltage between CMP and PWR GND circuits at the PCM harness connector.<br>● Bump engine in short burst with the starter without starting engine for at least 10 engine revolutions.<br>● **Does digital multimeter reading switch between low (less than 2.0 volts DC) and high (greater than 8.0 volts DC)?** | Yes ▶ | NOTE: A Hall effect type CMP sensor that is installed out of synchronization will produce a DTC. VERIFY the correct installation. If the CMP is installed properly, REPLACE PCM. RESTORE vehicle. RERUN Quick Test. |
| | No ▶ | REPLACE CMP sensor. RESTORE vehicle. COMPLETE Misfire Monitor Repair Verification Drive Cycle. RERUN Quick Test. |
| **HD41** CHECK CMP SENSOR OUTPUT | | |
| ● Connect PCM.<br>● Connect digital multimeter.<br>● Start engine and vary engine RPM.<br>● Measure voltage between CMP and PWR GND circuits at the PCM harness connector.<br>● **Does AC voltage vary greater than 0.1 volt AC?** | Yes ▶ | VERIFY the correct installation. If CMP is installed properly, REPLACE PCM. |
| | No ▶ | REPLACE CMP sensor. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |

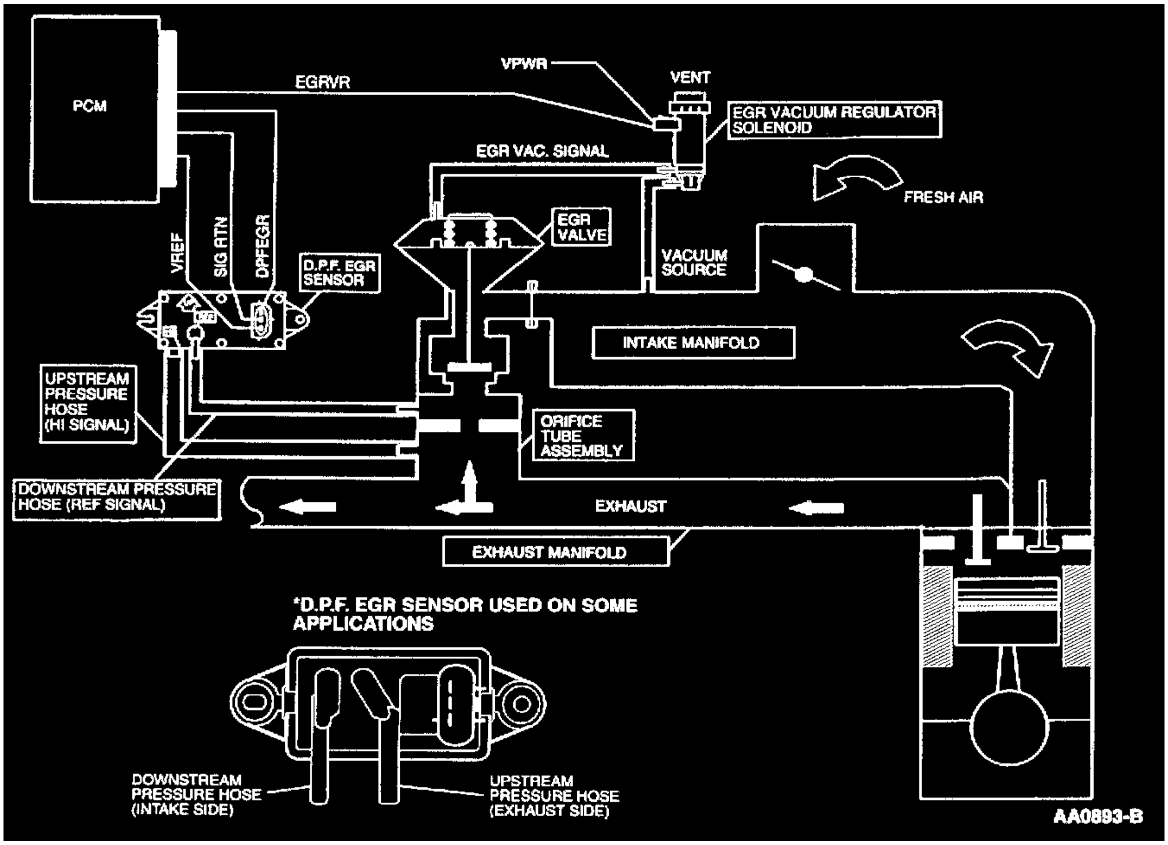
## Test Notes

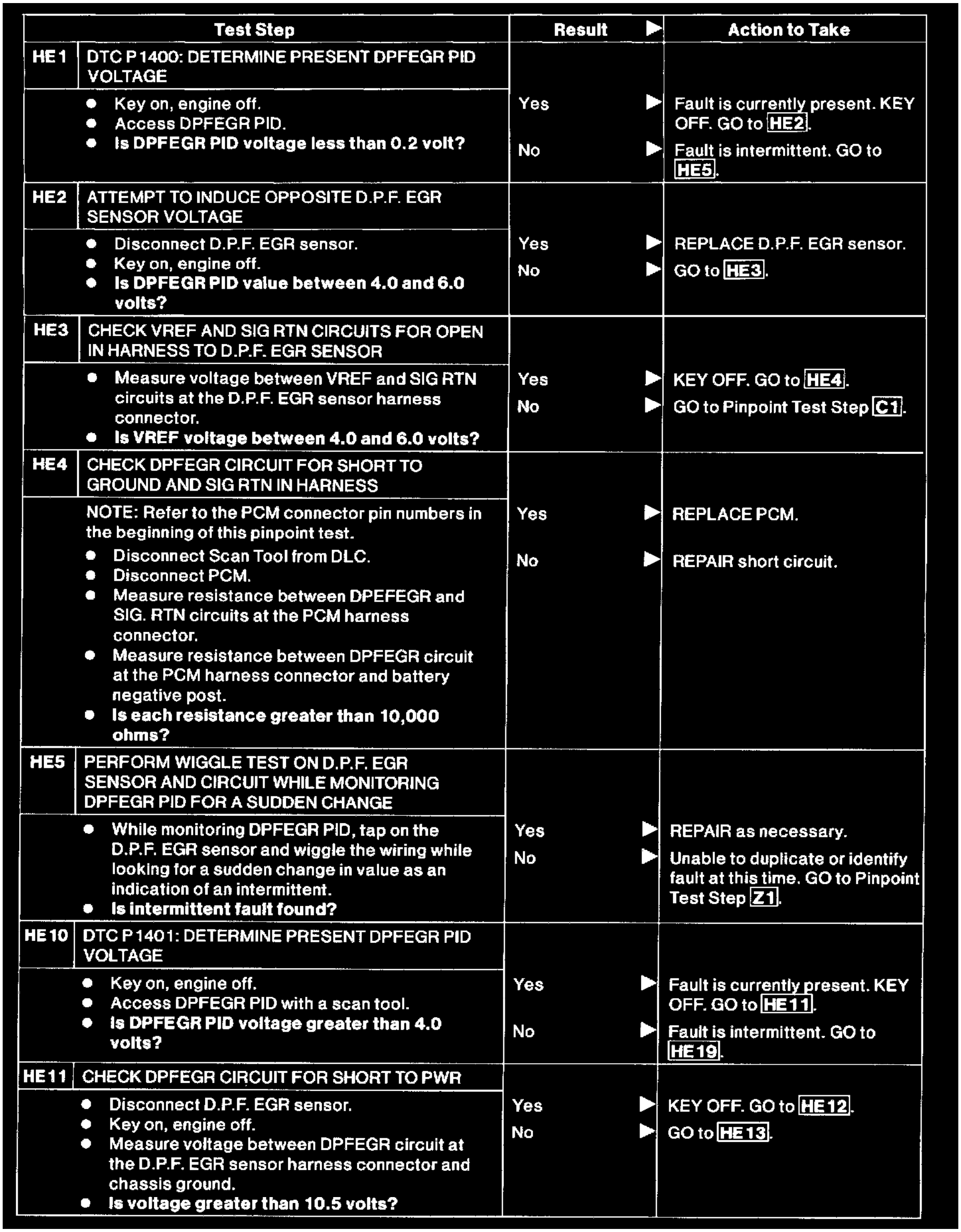
This Pinpoint Test is intended to diagnose the following:

- Differential pressure feedback EGR sensor
- Exhaust Gas Recirculation **(EGR)** valve
- EGR vacuum regulator solenoid
- Orifice tube assembly
- Differential pressure feedback EGR sensor pressure hoses
- Vacuum lines
- Harness circuits: VREF, DPFE, SIG, SIG RTN, EVR, EVR PWR
- Powertrain Control Module **(PCM)**

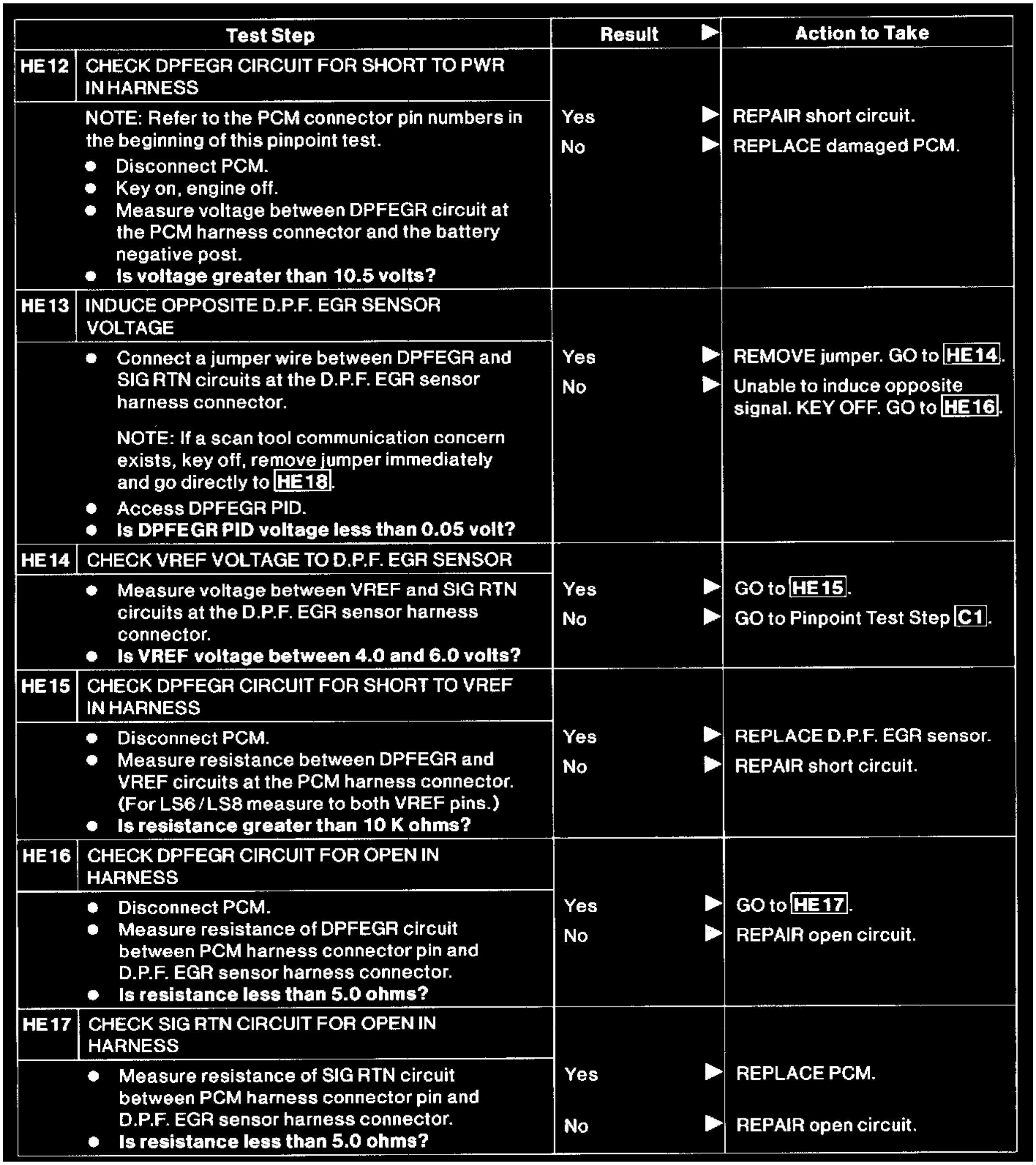



EGR VACUUM REGULATOR SOLENOID HARNESS CONNECTOR
FROM POWER RELAY
PCM PIN 71
VPWR
PCM PIN 47
EGRVR
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4825-A


PCM
EGRVR
VPWR
VENT
EGR VACUUM REGULATOR SOLENOID
EGR VAC. SIGNAL
FRESH AIR
EGR VALVE
VACUUM SOURCE
VREF
SIG RTN
DPFEGR
D.P.F. EGR SENSOR
INTAKE MANIFOLD
UPSTREAM PRESSURE HOSE (HI SIGNAL)
ORIFICE TUBE ASSEMBLY
DOWNSTREAM PRESSURE HOSE (REF SIGNAL)
EXHAUST
EXHAUST MANIFOLD
*D.P.F. EGR SENSOR USED ON SOME APPLICATIONS
DOWNSTREAM PRESSURE HOSE (INTAKE SIDE)
UPSTREAM PRESSURE HOSE (EXHAUST SIDE)
AA0893-B



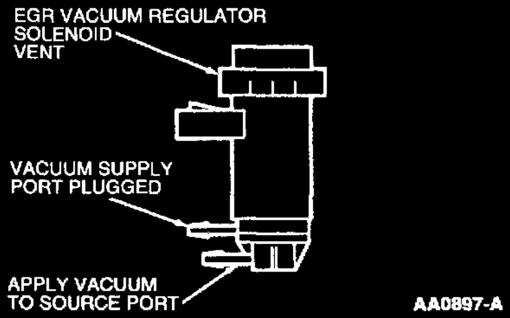
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HE1 | DTC P1400: DETERMINE PRESENT DPFEGR PID VOLTAGE | | |
| | ● Key on, engine off.<br>● Access DPFEGR PID.<br>● **Is DPFEGR PID voltage less than 0.2 volt?** | Yes ▶<br>No ▶ | Fault is currently present. KEY OFF. GO to HE2.<br>Fault is intermittent. GO to HE5. |
| HE2 | ATTEMPT TO INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE | | |
| | ● Disconnect D.P.F. EGR sensor.<br>● Key on, engine off.<br>● **Is DPFEGR PID value between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | REPLACE D.P.F. EGR sensor.<br>GO to HE3. |
| HE3 | CHECK VREF AND SIG RTN CIRCUITS FOR OPEN IN HARNESS TO D.P.F. EGR SENSOR | | |
| | ● Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector.<br>● **Is VREF voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE4.<br>GO to Pinpoint Test Step C1. |
| HE4 | CHECK DPFEGR CIRCUIT FOR SHORT TO GROUND AND SIG RTN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect Scan Tool from DLC.<br>● Disconnect PCM.<br>● Measure resistance between DPEFEGR and SIG. RTN circuits at the PCM harness connector.<br>● Measure resistance between DPFEGR circuit at the PCM harness connector and battery negative post.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| HE5 | PERFORM WIGGLE TEST ON D.P.F. EGR SENSOR AND CIRCUIT WHILE MONITORING DPFEGR PID FOR A SUDDEN CHANGE | | |
| | ● While monitoring DPFEGR PID, tap on the D.P.F. EGR sensor and wiggle the wiring while looking for a sudden change in value as an indication of an intermittent.<br>● **Is intermittent fault found?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| HE10 | DTC P1401: DETERMINE PRESENT DPFEGR PID VOLTAGE | | |
| | ● Key on, engine off.<br>● Access DPFEGR PID with a scan tool.<br>● **Is DPFEGR PID voltage greater than 4.0 volts?** | Yes ▶<br>No ▶ | Fault is currently present. KEY OFF. GO to HE11.<br>Fault is intermittent. GO to HE19. |
| HE11 | CHECK DPFEGR CIRCUIT FOR SHORT TO PWR | | |
| | ● Disconnect D.P.F. EGR sensor.<br>● Key on, engine off.<br>● Measure voltage between DPFEGR circuit at the D.P.F. EGR sensor harness connector and chassis ground.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE12.<br>GO to HE13. |

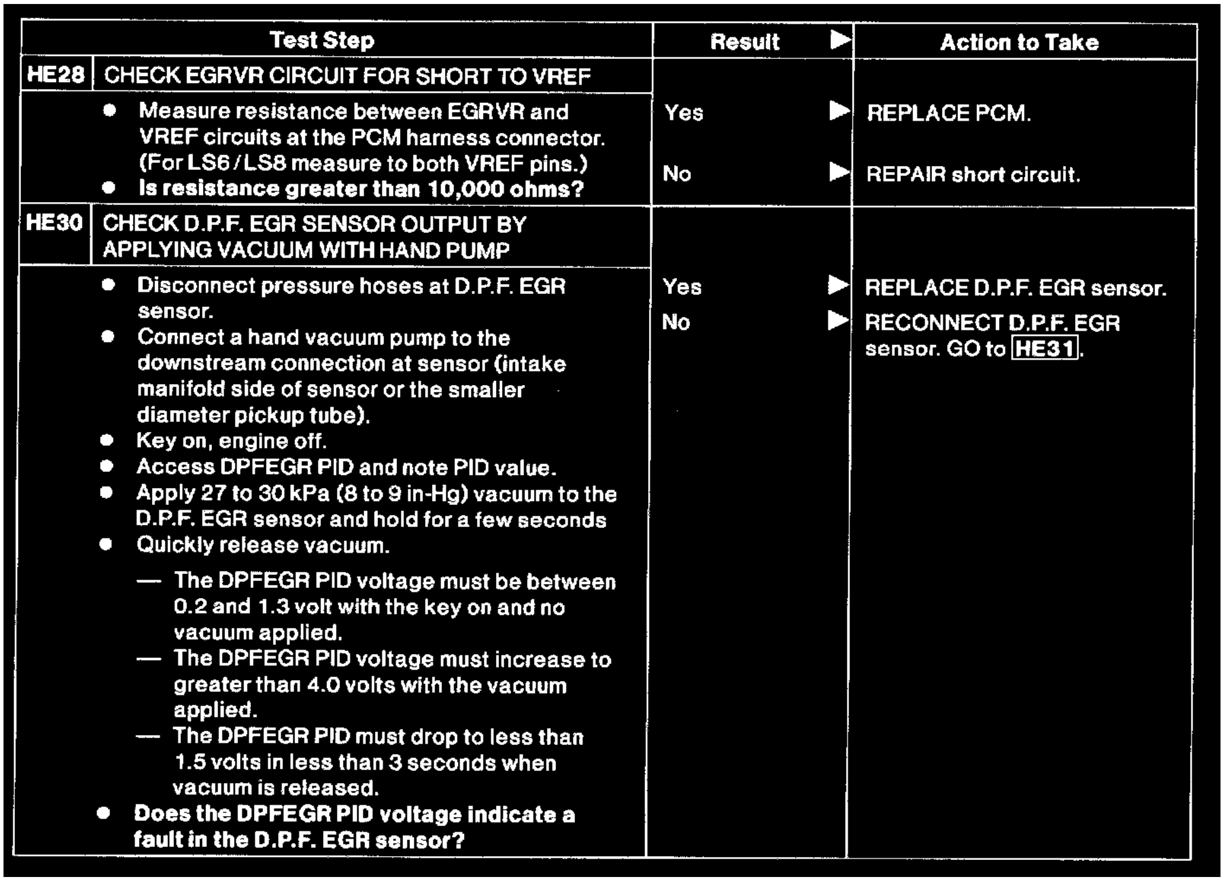


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HE12 | CHECK DPFEGR CIRCUIT FOR SHORT TO PWR IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between DPFEGR circuit at the PCM harness connector and the battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>REPLACE damaged PCM. |
| HE13 | INDUCE OPPOSITE D.P.F. EGR SENSOR VOLTAGE | | |
| | ● Connect a jumper wire between DPFEGR and SIG RTN circuits at the D.P.F. EGR sensor harness connector.<br>NOTE: If a scan tool communication concern exists, key off, remove jumper immediately and go directly to HE18.<br>● Access DPFEGR PID.<br>● **Is DPFEGR PID voltage less than 0.05 volt?** | Yes ▶<br>No ▶ | REMOVE jumper. GO to HE14.<br>Unable to induce opposite signal. KEY OFF. GO to HE16. |
| HE14 | CHECK VREF VOLTAGE TO D.P.F. EGR SENSOR | | |
| | ● Measure voltage between VREF and SIG RTN circuits at the D.P.F. EGR sensor harness connector.<br>● **Is VREF voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | GO to HE15.<br>GO to Pinpoint Test Step C1. |
| HE15 | CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance between DPFEGR and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is resistance greater than 10 K ohms?** | Yes ▶<br>No ▶ | REPLACE D.P.F. EGR sensor.<br>REPAIR short circuit. |
| HE16 | CHECK DPFEGR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance of DPFEGR circuit between PCM harness connector pin and D.P.F. EGR sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to HE17.<br>REPAIR open circuit. |
| HE17 | CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of SIG RTN circuit between PCM harness connector pin and D.P.F. EGR sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuit. |

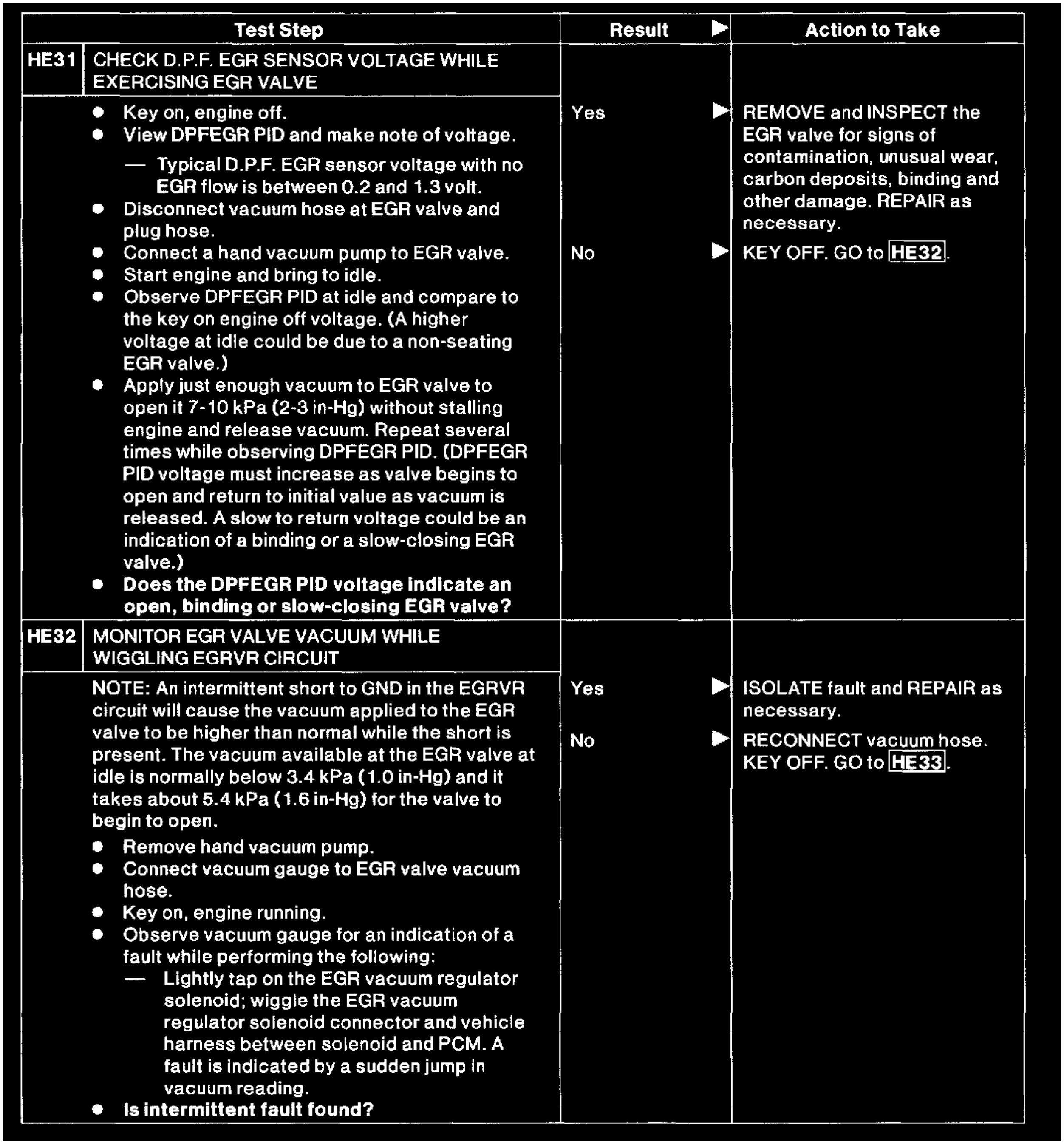
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE18** | CHECK DPFEGR CIRCUIT FOR SHORT TO VREF IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance between DPFEGR and VREF circuits at the PCM harness connector. (For LS6 / LS8 measure to both VREF pins.)<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **HE19** | COMPLETE A WIGGLE TEST ON D.P.F. EGR SENSOR AND CIRCUIT WHILE MONITORING DPFEGR PID FOR A SUDDEN CHANGE | | |
| | ● While monitoring DPFEGR PID, tap on the D.P.F. EGR sensor and wiggle the wiring while looking for a sudden change in value as an indication of an intermittent.<br>● **Is intermittent fault found?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HE20** | DTC P0402: CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE DISCONNECTED | | |
| | NOTE: If DTC P1405 is in continuous memory, diagnose that first starting with HE50.<br>● Disconnect vacuum hose at EGR valve and plug hose.<br>● Run Key On Engine Running (KOER) Self-Test.<br>● **Is KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?** | Yes ▶<br>No ▶ | KEY OFF. INSPECT pressure hoses first for pinching and icing. If OK, REMOVE and INSPECT the EGR valve and EGR tube for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary.<br>RECONNECT vacuum hose to EGR valve. GO to HE21. |
| **HE21** | CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM HOSE CONNECTED | | |
| | ● EGR vacuum hose connected.<br>● Run KOER Self-Test.<br>● **Is KOER DTC P0402 output or unable to run KOER Self-Test due to engine stall or no start?** | Yes ▶<br>No ▶ | There is possible EGR flow at idle. GO to HE22.<br>Fault is intermittent. INSPECT pressure hoses for pinching and icing. REPAIR as necessary. If OK, GO to HE30. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HE22 | CHECK EGR SYSTEM VACUUM HOSES FOR INTEGRITY AND CONNECTION | | |
| | NOTE: A pinched or plugged EGR vacuum hose can trap vacuum between the EGR vacuum regulator solenoid and EGR valve not allowing the EGR valve to close.<br>● Trace each vacuum hose from EGR vacuum regulator solenoid and verify that each hose is connected correctly. (Refer to vehicle vacuum diagram label.)<br>● Verify that the EGR valve vacuum hose is not pinched or plugged and routed properly.<br>● **Are vacuum hoses OK?** | Yes ▶ | RECONNECT vacuum hoses. GO to HE23. |
| | | No ▶ | REPAIR vacuum hoses as necessary. |
| HE23 | CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | ● Disconnect pressure hoses at D.P.F. EGR sensor.<br>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).<br>● Key on, engine off.<br>● Access DPFEGR PID and note PID value.<br>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.<br>● Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>● **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶ | REPLACE D.P.F. EGR sensor. |
| | | No ▶ | RECONNECT D.P.F. EGR sensor. GO to HE24. |
| HE24 | CHECK FOR EGR FLOW AT IDLE WITH EGR VACUUM REGULATOR SOLENOID CONNECTOR OFF | | |
| | ● Disconnect vacuum hose at EGR valve and connect hose to vacuum gauge.<br>● Start engine and bring to an idle.<br>● While monitoring vacuum gauge, disconnect the EGR vacuum regulator solenoid harness connector.<br>— The EGR valve requires vacuum greater than 5.4 kPa (1.6 in-Hg) to begin to open. If the vacuum reading remains greater than 5.4 kPa (1.6 in-Hg) after the EGR vacuum regulator solenoid is electrically disconnected, this would indicate a mechanical fault in the EGR vacuum regulator solenoid.<br>● **Does the EGR vacuum remain greater than 5.4 kPa (1.6 in-Hg) at idle even after EGR vacuum regulator solenoid is electrically disconnected?** | Yes ▶ | This indicates a fault in the EGR vacuum regulator solenoid. KEY OFF. GO to HE25. |
| | | No ▶ | KEY OFF. GO to HE26. |

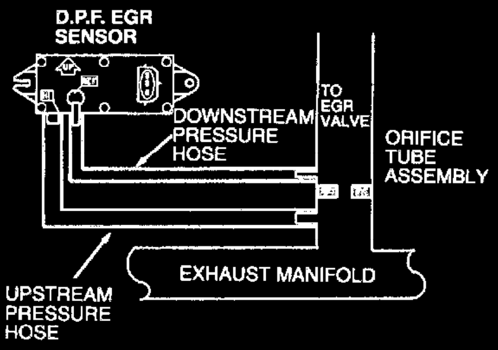
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE25** | INSPECT EGR VACUUM REGULATOR SOLENOID VENT FOR PLUGGING | | |
| | NOTE: A plugged EGR vacuum regulator solenoid vent will not allow EGR vacuum to vent to atmosphere.<br>● Disconnect EGR vacuum regulator solenoid vacuum hoses.<br>● Remove EGR vacuum regulator solenoid vent cap (if removable).<br>● Remove filter and inspect for blockage or icing in some cases.<br>● With the EGR vacuum supply port plugged, apply 34 to 51 kPa (10 to 15 in-Hg) of vacuum directly to EGR vacuum regulator solenoid vacuum source port with a hand vacuum pump. If the vacuum holds or is slow to release to atmosphere, the EGR vacuum regulator solenoid vent could be plugged or restricted.<br> <br>● **Is the EGR vacuum regulator solenoid vent or vent filter plugged or restricted?** | Yes ▶<br>No ▶ | REPAIR EGR vacuum regulator solenoid as necessary. If unable to repair, REPLACE EGR vacuum regulator solenoid.<br>REPLACE EGR vacuum regulator solenoid. |
| **HE26** | MEASURE EGR VACUUM REGULATOR SOLENOID COIL RESISTANCE | | |
| | ● Measure resistance across EGR vacuum regulator solenoid.<br>● **Is resistance between 26 and 40 ohms?** | Yes ▶<br>No ▶ | GO to HE27.<br>REPLACE EGR vacuum regulator solenoid. |
| **HE27** | CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Measure resistance between EGRVR circuit at the PCM harness connector and battery negative post.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HE28.<br>REPAIR short circuit. |

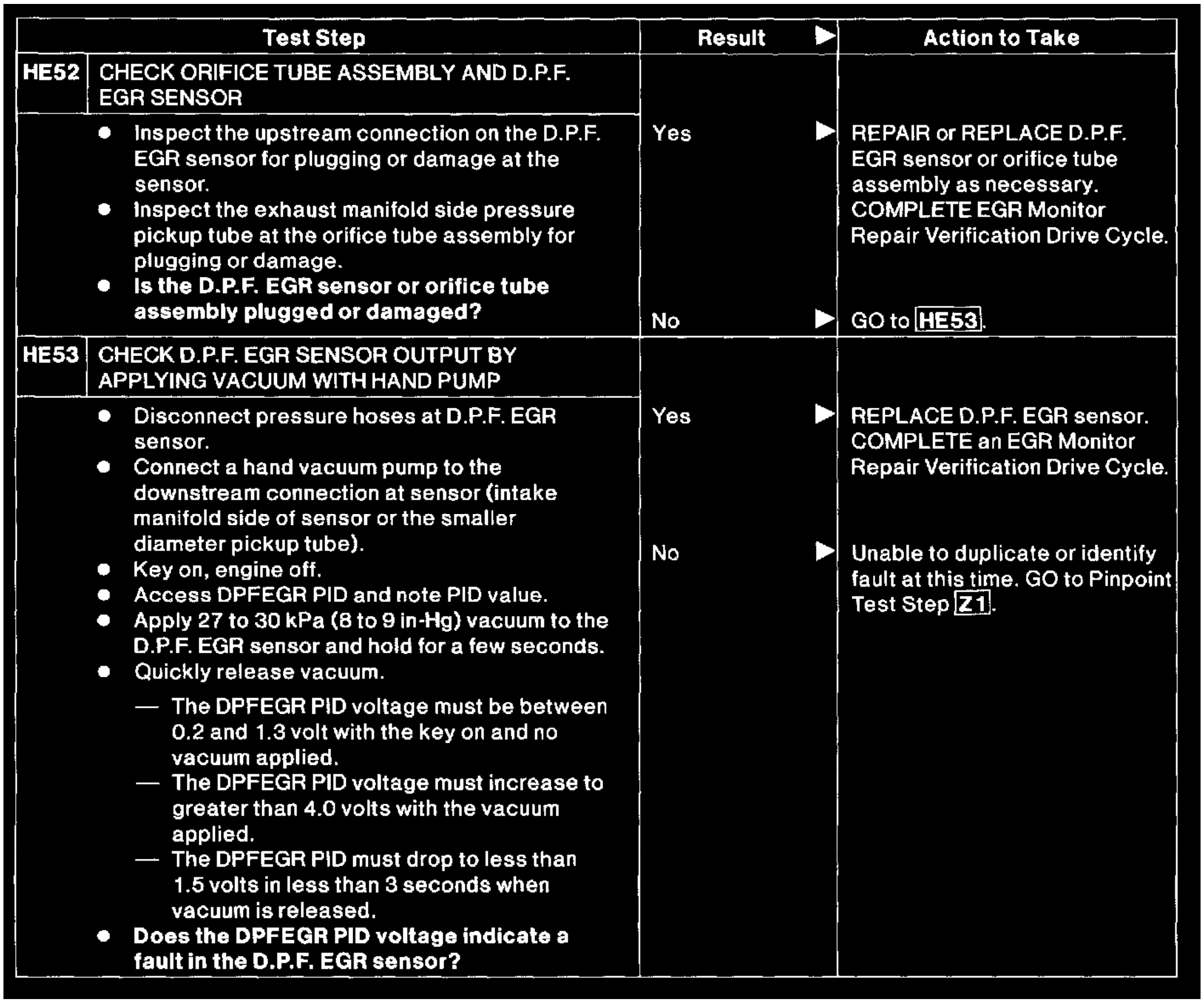


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE28** | CHECK EGRVR CIRCUIT FOR SHORT TO VREF | | |
| | • Measure resistance between EGRVR and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |
| **HE30** | CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | • Disconnect pressure hoses at D.P.F. EGR sensor.<br>• Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).<br>• Key on, engine off.<br>• Access DPFEGR PID and note PID value.<br>• Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds<br>• Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>• **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶ | REPLACE D.P.F. EGR sensor. |
| | | No ▶ | RECONNECT D.P.F. EGR sensor. GO to HE31. |

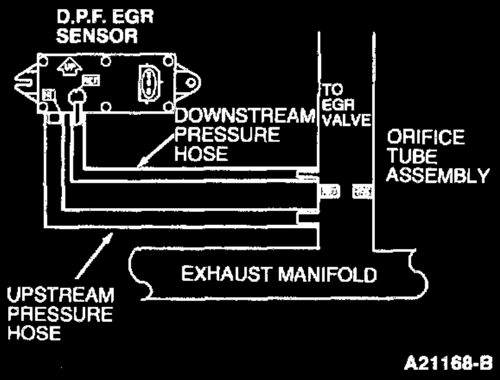


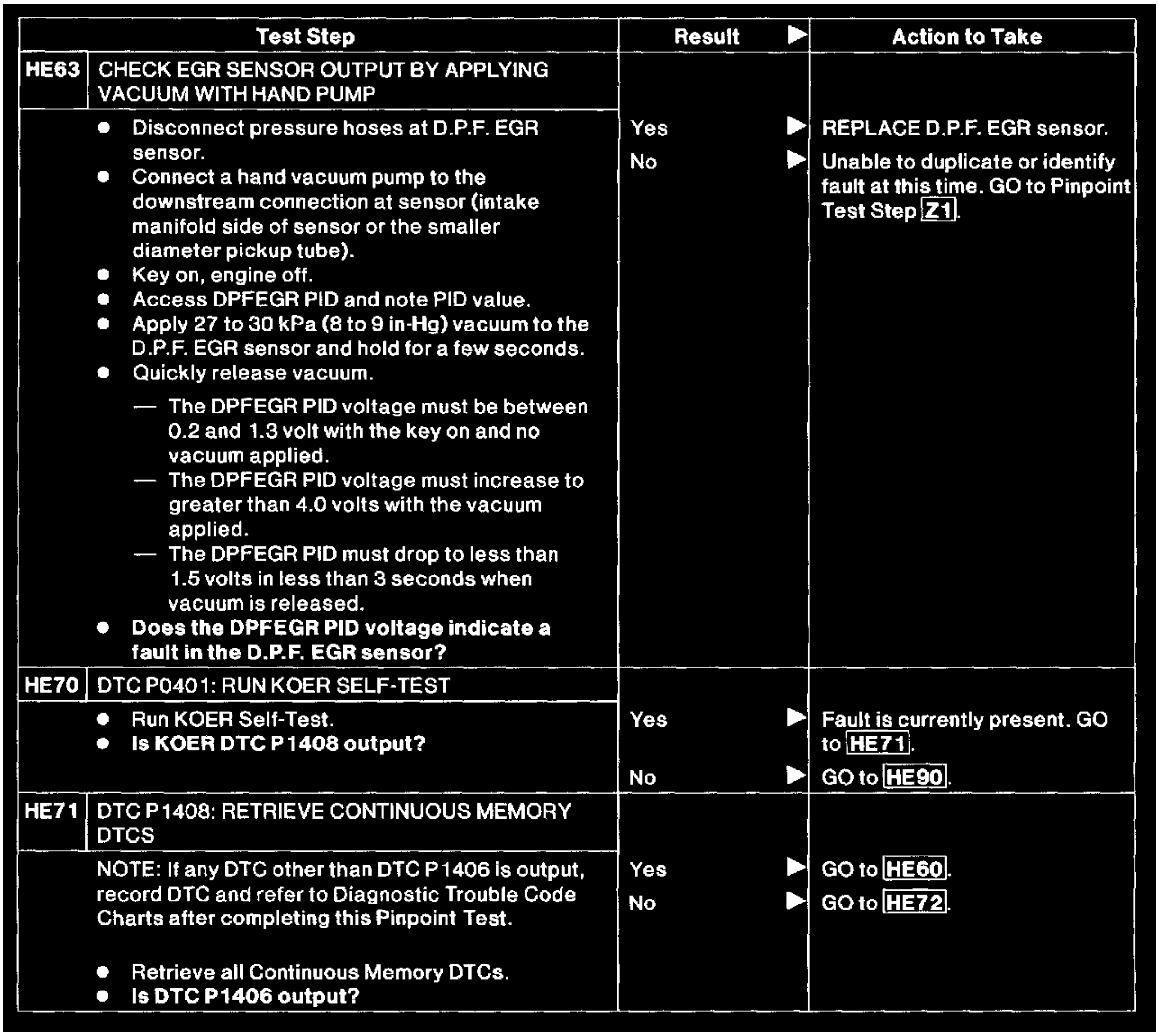
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE31** | CHECK D.P.F. EGR SENSOR VOLTAGE WHILE EXERCISING EGR VALVE | | |
| | ● Key on, engine off.<br>● View DPFEGR PID and make note of voltage.<br>— Typical D.P.F. EGR sensor voltage with no EGR flow is between 0.2 and 1.3 volt.<br>● Disconnect vacuum hose at EGR valve and plug hose.<br>● Connect a hand vacuum pump to EGR valve.<br>● Start engine and bring to idle.<br>● Observe DPFEGR PID at idle and compare to the key on engine off voltage. (A higher voltage at idle could be due to a non-seating EGR valve.)<br>● Apply just enough vacuum to EGR valve to open it 7-10 kPa (2-3 in-Hg) without stalling engine and release vacuum. Repeat several times while observing DPFEGR PID. (DPFEGR PID voltage must increase as valve begins to open and return to initial value as vacuum is released. A slow to return voltage could be an indication of a binding or a slow-closing EGR valve.)<br>● **Does the DPFEGR PID voltage indicate an open, binding or slow-closing EGR valve?** | Yes ▶ | REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. |
| | | No ▶ | KEY OFF. GO to HE32. |
| **HE32** | MONITOR EGR VALVE VACUUM WHILE WIGGLING EGRVR CIRCUIT | | |
| | NOTE: An intermittent short to GND in the EGRVR circuit will cause the vacuum applied to the EGR valve to be higher than normal while the short is present. The vacuum available at the EGR valve at idle is normally below 3.4 kPa (1.0 in-Hg) and it takes about 5.4 kPa (1.6 in-Hg) for the valve to begin to open.<br>● Remove hand vacuum pump.<br>● Connect vacuum gauge to EGR valve vacuum hose.<br>● Key on, engine running.<br>● Observe vacuum gauge for an indication of a fault while performing the following:<br>— Lightly tap on the EGR vacuum regulator solenoid; wiggle the EGR vacuum regulator solenoid connector and vehicle harness between solenoid and PCM. A fault is indicated by a sudden jump in vacuum reading.<br>● **Is intermittent fault found?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | RECONNECT vacuum hose. KEY OFF. GO to HE33. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE33** | INSPECT EGR VACUUM REGULATOR SOLENOID AND VACUUM HOSES FOR POTENTIAL PLUGGING | | |
| | • Remove EGR vacuum regulator solenoid vent filter and inspect for contamination and excessive water absorption. (In cold climate, excessive water in filter could freeze and plug the EGR vacuum regulator solenoid vent.)<br>• Inspect EGR vacuum hose for possible blockage or pinching.<br>• **Is EGR vacuum regulator solenoid vent or filter contaminated or vacuum hose plugged?** | Yes ▶ | REPAIR EGR vacuum regulator solenoid or EGR vacuum hose as necessary. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HE50** | DTC P1405: INSPECT UPSTREAM PRESSURE HOSE CONNECTIONS | | |
| | • Inspect upstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection.<br>• **Is hose off or poorly connected?** | Yes ▶ | REPAIR as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle. |
| |  <br>A21168-B | No ▶ | GO to HE51. |
| **HE51** | INSPECT UPSTREAM PRESSURE HOSE FOR PLUGGING | | |
| | NOTE: It is essential that the D.P.F. EGR pressure hose used is the correct repair part and not a substitute.<br>• Visually inspect upstream pressure hose routing. Hose must not be pinched or have dips in it where water could settle or freeze.<br>• Remove upstream pressure hose and carefully inspect for plugging, water or leaks.<br>• **Is there a fault detected in the hose?** | Yes ▶ | REPAIR or REPLACE upstream pressure hose as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to HE52. |

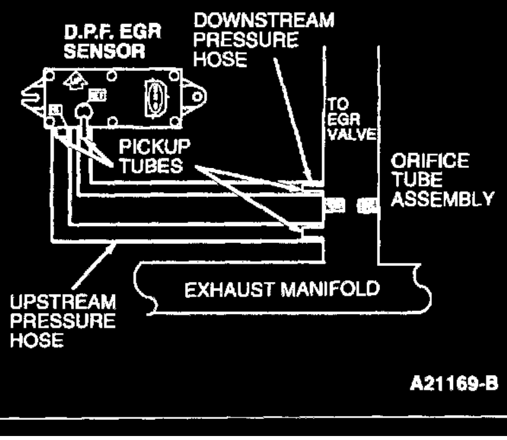


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE52** | CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR | | |
| | ● Inspect the upstream connection on the D.P.F. EGR sensor for plugging or damage at the sensor.<br>● Inspect the exhaust manifold side pressure pickup tube at the orifice tube assembly for plugging or damage.<br>● **Is the D.P.F. EGR sensor or orifice tube assembly plugged or damaged?** | Yes ▶ | REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary. COMPLETE EGR Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to HE53. |
| **HE53** | CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | ● Disconnect pressure hoses at D.P.F. EGR sensor.<br>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).<br>● Key on, engine off.<br>● Access DPFEGR PID and note PID value.<br>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.<br>● Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>● **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶ | REPLACE D.P.F. EGR sensor. COMPLETE an EGR Monitor Repair Verification Drive Cycle. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

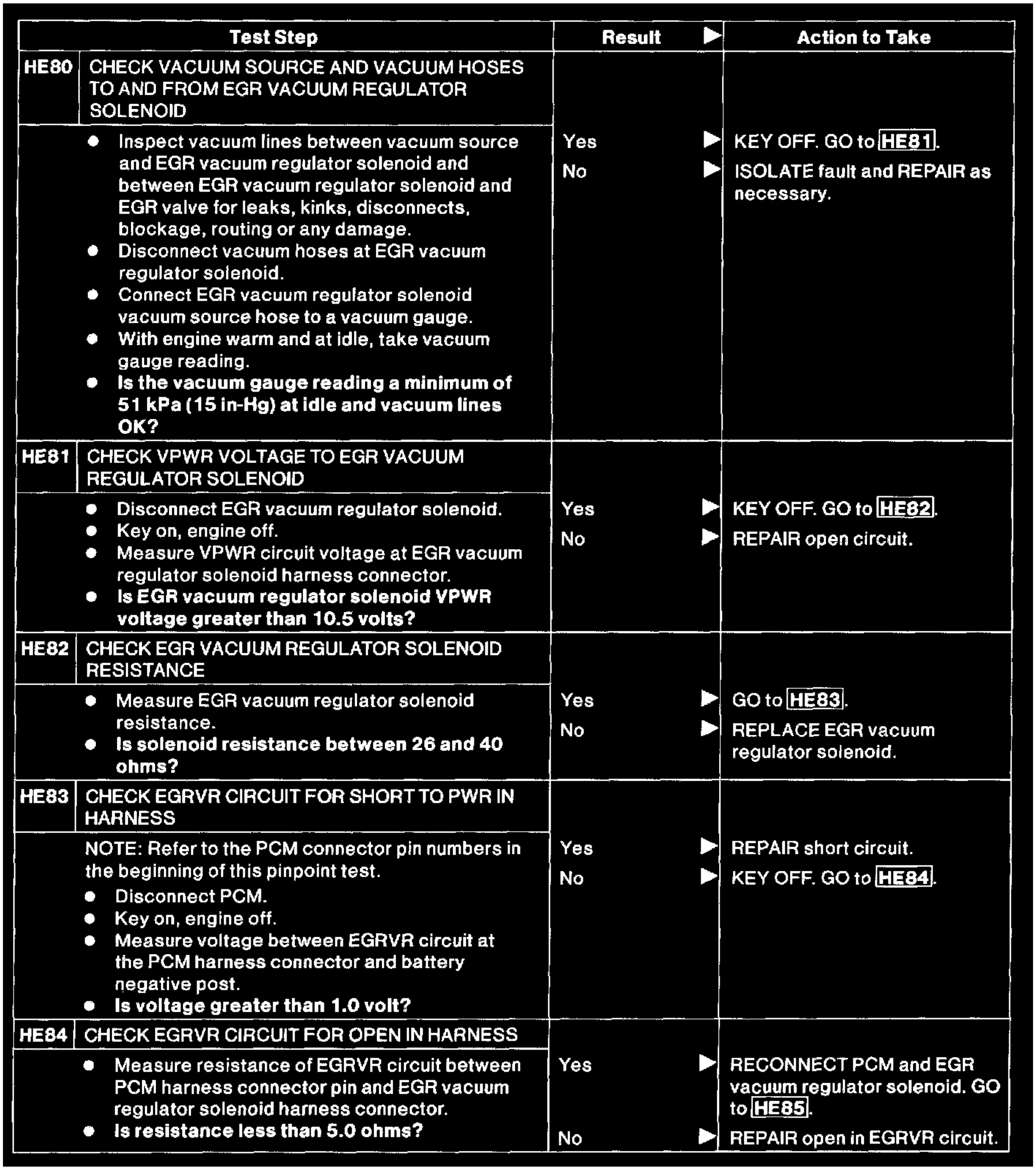
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE60** | DTC P1406: INSPECT DOWNSTREAM PRESSURE HOSE CONNECTIONS | | |
| | NOTE: If the fault is currently present, DTC P1408 will be output in Key On Engine Running (KOER) Self-Test.<br>● Inspect downstream hose at D.P.F. EGR sensor and orifice tube assembly for disconnect or poor connection.<br>● **Is hose OFF or poorly connected?**<br> | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to HE61. |
| **HE61** | INSPECT DOWNSTREAM PRESSURE HOSE FOR PLUGGING | | |
| | NOTE: It is essential that the D.P.F. EGR sensor pressure hose is the correct repair part and not a substitute.<br>● Visually inspect downstream pressure hose routing. Hose must not be pinched or have dips in it where water can settle or freeze.<br>● Remove downstream pressure hose and carefully inspect for plugging, water or leaks.<br>● **Is there a fault detected in the hose?** | Yes ▶<br>No ▶ | REPAIR or REPLACE as necessary.<br>GO to HE62. |
| **HE62** | CHECK ORIFICE TUBE ASSEMBLY AND D.P.F. EGR SENSOR | | |
| | ● Inspect the connections at the D.P.F. EGR sensor for plugging or damage.<br>● Inspect the intake manifold side pressure pickup tube and orifice tube assembly for plugging, loose connection or damage.<br>● **Is the D.P.F. EGR sensor or orifice tube assembly plugged, loose or damaged?** | Yes ▶<br>No ▶ | REPAIR or REPLACE D.P.F. EGR sensor or orifice tube assembly as necessary.<br>GO to HE63. |



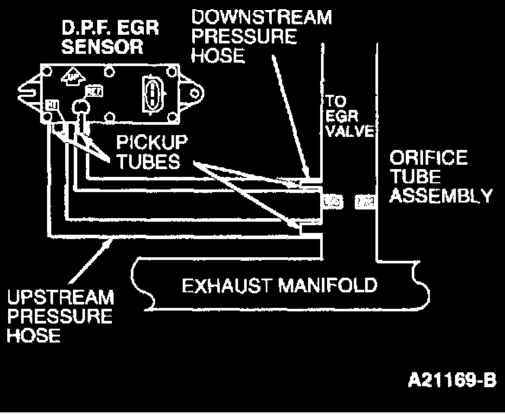
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE63** | CHECK EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | ● Disconnect pressure hoses at D.P.F. EGR sensor.<br>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube).<br>● Key on, engine off.<br>● Access DPFEGR PID and note PID value.<br>● Apply 27 to 30 kPa (8 to 9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.<br>● Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>● **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶ | REPLACE D.P.F. EGR sensor. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **HE70** | DTC P0401: RUN KOER SELF-TEST | | |
| | ● Run KOER Self-Test.<br>● **Is KOER DTC P1408 output?** | Yes ▶ | Fault is currently present. GO to HE71. |
| | | No ▶ | GO to HE90. |
| **HE71** | DTC P1408: RETRIEVE CONTINUOUS MEMORY DTCS | | |
| | NOTE: If any DTC other than DTC P1406 is output, record DTC and refer to Diagnostic Trouble Code Charts after completing this Pinpoint Test.<br>● Retrieve all Continuous Memory DTCs.<br>● **Is DTC P1406 output?** | Yes ▶ | GO to HE60. |
| | | No ▶ | GO to HE72. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE72** | RUN KOER SELF-TEST WHILE MONITORING EGR VACUUM | | |
| | ● Disconnect vacuum hose at EGR valve and connect hose to a vacuum gauge.<br>● NOTE: Since the EGR vacuum hose is disconnected, ignore DTCs during this KOER Self-Test.<br>Run Key On Engine Running (KOER) Self-Test while monitoring gauge. Approximately 30 seconds into test, EGR flow will be requested for a few seconds. The vacuum at this time should increase above 5.4 kPa (1.6 in-Hg) to open the valve.<br>● **Does the vacuum increase to 10 kPa (3.0 in-Hg) or greater at any time during KOER Self-Test?** | Yes ▶ | The vacuum indicated is sufficient to open the EGR valve. Fault is unlikely to be in EGR vacuum control system. KEY OFF. GO to HE73. |
| | | No ▶ | The vacuum indicated is insufficient to open the EGR valve. KEY OFF. GO to HE80. |
| **HE73** | INSPECT D.P.F. EGR SENSOR PRESSURE HOSES | | |
| | ● Visually inspect both pressure hoses for reversed connection at D.P.F. EGR sensor or at orifice tube assembly.<br>● Inspect both hoses for improper routing. Hoses should not be pinched or have dips where water could settle or freeze.<br>● Inspect both hoses for leaks and blockage.<br>● Inspect D.P.F. EGR sensor and orifice tube assembly for blockage or damage at the pickup tubes.<br>● **Is a fault detected?**<br> | Yes ▶ | REPAIR pressure hoses as necessary. |
| | | No ▶ | GO to HE74. |

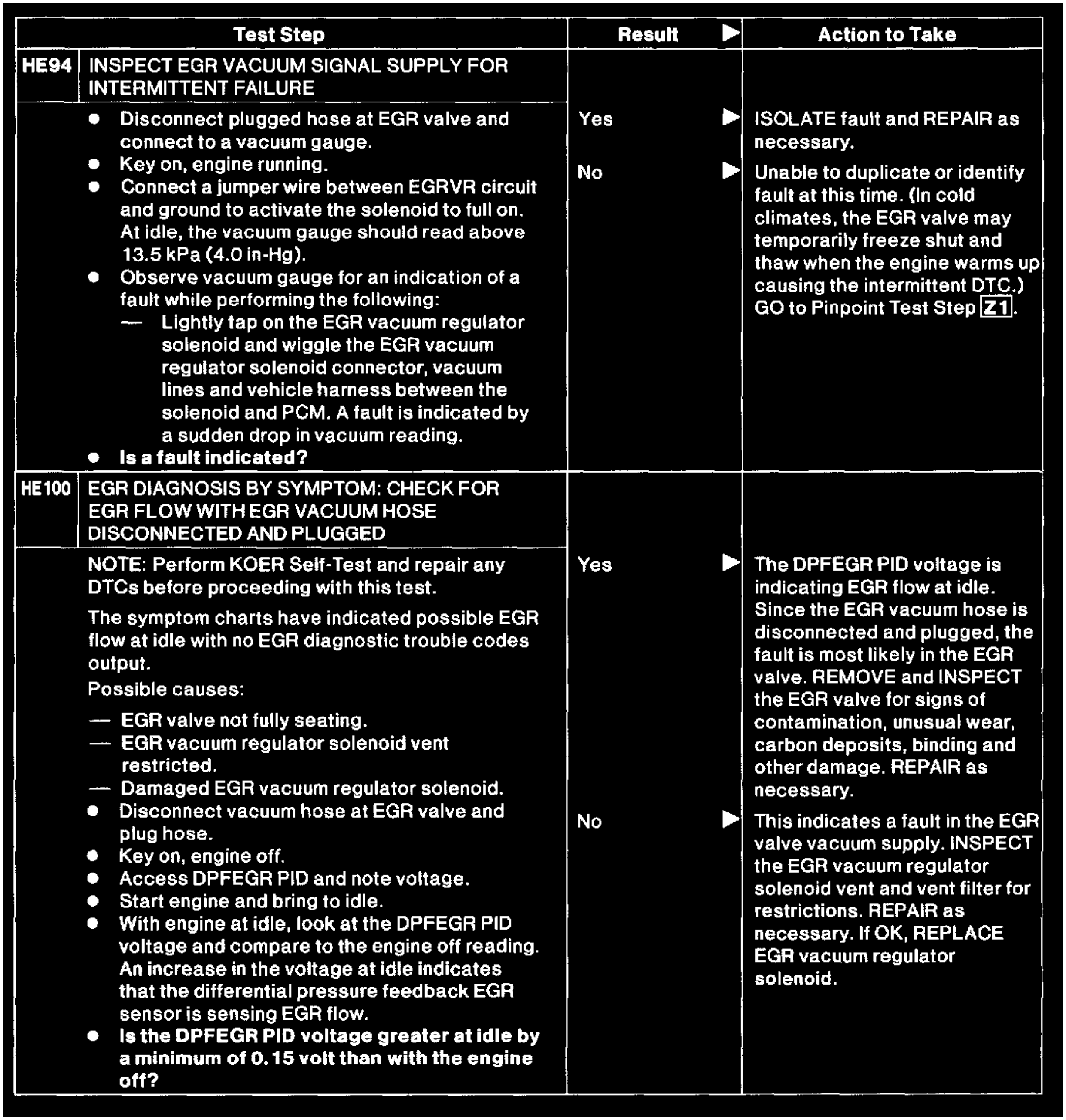
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE74** | CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | ● Disconnect pressure hoses at D.P.F. EGR sensor.<br>● Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube.)<br>● Key on, engine off.<br>● Access DPFEGR PID and note PID value.<br>● Apply 27-30 kPa (8-9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.<br>● Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>● **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶<br>No ▶ | REPLACE D.P.F. EGR sensor.<br>RECONNECT pressure hoses. GO to HE76. |
| **HE76** | CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP | | |
| | ● Disconnect vacuum hose at EGR valve and plug hose.<br>● Connect a hand vacuum pump to EGR valve.<br>● Start engine and bring to idle.<br>● Access DPFEGR and RPM PIDs.<br>● Slowly apply 27 to 34 kPa (8 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 1000 rpm.<br>● Look for the following:<br>— EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage.<br>— DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID must read 2.5 volts minimum with full vacuum applied.<br>— DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source can be leaking.<br>● **Does the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?** | Yes ▶<br>No ▶ | GO to HE85.<br>REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold or plugged orifice tube assembly. REPAIR as necessary. |



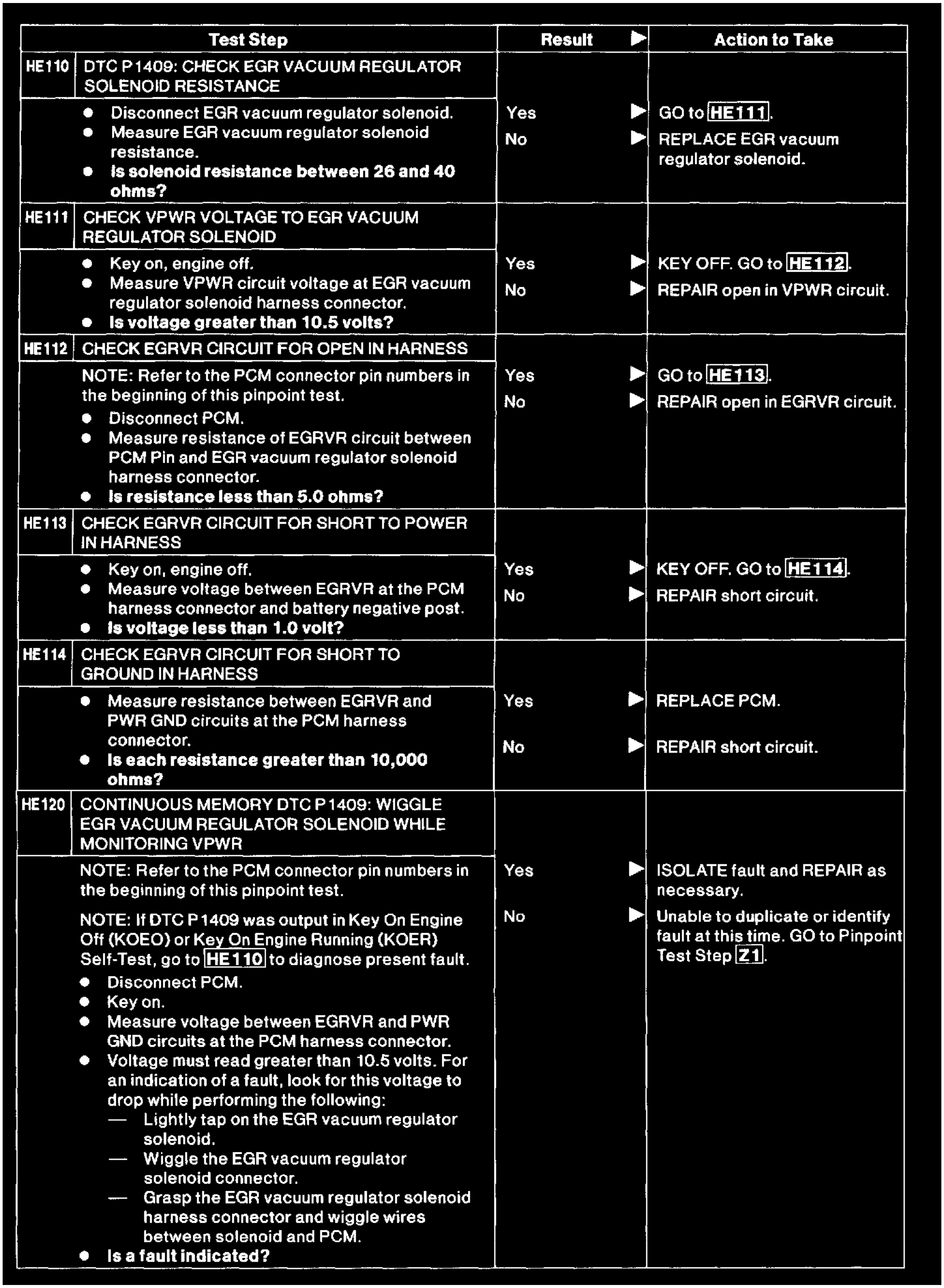
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE80** | CHECK VACUUM SOURCE AND VACUUM HOSES TO AND FROM EGR VACUUM REGULATOR SOLENOID | | |
| | ● Inspect vacuum lines between vacuum source and EGR vacuum regulator solenoid and between EGR vacuum regulator solenoid and EGR valve for leaks, kinks, disconnects, blockage, routing or any damage.<br>● Disconnect vacuum hoses at EGR vacuum regulator solenoid.<br>● Connect EGR vacuum regulator solenoid vacuum source hose to a vacuum gauge.<br>● With engine warm and at idle, take vacuum gauge reading.<br>● **Is the vacuum gauge reading a minimum of 51 kPa (15 in-Hg) at idle and vacuum lines OK?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE81.<br>ISOLATE fault and REPAIR as necessary. |
| **HE81** | CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID | | |
| | ● Disconnect EGR vacuum regulator solenoid.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector.<br>● **Is EGR vacuum regulator solenoid VPWR voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE82.<br>REPAIR open circuit. |
| **HE82** | CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE | | |
| | ● Measure EGR vacuum regulator solenoid resistance.<br>● **Is solenoid resistance between 26 and 40 ohms?** | Yes ▶<br>No ▶ | GO to HE83.<br>REPLACE EGR vacuum regulator solenoid. |
| **HE83** | CHECK EGRVR CIRCUIT FOR SHORT TO PWR IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between EGRVR circuit at the PCM harness connector and battery negative post.<br>● **Is voltage greater than 1.0 volt?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>KEY OFF. GO to HE84. |
| **HE84** | CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of EGRVR circuit between PCM harness connector pin and EGR vacuum regulator solenoid harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | RECONNECT PCM and EGR vacuum regulator solenoid. GO to HE85.<br>REPAIR open in EGRVR circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HE85** | CHECK EGR VACUUM REGULATOR SOLENOID VACUUM OUTPUT CAPABILITY BY GROUNDING EGRVR CIRCUIT | | |
| | ● Disconnect vacuum hose at the EGR valve and connect to a vacuum gauge.<br>● Key on, engine running.<br>● With engine at idle, jumper PCM EGRVR circuit to chassis ground.<br>● **Is vacuum gauge reading 13.5 kPa (4.0 in-Hg) or greater?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE EGR vacuum regulator solenoid. |
| **HE90** | INSPECT EGR SYSTEM FOR AN INTERMITTENT FAILURE | | |
| | ● Visually inspect the EGR system for signs of intermittent failure.<br>● **Is a fault found?** | Yes ▶<br>No ▶ | REPAIR fault as necessary.<br>GO to HE91. |
| **HE91** | INSPECT D.P.F. EGR SENSOR PRESSURE HOSES | | |
| | ● Visually inspect both pressure hoses for reversed connection at D.P.F. EGR sensor or at orifice tube assembly.<br>● Inspect both hoses for improper routing. Hoses should not be pinched or have dips where water could settle or freeze.<br>● Inspect both hoses for leaks and blockage.<br>● Inspect D.P.F. EGR sensor and orifice tube assembly for blockage or damage at the pickup tubes.<br>● **Is a fault detected?**<br> | Yes ▶<br>No ▶ | REPAIR pressure hoses as necessary.<br>GO to HE92. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HE92 | CHECK D.P.F. EGR SENSOR OUTPUT BY APPLYING VACUUM WITH HAND PUMP | | |
| | • Disconnect pressure hoses at D.P.F. EGR sensor.<br>• Connect a hand vacuum pump to the downstream connection at sensor (intake manifold side of sensor or the smaller diameter pickup tube.)<br>• Key on, engine off.<br>• Access DPFEGR PID and note PID value.<br>• Apply 27-30 kPa (8-9 in-Hg) vacuum to the D.P.F. EGR sensor and hold for a few seconds.<br>• Quickly release vacuum.<br>— The DPFEGR PID voltage must be between 0.2 and 1.3 volt with the key on and no vacuum applied.<br>— The DPFEGR PID voltage must increase to greater than 4.0 volts with the vacuum applied.<br>— The DPFEGR PID must drop to less than 1.5 volts in less than 3 seconds when vacuum is released.<br>• **Does the DPFEGR PID voltage indicate a fault in the D.P.F. EGR sensor?** | Yes ▶<br>No ▶ | REPLACE D.P.F. EGR sensor.<br>RECONNECT pressure hoses. GO to HE93. |
| HE93 | CHECK EGR VALVE FUNCTION BY APPLYING VACUUM WITH HAND PUMP | | |
| | • Disconnect vacuum hose at EGR valve and plug hose.<br>• Connect a hand vacuum pump to EGR valve.<br>• Start engine and bring to idle.<br>• Access DPFEGR and RPM PIDs.<br>• Slowly apply 17 to 34 kPa (5 to 10 in-Hg) of vacuum to the EGR valve and hold it for 10 seconds. If engine wants to stall, increase rpm with throttle to maintain a minimum of 800 rpm.<br>• Look for the following:<br>— EGR valve starts opening at about 5.4 kPa (1.6 in-Hg) vacuum indicated by increasing DPFEGR PID voltage.<br>— DPFEGR PID voltage increasing until EGR valve is fully open. DPFEGR PID should read 2.5 volts minimum with full vacuum applied.<br>— DPFEGR PID voltage steady when vacuum is held. If voltage drops within a few seconds, the EGR valve or vacuum source could be leaking.<br>• **Does the DPFEGR PID voltage indicate that the EGR valve is operating as described in this test?** | Yes ▶<br>No ▶ | GO to HE94.<br>REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding, leaking diaphragm and other damage. If EGR valve is OK, look for an obstructed EGR port in the intake manifold. REPAIR as necessary. |



| Test Step | | Result ▶ | | Action to Take |
|---|---|---|---|---|
| **HE94** | INSPECT EGR VACUUM SIGNAL SUPPLY FOR INTERMITTENT FAILURE | | | |
| | ● Disconnect plugged hose at EGR valve and connect to a vacuum gauge.<br>● Key on, engine running.<br>● Connect a jumper wire between EGRVR circuit and ground to activate the solenoid to full on. At idle, the vacuum gauge should read above 13.5 kPa (4.0 in-Hg).<br>● Observe vacuum gauge for an indication of a fault while performing the following:<br>— Lightly tap on the EGR vacuum regulator solenoid and wiggle the EGR vacuum regulator solenoid connector, vacuum lines and vehicle harness between the solenoid and PCM. A fault is indicated by a sudden drop in vacuum reading.<br>● **Is a fault indicated?** | Yes | ▶ | ISOLATE fault and REPAIR as necessary. |
| | | No | ▶ | Unable to duplicate or identify fault at this time. (In cold climates, the EGR valve may temporarily freeze shut and thaw when the engine warms up causing the intermittent DTC.) GO to Pinpoint Test Step Z1. |
| **HE100** | EGR DIAGNOSIS BY SYMPTOM: CHECK FOR EGR FLOW WITH EGR VACUUM HOSE DISCONNECTED AND PLUGGED | | | |
| | NOTE: Perform KOER Self-Test and repair any DTCs before proceeding with this test.<br>The symptom charts have indicated possible EGR flow at idle with no EGR diagnostic trouble codes output.<br>Possible causes:<br>— EGR valve not fully seating.<br>— EGR vacuum regulator solenoid vent restricted.<br>— Damaged EGR vacuum regulator solenoid.<br>● Disconnect vacuum hose at EGR valve and plug hose.<br>● Key on, engine off.<br>● Access DPFEGR PID and note voltage.<br>● Start engine and bring to idle.<br>● With engine at idle, look at the DPFEGR PID voltage and compare to the engine off reading. An increase in the voltage at idle indicates that the differential pressure feedback EGR sensor is sensing EGR flow.<br>● **Is the DPFEGR PID voltage greater at idle by a minimum of 0.15 volt than with the engine off?** | Yes | ▶ | The DPFEGR PID voltage is indicating EGR flow at idle. Since the EGR vacuum hose is disconnected and plugged, the fault is most likely in the EGR valve. REMOVE and INSPECT the EGR valve for signs of contamination, unusual wear, carbon deposits, binding and other damage. REPAIR as necessary. |
| | | No | ▶ | This indicates a fault in the EGR valve vacuum supply. INSPECT the EGR vacuum regulator solenoid vent and vent filter for restrictions. REPAIR as necessary. If OK, REPLACE EGR vacuum regulator solenoid. |

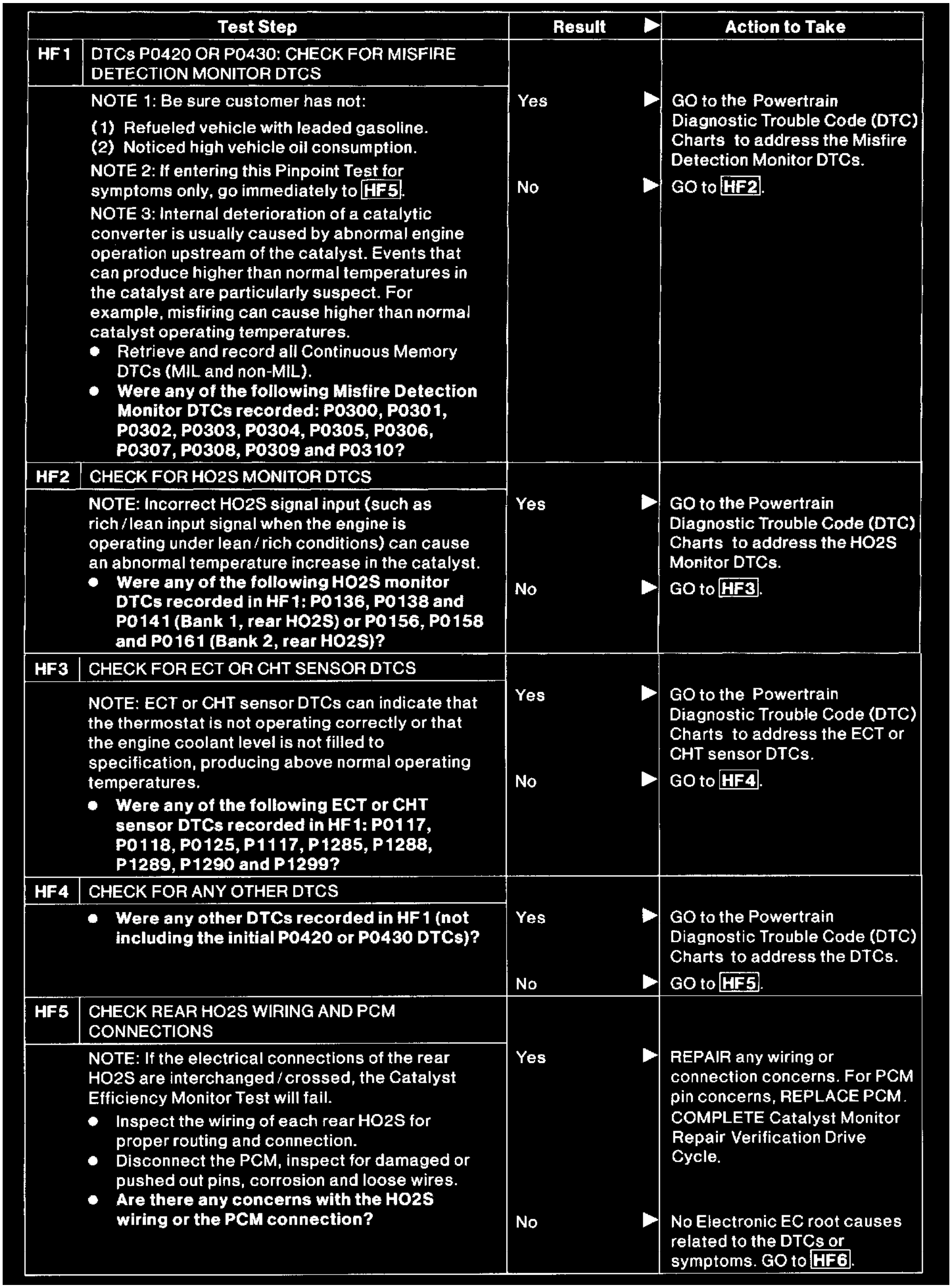


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HE110 | DTC P1409: CHECK EGR VACUUM REGULATOR SOLENOID RESISTANCE | | |
| | ● Disconnect EGR vacuum regulator solenoid.<br>● Measure EGR vacuum regulator solenoid resistance.<br>● **Is solenoid resistance between 26 and 40 ohms?** | Yes ▶<br>No ▶ | GO to HE111.<br>REPLACE EGR vacuum regulator solenoid. |
| HE111 | CHECK VPWR VOLTAGE TO EGR VACUUM REGULATOR SOLENOID | | |
| | ● Key on, engine off.<br>● Measure VPWR circuit voltage at EGR vacuum regulator solenoid harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE112.<br>REPAIR open in VPWR circuit. |
| HE112 | CHECK EGRVR CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of EGRVR circuit between PCM Pin and EGR vacuum regulator solenoid harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to HE113.<br>REPAIR open in EGRVR circuit. |
| HE113 | CHECK EGRVR CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure voltage between EGRVR at the PCM harness connector and battery negative post.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to HE114.<br>REPAIR short circuit. |
| HE114 | CHECK EGRVR CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Measure resistance between EGRVR and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| HE120 | CONTINUOUS MEMORY DTC P1409: WIGGLE EGR VACUUM REGULATOR SOLENOID WHILE MONITORING VPWR | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>NOTE: If DTC P1409 was output in Key On Engine Off (KOEO) or Key On Engine Running (KOER) Self-Test, go to HE110 to diagnose present fault.<br>● Disconnect PCM.<br>● Key on.<br>● Measure voltage between EGRVR and PWR GND circuits at the PCM harness connector.<br>● Voltage must read greater than 10.5 volts. For an indication of a fault, look for this voltage to drop while performing the following:<br>— Lightly tap on the EGR vacuum regulator solenoid.<br>— Wiggle the EGR vacuum regulator solenoid connector.<br>— Grasp the EGR vacuum regulator solenoid harness connector and wiggle wires between solenoid and PCM.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

# Test Notes

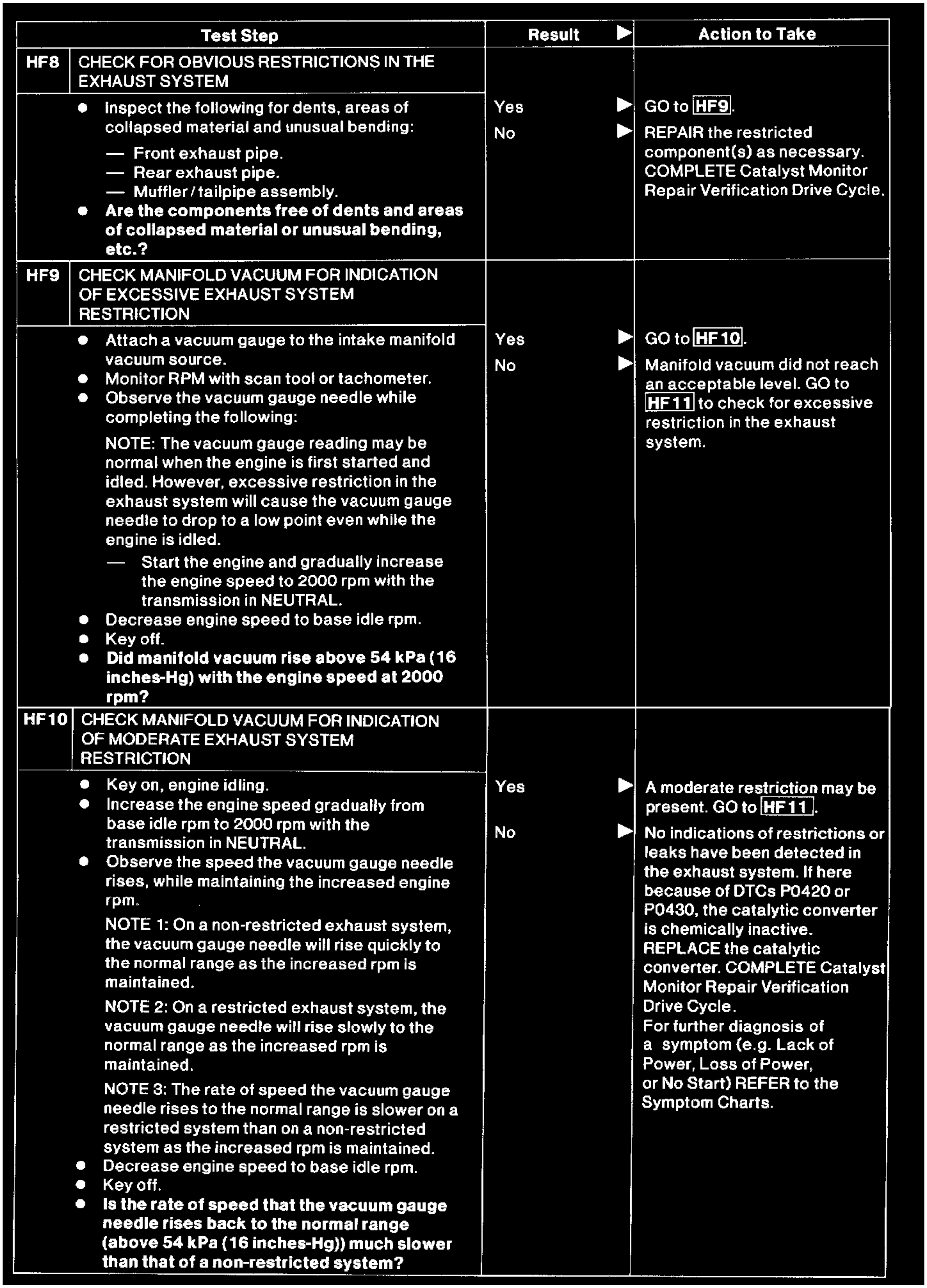
This Pinpoint Test is intended to diagnose the following:

- Exhaust system pipes (front and rear)
- Exhaust system muffler and tailpipe assembly
- Catalytic converter
- Exhaust manifold
- Harness circuits: Downstream Heated Oxygen Sensors **(HO2S)**

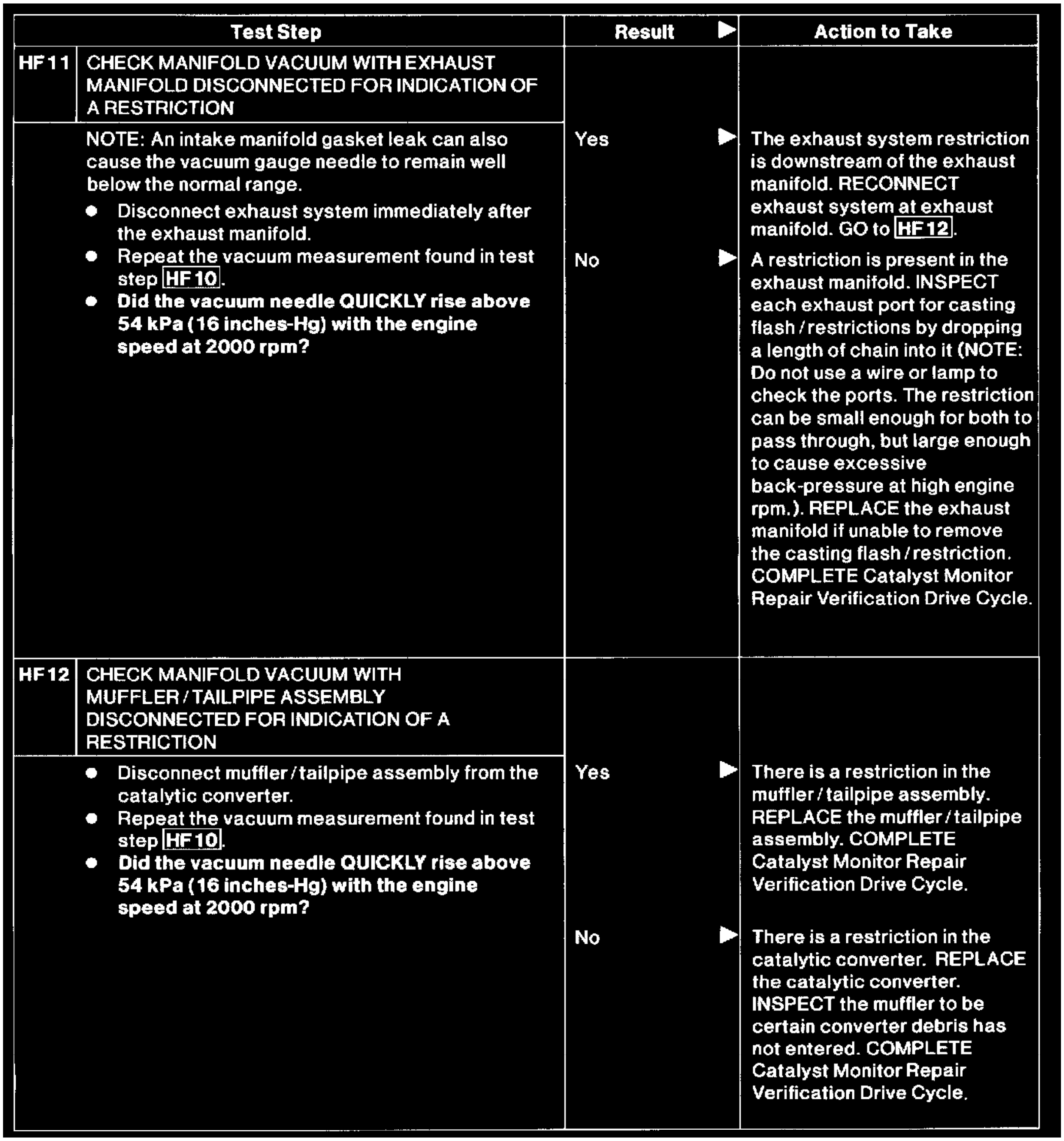


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HF1 | DTCs P0420 OR P0430: CHECK FOR MISFIRE DETECTION MONITOR DTCS | | |
| | NOTE 1: Be sure customer has not:<br>(1) Refueled vehicle with leaded gasoline.<br>(2) Noticed high vehicle oil consumption.<br>NOTE 2: If entering this Pinpoint Test for symptoms only, go immediately to HF5.<br>NOTE 3: Internal deterioration of a catalytic converter is usually caused by abnormal engine operation upstream of the catalyst. Events that can produce higher than normal temperatures in the catalyst are particularly suspect. For example, misfiring can cause higher than normal catalyst operating temperatures.<br>● Retrieve and record all Continuous Memory DTCs (MIL and non-MIL).<br>● **Were any of the following Misfire Detection Monitor DTCs recorded: P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0309 and P0310?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts to address the Misfire Detection Monitor DTCs. |
| | | No ▶ | GO to HF2. |
| HF2 | CHECK FOR HO2S MONITOR DTCS | | |
| | NOTE: Incorrect HO2S signal input (such as rich / lean input signal when the engine is operating under lean / rich conditions) can cause an abnormal temperature increase in the catalyst.<br>● **Were any of the following HO2S monitor DTCs recorded in HF1: P0136, P0138 and P0141 (Bank 1, rear HO2S) or P0156, P0158 and P0161 (Bank 2, rear HO2S)?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts to address the HO2S Monitor DTCs. |
| | | No ▶ | GO to HF3. |
| HF3 | CHECK FOR ECT OR CHT SENSOR DTCS | | |
| | NOTE: ECT or CHT sensor DTCs can indicate that the thermostat is not operating correctly or that the engine coolant level is not filled to specification, producing above normal operating temperatures.<br>● **Were any of the following ECT or CHT sensor DTCs recorded in HF1: P0117, P0118, P0125, P1117, P1285, P1288, P1289, P1290 and P1299?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts to address the ECT or CHT sensor DTCs. |
| | | No ▶ | GO to HF4. |
| HF4 | CHECK FOR ANY OTHER DTCS | | |
| | ● **Were any other DTCs recorded in HF1 (not including the initial P0420 or P0430 DTCs)?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts to address the DTCs. |
| | | No ▶ | GO to HF5. |
| HF5 | CHECK REAR HO2S WIRING AND PCM CONNECTIONS | | |
| | NOTE: If the electrical connections of the rear HO2S are interchanged / crossed, the Catalyst Efficiency Monitor Test will fail.<br>● Inspect the wiring of each rear HO2S for proper routing and connection.<br>● Disconnect the PCM, inspect for damaged or pushed out pins, corrosion and loose wires.<br>● **Are there any concerns with the HO2S wiring or the PCM connection?** | Yes ▶ | REPAIR any wiring or connection concerns. For PCM pin concerns, REPLACE PCM. COMPLETE Catalyst Monitor Repair Verification Drive Cycle. |
| | | No ▶ | No Electronic EC root causes related to the DTCs or symptoms. GO to HF6. |

<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td>HF6</td><td>CHECK FUEL PRESSURE</td><td rowspan="2">Yes ▶<br>No ▶</td><td rowspan="2">Fuel pressure is OK. REMOVE the fuel pressure gauge. GO to HF7.<br>Fuel pressure is out of specification.<br>GO to Pinpoint Test HC1 Fuel Delivery Systems, for diagnosis.</td></tr>
<tr><td></td><td>
<p><b>WARNING: THE FUEL SYSTEM WILL REMAIN PRESSURIZED WHEN THE ENGINE IS NOT RUNNING. TO PREVENT INJURY OR FIRE, USE CAUTION WHEN WORKING ON THE FUEL SYSTEM.</b></p>
<p>NOTE: Fuel pressures above specification can produce an abnormally rich air / fuel mixture. The rich air / fuel mixture can cause higher than normal catalyst operating temperatures.</p>
<ul>
<li>If applicable, inspect the vacuum hose going to the fuel pressure regulator for proper installation and cracks. Repair as necessary.</li>
<li>Install fuel pressure gauge.</li>
<li>If applicable, verify vacuum source to fuel pressure regulator.</li>
<li>Start and run the engine at idle. Record the fuel pressure.</li>
<li>Increase engine speed to 2500 rpm and maintain for one minute. Record the fuel pressure.</li>
<li>Key off.</li>
</ul>
<p><b>FUEL PRESSURE CHART</b></p>
<table>
<tr><th>Vehicle</th><th>kPa</th><th>Psi</th></tr>
<tr><td>Contour / Mystique, Cougar (2.5L)</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Continental</td><td>310-415</td><td>45-60</td></tr>
<tr><td>Escort / Tracer, Mustang, LS6 / LS8</td><td>240-380</td><td>35-55</td></tr>
<tr><td>Ranger</td><td>386-496</td><td>56-72</td></tr>
<tr><td>Ranger (Flex Fuel)</td><td>380-517</td><td>55-75</td></tr>
<tr><td>All Others</td><td>207-310</td><td>30-45</td></tr>
</table>
<ul>
<li><b>Was the fuel pressure within specifications listed in the chart above?</b></li>
</ul>
</td></tr>
<tr><td>HF7</td><td>CHECK FOR OBVIOUS LEAK SOURCES IN THE EXHAUST SYSTEM</td><td rowspan="2">Yes ▶<br>No ▶</td><td rowspan="2">GO to HF8.<br>REPAIR the leak source(s). COMPLETE Catalyst Monitor Repair Verification Drive Cycle.</td></tr>
<tr><td></td><td>
<p>NOTE: If a catalyst is in series with a leaking exhaust system, it can fail the Catalyst Efficiency Monitor test.</p>
<ul>
<li>Inspect the following for leaks, cracks, loose connections or punctures:
<ul>
<li>— Exhaust manifold.</li>
<li>— Front exhaust pipe.</li>
<li>— Rear exhaust pipe.</li>
<li>— Muffler / tailpipe assembly.</li>
</ul></li>
<li><b>Are the above components free of cracks and punctures,etc.?</b></li>
</ul>
</td></tr>
</table>



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HF8 | CHECK FOR OBVIOUS RESTRICTIONS IN THE EXHAUST SYSTEM | | |
| | • Inspect the following for dents, areas of collapsed material and unusual bending:<br>— Front exhaust pipe.<br>— Rear exhaust pipe.<br>— Muffler/tailpipe assembly.<br>• **Are the components free of dents and areas of collapsed material or unusual bending, etc.?** | Yes ▶ | GO to HF9. |
| | | No ▶ | REPAIR the restricted component(s) as necessary. COMPLETE Catalyst Monitor Repair Verification Drive Cycle. |
| HF9 | CHECK MANIFOLD VACUUM FOR INDICATION OF EXCESSIVE EXHAUST SYSTEM RESTRICTION | | |
| | • Attach a vacuum gauge to the intake manifold vacuum source.<br>• Monitor RPM with scan tool or tachometer.<br>• Observe the vacuum gauge needle while completing the following:<br>NOTE: The vacuum gauge reading may be normal when the engine is first started and idled. However, excessive restriction in the exhaust system will cause the vacuum gauge needle to drop to a low point even while the engine is idled.<br>— Start the engine and gradually increase the engine speed to 2000 rpm with the transmission in NEUTRAL.<br>• Decrease engine speed to base idle rpm.<br>• Key off.<br>• **Did manifold vacuum rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?** | Yes ▶ | GO to HF10. |
| | | No ▶ | Manifold vacuum did not reach an acceptable level. GO to HF11 to check for excessive restriction in the exhaust system. |
| HF10 | CHECK MANIFOLD VACUUM FOR INDICATION OF MODERATE EXHAUST SYSTEM RESTRICTION | | |
| | • Key on, engine idling.<br>• Increase the engine speed gradually from base idle rpm to 2000 rpm with the transmission in NEUTRAL.<br>• Observe the speed the vacuum gauge needle rises, while maintaining the increased engine rpm.<br>NOTE 1: On a non-restricted exhaust system, the vacuum gauge needle will rise quickly to the normal range as the increased rpm is maintained.<br>NOTE 2: On a restricted exhaust system, the vacuum gauge needle will rise slowly to the normal range as the increased rpm is maintained.<br>NOTE 3: The rate of speed the vacuum gauge needle rises to the normal range is slower on a restricted system than on a non-restricted system as the increased rpm is maintained.<br>• Decrease engine speed to base idle rpm.<br>• Key off.<br>• **Is the rate of speed that the vacuum gauge needle rises back to the normal range (above 54 kPa (16 inches-Hg)) much slower than that of a non-restricted system?** | Yes ▶ | A moderate restriction may be present. GO to HF11. |
| | | No ▶ | No indications of restrictions or leaks have been detected in the exhaust system. If here because of DTCs P0420 or P0430, the catalytic converter is chemically inactive. REPLACE the catalytic converter. COMPLETE Catalyst Monitor Repair Verification Drive Cycle.<br>For further diagnosis of a symptom (e.g. Lack of Power, Loss of Power, or No Start) REFER to the Symptom Charts. |

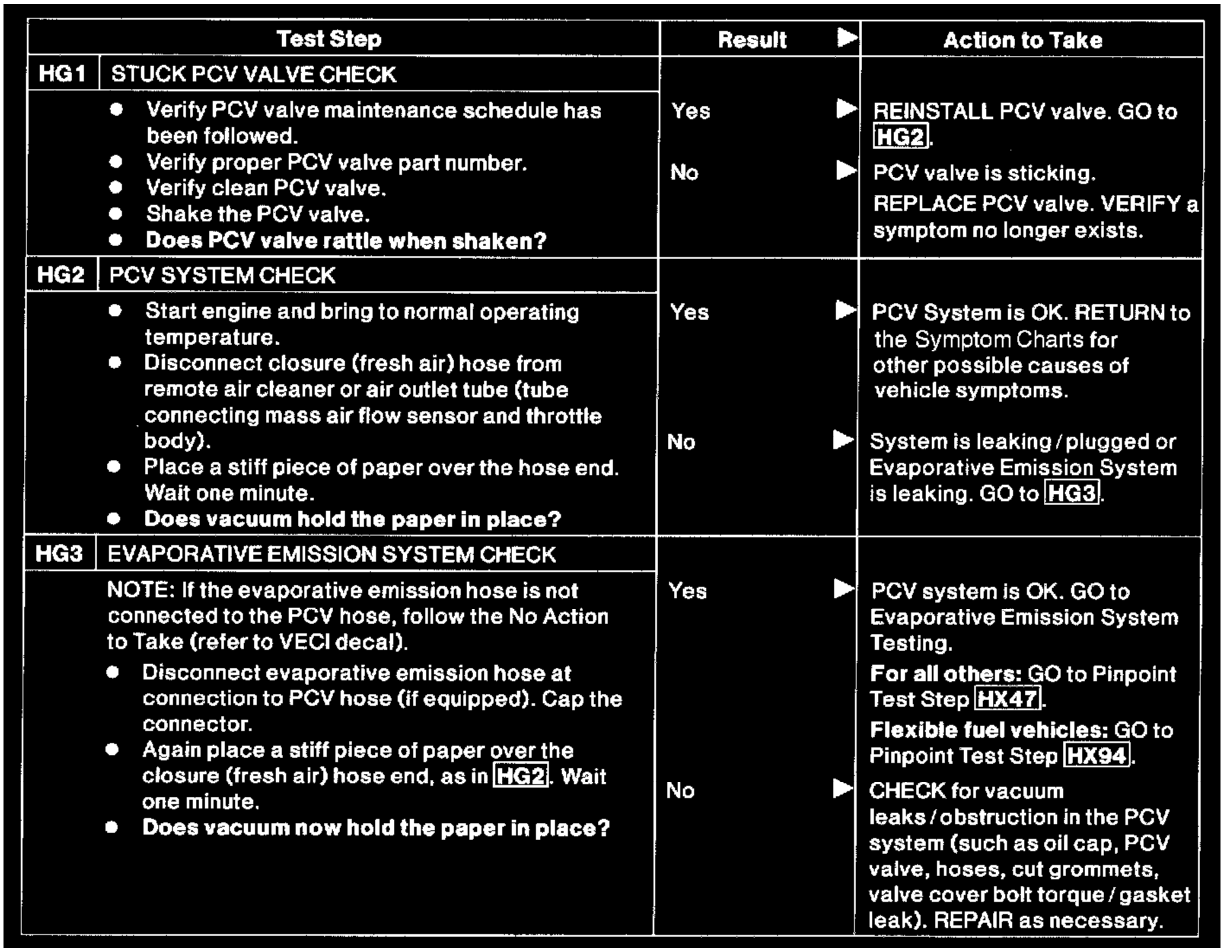


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HF11** | CHECK MANIFOLD VACUUM WITH EXHAUST MANIFOLD DISCONNECTED FOR INDICATION OF A RESTRICTION | | |
| | NOTE: An intake manifold gasket leak can also cause the vacuum gauge needle to remain well below the normal range.<br>● Disconnect exhaust system immediately after the exhaust manifold.<br>● Repeat the vacuum measurement found in test step HF10.<br>● **Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?** | Yes ▶ | The exhaust system restriction is downstream of the exhaust manifold. RECONNECT exhaust system at exhaust manifold. GO to HF12. |
| | | No ▶ | A restriction is present in the exhaust manifold. INSPECT each exhaust port for casting flash / restrictions by dropping a length of chain into it (NOTE: Do not use a wire or lamp to check the ports. The restriction can be small enough for both to pass through, but large enough to cause excessive back-pressure at high engine rpm.). REPLACE the exhaust manifold if unable to remove the casting flash / restriction. COMPLETE Catalyst Monitor Repair Verification Drive Cycle. |
| **HF12** | CHECK MANIFOLD VACUUM WITH MUFFLER / TAILPIPE ASSEMBLY DISCONNECTED FOR INDICATION OF A RESTRICTION | | |
| | ● Disconnect muffler / tailpipe assembly from the catalytic converter.<br>● Repeat the vacuum measurement found in test step HF10.<br>● **Did the vacuum needle QUICKLY rise above 54 kPa (16 inches-Hg) with the engine speed at 2000 rpm?** | Yes ▶ | There is a restriction in the muffler / tailpipe assembly. REPLACE the muffler / tailpipe assembly. COMPLETE Catalyst Monitor Repair Verification Drive Cycle. |
| | | No ▶ | There is a restriction in the catalytic converter. REPLACE the catalytic converter. INSPECT the muffler to be certain converter debris has not entered. COMPLETE Catalyst Monitor Repair Verification Drive Cycle. |

## Test Notes

This Pinpoint Test is intended to diagnose only the following:

- Positive Crankcase Ventilation **(PCV)** valve and related vacuum lines.



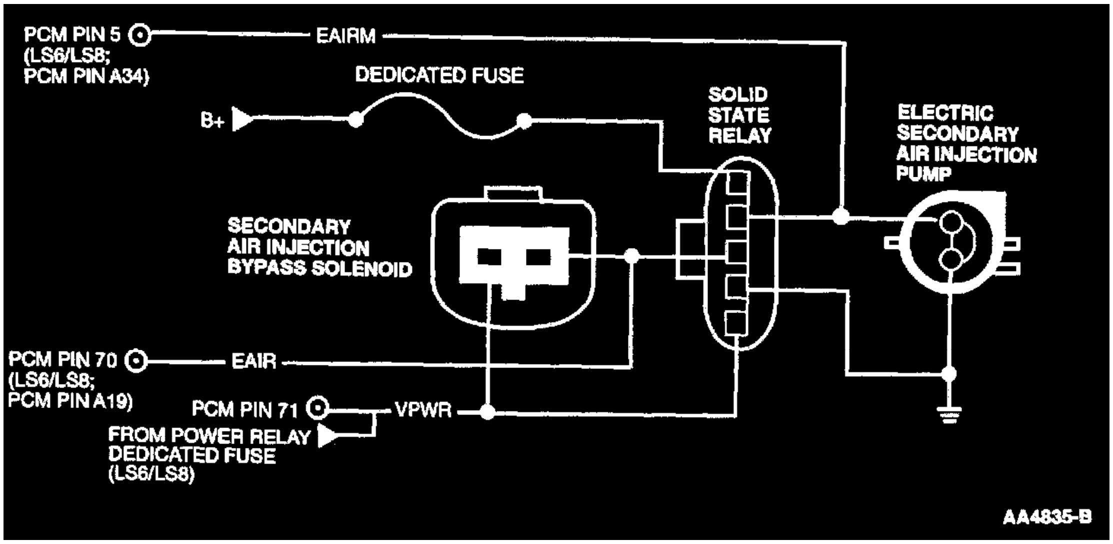
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HG1** | STUCK PCV VALVE CHECK | | |
| | ● Verify PCV valve maintenance schedule has been followed.<br>● Verify proper PCV valve part number.<br>● Verify clean PCV valve.<br>● Shake the PCV valve.<br>● **Does PCV valve rattle when shaken?** | Yes ▶ | REINSTALL PCV valve. GO to HG2. |
| | | No ▶ | PCV valve is sticking.<br>REPLACE PCV valve. VERIFY a symptom no longer exists. |
| **HG2** | PCV SYSTEM CHECK | | |
| | ● Start engine and bring to normal operating temperature.<br>● Disconnect closure (fresh air) hose from remote air cleaner or air outlet tube (tube connecting mass air flow sensor and throttle body).<br>● Place a stiff piece of paper over the hose end. Wait one minute.<br>● **Does vacuum hold the paper in place?** | Yes ▶ | PCV System is OK. RETURN to the Symptom Charts for other possible causes of vehicle symptoms. |
| | | No ▶ | System is leaking / plugged or Evaporative Emission System is leaking. GO to HG3. |
| **HG3** | EVAPORATIVE EMISSION SYSTEM CHECK | | |
| | NOTE: If the evaporative emission hose is not connected to the PCV hose, follow the No Action to Take (refer to VECI decal).<br>● Disconnect evaporative emission hose at connection to PCV hose (if equipped). Cap the connector.<br>● Again place a stiff piece of paper over the closure (fresh air) hose end, as in HG2. Wait one minute.<br>● **Does vacuum now hold the paper in place?** | Yes ▶ | PCV system is OK. GO to Evaporative Emission System Testing.<br>**For all others:** GO to Pinpoint Test Step HX47.<br>**Flexible fuel vehicles:** GO to Pinpoint Test Step HX94. |
| | | No ▶ | CHECK for vacuum leaks / obstruction in the PCV system (such as oil cap, PCV valve, hoses, cut grommets, valve cover bolt torque / gasket leak). REPAIR as necessary. |

## Test Notes

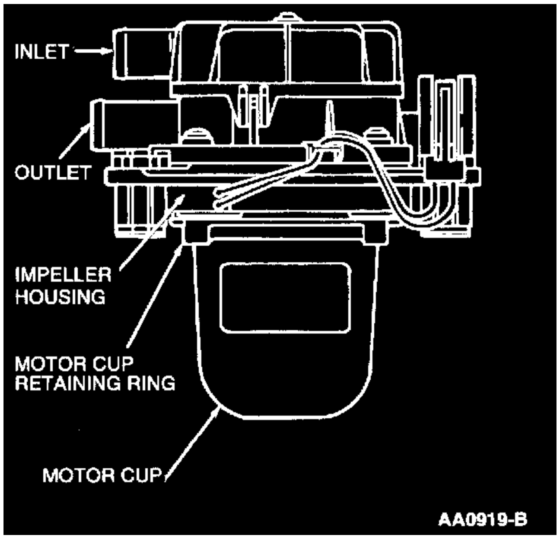
This Pinpoint Test is intended to diagnose the following:

- Harness circuits: B+, EAIR, EAIR Monitor, Ground, AIRB, AIRD
- Solid State Relay **(SSR)**
- Electric secondary air injection (AIR) pump
- Secondary air injection bypass solenoid
- Powertrain Control Module **(PCM)**
- Secondary air injection diverter solenoid
- Secondary air injection diverter valve
- Vacuum supply
- Air silencer
- Secondary air injection check valve

## Pinpoint Test Schematics

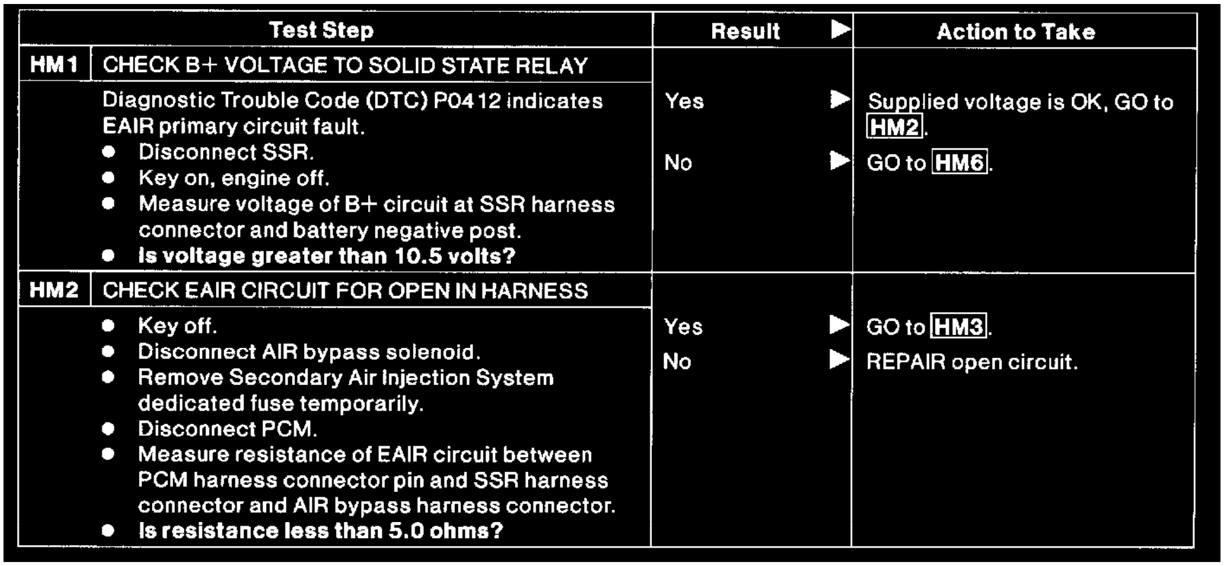


System Schematic

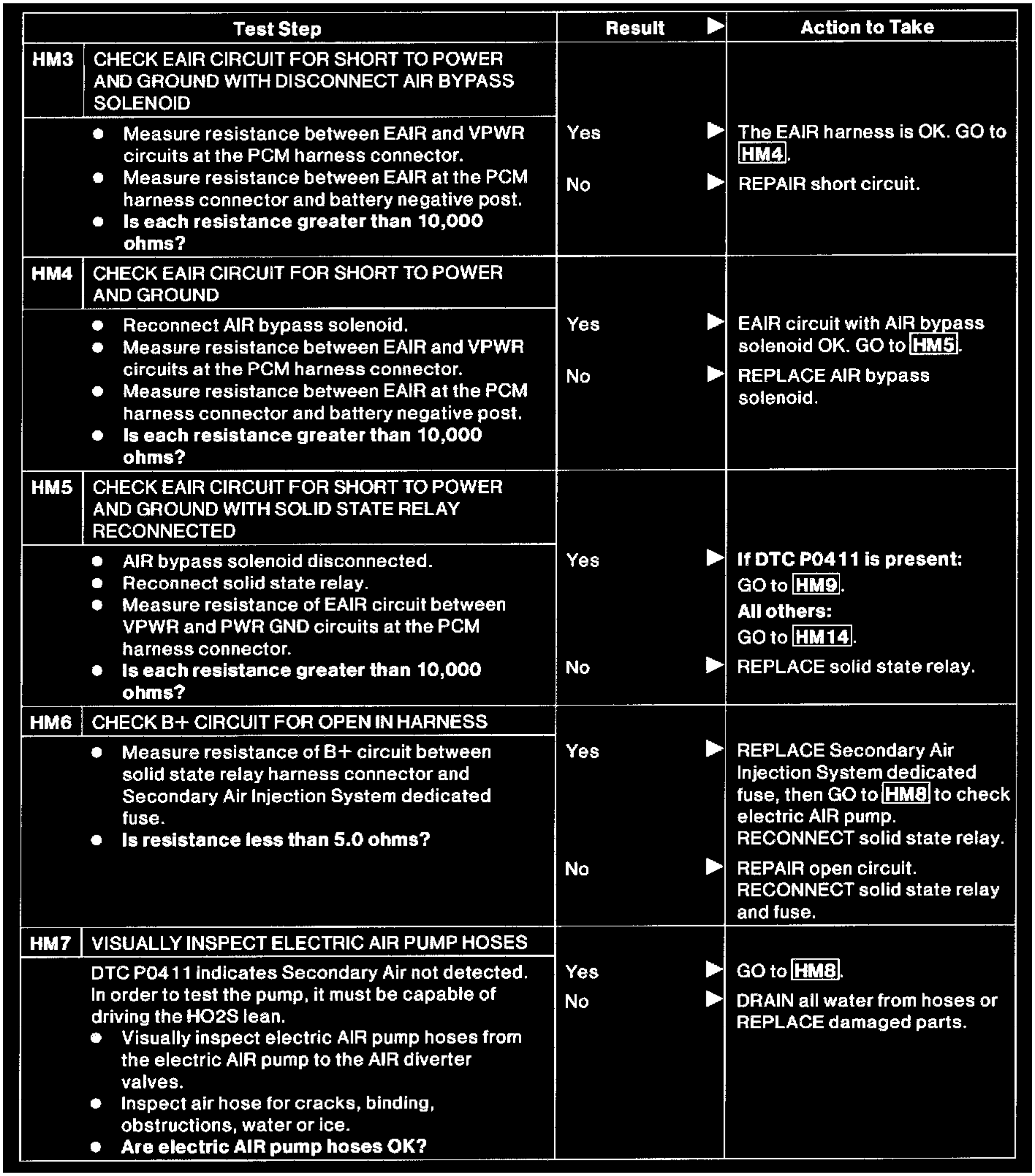


Electric AIR Pump

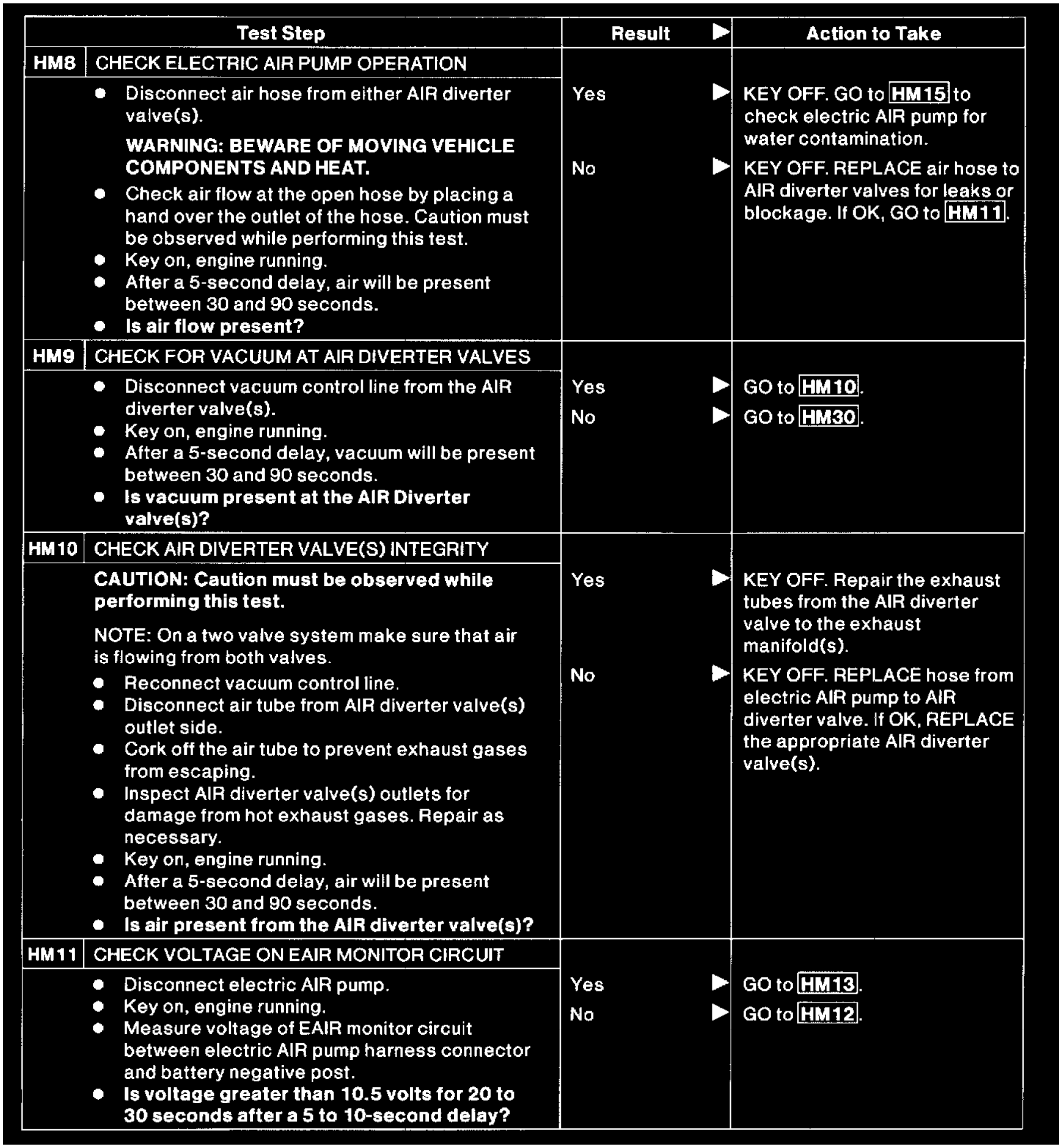
**NOTE:** Not all applications are equipped with both AIR Bypass or AIR Diverter solenoids.



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HM1** | CHECK B+ VOLTAGE TO SOLID STATE RELAY | | |
| | Diagnostic Trouble Code (DTC) P0412 indicates EAIR primary circuit fault.<br>● Disconnect SSR.<br>● Key on, engine off.<br>● Measure voltage of B+ circuit at SSR harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | Supplied voltage is OK, GO to HM2. |
| | | No ▶ | GO to HM6. |
| **HM2** | CHECK EAIR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Key off.<br>● Disconnect AIR bypass solenoid.<br>● Remove Secondary Air Injection System dedicated fuse temporarily.<br>● Disconnect PCM.<br>● Measure resistance of EAIR circuit between PCM harness connector pin and SSR harness connector and AIR bypass harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to HM3. |
| | | No ▶ | REPAIR open circuit. |

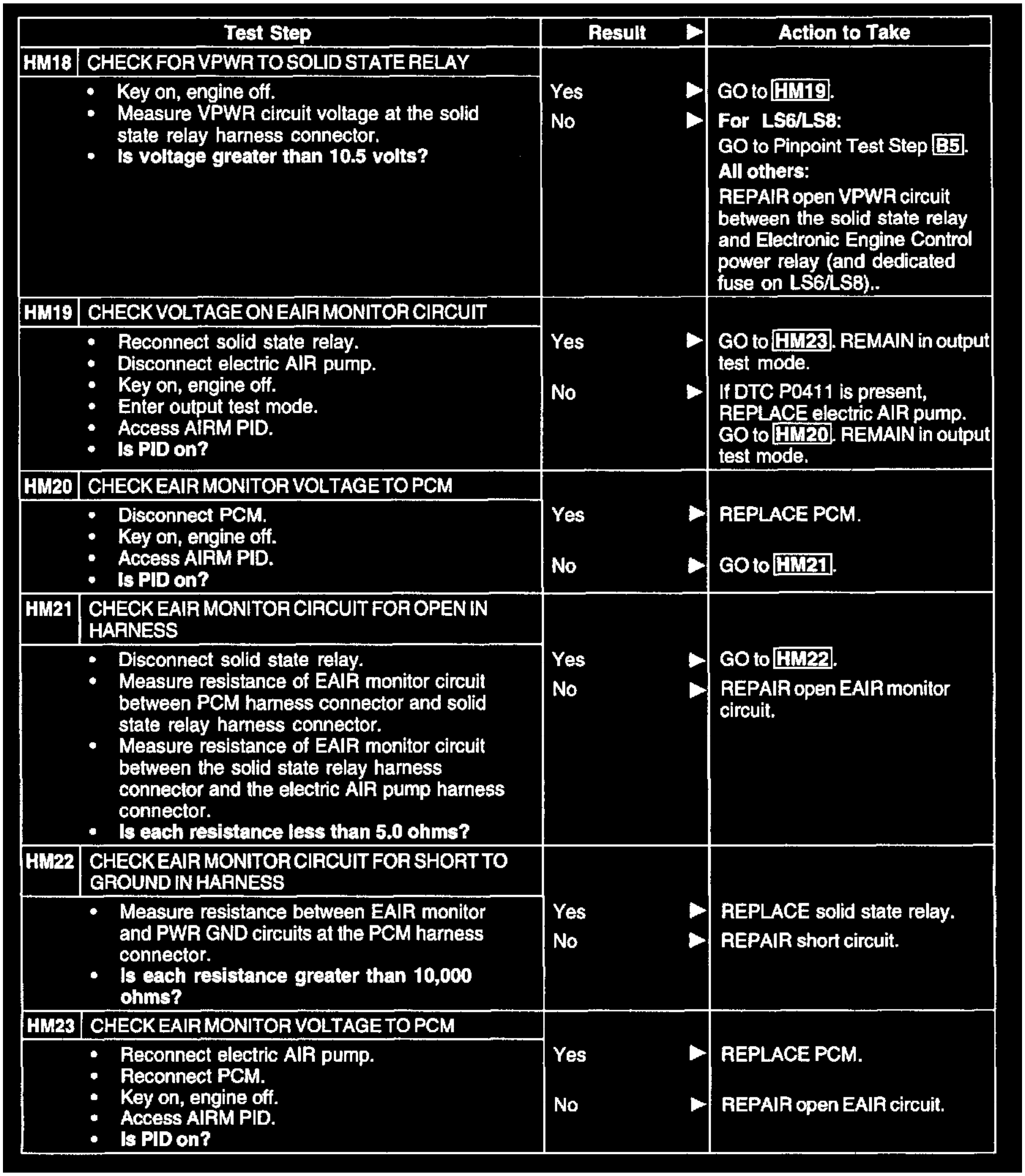


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HM3** | CHECK EAIR CIRCUIT FOR SHORT TO POWER AND GROUND WITH DISCONNECT AIR BYPASS SOLENOID | | |
| | ● Measure resistance between EAIR and VPWR circuits at the PCM harness connector.<br>● Measure resistance between EAIR at the PCM harness connector and battery negative post.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | The EAIR harness is OK. GO to HM4.<br>REPAIR short circuit. |
| **HM4** | CHECK EAIR CIRCUIT FOR SHORT TO POWER AND GROUND | | |
| | ● Reconnect AIR bypass solenoid.<br>● Measure resistance between EAIR and VPWR circuits at the PCM harness connector.<br>● Measure resistance between EAIR at the PCM harness connector and battery negative post.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | EAIR circuit with AIR bypass solenoid OK. GO to HM5.<br>REPLACE AIR bypass solenoid. |
| **HM5** | CHECK EAIR CIRCUIT FOR SHORT TO POWER AND GROUND WITH SOLID STATE RELAY RECONNECTED | | |
| | ● AIR bypass solenoid disconnected.<br>● Reconnect solid state relay.<br>● Measure resistance of EAIR circuit between VPWR and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | **If DTC P0411 is present:** GO to HM9.<br>**All others:** GO to HM14.<br>REPLACE solid state relay. |
| **HM6** | CHECK B+ CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of B+ circuit between solid state relay harness connector and Secondary Air Injection System dedicated fuse.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE Secondary Air Injection System dedicated fuse, then GO to HM8 to check electric AIR pump. RECONNECT solid state relay.<br>REPAIR open circuit. RECONNECT solid state relay and fuse. |
| **HM7** | VISUALLY INSPECT ELECTRIC AIR PUMP HOSES | | |
| | DTC P0411 indicates Secondary Air not detected. In order to test the pump, it must be capable of driving the HO2S lean.<br>● Visually inspect electric AIR pump hoses from the electric AIR pump to the AIR diverter valves.<br>● Inspect air hose for cracks, binding, obstructions, water or ice.<br>● **Are electric AIR pump hoses OK?** | Yes ▶<br>No ▶ | GO to HM8.<br>DRAIN all water from hoses or REPLACE damaged parts. |

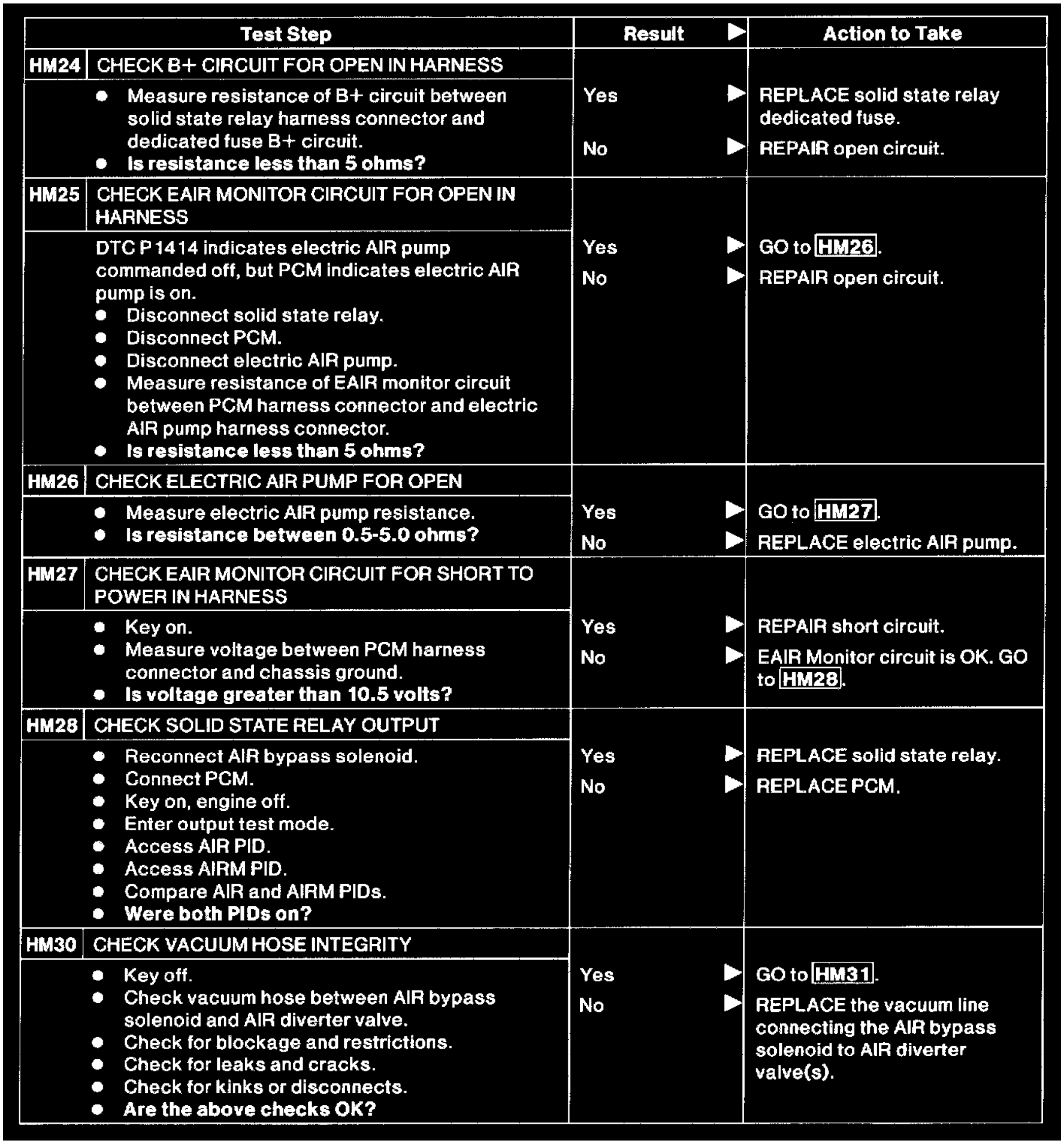


| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HM8** CHECK ELECTRIC AIR PUMP OPERATION | | |
| ● Disconnect air hose from either AIR diverter valve(s).<br>**WARNING: BEWARE OF MOVING VEHICLE COMPONENTS AND HEAT.**<br>● Check air flow at the open hose by placing a hand over the outlet of the hose. Caution must be observed while performing this test.<br>● Key on, engine running.<br>● After a 5-second delay, air will be present between 30 and 90 seconds.<br>● **Is air flow present?** | Yes ▶ | KEY OFF. GO to HM15 to check electric AIR pump for water contamination. |
| | No ▶ | KEY OFF. REPLACE air hose to AIR diverter valves for leaks or blockage. If OK, GO to HM11. |
| **HM9** CHECK FOR VACUUM AT AIR DIVERTER VALVES | | |
| ● Disconnect vacuum control line from the AIR diverter valve(s).<br>● Key on, engine running.<br>● After a 5-second delay, vacuum will be present between 30 and 90 seconds.<br>● **Is vacuum present at the AIR Diverter valve(s)?** | Yes ▶ | GO to HM10. |
| | No ▶ | GO to HM30. |
| **HM10** CHECK AIR DIVERTER VALVE(S) INTEGRITY | | |
| **CAUTION: Caution must be observed while performing this test.**<br>NOTE: On a two valve system make sure that air is flowing from both valves.<br>● Reconnect vacuum control line.<br>● Disconnect air tube from AIR diverter valve(s) outlet side.<br>● Cork off the air tube to prevent exhaust gases from escaping.<br>● Inspect AIR diverter valve(s) outlets for damage from hot exhaust gases. Repair as necessary.<br>● Key on, engine running.<br>● After a 5-second delay, air will be present between 30 and 90 seconds.<br>● **Is air present from the AIR diverter valve(s)?** | Yes ▶ | KEY OFF. Repair the exhaust tubes from the AIR diverter valve to the exhaust manifold(s). |
| | No ▶ | KEY OFF. REPLACE hose from electric AIR pump to AIR diverter valve. If OK, REPLACE the appropriate AIR diverter valve(s). |
| **HM11** CHECK VOLTAGE ON EAIR MONITOR CIRCUIT | | |
| ● Disconnect electric AIR pump.<br>● Key on, engine running.<br>● Measure voltage of EAIR monitor circuit between electric AIR pump harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts for 20 to 30 seconds after a 5 to 10-second delay?** | Yes ▶ | GO to HM13. |
| | No ▶ | GO to HM12. |

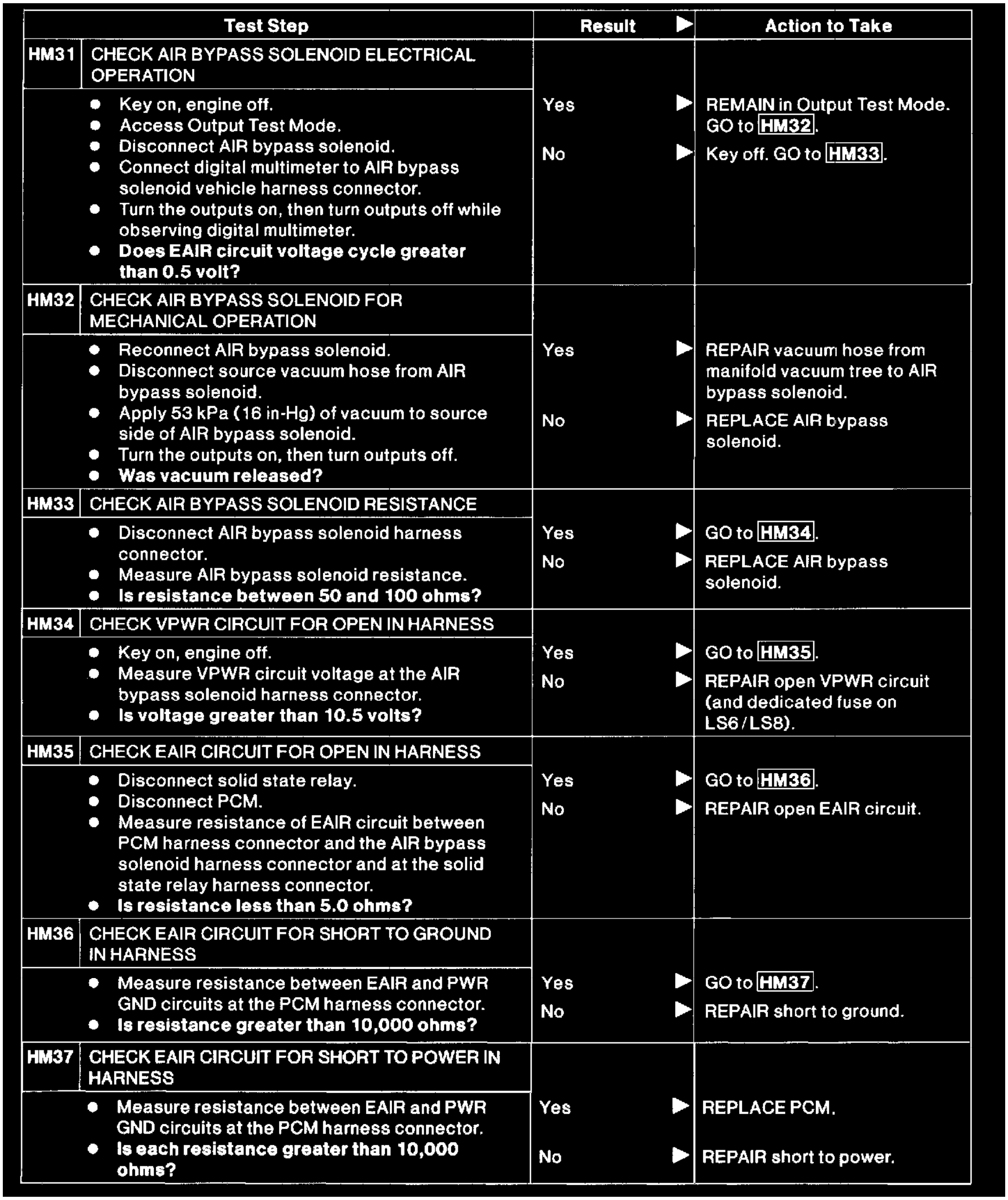
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HM12** | CHECK ELECTRIC AIR PUMP GROUND FOR OPEN IN HARNESS | | |
| | ● Measure resistance of EAP ground circuit between electric AIR pump harness connector and battery negative post.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to HM19.<br>REPAIR open circuit. |
| **HM13** | CHECK AIR HOSE TO ELECTRIC AIR PUMP | | |
| | ● Disconnect inlet air hose.<br>● Visually inspect inlet air hose for binding, obstructions, water or ice to the electric AIR pump.<br>● **Is the hose integrity or orientation OK?** | Yes ▶<br>No ▶ | GO to HM15.<br>DRAIN all water from air hose. REPLACE or RE-ORIENT hose as appropriate. GO to HM15. |
| **HM14** | CHECK SOLID STATE RELAY OUTPUT | | |
| | ● Reconnect AIR bypass solenoid.<br>● Connect PCM.<br>● Key on, engine off.<br>● Enter output test mode.<br>● Access AIR PID.<br>● Access AIRM PID.<br>● Compare AIR and AIRM PIDs.<br>● **Were both PIDs on?** | Yes ▶<br>No ▶ | REPLACE solid state relay.<br>REPLACE PCM. |
| **HM15** | CHECK AIR PUMP FOR WATER | | |
| | NOTE: Water ingested in the electric AIR pump will reduce the life of the pump.<br>● Disconnect electric AIR pump connector and air hoses.<br>● Carefully tilt electric AIR pump in various positions to verify if any water is present.<br>● **Is any water present?** | Yes ▶<br>No ▶ | REPLACE electric AIR pump.<br>If fuse was replaced in HM6, Testing is complete.<br>All others, GO to HM9. |
| **HM17** | CHECK B+ CIRCUIT VOLTAGE TO SOLID STATE RELAY | | |
| | DTC P1413 indicates EAIR monitor circuit is low while the electric AIR pump was commanded ON.<br>● Disconnect solid state relay.<br>● Key on.<br>● Measure voltage of B+ circuit between solid state relay harness connector and chassis ground.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HM18.<br>GO to HM24. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HM18** | CHECK FOR VPWR TO SOLID STATE RELAY | | |
| | • Key on, engine off.<br>• Measure VPWR circuit voltage at the solid state relay harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HM19.<br>**For LS6/LS8:**<br>GO to Pinpoint Test Step B5.<br>**All others:**<br>REPAIR open VPWR circuit between the solid state relay and Electronic Engine Control power relay (and dedicated fuse on LS6/LS8).. |
| **HM19** | CHECK VOLTAGE ON EAIR MONITOR CIRCUIT | | |
| | • Reconnect solid state relay.<br>• Disconnect electric AIR pump.<br>• Key on, engine off.<br>• Enter output test mode.<br>• Access AIRM PID.<br>• **Is PID on?** | Yes ▶<br>No ▶ | GO to HM23. REMAIN in output test mode.<br>If DTC P0411 is present, REPLACE electric AIR pump. GO to HM20. REMAIN in output test mode. |
| **HM20** | CHECK EAIR MONITOR VOLTAGE TO PCM | | |
| | • Disconnect PCM.<br>• Key on, engine off.<br>• Access AIRM PID.<br>• **Is PID on?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>GO to HM21. |
| **HM21** | CHECK EAIR MONITOR CIRCUIT FOR OPEN IN HARNESS | | |
| | • Disconnect solid state relay.<br>• Measure resistance of EAIR monitor circuit between PCM harness connector and solid state relay harness connector.<br>• Measure resistance of EAIR monitor circuit between the solid state relay harness connector and the electric AIR pump harness connector.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to HM22.<br>REPAIR open EAIR monitor circuit. |
| **HM22** | CHECK EAIR MONITOR CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | • Measure resistance between EAIR monitor and PWR GND circuits at the PCM harness connector.<br>• **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE solid state relay.<br>REPAIR short circuit. |
| **HM23** | CHECK EAIR MONITOR VOLTAGE TO PCM | | |
| | • Reconnect electric AIR pump.<br>• Reconnect PCM.<br>• Key on, engine off.<br>• Access AIRM PID.<br>• **Is PID on?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open EAIR circuit. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HM24** | CHECK B+ CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of B+ circuit between solid state relay harness connector and dedicated fuse B+ circuit.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | REPLACE solid state relay dedicated fuse.<br>REPAIR open circuit. |
| **HM25** | CHECK EAIR MONITOR CIRCUIT FOR OPEN IN HARNESS | | |
| | DTC P1414 indicates electric AIR pump commanded off, but PCM indicates electric AIR pump is on.<br>● Disconnect solid state relay.<br>● Disconnect PCM.<br>● Disconnect electric AIR pump.<br>● Measure resistance of EAIR monitor circuit between PCM harness connector and electric AIR pump harness connector.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to HM26.<br>REPAIR open circuit. |
| **HM26** | CHECK ELECTRIC AIR PUMP FOR OPEN | | |
| | ● Measure electric AIR pump resistance.<br>● **Is resistance between 0.5-5.0 ohms?** | Yes ▶<br>No ▶ | GO to HM27.<br>REPLACE electric AIR pump. |
| **HM27** | CHECK EAIR MONITOR CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Key on.<br>● Measure voltage between PCM harness connector and chassis ground.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>EAIR Monitor circuit is OK. GO to HM28. |
| **HM28** | CHECK SOLID STATE RELAY OUTPUT | | |
| | ● Reconnect AIR bypass solenoid.<br>● Connect PCM.<br>● Key on, engine off.<br>● Enter output test mode.<br>● Access AIR PID.<br>● Access AIRM PID.<br>● Compare AIR and AIRM PIDs.<br>● **Were both PIDs on?** | Yes ▶<br>No ▶ | REPLACE solid state relay.<br>REPLACE PCM. |
| **HM30** | CHECK VACUUM HOSE INTEGRITY | | |
| | ● Key off.<br>● Check vacuum hose between AIR bypass solenoid and AIR diverter valve.<br>● Check for blockage and restrictions.<br>● Check for leaks and cracks.<br>● Check for kinks or disconnects.<br>● **Are the above checks OK?** | Yes ▶<br>No ▶ | GO to HM31.<br>REPLACE the vacuum line connecting the AIR bypass solenoid to AIR diverter valve(s). |

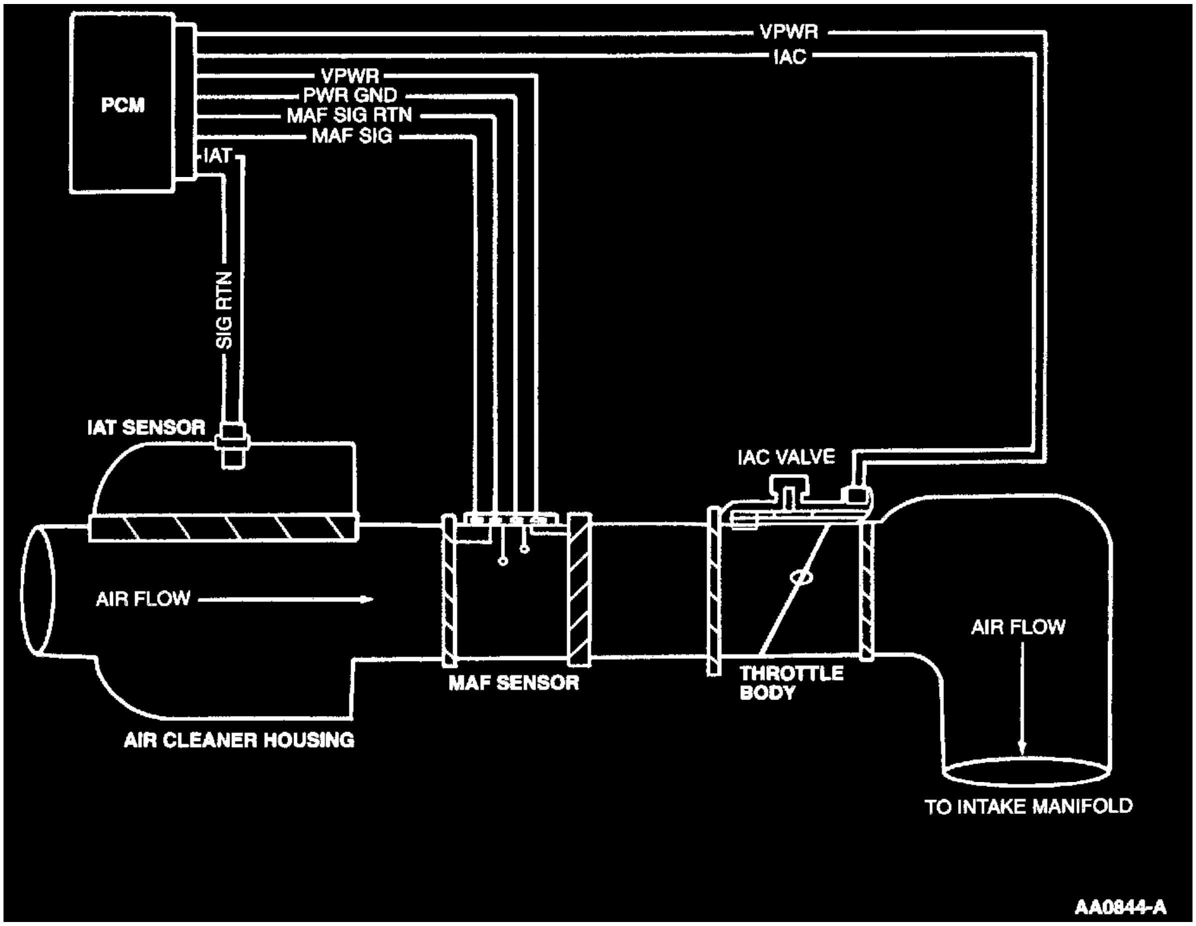


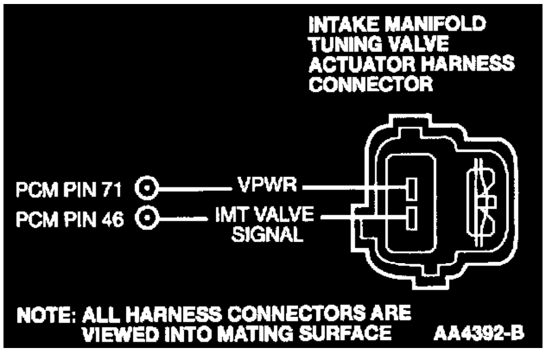
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HM31 | CHECK AIR BYPASS SOLENOID ELECTRICAL OPERATION | | |
| | ● Key on, engine off.<br>● Access Output Test Mode.<br>● Disconnect AIR bypass solenoid.<br>● Connect digital multimeter to AIR bypass solenoid vehicle harness connector.<br>● Turn the outputs on, then turn outputs off while observing digital multimeter.<br>● **Does EAIR circuit voltage cycle greater than 0.5 volt?** | Yes ▶<br>No ▶ | REMAIN in Output Test Mode. GO to HM32.<br>Key off. GO to HM33. |
| HM32 | CHECK AIR BYPASS SOLENOID FOR MECHANICAL OPERATION | | |
| | ● Reconnect AIR bypass solenoid.<br>● Disconnect source vacuum hose from AIR bypass solenoid.<br>● Apply 53 kPa (16 in-Hg) of vacuum to source side of AIR bypass solenoid.<br>● Turn the outputs on, then turn outputs off.<br>● **Was vacuum released?** | Yes ▶<br>No ▶ | REPAIR vacuum hose from manifold vacuum tree to AIR bypass solenoid.<br>REPLACE AIR bypass solenoid. |
| HM33 | CHECK AIR BYPASS SOLENOID RESISTANCE | | |
| | ● Disconnect AIR bypass solenoid harness connector.<br>● Measure AIR bypass solenoid resistance.<br>● **Is resistance between 50 and 100 ohms?** | Yes ▶<br>No ▶ | GO to HM34.<br>REPLACE AIR bypass solenoid. |
| HM34 | CHECK VPWR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure VPWR circuit voltage at the AIR bypass solenoid harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HM35.<br>REPAIR open VPWR circuit (and dedicated fuse on LS6/LS8). |
| HM35 | CHECK EAIR CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Disconnect solid state relay.<br>● Disconnect PCM.<br>● Measure resistance of EAIR circuit between PCM harness connector and the AIR bypass solenoid harness connector and at the solid state relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to HM36.<br>REPAIR open EAIR circuit. |
| HM36 | CHECK EAIR CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Measure resistance between EAIR and PWR GND circuits at the PCM harness connector.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HM37.<br>REPAIR short to ground. |
| HM37 | CHECK EAIR CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Measure resistance between EAIR and PWR GND circuits at the PCM harness connector.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short to power. |

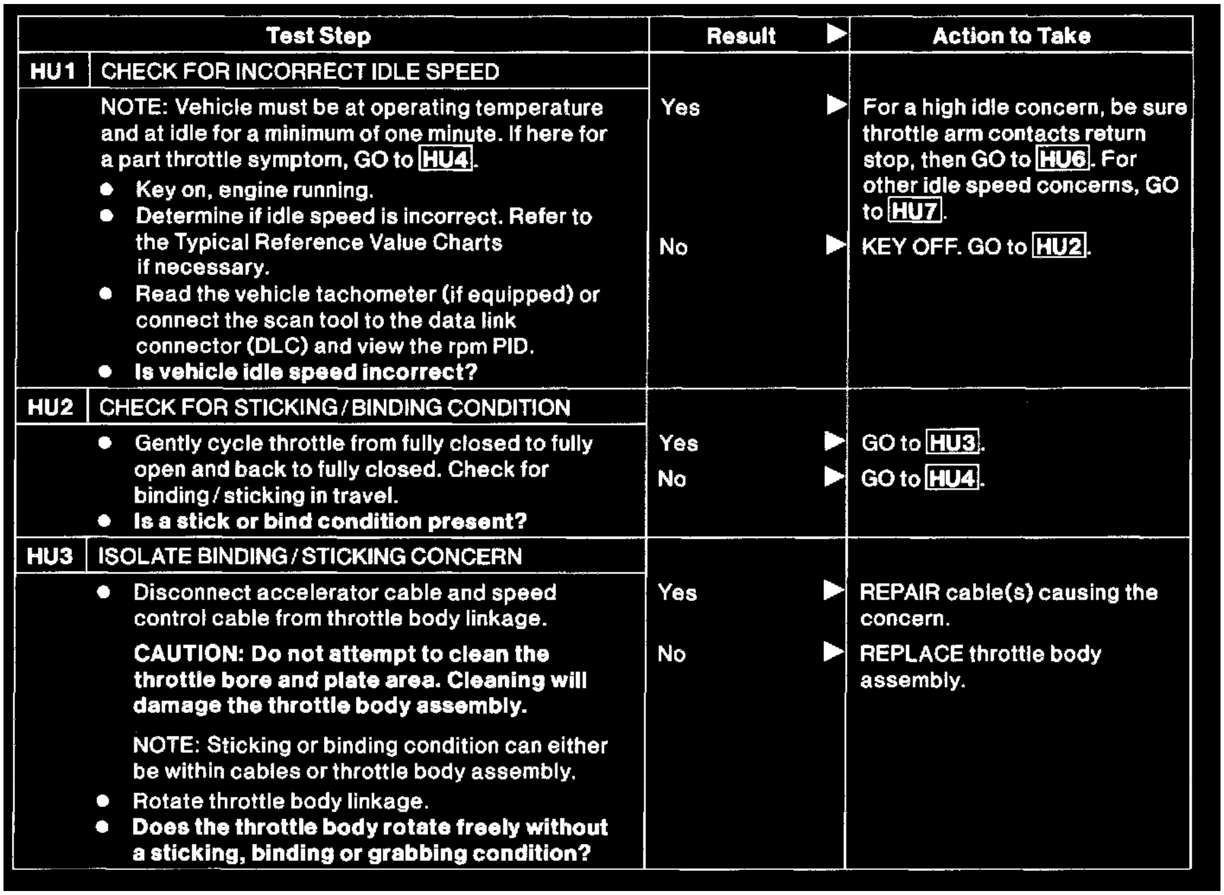
# Test Notes

This Pinpoint Test is intended to diagnose the following:

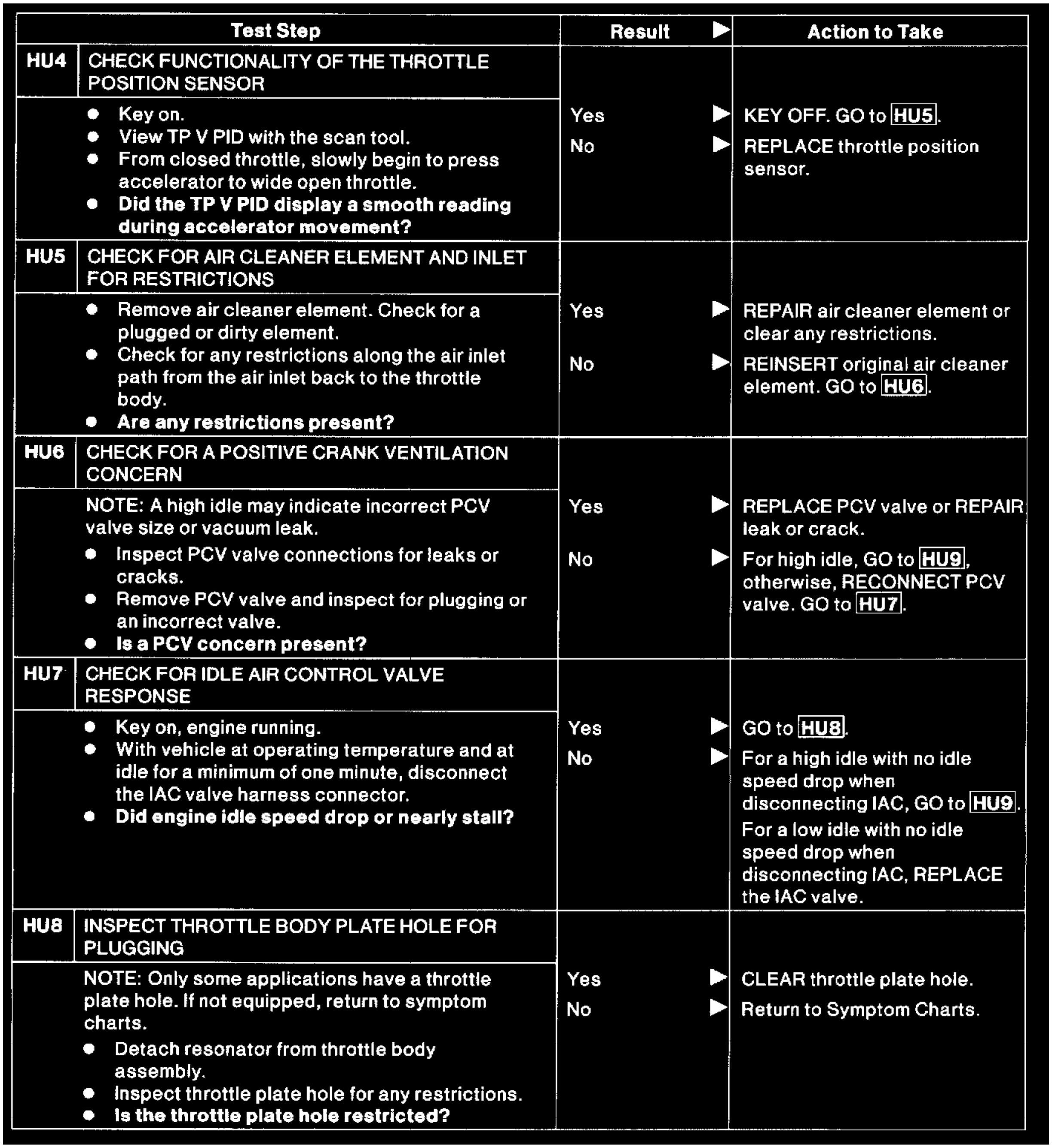
- Throttle body assembly
- Speed control cable
- Accelerator cable linkage to throttle body
- Air cleaner assembly (including air cleaner element)
- Air inlet tube
- Clean air tube hose and resonator
- Intake Manifold Runner Control housing assembly **(IMRC)** and
- IMRC actuator assembly
- Harness circuits: IMRC, IMRC Monitor, SIG RTN, PWR GND, VPWR
- Intake Manifold Tuning (**IMT** Valve) electric
- Powertrain Control Module **(PCM)**


PCM
VPWR
IAC
VPWR
PWR GND
MAF SIG RTN
MAF SIG
IAT
SIG RTN
IAT SENSOR
IAC VALVE
AIR FLOW
MAF SENSOR
THROTTLE BODY
AIR CLEANER HOUSING
AIR FLOW
TO INTAKE MANIFOLD
AA0844-A


INTAKE MANIFOLD TUNING VALVE ACTUATOR HARNESS CONNECTOR
PCM PIN 71
VPWR
PCM PIN 46
IMT VALVE SIGNAL
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4392-B

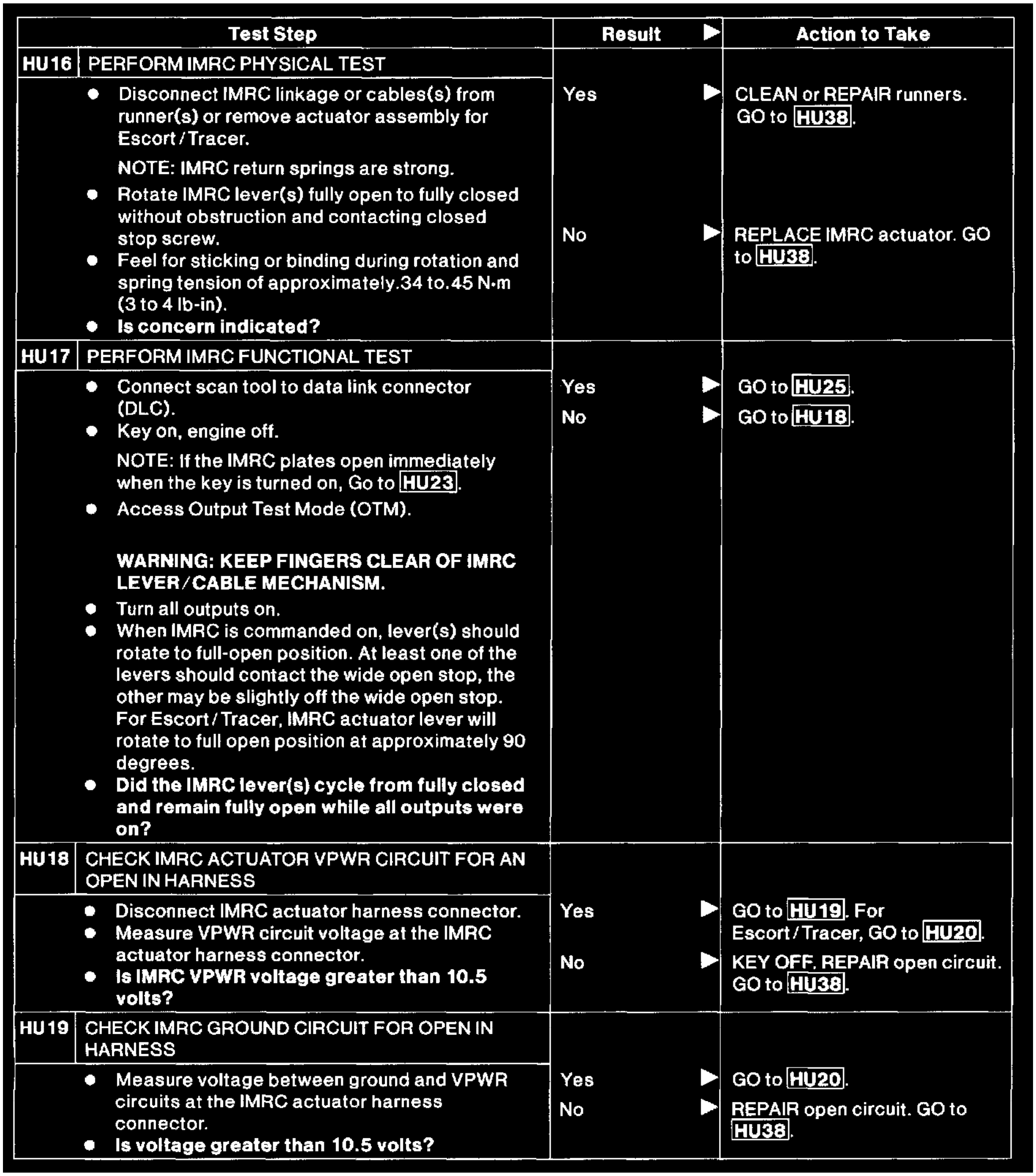


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HU1 | CHECK FOR INCORRECT IDLE SPEED | | |
| | NOTE: Vehicle must be at operating temperature and at idle for a minimum of one minute. If here for a part throttle symptom, GO to HU4.<br>● Key on, engine running.<br>● Determine if idle speed is incorrect. Refer to the Typical Reference Value Charts if necessary.<br>● Read the vehicle tachometer (if equipped) or connect the scan tool to the data link connector (DLC) and view the rpm PID.<br>● **Is vehicle idle speed incorrect?** | Yes ▶ | For a high idle concern, be sure throttle arm contacts return stop, then GO to HU6. For other idle speed concerns, GO to HU7. |
| | | No ▶ | KEY OFF. GO to HU2. |
| HU2 | CHECK FOR STICKING / BINDING CONDITION | | |
| | ● Gently cycle throttle from fully closed to fully open and back to fully closed. Check for binding / sticking in travel.<br>● **Is a stick or bind condition present?** | Yes ▶ | GO to HU3. |
| | | No ▶ | GO to HU4. |
| HU3 | ISOLATE BINDING / STICKING CONCERN | | |
| | ● Disconnect accelerator cable and speed control cable from throttle body linkage.<br>**CAUTION: Do not attempt to clean the throttle bore and plate area. Cleaning will damage the throttle body assembly.**<br>NOTE: Sticking or binding condition can either be within cables or throttle body assembly.<br>● Rotate throttle body linkage.<br>● **Does the throttle body rotate freely without a sticking, binding or grabbing condition?** | Yes ▶ | REPAIR cable(s) causing the concern. |
| | | No ▶ | REPLACE throttle body assembly. |

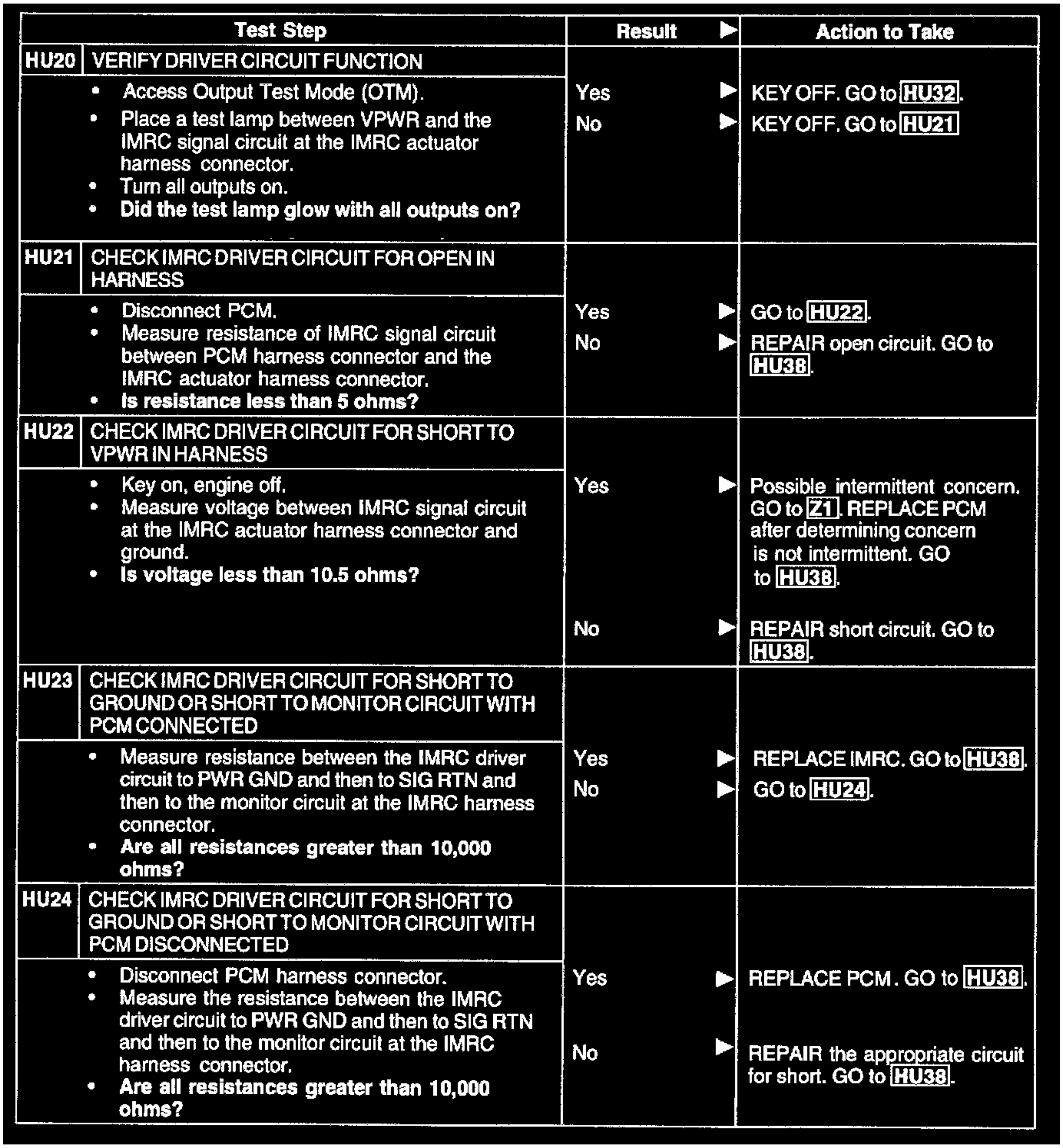


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU4** | CHECK FUNCTIONALITY OF THE THROTTLE POSITION SENSOR | | |
| | ● Key on.<br>● View TP V PID with the scan tool.<br>● From closed throttle, slowly begin to press accelerator to wide open throttle.<br>● **Did the TP V PID display a smooth reading during accelerator movement?** | Yes ▶<br>No ▶ | KEY OFF. GO to HU5.<br>REPLACE throttle position sensor. |
| **HU5** | CHECK FOR AIR CLEANER ELEMENT AND INLET FOR RESTRICTIONS | | |
| | ● Remove air cleaner element. Check for a plugged or dirty element.<br>● Check for any restrictions along the air inlet path from the air inlet back to the throttle body.<br>● **Are any restrictions present?** | Yes ▶<br>No ▶ | REPAIR air cleaner element or clear any restrictions.<br>REINSERT original air cleaner element. GO to HU6. |
| **HU6** | CHECK FOR A POSITIVE CRANK VENTILATION CONCERN | | |
| | NOTE: A high idle may indicate incorrect PCV valve size or vacuum leak.<br>● Inspect PCV valve connections for leaks or cracks.<br>● Remove PCV valve and inspect for plugging or an incorrect valve.<br>● **Is a PCV concern present?** | Yes ▶<br>No ▶ | REPLACE PCV valve or REPAIR leak or crack.<br>For high idle, GO to HU9, otherwise, RECONNECT PCV valve. GO to HU7. |
| **HU7** | CHECK FOR IDLE AIR CONTROL VALVE RESPONSE | | |
| | ● Key on, engine running.<br>● With vehicle at operating temperature and at idle for a minimum of one minute, disconnect the IAC valve harness connector.<br>● **Did engine idle speed drop or nearly stall?** | Yes ▶<br>No ▶ | GO to HU8.<br>For a high idle with no idle speed drop when disconnecting IAC, GO to HU9.<br>For a low idle with no idle speed drop when disconnecting IAC, REPLACE the IAC valve. |
| **HU8** | INSPECT THROTTLE BODY PLATE HOLE FOR PLUGGING | | |
| | NOTE: Only some applications have a throttle plate hole. If not equipped, return to symptom charts.<br>● Detach resonator from throttle body assembly.<br>● Inspect throttle plate hole for any restrictions.<br>● **Is the throttle plate hole restricted?** | Yes ▶<br>No ▶ | CLEAR throttle plate hole.<br>Return to Symptom Charts. |

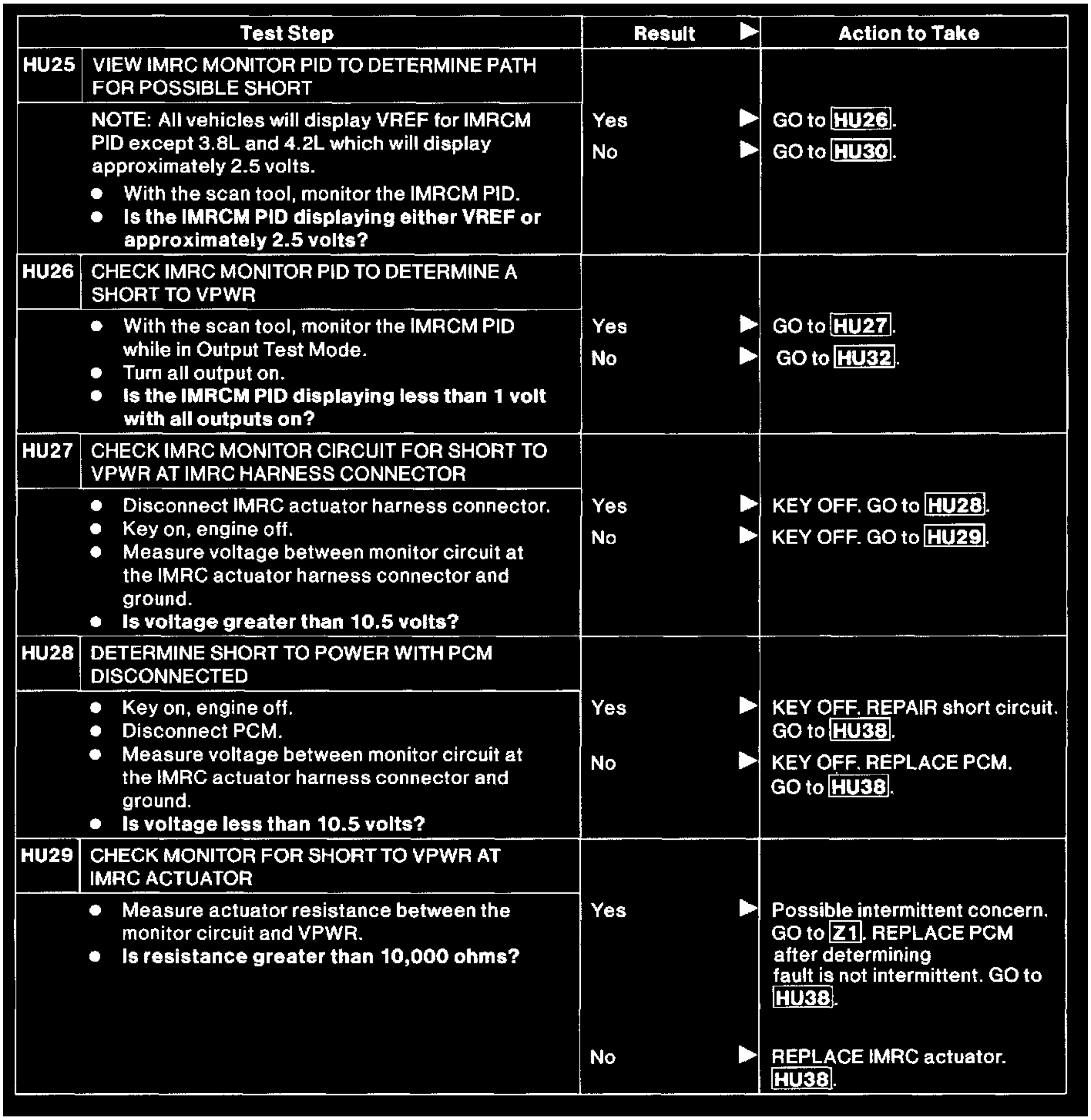
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU9** | CHECK FOR VACUUM LEAKS | | |
| | ● Listen for vacuum leaks.<br>● Inspect entire air intake system from the mass air flow (MAF) sensor to the intake manifold for leaks such as:<br>— cracked or punctured inlet air tube.<br>— loose connections on the inlet air tube at the air cleaner housing or throttle body.<br>— idle air control (IAC) valve assembly or gasket seal.<br>— EGR valve gasket seal leak to intake manifold.<br>— Intake manifold assembly or gasket seal.<br>— EGR valve diaphragm or control solenoid.<br>— vacuum supply connectors and hose.<br>● **Are any leaks detected?** | Yes ▶<br>No ▶ | KEY OFF. REPAIR any leaks.<br>REPLACE IAC valve if idle speed does not drop when disconnecting harness connector otherwise, KEY OFF. GO to HU10. |
| **HU10** | CHECK THROTTLE BODY FOR EXCESSIVE WEAR | | |
| | ● Remove throttle body assembly.<br>● Hold throttle body up to a light source.<br>● Rotate the throttle lever to wide open throttle and inspect bore for excessive wear or grooving.<br>● Rotate the throttle lever to closed throttle position while inspecting for misaligned or worn plate. Look for excessive gap between bore and plate area.<br>● **Is a concern detected?** | Yes ▶<br>No ▶ | REPLACE throttle body.<br>RETURN to Symptom Charts. |
| **HU15** | DTCS P1516, P1517, P1518, P1519 PERFORM VISUAL INSPECTION | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of the pinpoint test.<br>● View linkage or cable routing. Check for any binding or improper routing. Cable core wire (if applicable) at IMRC housing attachment must have slack and lever must contact close plate stop screw. For Escort/Tracer, view IMRC actuator lever. Make sure lever is visible.<br>NOTE: The IMRC return springs are strong. Make sure the return springs operate properly and plates open and close fully.<br>● Manually open and close IMRC plates at intake manifold (press IMRC lever down for Escort/Tracer) and feel for sticking/binding.<br>● **Is concern indicated?** | Yes ▶<br>No ▶ | GO to HU16.<br>GO to HU17. |



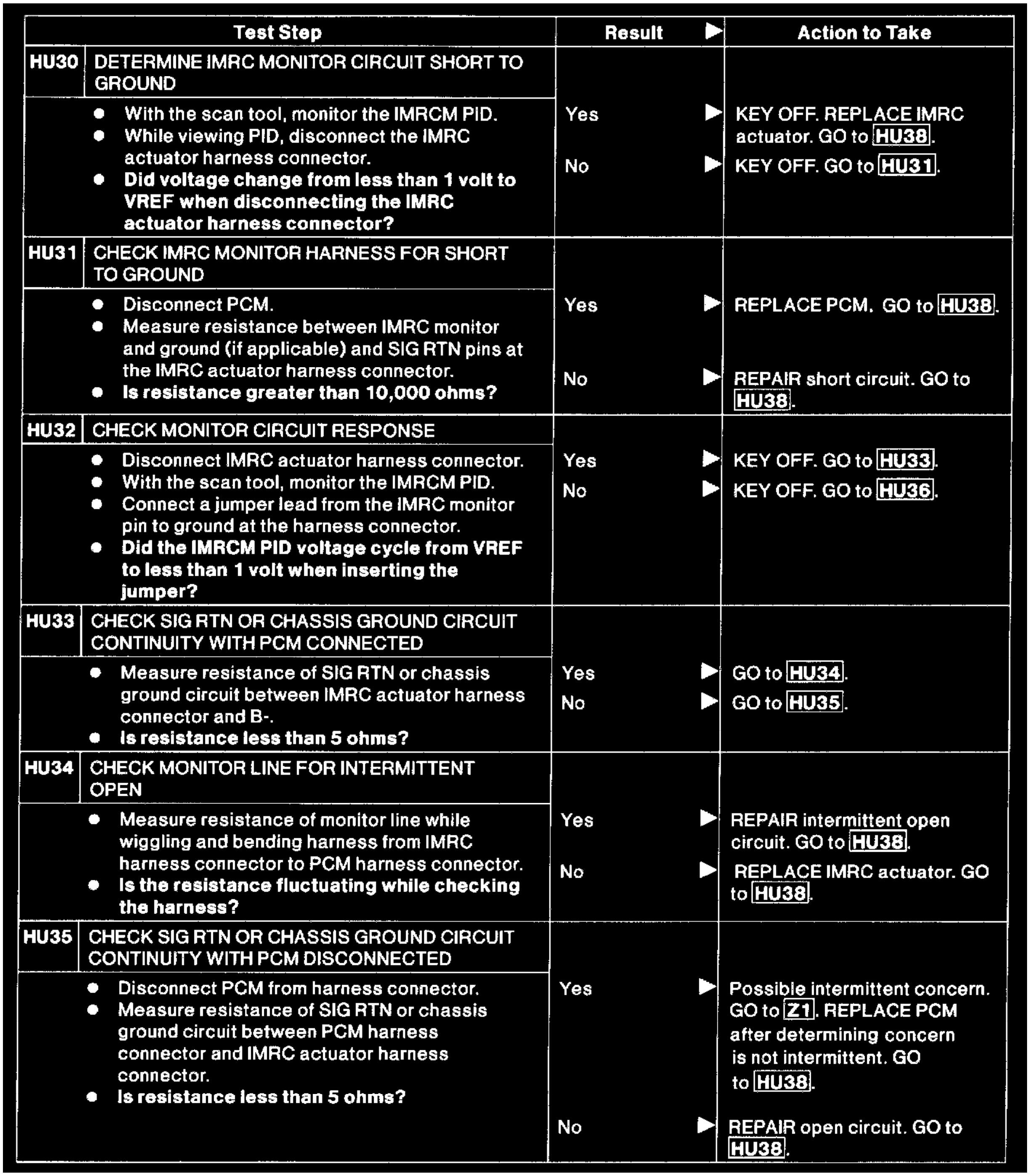
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU16** | PERFORM IMRC PHYSICAL TEST | | |
| | • Disconnect IMRC linkage or cables(s) from runner(s) or remove actuator assembly for Escort / Tracer.<br>NOTE: IMRC return springs are strong.<br>• Rotate IMRC lever(s) fully open to fully closed without obstruction and contacting closed stop screw.<br>• Feel for sticking or binding during rotation and spring tension of approximately.34 to.45 N•m (3 to 4 lb-in).<br>• **Is concern indicated?** | Yes ▶ | CLEAN or REPAIR runners. GO to HU38. |
| | | No ▶ | REPLACE IMRC actuator. GO to HU38. |
| **HU17** | PERFORM IMRC FUNCTIONAL TEST | | |
| | • Connect scan tool to data link connector (DLC).<br>• Key on, engine off.<br>NOTE: If the IMRC plates open immediately when the key is turned on, Go to HU23.<br>• Access Output Test Mode (OTM).<br>**WARNING: KEEP FINGERS CLEAR OF IMRC LEVER / CABLE MECHANISM.**<br>• Turn all outputs on.<br>• When IMRC is commanded on, lever(s) should rotate to full-open position. At least one of the levers should contact the wide open stop, the other may be slightly off the wide open stop. For Escort / Tracer, IMRC actuator lever will rotate to full open position at approximately 90 degrees.<br>• **Did the IMRC lever(s) cycle from fully closed and remain fully open while all outputs were on?** | Yes ▶ | GO to HU25. |
| | | No ▶ | GO to HU18. |
| **HU18** | CHECK IMRC ACTUATOR VPWR CIRCUIT FOR AN OPEN IN HARNESS | | |
| | • Disconnect IMRC actuator harness connector.<br>• Measure VPWR circuit voltage at the IMRC actuator harness connector.<br>• **Is IMRC VPWR voltage greater than 10.5 volts?** | Yes ▶ | GO to HU19. For Escort / Tracer, GO to HU20. |
| | | No ▶ | KEY OFF. REPAIR open circuit. GO to HU38. |
| **HU19** | CHECK IMRC GROUND CIRCUIT FOR OPEN IN HARNESS | | |
| | • Measure voltage between ground and VPWR circuits at the IMRC actuator harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶ | GO to HU20. |
| | | No ▶ | REPAIR open circuit. GO to HU38. |



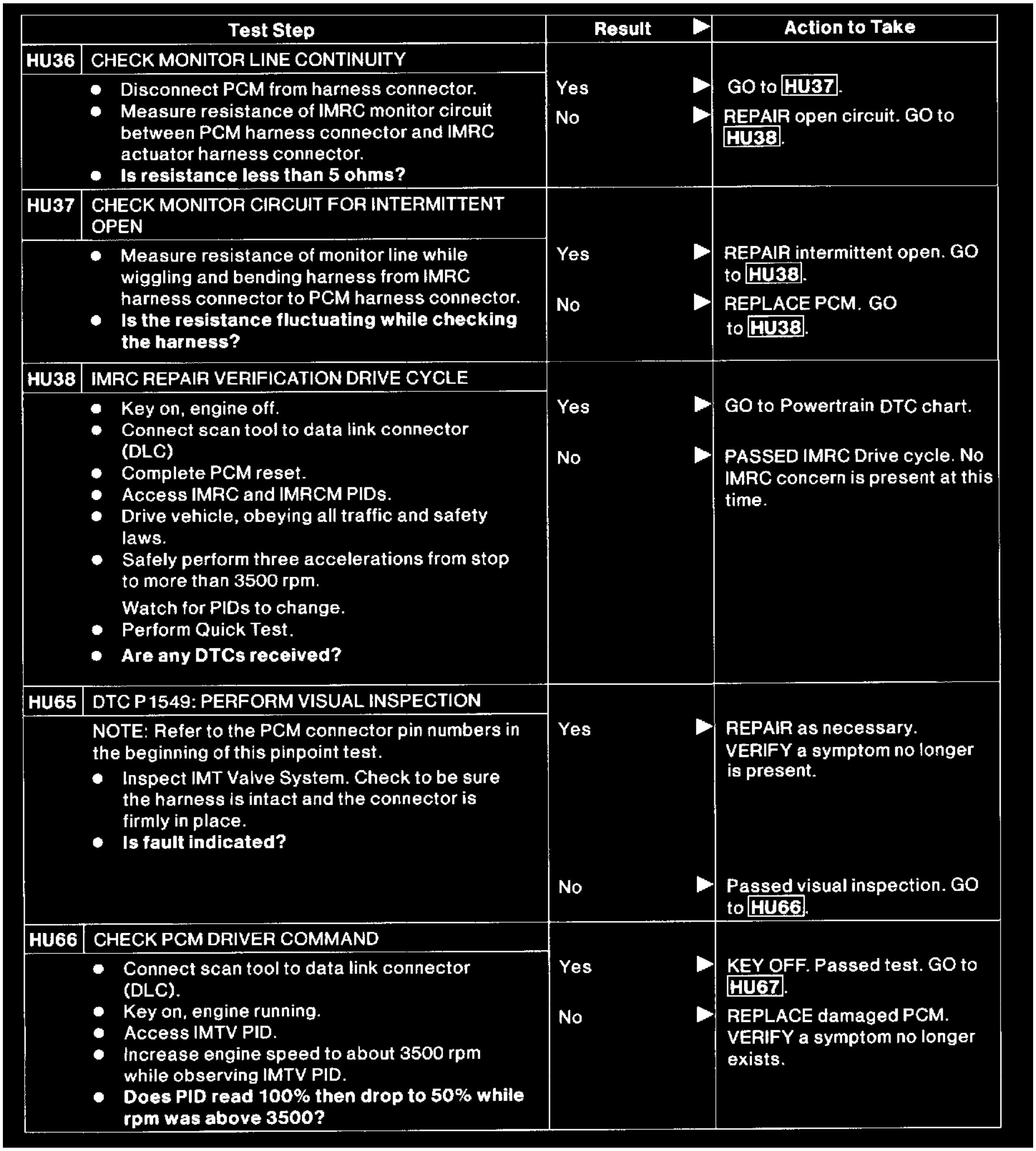
| Test Step | | Result ► | Action to Take |
|---|---|---|---|
| **HU20** | VERIFY DRIVER CIRCUIT FUNCTION | | |
| | • Access Output Test Mode (OTM).<br>• Place a test lamp between VPWR and the IMRC signal circuit at the IMRC actuator harness connector.<br>• Turn all outputs on.<br>• **Did the test lamp glow with all outputs on?** | Yes ►<br>No ► | KEY OFF. GO to HU32.<br>KEY OFF. GO to HU21 |
| **HU21** | CHECK IMRC DRIVER CIRCUIT FOR OPEN IN HARNESS | | |
| | • Disconnect PCM.<br>• Measure resistance of IMRC signal circuit between PCM harness connector and the IMRC actuator harness connector.<br>• **Is resistance less than 5 ohms?** | Yes ►<br>No ► | GO to HU22.<br>REPAIR open circuit. GO to HU38. |
| **HU22** | CHECK IMRC DRIVER CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | • Key on, engine off.<br>• Measure voltage between IMRC signal circuit at the IMRC actuator harness connector and ground.<br>• **Is voltage less than 10.5 ohms?** | Yes ►<br>No ► | Possible intermittent concern. GO to Z1. REPLACE PCM after determining concern is not intermittent. GO to HU38.<br>REPAIR short circuit. GO to HU38. |
| **HU23** | CHECK IMRC DRIVER CIRCUIT FOR SHORT TO GROUND OR SHORT TO MONITOR CIRCUIT WITH PCM CONNECTED | | |
| | • Measure resistance between the IMRC driver circuit to PWR GND and then to SIG RTN and then to the monitor circuit at the IMRC harness connector.<br>• **Are all resistances greater than 10,000 ohms?** | Yes ►<br>No ► | REPLACE IMRC. GO to HU38.<br>GO to HU24. |
| **HU24** | CHECK IMRC DRIVER CIRCUIT FOR SHORT TO GROUND OR SHORT TO MONITOR CIRCUIT WITH PCM DISCONNECTED | | |
| | • Disconnect PCM harness connector.<br>• Measure the resistance between the IMRC driver circuit to PWR GND and then to SIG RTN and then to the monitor circuit at the IMRC harness connector.<br>• **Are all resistances greater than 10,000 ohms?** | Yes ►<br>No ► | REPLACE PCM. GO to HU38.<br>REPAIR the appropriate circuit for short. GO to HU38. |



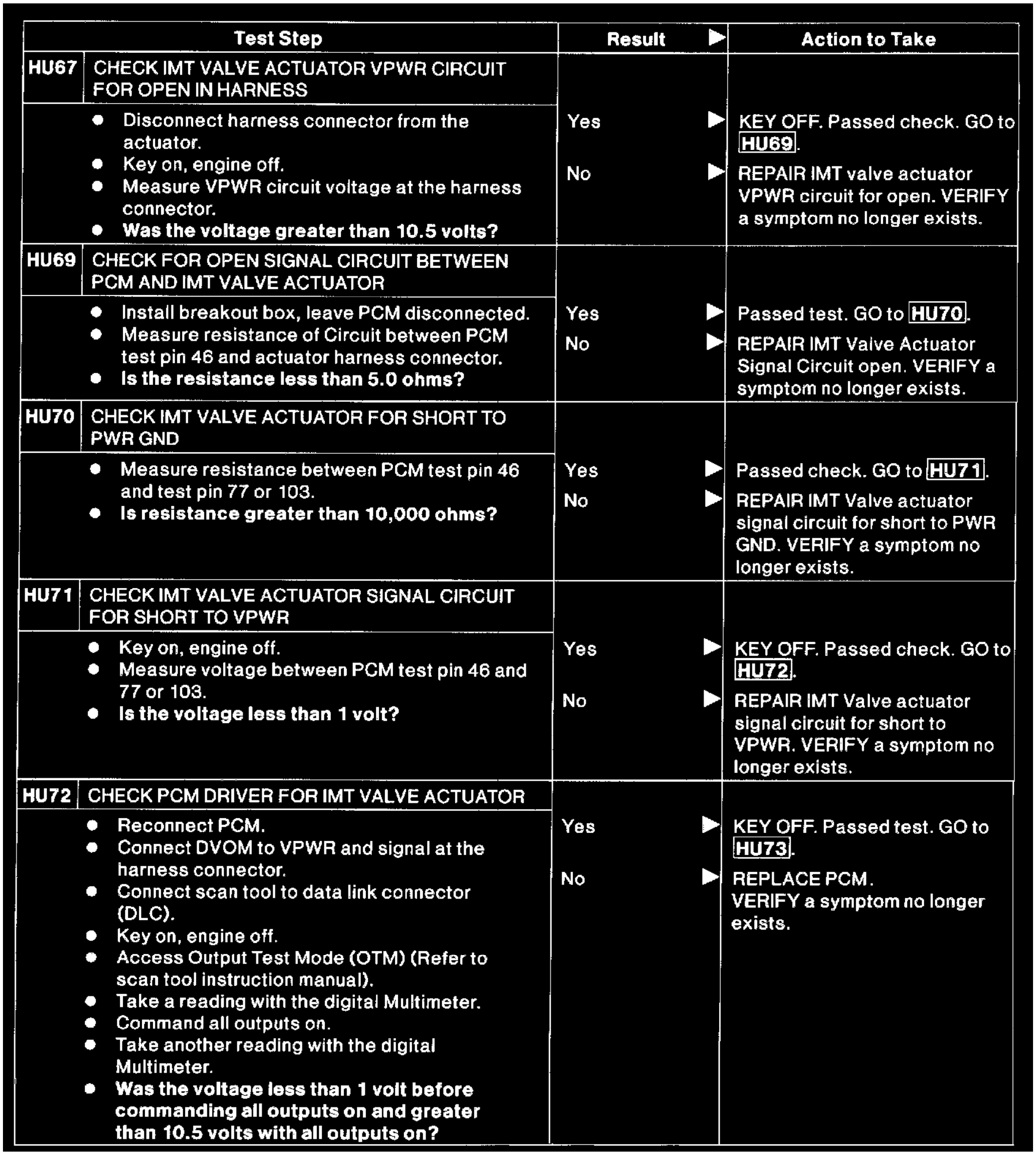
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU25** | VIEW IMRC MONITOR PID TO DETERMINE PATH FOR POSSIBLE SHORT | | |
| | NOTE: All vehicles will display VREF for IMRCM PID except 3.8L and 4.2L which will display approximately 2.5 volts.<br>● With the scan tool, monitor the IMRCM PID.<br>● **Is the IMRCM PID displaying either VREF or approximately 2.5 volts?** | Yes ▶<br>No ▶ | GO to HU26.<br>GO to HU30. |
| **HU26** | CHECK IMRC MONITOR PID TO DETERMINE A SHORT TO VPWR | | |
| | ● With the scan tool, monitor the IMRCM PID while in Output Test Mode.<br>● Turn all output on.<br>● **Is the IMRCM PID displaying less than 1 volt with all outputs on?** | Yes ▶<br>No ▶ | GO to HU27.<br>GO to HU32. |
| **HU27** | CHECK IMRC MONITOR CIRCUIT FOR SHORT TO VPWR AT IMRC HARNESS CONNECTOR | | |
| | ● Disconnect IMRC actuator harness connector.<br>● Key on, engine off.<br>● Measure voltage between monitor circuit at the IMRC actuator harness connector and ground.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HU28.<br>KEY OFF. GO to HU29. |
| **HU28** | DETERMINE SHORT TO POWER WITH PCM DISCONNECTED | | |
| | ● Key on, engine off.<br>● Disconnect PCM.<br>● Measure voltage between monitor circuit at the IMRC actuator harness connector and ground.<br>● **Is voltage less than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPAIR short circuit. GO to HU38.<br>KEY OFF. REPLACE PCM. GO to HU38. |
| **HU29** | CHECK MONITOR FOR SHORT TO VPWR AT IMRC ACTUATOR | | |
| | ● Measure actuator resistance between the monitor circuit and VPWR.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | Possible intermittent concern. GO to Z1. REPLACE PCM after determining fault is not intermittent. GO to HU38.<br>REPLACE IMRC actuator. HU38. |



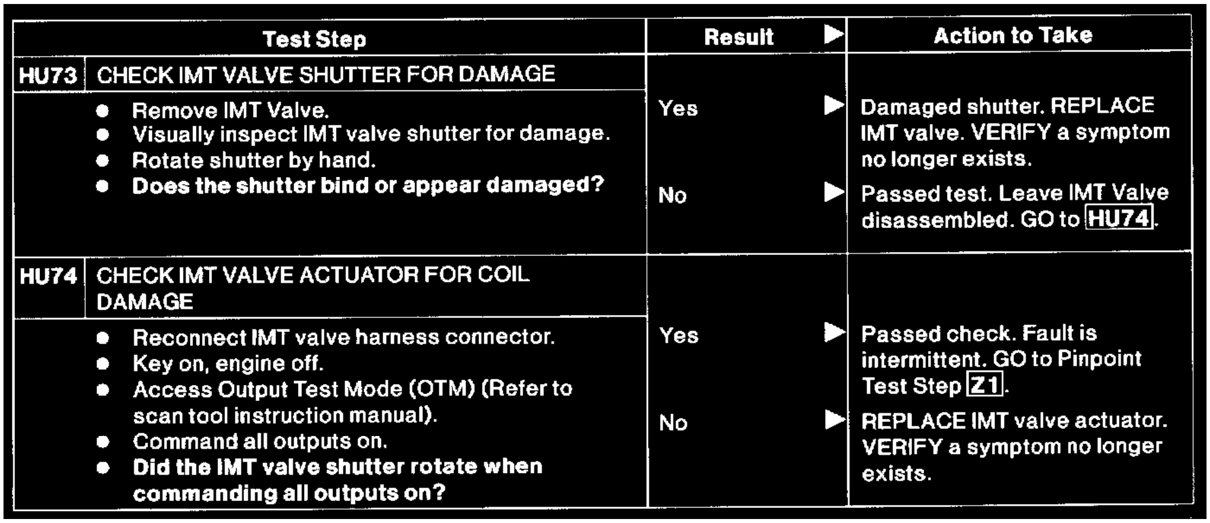
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU30** | DETERMINE IMRC MONITOR CIRCUIT SHORT TO GROUND | | |
| | ● With the scan tool, monitor the IMRCM PID.<br>● While viewing PID, disconnect the IMRC actuator harness connector.<br>● **Did voltage change from less than 1 volt to VREF when disconnecting the IMRC actuator harness connector?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE IMRC actuator. GO to HU38.<br>KEY OFF. GO to HU31. |
| **HU31** | CHECK IMRC MONITOR HARNESS FOR SHORT TO GROUND | | |
| | ● Disconnect PCM.<br>● Measure resistance between IMRC monitor and ground (if applicable) and SIG RTN pins at the IMRC actuator harness connector.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. GO to HU38.<br>REPAIR short circuit. GO to HU38. |
| **HU32** | CHECK MONITOR CIRCUIT RESPONSE | | |
| | ● Disconnect IMRC actuator harness connector.<br>● With the scan tool, monitor the IMRCM PID.<br>● Connect a jumper lead from the IMRC monitor pin to ground at the harness connector.<br>● **Did the IMRCM PID voltage cycle from VREF to less than 1 volt when inserting the jumper?** | Yes ▶<br>No ▶ | KEY OFF. GO to HU33.<br>KEY OFF. GO to HU36. |
| **HU33** | CHECK SIG RTN OR CHASSIS GROUND CIRCUIT CONTINUITY WITH PCM CONNECTED | | |
| | ● Measure resistance of SIG RTN or chassis ground circuit between IMRC actuator harness connector and B-.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to HU34.<br>GO to HU35. |
| **HU34** | CHECK MONITOR LINE FOR INTERMITTENT OPEN | | |
| | ● Measure resistance of monitor line while wiggling and bending harness from IMRC harness connector to PCM harness connector.<br>● **Is the resistance fluctuating while checking the harness?** | Yes ▶<br>No ▶ | REPAIR intermittent open circuit. GO to HU38.<br>REPLACE IMRC actuator. GO to HU38. |
| **HU35** | CHECK SIG RTN OR CHASSIS GROUND CIRCUIT CONTINUITY WITH PCM DISCONNECTED | | |
| | ● Disconnect PCM from harness connector.<br>● Measure resistance of SIG RTN or chassis ground circuit between PCM harness connector and IMRC actuator harness connector.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | Possible intermittent concern. GO to Z1. REPLACE PCM after determining concern is not intermittent. GO to HU38.<br>REPAIR open circuit. GO to HU38. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HU36** | CHECK MONITOR LINE CONTINUITY | | |
| | - Disconnect PCM from harness connector.<br>- Measure resistance of IMRC monitor circuit between PCM harness connector and IMRC actuator harness connector.<br>- **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to HU37.<br>REPAIR open circuit. GO to HU38. |
| **HU37** | CHECK MONITOR CIRCUIT FOR INTERMITTENT OPEN | | |
| | - Measure resistance of monitor line while wiggling and bending harness from IMRC harness connector to PCM harness connector.<br>- **Is the resistance fluctuating while checking the harness?** | Yes ▶<br>No ▶ | REPAIR intermittent open. GO to HU38.<br>REPLACE PCM. GO to HU38. |
| **HU38** | IMRC REPAIR VERIFICATION DRIVE CYCLE | | |
| | - Key on, engine off.<br>- Connect scan tool to data link connector (DLC)<br>- Complete PCM reset.<br>- Access IMRC and IMRCM PIDs.<br>- Drive vehicle, obeying all traffic and safety laws.<br>- Safely perform three accelerations from stop to more than 3500 rpm.<br>Watch for PIDs to change.<br>- Perform Quick Test.<br>- **Are any DTCs received?** | Yes ▶<br>No ▶ | GO to Powertrain DTC chart.<br>PASSED IMRC Drive cycle. No IMRC concern is present at this time. |
| **HU65** | DTC P1549: PERFORM VISUAL INSPECTION | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>- Inspect IMT Valve System. Check to be sure the harness is intact and the connector is firmly in place.<br>- **Is fault indicated?** | Yes ▶<br>No ▶ | REPAIR as necessary. VERIFY a symptom no longer is present.<br>Passed visual inspection. GO to HU66. |
| **HU66** | CHECK PCM DRIVER COMMAND | | |
| | - Connect scan tool to data link connector (DLC).<br>- Key on, engine running.<br>- Access IMTV PID.<br>- Increase engine speed to about 3500 rpm while observing IMTV PID.<br>- **Does PID read 100% then drop to 50% while rpm was above 3500?** | Yes ▶<br>No ▶ | KEY OFF. Passed test. GO to HU67.<br>REPLACE damaged PCM. VERIFY a symptom no longer exists. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HU67 | CHECK IMT VALVE ACTUATOR VPWR CIRCUIT FOR OPEN IN HARNESS | | |
| | • Disconnect harness connector from the actuator.<br>• Key on, engine off.<br>• Measure VPWR circuit voltage at the harness connector.<br>• **Was the voltage greater than 10.5 volts?** | Yes ▶ | KEY OFF. Passed check. GO to HU69. |
| | | No ▶ | REPAIR IMT valve actuator VPWR circuit for open. VERIFY a symptom no longer exists. |
| HU69 | CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND IMT VALVE ACTUATOR | | |
| | • Install breakout box, leave PCM disconnected.<br>• Measure resistance of Circuit between PCM test pin 46 and actuator harness connector.<br>• **Is the resistance less than 5.0 ohms?** | Yes ▶ | Passed test. GO to HU70. |
| | | No ▶ | REPAIR IMT Valve Actuator Signal Circuit open. VERIFY a symptom no longer exists. |
| HU70 | CHECK IMT VALVE ACTUATOR FOR SHORT TO PWR GND | | |
| | • Measure resistance between PCM test pin 46 and test pin 77 or 103.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶ | Passed check. GO to HU71. |
| | | No ▶ | REPAIR IMT Valve actuator signal circuit for short to PWR GND. VERIFY a symptom no longer exists. |
| HU71 | CHECK IMT VALVE ACTUATOR SIGNAL CIRCUIT FOR SHORT TO VPWR | | |
| | • Key on, engine off.<br>• Measure voltage between PCM test pin 46 and 77 or 103.<br>• **Is the voltage less than 1 volt?** | Yes ▶ | KEY OFF. Passed check. GO to HU72. |
| | | No ▶ | REPAIR IMT Valve actuator signal circuit for short to VPWR. VERIFY a symptom no longer exists. |
| HU72 | CHECK PCM DRIVER FOR IMT VALVE ACTUATOR | | |
| | • Reconnect PCM.<br>• Connect DVOM to VPWR and signal at the harness connector.<br>• Connect scan tool to data link connector (DLC).<br>• Key on, engine off.<br>• Access Output Test Mode (OTM) (Refer to scan tool instruction manual).<br>• Take a reading with the digital Multimeter.<br>• Command all outputs on.<br>• Take another reading with the digital Multimeter.<br>• **Was the voltage less than 1 volt before commanding all outputs on and greater than 10.5 volts with all outputs on?** | Yes ▶ | KEY OFF. Passed test. GO to HU73. |
| | | No ▶ | REPLACE PCM.<br>VERIFY a symptom no longer exists. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HU73 | CHECK IMT VALVE SHUTTER FOR DAMAGE | | |
| | • Remove IMT Valve.<br>• Visually inspect IMT valve shutter for damage.<br>• Rotate shutter by hand.<br>• **Does the shutter bind or appear damaged?** | Yes ▶ | Damaged shutter. REPLACE IMT valve. VERIFY a symptom no longer exists. |
| | | No ▶ | Passed test. Leave IMT Valve disassembled. GO to HU74. |
| HU74 | CHECK IMT VALVE ACTUATOR FOR COIL DAMAGE | | |
| | • Reconnect IMT valve harness connector.<br>• Key on, engine off.<br>• Access Output Test Mode (OTM) (Refer to scan tool instruction manual).<br>• Command all outputs on.<br>• **Did the IMT valve shutter rotate when commanding all outputs on?** | Yes ▶ | Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1. |
| | | No ▶ | REPLACE IMT valve actuator. VERIFY a symptom no longer exists. |

## Test Notes

Enter this Pinpoint Test only when directed here.

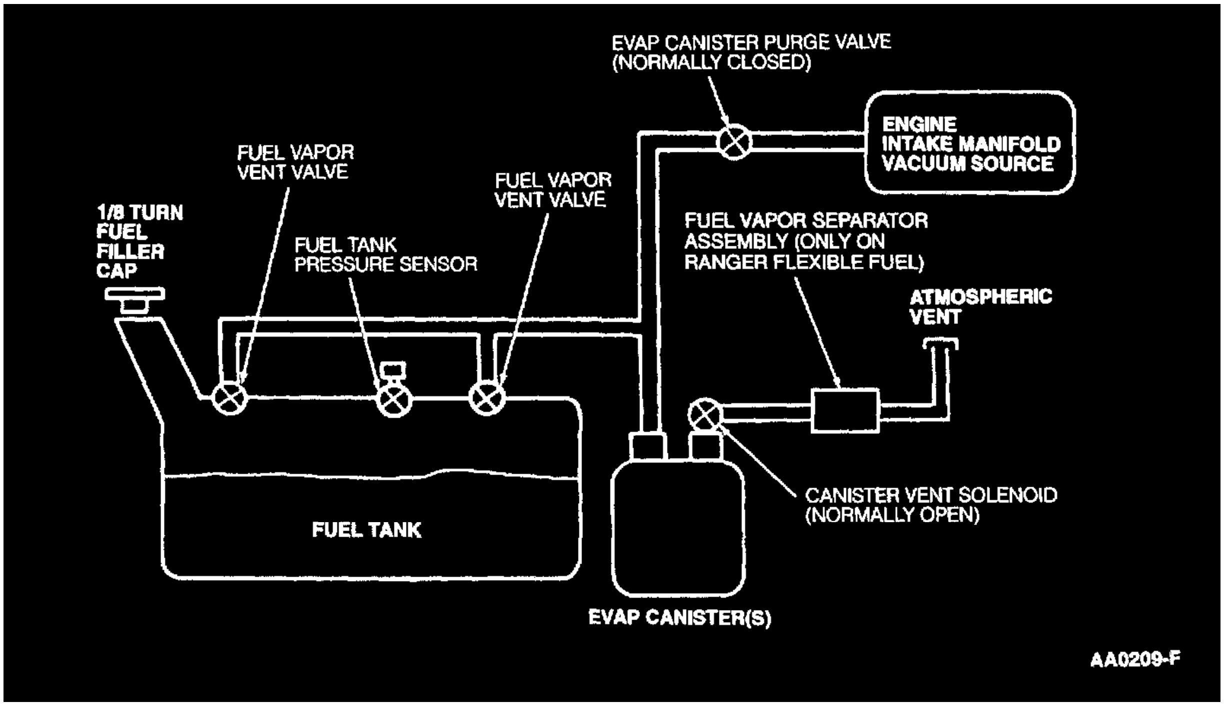
The use of a soap solution, such as SNOOP, around the fuel filler cap or the use of the hydrocarbon emission analyzer to determine an evaporative emission system leak is not recommended. The mandatory Rotunda Evaporative Emission System Leak Tester for OBD II (including the ultra-sonic tester) is the only device to be used at this time for evaporative emission system leak detection.

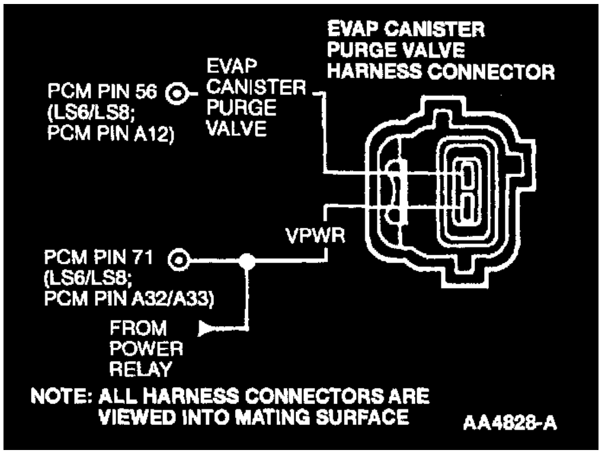
This Pinpoint Test is intended to diagnose the following:

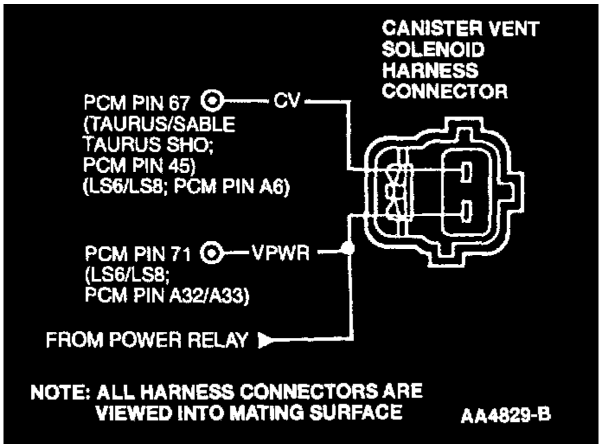
- Canister Vent **(CV)** solenoid (electrical concern only)
- Fuel filler cap
- Fuel Tank Pressure **(FTP)** sensor
- In-line fuel tank pressure sensor
- EVAP canister tube (fuel tank to EVAP canister)
- Front fuel vapor hose assembly (fuel tank to EVAP canister)
- Fuel canister purge outlet tube (EVAP canister to EVAP canister purge valve)
- EVAP return tube (EVAP canister purge valve to intake manifold)
- EVAP canister purge valve
- Vacuum source line (input port vacuum to intake manifold)
- Harness circuits: CV, FLI, FTP, EVAP Canister Purge Valve, SIG RTN, Vehicle Power **(VPWR)**, Reference Voltage **(VREF)** and Power Ground **(PWR GND)**
- Powertrain Control Module **(PCM)**

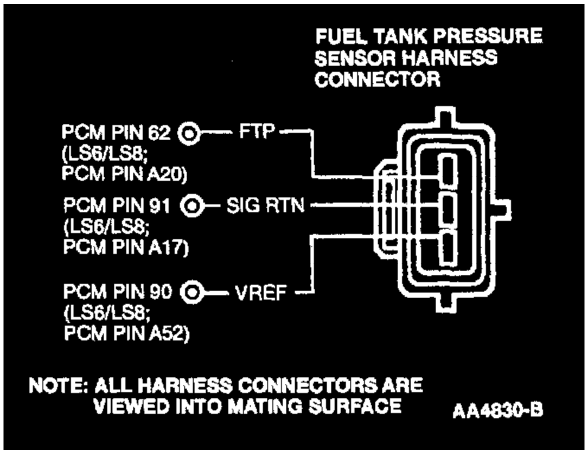
This Pinpoint Test is used as an assistance in diagnosing the following EVAP components:

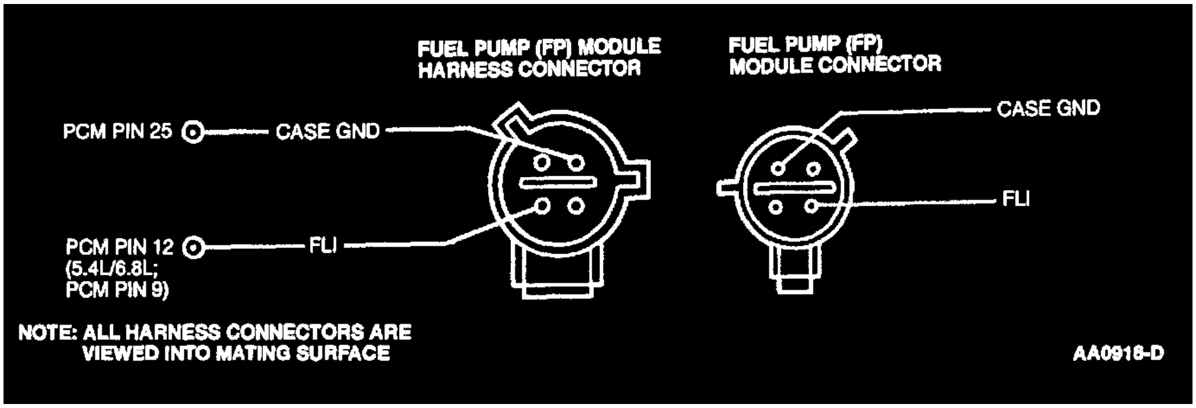
- EVAP canister and bracket assembly
    - EVAP canister sleeve assembly (fitting)
    - Canister vent solenoid hose assembly
    - EVAP canister
    - Canister vent solenoid-(mechanical concern only)
- Fill limit valve assembly
- Fuel filler pipe flapper valve
- Fuel filler pipe check valve, assembly
- Fuel tank filler pipe
- Fuel tank assembly (with fuel vapor vent valve)
- Fuel tank assembly (without fuel vapor vent valve)
- Fuel vapor control valve [can be referred to as a Grade Vent Valve **(GVV)**]
- Fuel vapor vent valve [can be referred to as a Fill limiting Vent Valve **(FVV)**]
- Fuel vapor separator assembly [can be referred to as a dust separator]
- Liquid/vapor fuel discriminator
- On-board Refueling Vapor Recovery **(ORVR)** T-connector assembly

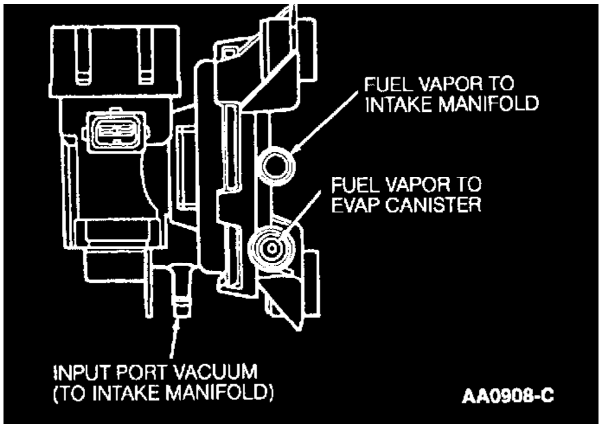


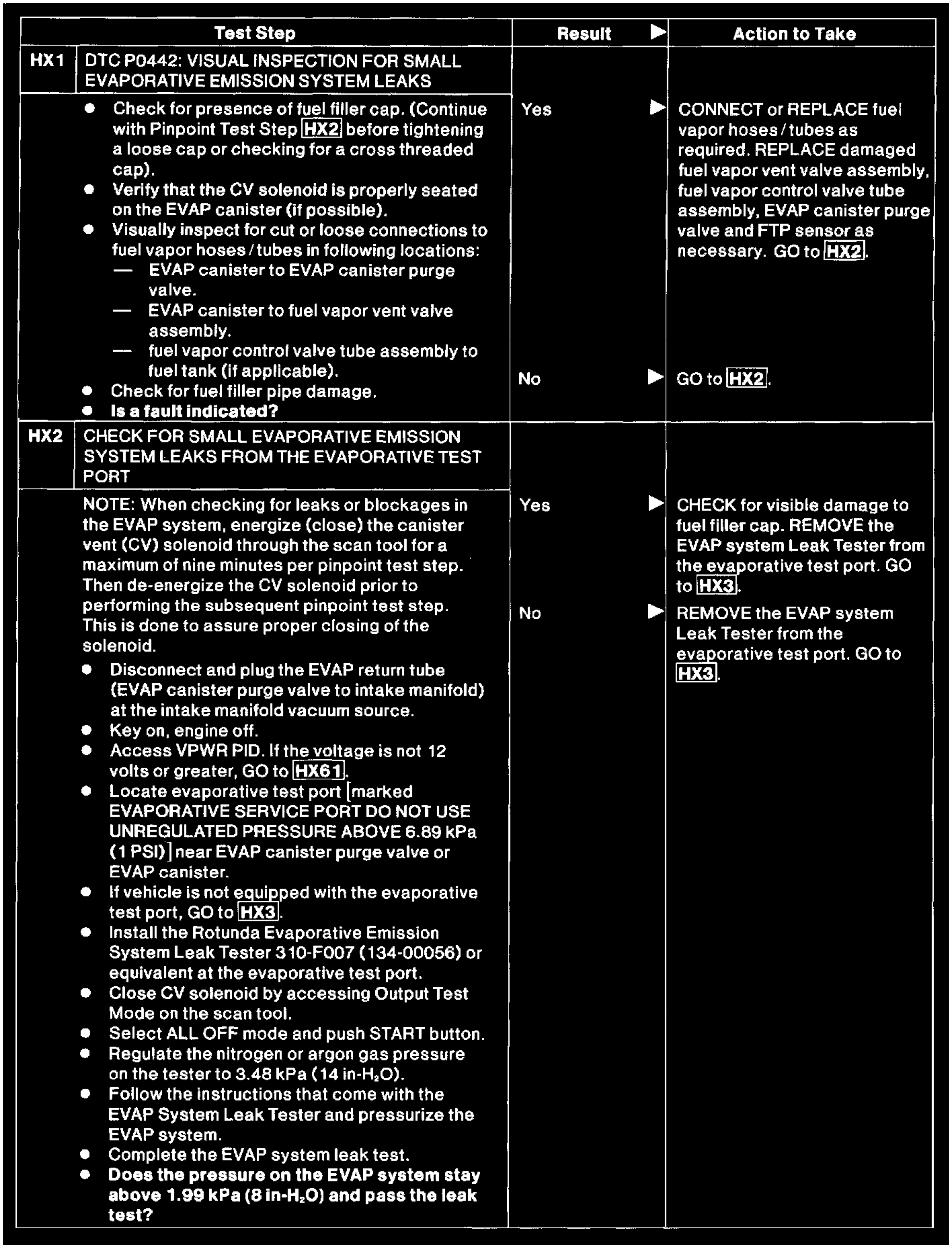

EVAP CANISTER PURGE VALVE HARNESS CONNECTOR
PCM PIN 56
(LS6/LS8;
PCM PIN A12)
EVAP CANISTER PURGE VALVE
VPWR
PCM PIN 71
(LS6/LS8;
PCM PIN A32/A33)
FROM POWER RELAY
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4828-A


CANISTER VENT SOLENOID HARNESS CONNECTOR
PCM PIN 67
(TAURUS/SABLE
TAURUS SHO;
PCM PIN 45)
(LS6/LS8; PCM PIN A6)
CV
PCM PIN 71
(LS6/LS8;
PCM PIN A32/A33)
VPWR
FROM POWER RELAY
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4829-B

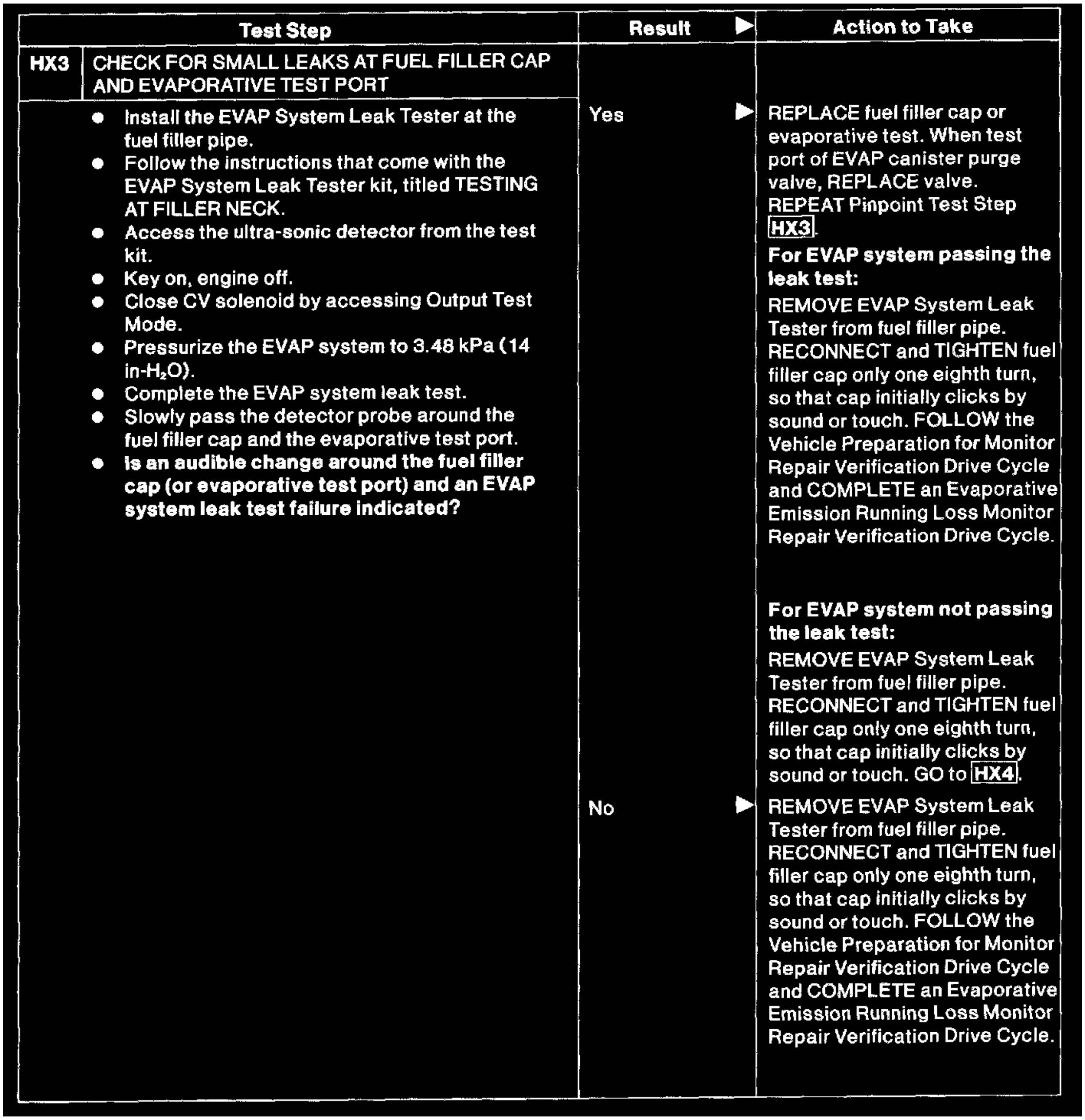

FUEL TANK PRESSURE SENSOR HARNESS CONNECTOR
PCM PIN 62
(LS6/LS8;
PCM PIN A20)
FTP
PCM PIN 91
(LS6/LS8;
PCM PIN A17)
SIG RTN
PCM PIN 90
(LS6/LS8;
PCM PIN A52)
VREF
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA4830-B


FUEL PUMP (FP) MODULE HARNESS CONNECTOR
FUEL PUMP (FP) MODULE CONNECTOR
PCM PIN 25
CASE GND
PCM PIN 12
(5.4L/6.8L;
PCM PIN 9)
FLI
CASE GND
FLI
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA0916-D


FUEL VAPOR TO
INTAKE MANIFOLD
FUEL VAPOR TO
EVAP CANISTER
INPUT PORT VACUUM
(TO INTAKE MANIFOLD)
AA0908-C



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HX1 | DTC P0442: VISUAL INSPECTION FOR SMALL EVAPORATIVE EMISSION SYSTEM LEAKS | | |
| | ● Check for presence of fuel filler cap. (Continue with Pinpoint Test Step HX2 before tightening a loose cap or checking for a cross threaded cap).<br>● Verify that the CV solenoid is properly seated on the EVAP canister (if possible).<br>● Visually inspect for cut or loose connections to fuel vapor hoses / tubes in following locations:<br>— EVAP canister to EVAP canister purge valve.<br>— EVAP canister to fuel vapor vent valve assembly.<br>— fuel vapor control valve tube assembly to fuel tank (if applicable).<br>● Check for fuel filler pipe damage.<br>● **Is a fault indicated?** | Yes ▶ | CONNECT or REPLACE fuel vapor hoses / tubes as required. REPLACE damaged fuel vapor vent valve assembly, fuel vapor control valve tube assembly, EVAP canister purge valve and FTP sensor as necessary. GO to HX2. |
| | | No ▶ | GO to HX2. |
| HX2 | CHECK FOR SMALL EVAPORATIVE EMISSION SYSTEM LEAKS FROM THE EVAPORATIVE TEST PORT | | |
| | NOTE: When checking for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid.<br>● Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source.<br>● Key on, engine off.<br>● Access VPWR PID. If the voltage is not 12 volts or greater, GO to HX61.<br>● Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister.<br>● If vehicle is not equipped with the evaporative test port, GO to HX3.<br>● Install the Rotunda Evaporative Emission System Leak Tester 310-F007 (134-00056) or equivalent at the evaporative test port.<br>● Close CV solenoid by accessing Output Test Mode on the scan tool.<br>● Select ALL OFF mode and push START button.<br>● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-$H_2O$).<br>● Follow the instructions that come with the EVAP System Leak Tester and pressurize the EVAP system.<br>● Complete the EVAP system leak test.<br>● **Does the pressure on the EVAP system stay above 1.99 kPa (8 in-$H_2O$) and pass the leak test?** | Yes ▶ | CHECK for visible damage to fuel filler cap. REMOVE the EVAP system Leak Tester from the evaporative test port. GO to HX3. |
| | | No ▶ | REMOVE the EVAP system Leak Tester from the evaporative test port. GO to HX3. |



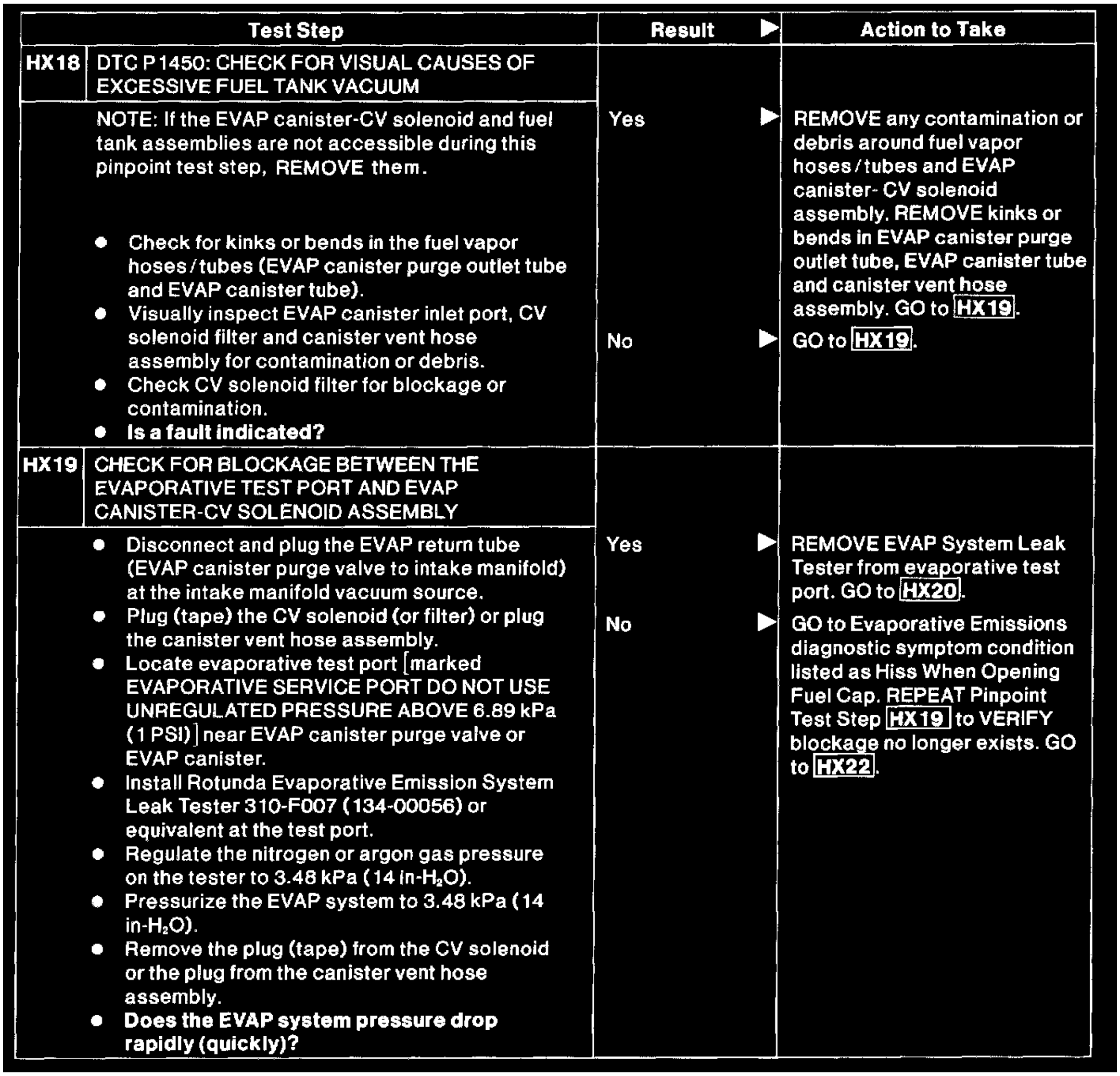
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX3** | CHECK FOR SMALL LEAKS AT FUEL FILLER CAP AND EVAPORATIVE TEST PORT | | |
| | ● Install the EVAP System Leak Tester at the fuel filler pipe.<br>● Follow the instructions that come with the EVAP System Leak Tester kit, titled TESTING AT FILLER NECK.<br>● Access the ultra-sonic detector from the test kit.<br>● Key on, engine off.<br>● Close CV solenoid by accessing Output Test Mode.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● Complete the EVAP system leak test.<br>● Slowly pass the detector probe around the fuel filler cap and the evaporative test port.<br>● **Is an audible change around the fuel filler cap (or evaporative test port) and an EVAP system leak test failure indicated?** | Yes ▶ | REPLACE fuel filler cap or evaporative test. When test port of EVAP canister purge valve, REPLACE valve. REPEAT Pinpoint Test Step HX3.<br>**For EVAP system passing the leak test:**<br>REMOVE EVAP System Leak Tester from fuel filler pipe. RECONNECT and TIGHTEN fuel filler cap only one eighth turn, so that cap initially clicks by sound or touch. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.<br>**For EVAP system not passing the leak test:**<br>REMOVE EVAP System Leak Tester from fuel filler pipe. RECONNECT and TIGHTEN fuel filler cap only one eighth turn, so that cap initially clicks by sound or touch. GO to HX4. |
| | | No ▶ | REMOVE EVAP System Leak Tester from fuel filler pipe. RECONNECT and TIGHTEN fuel filler cap only one eighth turn, so that cap initially clicks by sound or touch. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX4** | SMALL LEAK CHECK FOR EVAP SYSTEM WITH LEAK TESTER SET AT FILL POSITION | | |
| | ● Install EVAP System Leak Tester at evaporative test port.<br>● Close canister vent (CV) solenoid by accessing Output Test Mode.<br>● Select ALL OFF mode and push START button.<br>● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-$H_2O$).<br>● Follow the instructions that come with the EVAP System Leak Tester.<br>● Turn selector on the Leak Tester to FILL POSITION.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● **Does the pressure on the EVAP system hold between 3.43 and 3.53 kPa (13.80 and 14.20 in-$H_2O$)?** | Yes ▶<br>No ▶ | GO to HX5.<br>DISCONTINUE pressurizing the EVAP system. GO to HX6. |
| **HX5** | CHECK FOR SMALL LEAK IN THE ENTIRE EVAP SYSTEM WITH ULTRA-SONIC DETECTOR | | |
| | NOTE: If the EVAP canister-CV solenoid and fuel tank assemblies are not accessible during this pinpoint test step, remove them.<br>● Key on, engine off.<br>● NOTE: To assure that the CV solenoid remains closed do not energize the solenoid with the scan tool for more than nine minutes. If necessary, de-energize the CV solenoid with some time passing between checks. Close the CV solenoid closed by accessing Output Test Mode.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● Access the ultra-sonic detector from the EVAP System Leak Tester kit.<br>● Slowly pass the detector probe over the EVAP system at the following locations:<br>— EVAP return tube to EVAP canister purge valve.<br>— EVAP canister purge valve to EVAP canister-CV solenoid assembly.<br>— EVAP canister-CV solenoid assembly to fuel tank.<br>— Fuel filler cap and fuel filler pipe.<br>● **Is a sudden audible change indicated?** | Yes ▶<br>No ▶ | RECONNECT loose or REPLACE damaged fuel vapor hoses/tubes (EVAP return tube, EVAP canister purge outlet tube and EVAP canister tube). GO to HX6.<br>DISCONTINUE pressurizing EVAP system. GO to HX6. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX6** | CHECK FOR SMALL EVAPORATIVE LEAK FROM EVAP RETURN TUBE TO THE EVAP CANISTER WITH ULTRA-SONIC DETECTOR | | |
| | NOTE: Mustang, Town Car, Windstar and Ranger have a quick disconnect between the EVAP canister tube and front fuel vapor hose assembly (fuel tank to the EVAP canister). This disconnect is used as an alternative location to a fuel vapor tee or F-fitting on the EVAP canister for leak check purposes.<br>● Disconnect the EVAP canister tube (from the fuel tank) at the fuel vapor tee between the EVAP canister purge valve and EVAP canister (or at the F-fitting on the EVAP canister).<br>● Plug (cap) the fuel vapor tee open end of front fuel vapor hose at quick disconnect, or the F-fitting on the canister.<br>● Close the CV solenoid by accessing Output Test Mode on the scan tool.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at the evaporative test port.<br>● Access the ultra-sonic detector from the EVAP System Leak Tester kit.<br>● Slowly pass the detector probe from the EVAP return tube (intake manifold to EVAP canister purge valve), EVAP canister purge outlet tube (EVAP canister purge valve to EVAP canister-CV solenoid assembly) and canister vent hose assembly.<br>● **Is a sudden audible change indicated?** | Yes ▶ | RECONNECT loose or REPLACE damaged EVAP return tube, EVAP canister purge outlet tube or canister vent hose assembly.<br>REPEAT Pinpoint Test Step HX6 to VERIFY fuel vapor leak no longer exists. GO to HX7. |
| | | No ▶ | REMOVE plug from fuel vapor tee, front fuel vapor hose or F-fitting on the EVAP canister. GO to HX7. |
| **HX7** | CHECK FOR SMALL EVAPORATIVE LEAK BETWEEN EVAP CANISTER TUBE AND THE FUEL TANK AT THE FUEL FILLER PIPE | | |
| | NOTE: If the fuel vapor vent valve and fuel vapor control valve tube assemblies are not accessible to perform the following step, remove them.<br>● Remove the EVAP System Leak Tester equipment from the evaporative test port.<br>● Remove fuel filler cap.<br>● Install EVAP System Leak Tester at the fuel filler pipe.<br>● Plug the open end of the EVAP canister tube (from the fuel tank) at either the fuel vapor tee, at the quick disconnect to front fuel vapor hose, or at the F-fitting on the EVAP canister.<br>● Key on, engine off.<br>● Pressurize the EVAP system at 6.47 to 6.97 kPa (26 to 28 in-$H_2O$) with selector on the Leak Tester at FILL POSITION.<br>● Access the ultra-sonic detector from the EVAP System Tester kit.<br>● Slowly pass the detector probe from the EVAP canister tube to the fuel tank, checking the FTP sensor, fuel vapor vent valve(s), fuel vapor control valve and fuel filler pipe.<br>● **Is a sudden audible change indicated?** | Yes ▶ | RECONNECT loose or REPLACE EVAP canister tube. REPEAT Pinpoint Test Step HX7 to VERIFY a leak no longer exists. GO to HX8. |
| | | No ▶ | GO to HX8. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX8** | VERIFICATION LEAK CHECK ON THE EVAP SYSTEM AT THE FUEL FILLER PIPE | | |
| | ● Reconnect the EVAP canister tube to either the fuel vapor tee, the front fuel vapor hose to EVAP canister or the F-fitting on the EVAP canister).<br>● Key on, engine off.<br>● Close the CV solenoid by accessing Output Test Mode.<br>● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-$H_2O$).<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at the fuel filler pipe.<br>● Follow the instructions that come with the EVAP System Leak Tester.<br>● Complete the EVAP system leak test.<br>● **Does the EVAP system pass the leak test?** | Yes ▶ | REMOVE the EVAP System Leak Tester from the fuel filler pipe. RECONNECT and TIGHTEN the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. RECONNECT the EVAP return tube to the intake manifold vacuum. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | Begin at Pinpoint Test Step HX4 and locate a small leak that still exists. Proceed to Pinpoint Test Step HX8 afterwards to VERIFY repair. REMOVE the EVAP System Leak Tester. RECONNECT and TIGHTEN the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. RECONNECT the EVAP return tube to the intake manifold. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| **HX10** | DTC P0443: INSPECT EVAP CANISTER PURGE VALVE CIRCUIT FOR INTERMITTENT FAILURE | | |
| | ● Rerun KOEO, KOER Self-Tests and retrieve Continuous Memory DTCs.<br>● **Is DTC P0443 present in Continuous Memory Self-Test only?** | Yes ▶ | The fault that produced Continuous Memory DTC P0443 can be intermittent. GO to Pinpoint Test Step Z1. If OK REPLACE PCM. |
| | | No ▶ | GO to HX11. |

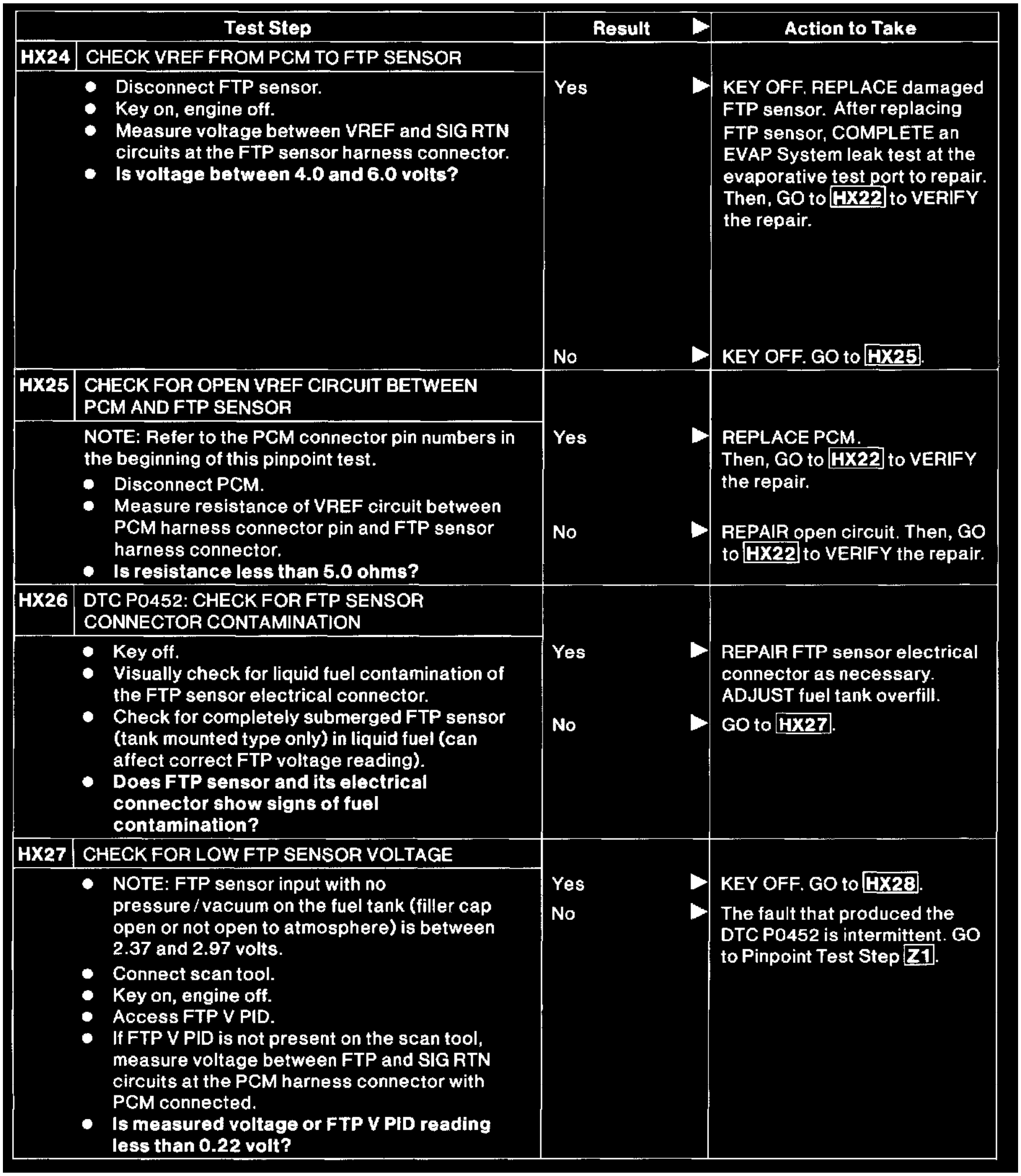
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX11** | DTC P0443: CHECK VPWR VOLTAGE TO EVAP CANISTER PURGE VALVE | | |
| | ● Key off.<br>● Disconnect EVAP canister purge valve.<br>● Key on, engine off.<br>● Measure voltage between VPWR circuit at the EVAP canister purge valve harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to **HX12**.<br>REPAIR open circuit. |
| **HX12** | CHECK EVAP CANISTER PURGE VALVE RESISTANCE | | |
| | NOTE: EVAP canister purge valve resistance reading must be taken with engine cooled down.<br>● Disconnect EVAP canister purge valve.<br>● Measure EVAP canister purge valve resistance.<br>● **Is resistance between 30 and 38 ohms?** | Yes ▶<br>No ▶ | GO to **HX13**.<br>REPLACE damaged EVAP canister purge valve. COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| **HX13** | CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of EVAP canister purge valve circuit between PCM harness connector pin and EVAP canister purge valve harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to **HX14**.<br>REPAIR open circuit. |
| **HX14** | CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO PWR GND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between EVAP canister purge valve circuit at the EVAP canister purge valve harness connector and battery negative post<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to **HX15**.<br>REPAIR short circuit. |
| **HX15** | CHECK EVAP CANISTER PURGE VALVE CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure voltage between EVAP canister purge valve circuit at the EVAP canister purge valve harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>REPLACE PCM. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX18** | DTC P1450: CHECK FOR VISUAL CAUSES OF EXCESSIVE FUEL TANK VACUUM | | |
| | NOTE: If the EVAP canister-CV solenoid and fuel tank assemblies are not accessible during this pinpoint test step, REMOVE them.<br>● Check for kinks or bends in the fuel vapor hoses/tubes (EVAP canister purge outlet tube and EVAP canister tube).<br>● Visually inspect EVAP canister inlet port, CV solenoid filter and canister vent hose assembly for contamination or debris.<br>● Check CV solenoid filter for blockage or contamination.<br>● **Is a fault indicated?** | Yes ▶ | REMOVE any contamination or debris around fuel vapor hoses/tubes and EVAP canister- CV solenoid assembly. REMOVE kinks or bends in EVAP canister purge outlet tube, EVAP canister tube and canister vent hose assembly. GO to HX19. |
| | | No ▶ | GO to HX19. |
| **HX19** | CHECK FOR BLOCKAGE BETWEEN THE EVAPORATIVE TEST PORT AND EVAP CANISTER-CV SOLENOID ASSEMBLY | | |
| | ● Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source.<br>● Plug (tape) the CV solenoid (or filter) or plug the canister vent hose assembly.<br>● Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister.<br>● Install Rotunda Evaporative Emission System Leak Tester 310-F007 (134-00056) or equivalent at the test port.<br>● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-$H_2O$).<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● Remove the plug (tape) from the CV solenoid or the plug from the canister vent hose assembly.<br>● **Does the EVAP system pressure drop rapidly (quickly)?** | Yes ▶ | REMOVE EVAP System Leak Tester from evaporative test port. GO to HX20. |
| | | No ▶ | GO to Evaporative Emissions diagnostic symptom condition listed as Hiss When Opening Fuel Cap. REPEAT Pinpoint Test Step HX19 to VERIFY blockage no longer exists. GO to HX22. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HX20 | PRESSURE CHECK THE FUEL FILLER CAP | | |
| | NOTE: When checking for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid.<br>● Install the EVAP System Leak Tester at the fuel filler pipe.<br>● Follow the instructions that come with the EVAP System Leak Tester kit to perform TESTING AT FILLER NECK.<br>● Key on, engine off.<br>● Close CV solenoid by accessing Output Test Mode on the scan tool.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at the evaporative test port.<br>● NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector. Access the ultra-sonic detector from the EVAP System Leak Tester kit.<br>● Slowly pass the detector probe around the fuel filler cap and the evaporative test port.<br>● **Is an audible change around the fuel filler cap indicated?** | Yes ▶ | REPLACE fuel filler cap. REPEAT HX20 to VERIFY repair. GO to HX21. |
| | | No ▶ | GO to HX21. |
| HX21 | CHECK FOR BLOCKAGE BETWEEN THE EVAPORATIVE TEST PORT TANK WITH FUEL FILLER CAP REMOVED | | |
| | ● Key on, engine off.<br>● Close CV solenoid by accessing Output Test Mode.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● REMOVE fuel filler cap.<br>● **Does the pressure drop rapidly (quickly)?** | Yes ▶ | REMOVE the EVAP System Leak Tester from the fuel filler pipe. GO to HX22. |
| | | No ▶ | GO to Evaporative Emissions diagnostic symptom condition listed as Hiss When Opening Fuel Cap. REPEAT Pinpoint Test Step HX21 to VERIFY a blockage no longer exists. Then, GO to HX22. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX22** | CHECK FUEL TANK PRESSURE SENSOR PIDS WITH FUEL FILLER CAP REMOVED | | |
| | NOTE: FTP sensor input for KOEO, KOER with no pressure or no vacuum on the fuel tank (fuel filler cap on or off) is 2.40 to 2.80 volts.<br>● Remove fuel filler cap.<br>● Key on, engine off.<br>● Access the FTP [FTP V] PIDs.<br>● Record the reading.<br>● **Is FTP [FTP V] PID reading between -0.37 and 0.37 kPa (-1.50 and 1.50 in-$H_2O$) [2.40 and 2.80 volts] with the fuel filler cap off?** | Yes ▶ | INSTALL the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. GO to HX23. |
| | | No ▶ | GO to HX24. |
| **HX23** | CHECK FOR STUCK OPEN EVAP CANISTER PURGE VALVE CONDITION AT IDLE | | |
| | NOTE: When the EVAPPDC PID reads zero the FTP [FTP V] PID must read +/-0.37 kPa (+/-1.50 in-$H_2O$) [2.40 to 2.80 volts].<br>● Open the CV solenoid to atmosphere by removing the plug from the canister vent hose assembly or the tape from the the CV solenoid filter cap.<br>● Remove plug and reconnect the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source.<br>● Verify fuel filler cap is installed.<br>● Key on, engine off.<br>● Access the FTP, FTP V and EVAPPDC PIDs.<br>● Start engine.<br>● **When EVAPPDC PID is zero, is the FTP [FTP V] PID reading below -0.37 kPa (-1.50 in-$H_2O$) 2.40 volts?** | Yes ▶ | The EVAP canister purge valve is stuck open. REPLACE EVAP canister purge valve. INSTALL the EVAP System Leak Tester or equivalent to the evaporative test port. COMPLETE an EVAP system leak test to VERIFY a leak did not occur during component replacement. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | If FTP (FTP V) PID is within the range specified in Pinpoint Test Step HX22, COMPLETE an EVAP system leak test to VERIFY no leak exists. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle GO to HX19 to find additional blockages. |



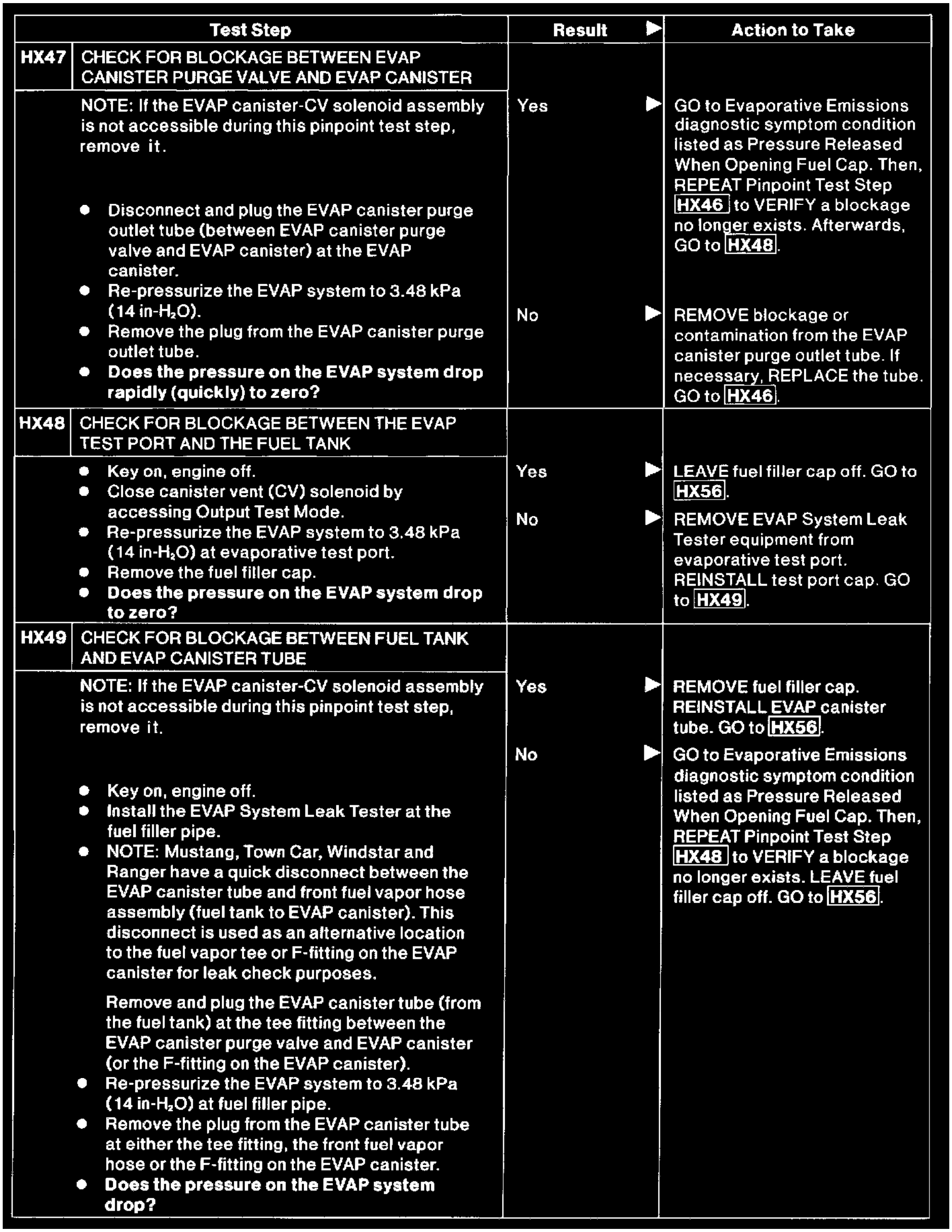
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX24** | CHECK VREF FROM PCM TO FTP SENSOR | | |
| | ● Disconnect FTP sensor.<br>● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector.<br>● **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. REPLACE damaged FTP sensor. After replacing FTP sensor, COMPLETE an EVAP System leak test at the evaporative test port to repair. Then, GO to HX22 to VERIFY the repair. |
| | | No ▶ | KEY OFF. GO to HX25. |
| **HX25** | CHECK FOR OPEN VREF CIRCUIT BETWEEN PCM AND FTP SENSOR | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of VREF circuit between PCM harness connector pin and FTP sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE PCM. Then, GO to HX22 to VERIFY the repair. |
| | | No ▶ | REPAIR open circuit. Then, GO to HX22 to VERIFY the repair. |
| **HX26** | DTC P0452: CHECK FOR FTP SENSOR CONNECTOR CONTAMINATION | | |
| | ● Key off.<br>● Visually check for liquid fuel contamination of the FTP sensor electrical connector.<br>● Check for completely submerged FTP sensor (tank mounted type only) in liquid fuel (can affect correct FTP voltage reading).<br>● **Does FTP sensor and its electrical connector show signs of fuel contamination?** | Yes ▶ | REPAIR FTP sensor electrical connector as necessary. ADJUST fuel tank overfill. |
| | | No ▶ | GO to HX27. |
| **HX27** | CHECK FOR LOW FTP SENSOR VOLTAGE | | |
| | ● NOTE: FTP sensor input with no pressure / vacuum on the fuel tank (filler cap open or not open to atmosphere) is between 2.37 and 2.97 volts.<br>● Connect scan tool.<br>● Key on, engine off.<br>● Access FTP V PID.<br>● If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected.<br>● **Is measured voltage or FTP V PID reading less than 0.22 volt?** | Yes ▶ | KEY OFF. GO to HX28. |
| | | No ▶ | The fault that produced the DTC P0452 is intermittent. GO to Pinpoint Test Step Z1. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX28** | CHECK OPPOSITE INDUCED HIGH FTP SIGNAL | | |
| | • Disconnect FTP sensor.<br>• Connect a jumper wire between VREF circuit and FTP circuits at the FTP sensor harness connector.<br>• Key on, engine off.<br>• If a scan tool communication concern exists, remove jumper immediately and go directly to HX29.<br>• Access FTP V PID.<br>• If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected.<br>• **Is measured voltage or FTP V PID reading between 4.0 and 6.0 volts?** | Yes ▶ | REPLACE FTP sensor. RESTORE vehicle. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REMOVE jumper. GO to HX29. |
| **HX29** | CHECK VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR | | |
| | • Key on, engine off.<br>• Measure voltage between VREF and SIG RTN circuits at the FTP sensor harness connector.<br>• **Is voltage between 4.0 and 6.0 volts?** | Yes ▶ | KEY OFF. GO to HX30. |
| | | No ▶ | VREF voltage is out of range. GO to Pinpoint Test Step C1. |
| **HX30** | CHECK FTP CIRCUIT FOR SHORT TO SIG RTN OR PWR GND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>• Disconnect PCM.<br>• Disconnect scan tool from DLC.<br>• Measure resistance between FTP and SIG RTN circuits at the PCM harness connector.<br>• Measure resistance between FTP circuit at the PCM harness connector and battery negative post.<br>• **Is each resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |
| **HX33** | DTC P0453: CHECK FOR HIGH FTP SENSOR VOLTAGE | | |
| | NOTE: FTP sensor input with no pressure/vacuum on the fuel tank (fuel filler cap open or not open to atmosphere) is 2.37 to 2.97 volts.<br>• Connect scan tool.<br>• Key on, engine off.<br>• Access FTP V PID.<br>• If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected.<br>• **Is measured voltage or FTP V PID reading greater than 4.50 volts?** | Yes ▶ | KEY OFF. GO to HX34. |
| | | No ▶ | The fault that produced DTC P0453 is intermittent. GO to Pinpoint Test Step Z1. |

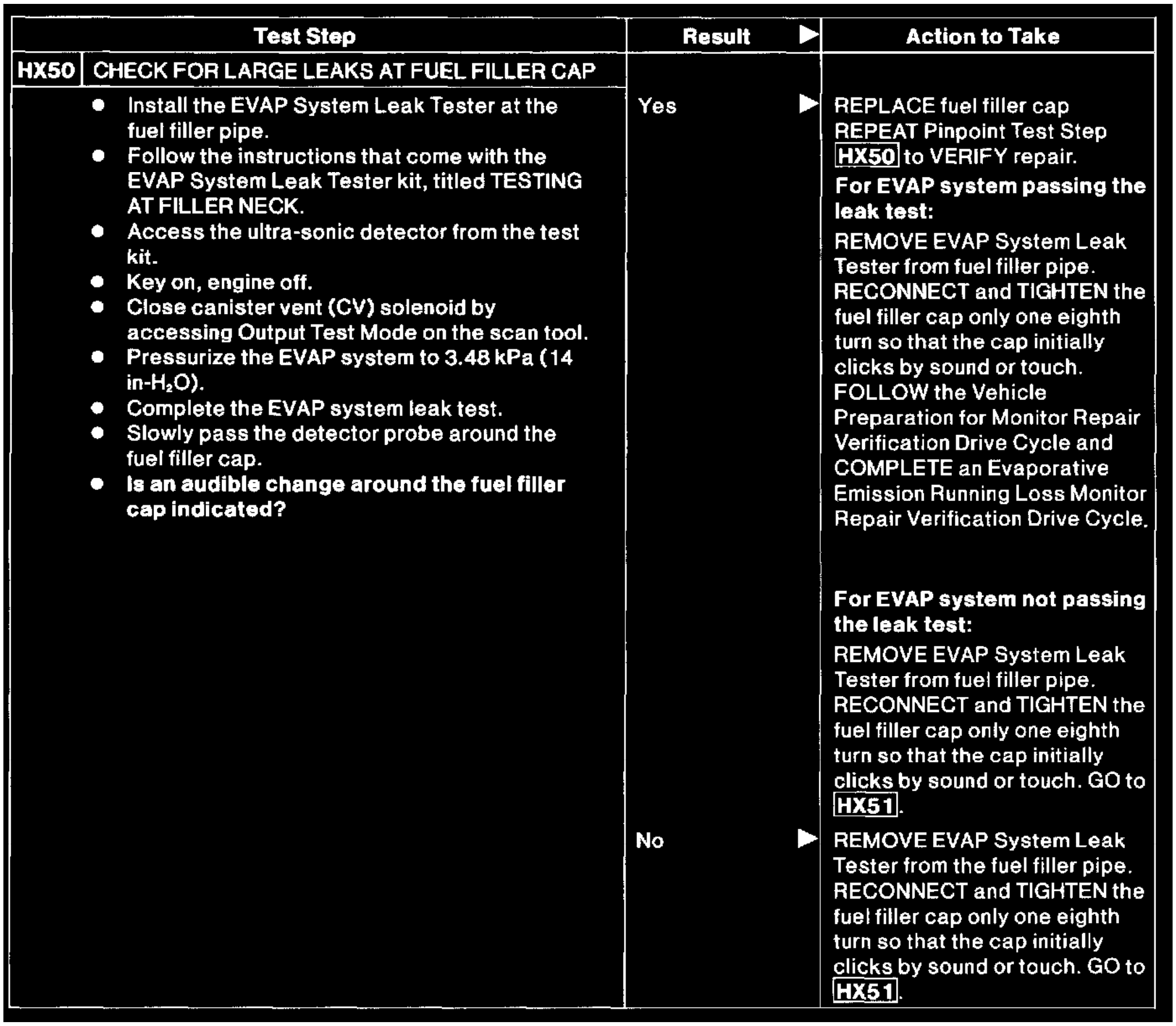
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX34** | CHECK FTP CIRCUIT FOR SHORT TO POWER | | |
| | - Disconnect FTP sensor.<br>- Key on, engine off.<br>- Measure voltage between FTP circuit at the FTP sensor harness connector and battery negative post.<br>- **Is the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. The FTP is indicating a short to VPWR. GO to HX35.<br>KEY OFF. GO to HX36. |
| **HX35** | CHECK FTP CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>- Disconnect PCM.<br>- Key on, engine off.<br>- Measure the voltage between FTP circuit at the PCM harness connector and battery negative post.<br>- **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>REPLACE PCM. |
| **HX36** | CHECK OPPOSITE INDUCED LOW FTP SIGNAL | | |
| | - Connect a jumper wire between SIG RTN and FTP circuits at the FTP sensor harness connector.<br>- Key on, engine off.<br>- If a scan tool communication concern exists, turn the key off, remove jumper immediately and go directly to HX41.<br>- Access FTP V PID.<br>- If FTP V PID is not present on the scan tool, measure voltage between FTP and SIG RTN circuits at the PCM harness connector with PCM connected.<br>- **Is measured voltage or FTP V PID reading less than 0.10 volt?** | Yes ▶<br>No ▶ | REMOVE jumper. GO to HX37.<br>Unable to induce opposite signal. KEY OFF. GO to HX39. |
| **HX37** | CHECK FOR IN RANGE VOLTAGE BETWEEN VREF AND SIG RTN CIRCUITS AT FTP SENSOR | | |
| | - Key on, engine off.<br>- Measure voltage between VREF and SIG RTN circuits at the FTP sensor vehicle harness connector.<br>- **Is voltage between 4.0 and 6.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HX38.<br>VREF voltage is out of range. GO to Pinpoint Test Step C1. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX38** | CHECK FTP CIRCUIT FOR SHORT TO VREF IN SENSOR OR HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance between FTP and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is the resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE FTP sensor. RESTORE vehicle. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REPAIR short circuit. |
| **HX39** | CHECK FTP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of FTP circuit between PCM harness connector pin and FTP sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to HX40. |
| | | No ▶ | REPAIR open circuit. |
| **HX40** | CHECK FOR OPEN SIG RTN CIRCUIT BETWEEN PCM AND FTP SENSOR | | |
| | ● Measure resistance of SIG RTN circuit between PCM harness connector pin and FTP sensor harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to HX41. |
| | | No ▶ | REPAIR open circuit. |
| **HX41** | CHECK FTP CIRCUIT FOR SHORT TO VREF IN PCM | | |
| | ● PCM disconnected.<br>● Measure resistance between FTP and VREF circuits at the PCM harness connector. (For LS6/LS8 measure to both VREF pins.)<br>● **Is the resistance greater than 10,000?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |
| **HX44** | DTC P0455: VISUAL INSPECTION FOR SUBSTANTIAL EVAPORATIVE EMISSION SYSTEM LEAKS | | |
| | ● Check for missing fuel filler cap. If the cap is loose DO NOT DISTURB EVAP system.<br>● Verify that both the input port vacuum hose and EVAP return tube are attached to the EVAP canister purge valve.<br>● NOTE: If the EVAP canister-CV solenoid assembly is not accessible during this pinpoint test step, remove. Verify that the CV solenoid is properly seated on the EVAP canister (if possible).<br>● Visually inspect for disconnected or cracked fuel vapor hoses/tubes between the intake manifold, the EVAP canister purge valve, the EVAP canister, the fuel vapor vent valve assembly and if applicable the fuel vapor control valve tube assembly.<br>● Check for damage to the fuel filler pipe and the fuel tank.<br>● **Is a fault indicated?** | Yes ▶ | CONNECT or REPLACE fuel vapor hoses/tubes as required. REPLACE damaged EVAP system components (fuel filler pipe, fuel vapor vent valve assembly, fuel vapor control valve tube assembly, EVAP canister purge valve, FTP sensor and EVAP canister-CV solenoid assembly) as necessary. GO to HX45. |
| | | No ▶ | GO to HX45. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX45** | CHECK FOR EVAPORATIVE EMISSION SYSTEM LEAKS | | |
| | NOTE: When checking for leaks or blockages in the EVAP system, energize (close) the canister vent (CV) solenoid through the scan tool for a maximum of nine minutes per pinpoint test step. Then de-energize the CV solenoid prior to performing the subsequent pinpoint test step. This is done to assure proper closing of the solenoid.<br>● Disconnect and plug the EVAP return tube (EVAP canister purge valve to intake manifold) at the intake manifold vacuum source.<br>● Connect scan tool.<br>● Key on, engine off.<br>● Access VPWR PID. If the voltage is not 12 volts or greater, GO to HX61.<br>● Locate evaporative test port [marked EVAPORATIVE SERVICE PORT DO NOT USE UNREGULATED PRESSURE ABOVE 6.89 kPa (1 PSI)] near EVAP canister purge valve or EVAP canister.<br>● If vehicle is not equipped with the evaporative test port, GO to HX50.<br>● Install the Rotunda Evaporative Emission System Leak Tester 310-F007 (134-00056) or equivalent at the evaporative test port.<br>● Close CV solenoid by accessing Output Test Mode on the scan tool.<br>● Select ALL OFF mode and push START button.<br>● Regulate the nitrogen or argon gas pressure on the tester to 3.48 kPa (14 in-$H_2O$).<br>● Follow the instructions that come with the EVAP System Leak Tester and pressurize the EVAP system.<br>● Perform the EVAP system leak test.<br>● **Does the pressure on the EVAP system stay above 1.99 kPa (8 in-$H_2O$) and pass the leak test?** | Yes ▶<br>No ▶ | GO to HX46.<br>REMOVE the EVAP System Leak Tester from the evaporative test port and REINSTALL the test port cap. GO to HX50. |
| **HX46** | BLOCKAGE CHECK FOR EVAP CANISTER-CV SOLENOID ASSEMBLY | | |
| | ● Key on, engine off.<br>● Close CV solenoid by accessing Output Test Mode.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● De-energize the CV solenoid using scan tool.<br>● **Does the pressure on the EVAP system drop rapidly (quickly) to zero?** | Yes ▶<br>No ▶ | GO to HX48.<br>GO to HX47. |

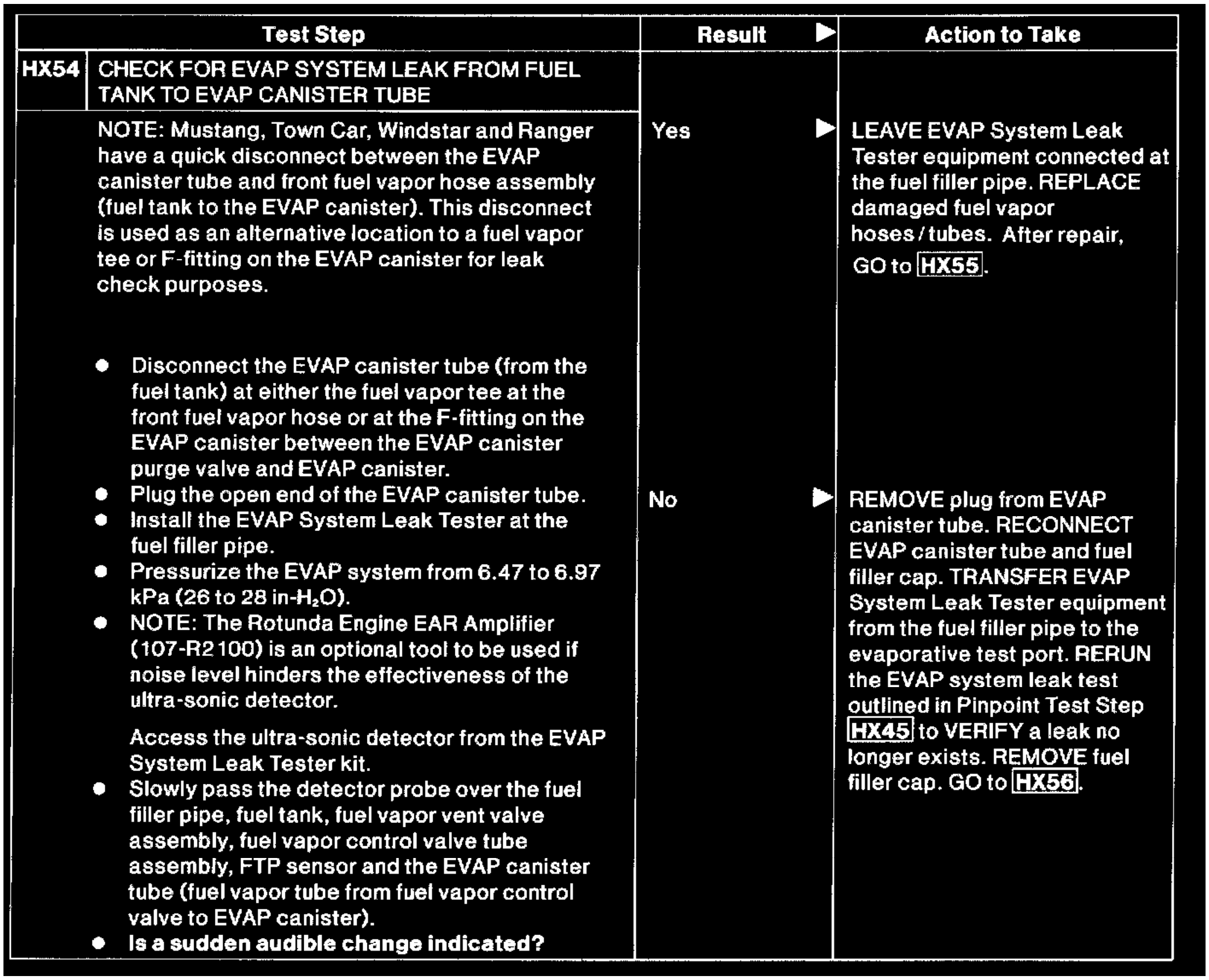


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX47** | CHECK FOR BLOCKAGE BETWEEN EVAP CANISTER PURGE VALVE AND EVAP CANISTER | | |
| | NOTE: If the EVAP canister-CV solenoid assembly is not accessible during this pinpoint test step, remove it.<br>● Disconnect and plug the EVAP canister purge outlet tube (between EVAP canister purge valve and EVAP canister) at the EVAP canister.<br>● Re-pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● Remove the plug from the EVAP canister purge outlet tube.<br>● **Does the pressure on the EVAP system drop rapidly (quickly) to zero?** | Yes ▶ | GO to Evaporative Emissions diagnostic symptom condition listed as Pressure Released When Opening Fuel Cap. Then, REPEAT Pinpoint Test Step HX46 to VERIFY a blockage no longer exists. Afterwards, GO to HX48. |
| | | No ▶ | REMOVE blockage or contamination from the EVAP canister purge outlet tube. If necessary, REPLACE the tube. GO to HX46. |
| **HX48** | CHECK FOR BLOCKAGE BETWEEN THE EVAP TEST PORT AND THE FUEL TANK | | |
| | ● Key on, engine off.<br>● Close canister vent (CV) solenoid by accessing Output Test Mode.<br>● Re-pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at evaporative test port.<br>● Remove the fuel filler cap.<br>● **Does the pressure on the EVAP system drop to zero?** | Yes ▶ | LEAVE fuel filler cap off. GO to HX56. |
| | | No ▶ | REMOVE EVAP System Leak Tester equipment from evaporative test port. REINSTALL test port cap. GO to HX49. |
| **HX49** | CHECK FOR BLOCKAGE BETWEEN FUEL TANK AND EVAP CANISTER TUBE | | |
| | NOTE: If the EVAP canister-CV solenoid assembly is not accessible during this pinpoint test step, remove it.<br>● Key on, engine off.<br>● Install the EVAP System Leak Tester at the fuel filler pipe.<br>● NOTE: Mustang, Town Car, Windstar and Ranger have a quick disconnect between the EVAP canister tube and front fuel vapor hose assembly (fuel tank to EVAP canister). This disconnect is used as an alternative location to the fuel vapor tee or F-fitting on the EVAP canister for leak check purposes.<br>Remove and plug the EVAP canister tube (from the fuel tank) at the tee fitting between the EVAP canister purge valve and EVAP canister (or the F-fitting on the EVAP canister).<br>● Re-pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at fuel filler pipe.<br>● Remove the plug from the EVAP canister tube at either the tee fitting, the front fuel vapor hose or the F-fitting on the EVAP canister.<br>● **Does the pressure on the EVAP system drop?** | Yes ▶ | REMOVE fuel filler cap. REINSTALL EVAP canister tube. GO to HX56. |
| | | No ▶ | GO to Evaporative Emissions diagnostic symptom condition listed as Pressure Released When Opening Fuel Cap. Then, REPEAT Pinpoint Test Step HX48 to VERIFY a blockage no longer exists. LEAVE fuel filler cap off. GO to HX56. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX50** | CHECK FOR LARGE LEAKS AT FUEL FILLER CAP | | |
| | - Install the EVAP System Leak Tester at the fuel filler pipe.<br>- Follow the instructions that come with the EVAP System Leak Tester kit, titled TESTING AT FILLER NECK.<br>- Access the ultra-sonic detector from the test kit.<br>- Key on, engine off.<br>- Close canister vent (CV) solenoid by accessing Output Test Mode on the scan tool.<br>- Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>- Complete the EVAP system leak test.<br>- Slowly pass the detector probe around the fuel filler cap.<br>- **Is an audible change around the fuel filler cap indicated?** | Yes ▶ | REPLACE fuel filler cap<br>REPEAT Pinpoint Test Step HX50 to VERIFY repair.<br>**For EVAP system passing the leak test:**<br>REMOVE EVAP System Leak Tester from fuel filler pipe. RECONNECT and TIGHTEN the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.<br>**For EVAP system not passing the leak test:**<br>REMOVE EVAP System Leak Tester from fuel filler pipe. RECONNECT and TIGHTEN the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. GO to HX51. |
| | | No ▶ | REMOVE EVAP System Leak Tester from the fuel filler pipe. RECONNECT and TIGHTEN the fuel filler cap only one eighth turn so that the cap initially clicks by sound or touch. GO to HX51. |

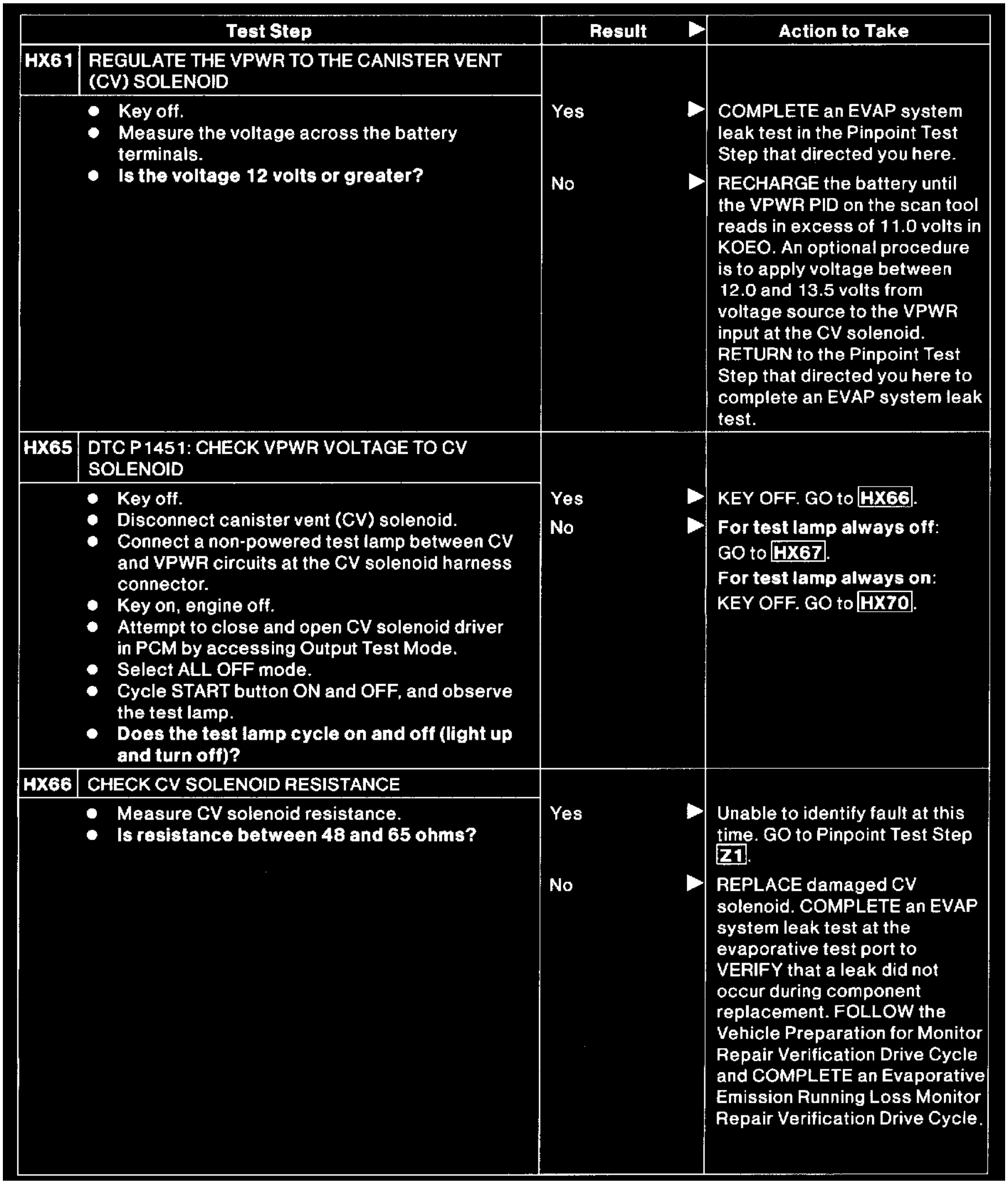
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX51** | CHECK FOR FUEL VAPOR LEAK IN THE EVAP CANISTER-CV SOLENOID ASSEMBLY | | |
| | NOTE: If the EVAP canister-CV solenoid assembly is not accessible during this pinpoint test step,<br>● Plug the canister vent hose assembly or close (tape CV filter shut) the CV solenoid to atmosphere.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at evaporative service port.<br>● Slowly pass the detector probe around the EVAP canister-CV solenoid assembly.<br>● **Is an audible change around the EVAP canister-CV solenoid assembly indicated?** | Yes ▶ | LEAK test the EVAP canister-CV solenoid assembly. REPLACE damaged component. COMPLETE leak test on EVAP canister-CV solenoid assembly prior to installation in vehicle. Then, REPEAT Pinpoint Test Step HX45 to VERIFY fuel vapor leak no longer exists, disregarding the Action To Take direction in that step.<br>**For EVAP system passing the leak test:**<br>FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle.<br>**For EVAP system not passing the leak test:**<br>GO to HX52. |
| | | No ▶ | GO to HX52. |
| **HX52** | CHECK FOR EVAP SYSTEM LEAK FROM EVAP TEST PORT TO EVAP CANISTER ASSEMBLY | | |
| | ● Disconnect the EVAP canister tube (from the fuel tank) at the fuel vapor tee between the EVAP canister purge valve and EVAP canister (or at the F-fitting on the EVAP canister).<br>● Plug (cap) the fuel vapor tee (or F-fitting on the EVAP canister).<br>● Close the CV solenoid closed by accessing Output Test Mode on the scan tool.<br>● Re-pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) at the evaporative service port.<br>● NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector.<br>Access the ultra-sonic detector from the EVAP System Leak Tester kit.<br>● Slowly pass the detector probe from the EVAP return tube (intake manifold to EVAP canister purge valve) to the EVAP canister assembly.<br>● **Is a sudden audible change indicated?** | Yes ▶ | REPLACE fuel vapor hoses/tubes or damaged components as necessary. REMOVE plug tee or F-fitting.RECONNECT the EVAP canister tube. GO to HX53. |
| | | No ▶ | GO to HX54. |
| **HX53** | VERIFICATION OF REPAIR BETWEEN EVAP TEST PORT TO EVAP CANISTER ASSEMBLY | | |
| | ● Complete the leak test outlined in Pinpoint Test Step HX45, disregarding the Action To Take direction in that step.<br>● **Does the pressure on the EVAP system stay above 1.99 kPa (8 in-$H_2O$) and pass the leak test?** | Yes ▶ | REMOVE EVAP System Leak Tester equipment from evaporative test port. LEAVE fuel filler cap off. GO to HX56. |
| | | No ▶ | REMOVE EVAP System Leak Tester equipment from evaporative test port. GO to HX54. |



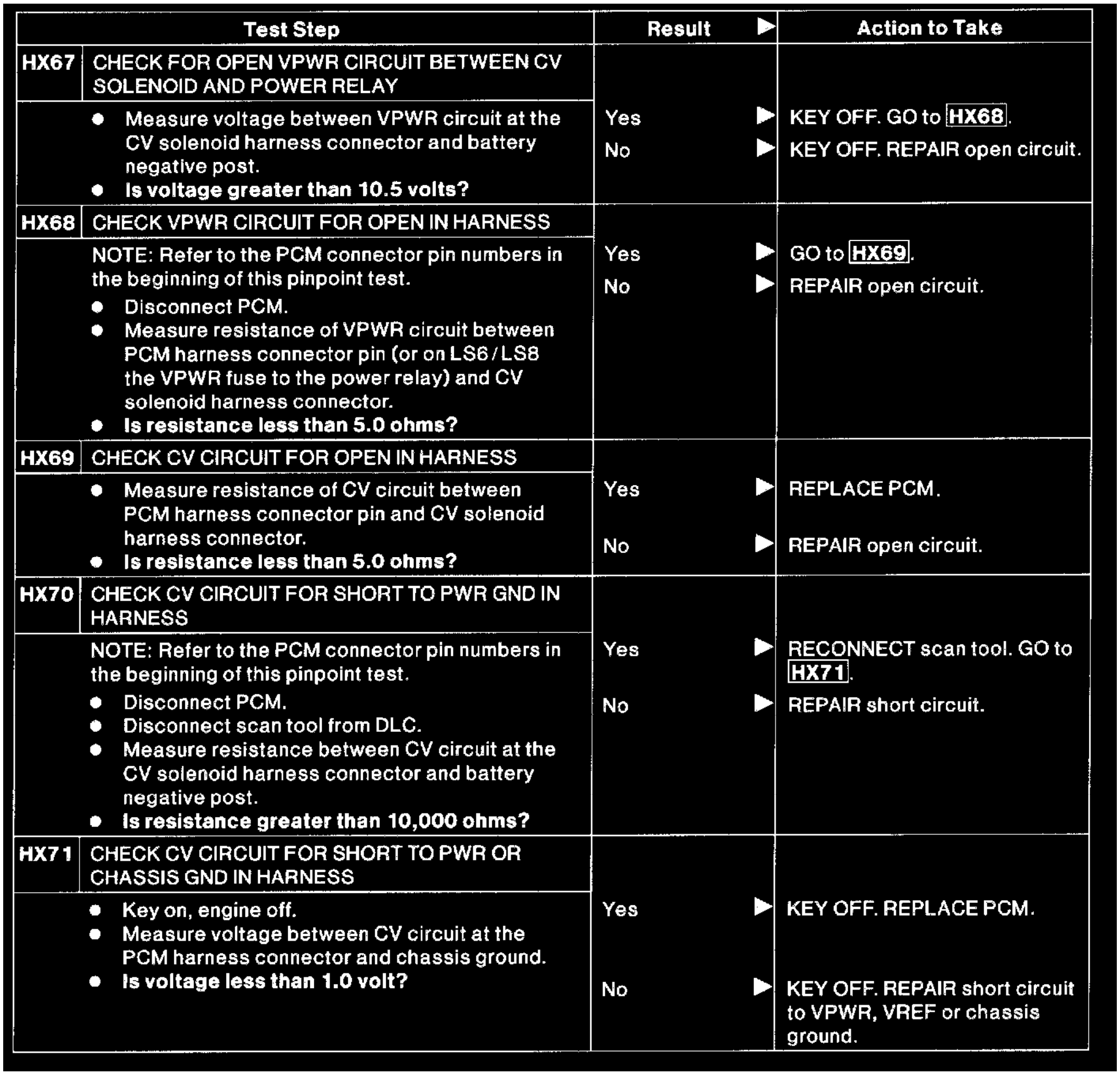
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HX54 | CHECK FOR EVAP SYSTEM LEAK FROM FUEL TANK TO EVAP CANISTER TUBE | | |
| | NOTE: Mustang, Town Car, Windstar and Ranger have a quick disconnect between the EVAP canister tube and front fuel vapor hose assembly (fuel tank to the EVAP canister). This disconnect is used as an alternative location to a fuel vapor tee or F-fitting on the EVAP canister for leak check purposes.<br>● Disconnect the EVAP canister tube (from the fuel tank) at either the fuel vapor tee at the front fuel vapor hose or at the F-fitting on the EVAP canister between the EVAP canister purge valve and EVAP canister.<br>● Plug the open end of the EVAP canister tube.<br>● Install the EVAP System Leak Tester at the fuel filler pipe.<br>● Pressurize the EVAP system from 6.47 to 6.97 kPa (26 to 28 in-$H_2O$).<br>● NOTE: The Rotunda Engine EAR Amplifier (107-R2100) is an optional tool to be used if noise level hinders the effectiveness of the ultra-sonic detector.<br>Access the ultra-sonic detector from the EVAP System Leak Tester kit.<br>● Slowly pass the detector probe over the fuel filler pipe, fuel tank, fuel vapor vent valve assembly, fuel vapor control valve tube assembly, FTP sensor and the EVAP canister tube (fuel vapor tube from fuel vapor control valve to EVAP canister).<br>● **Is a sudden audible change indicated?** | Yes ▶ | LEAVE EVAP System Leak Tester equipment connected at the fuel filler pipe. REPLACE damaged fuel vapor hoses / tubes. After repair, GO to HX55. |
| | | No ▶ | REMOVE plug from EVAP canister tube. RECONNECT EVAP canister tube and fuel filler cap. TRANSFER EVAP System Leak Tester equipment from the fuel filler pipe to the evaporative test port. RERUN the EVAP system leak test outlined in Pinpoint Test Step HX45 to VERIFY a leak no longer exists. REMOVE fuel filler cap. GO to HX56. |

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HX55** VERIFICATION OF REPAIR BETWEEN FUEL TANK AND EVAP CANISTER | | |
| ● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$) and perform leak test.<br>● **Does the pressure on the EVAP system stay above 1.99 kPa (8 in-$H_2O$) and pass the leak test?** | Yes ▶ | REMOVE plug from EVAP canister tube. RECONNECT EVAP canister tube and fuel filler cap. TRANSFER EVAP System Leak Tester equipment from the fuel filler pipe to the evaporative test port. RERUN the EVAP system leak test outlined in Pinpoint Test Step HX45 to VERIFY a leak no longer exists. REMOVE fuel filler cap. GO to HX56. |
| | No ▶ | REPEAT Pinpoint Test Step HX54 to isolate the additional source of the fuel vapor leak. |
| **HX56** CHECK FOR FUEL TANK PRESSURE SENSOR FUNCTION WITH FUEL FILLER CAP REMOVED | | |
| ● Key on, engine off.<br>● Access the VPWR PID.<br>● If VPWR PID is not greater than 10.5 volts less, refer to Pinpoint Test Step HX61 to charge the system. Then, return to this pinpoint test step.<br>● Access the FTP (FTP V) PID.<br>● **Is the FTP (FTP V) PID voltage between (-0.12 to +0.12 kPa [-0.5 to +0.5 in-$H_2O$]) (2.40 to 2.80 volts) with the fuel filler cap off?** | Yes ▶ | GO to HX57. |
| | No ▶ | REPLACE damaged FTP sensor. REPEAT this Pinpoint Test Step to VERIFY the repair. GO to HX57. |
| **HX57** FUEL TANK PRESSURE SENSOR FUNCTIONAL CHECK WITH PRESSURE APPLIED TO EVAP SYSTEM | | |
| ● Install the EVAP System Leak Tester equipment at the fuel filler pipe.<br>● Plug the canister vent hose assembly or close (tape CV filter shut) the CV solenoid to atmosphere.<br>● Key on, engine off<br>● Access the FTP (FTP V) PID.<br>● Pressurize the EVAP system to 3.48 kPa (14 in-$H_2O$).<br>● Key off.<br>● **Was the FTP (FTP V) PID reading (3.11 to 3.86 kPa [12.5 to 15.5 in-$H_2O$]) (4.22 to 4.90 volts) with pressure applied to EVAP system?** | Yes ▶ | REMOVE the EVAP System Leak Tester equipment from fuel filler pipe. RECONNECT fuel filler cap. REMOVE the plug from the canister vent hose assembly or tape from the CV solenoid. GO to HX58. |
| | No ▶ | DISCONTINUE pressurizing the EVAP system. REPLACE damaged FTP sensor. REPEAT Pinpoint Test Step HX56 to VERIFY a -0.5 to +0.5 in-$H_2O$ (2.40 to 2.80 voltage) reading with fuel filler cap removed. |

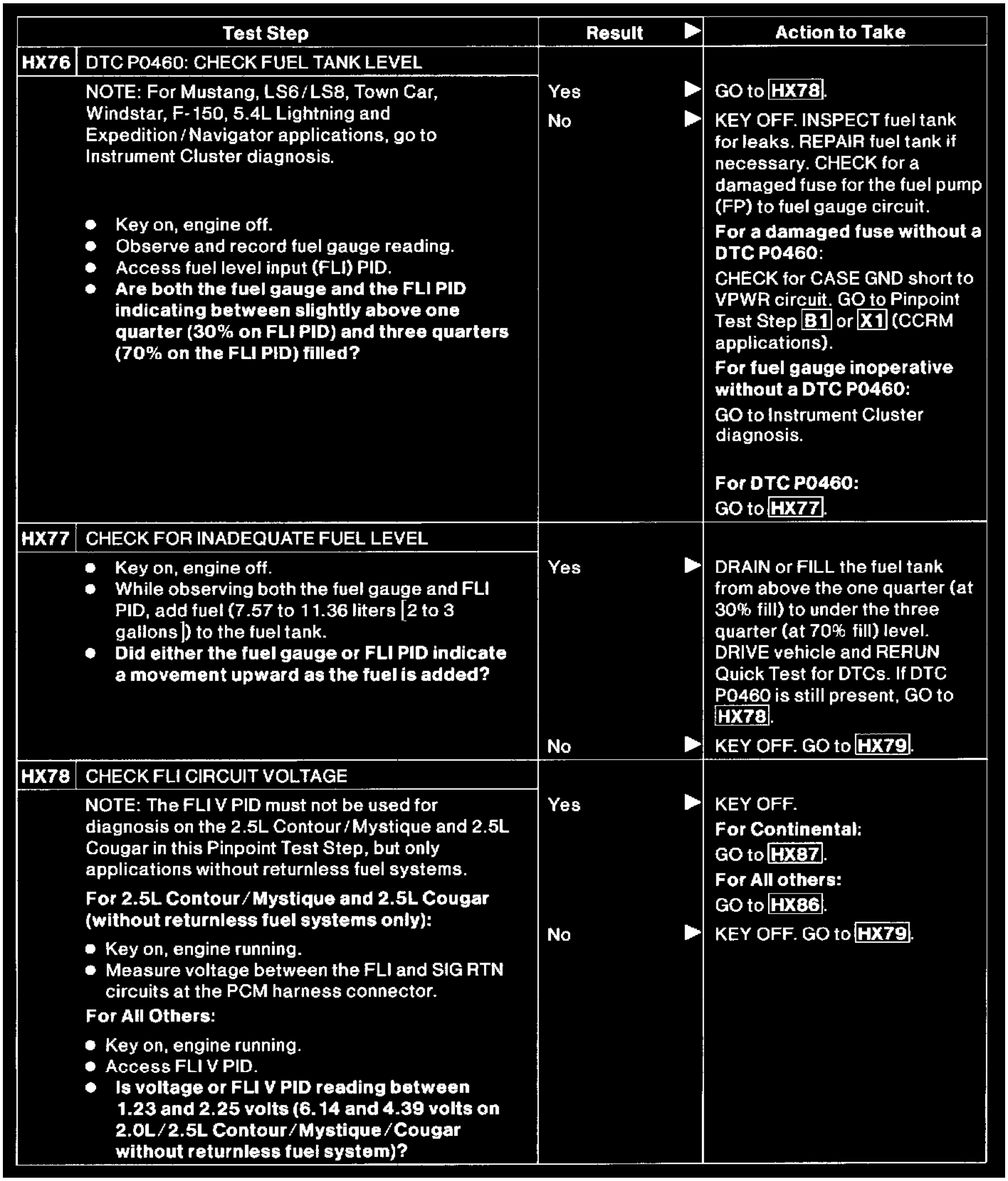
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX58** | CHECK FOR EVAP CANISTER PURGE VALVE OPERATION WITH ENGINE AT IDLE | | |
| | ● Remove plug and connect EVAP return tube at the intake manifold vacuum source.<br>● Key on, engine off.<br>● Access EVAPPDC PID and FTP (FTP V) PID.<br>● Start engine. Observe the EVAPPDC PID and FTP (FTP V) PID.<br>● Idle engine until EVAPPDC PID reaches a minimum of 40% duty cycle.<br>● **Does the FTP V PID read less than 0.0 in-$H_2O$ (2.60 volts)?** | Yes ▶ | FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to HX59. |
| **HX59** | CHECK FOR INTAKE MANIFOLD VACUUM TO EVAP CANISTER PURGE VALVE | | |
| | NOTE: At high elevations (altitude) the intake manifold vacuum source readings at both the input port vacuum hose and EVAP return tube must be at least 33.77 kPa (10 in-Hg).<br>● Disconnect the input port vacuum hose and EVAP return tube at the EVAP canister purge valve.<br>● Install a vacuum gauge in kPa (in-Hg) to the open end of the input port vacuum hose and plug the open end of the EVAP return tube.<br>● Start engine.<br>● Observe vacuum gauge for manifold vacuum and record reading.<br>● Key on, engine off.<br>● Install the vacuum gauge to the EVAP return tube and plug the open end of the input port vacuum hose.<br>● Again, start engine.<br>● Again, observe the vacuum gauge for manifold vacuum.<br>● **Are both vacuum gauge readings between 47.28 and 67.54 kPa (14 and 20 in-Hg)?** | Yes ▶ | REMOVE vacuum gauge. REPLACE damaged EVAP canister purge valve. RECONNECT input port vacuum hose and EVAP return tube to the EVAP canister purge valve. COMPLETE an EVAP system leak test at evaporative test port to VERIFY the repair. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |
| | | No ▶ | CHECK for blockage in the input port vacuum hose or EVAP return tube. CHECK intake manifold tree or port for debris or obstructions. REPLACE or REPAIR as necessary. If fuel vapor hoses/tube are replaced, COMPLETE an EVAP System leak test at evaporative test port to VERIFY the repair. REPEAT Pinpoint Test Step HX58 to VERIFY blockage repair. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **HX61** REGULATE THE VPWR TO THE CANISTER VENT (CV) SOLENOID | | |
| ● Key off.<br>● Measure the voltage across the battery terminals.<br>● **Is the voltage 12 volts or greater?** | Yes ▶ | COMPLETE an EVAP system leak test in the Pinpoint Test Step that directed you here. |
| | No ▶ | RECHARGE the battery until the VPWR PID on the scan tool reads in excess of 11.0 volts in KOEO. An optional procedure is to apply voltage between 12.0 and 13.5 volts from voltage source to the VPWR input at the CV solenoid. RETURN to the Pinpoint Test Step that directed you here to complete an EVAP system leak test. |
| **HX65** DTC P1451: CHECK VPWR VOLTAGE TO CV SOLENOID | | |
| ● Key off.<br>● Disconnect canister vent (CV) solenoid.<br>● Connect a non-powered test lamp between CV and VPWR circuits at the CV solenoid harness connector.<br>● Key on, engine off.<br>● Attempt to close and open CV solenoid driver in PCM by accessing Output Test Mode.<br>● Select ALL OFF mode.<br>● Cycle START button ON and OFF, and observe the test lamp.<br>● **Does the test lamp cycle on and off (light up and turn off)?** | Yes ▶ | KEY OFF. GO to HX66. |
| | No ▶ | **For test lamp always off:**<br>GO to HX67.<br>**For test lamp always on:**<br>KEY OFF. GO to HX70. |
| **HX66** CHECK CV SOLENOID RESISTANCE | | |
| ● Measure CV solenoid resistance.<br>● **Is resistance between 48 and 65 ohms?** | Yes ▶ | Unable to identify fault at this time. GO to Pinpoint Test Step Z1. |
| | No ▶ | REPLACE damaged CV solenoid. COMPLETE an EVAP system leak test at the evaporative test port to VERIFY that a leak did not occur during component replacement. FOLLOW the Vehicle Preparation for Monitor Repair Verification Drive Cycle and COMPLETE an Evaporative Emission Running Loss Monitor Repair Verification Drive Cycle. |

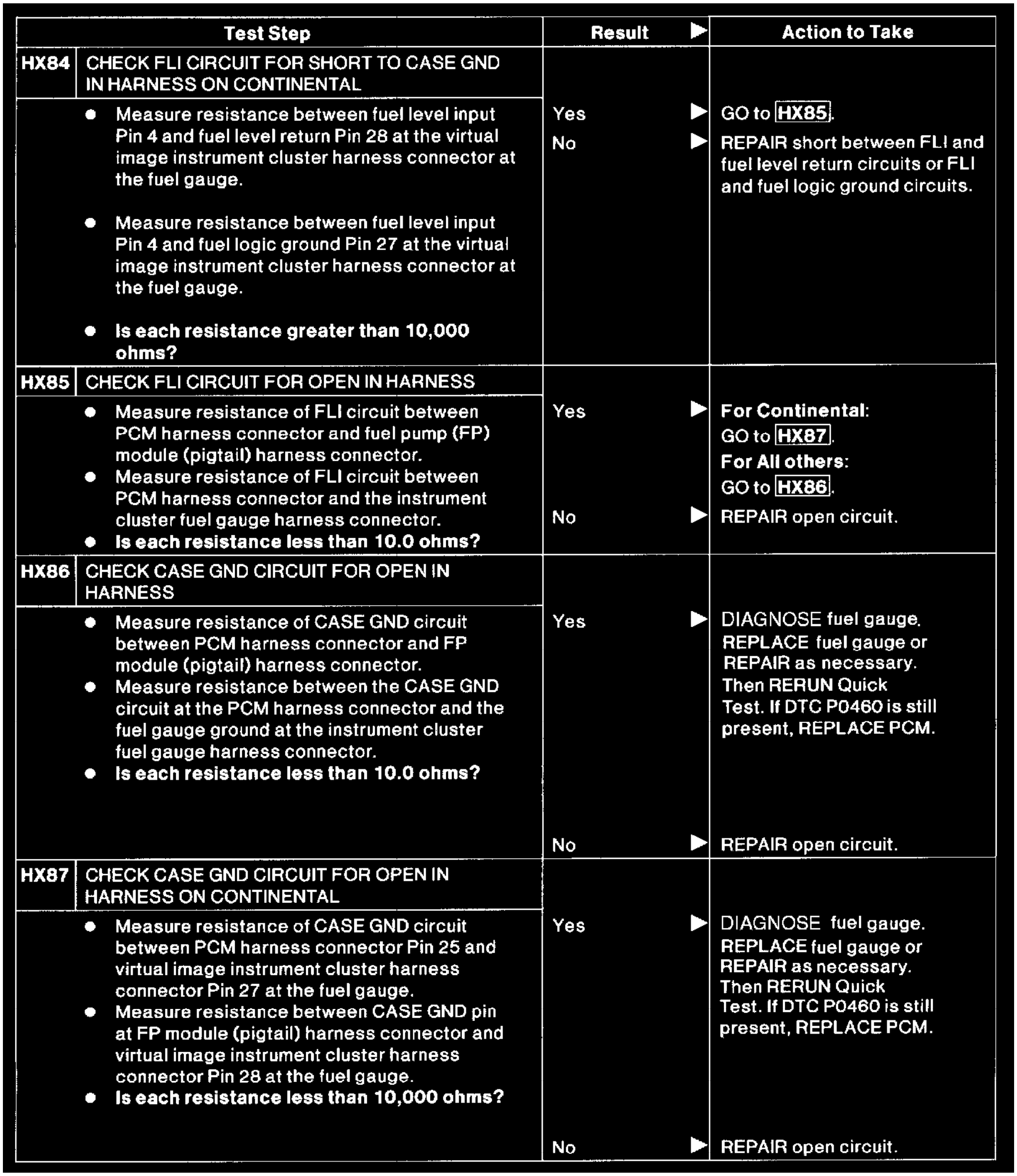


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX67** | CHECK FOR OPEN VPWR CIRCUIT BETWEEN CV SOLENOID AND POWER RELAY | | |
| | ● Measure voltage between VPWR circuit at the CV solenoid harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | KEY OFF. GO to HX68. |
| | | No ▶ | KEY OFF. REPAIR open circuit. |
| **HX68** | CHECK VPWR CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure resistance of VPWR circuit between PCM harness connector pin (or on LS6/LS8 the VPWR fuse to the power relay) and CV solenoid harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to HX69. |
| | | No ▶ | REPAIR open circuit. |
| **HX69** | CHECK CV CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance of CV circuit between PCM harness connector pin and CV solenoid harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR open circuit. |
| **HX70** | CHECK CV CIRCUIT FOR SHORT TO PWR GND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Disconnect scan tool from DLC.<br>● Measure resistance between CV circuit at the CV solenoid harness connector and battery negative post.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | RECONNECT scan tool. GO to HX71. |
| | | No ▶ | REPAIR short circuit. |
| **HX71** | CHECK CV CIRCUIT FOR SHORT TO PWR OR CHASSIS GND IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure voltage between CV circuit at the PCM harness connector and chassis ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶ | KEY OFF. REPLACE PCM. |
| | | No ▶ | KEY OFF. REPAIR short circuit to VPWR, VREF or chassis ground. |

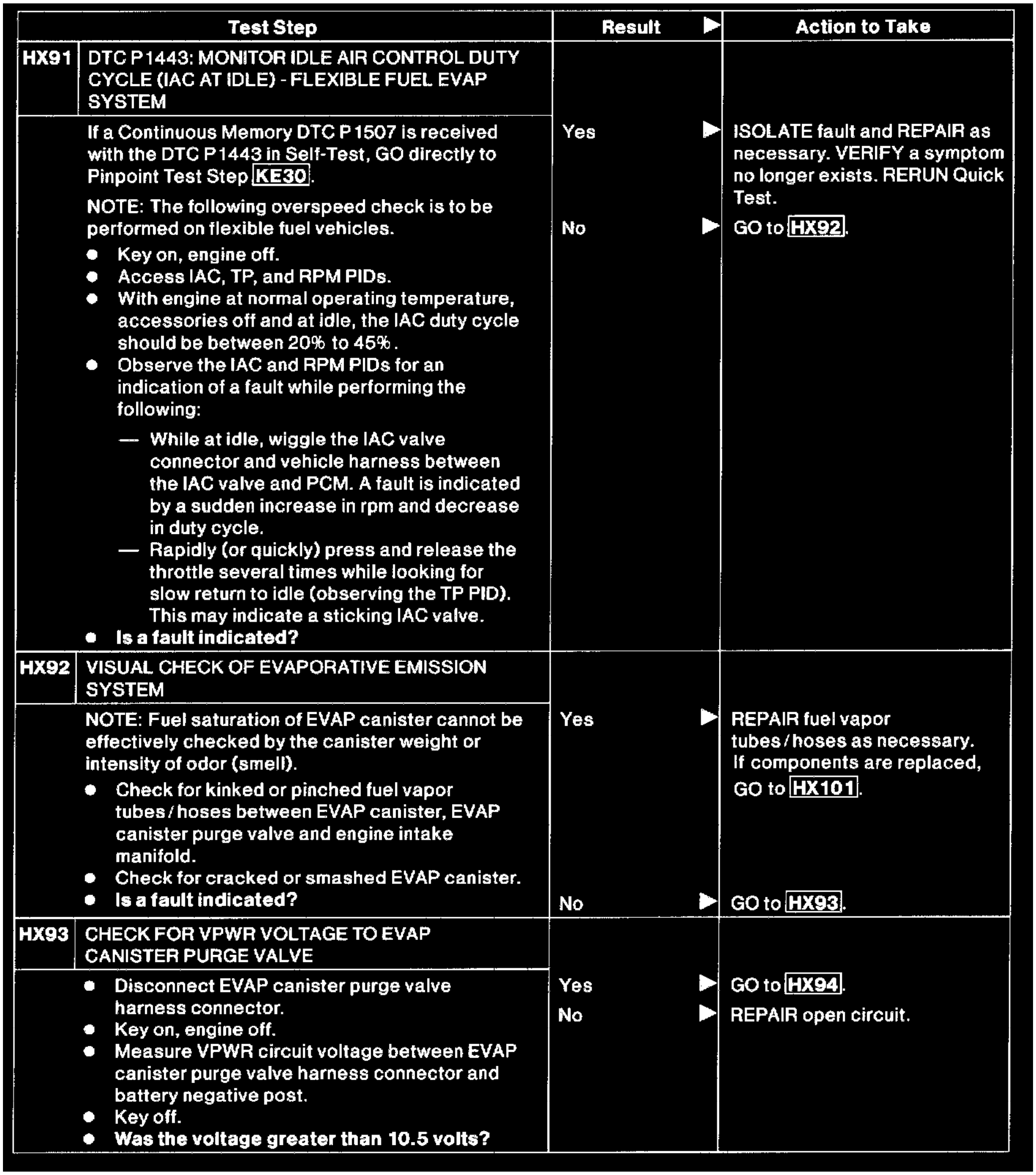


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX76** | DTC P0460: CHECK FUEL TANK LEVEL | | |
| | NOTE: For Mustang, LS6/LS8, Town Car, Windstar, F-150, 5.4L Lightning and Expedition/Navigator applications, go to Instrument Cluster diagnosis.<br>● Key on, engine off.<br>● Observe and record fuel gauge reading.<br>● Access fuel level input (FLI) PID.<br>● **Are both the fuel gauge and the FLI PID indicating between slightly above one quarter (30% on FLI PID) and three quarters (70% on the FLI PID) filled?** | Yes ▶ | GO to HX78. |
| | | No ▶ | KEY OFF. INSPECT fuel tank for leaks. REPAIR fuel tank if necessary. CHECK for a damaged fuse for the fuel pump (FP) to fuel gauge circuit.<br>**For a damaged fuse without a DTC P0460:**<br>CHECK for CASE GND short to VPWR circuit. GO to Pinpoint Test Step B1 or X1 (CCRM applications).<br>**For fuel gauge inoperative without a DTC P0460:**<br>GO to Instrument Cluster diagnosis.<br>**For DTC P0460:**<br>GO to HX77. |
| **HX77** | CHECK FOR INADEQUATE FUEL LEVEL | | |
| | ● Key on, engine off.<br>● While observing both the fuel gauge and FLI PID, add fuel (7.57 to 11.36 liters [2 to 3 gallons]) to the fuel tank.<br>● **Did either the fuel gauge or FLI PID indicate a movement upward as the fuel is added?** | Yes ▶ | DRAIN or FILL the fuel tank from above the one quarter (at 30% fill) to under the three quarter (at 70% fill) level. DRIVE vehicle and RERUN Quick Test for DTCs. If DTC P0460 is still present, GO to HX78. |
| | | No ▶ | KEY OFF. GO to HX79. |
| **HX78** | CHECK FLI CIRCUIT VOLTAGE | | |
| | NOTE: The FLI V PID must not be used for diagnosis on the 2.5L Contour/Mystique and 2.5L Cougar in this Pinpoint Test Step, but only applications without returnless fuel systems.<br>**For 2.5L Contour/Mystique and 2.5L Cougar (without returnless fuel systems only):**<br>● Key on, engine running.<br>● Measure voltage between the FLI and SIG RTN circuits at the PCM harness connector.<br>**For All Others:**<br>● Key on, engine running.<br>● Access FLI V PID.<br>● **Is voltage or FLI V PID reading between 1.23 and 2.25 volts (6.14 and 4.39 volts on 2.0L/2.5L Contour/Mystique/Cougar without returnless fuel system)?** | Yes ▶ | KEY OFF.<br>**For Continental:**<br>GO to HX87.<br>**For All others:**<br>GO to HX86. |
| | | No ▶ | KEY OFF. GO to HX79. |

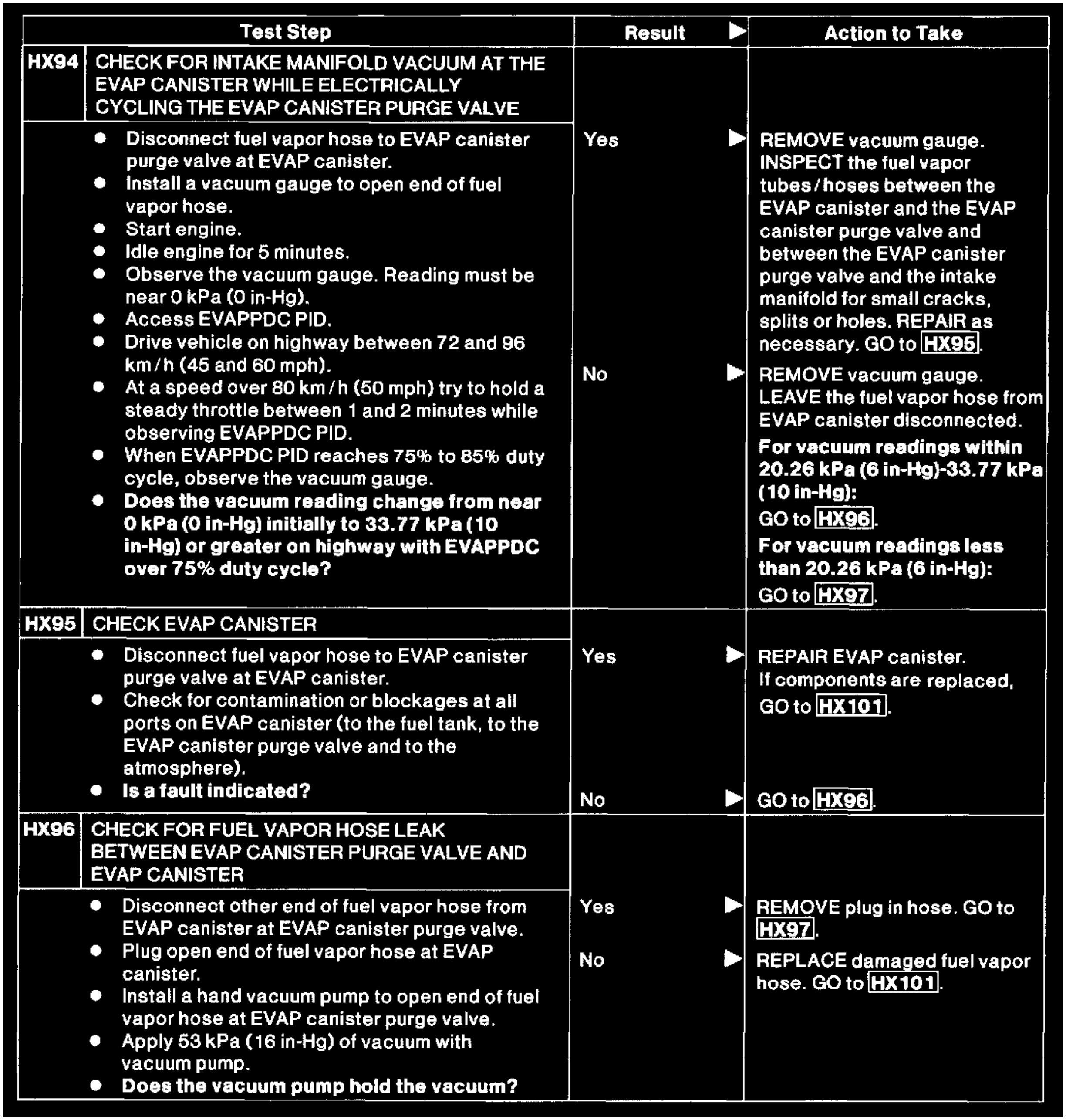
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX79** | CHECK FUEL PUMP MODULE RESISTANCE | | |
| | ● Disconnect fuel pump (FP) module (refer to FP module pigtail connector at the beginning of this pinpoint test).<br>● Measure resistance between FLI and CASE GND pins on the FP module (at pigtail).<br>● **Is resistance between 15 and 160 ohms?** | Yes ▶<br>No ▶ | GO to HX80.<br>CHECK for stuck fuel level float on fuel pump (FP) module. REPAIR as necessary. If free movement is present, REPLACE fuel pump module assembly. |
| **HX80** | CHECK FLI CIRCUIT VOLTAGE AT FP MODULE | | |
| | ● Disconnect the instrument cluster connector to the fuel gauge.<br>● Key on, engine running.<br>● Measure voltage between FLI circuit at the FP module harness connector and battery negative post.<br>● **Is voltage greater than 5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to HX81.<br>KEY OFF. GO to HX82. |
| **HX81** | CHECK FLI CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between FLI circuit at the FP module harness connector and battery negative post.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>REPLACE PCM. |
| **HX82** | CHECK FLI CIRCUIT FOR SHORT TO PWR GND IN HARNESS | | |
| | ● Disconnect PCM.<br>● Measure resistance between FLI circuit at the PCM harness connector and battery negative post.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | **For Continental:** GO to HX84. **For All others:** GO to HX83.<br>REPAIR short circuit. |
| **HX83** | CHECK FLI CIRCUIT FOR SHORT TO CASE GND IN HARNESS | | |
| | ● Measure resistance between FLI and CASE GND circuits at the PCM harness connector.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to HX85.<br>REPAIR short between FLI and CASE GND circuits. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX84** | CHECK FLI CIRCUIT FOR SHORT TO CASE GND IN HARNESS ON CONTINENTAL | | |
| | - Measure resistance between fuel level input Pin 4 and fuel level return Pin 28 at the virtual image instrument cluster harness connector at the fuel gauge.<br>- Measure resistance between fuel level input Pin 4 and fuel logic ground Pin 27 at the virtual image instrument cluster harness connector at the fuel gauge.<br>- **Is each resistance greater than 10,000 ohms?** | Yes ▶ | GO to HX85. |
| | | No ▶ | REPAIR short between FLI and fuel level return circuits or FLI and fuel logic ground circuits. |
| **HX85** | CHECK FLI CIRCUIT FOR OPEN IN HARNESS | | |
| | - Measure resistance of FLI circuit between PCM harness connector and fuel pump (FP) module (pigtail) harness connector.<br>- Measure resistance of FLI circuit between PCM harness connector and the instrument cluster fuel gauge harness connector.<br>- **Is each resistance less than 10.0 ohms?** | Yes ▶ | **For Continental:**<br>GO to HX87.<br>**For All others:**<br>GO to HX86. |
| | | No ▶ | REPAIR open circuit. |
| **HX86** | CHECK CASE GND CIRCUIT FOR OPEN IN HARNESS | | |
| | - Measure resistance of CASE GND circuit between PCM harness connector and FP module (pigtail) harness connector.<br>- Measure resistance between the CASE GND circuit at the PCM harness connector and the fuel gauge ground at the instrument cluster fuel gauge harness connector.<br>- **Is each resistance less than 10.0 ohms?** | Yes ▶ | DIAGNOSE fuel gauge. REPLACE fuel gauge or REPAIR as necessary. Then RERUN Quick Test. If DTC P0460 is still present, REPLACE PCM. |
| | | No ▶ | REPAIR open circuit. |
| **HX87** | CHECK CASE GND CIRCUIT FOR OPEN IN HARNESS ON CONTINENTAL | | |
| | - Measure resistance of CASE GND circuit between PCM harness connector Pin 25 and virtual image instrument cluster harness connector Pin 27 at the fuel gauge.<br>- Measure resistance between CASE GND pin at FP module (pigtail) harness connector and virtual image instrument cluster harness connector Pin 28 at the fuel gauge.<br>- **Is each resistance less than 10,000 ohms?** | Yes ▶ | DIAGNOSE fuel gauge. REPLACE fuel gauge or REPAIR as necessary. Then RERUN Quick Test. If DTC P0460 is still present, REPLACE PCM. |
| | | No ▶ | REPAIR open circuit. |



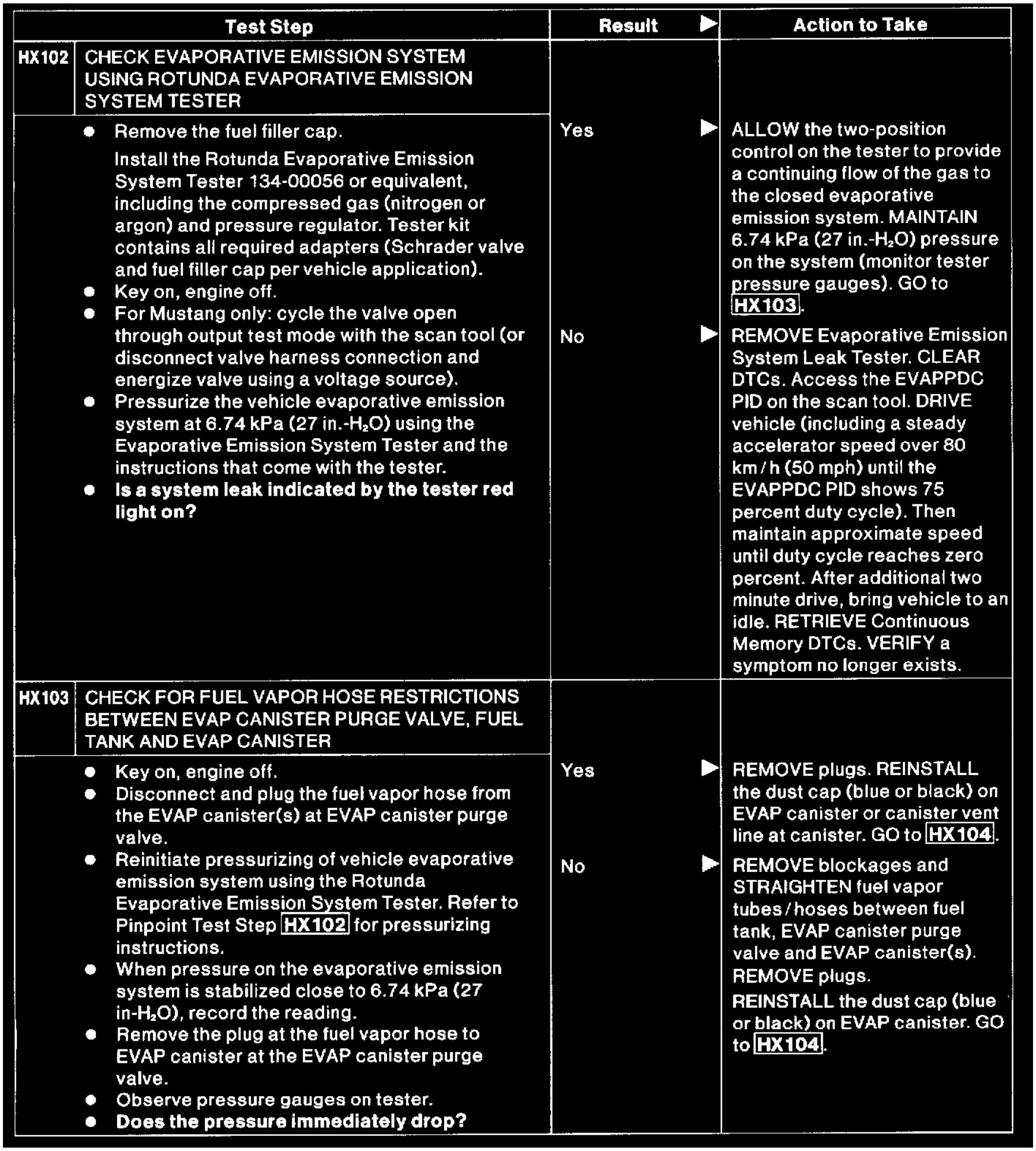
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX91** | DTC P1443: MONITOR IDLE AIR CONTROL DUTY CYCLE (IAC AT IDLE) - FLEXIBLE FUEL EVAP SYSTEM | | |
| | If a Continuous Memory DTC P1507 is received with the DTC P1443 in Self-Test, GO directly to Pinpoint Test Step KE30.<br>NOTE: The following overspeed check is to be performed on flexible fuel vehicles.<br>● Key on, engine off.<br>● Access IAC, TP, and RPM PIDs.<br>● With engine at normal operating temperature, accessories off and at idle, the IAC duty cycle should be between 20% to 45%.<br>● Observe the IAC and RPM PIDs for an indication of a fault while performing the following:<br>— While at idle, wiggle the IAC valve connector and vehicle harness between the IAC valve and PCM. A fault is indicated by a sudden increase in rpm and decrease in duty cycle.<br>— Rapidly (or quickly) press and release the throttle several times while looking for slow return to idle (observing the TP PID). This may indicate a sticking IAC valve.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary. VERIFY a symptom no longer exists. RERUN Quick Test.<br>GO to HX92. |
| **HX92** | VISUAL CHECK OF EVAPORATIVE EMISSION SYSTEM | | |
| | NOTE: Fuel saturation of EVAP canister cannot be effectively checked by the canister weight or intensity of odor (smell).<br>● Check for kinked or pinched fuel vapor tubes/hoses between EVAP canister, EVAP canister purge valve and engine intake manifold.<br>● Check for cracked or smashed EVAP canister.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | REPAIR fuel vapor tubes/hoses as necessary. If components are replaced, GO to HX101.<br>GO to HX93. |
| **HX93** | CHECK FOR VPWR VOLTAGE TO EVAP CANISTER PURGE VALVE | | |
| | ● Disconnect EVAP canister purge valve harness connector.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage between EVAP canister purge valve harness connector and battery negative post.<br>● Key off.<br>● **Was the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | GO to HX94.<br>REPAIR open circuit. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| HX94 | CHECK FOR INTAKE MANIFOLD VACUUM AT THE EVAP CANISTER WHILE ELECTRICALLY CYCLING THE EVAP CANISTER PURGE VALVE | | |
| | ● Disconnect fuel vapor hose to EVAP canister purge valve at EVAP canister.<br>● Install a vacuum gauge to open end of fuel vapor hose.<br>● Start engine.<br>● Idle engine for 5 minutes.<br>● Observe the vacuum gauge. Reading must be near 0 kPa (0 in-Hg).<br>● Access EVAPPDC PID.<br>● Drive vehicle on highway between 72 and 96 km/h (45 and 60 mph).<br>● At a speed over 80 km/h (50 mph) try to hold a steady throttle between 1 and 2 minutes while observing EVAPPDC PID.<br>● When EVAPPDC PID reaches 75% to 85% duty cycle, observe the vacuum gauge.<br>● **Does the vacuum reading change from near 0 kPa (0 in-Hg) initially to 33.77 kPa (10 in-Hg) or greater on highway with EVAPPDC over 75% duty cycle?** | Yes ▶ | REMOVE vacuum gauge. INSPECT the fuel vapor tubes/hoses between the EVAP canister and the EVAP canister purge valve and between the EVAP canister purge valve and the intake manifold for small cracks, splits or holes. REPAIR as necessary. GO to HX95. |
| | | No ▶ | REMOVE vacuum gauge. LEAVE the fuel vapor hose from EVAP canister disconnected.<br>**For vacuum readings within 20.26 kPa (6 in-Hg)-33.77 kPa (10 in-Hg):**<br>GO to HX96.<br>**For vacuum readings less than 20.26 kPa (6 in-Hg):**<br>GO to HX97. |
| HX95 | CHECK EVAP CANISTER | | |
| | ● Disconnect fuel vapor hose to EVAP canister purge valve at EVAP canister.<br>● Check for contamination or blockages at all ports on EVAP canister (to the fuel tank, to the EVAP canister purge valve and to the atmosphere).<br>● **Is a fault indicated?** | Yes ▶ | REPAIR EVAP canister. If components are replaced, GO to HX101. |
| | | No ▶ | GO to HX96. |
| HX96 | CHECK FOR FUEL VAPOR HOSE LEAK BETWEEN EVAP CANISTER PURGE VALVE AND EVAP CANISTER | | |
| | ● Disconnect other end of fuel vapor hose from EVAP canister at EVAP canister purge valve.<br>● Plug open end of fuel vapor hose at EVAP canister.<br>● Install a hand vacuum pump to open end of fuel vapor hose at EVAP canister purge valve.<br>● Apply 53 kPa (16 in-Hg) of vacuum with vacuum pump.<br>● **Does the vacuum pump hold the vacuum?** | Yes ▶ | REMOVE plug in hose. GO to HX97. |
| | | No ▶ | REPLACE damaged fuel vapor hose. GO to HX101. |

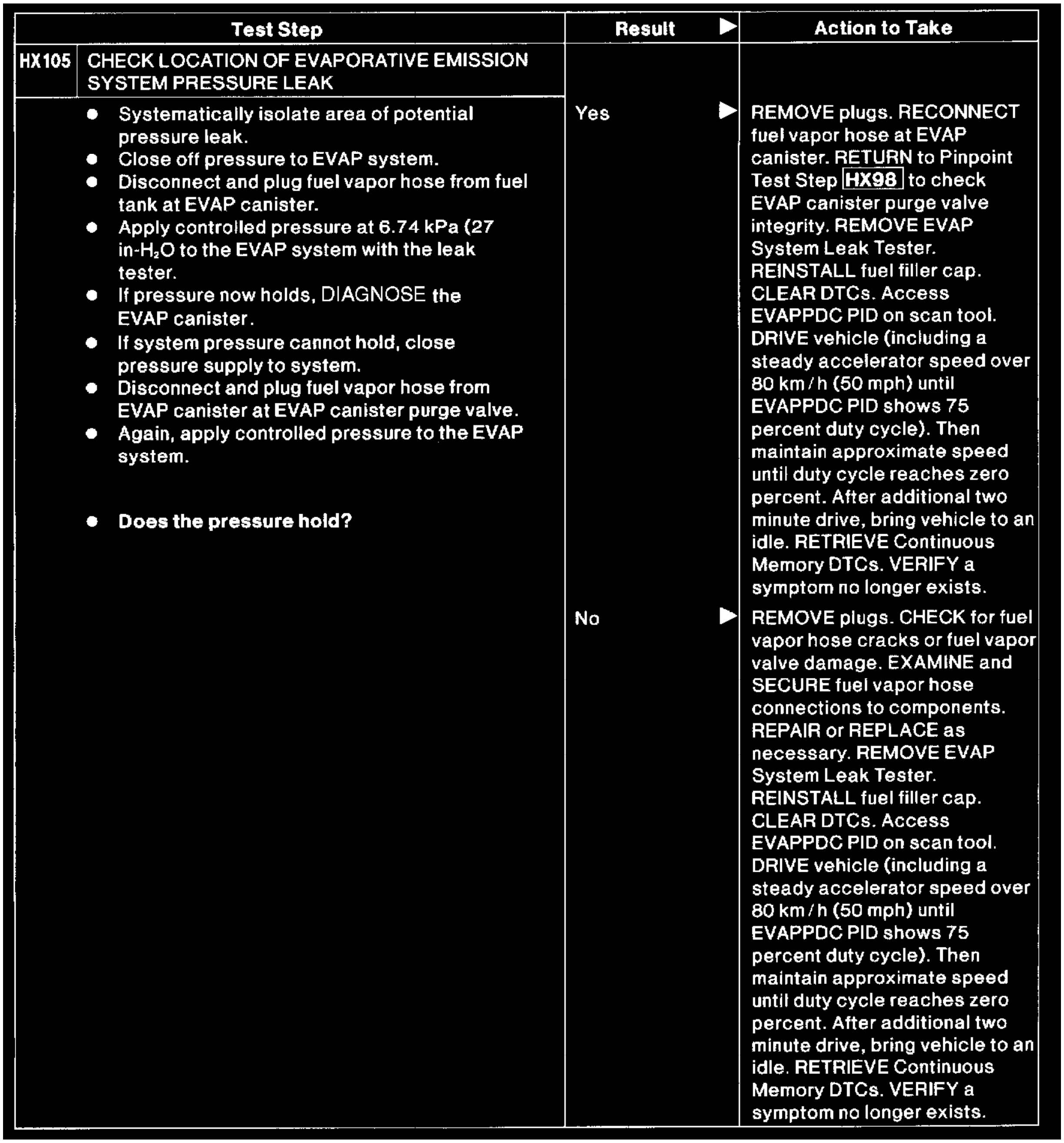
| Test Step | | Result ▶ | | Action to Take |
|---|---|---|---|---|
| **HX97** | CHECK FOR FUEL VAPOR HOSE BLOCKAGE BETWEEN EVAP CANISTER PURGE VALVE AND EVAP CANISTER | | | |
| | ● Disconnect other end of fuel vapor hose from EVAP canister at EVAP canister purge valve.<br>● Install a hand vacuum pump to open end of fuel vapor hose at EVAP canister purge valve.<br>● Apply 53 kPa (16 in-Hg) of vacuum with vacuum pump.<br>● **Does the vacuum pump hold the vacuum?** | Yes | ▶ | REMOVE vacuum pump. REPAIR or STRAIGHTEN fuel vapor hose as necessary. GO to HX101. |
| | | No | ▶ | REMOVE vacuum pump. RECONNECT fuel vapor hose between EVAP canister and EVAP canister purge valve. GO to HX98. |
| **HX98** | CHECK FOR FILTER CONTAMINATION OR DAMAGE TO THE EVAP CANISTER PURGE VALVE | | | |
| | ● Disconnect vacuum line from input vacuum port to intake manifold on EVAP canister purge valve. (Refer to EVAP canister purge valve vacuum schematic at the beginning of this pinpoint test.)<br>● Install a hand vacuum pump to input vacuum port on EVAP canister purge valve.<br>● Apply 48-52 kPa (10-15 in-Hg) of vacuum to EVAP canister purge valve.<br>● **Does the EVAP canister purge valve hold vacuum or show a very slow release of vacuum to atmosphere?** | Yes | ▶ | REPAIR EVAP canister purge valve filter blockage or REPLACE EVAP canister purge valve. GO to HX101. |
| | | No | ▶ | REMOVE vacuum pump. GO to HX99. |
| **HX99** | CHECK FOR INTAKE MANIFOLD VACUUM AT VMV: BOTH INPUT PORT VACUUM HOSE AND FUEL VAPOR HOSE | | | |
| | ● EVAP canister purge valve electrically connected.<br>● Disconnect both input port vacuum and fuel vapor hoses from intake manifold vacuum source and fuel vapor ports at EVAP canister purge valve. (Refer to the EVAP canister purge valve vacuum schematic at the beginning of this pinpoint test.)<br>● Install a vacuum gauge (two gauges or one gauge at a time) to open end of input port vacuum hose and open end of the fuel vapor hose at EVAP canister purge valve.<br>● Start engine.<br>● **Are both vacuum gauge readings greater than 33.77 kPa (10 in-Hg)?** | Yes | ▶ | LEAVE input port vacuum and fuel vapor hoses to the intake manifold at EVAP canister purge valve disconnected. GO to HX100. |
| | | No | ▶ | ISOLATE causes of missing intake manifold vacuum. REPAIR partially unconnected hoses or kinked / blocked hoses to intake manifold. REMOVE vacuum gauge(s). INSPECT for base engine vacuum loss. GO to HX100. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX100** | CHECK FOR INPUT PORT VACUUM HOSE AND FUEL VAPOR HOSE RESTRICTIONS BETWEEN EVAP CANISTER PURGE VALVE AND INTAKE MANIFOLD | | |
| | ● Disconnect input port vacuum hose and fuel vapor hose from EVAP canister purge valve at intake manifold (other end of hoses are already disconnected).<br>● Install a hand vacuum pump to one end of each completely disconnected hose from EVAP canister purge valve to intake manifold.<br>● Apply 53 kPa (16 in-Hg) of vacuum with vacuum pump.<br>● Observe the vacuum reading for 30 seconds.<br>● **Does the vacuum bleed off immediately?** | Yes ▶ | REMOVE vacuum pump. CORRECT minor concerns with input vacuum hose and fuel vapor hose between EVAP canister purge valve and intake manifold. If hoses were OK, REPLACE damaged EVAP canister purge valve. GO to HX101. |
| | | No ▶ | REMOVE vacuum pump. REMOVE blockages or minor kinks in input vacuum hose and fuel vapor hose between EVAP canister purge valve and intake manifold. GO to HX101. |
| **HX101** | CHECK EVAPORATIVE EMISSION SYSTEM LEAK THROUGH EVAPORATIVE EMISSION SERVICE PORT | | |
| | Odors in the engine compartment or near the exhaust system and stalls can be associated to the evaporative emission system.<br>Possible causes:<br>— After-market parts and accessories not conforming to evaporative system specifications.<br>— Leaks in the evaporative emission system.<br>— Blockages in the evaporative emission system.<br>● Remove atmospheric vent cap (blue or black) on EVAP canister(s) or canister vent line.<br>● Plug (or tape) open vent on EVAP canister(s).<br>● Disconnect and plug fuel vapor hose to EVAP canister purge valve from intake manifold at the intake manifold vacuum source.<br>● Locate evaporative emission test port (marked EVAPORATIVE SERVICE PORT) between EVAP canister purge valve and EVAP canister. If vehicle does not have a test port, GO to Pinpoint Test step HX102.<br>● Access the Rotunda Evaporative Emission System Tester 134-00056 or equivalent, including the compressed gas source (nitrogen or argon) and pressure regulator.<br>● Perform a Tester Self-Test using the instructions provided with the Tester Kit.<br>● Regulate the gas pressure on the Tester to 6.74 kPa (27 in-$H_2O$).<br>● Install the Rotunda Evaporative Emission System Tester to the test port and follow the system leak test instructions provided with the Tester Kit.<br>● If the pressure is not between 6.46 and 6.97 kPa (26 and 28 in-$H_2O$), use the ultra-sonic leak detector provided with the Tester Kit to check for leakage at the vehicle's fuel filler cap and filler pipe assembly.<br>● **Is a leak indicated?** | Yes ▶ | REMOVE and VERIFY fuel filler cap according to original equipment specifications. REPLACE damaged fuel filler cap. REINSTALL fuel filler cap and TIGHTEN cap only one eighth turn so that cap initially clicks by sound or touch. REPEAT evaporative emission system leak test using Tester. If the leak is still present, REPAIR or REPLACE fuel tank, fuel filler pipe, fuel vapor valve or fuel vapor hose between fuel tank and EVAP canister as necessary. VERIFY a symptom no longer exists. |
| | | No ▶ | GO to HX102. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX102** | CHECK EVAPORATIVE EMISSION SYSTEM USING ROTUNDA EVAPORATIVE EMISSION SYSTEM TESTER | | |
| | ● Remove the fuel filler cap.<br>Install the Rotunda Evaporative Emission System Tester 134-00056 or equivalent, including the compressed gas (nitrogen or argon) and pressure regulator. Tester kit contains all required adapters (Schrader valve and fuel filler cap per vehicle application).<br>● Key on, engine off.<br>● For Mustang only: cycle the valve open through output test mode with the scan tool (or disconnect valve harness connection and energize valve using a voltage source).<br>● Pressurize the vehicle evaporative emission system at 6.74 kPa (27 in.-$H_2O$) using the Evaporative Emission System Tester and the instructions that come with the tester.<br>● **Is a system leak indicated by the tester red light on?** | Yes ▶ | ALLOW the two-position control on the tester to provide a continuing flow of the gas to the closed evaporative emission system. MAINTAIN 6.74 kPa (27 in.-$H_2O$) pressure on the system (monitor tester pressure gauges). GO to HX103. |
| | | No ▶ | REMOVE Evaporative Emission System Leak Tester. CLEAR DTCs. Access the EVAPPDC PID on the scan tool. DRIVE vehicle (including a steady accelerator speed over 80 km / h (50 mph) until the EVAPPDC PID shows 75 percent duty cycle). Then maintain approximate speed until duty cycle reaches zero percent. After additional two minute drive, bring vehicle to an idle. RETRIEVE Continuous Memory DTCs. VERIFY a symptom no longer exists. |
| **HX103** | CHECK FOR FUEL VAPOR HOSE RESTRICTIONS BETWEEN EVAP CANISTER PURGE VALVE, FUEL TANK AND EVAP CANISTER | | |
| | ● Key on, engine off.<br>● Disconnect and plug the fuel vapor hose from the EVAP canister(s) at EVAP canister purge valve.<br>● Reinitiate pressurizing of vehicle evaporative emission system using the Rotunda Evaporative Emission System Tester. Refer to Pinpoint Test Step HX102 for pressurizing instructions.<br>● When pressure on the evaporative emission system is stabilized close to 6.74 kPa (27 in-$H_2O$), record the reading.<br>● Remove the plug at the fuel vapor hose to EVAP canister at the EVAP canister purge valve.<br>● Observe pressure gauges on tester.<br>● **Does the pressure immediately drop?** | Yes ▶ | REMOVE plugs. REINSTALL the dust cap (blue or black) on EVAP canister or canister vent line at canister. GO to HX104. |
| | | No ▶ | REMOVE blockages and STRAIGHTEN fuel vapor tubes / hoses between fuel tank, EVAP canister purge valve and EVAP canister(s). REMOVE plugs.<br>REINSTALL the dust cap (blue or black) on EVAP canister. GO to HX104. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX104** | VERIFICATION OF EVAPORATIVE EMISSION SYSTEM REPAIR USING ROTUNDA EVAPORATIVE EMISSION SYSTEM LEAK TESTER | | |
| | • Complete PCM Reset to clear DTCs.<br>• Plug or tape atmospheric vent cap on EVAP canister (if applicable).<br>• Remove fuel filler cap at fuel filler pipe.<br>• Install Rotunda Evaporative Emission System Leak Tester 134-00056 or equivalent including the nitrogen or argon gas supply and pressure regulator.<br>• Disconnect and plug fuel vapor hose to PF sensor (or EVAP canister purge valve on Ranger) from intake manifold at the intake manifold vacuum source.<br>• Pressurize the EVAP system at 6.74 kPa (27 in-$H_2O$) with tester.<br>• Observe tester installation leak self-test for two minutes and then the EVAP system leak test.<br>• Listen for a vacuum leak noise and check for substantial fuel vapor odors at isolated areas in the EVAP system.<br>• **Does the pressure applied to the EVAP system hold?** | Yes ▶ | REMOVE plug and RECONNECT fuel vapor hose from PF sensor (or EVAP canister purge valve) at intake manifold vacuum source. REMOVE EVAP System Leak Tester. REINSTALL fuel filler cap. TIGHTEN cap only one eighth turn so that cap initially clicks by sound or touch. CLEAR DTCs. Access EVAPPDC PID on scan tool. DRIVE vehicle (including a steady accelerator speed over 80 km/h (50 mph) until EVAPPDC PID shows 75 percent duty cycle). Then maintain approximate speed until duty cycle reaches zero percent. After additional two minute drive, bring vehicle to an idle. RETRIEVE Continuous Memory DTCs. VERIFY a symptom no longer exists. |
| | | No ▶ | GO to **HX105**. |



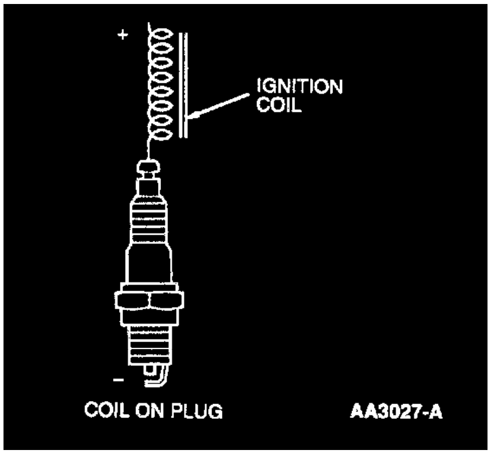
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **HX105** | CHECK LOCATION OF EVAPORATIVE EMISSION SYSTEM PRESSURE LEAK | | |
| | ● Systematically isolate area of potential pressure leak.<br>● Close off pressure to EVAP system.<br>● Disconnect and plug fuel vapor hose from fuel tank at EVAP canister.<br>● Apply controlled pressure at 6.74 kPa (27 in-$H_2O$ to the EVAP system with the leak tester.<br>● If pressure now holds, DIAGNOSE the EVAP canister.<br>● If system pressure cannot hold, close pressure supply to system.<br>● Disconnect and plug fuel vapor hose from EVAP canister at EVAP canister purge valve.<br>● Again, apply controlled pressure to the EVAP system.<br>● **Does the pressure hold?** | Yes ▶ | REMOVE plugs. RECONNECT fuel vapor hose at EVAP canister. RETURN to Pinpoint Test Step **HX98** to check EVAP canister purge valve integrity. REMOVE EVAP System Leak Tester. REINSTALL fuel filler cap. CLEAR DTCs. Access EVAPPDC PID on scan tool. DRIVE vehicle (including a steady accelerator speed over 80 km / h (50 mph) until EVAPPDC PID shows 75 percent duty cycle). Then maintain approximate speed until duty cycle reaches zero percent. After additional two minute drive, bring vehicle to an idle. RETRIEVE Continuous Memory DTCs. VERIFY a symptom no longer exists. |
| | | No ▶ | REMOVE plugs. CHECK for fuel vapor hose cracks or fuel vapor valve damage. EXAMINE and SECURE fuel vapor hose connections to components. REPAIR or REPLACE as necessary. REMOVE EVAP System Leak Tester. REINSTALL fuel filler cap. CLEAR DTCs. Access EVAPPDC PID on scan tool. DRIVE vehicle (including a steady accelerator speed over 80 km / h (50 mph) until EVAPPDC PID shows 75 percent duty cycle). Then maintain approximate speed until duty cycle reaches zero percent. After additional two minute drive, bring vehicle to an idle. RETRIEVE Continuous Memory DTCs. VERIFY a symptom no longer exists. |

## Test Notes

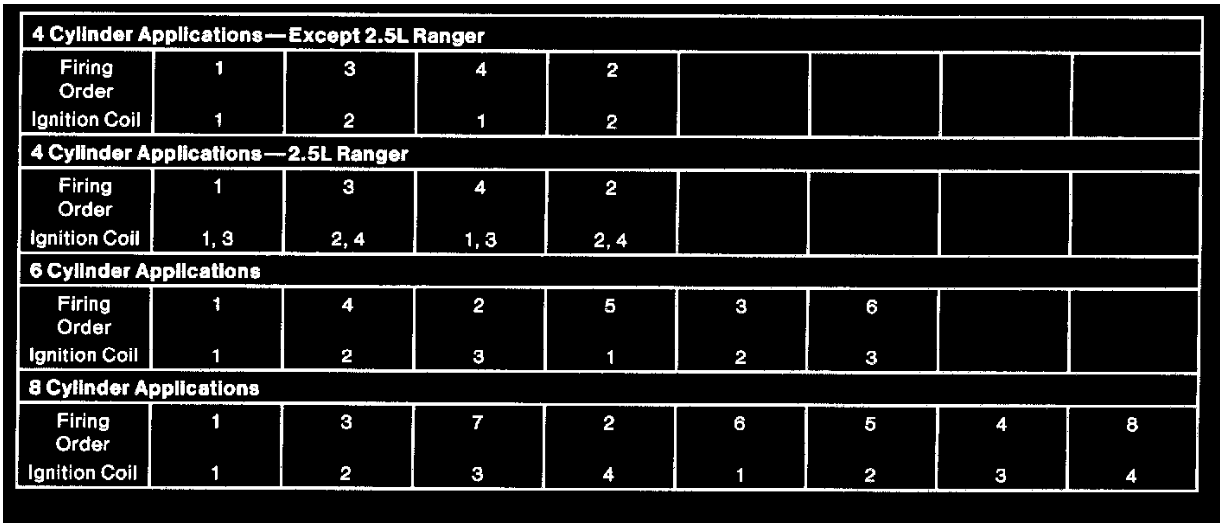
This Pinpoint Test is intended to diagnose the following:

- Spark plugs
- Spark plug wires

**CAUTION:** Fouled plugs or a damaged ignition may cause high catalyst temperatures. Check components next to the catalyst and muffler for heat damage.



# Tables



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **4 Cylinder Applications—Except 2.5L Ranger** | | | | | | | | |
| Firing Order | 1 | 3 | 4 | 2 | | | | |
| Ignition Coil | 1 | 2 | 1 | 2 | | | | |
| **4 Cylinder Applications—2.5L Ranger** | | | | | | | | |
| Firing Order | 1 | 3 | 4 | 2 | | | | |
| Ignition Coil | 1, 3 | 2, 4 | 1, 3 | 2, 4 | | | | |
| **6 Cylinder Applications** | | | | | | | | |
| Firing Order | 1 | 4 | 2 | 5 | 3 | 6 | | |
| Ignition Coil | 1 | 2 | 3 | 1 | 2 | 3 | | |
| **8 Cylinder Applications** | | | | | | | | |
| Firing Order | 1 | 3 | 7 | 2 | 6 | 5 | 4 | 8 |
| Ignition Coil | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |

**Ignition Coil To Cylinder Correlation And Firing Order**

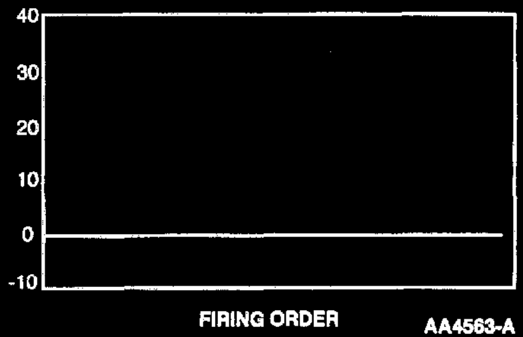
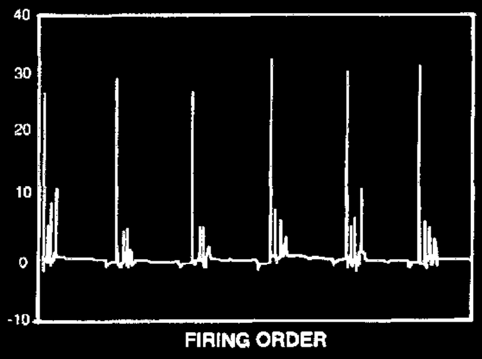
**Ignition Coil And Firing Order-Coil On Plug Applications:**

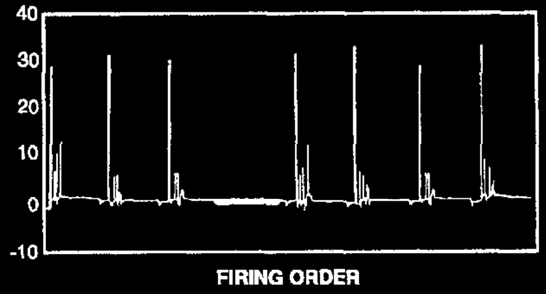
**8 Cylinder Applications - Except 3.4L Taurus SHO**
1 3 7 2 6 5 4 8

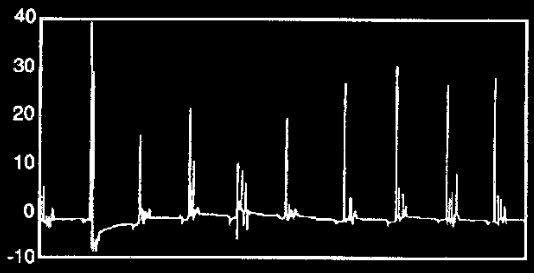
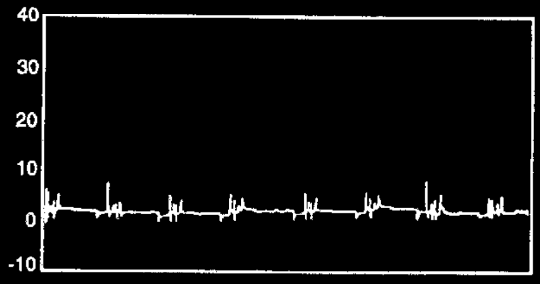
**8 Cylinder Applications - Taurus SHO**
1 5 4 2 6 3 7 8

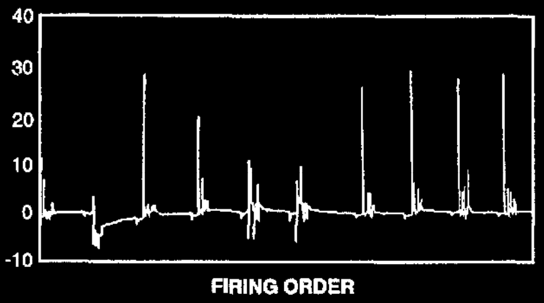
**10 Cylinder Applications**
1 6 5 10 2 7 3 8 4 9

| Test Step | | Result | ▶ | Action to Take |
|---|---|---|---|---|
| **JB1** | VISUAL INSPECTION OF IGNITION SYSTEM | | | |
| | - Visually inspect the engine compartment to make sure all coils and spark plug wires are properly and securely connected.<br>- Examine all wiring harnesses and connectors for damaged, burned or overheated insulation and loose or broken conditions.<br>- Be certain the battery is fully charged.<br>- All accessories must be off during diagnosis.<br>- **Is a problem indicated?** | Yes | ▶ | REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No | ▶ | **For coil pack application using engine analyzer:**<br>GO to JB2.<br>**For coil pack applications not using engine analyzer:**<br>GO to JB20.<br>**For coil on plug applications:**<br>GO to JB15. |
| **JB2** | CONNECT ENGINE ANALYZER | | | |
| | Obtain Rotunda Series 100 Engine Analyzer 010-01060 or equivalent to diagnose concerns in the secondary side of the ignition system.<br>NOTE: In order for the diagnostic procedures to provide accurate results, it is essential that the calibration of the engine analyzer be maintained. Refer to the equipment manual for the procedure to calibrate the engine analyzer. If the equipment manual is not available, an estimate of the calibration can be made by connecting the Spark Tester D81P-6666-A or equivalent to a properly operating ignition system and measuring the firing voltage of the spark tester only. The spark tester firing voltage should be approximately 28KV.<br>- **Is the engine analyzer connected?** | Yes | ▶ | GO to JB3. |
| | | No | ▶ | REPEAT JB2. |

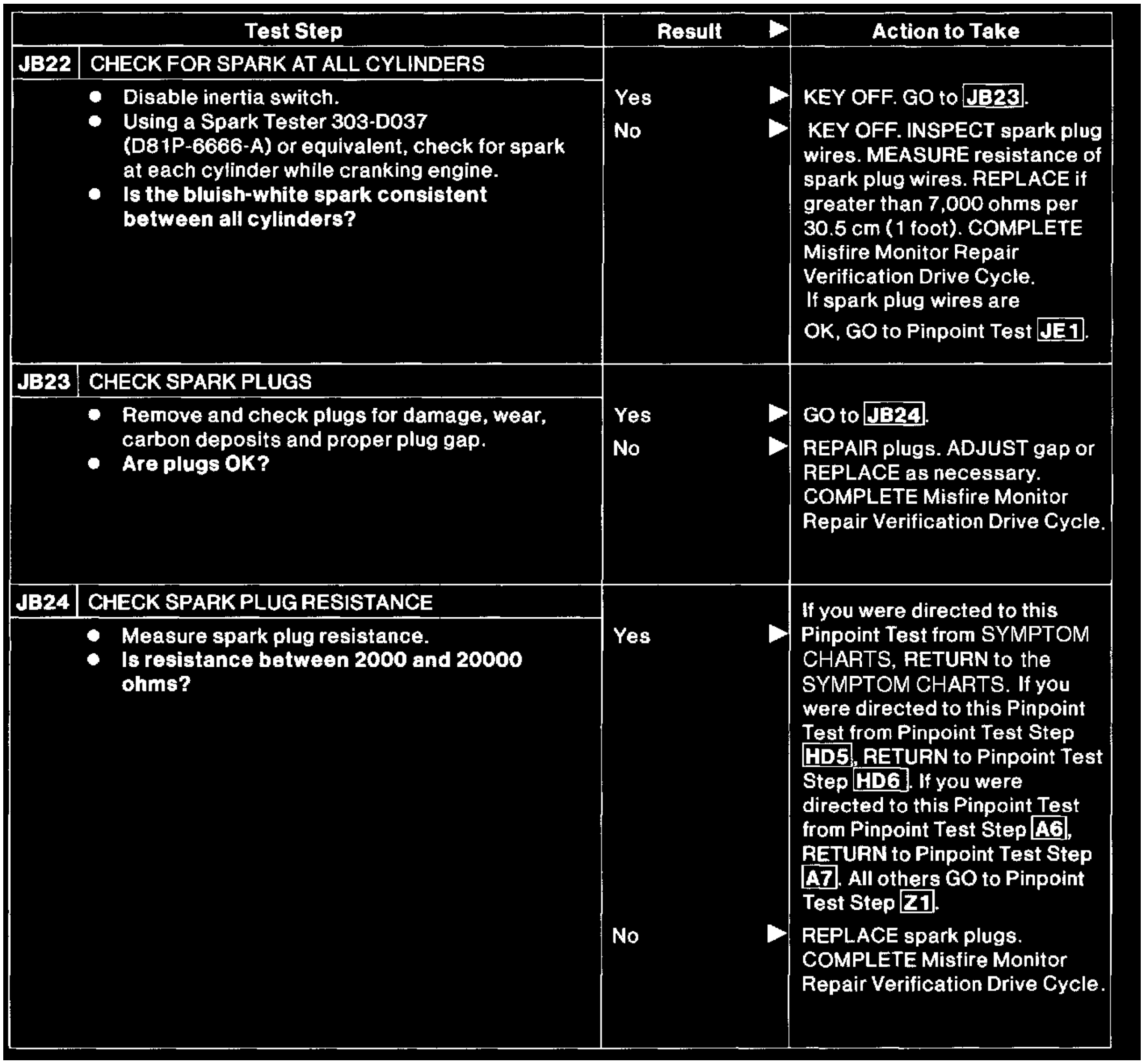
| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **JB3** CHECK FOR IGNITION PATTERN | | |
| • Observe pattern on scope while cranking engine.<br><br> <br>AA4563-A<br>• **Is the pattern flat which indicates no spark on all cylinders?** | Yes ▶ | IGN START/RUN circuit concern. KEY OFF. CHECK condition of related fuses/fuse links. If OK, REPAIR open circuit. If fuse/fuse link is damaged, CHECK IGN START/RUN circuit for short to ground. REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | No ▶ | GO to JB4. |
| **JB4** CHECK FOR NORMAL IGNITION PATTERN | | |
| • NOTE: Spark plugs are fired up to four strikes per firing. Multi-strike operating mode is dependent on the PCM calibration and is limited to less than 2000 rpm. Above 2000 rpm, spark plugs are fired once per firing.<br>• Key on, engine running.<br>• Check spark plug firing voltage average and evenness of patterns.<br><br> <br>AA1390-A<br>• **Are the patterns even and is the average value of spark plug firing voltage 20KV or less with evenness of spark plug firing voltage 8KV or less?** | Yes ▶ | If you were directed to this Pinpoint Test from SYMPTOM CHARTS, RETURN to the SYMPTOM CHARTS. If you were directed to this Pinpoint Test from Pinpoint Test Step HD5, RETURN to Pinpoint Test Step HD6. If you were directed to this Pinpoint Test from Pinpoint Test Step A6, RETURN to Pinpoint Test Step A7. All others GO to Pinpoint Test Step Z1. |
| | No ▶ | GO to JB5. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JB5** | CHECK FOR TWO MISSING SPARK PATTERNS ON THE SAME COIL | | |
| | • Observe pattern on scope.<br> <br>AA3036-A<br>• **Is the spark pattern missing from two cylinders on the same coil?** | Yes ▶ | INSPECT spark plug wires and spark plugs for missing cylinders. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). Measure resistance of spark plugs. REPLACE if lower than 2000 or higher than 2000 ohms. If spark plug wires and spark plugs are OK, GO to Pinpoint Test Step JE1. |
| | | No ▶ | GO to JB6. |
| **JB6** | CHECK FOR ONE MISSING SPARK PATTERN | | |
| | • Observe pattern on scope.<br> <br>AA3035-A<br>• **Is spark pattern missing from one cylinder?** | Yes ▶ | INSPECT spark plug wire and spark plug for missing cylinder. MEASURE resistance of spark plug wire. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). MEASURE resistance of spark plug. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to JB7. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| JB7 | CHECK FOR HIGH SPARK PLUG FIRING VOLTAGE | | |
| | - Check the spark plug firing voltage average and evenness.<br><br> <br>- **Is the average value of spark plug firing voltage greater than 20KV with evenness of spark plug voltage 8KV or less?** | Yes ▶ | Conditions affect all cylinders. INSPECT spark plug wires and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). CHECK spark plug gaps. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to JB8. |
| JB8 | CHECK FOR LOW SPARK PLUG FIRING VOLTAGE | | |
| | - Check the spark plug firing voltage average and evenness.<br><br> <br>- **Is there consistently low spark plug firing voltage or sloping spark line on one or more cylinders?** | Yes ▶ | INSPECT spark plug wire and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to JB9. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JB9** | CHECK FOR EVENESS BETWEEN CYLINDERS | | |
| | - Check the spark plug firing voltage average and evenness.<br> <br>AA3038-A<br>- **Is the evenness of spark plug firing voltage greater than 8KV?** | Yes ▶ | Inspect spark plug wires and spark plugs. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). CHECK for damaged spark plugs or narrow spark plug gaps. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | GO to Pinpoint Test Step Z1. |
| **JB15** | DTC P0301 THROUGH P0310: MISFIRE ON CYLINDERS 1 THROUGH 10 | | |
| | - **Are any of the above listed DTCs present?** | Yes ▶ | GO to JB16. |
| | | No ▶ | GO to JB17. |
| **JB16** | CHECK FOR SPARK AT CYLINDER(S) INDICATED BY DTC(S) | | |
| | - Disable inertia switch.<br>- Disconnect ignition coil(s) from spark plug(s).<br>- Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a coil.<br>- Check for spark while cranking engine.<br>- **Is the bluish-white spark present?** | Yes ▶ | KEY OFF. GO to JB18. |
| | | No ▶ | KEY OFF. INSPECT spark plugs for missing cylinders. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. GO to Pinpoint Test Step JF1. |
| **JB17** | CHECK FOR SPARK AT ALL CYLINDERS | | |
| | - Disable inertia switch.<br>- Using a Spark Tester 303-D037 (D81P-6666-A) or equivalent, check for spark at each cylinder while cranking engine.<br>- **Is the bluish-white spark consistent between all cylinders?** | Yes ▶ | KEY OFF. GO to JB18. |
| | | No ▶ | KEY OFF. INSPECT spark plugs for missing cylinders. MEASURE resistance of spark plugs. REPLACE if lower than 2000 or higher than 20000 ohms. Record cylinders with inconsistent spark and GO to Pinpoint Test Step JF1. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JB18** | CHECK SPARK PLUGS | | |
| | - Remove and check plugs for damage, wear, carbon deposits and proper plug gap.<br>- **Are plugs OK?** | Yes ▶ | GO to JB19. |
| | | No ▶ | REPAIR plugs. ADJUST gap or REPLACE as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JB19** | CHECK SPARK PLUG RESISTANCE | | |
| | - Measure spark plug resistance.<br>- **Is resistance between 2000 and 20000 ohms?** | Yes ▶ | If you were directed to this Pinpoint Test from SYMPTOM CHARTS, RETURN to the SYMPTOM CHARTS. If you were directed to this Pinpoint Test from Pinpoint Test Step HD5, RETURN to Pinpoint Test Step HD6. If you were directed to this Pinpoint Test from Pinpoint Test Step A6, RETURN to Pinpoint Test Step A7. All others GO to Pinpoint Test Step Z1. |
| | | No ▶ | REPLACE spark plugs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JB20** | DTC P0301 THROUGH DTC P0310: MISFIRE ON CYLINDERS 1 THROUGH 10 | | |
| | - **Are any of the above listed DTCs present?** | Yes ▶ | GO to JB21. |
| | | No ▶ | GO to JB22. |
| **JB21** | CHECK FOR SPARK AT CYLINDER(S) INDICATED BY DTC(S) | | |
| | - Disable inertia switch.<br>- Disconnect spark plug wire(s) from spark plug(s).<br>- Connect a Spark Tester 303-D037 (D81P-6666-A) or equivalent to a spark plug wire.<br>- Check for spark while cranking engine.<br>- **Is the bluish-white spark present?** | Yes ▶ | KEY OFF. GO to JB23. |
| | | No ▶ | KEY OFF. INSPECT spark plug wires. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). COMPLETE Misfire Monitor Repair Verification Drive Cycle. If spark plug wires are OK, GO to Pinpoint Test JE1. |

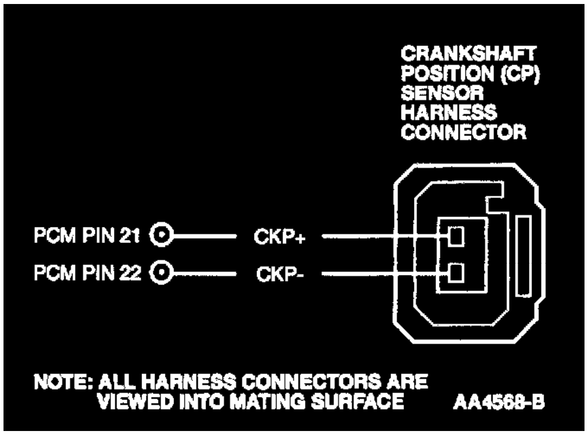


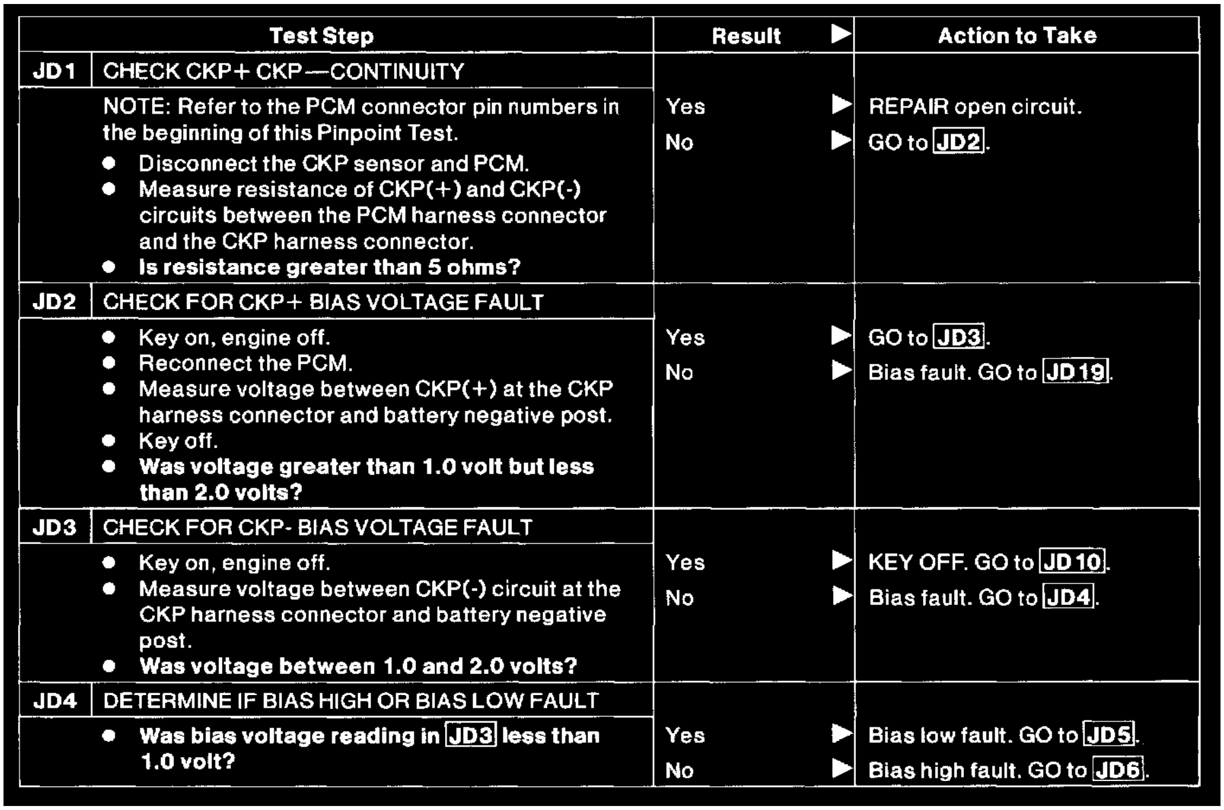
| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **JB22** CHECK FOR SPARK AT ALL CYLINDERS | | |
| • Disable inertia switch.<br>• Using a Spark Tester 303-D037 (D81P-6666-A) or equivalent, check for spark at each cylinder while cranking engine.<br>• **Is the bluish-white spark consistent between all cylinders?** | Yes ▶ | KEY OFF. GO to JB23. |
| | No ▶ | KEY OFF. INSPECT spark plug wires. MEASURE resistance of spark plug wires. REPLACE if greater than 7,000 ohms per 30.5 cm (1 foot). COMPLETE Misfire Monitor Repair Verification Drive Cycle. If spark plug wires are OK, GO to Pinpoint Test JE1. |
| **JB23** CHECK SPARK PLUGS | | |
| • Remove and check plugs for damage, wear, carbon deposits and proper plug gap.<br>• **Are plugs OK?** | Yes ▶ | GO to JB24. |
| | No ▶ | REPAIR plugs. ADJUST gap or REPLACE as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JB24** CHECK SPARK PLUG RESISTANCE | | |
| • Measure spark plug resistance.<br>• **Is resistance between 2000 and 20000 ohms?** | Yes ▶ | If you were directed to this Pinpoint Test from SYMPTOM CHARTS, RETURN to the SYMPTOM CHARTS. If you were directed to this Pinpoint Test from Pinpoint Test Step HD5, RETURN to Pinpoint Test Step HD6. If you were directed to this Pinpoint Test from Pinpoint Test Step A6, RETURN to Pinpoint Test Step A7. All others GO to Pinpoint Test Step Z1. |
| | No ▶ | REPLACE spark plugs. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |

# Test Notes

This pinpoint test is intended to diagnose the following:

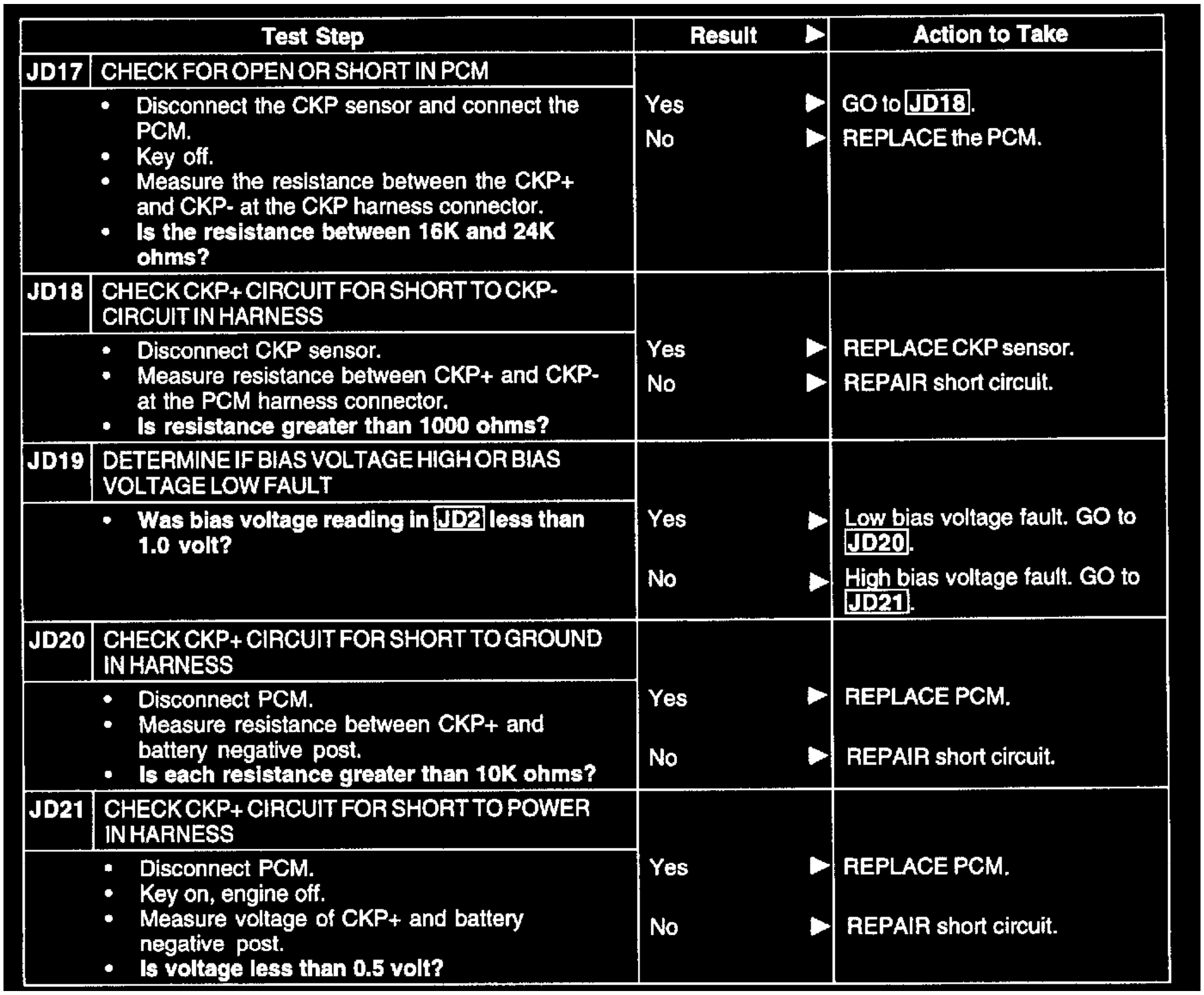
- Crankshaft Position **(CKP)** sensor
- Harness Circuits: CKP+ and CKP-
- Powertrain Control Module **(PCM)**





| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JD1** | CHECK CKP+ CKP—CONTINUITY | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.<br>● Disconnect the CKP sensor and PCM.<br>● Measure resistance of CKP(+) and CKP(-) circuits between the PCM harness connector and the CKP harness connector.<br>● **Is resistance greater than 5 ohms?** | Yes ▶<br>No ▶ | REPAIR open circuit.<br>GO to JD2. |
| **JD2** | CHECK FOR CKP+ BIAS VOLTAGE FAULT | | |
| | ● Key on, engine off.<br>● Reconnect the PCM.<br>● Measure voltage between CKP(+) at the CKP harness connector and battery negative post.<br>● Key off.<br>● **Was voltage greater than 1.0 volt but less than 2.0 volts?** | Yes ▶<br>No ▶ | GO to JD3.<br>Bias fault. GO to JD19. |
| **JD3** | CHECK FOR CKP- BIAS VOLTAGE FAULT | | |
| | ● Key on, engine off.<br>● Measure voltage between CKP(-) circuit at the CKP harness connector and battery negative post.<br>● **Was voltage between 1.0 and 2.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to JD10.<br>Bias fault. GO to JD4. |
| **JD4** | DETERMINE IF BIAS HIGH OR BIAS LOW FAULT | | |
| | ● **Was bias voltage reading in JD3 less than 1.0 volt?** | Yes ▶<br>No ▶ | Bias low fault. GO to JD5.<br>Bias high fault. GO to JD6. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JD5** | CHECK CKP- CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | - Disconnect PCM.<br>- Measure resistance of CKP(-) circuit at the PCM harness connector and battery negative post.<br>- **Is each resistance greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **JD6** | CHECK CKP- CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | - Disconnect PCM.<br>- Key on, engine off.<br>- Measure voltage of CKP(-) circuit at the PCM harness connector and battery negative post.<br>- **Is voltage less than 0.5 volt?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| **JD10** | CHECK CKP SENSOR AMPLITUDE AT PCM | | |
| | - Reconnect CKP sensor.<br>- Disconnect PCM.<br>- Measure voltage between CKP(+) and CKP(-) at the PCM harness connector when cranking engine.<br>- Key off.<br>- **Was settled ac voltage reading greater than 0.4 volt?** | Yes ▶<br>No ▶ | CKP circuit is OK. GO to JD17.<br>Amplitude fault. GO to JD12. |
| **JD12** | CHECK CKP CIRCUIT RESISTANCE FOR AMPLITUDE FAULT | | |
| | - Measure resistance between CKP(+) and CKP(-) at the PCM harness connector.<br>- **Is resistance between 300 and 800 ohms?** | Yes ▶<br>No ▶ | GO to JD16.<br>GO to JD13. |
| **JD13** | DETERMINE IF RESISTANCE HIGH OR RESISTANCE LOW FAULT | | |
| | - **Was the resistance from JD12 less than 300 ohms?** | Yes ▶<br>No ▶ | Low resistance fault. GO to JD14.<br>REPLACE CKP sensor. |
| **JD14** | CHECK CKP+ FOR SHORT TO CKP- | | |
| | - Disconnect CKP sensor.<br>- Measure resistance between the CKP+ and CKP- at the harness connector.<br>- **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | REPAIR short.<br>REPAIR open circuit. |
| **JD16** | CHECK CKP SENSOR AND PULSE WHEEL | | |
| | - Check pulse wheel and CKP sensor visually for damage.<br>- **Is CKP sensor and pulse wheel OK?** | Yes ▶<br>No ▶ | REPLACE CKP sensor.<br>REPAIR or REPLACE damaged parts. |

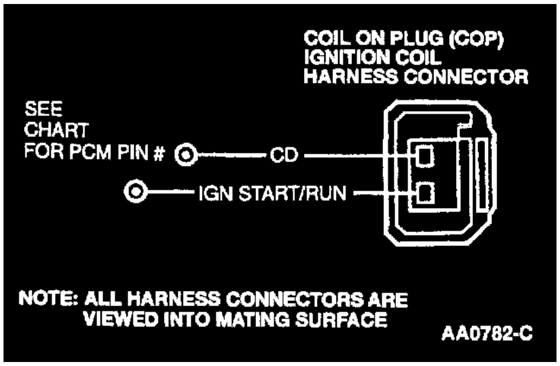


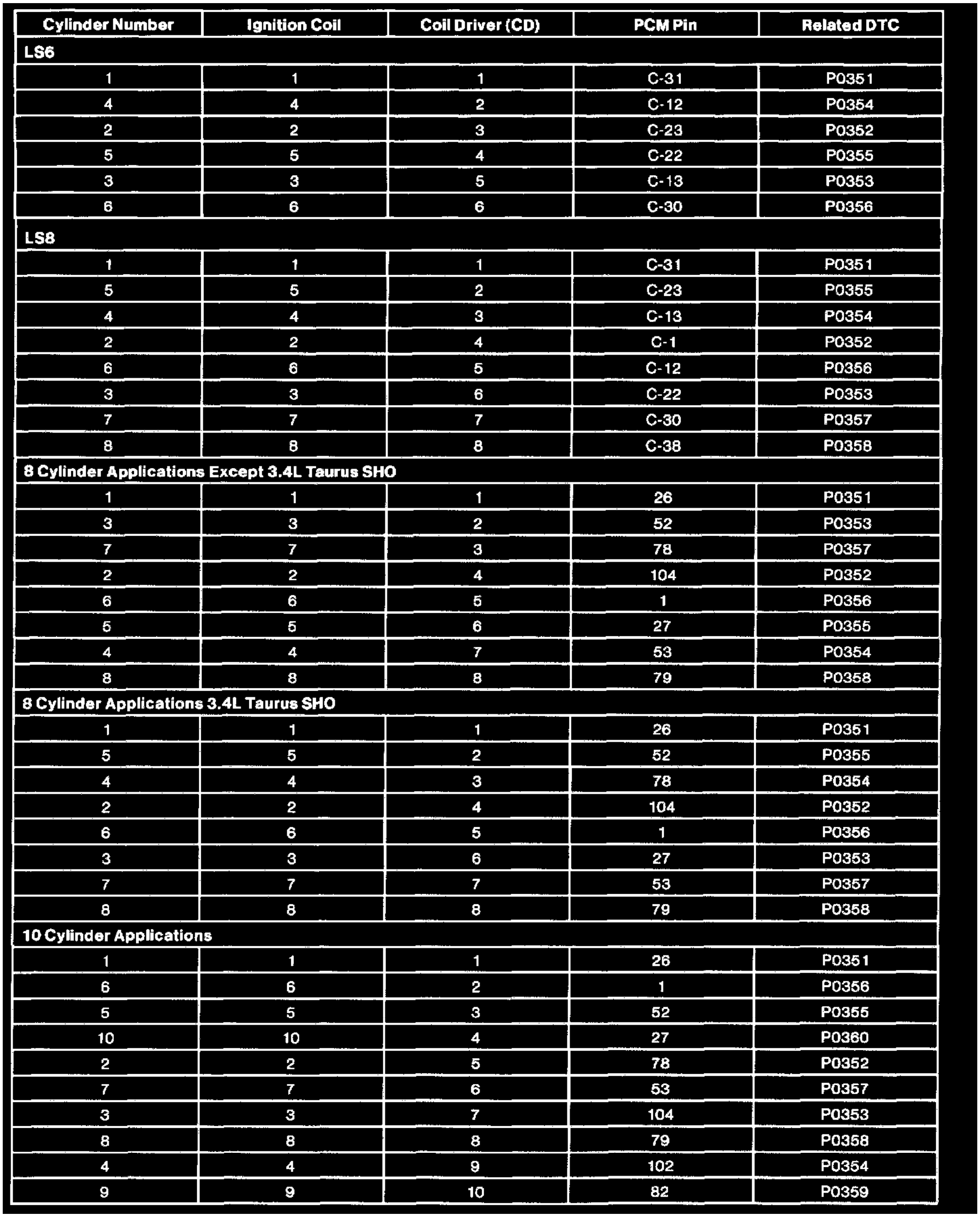
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| JD17 | CHECK FOR OPEN OR SHORT IN PCM | | |
| | • Disconnect the CKP sensor and connect the PCM.<br>• Key off.<br>• Measure the resistance between the CKP+ and CKP- at the CKP harness connector.<br>• **Is the resistance between 16K and 24K ohms?** | Yes ▶<br>No ▶ | GO to JD18.<br>REPLACE the PCM. |
| JD18 | CHECK CKP+ CIRCUIT FOR SHORT TO CKP- CIRCUIT IN HARNESS | | |
| | • Disconnect CKP sensor.<br>• Measure resistance between CKP+ and CKP- at the PCM harness connector.<br>• **Is resistance greater than 1000 ohms?** | Yes ▶<br>No ▶ | REPLACE CKP sensor.<br>REPAIR short circuit. |
| JD19 | DETERMINE IF BIAS VOLTAGE HIGH OR BIAS VOLTAGE LOW FAULT | | |
| | • **Was bias voltage reading in JD2 less than 1.0 volt?** | Yes ▶<br>No ▶ | Low bias voltage fault. GO to JD20.<br>High bias voltage fault. GO to JD21. |
| JD20 | CHECK CKP+ CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | • Disconnect PCM.<br>• Measure resistance between CKP+ and battery negative post.<br>• **Is each resistance greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |
| JD21 | CHECK CKP+ CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | • Disconnect PCM.<br>• Key on, engine off.<br>• Measure voltage of CKP+ and battery negative post.<br>• **Is voltage less than 0.5 volt?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |

# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Ignition coils
- Ignition coil harness
- Powertrain Control Module **(PCM)**



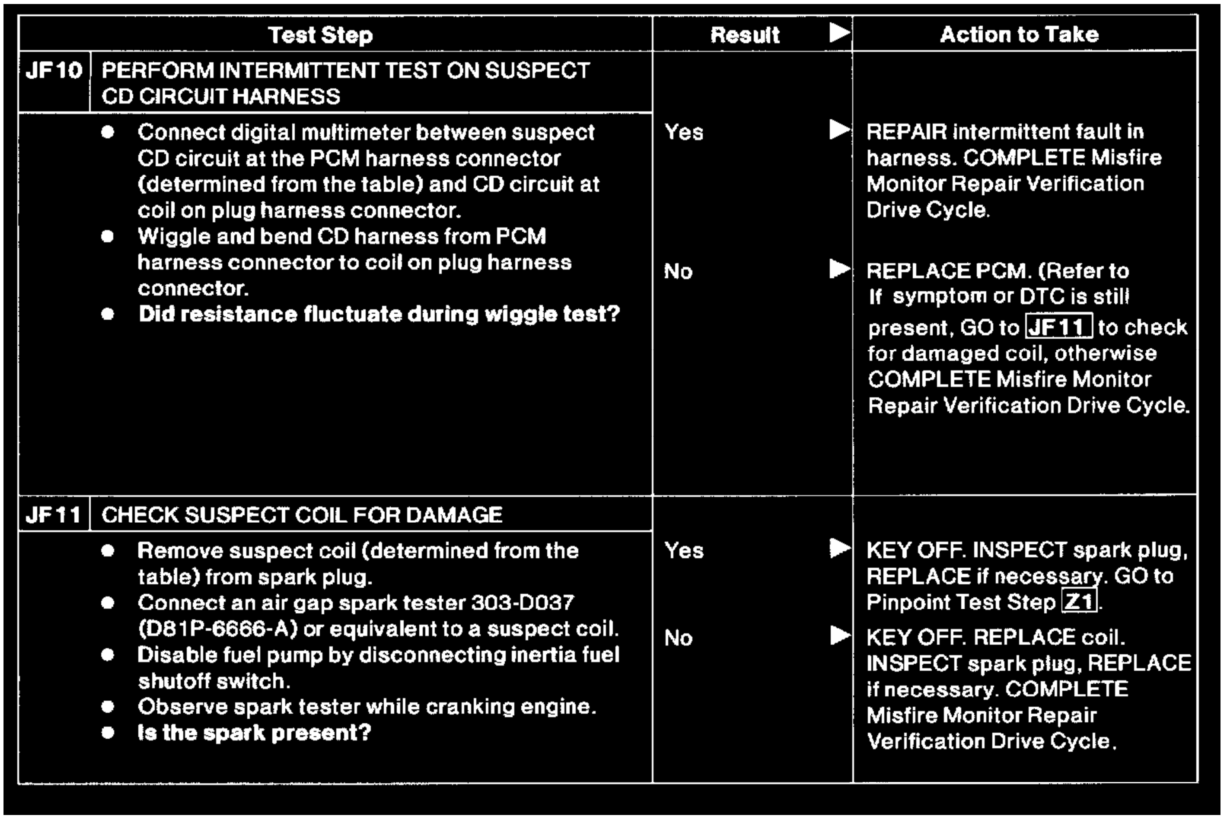


| Cylinder Number | Ignition Coil | Coil Driver (CD) | PCM Pin | Related DTC |
|---|---|---|---|---|
| **LS6** | | | | |
| 1 | 1 | 1 | C-31 | P0351 |
| 4 | 4 | 2 | C-12 | P0354 |
| 2 | 2 | 3 | C-23 | P0352 |
| 5 | 5 | 4 | C-22 | P0355 |
| 3 | 3 | 5 | C-13 | P0353 |
| 6 | 6 | 6 | C-30 | P0356 |
| **LS8** | | | | |
| 1 | 1 | 1 | C-31 | P0351 |
| 5 | 5 | 2 | C-23 | P0355 |
| 4 | 4 | 3 | C-13 | P0354 |
| 2 | 2 | 4 | C-1 | P0352 |
| 6 | 6 | 5 | C-12 | P0356 |
| 3 | 3 | 6 | C-22 | P0353 |
| 7 | 7 | 7 | C-30 | P0357 |
| 8 | 8 | 8 | C-38 | P0358 |
| **8 Cylinder Applications Except 3.4L Taurus SHO** | | | | |
| 1 | 1 | 1 | 26 | P0351 |
| 3 | 3 | 2 | 52 | P0353 |
| 7 | 7 | 3 | 78 | P0357 |
| 2 | 2 | 4 | 104 | P0352 |
| 6 | 6 | 5 | 1 | P0356 |
| 5 | 5 | 6 | 27 | P0355 |
| 4 | 4 | 7 | 53 | P0354 |
| 8 | 8 | 8 | 79 | P0358 |
| **8 Cylinder Applications 3.4L Taurus SHO** | | | | |
| 1 | 1 | 1 | 26 | P0351 |
| 5 | 5 | 2 | 52 | P0355 |
| 4 | 4 | 3 | 78 | P0354 |
| 2 | 2 | 4 | 104 | P0352 |
| 6 | 6 | 5 | 1 | P0356 |
| 3 | 3 | 6 | 27 | P0353 |
| 7 | 7 | 7 | 53 | P0357 |
| 8 | 8 | 8 | 79 | P0358 |
| **10 Cylinder Applications** | | | | |
| 1 | 1 | 1 | 26 | P0351 |
| 6 | 6 | 2 | 1 | P0356 |
| 5 | 5 | 3 | 52 | P0355 |
| 10 | 10 | 4 | 27 | P0360 |
| 2 | 2 | 5 | 78 | P0352 |
| 7 | 7 | 6 | 53 | P0357 |
| 3 | 3 | 7 | 104 | P0353 |
| 8 | 8 | 8 | 79 | P0358 |
| 4 | 4 | 9 | 102 | P0354 |
| 9 | 9 | 10 | 82 | P0359 |

Ignition Coil To Cylinder Correlation

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JF1** | DETERMINE WHICH COIL IS NOT FIRING | | |
| | NOTE: Electronic ignition engine timing is entirely controlled by the PCM. Electronic ignition timing is NOT adjustable. Do not attempt to check base timing. You will receive false readings.<br>● Determine which coil is not firing using information from Pinpoint Test JB or DTC and the table at the beginning of this pinpoint test.<br>● Record cylinder, coil and PCM pin number from the table.<br>● **Have the cylinder number, coil driver and PCM pin number been recorded?** | Yes ▶<br>No ▶ | GO to JF2.<br>To obtain required information, REPEAT JF1. |
| **JF2** | DTC P0351, P0356, P0357: CRANKSHAFT POSITION SENSOR FAILURE | | |
| | ● **Are any of the above listed DTCs present?** | Yes ▶<br>No ▶ | GO to JF3.<br>GO to JF4. |
| **JF3** | CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR | | |
| | ● Measure resistance of crankshaft position sensor.<br>● **Is resistance between 290 and 390 ohms?** | Yes ▶<br>No ▶ | GO to JF4.<br>REPLACE crankshaft position sensor. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JF4** | CHECK FUNCTIONALITY OF SUSPECT COIL DRIVER (CD) CIRCUIT | | |
| | ● Disconnect suspect coil (determined from the table).<br>● Connect incandescent test lamp between IGN START/RUN and suspect CD circuit (determined from the table) at the coil on plug harness connector.<br>● Disable fuel pump by disconnecting inertia fuel shutoff switch.<br>● Observe incandescent test lamp while cranking engine.<br>● **Is the test lamp blinking consistently?** | Yes ▶<br>No ▶ | KEY OFF. GO to JF5.<br>KEY OFF. GO to JF6. |
| **JF5** | CHECK FUNCTIONALITY OF SUSPECT COIL | | |
| | ● Remove suspect coil (determined from the table) from spark plug.<br>● Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent to a suspect coil.<br>● Reconnect suspect coil harness connector.<br>● Observe spark tester while cranking engine.<br>● **Is the spark present?** | Yes ▶<br>No ▶ | KEY OFF. INSPECT spark plug, REPLACE if necessary. GO to Pinpoint Test Step Z1.<br>KEY OFF. REPLACE coil. INSPECT spark plug, REPLACE if necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JF6** | CHECK IGN START/RUN VOLTAGE TO SUSPECT COIL | | |
| | • Key on, engine off.<br>• Measure voltage between IGN START/RUN circuit at the coil on plug harness connector and ground.<br>• **Is voltage greater than 10.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to JF7.<br>KEY OFF. **LS6 and LS8**: GO to Pinpoint Test Step B5. **All others**: IGN START/RUN circuit fault. CHECK condition of related fuses/fuse links. If OK, REPAIR open circuit. If fuse/fuse link is damaged, CHECK IGN START/RUN circuit for short to ground. REPAIR as necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JF7** | CHECK SUSPECT CD CIRCUIT FOR OPEN IN HARNESS | | |
| | • Disconnect PCM.<br>• Measure resistance of suspect CD circuit between PCM harness connector pin (determined from the table) and coil on plug harness connector.<br>• **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to JF8.<br>REPAIR open circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JF8** | CHECK SUSPECT CD CIRCUIT FOR SHORT TO VPWR IN HARNESS | | |
| | • Key on, engine off.<br>• Measure voltage between suspect CD circuit at the PCM harness connector (determined from the table) and ground.<br>• **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to JF9.<br>KEY OFF. REPAIR short circuit. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JF9** | CHECK SUSPECT CD CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | • Disconnect scan tool.<br>• Measure resistance between suspect CD circuit at the PCM harness connector (determined from the table) and ground.<br>• **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to JF10.<br>REPAIR short circuit. If symptom or DTC is still present, GO to JF11 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle. |

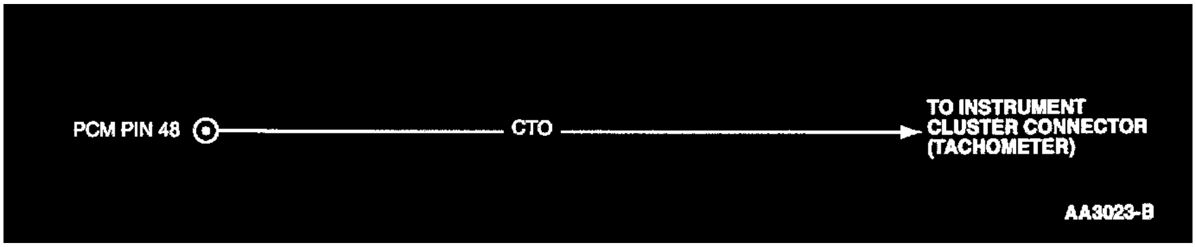


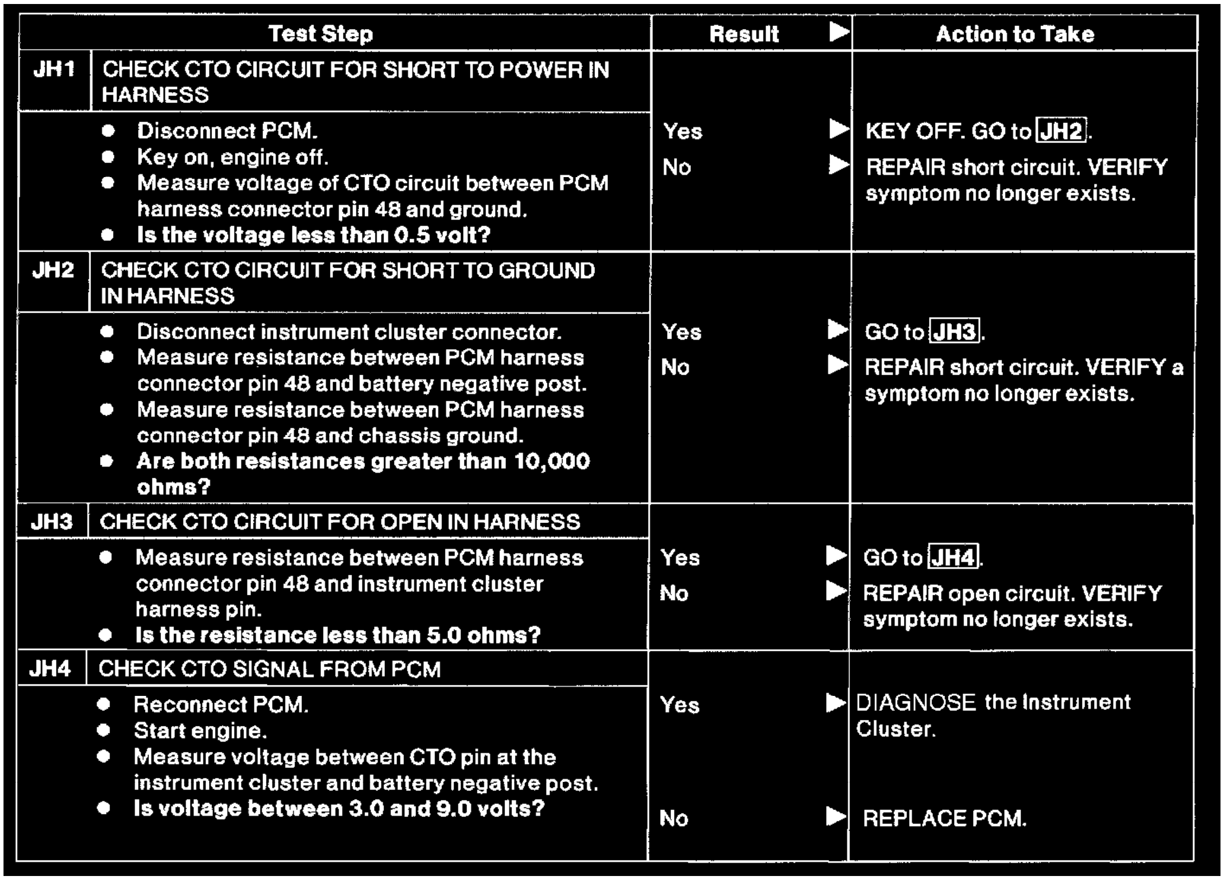
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JF10** | PERFORM INTERMITTENT TEST ON SUSPECT CD CIRCUIT HARNESS | | |
| | ● Connect digital multimeter between suspect CD circuit at the PCM harness connector (determined from the table) and CD circuit at coil on plug harness connector.<br>● Wiggle and bend CD harness from PCM harness connector to coil on plug harness connector.<br>● **Did resistance fluctuate during wiggle test?** | Yes ▶ | REPAIR intermittent fault in harness. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| | | No ▶ | REPLACE PCM. (Refer to If symptom or DTC is still present, GO to JF11 to check for damaged coil, otherwise COMPLETE Misfire Monitor Repair Verification Drive Cycle. |
| **JF11** | CHECK SUSPECT COIL FOR DAMAGE | | |
| | ● Remove suspect coil (determined from the table) from spark plug.<br>● Connect an air gap spark tester 303-D037 (D81P-6666-A) or equivalent to a suspect coil.<br>● Disable fuel pump by disconnecting inertia fuel shutoff switch.<br>● Observe spark tester while cranking engine.<br>● **Is the spark present?** | Yes ▶ | KEY OFF. INSPECT spark plug, REPLACE if necessary. GO to Pinpoint Test Step Z1. |
| | | No ▶ | KEY OFF. REPLACE coil. INSPECT spark plug, REPLACE if necessary. COMPLETE Misfire Monitor Repair Verification Drive Cycle. |

# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module **(PCM)**



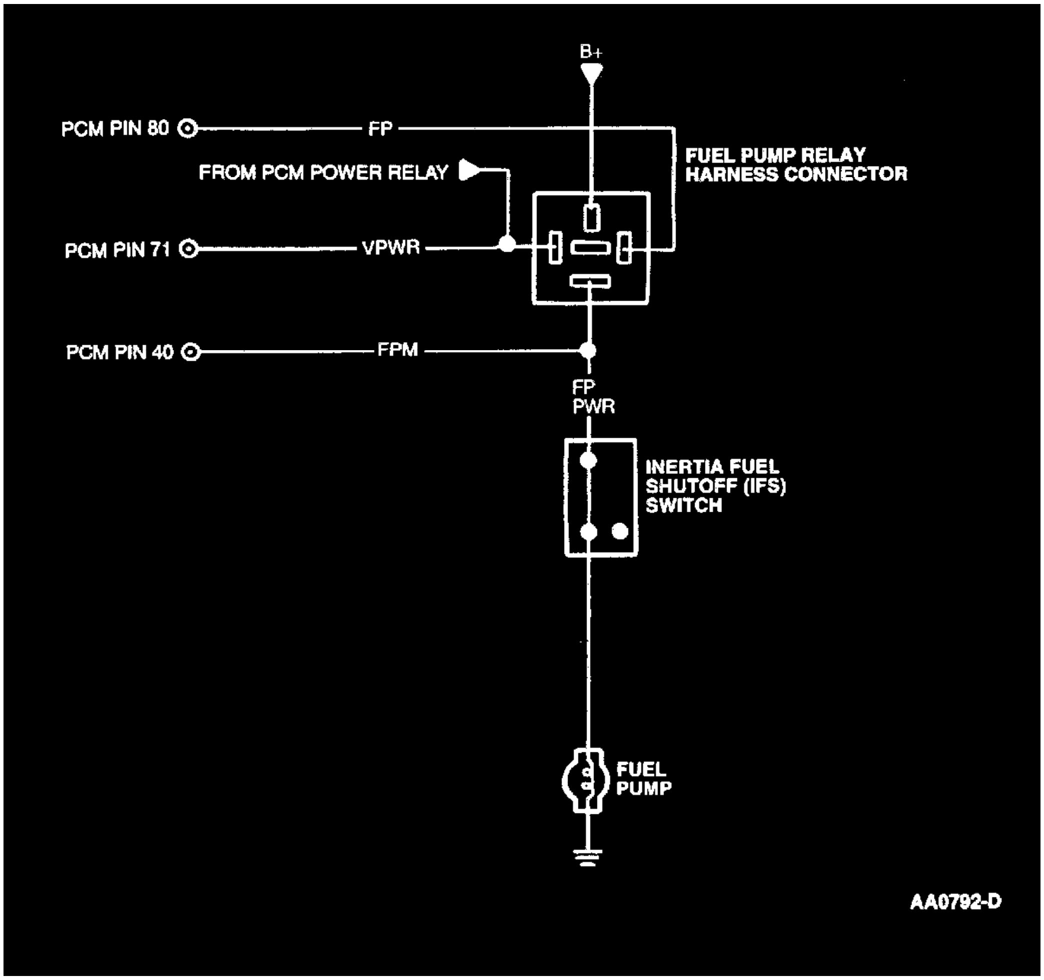


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **JH1** | CHECK CTO CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage of CTO circuit between PCM harness connector pin 48 and ground.<br>● **Is the voltage less than 0.5 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to JH2.<br>REPAIR short circuit. VERIFY symptom no longer exists. |
| **JH2** | CHECK CTO CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect instrument cluster connector.<br>● Measure resistance between PCM harness connector pin 48 and battery negative post.<br>● Measure resistance between PCM harness connector pin 48 and chassis ground.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to JH3.<br>REPAIR short circuit. VERIFY a symptom no longer exists. |
| **JH3** | CHECK CTO CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure resistance between PCM harness connector pin 48 and instrument cluster harness pin.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to JH4.<br>REPAIR open circuit. VERIFY symptom no longer exists. |
| **JH4** | CHECK CTO SIGNAL FROM PCM | | |
| | ● Reconnect PCM.<br>● Start engine.<br>● Measure voltage between CTO pin at the instrument cluster and battery negative post.<br>● **Is voltage between 3.0 and 9.0 volts?** | Yes ▶<br>No ▶ | DIAGNOSE the Instrument Cluster.<br>REPLACE PCM. |

## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Fuel pump relay
- Inertia Fuel Shutoff **(IFS)** switch
- Harness circuits: B+, VPWR, FP, LFP, GND, FPM and FP PWR
- Powertrain Control Module **(PCM)**

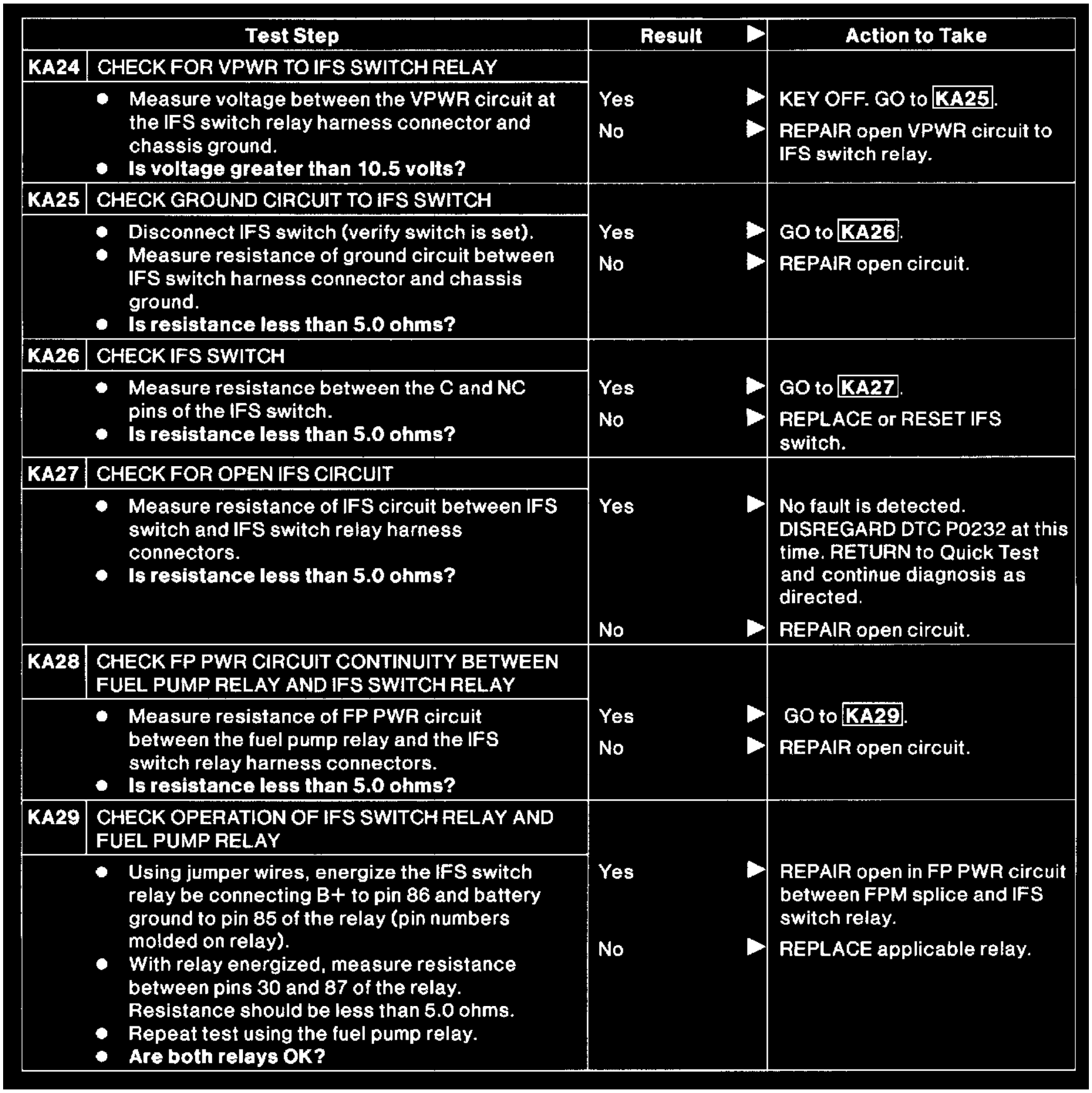

B+
PCM PIN 80
FP
FUEL PUMP RELAY HARNESS CONNECTOR
FROM PCM POWER RELAY
PCM PIN 71
VPWR
PCM PIN 40
FPM
FP PWR
INERTIA FUEL SHUTOFF (IFS) SWITCH
FUEL PUMP
AA0792-D

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| KA1 | DTC P0230: CHECK VPWR VOLTAGE TO FUEL PUMP RELAY | | |
| | ● Disconnect fuel pump relay.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the fuel pump relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KA2.<br>REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the fuel pump relay. |
| KA2 | CHECK FUEL PUMP RELAY | | |
| | ● Refer to the pin numbers moulded on the Fuel Pump Relay. There will be either a pin 1 or pin 85.<br>● Measure resistance between either pin 1 or pin 85 and all other pins of the Fuel Pump Relay. One measurement should be between 40 and 120 ohms, with the other measurements being greater than 10,000 ohms.<br>● **Are all resistance checks OK?** | Yes ▶<br>No ▶ | GO to KA3.<br>REPLACE fuel pump relay. |
| KA3 | CHECK FUEL PUMP (FP) CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between FP circuit at the fuel pump relay harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to KA4.<br>REPAIR short circuit. |
| KA4 | CHECK FP CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between FP circuit at the fuel pump relay harness connector and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to KA5.<br>REPAIR short circuit. |
| KA5 | CHECK FP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Measure resistance of FP circuit between fuel pump relay harness connector and PCM harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | **If Key On Engine Off (KOEO) DTC P0231 or P0232 is also present with the P0230:**<br>GO to KA6.<br>**All others:**<br>REPLACE PCM.<br>REPAIR open circuit. |
| KA6 | CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM | | |
| | NOTE: The next two test steps will check the FP circuit in the PCM. To do this the FPF PID will be monitored. The FPF PID is able to detect for faults on the FP circuit, and will indicate NO when no fault is detected and YES when a fault is detected.<br>● Reconnect PCM, fuel pump relay and scan tool.<br>● Key on, engine off.<br>● Access FPF PID.<br>● **Is the FPF PID Yes?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE PCM.<br>GO to KA7. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| KA7 | CHECK THE FUEL PUMP PRIMARY CIRCUIT INSIDE THE PCM WHILE CRANKING ENGINE | | |
| | NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged.<br>● While viewing the FPF PID, crank engine.<br>● **Is the FPF PID Yes during crank?** | Yes ▶ | KEY OFF. REPLACE PCM. |
| | | No ▶ | KEY OFF. The fuel pump primary circuit is OK in the harness and PCM.<br>**If KOEO P0231 is present:**<br>KEY OFF. GO to KA20.<br>**If KOEO P0232 is present:**<br>GO to KA10. |
| KA10 | DTC P0232: DOES ENGINE START? | | |
| | ● **Does the engine start?** | Yes ▶ | GO to KA11. |
| | | No ▶ | **For F-150 Lightning:**<br>GO to KA65.<br>**All others:**<br>GO to KA15. |
| KA11 | VERIFY THAT FUEL PUMP IS OFF | | |
| | ● Key on, wait five seconds.<br>● Listen for motor noise from fuel pump (it may be necessary to listen near fuel tank).<br>● **Is fuel pump off with the key on?** | Yes ▶ | KEY OFF. GO to KA13. |
| | | No ▶ | KEY OFF. GO to KA12. |
| KA12 | CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED | | |
| | ● Disconnect fuel pump relay.<br>● Key on.<br>● **Is the fuel pump off?** | Yes ▶ | REPLACE fuel pump relay. |
| | | No ▶ | REPAIR short to power in FP PWR / FPM circuit. |
| KA13 | CHECK FOR OPEN FPM CIRCUIT | | |
| | ● Disconnect PCM.<br>● Disconnect fuel pump relay.<br>● Measure resistance between PCM harness connector pin 40 and FP PWR circuit at the fuel pump relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to KA14. |
| | | No ▶ | REPAIR open circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA14** | CHECK FPM CIRCUIT IN PCM | | |
| | ● Reconnect PCM and fuel pump relay.<br>● Key on, engine off.<br>● Access FPM PID.<br>● **Is the FPM PID OFF?** | Yes ▶ | Key off.<br>**For F-150 Lightning and 5.4L/6.8L F-250 HD/ 350/450:**<br>GO to KA55.<br>**All others:**<br>No fault is detected. The FPM circuit is OK in the harness and PCM. DISREGARD DTC P0232 at this time. RETURN to Quick Test and CONTINUE diagnosis as directed. |
| | | No ▶ | REPLACE PCM. |
| **KA15** | CHECK INERTIA FUEL SHUTOFF (IFS) SWITCH | | |
| | ● Disconnect inertia fuel shutoff (IFS) switch (verify that switch is reset).<br>● Measure resistance between the C and NC pins of the IFS switch.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to KA16. |
| | | No ▶ | REPLACE or RESET IFS switch. |
| **KA16** | CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL PUMP RELAY | | |
| | ● Disconnect fuel pump relay.<br>● Measure resistance of the FP PWR circuit between fuel pump relay and IFS switch harness connectors.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | RECONNECT fuel pump relay. GO to KA17. |
| | | No ▶ | REPAIR open in FP PWR circuit between IFS switch and FPM connection to circuit. (REFER to Wiring Diagram to determine IFS switch location in circuit). |
| **KA17** | CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT | | |
| | ● Disconnect fuel pump.<br>● Measure resistance of fuel pump ground circuit between fuel pump harness connector and ground.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to KA18. |
| | | No ▶ | REPAIR open circuit. For F-250 HD/350/450, be aware of resistor in ground circuit. |
| **KA18** | CHECK FOR OPEN FP PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL PUMP | | |
| | ● Measure resistance of FP PWR circuit between IFS switch and fuel pump harness connectors.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to KA19. |
| | | No ▶ | REPAIR open circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA19** | CHECK INTERNAL RESISTANCE OF FUEL PUMP | | |
| | ● Measure internal resistance of fuel pump between FP PWR pin and ground pin of the fuel pump.<br>● **Is resistance less than 10.0 ohms?** | Yes ▶ | All fuel pump circuit checks are OK. VERIFY test step results. If all test steps are OK, RECONNECT all components. Disregard DTC P0232 at this time. RETURN to Quick Test and CONTINUE diagnosis as directed. |
| | | No ▶ | REPLACE fuel pump. |
| **KA20** | DTC P0231: DOES ENGINE START? | | |
| | NOTE: If key on, engine off DTC P0230 is also present and has not been diagnosed, go to KA1 (to check the primary fuel pump circuits first).<br>● **Does the engine start?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | GO to KA21. |
| **KA21** | CHECK B+ VOLTAGE TO FUEL PUMP RELAY | | |
| | ● Disconnect fuel pump relay.<br>● Measure B+ circuit voltage at fuel pump relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | **For F-150 Lightning:**<br>GO to KA23.<br>**All others:**<br>GO to KA22. |
| | | No ▶ | VERIFY integrity of fuse for B+ supply to fuel pump relay. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FP PWR circuits for short to ground before replacing. |
| **KA22** | CHECK FOR OPEN FP PWR CIRCUIT BETWEEN FUEL PUMP RELAY AND FPM SPLICE | | |
| | ● Measure resistance between FP PWR circuit at the fuel pump relay harness connector and the battery negative post.<br>● **Is resistance less than 10.0 ohms?** | Yes ▶ | REPLACE fuel pump relay. |
| | | No ▶ | REPAIR open in FP PWR circuit between FPM splice and fuel pump relay. |
| **KA23** | CHECK VPWR AND INERTIA FUEL SHUTOFF (IFS) CIRCUITS TO INERTIA FUEL SHUTOFF SWITCH RELAY | | |
| | ● Disconnect inertia fuel shutoff (IFS) switch relay.<br>● Key on, engine off.<br>● Measure voltage between the VPWR and IFS circuits at the IFS switch relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶ | KEY OFF. GO to KA28. |
| | | No ▶ | GO to KA24. |

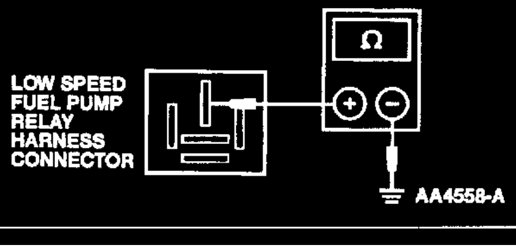


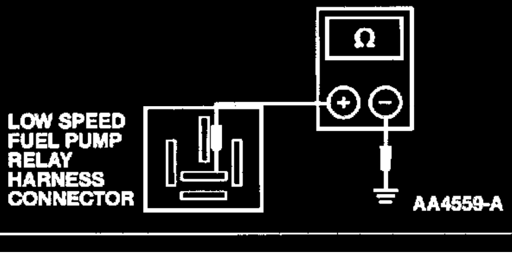
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA24** | CHECK FOR VPWR TO IFS SWITCH RELAY | | |
| | ● Measure voltage between the VPWR circuit at the IFS switch relay harness connector and chassis ground.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KA25.<br>REPAIR open VPWR circuit to IFS switch relay. |
| **KA25** | CHECK GROUND CIRCUIT TO IFS SWITCH | | |
| | ● Disconnect IFS switch (verify switch is set).<br>● Measure resistance of ground circuit between IFS switch harness connector and chassis ground.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to KA26.<br>REPAIR open circuit. |
| **KA26** | CHECK IFS SWITCH | | |
| | ● Measure resistance between the C and NC pins of the IFS switch.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to KA27.<br>REPLACE or RESET IFS switch. |
| **KA27** | CHECK FOR OPEN IFS CIRCUIT | | |
| | ● Measure resistance of IFS circuit between IFS switch and IFS switch relay harness connectors.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Quick Test and continue diagnosis as directed.<br>REPAIR open circuit. |
| **KA28** | CHECK FP PWR CIRCUIT CONTINUITY BETWEEN FUEL PUMP RELAY AND IFS SWITCH RELAY | | |
| | ● Measure resistance of FP PWR circuit between the fuel pump relay and the IFS switch relay harness connectors.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to KA29.<br>REPAIR open circuit. |
| **KA29** | CHECK OPERATION OF IFS SWITCH RELAY AND FUEL PUMP RELAY | | |
| | ● Using jumper wires, energize the IFS switch relay be connecting B+ to pin 86 and battery ground to pin 85 of the relay (pin numbers molded on relay).<br>● With relay energized, measure resistance between pins 30 and 87 of the relay. Resistance should be less than 5.0 ohms.<br>● Repeat test using the fuel pump relay.<br>● **Are both relays OK?** | Yes ▶<br>No ▶ | REPAIR open in FP PWR circuit between FPM splice and IFS switch relay.<br>REPLACE applicable relay. |

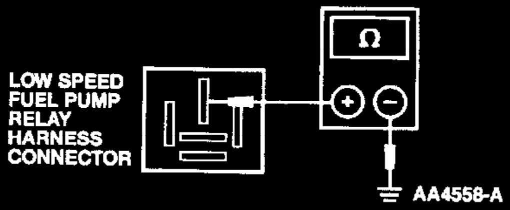
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA30** | CONTINUOUS MEMORY DTC P0232: CHECK FUEL PUMP SECONDARY CIRCUITS | | |
| | NOTE: If Continuous Memory (DTC) P0230 is also present, GO to KA40.<br>● Key on, engine off.<br>● Access FPM PID on Scan Tool.<br>● Observe the FPM PID for an indication of a fault while completing the following (the FPM PID will turn ON when an open or short to power is detected):<br>— Shake, wiggle, bend the FP PWR circuit between the FP PWR pin at the fuel pump relay and the fuel pump.<br>— Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground.<br>— Shake, wiggle, bend the FPM circuit between the PCM and the splice to the FP PWR circuit.<br>— Lightly tap the fuel pump, inertia fuel shutoff switch and fuel pump relay to simulate road shock.<br>— For F-150 Lightning and 5.4L/6.8L F-250 HD/350/450, disconnect low speed fuel pump relay and note FPM PID.<br>● Key off.<br>● **Was a fault indicated/found?** | Yes ▶ | **For F-150 Lightning and 5.4L/6.8L F-250 HD/350/450:**<br>If the FPM PID is consistently on with the low speed fuel pump relay disconnected; VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit between low speed fuel pump relay, through resistor to splice. Otherwise, GO to "All others" Action to Take.<br>**All others:**<br>ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

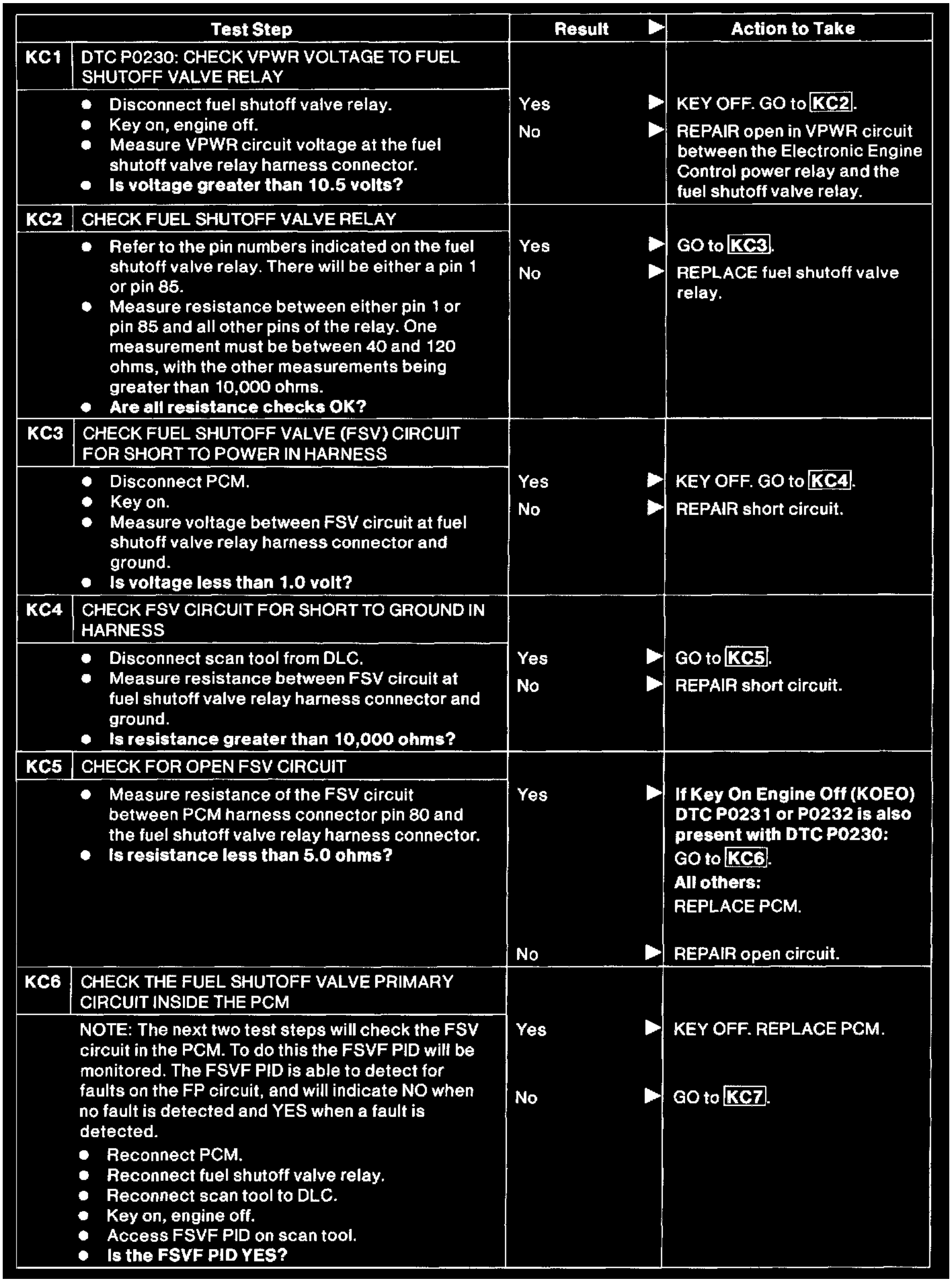
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA35** | CONTINUOUS MEMORY DTC P0231: CHECK HARNESS CIRCUITS | | |
| | ● Disconnect PCM.<br>● Install a jumper wire between PCM harness connector pin 80 (54 for Cougar, 2.5L Contour/Mystique) and ground.<br>● Connect a digital multimeter between PCM harness connector pin 40 and ground.<br>● Key on. The fuel pump will turn on and voltage will be greater than 10.0 volts.<br>● Observe voltage for an indication of a fault while completing the following (voltage will change suddenly when a fault is detected, indicating an open):<br>— Shake, wiggle, bend the B+ circuit to the fuel pump relay.<br>— Lightly tap the fuel pump relay to simulate road shock.<br>— Shake, wiggle, bend the FP PWR circuit between the fuel pump relay and the FPM splice.<br>— For F-150 Lightning, also shake, wiggle and bend the circuits connected to the inertia fuel shutoff (IFS) switch relay. Lightly tap the IFS switch and IFS switch relay.<br>● Key off.<br>● Inspect the fuel pump relay connector for corrosion and damaged pins.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **KA40** | CONTINUOUS MEMORY DTC P0230: CHECK FUEL PUMP PRIMARY CIRCUITS | | |
| | ● Key on, engine off. Wait 5 seconds.<br>● Access FPF PID. The FPF PID will be NO, indicating that the PCM detects VPWR voltage through the fuel pump relay coil and FP circuit.<br>● Observe the FPF PID for an indication of a fault while completing the following (the FPF PID will read YES, when an open is detected).<br>— Shake, wiggle, bend the Fuel Pump (FP) circuit between the PCM and the fuel pump relay.<br>— Shake, wiggle bend the VPWR circuit between the electronic engine control power relay and the fuel pump relay.<br>— Lightly tap the fuel pump relay (to simulate road shock).<br>● Key off.<br>● Inspect the PCM and fuel pump relay connectors for corrosion, damaged pins.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA45** | DTC P1232: CHECK VPWR VOLTAGE TO LOW SPEED FUEL PUMP RELAY | | |
| | ● Disconnect low speed fuel pump relay.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the low speed fuel pump relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KA46.<br>REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the low speed fuel pump relay. |
| **KA46** | CHECK LOW SPEED FUEL PUMP RELAY | | |
| | ● Measure resistance between pin 85 and all other pin of the low speed fuel pump relay (pin numbers moulded on relay). One measurement must be between 40 and 100 ohms, with the other measurements being greater than 10,000 ohms.<br>● **Are all resistance checks OK?** | Yes ▶<br>No ▶ | GO to KA47.<br>REPLACE low speed fuel pump relay. |
| **KA47** | CHECK LOW FUEL PUMP (LFP) CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on.<br>● Measure voltage between LFP circuit at low fuel pump relay harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to KA48.<br>REPAIR short circuit. |
| **KA48** | CHECK LFP CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between LFP circuit at low fuel pump relay harness connector and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to KA49.<br>REPAIR short circuit. |
| **KA49** | CHECK FOR OPEN LFP CIRCUIT | | |
| | ● Measure resistance of LFP circuit between PCM harness connector pin 19 and the low speed fuel pump relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuit. |
| **KA55** | CHECK FOR OPEN FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR | | |
| | ● Disconnect low speed fuel pump relay.<br>● Key on, engine off.<br>● Again, access FPM PID.<br>● **Is the FPM PID off?** | Yes ▶<br>No ▶ | KEY OFF. No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Quick Test and CONTINUE diagnosis as directed.<br>VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit between low speed fuel pump relay, through resistor, to splice. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA60** | CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE (DTC) P1232: CHECK LOW SPEED FUEL PUMP PRIMARY CIRCUITS | | |
| | - Key on, engine off. Wait 5 seconds.<br>- Access LFPF PID. The LFPF PID will be NO, indicating that the PCM detects VPWR voltage through the low speed fuel pump relay coil and LFP circuit (pin 19) to the PCM.<br>- Observe the LFPF PID for an indication of a fault while completing the following (the LFPF PID will be YES if a fault is detected).<br>— Shake, wiggle, bend the LFP circuit between the PCM and the low speed fuel pump relay.<br>— Shake, wiggle, bend the VPWR circuit between the electronic engine control power relay and the low speed fuel pump relay.<br>— Lightly tap the low speed fuel pump relay (to simulate road shock).<br>- Key off.<br>- Inspect the PCM and low speed fuel pump relay connectors for corrosion, damaged pins.<br>- **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **KA65** | CHECK RESISTANCE OF FUEL PUMP GROUND CIRCUIT THROUGH RESISTOR | | |
| | - Disconnect low speed fuel pump relay.<br>- Measure resistance of ground circuit through resistor between low speed fuel pump relay harness connector and chassis ground.<br>- **Is resistance less than 7.0 ohms?**<br><br> | Yes ▶ | GO to KA66. |
| | | No ▶ | VERIFY condition of fuel pump ground circuit resistor. If OK, REPAIR open circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA66** | CHECK FOR OPEN GROUND CIRCUIT BETWEEN LOW SPEED FUEL PUMP RELAY AND FUEL PUMPS | | |
| | ● Disconnect fuel pumps.<br>● Measure resistance of ground circuit between one of the fuel pumps and the low speed fuel pump relay harness connectors (same relay pin as one used in previous step).<br>● Repeat same check except check ground to other fuel pump.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to KA67.<br>REPAIR open circuit(s). |
| **KA67** | CHECK INTERNAL RESISTANCES OF EACH FUEL PUMP | | |
| | ● Measure internal resistance of one fuel pump between FP PWR pin and ground pin of the fuel pump.<br>● Repeat test for other fuel pump.<br>● **Are both resistances less than 10.0 ohms?** | Yes ▶<br>No ▶ | GO to KA68.<br>REPLACE appropriate fuel pump(s). |
| **KA68** | CHECK FOR OPEN FP PWR CIRCUIT BETWEEN FPM SPLICE AND FUEL PUMPS | | |
| | ● Disconnect inertia fuel shutoff (IFS) switch relay.<br>● Measure resistance of FP PWR circuit between IFS switch relay and one of the fuel pump's harness connectors.<br>● Repeat test for other fuel pump.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶<br>No ▶ | No fault is detected. DISREGARD DTC P0232 at this time. RETURN to Quick Test and continue diagnosis as directed.<br>REPAIR open FP PWR circuit between fuel pump and FPM circuit splice to circuit. |
| **KA70** | HARD START/LACKS POWER: CHECK GROUND CIRCUIT USED FOR HIGH SPEED FUEL PUMP OPERATION BETWEEN LOW SPEED FUEL PUMP RELAY AND CHASSIS | | |
| | ● Disconnect low speed fuel pump relay.<br>● Measure resistance of ground circuit between low speed fuel pump relay harness connector and chassis ground.<br>● **Is resistance less than 5.0 ohms?**<br> | Yes ▶<br>No ▶ | GO to KA71.<br>REPAIR open ground circuit. |

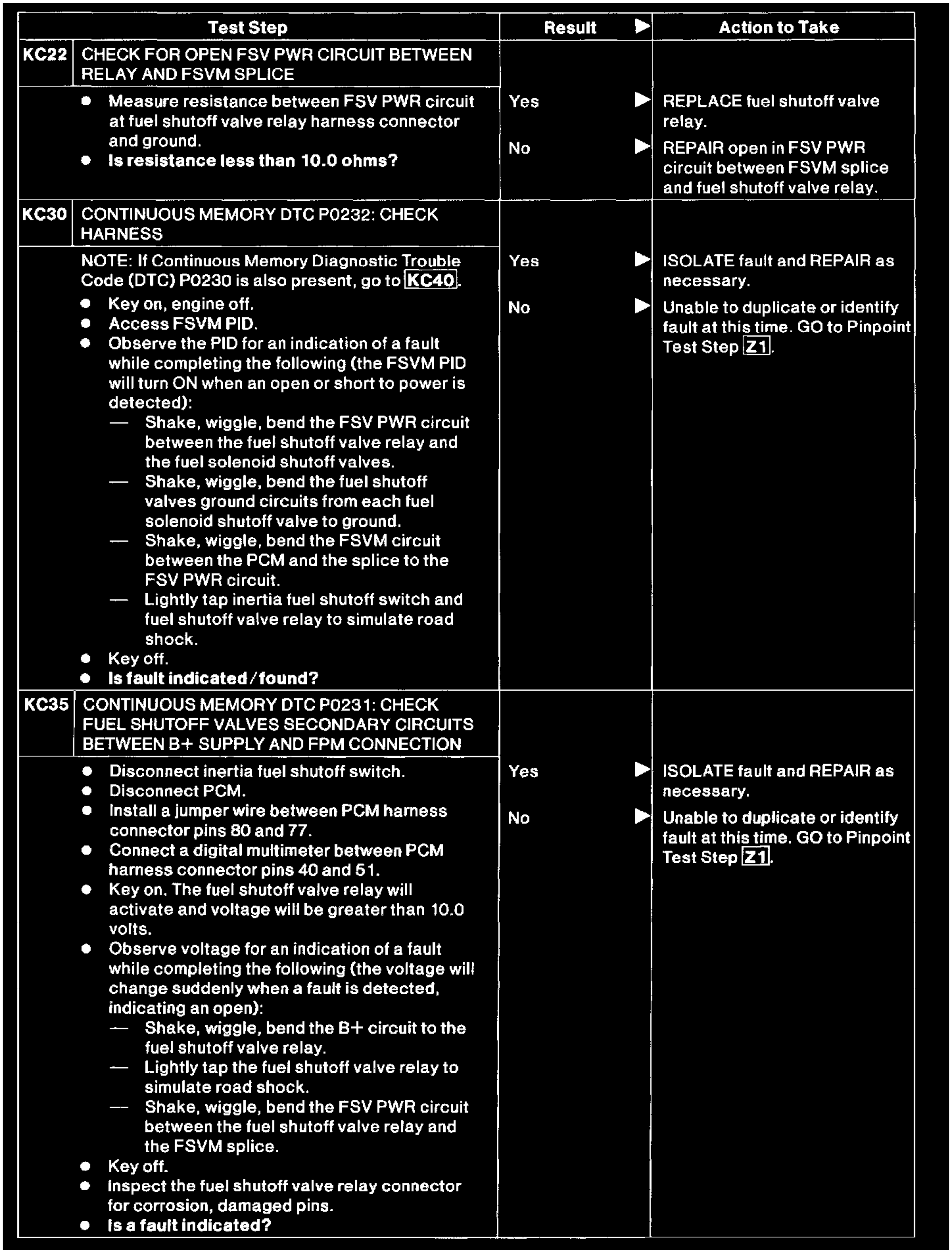
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KA71** | MEASURE RESISTANCE OF FUEL PUMP GROUND CIRCUIT THROUGH THE RESISTOR TO CHASSIS GROUND | | |
| | - Measure resistance of fuel pump ground circuit through resistor between low speed fuel pump relay harness connector and chassis ground.<br>- **Is resistance less than 7.0 ohms?**<br><br> | Yes ▶<br>No ▶ | GO to KA72.<br>REPAIR open circuit between low speed fuel pump relay and splice to ground circuit that goes through resistor. |
| **KA72** | CHECK NORMALLY CLOSED CONTACTS OF LOW SPEED FUEL PUMP RELAY | | |
| | - Measure resistance between pin 30 and pin 87A of the low speed fuel pump relay (pin numbers molded on relay).<br>- **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | High speed fuel pump circuits OK. RETURN to SYMPTOM CHARTS to continue diagnosis.<br>REPLACE low speed fuel pump relay. |
| **KA75** | CHECK FPF AND FPM PIDS | | |
| | NOTE: The applications being sent to this test step do not have any fuel pump related Key On Engine Off DTCs. The following test steps will determine if the fuel pump electrical circuits are a cause of the no start.<br>- If the fuel pump can be heard turning on for one second when the key is first turned on, GO to Pinpoint Test Step A1.<br>- Key on, engine off. Wait one second.<br>- Access the FPF and FPM PIDs (if scan tool being used is only capable of viewing one PID at a time, complete test step for each PID).<br>- **Does the FPF PID read NO, and the FPM PID read OFF?** | Yes ▶<br>No ▶ | GO to KA76.<br>**IF the FPF PID reads YES:**<br>Go to KA1 and follow P0230 diagnostics.<br>**If the FPM PID reads ON:**<br>GO to KA10 and follow P0232 diagnostics. |
| **KA76** | CHECK FPF AND FPM PIDS WHILE CRANKING ENGINE | | |
| | NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify the battery is fully charged.<br>- While viewing the FPF and FPM PIDs, crank engine.<br>- **Does the FPF PID read NO, and the FPM PID read ON during crank?** | Yes ▶<br>No ▶ | Fuel pump circuits are OK. GO to Pinpoint Test Step A1.<br>**If the FPF PID reads YES:**<br>GO to KA1 and follow P0230 diagnostics.<br>**If the FPM PID reads OFF:**<br>GO to KA20 and follow P0231 diagnostics. |



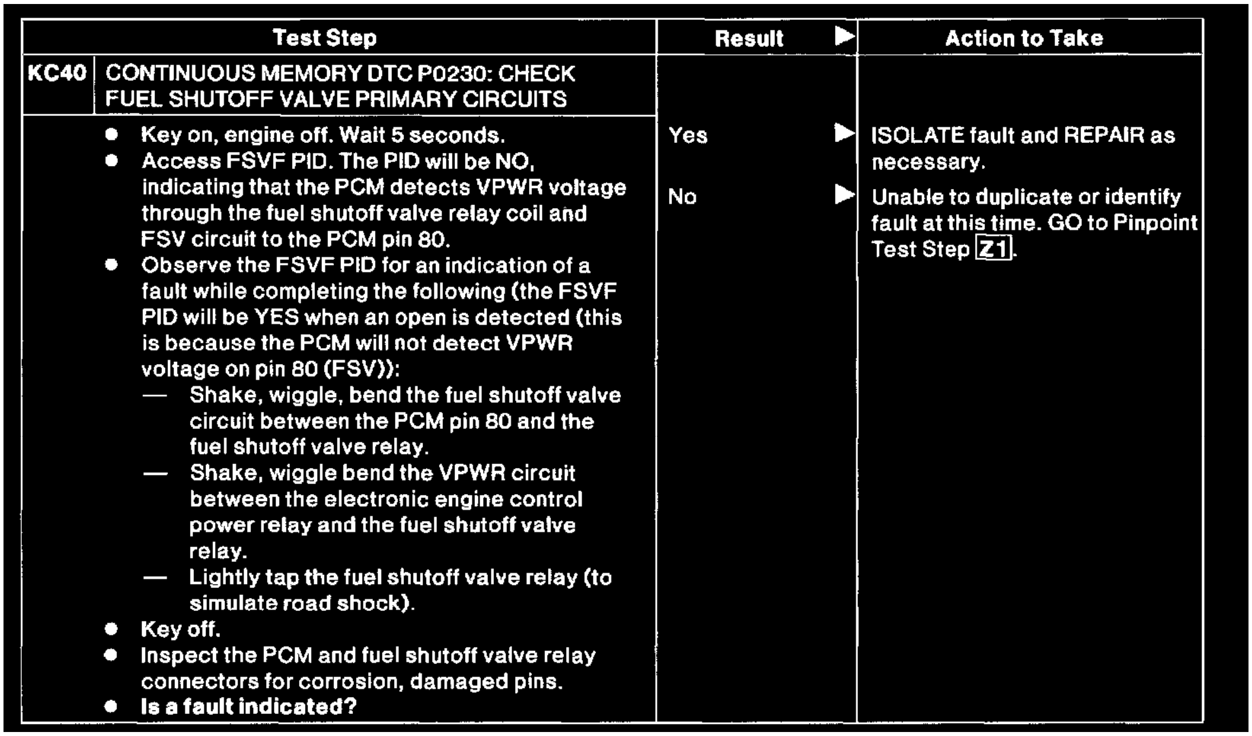
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KC1** | DTC P0230: CHECK VPWR VOLTAGE TO FUEL SHUTOFF VALVE RELAY | | |
| | ● Disconnect fuel shutoff valve relay.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the fuel shutoff valve relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KC2.<br>REPAIR open in VPWR circuit between the Electronic Engine Control power relay and the fuel shutoff valve relay. |
| **KC2** | CHECK FUEL SHUTOFF VALVE RELAY | | |
| | ● Refer to the pin numbers indicated on the fuel shutoff valve relay. There will be either a pin 1 or pin 85.<br>● Measure resistance between either pin 1 or pin 85 and all other pins of the relay. One measurement must be between 40 and 120 ohms, with the other measurements being greater than 10,000 ohms.<br>● **Are all resistance checks OK?** | Yes ▶<br>No ▶ | GO to KC3.<br>REPLACE fuel shutoff valve relay. |
| **KC3** | CHECK FUEL SHUTOFF VALVE (FSV) CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on.<br>● Measure voltage between FSV circuit at fuel shutoff valve relay harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to KC4.<br>REPAIR short circuit. |
| **KC4** | CHECK FSV CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between FSV circuit at fuel shutoff valve relay harness connector and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to KC5.<br>REPAIR short circuit. |
| **KC5** | CHECK FOR OPEN FSV CIRCUIT | | |
| | ● Measure resistance of the FSV circuit between PCM harness connector pin 80 and the fuel shutoff valve relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | **If Key On Engine Off (KOEO) DTC P0231 or P0232 is also present with DTC P0230:**<br>GO to KC6.<br>**All others:**<br>REPLACE PCM.<br>REPAIR open circuit. |
| **KC6** | CHECK THE FUEL SHUTOFF VALVE PRIMARY CIRCUIT INSIDE THE PCM | | |
| | NOTE: The next two test steps will check the FSV circuit in the PCM. To do this the FSVF PID will be monitored. The FSVF PID is able to detect for faults on the FP circuit, and will indicate NO when no fault is detected and YES when a fault is detected.<br>● Reconnect PCM.<br>● Reconnect fuel shutoff valve relay.<br>● Reconnect scan tool to DLC.<br>● Key on, engine off.<br>● Access FSVF PID on scan tool.<br>● **Is the FSVF PID YES?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE PCM.<br>GO to KC7. |

| Test Step | | Result | ▶ | Action to Take |
|---|---|---|---|---|
| **KC7** | CHECK FUEL SHUTOFF VALVE PRIMARY CIRCUIT INSIDE PCM WHILE CRANKING ENGINE | | | |
| | NOTE: The scan tool must be connected to a reliable power source that is powered with the key in the START position (such as directly to the vehicle battery). Also verify that the vehicle battery is fully charged.<br>● Key on, engine off.<br>● While viewing the FSVF PID, crank the engine.<br>● **Is the PID display YES during crank?** | Yes | ▶ | KEY OFF. REPLACE PCM. |
| | | No | ▶ | KEY OFF. The fuel pump primary circuit is OK in the harness and PCM.<br>**If DTC P0231 is present:**<br>GO to KC20.<br>**If DTC P0232 is present:**<br>GO to KC10. |
| **KC10** | DTC P0232: DOES ENGINE START? | | | |
| | ● **Does the engine start?** | Yes | ▶ | GO to KC11. |
| | | No | ▶ | GO to KC15. |
| **KC11** | CHECK IF POWER IS ALWAYS BEING SUPPLIED TO FSV PWR CIRCUIT | | | |
| | ● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● All accessories off (such as interior lamps or radios).<br>● Measure voltage between PCM harness connector pin 40 and ground.<br>● **Is voltage less than 1.5 volts?** | Yes | ▶ | GO to KC13. |
| | | No | ▶ | GO to KC12. |
| **KC12** | CHECK FOR FUEL SHUTOFF VALVE RELAY CONTACTS ALWAYS CLOSED | | | |
| | ● Disconnect fuel shutoff valve relay.<br>● Key on, engine off (with accessories off).<br>● Again measure voltage between PCM harness connector pin 40 and ground.<br>● **Is voltage less than 1.5 volts?** | Yes | ▶ | REPLACE fuel shutoff valve relay. |
| | | No | ▶ | REPAIR FSV PWR / FSVM circuit short to power. |
| **KC13** | CHECK FOR OPEN FSVM CIRCUIT BETWEEN PCM AND FUEL SHUTOFF VALVE RELAY | | | |
| | ● Disconnect fuel shutoff valve relay.<br>● Measure resistance between PCM harness connector pin 40 and FSV PWR circuit at the fuel shutoff valve relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes | ▶ | REPLACE PCM. |
| | | No | ▶ | REPAIR open circuit. |
| **KC15** | CHECK INERTIA FUEL SHUTOFF (IFS) SWITCH | | | |
| | ● Disconnect inertia fuel shutoff (IFS) switch (verify that switch is reset).<br>● Measure resistance between the C and NC pins of the IFS switch.<br>● **Is resistance less than 5.0 ohms?** | Yes | ▶ | GO to KC16. |
| | | No | ▶ | REPLACE or RESET IFS switch. |

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **KC16** CHECK FOR OPEN FSV PWR CIRCUIT BETWEEN IFS SWITCH AND FUEL SHUTOFF VALVE RELAY | | |
| • Disconnect fuel shutoff valve relay.<br>• Measure resistance of FSV PWR circuit between the fuel shutoff valve relay and IFS switch harness connectors.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | RECONNECT fuel shutoff valve relay. GO to KC17. |
| | No ▶ | REPAIR open in FSV PWR circuit between IFS switch and FSVM connection to circuit. |
| **KC17** CHECK FSV PWR CIRCUIT RESISTANCE TO GROUND THROUGH THE FUEL SOLENOID SHUTOFF VALVES | | |
| • Measure resistance between the FSV PWR circuit to the fuel solenoid shutoff valves at the IFS switch harness connector and chassis ground.<br>• **Is resistance less than 10.0 ohms?** | Yes ▶ | No fault is indicated. VERIFY previous test step results. If OK, disregard DTC P0232 at this time. RECONNECT IFS switch. RETURN to Quick Test and CONTINUE diagnosis as directed. |
| | No ▶ | REPAIR open circuit. Open is either in the common FSV PWR circuit before any splice to the individual fuel solenoid shutoff valves, or in each of the individual fuel solenoid shutoff valve circuits path to ground. |
| **KC20** DTC P0231: DOES ENGINE START? | | |
| NOTE: If Key On, Engine Off (KOEO) DTC P0230 is also present and has not been checked, go to KC1 to check primary fuel shutoff valve circuit first.<br>• **Does the engine start?** | Yes ▶ | REPLACE PCM. |
| | No ▶ | GO to KC21. |
| **KC21** CHECK B+ VOLTAGE TO FUEL SHUTOFF VALVE RELAY | | |
| • Disconnect fuel shutoff valve relay.<br>• Measure B+ circuit voltage at the fuel shutoff valve relay harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶ | GO to KC22. |
| | No ▶ | VERIFY integrity of fuse for B+ supply to fuel shutoff valve relay. If OK, REPAIR open B+ circuit. If fuse is damaged, check B+ and FSV PWR circuit for short to ground before replacing. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KC22** | CHECK FOR OPEN FSV PWR CIRCUIT BETWEEN RELAY AND FSVM SPLICE | | |
| | ● Measure resistance between FSV PWR circuit at fuel shutoff valve relay harness connector and ground.<br>● **Is resistance less than 10.0 ohms?** | Yes ▶<br>No ▶ | REPLACE fuel shutoff valve relay.<br>REPAIR open in FSV PWR circuit between FSVM splice and fuel shutoff valve relay. |
| **KC30** | CONTINUOUS MEMORY DTC P0232: CHECK HARNESS | | |
| | NOTE: If Continuous Memory Diagnostic Trouble Code (DTC) P0230 is also present, go to KC40.<br>● Key on, engine off.<br>● Access FSVM PID.<br>● Observe the PID for an indication of a fault while completing the following (the FSVM PID will turn ON when an open or short to power is detected):<br>— Shake, wiggle, bend the FSV PWR circuit between the fuel shutoff valve relay and the fuel solenoid shutoff valves.<br>— Shake, wiggle, bend the fuel shutoff valves ground circuits from each fuel solenoid shutoff valve to ground.<br>— Shake, wiggle, bend the FSVM circuit between the PCM and the splice to the FSV PWR circuit.<br>— Lightly tap inertia fuel shutoff switch and fuel shutoff valve relay to simulate road shock.<br>● Key off.<br>● **Is fault indicated/found?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |
| **KC35** | CONTINUOUS MEMORY DTC P0231: CHECK FUEL SHUTOFF VALVES SECONDARY CIRCUITS BETWEEN B+ SUPPLY AND FPM CONNECTION | | |
| | ● Disconnect inertia fuel shutoff switch.<br>● Disconnect PCM.<br>● Install a jumper wire between PCM harness connector pins 80 and 77.<br>● Connect a digital multimeter between PCM harness connector pins 40 and 51.<br>● Key on. The fuel shutoff valve relay will activate and voltage will be greater than 10.0 volts.<br>● Observe voltage for an indication of a fault while completing the following (the voltage will change suddenly when a fault is detected, indicating an open):<br>— Shake, wiggle, bend the B+ circuit to the fuel shutoff valve relay.<br>— Lightly tap the fuel shutoff valve relay to simulate road shock.<br>— Shake, wiggle, bend the FSV PWR circuit between the fuel shutoff valve relay and the FSVM splice.<br>● Key off.<br>● Inspect the fuel shutoff valve relay connector for corrosion, damaged pins.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

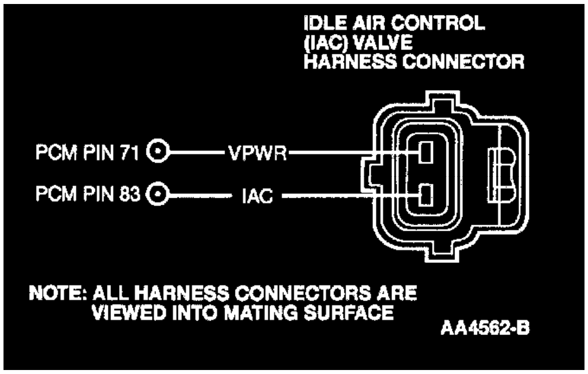


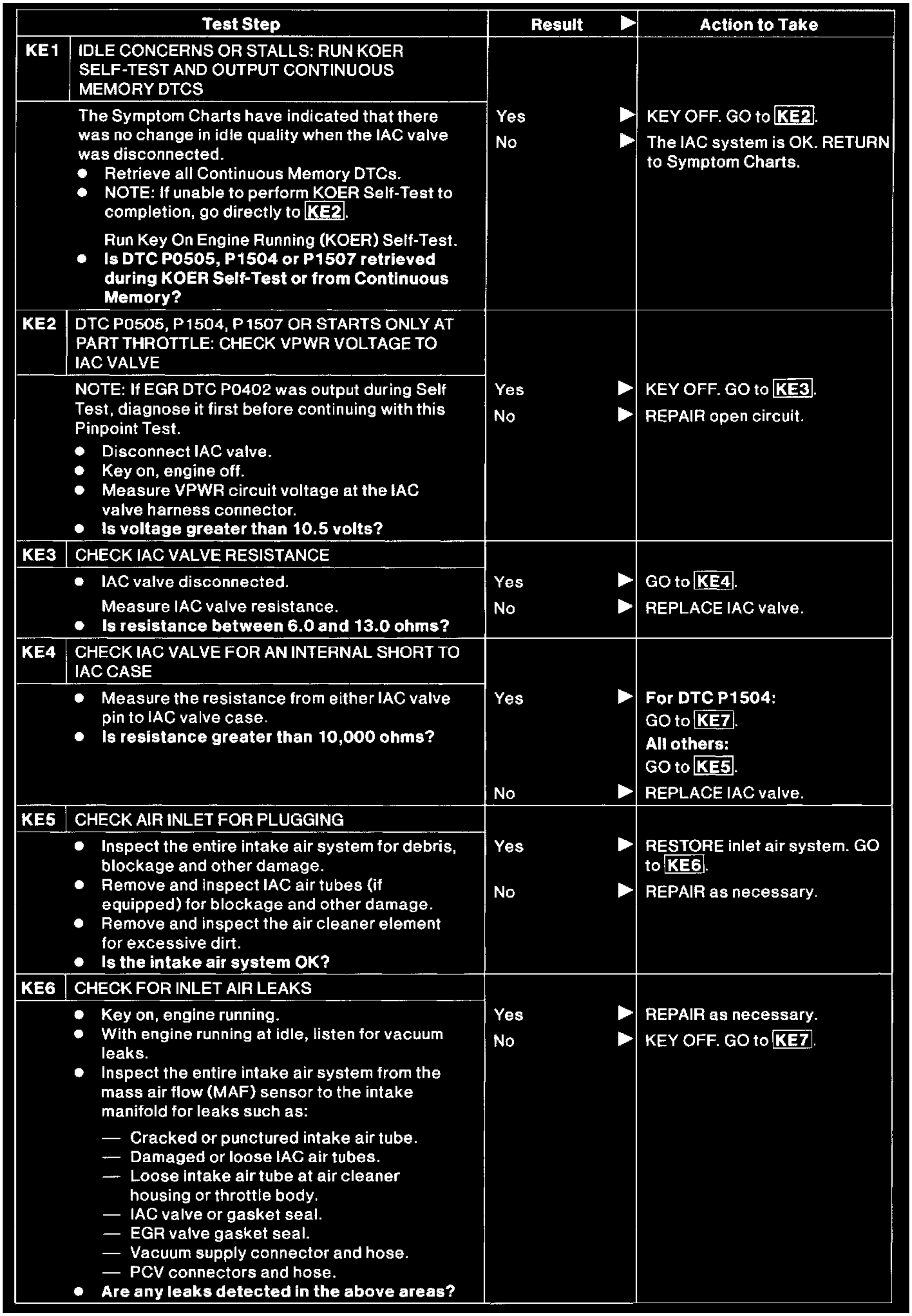
| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **KC40** CONTINUOUS MEMORY DTC P0230: CHECK FUEL SHUTOFF VALVE PRIMARY CIRCUITS | | |
| ● Key on, engine off. Wait 5 seconds.<br>● Access FSVF PID. The PID will be NO, indicating that the PCM detects VPWR voltage through the fuel shutoff valve relay coil and FSV circuit to the PCM pin 80.<br>● Observe the FSVF PID for an indication of a fault while completing the following (the FSVF PID will be YES when an open is detected (this is because the PCM will not detect VPWR voltage on pin 80 (FSV)):<br>— Shake, wiggle, bend the fuel shutoff valve circuit between the PCM pin 80 and the fuel shutoff valve relay.<br>— Shake, wiggle bend the VPWR circuit between the electronic engine control power relay and the fuel shutoff valve relay.<br>— Lightly tap the fuel shutoff valve relay (to simulate road shock).<br>● Key off.<br>● Inspect the PCM and fuel shutoff valve relay connectors for corrosion, damaged pins.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | ISOLATE fault and REPAIR as necessary.<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

# Test Notes

This Pinpoint Test is intended to diagnose the following:

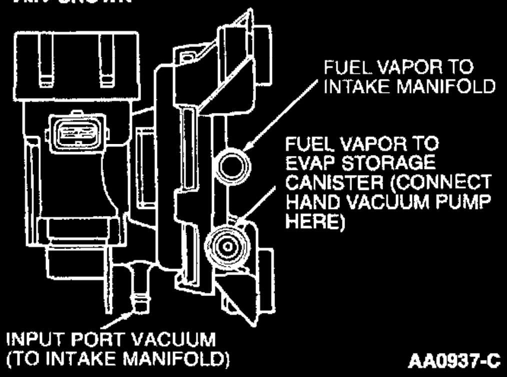
- Idle Air Control **(IAC)** Valve
- Harness Circuits: IAC and VPWR
- Powertrain Control Module **(PCM)**

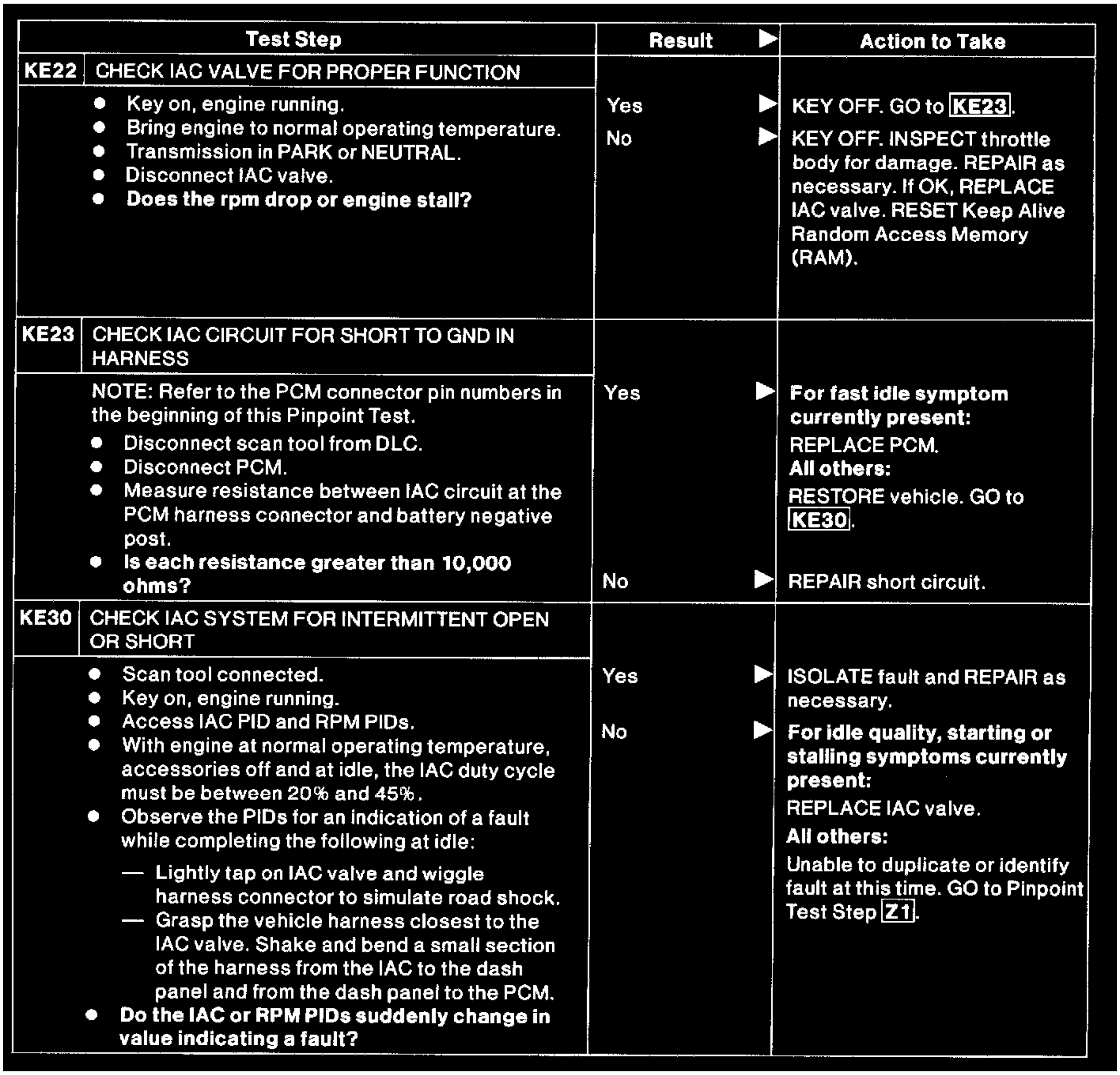




| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KE1** | IDLE CONCERNS OR STALLS: RUN KOER SELF-TEST AND OUTPUT CONTINUOUS MEMORY DTCS | | |
| | The Symptom Charts have indicated that there was no change in idle quality when the IAC valve was disconnected.<br>● Retrieve all Continuous Memory DTCs.<br>● NOTE: If unable to perform KOER Self-Test to completion, go directly to KE2.<br>Run Key On Engine Running (KOER) Self-Test.<br>● **Is DTC P0505, P1504 or P1507 retrieved during KOER Self-Test or from Continuous Memory?** | Yes ▶<br>No ▶ | KEY OFF. GO to KE2.<br>The IAC system is OK. RETURN to Symptom Charts. |
| **KE2** | DTC P0505, P1504, P1507 OR STARTS ONLY AT PART THROTTLE: CHECK VPWR VOLTAGE TO IAC VALVE | | |
| | NOTE: If EGR DTC P0402 was output during Self Test, diagnose it first before continuing with this Pinpoint Test.<br>● Disconnect IAC valve.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the IAC valve harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KE3.<br>REPAIR open circuit. |
| **KE3** | CHECK IAC VALVE RESISTANCE | | |
| | ● IAC valve disconnected.<br>Measure IAC valve resistance.<br>● **Is resistance between 6.0 and 13.0 ohms?** | Yes ▶<br>No ▶ | GO to KE4.<br>REPLACE IAC valve. |
| **KE4** | CHECK IAC VALVE FOR AN INTERNAL SHORT TO IAC CASE | | |
| | ● Measure the resistance from either IAC valve pin to IAC valve case.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | **For DTC P1504:**<br>GO to KE7.<br>**All others:**<br>GO to KE5.<br>REPLACE IAC valve. |
| **KE5** | CHECK AIR INLET FOR PLUGGING | | |
| | ● Inspect the entire intake air system for debris, blockage and other damage.<br>● Remove and inspect IAC air tubes (if equipped) for blockage and other damage.<br>● Remove and inspect the air cleaner element for excessive dirt.<br>● **Is the intake air system OK?** | Yes ▶<br>No ▶ | RESTORE inlet air system. GO to KE6.<br>REPAIR as necessary. |
| **KE6** | CHECK FOR INLET AIR LEAKS | | |
| | ● Key on, engine running.<br>● With engine running at idle, listen for vacuum leaks.<br>● Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for leaks such as:<br>— Cracked or punctured intake air tube.<br>— Damaged or loose IAC air tubes.<br>— Loose intake air tube at air cleaner housing or throttle body.<br>— IAC valve or gasket seal.<br>— EGR valve gasket seal.<br>— Vacuum supply connector and hose.<br>— PCV connectors and hose.<br>● **Are any leaks detected in the above areas?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>KEY OFF. GO to KE7. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KE7** | CHECK IAC CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.<br>• IAC valve disconnected.<br>• Disconnect PCM.<br>• Measure resistance of IAC circuit between PCM harness connector pin and IAC valve harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to KE8. |
| | | No ▶ | REPAIR open circuit. |
| **KE8** | CHECK IAC CIRCUIT FOR SHORT TO PWR IN HARNESS | | |
| | • Key on, engine off.<br>• Measure voltage on IAC circuit between PCM harness connector pin and battery negative post.<br>• **Is voltage less than 1.0 volt?** | Yes ▶ | KEY OFF. GO to KE9. |
| | | No ▶ | REPAIR short circuit. |
| **KE9** | CHECK IAC CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | • Disconnect scan tool from DLC.<br>• Measure resistance between IAC and PWR GND circuits at the PCM harness connector.<br>• **Is each resistance greater than 10,000 ohms?** | Yes ▶ | GO to KE10. |
| | | No ▶ | REPAIR short circuit. |
| **KE10** | CHECK IAC SIGNAL FROM PCM | | |
| | • Reconnect PCM and IAC valve.<br>NOTE: If stalling occurs place a shim under the hard stop screw to maintain idle conditions).<br>• Key on, engine running.<br>• Access IAC and RPM PIDS.<br>• With engine at normal operating temperature, accessories OFF and at closed throttle, the IAC duty cycle must be between approximately 22 percent and 45 percent.<br>• Slowly increase engine speed to 3000 rpm and return to closed throttle (Note: If closed throttle rpm is significantly higher than normal, ignore this step).<br>• **Is the IAC duty cycle within specification at closed throttle and does the duty cycle respond to the change in rpm?** | Yes ▶ | **For Continuous Memory DTCs P1504 and P1507:**<br>GO to KE30.<br>**All others:**<br>KEY OFF. INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. RESET Keep Alive Random Access Memory (RAM). |
| | | No ▶ | For DTC P1507, REPLACE IAC valve, otherwise REPLACE PCM. |

| Test Step | | Result | ▶ | Action to Take |
|---|---|---|---|---|
| KE20 | DTC P1506: CHECK FOR VACUUM LEAKS | | | |
| | • Key on, engine running.<br>• With the engine at idle, listen for vacuum leaks.<br>• Inspect the entire intake air system from the mass air flow (MAF) sensor to the intake manifold for damage or leaks such as:<br>  • Cracked or punctured intake air tube.<br>  • Loose or cracked IAC air tubes.<br>  • Loose intake air tube at the air cleaner housing or throttle body.<br>  • IAC valve or gasket seal.<br>  • Intake manifold assembly or gasket seal.<br>  • EGR valve gasket seal.<br>  • Vacuum supply connectors and hose.<br>  • PCV valve, connectors and hose.<br>• **Are any leaks detected in the above areas?** | Yes<br>No | ▶<br>▶ | KEY OFF. REPAIR as necessary.<br>KEY OFF. GO to KE21. |
| KE21 | CHECK EVAP SYSTEM FOR A STUCK OPEN VALVE | | | |
| | • Disconnect hoses at EVAP canister purge valve (or VMV).<br>• Connect a hand vacuum pump at the fuel vapor port to EVAP canister at the EVAP canister purge valve (or VMV).<br>• Apply 53 kPa (16 in-Hg) of vacuum to EVAP canister purge valve (or VMV).<br>**VMV SHOWN**<br> <br>• **Does the EVAP canister purge valve (or VMV) hold vacuum for 20 seconds?** | Yes<br>No | ▶<br>▶ | RECONNECT hoses. GO to KE22.<br>REPLACE EVAP canister purge valve. |



| Test Step | | Result | Action to Take |
|---|---|---|---|
| **KE22** | CHECK IAC VALVE FOR PROPER FUNCTION | | |
| | - Key on, engine running.<br>- Bring engine to normal operating temperature.<br>- Transmission in PARK or NEUTRAL.<br>- Disconnect IAC valve.<br>- **Does the rpm drop or engine stall?** | Yes ▶ | KEY OFF. GO to KE23. |
| | | No ▶ | KEY OFF. INSPECT throttle body for damage. REPAIR as necessary. If OK, REPLACE IAC valve. RESET Keep Alive Random Access Memory (RAM). |
| **KE23** | CHECK IAC CIRCUIT FOR SHORT TO GND IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this Pinpoint Test.<br>- Disconnect scan tool from DLC.<br>- Disconnect PCM.<br>- Measure resistance between IAC circuit at the PCM harness connector and battery negative post.<br>- **Is each resistance greater than 10,000 ohms?** | Yes ▶ | **For fast idle symptom currently present:**<br>REPLACE PCM.<br>**All others:**<br>RESTORE vehicle. GO to KE30. |
| | | No ▶ | REPAIR short circuit. |
| **KE30** | CHECK IAC SYSTEM FOR INTERMITTENT OPEN OR SHORT | | |
| | - Scan tool connected.<br>- Key on, engine running.<br>- Access IAC PID and RPM PIDs.<br>- With engine at normal operating temperature, accessories off and at idle, the IAC duty cycle must be between 20% and 45%.<br>- Observe the PIDs for an indication of a fault while completing the following at idle:<br>— Lightly tap on IAC valve and wiggle harness connector to simulate road shock.<br>— Grasp the vehicle harness closest to the IAC valve. Shake and bend a small section of the harness from the IAC to the dash panel and from the dash panel to the PCM.<br>- **Do the IAC or RPM PIDs suddenly change in value indicating a fault?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | **For idle quality, starting or stalling symptoms currently present:**<br>REPLACE IAC valve.<br>**All others:**<br>Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |

# KH - Hydraulic Cooling Fan

## KH: HYDRAULIC COOLING FAN

### KH1 - DTC P1474: Check HCF Solenoid Resistance

Key off.

Disconnect HCF solenoid.

Measure HCF solenoid resistance.

Is resistance between 8.5 and 11.5 ohms?

**YES** GO to KH2.

**NO** REPLACE HCF solenoid assembly.

### KH2 - Check VPWR Voltage To HCF Solenoid

Key on.

Measure VPWR circuit voltage at HCF solenoid.

Is voltage greater than 10.5 volts?

**YES** GO to KH3.

**NO** REPAIR open circuit

**KH3 - Check HCF Circuit For Open In Harness**

Measure resistance of HCF circuit between PCM harness connector and HCF solenoid harness connector.

Is resistance less than 5 ohms?

**YES** GO to KH4.

**NO** REPAIR open circuit.

**KH4 - Check HCF Circuit For Short To Power In Harness**

Key on.

Measure voltage between HCF circuit at the PCM harness connector and ground.

Is voltage less than 1.0 volt?

**YES** KEY OFF. GO to KH5.

**NO** REPAIR short circuit.

**KH5 - Check HCF Circuit For Short To Ground In Harness**

Disconnect scan tool from DLC.

Measure resistance between HCF circuit at the PCM harness connector and ground.

Is resistance greater than 10,000 ohms?

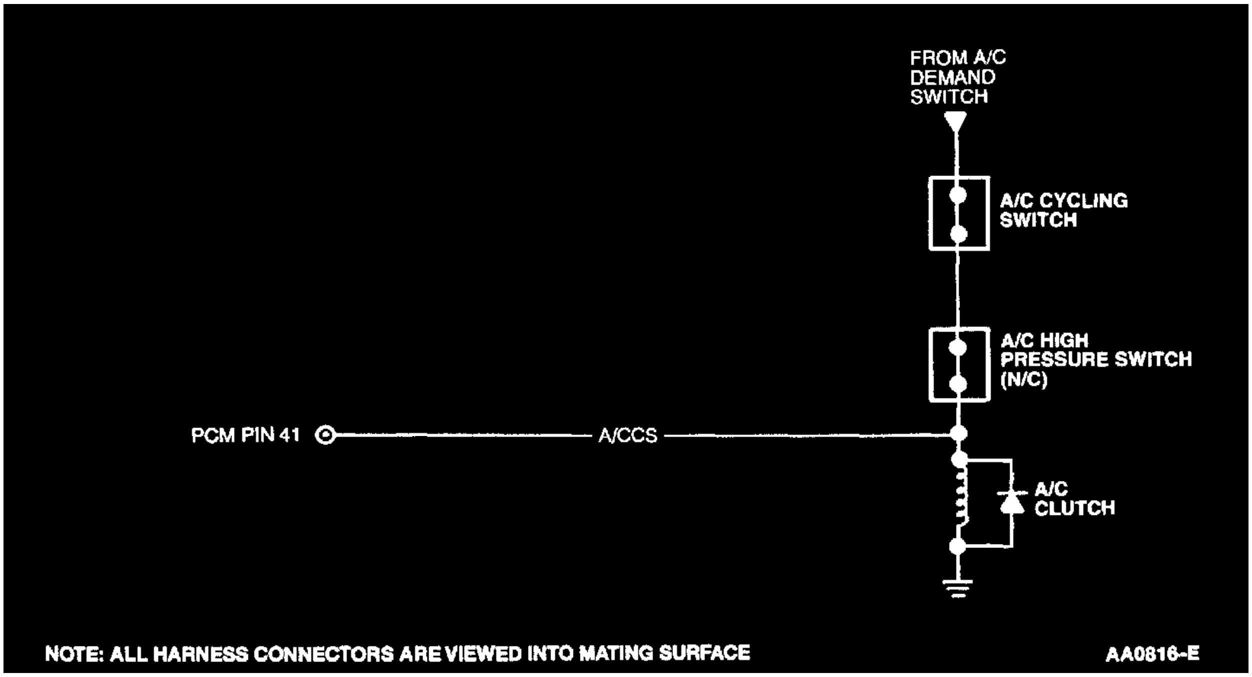
**YES** REPLACE PCM.

**NO** REPAIR short circuit.

## Test Notes

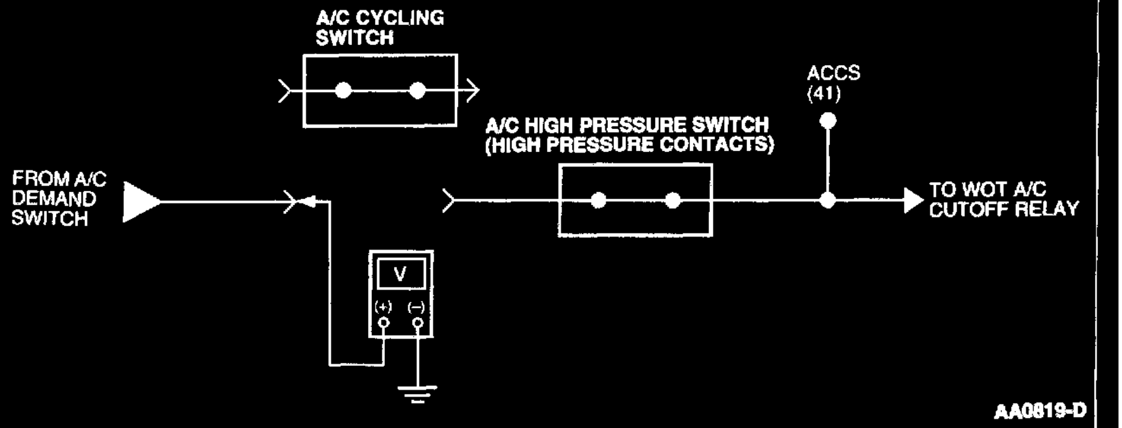
This Pinpoint Test is intended to diagnose the following:

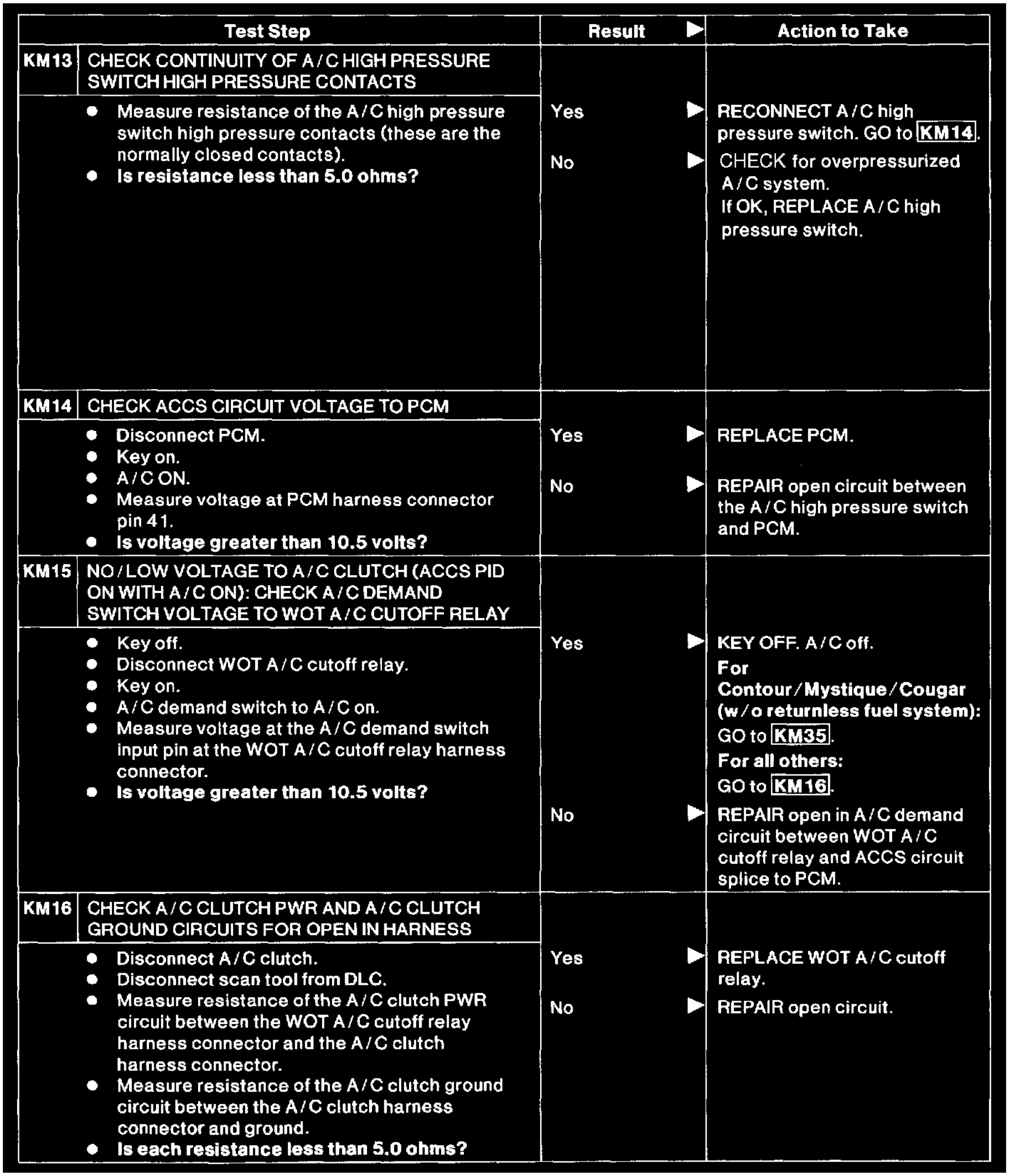
- Harness circuits: VPWR, A/C Demand to WOT A/C cutoff relay, A/CCS, WAC, A/C Clutch PWR
- WOT A/C cutout relay
- Powertrain Control Module **(PCM)**


FROM A/C DEMAND SWITCH
A/C CYCLING SWITCH
A/C HIGH PRESSURE SWITCH (N/C)
PCM PIN 41
A/CCS
A/C CLUTCH
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA0816-E

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM1** | KOEO / KOER DTC P1460: VERIFY ACCS PID IS OFF | | |
| | NOTE: Verify A / C and defrost were off during KOEO / KOER Self-Tests. If the vehicle is not equipped with A / C, the WOT A / C Cutoff (WAC) circuit is not used and the DTC P1460 can be ignored.<br>● Start engine.<br>● A / C and defroster off.<br>● Access ACCS PID.<br>● **Is the ACCS PID off?** | Yes ▶<br>No ▶ | KEY OFF. GO to KM2.<br>GO to KM22 to check A / C circuits for short to power. |
| **KM2** | CHECK VPWR VOLTAGE TO WOT A / C CUTOFF RELAY | | |
| | ● Disconnect WOT A / C cutoff relay.<br>● Key on, engine off.<br>● Measure VPWR circuit voltage at the WOT A / C cutoff relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to KM3.<br>**For LS6 / LS8:**<br>GO to Pinpoint Test Step B5.<br>**All others:**<br>REPAIR open circuit. START engine. Turn A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test. |
| **KM3** | CHECK WOT A / C CUTOFF RELAY | | |
| | ● Refer to pin numbers molded on WOT A / C cutoff relay. There will be either a Pin 1 or Pin 85.<br>● Measure resistance between either Pin 1 or Pin 85 and all other pins of the WOT A / C cutoff relay. One measurement must be between 40 and 120 ohms, with the other measurements being greater than 10,000 ohms.<br>● **Are all resistance checks OK?** | Yes ▶<br>No ▶ | GO to KM4.<br>REPLACE WOT A / C cutoff relay. START engine. TURN A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test. |
| **KM4** | CHECK WOT A / C CUTOFF (WAC) CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on, engine off.<br>● Measure voltage between WAC circuit at WOT A / C cutoff relay vehicle harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to KM5.<br>REPAIR short circuit. START engine. Turn A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test. |
| **KM5** | CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between WAC circuit at WOT A / C cutoff relay vehicle harness connector and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>▶ | GO to KM6.<br>REPAIR short circuit. START engine. Turn A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test. |
| **KM6** | CHECK WAC CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM pin numbers at the beginning of this pinpoint test.<br>● Measure resistance of WAC circuit between PCM harness connector and the WOT A / C cutoff relay harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. START engine. Turn A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test.<br>REPAIR open circuit. START engine. Turn A / C on, WAIT 15 seconds. A / C off. Key off. RERUN Quick Test. |

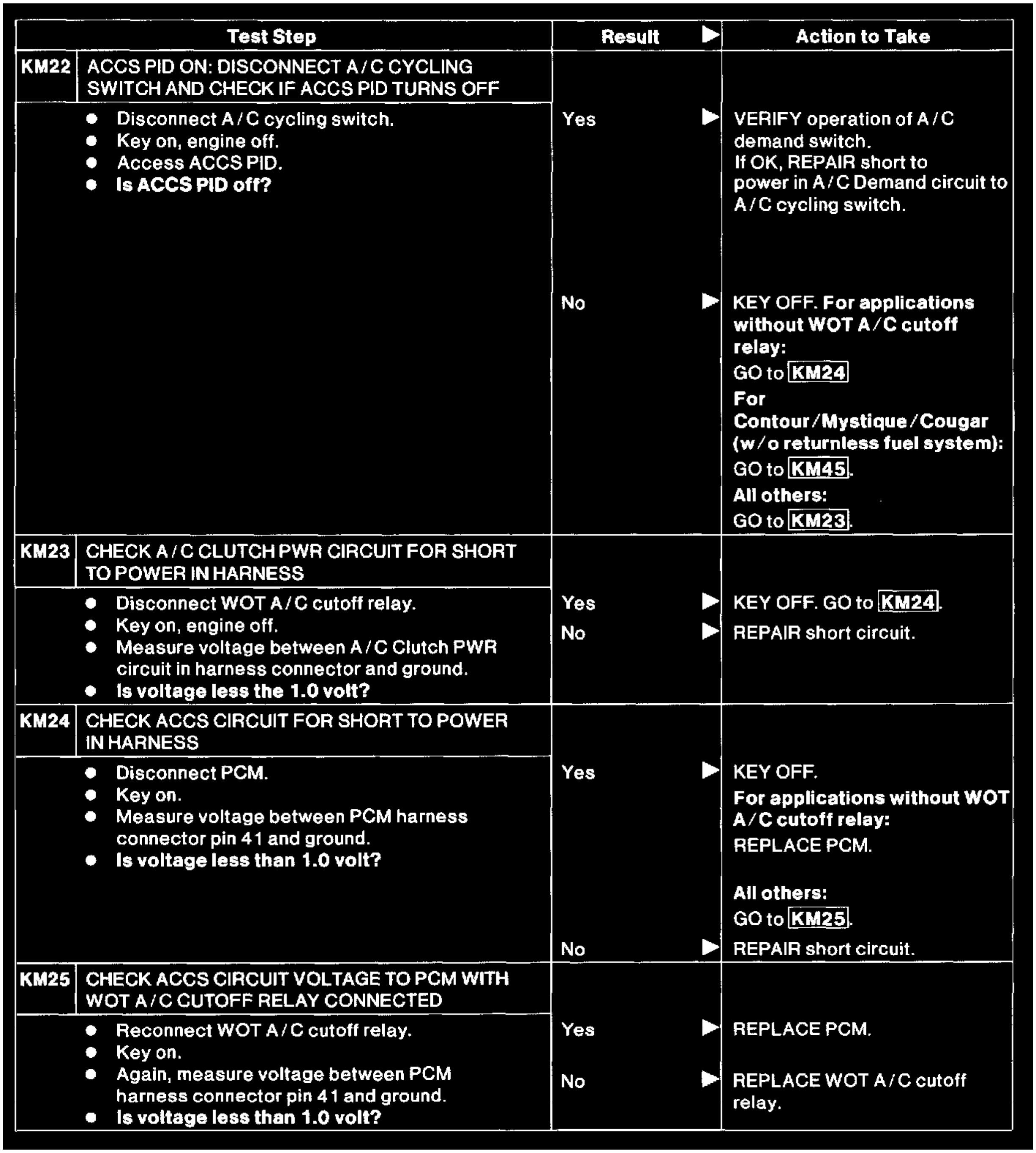
| Test Step | | Result | ▶ | Action to Take |
|---|---|---|---|---|
| **KM8** | LACK OF COOLING (A/C) / A/C NOT FUNCTIONING: CHECK FOR VOLTAGE TO A/C CLUTCH | | | |
| | NOTE: If the A/C clutch will engage, follow the "Yes" Action To Take of this test step. If not, or unsure, continue with this test step.<br>● Key off.<br>● Disconnect A/C cycling switch.<br>● Install a jumper wire in the A/C cycling switch harness connector (to complete the circuit).<br>● Disconnect A/C clutch.<br>● Connect digital multimeter between the power pin and ground pin at the A/C clutch vehicle harness connector.<br>● Start engine.<br>● Turn A/C on, wait 15 seconds.<br>● Check voltage reading.<br>● After testing, turn key off and reconnect A/C clutch.<br>● **Was voltage greater than 10.5 volts?** | Yes | ▶ | REMOVE jumper. RECONNECT A/C cycling switch.<br>**For Contour/Mystique/Cougar with symptom "poor A/C system performance in hot ambient temperatures":**<br>GO to KM55 to check A/C high pressure switch input to PCM.<br>**All others:**<br>DIAGNOSE cause of low voltage. |
| | | No | ▶ | No voltage to A/C clutch. GO to KM9. |
| **KM9** | CHECK ACCS INPUT TO PCM WITH A/C ON | | | |
| | ● A/C cycling switch disconnected and jumper wire installed in the harness connector.<br>● Start engine.<br>● A/C on.<br>● Access and view ACCS PID.<br>● After testing, remove jumper reconnect A/C cycling switch and turn key OFF.<br>● **Was the ACCS PID "ON"?** | Yes | ▶ | GO to KM15. |
| | | No | ▶ | The PCM is not receiving the ACCS signal, and as a result will not allow the A/C to turn on. GO to KM10. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM10** | ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH | | |
| | ● Key on, engine off.<br>● Disconnect A/C cycling switch.<br>● A/C demand switch to A/C on.<br>● Measure voltage at the A/C demand switch side of the A/C cycling switch harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to **KM11**.<br>KEY OFF. CHECK A/C demand switch operation, applicable fuses, wiring to A/C cycling switch or other checks as required. |
| <br> | | | |
| **KM11** | CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED | | |
| | ● Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | RECONNECT A/C cycling switch. GO to **KM12**.<br>CHECK for causes of A/C cycling switch being open (such as low refrigerant charge). REPAIR as necessary. |
| **KM12** | CHECK FOR VOLTAGE TO A/C HIGH PRESSURE SWITCH FROM A/C DEMAND SWITCH | | |
| | ● Disconnect A/C high pressure switch.<br>● Key on, engine off.<br>● A/C on.<br>● Measure voltage at the "from A/C demand switch/A/C cycling switch" pin of the A/C high pressure switch harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to **KM13**.<br>REPAIR open between A/C cycling switch and A/C high pressure switch. |

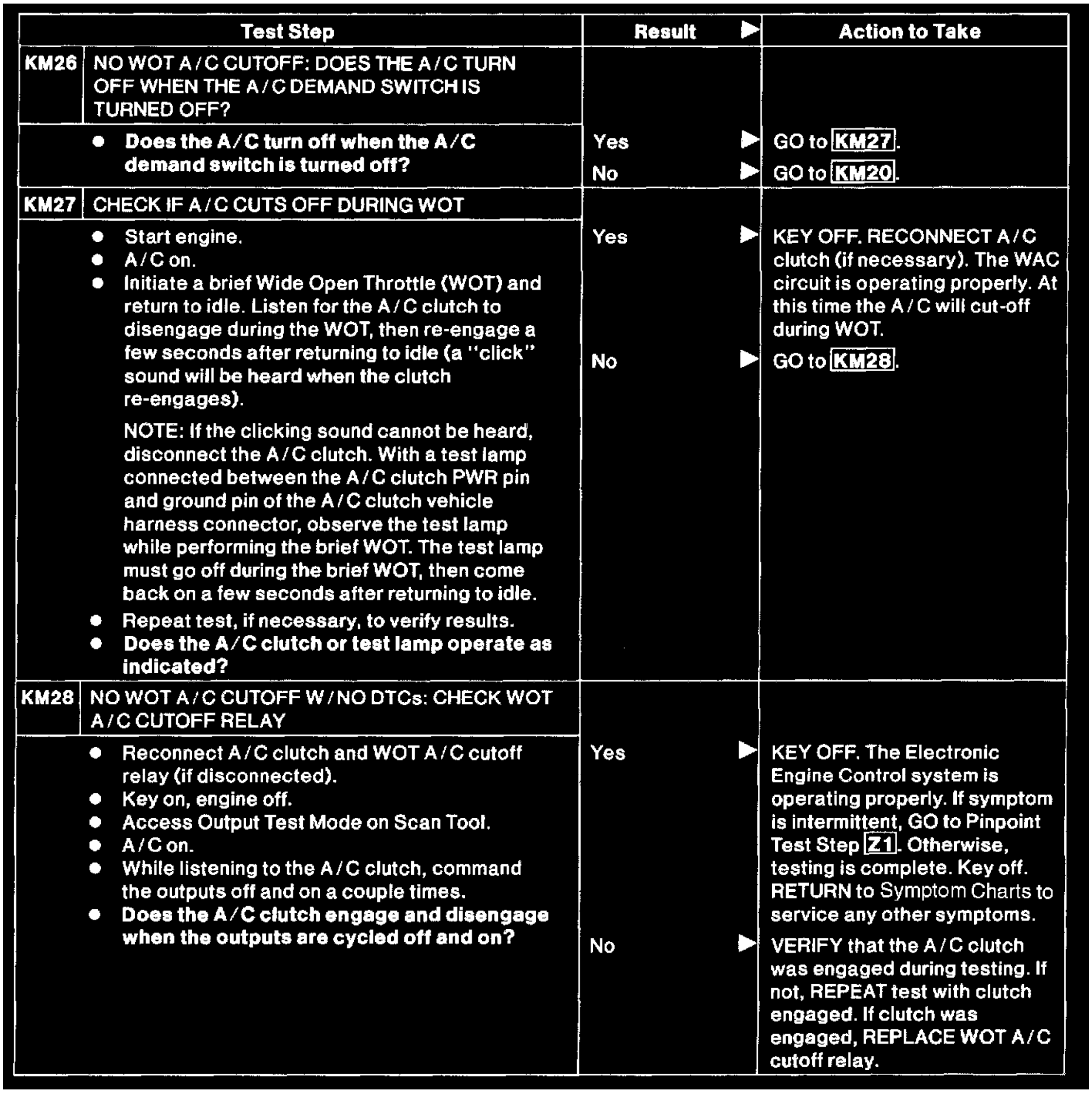


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM13** | CHECK CONTINUITY OF A/C HIGH PRESSURE SWITCH HIGH PRESSURE CONTACTS | | |
| | • Measure resistance of the A/C high pressure switch high pressure contacts (these are the normally closed contacts).<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | RECONNECT A/C high pressure switch. GO to KM14. |
| | | No ▶ | CHECK for overpressurized A/C system.<br>If OK, REPLACE A/C high pressure switch. |
| **KM14** | CHECK ACCS CIRCUIT VOLTAGE TO PCM | | |
| | • Disconnect PCM.<br>• Key on.<br>• A/C ON.<br>• Measure voltage at PCM harness connector pin 41.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR open circuit between the A/C high pressure switch and PCM. |
| **KM15** | NO/LOW VOLTAGE TO A/C CLUTCH (ACCS PID ON WITH A/C ON): CHECK A/C DEMAND SWITCH VOLTAGE TO WOT A/C CUTOFF RELAY | | |
| | • Key off.<br>• Disconnect WOT A/C cutoff relay.<br>• Key on.<br>• A/C demand switch to A/C on.<br>• Measure voltage at the A/C demand switch input pin at the WOT A/C cutoff relay harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶ | KEY OFF. A/C off.<br>**For Contour/Mystique/Cougar (w/o returnless fuel system):**<br>GO to KM35.<br>**For all others:**<br>GO to KM16. |
| | | No ▶ | REPAIR open in A/C demand circuit between WOT A/C cutoff relay and ACCS circuit splice to PCM. |
| **KM16** | CHECK A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS FOR OPEN IN HARNESS | | |
| | • Disconnect A/C clutch.<br>• Disconnect scan tool from DLC.<br>• Measure resistance of the A/C clutch PWR circuit between the WOT A/C cutoff relay harness connector and the A/C clutch harness connector.<br>• Measure resistance of the A/C clutch ground circuit between the A/C clutch harness connector and ground.<br>• **Is each resistance less than 5.0 ohms?** | Yes ▶ | REPLACE WOT A/C cutoff relay. |
| | | No ▶ | REPAIR open circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| KM19 | DTC P1464: CHECK ACCS PID | | |
| | NOTE: Verify A/C and defrost were off during Self-Test. If A/C or defrost were on, turn off and rerun Self-Test.<br>• Key on, engine off.<br>• A/C and defrost off.<br>• Access ACCS PID.<br>• **Is ACCS PID on?** | Yes ▶ | GO to KM22. |
| | | No ▶ | The ACCS PID indicates that the ACCS input to the PCM is low. VERIFY test results. With A/C and defrost off, RERUN Self-Test where P1464 was received. |
| KM20 | A/C ALWAYS ON: CHECK FOR VOLTAGE AT A/C CLUTCH WITH A/C OFF | | |
| | • A/C and defroster OFF.<br>• Disconnect A/C clutch.<br>• Connect a digital multimeter between the power pin and ground pin at the A/C clutch harness connector.<br>• Start engine.<br>• Monitor voltage.<br>• After testing, turn key off and reconnect A/C clutch.<br>• **Was voltage less than 2.0 volts?** | Yes ▶ | The electrical portion of the A/C system is not at fault. |
| | | No ▶ | A fault is indicated in the A/C electrical system. GO to KM21. |
| KM21 | CHECK ACCS INPUT TO PCM WITH A/C OFF | | |
| | • Key off.<br>• Connect scan tool to data link connector.<br>• Start engine.<br>• A/C and defrost off.<br>• Access ACCS PID (Powertrain Menu).<br>• **Is the ACCS PID "OFF"?** | Yes ▶ | KEY OFF.<br>**For Contour/Mystique/Cougar (w/o returnless fuel system):** GO to Pinpoint Test Step KM50.<br>**All others:** DIAGNOSE the Climate Control System. |
| | | No ▶ | KEY OFF. GO to KM22. |

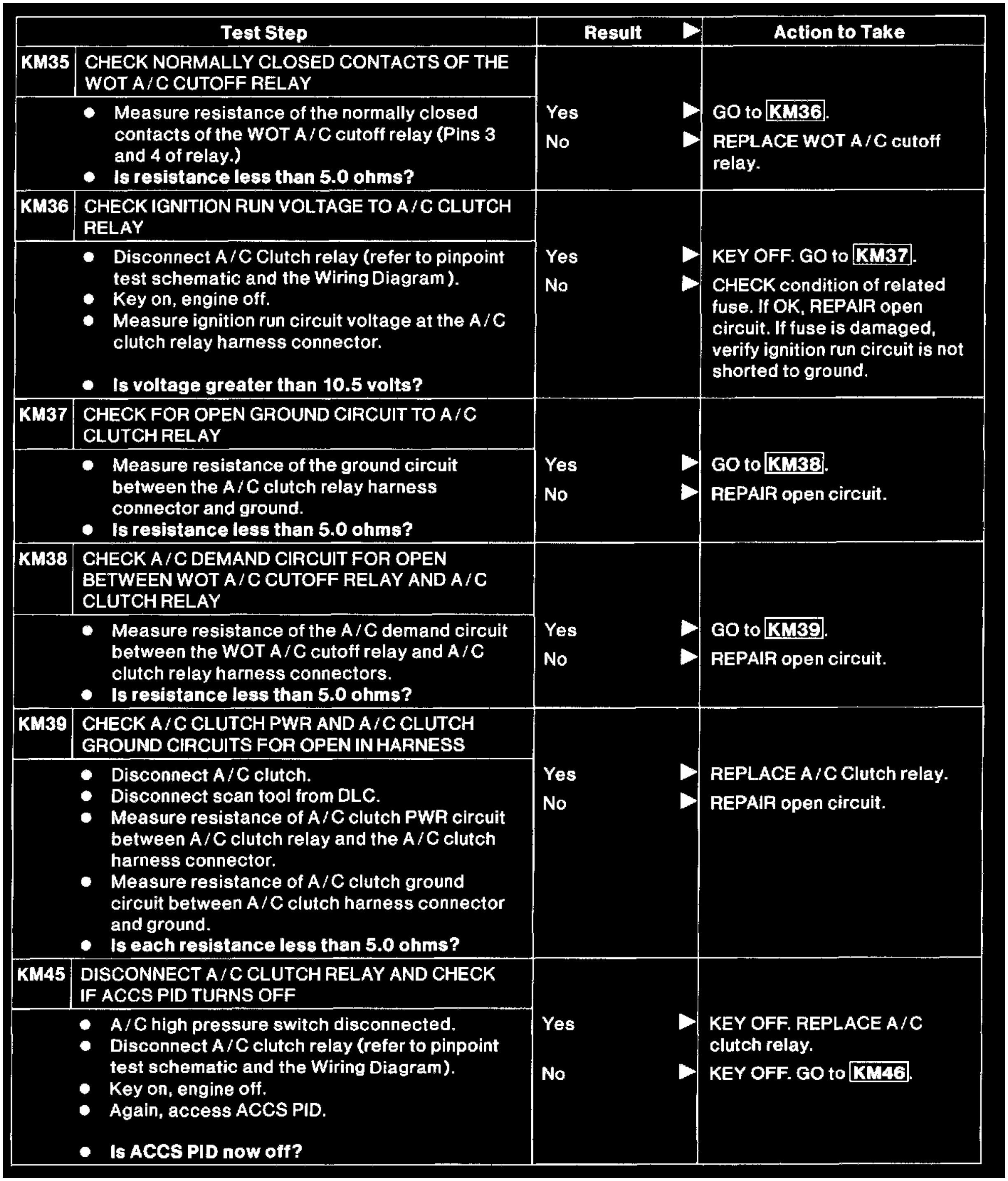


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM22** | ACCS PID ON: DISCONNECT A/C CYCLING SWITCH AND CHECK IF ACCS PID TURNS OFF | | |
| | ● Disconnect A/C cycling switch.<br>● Key on, engine off.<br>● Access ACCS PID.<br>● **Is ACCS PID off?** | Yes ▶ | VERIFY operation of A/C demand switch.<br>If OK, REPAIR short to power in A/C Demand circuit to A/C cycling switch. |
| | | No ▶ | KEY OFF. **For applications without WOT A/C cutoff relay:**<br>GO to KM24<br>**For Contour/Mystique/Cougar (w/o returnless fuel system):**<br>GO to KM45.<br>**All others:**<br>GO to KM23. |
| **KM23** | CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect WOT A/C cutoff relay.<br>● Key on, engine off.<br>● Measure voltage between A/C Clutch PWR circuit in harness connector and ground.<br>● **Is voltage less the 1.0 volt?** | Yes ▶ | KEY OFF. GO to KM24. |
| | | No ▶ | REPAIR short circuit. |
| **KM24** | CHECK ACCS CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on.<br>● Measure voltage between PCM harness connector pin 41 and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶ | KEY OFF.<br>**For applications without WOT A/C cutoff relay:**<br>REPLACE PCM.<br>**All others:**<br>GO to KM25. |
| | | No ▶ | REPAIR short circuit. |
| **KM25** | CHECK ACCS CIRCUIT VOLTAGE TO PCM WITH WOT A/C CUTOFF RELAY CONNECTED | | |
| | ● Reconnect WOT A/C cutoff relay.<br>● Key on.<br>● Again, measure voltage between PCM harness connector pin 41 and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPLACE WOT A/C cutoff relay. |

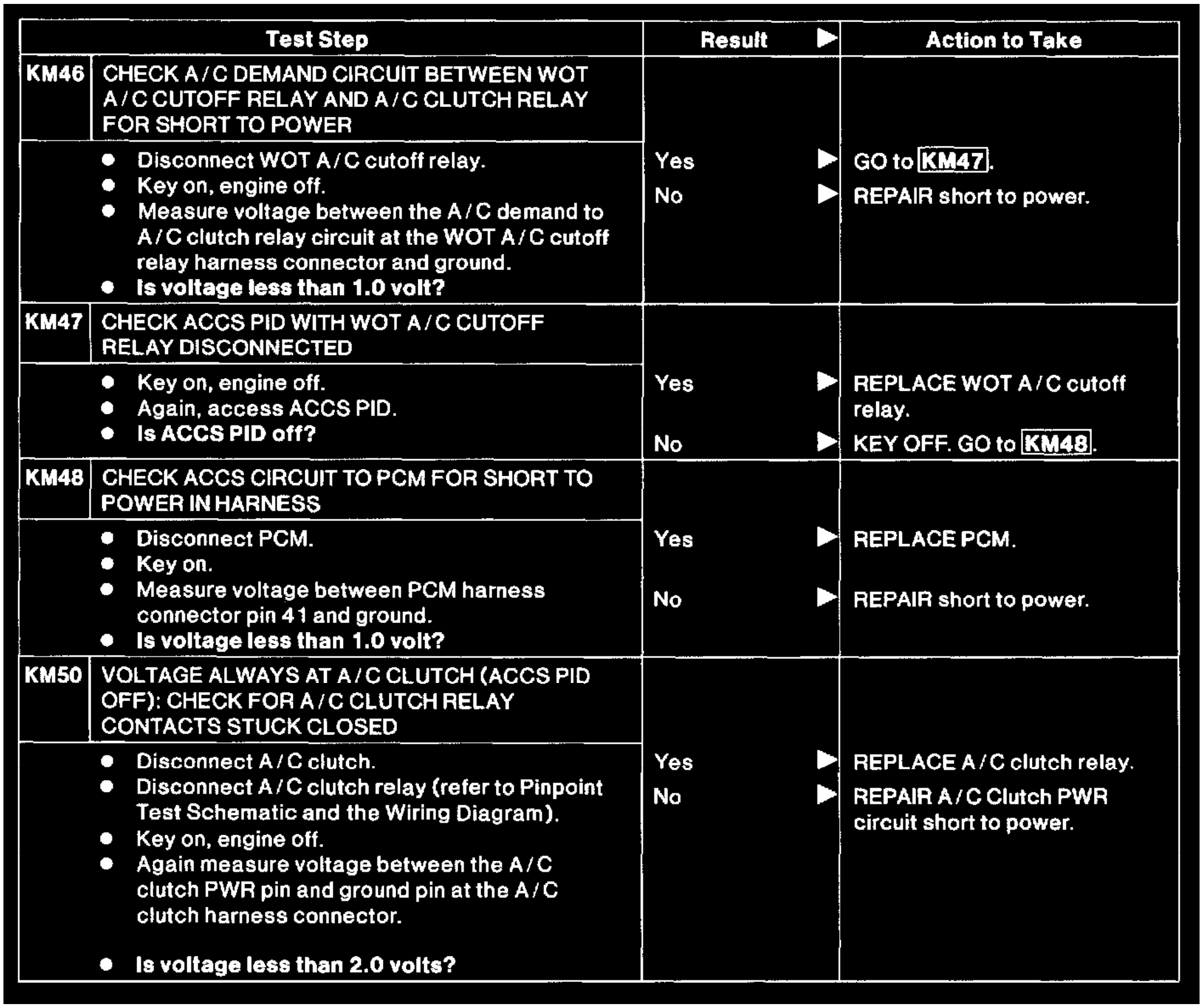


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM26** | NO WOT A/C CUTOFF: DOES THE A/C TURN OFF WHEN THE A/C DEMAND SWITCH IS TURNED OFF? | | |
| | ● **Does the A/C turn off when the A/C demand switch is turned off?** | Yes ▶<br>No ▶ | GO to KM27.<br>GO to KM20. |
| **KM27** | CHECK IF A/C CUTS OFF DURING WOT | | |
| | ● Start engine.<br>● A/C on.<br>● Initiate a brief Wide Open Throttle (WOT) and return to idle. Listen for the A/C clutch to disengage during the WOT, then re-engage a few seconds after returning to idle (a "click" sound will be heard when the clutch re-engages).<br>NOTE: If the clicking sound cannot be heard, disconnect the A/C clutch. With a test lamp connected between the A/C clutch PWR pin and ground pin of the A/C clutch vehicle harness connector, observe the test lamp while performing the brief WOT. The test lamp must go off during the brief WOT, then come back on a few seconds after returning to idle.<br>● Repeat test, if necessary, to verify results.<br>● **Does the A/C clutch or test lamp operate as indicated?** | Yes ▶<br>No ▶ | KEY OFF. RECONNECT A/C clutch (if necessary). The WAC circuit is operating properly. At this time the A/C will cut-off during WOT.<br>GO to KM28. |
| **KM28** | NO WOT A/C CUTOFF W/NO DTCs: CHECK WOT A/C CUTOFF RELAY | | |
| | ● Reconnect A/C clutch and WOT A/C cutoff relay (if disconnected).<br>● Key on, engine off.<br>● Access Output Test Mode on Scan Tool.<br>● A/C on.<br>● While listening to the A/C clutch, command the outputs off and on a couple times.<br>● **Does the A/C clutch engage and disengage when the outputs are cycled off and on?** | Yes ▶<br>No ▶ | KEY OFF. The Electronic Engine Control system is operating properly. If symptom is intermittent, GO to Pinpoint Test Step Z1. Otherwise, testing is complete. Key off. RETURN to Symptom Charts to service any other symptoms.<br>VERIFY that the A/C clutch was engaged during testing. If not, REPEAT test with clutch engaged. If clutch was engaged, REPLACE WOT A/C cutoff relay. |

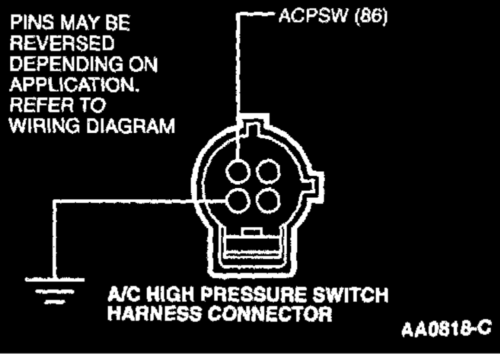
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM30** | CONTINUOUS MEMORY DTC P1460: CHECK WAC CIRCUIT FOR INTERMITTENT CONCERNS | | |
| | NOTE: If the vehicle is not equipped with A/C, the WAC circuit is not used and the P1460 can be ignored.<br>NOTE: Refer to the beginning of this pinpoint test for PCM pin numbers and to determine if relay is normally open or closed.<br>● Key off.<br>● For normally closed relays, disconnect A/C cycling switch. Install a jumper wire in the A/C cycling switch harness connector (to complete the circuit).<br>● Key on, engine off.<br>● A/C demand switch on.<br>● Check WAC circuit for short to ground (open or short to power for normally closed relays) while completing the following (the A/C clutch will click on when a fault is detected):<br>— Shake, wiggle and bend the WAC circuit between the PCM and the WOT A/C cutoff relay.<br>— Lightly tap on the WOT A/C cutoff relay (to simulate road shock).<br>● **Is a fault indicated?** | Yes ▶ | KEY OFF. ISOLATE fault and REPAIR as necessary. REMOVE jumper wire. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| | | No ▶ | GO to KM31. |
| **KM31** | CHECK WOT A/C CUTOFF CIRCUIT FOR INTERMITTENT CONCERNS | | |
| | ● Key on, engine off.<br>● For normally closed relays, jumper wire installed in A/C cycling switch.<br>● A/C demand on.<br>● Access Output Test Mode on scan tool.<br>● **For normally open relays:**<br>Turn outputs on.<br>**For normally closed relays:**<br>Turn outputs off.<br>● Check WAC circuit for open or short to power (short to ground for normally closed relays) while completing the following (the A/C clutch will click off when a fault is detected):<br>— Shake, wiggle and bend the WAC circuit between the PCM and the WOT A/C cutoff relay.<br>— Shake, wiggle and bend the VPWR circuit to the WOT A/C cutoff relay.<br>— Lightly tap on the WOT A/C cutoff relay (to simulate road shock).<br>● Key off, A/C off.<br>● **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. REMOVE jumper wire. COMPLETE PCM Reset to clear DTCs. START engine. Turn A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| | | No ▶ | Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM35** | CHECK NORMALLY CLOSED CONTACTS OF THE WOT A/C CUTOFF RELAY | | |
| | ● Measure resistance of the normally closed contacts of the WOT A/C cutoff relay (Pins 3 and 4 of relay.)<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to **KM36**.<br>REPLACE WOT A/C cutoff relay. |
| **KM36** | CHECK IGNITION RUN VOLTAGE TO A/C CLUTCH RELAY | | |
| | ● Disconnect A/C Clutch relay (refer to pinpoint test schematic and the Wiring Diagram).<br>● Key on, engine off.<br>● Measure ignition run circuit voltage at the A/C clutch relay harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to **KM37**.<br>CHECK condition of related fuse. If OK, REPAIR open circuit. If fuse is damaged, verify ignition run circuit is not shorted to ground. |
| **KM37** | CHECK FOR OPEN GROUND CIRCUIT TO A/C CLUTCH RELAY | | |
| | ● Measure resistance of the ground circuit between the A/C clutch relay harness connector and ground.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to **KM38**.<br>REPAIR open circuit. |
| **KM38** | CHECK A/C DEMAND CIRCUIT FOR OPEN BETWEEN WOT A/C CUTOFF RELAY AND A/C CLUTCH RELAY | | |
| | ● Measure resistance of the A/C demand circuit between the WOT A/C cutoff relay and A/C clutch relay harness connectors.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to **KM39**.<br>REPAIR open circuit. |
| **KM39** | CHECK A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS FOR OPEN IN HARNESS | | |
| | ● Disconnect A/C clutch.<br>● Disconnect scan tool from DLC.<br>● Measure resistance of A/C clutch PWR circuit between A/C clutch relay and the A/C clutch harness connector.<br>● Measure resistance of A/C clutch ground circuit between A/C clutch harness connector and ground.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE A/C Clutch relay.<br>REPAIR open circuit. |
| **KM45** | DISCONNECT A/C CLUTCH RELAY AND CHECK IF ACCS PID TURNS OFF | | |
| | ● A/C high pressure switch disconnected.<br>● Disconnect A/C clutch relay (refer to pinpoint test schematic and the Wiring Diagram).<br>● Key on, engine off.<br>● Again, access ACCS PID.<br>● **Is ACCS PID now off?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE A/C clutch relay.<br>KEY OFF. GO to **KM46**. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **KM46** | CHECK A/C DEMAND CIRCUIT BETWEEN WOT A/C CUTOFF RELAY AND A/C CLUTCH RELAY FOR SHORT TO POWER | | |
| | ● Disconnect WOT A/C cutoff relay.<br>● Key on, engine off.<br>● Measure voltage between the A/C demand to A/C clutch relay circuit at the WOT A/C cutoff relay harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | GO to **KM47**.<br>REPAIR short to power. |
| **KM47** | CHECK ACCS PID WITH WOT A/C CUTOFF RELAY DISCONNECTED | | |
| | ● Key on, engine off.<br>● Again, access ACCS PID.<br>● **Is ACCS PID off?** | Yes ▶<br>No ▶ | REPLACE WOT A/C cutoff relay.<br>KEY OFF. GO to **KM48**. |
| **KM48** | CHECK ACCS CIRCUIT TO PCM FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on.<br>● Measure voltage between PCM harness connector pin 41 and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short to power. |
| **KM50** | VOLTAGE ALWAYS AT A/C CLUTCH (ACCS PID OFF): CHECK FOR A/C CLUTCH RELAY CONTACTS STUCK CLOSED | | |
| | ● Disconnect A/C clutch.<br>● Disconnect A/C clutch relay (refer to Pinpoint Test Schematic and the Wiring Diagram).<br>● Key on, engine off.<br>● Again measure voltage between the A/C clutch PWR pin and ground pin at the A/C clutch harness connector.<br>● **Is voltage less than 2.0 volts?** | Yes ▶<br>No ▶ | REPLACE A/C clutch relay.<br>REPAIR A/C Clutch PWR circuit short to power. |

| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **KM55** CHECK A/C HIGH PRESSURE SWITCH MEDIUM PRESSURE CIRCUITS | | |
| NOTE: An A/C high pressure switch medium pressure circuit concern can result in the high speed cooling fan not coming on when the A/C refrigerant pressure becomes high. In hot ambient conditions, this may result in the refrigerant pressure continuing to increase until the A/C high pressure switch high pressure contacts open, shutting off the A/C until the pressure drops to an acceptable range.<br>● Key off.<br>● Disconnect A/C high pressure switch.<br>● A/C off (to prevent chance of short circuits).<br>● Connect a jumper wire between the A/C high pressure switch circuit and ground circuit at the A/C high pressure switch harness connector.<br>● Start engine, wait 15 seconds.<br>● **Does the high speed fan come on?**<br><br> | Yes ▶ | KEY OFF. A/C high pressure switch medium pressure circuits are OK. REMOVE jumper. RECONNECT A/C high pressure switch. DIAGNOSE the Climate Control System. |
| | No ▶ | An A/C high pressure switch medium pressure circuit concern may exist. GO to KM56. |
| **KM56** CHECK FOR OPEN GROUND CIRCUIT TO A/C HIGH PRESSURE SWITCH | | |
| ● Key on, engine running.<br>● Connect jumper wire between the A/C high pressure switch circuit at the A/C high pressure switch harness connector and the battery negative post.<br>● Wait 15 seconds.<br>● **Does the high speed fan come on now?** | Yes ▶ | KEY OFF. REPAIR open ground circuit to the A/C high pressure switch. REMOVE jumper wire. VERIFY a symptom no longer exists. |
| | No ▶ | KEY OFF. REMOVE jumper wire. GO to KM57. |
| **KM57** CHECK FOR OPEN A/C HIGH PRESSURE SWITCH (ACPSW) CIRCUIT BETWEEN A/C HIGH PRESSURE SWITCH AND PCM | | |
| ● Disconnect PCM.<br>● Measure resistance of the ACPSW circuit between the PCM harness connector pin 86 and the A/C high pressure switch harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | REPLACE PCM. |
| | No ▶ | REPAIR open circuit. |

# KP - Charge Air Cooler Pump (CAC)

## KP: CHARGE AIR COOLER PUMP (CAC)

### KP1 - P1229: Check Power Feed To CAC Pump Relay Coil

Check Fuse 23.

Is the fuse OK?

**YES** GO to KP2.

**NO** CHECK circuit 391 and 369 for short to ground.

### KP2 - Check Power Feed To CAC Pump Relay

Check Fuse 1O6.

Is the fuse OK?

**YES** GO to KP3.

**NO** CHECK circuit 17 and 18 for short to ground.

### KP3 - Check Integrity Of CAC Pump Ground Connection

Disconnect the CAC pump.

Measure the resistance between chassis ground circuit at the CAC pump connector and battery negative post.

Is the resistance less than 2 ohms?

**YES** GO to KP4.

**NO** CHECK the tightness of the grounded lug. If tight. check wire back to the CAC connector.

### KP4 - Check CAC Pump Motor Resistance

Disconnect the CAC pump motor.

Measure the resistance between the pins at the CAC connector to the pump motor.

Is the resistance less than 10 ohms?

**YES** GO to KP5.

**NO** REPLACE the CAC pump motor.

### KP5 - Check CAC Pump Relay

Remove relay from power distribution box.

Measure resistance between pin 1 or 2 and all other pins. One reading must be between 65-90 ohms and all other readings must be greater than 10K ohms.

Are resistance checks OK?

**YES** GO to KP6.

**NO** REPLACE the CAC pump assembly.

### KP6 - Check For Open CAC Circuit Between PCM And CAC Relay

**NOTE:** Refer to PCM Pin numbers in the beginning of this pinpoint test.

Key off.

Disconnect the PCM and the CAC pump relay.

Measure the resistance of the CAC circuit at the PCM harness connector and pin 85 of the relay socket.

Is the resistance less than 5 ohms?

**YES** GO to KP7.

**NO** REPAIR open circuit.

### KP7 - Check CAC Circuit Between PCM And CAC RELAY For Short To Ground

Key off.

Measure the resistance of the CAC circuit at the PCM harness connector and the battery negative post.

Is the resistance greater than 10K ohms?

**YES** GO to KP8.

**NO** REPAIR short to ground condition.

### KP8 - Check CAC Circuit Between PCM And CAC Relay For Short To Power

Key on, engine off.

Remove CAC pump relay.

Measure the voltage between the CAC circuit at the PCM harness connector and the battery negative post.

Is the voltage less than 0.05 volt?

**YES** GO to KP9.

**NO** REPAIR short to B+.

### KP9 - Check For Open Circuit Between CAC Pump Relay Coil And Power Feed

Remove the CAC pump relay and fuse 23.

Measure the resistance between relay socket pin 1 and fuse 23 (load side).

Is resistance less than 5 ohms?

**YES** GO to KP10.

**NO** REPAIR open circuit.

### KP10 - Check For Open Power Feed Circuit At CAC Pump Motor Relay

Remove CAC Pump Relay and fuse 106 from their sockets.

Measure resistance between relay socket pin 3 and load side of fuse socket.

Is resistance less than 5 ohms?

**YES** GO to KP11.

**NO** REPAIR open circuit.

### KP11 - Check For Open CAC Circuit Between CAC, CAC Pump Relay And Pump Motor

Disconnect the CAC pump motor.

Measure resistance between relay socket pin 5 and the CAC harness connector.

Is the resistance less than 5 ohms?

**YES** GO to KP12.

**NO** REPAIR open circuit.

### KP12 - Check Status Of PID

Key on, engine off.

Access SCICP PID.

Does the SCICP indicate PID on?

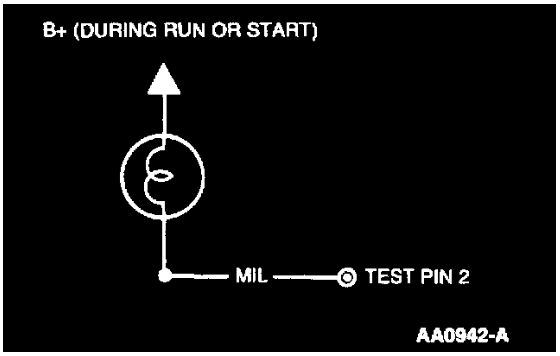
**YES** If the CAC reservoir is full, no air flow blockage at the CAC radiator, the ACT 2 and connecting circuits are not high resistance or open circuited, and DTC P1229 is present in KOEO and KOER, then REPLACE PCM.

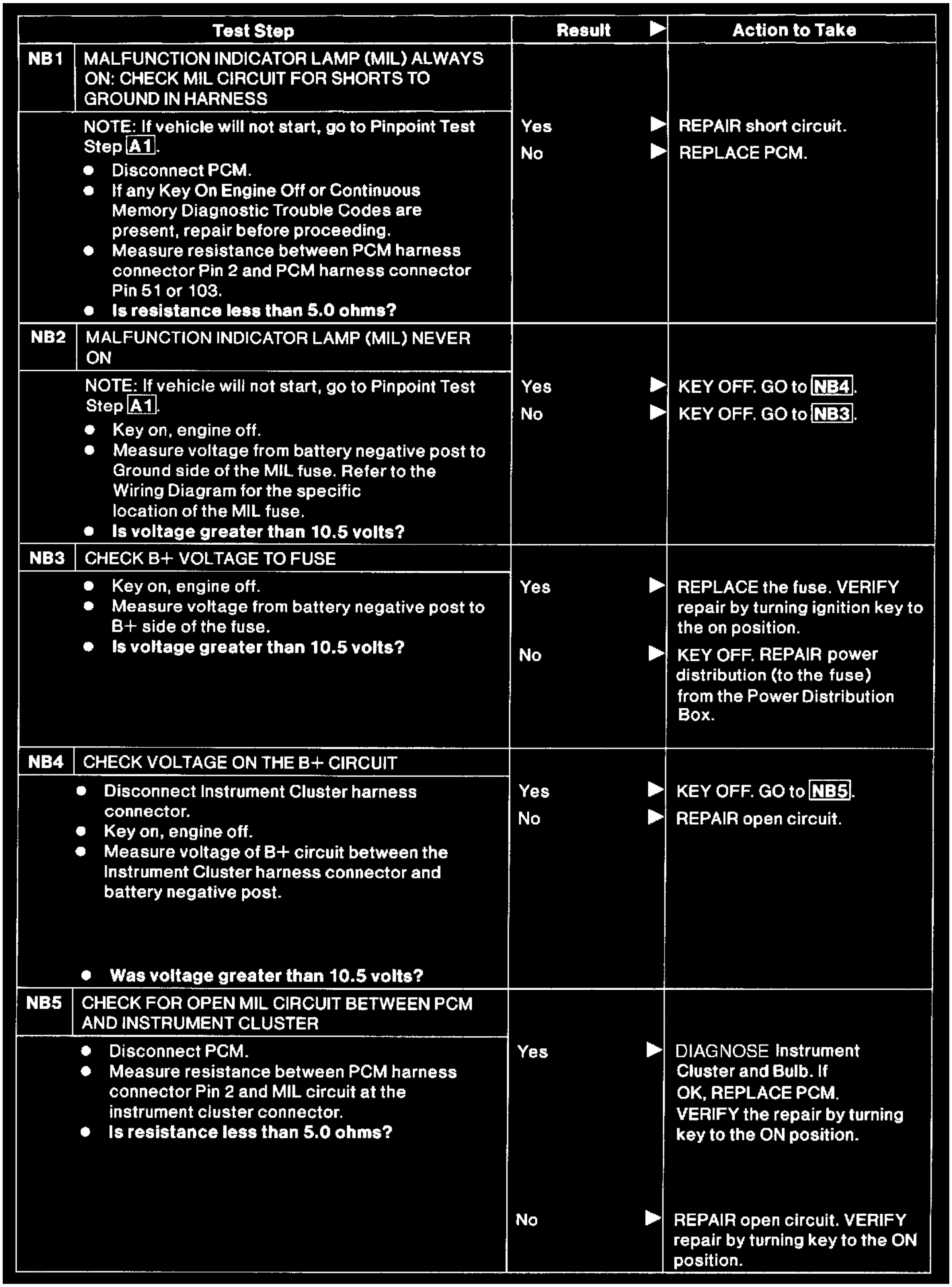
**NO** Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1. See: Z - Intermittent

# Test Notes

This Pinpoint Test is intended to diagnose only the following:

- Malfunction Indicator Lamp **(MIL)** circuit
- Powertrain Control Module **(PCM)**
- Fuse, bulb and socket



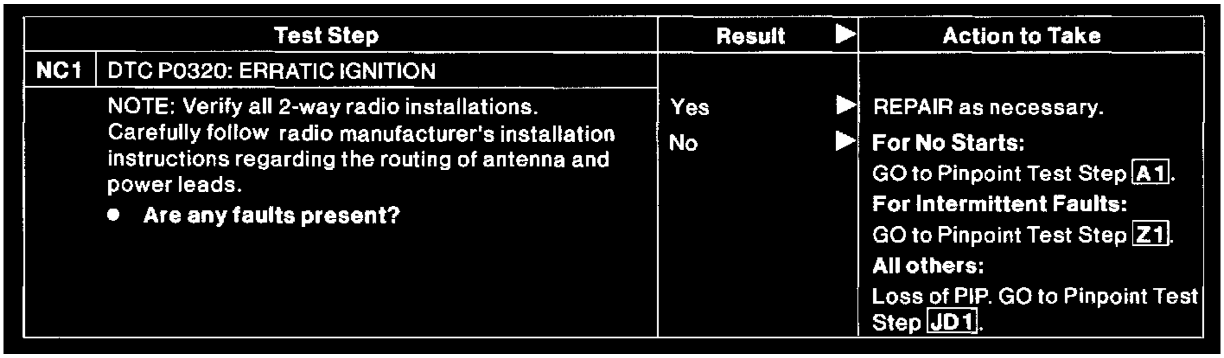


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **NB1** | MALFUNCTION INDICATOR LAMP (MIL) ALWAYS ON: CHECK MIL CIRCUIT FOR SHORTS TO GROUND IN HARNESS | | |
| | NOTE: If vehicle will not start, go to Pinpoint Test Step A1.<br>● Disconnect PCM.<br>● If any Key On Engine Off or Continuous Memory Diagnostic Trouble Codes are present, repair before proceeding.<br>● Measure resistance between PCM harness connector Pin 2 and PCM harness connector Pin 51 or 103.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPAIR short circuit.<br>REPLACE PCM. |
| **NB2** | MALFUNCTION INDICATOR LAMP (MIL) NEVER ON | | |
| | NOTE: If vehicle will not start, go to Pinpoint Test Step A1.<br>● Key on, engine off.<br>● Measure voltage from battery negative post to Ground side of the MIL fuse. Refer to the Wiring Diagram for the specific location of the MIL fuse.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to NB4.<br>KEY OFF. GO to NB3. |
| **NB3** | CHECK B+ VOLTAGE TO FUSE | | |
| | ● Key on, engine off.<br>● Measure voltage from battery negative post to B+ side of the fuse.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPLACE the fuse. VERIFY repair by turning ignition key to the on position.<br>KEY OFF. REPAIR power distribution (to the fuse) from the Power Distribution Box. |
| **NB4** | CHECK VOLTAGE ON THE B+ CIRCUIT | | |
| | ● Disconnect Instrument Cluster harness connector.<br>● Key on, engine off.<br>● Measure voltage of B+ circuit between the Instrument Cluster harness connector and battery negative post.<br>● **Was voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to NB5.<br>REPAIR open circuit. |
| **NB5** | CHECK FOR OPEN MIL CIRCUIT BETWEEN PCM AND INSTRUMENT CLUSTER | | |
| | ● Disconnect PCM.<br>● Measure resistance between PCM harness connector Pin 2 and MIL circuit at the instrument cluster connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | DIAGNOSE Instrument Cluster and Bulb. If OK, REPLACE PCM. VERIFY the repair by turning key to the ON position.<br>REPAIR open circuit. VERIFY repair by turning key to the ON position. |

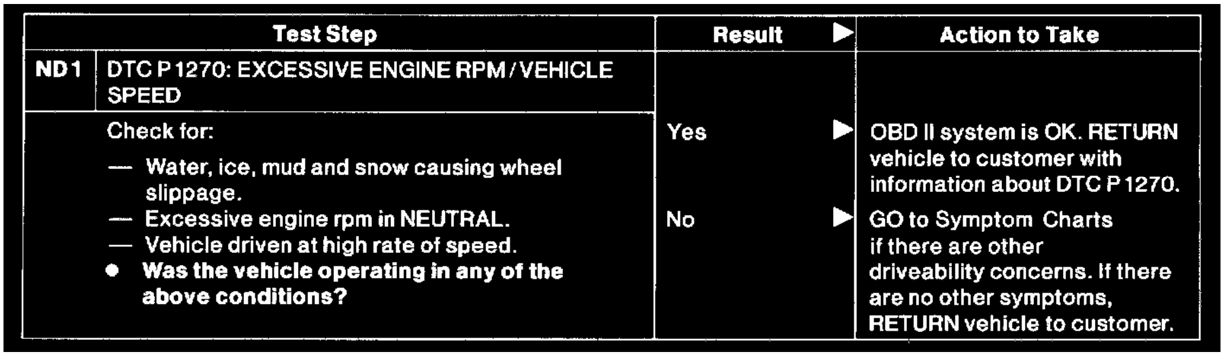
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Powertrain Control Module **(PCM)**



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **NC1** | DTC P0320: ERRATIC IGNITION | | |
| | NOTE: Verify all 2-way radio installations. Carefully follow radio manufacturer's installation instructions regarding the routing of antenna and power leads.<br>● **Are any faults present?** | Yes ▶ | REPAIR as necessary. |
| | | No ▶ | **For No Starts:**<br>GO to Pinpoint Test Step A1.<br>**For Intermittent Faults:**<br>GO to Pinpoint Test Step Z1.<br>**All others:**<br>Loss of PIP. GO to Pinpoint Test Step JD1. |



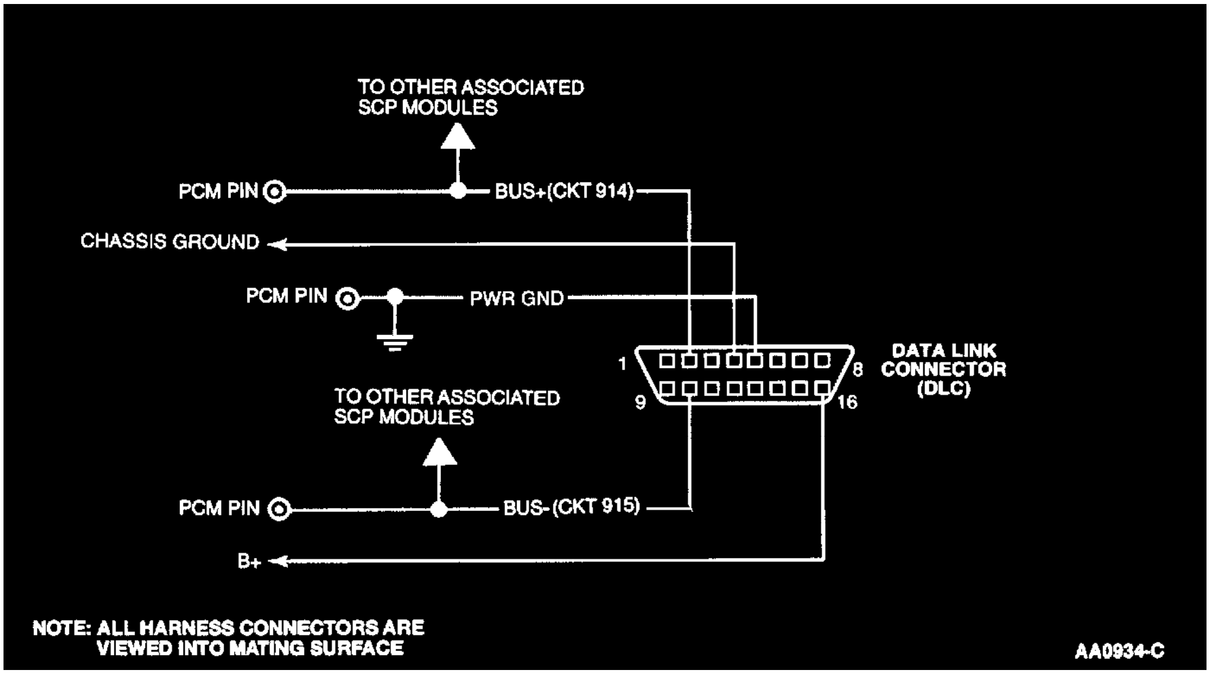
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **ND1** | DTC P1270: EXCESSIVE ENGINE RPM/VEHICLE SPEED | | |
| | Check for:<br>— Water, ice, mud and snow causing wheel slippage.<br>— Excessive engine rpm in NEUTRAL.<br>— Vehicle driven at high rate of speed.<br>● **Was the vehicle operating in any of the above conditions?** | Yes ▶ | OBD II system is OK. RETURN vehicle to customer with information about DTC P1270. |
| | | No ▶ | GO to Symptom Charts if there are other driveability concerns. If there are no other symptoms, RETURN vehicle to customer. |

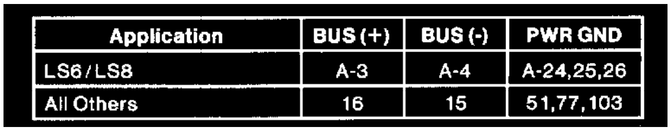
## Test Notes

This Pinpoint Test is intended to diagnose the following:

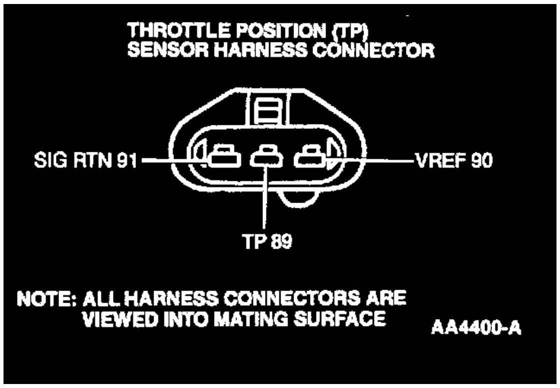
- Standard Corporate Protocol **(SCP)** communication bus harness circuits: BUS+, BUS-, between DLC and PCM
- Data link connector harness circuits: chassis ground, Power Ground **(PWR GND)**, battery positive voltage (B+)
- Powertrain Control Module **(PCM)**

**NOTE:** Concerns found that affect the entire network are referred to in the Module Communication Network.

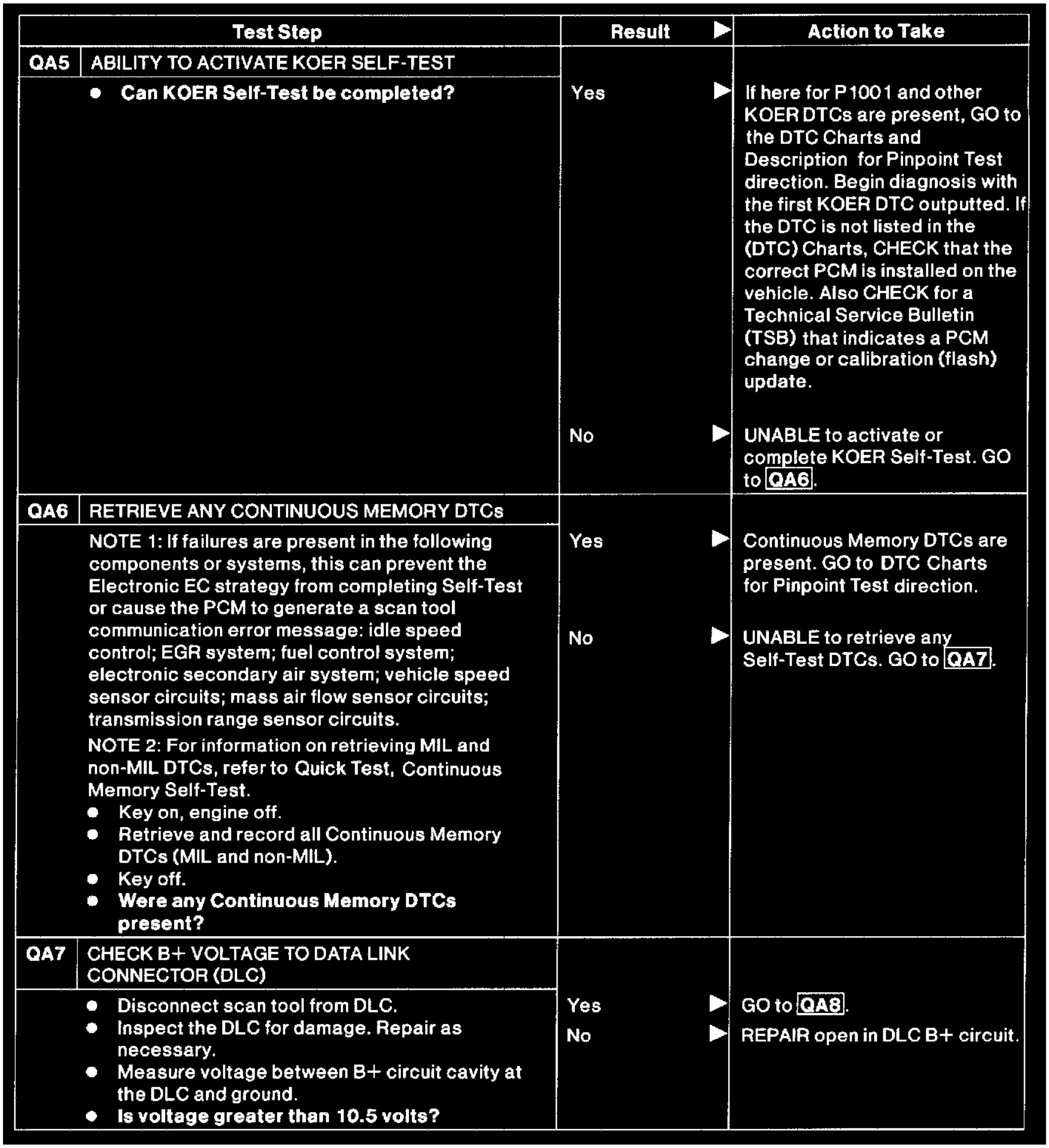




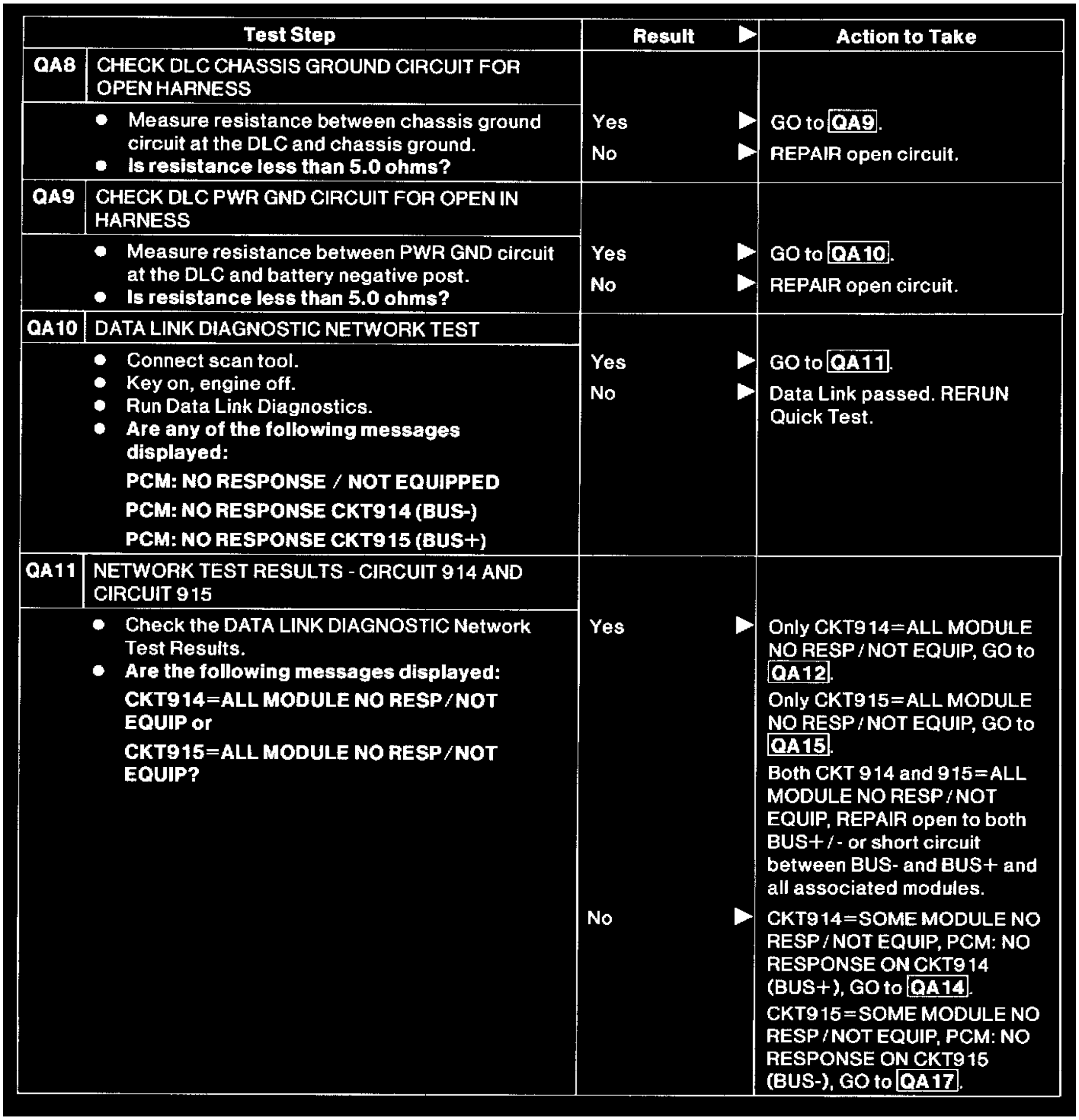
| Application | BUS (+) | BUS (-) | PWR GND |
|---|---|---|---|
| LS6/LS8 | A-3 | A-4 | A-24,25,26 |
| All Others | 16 | 15 | 51,77,103 |



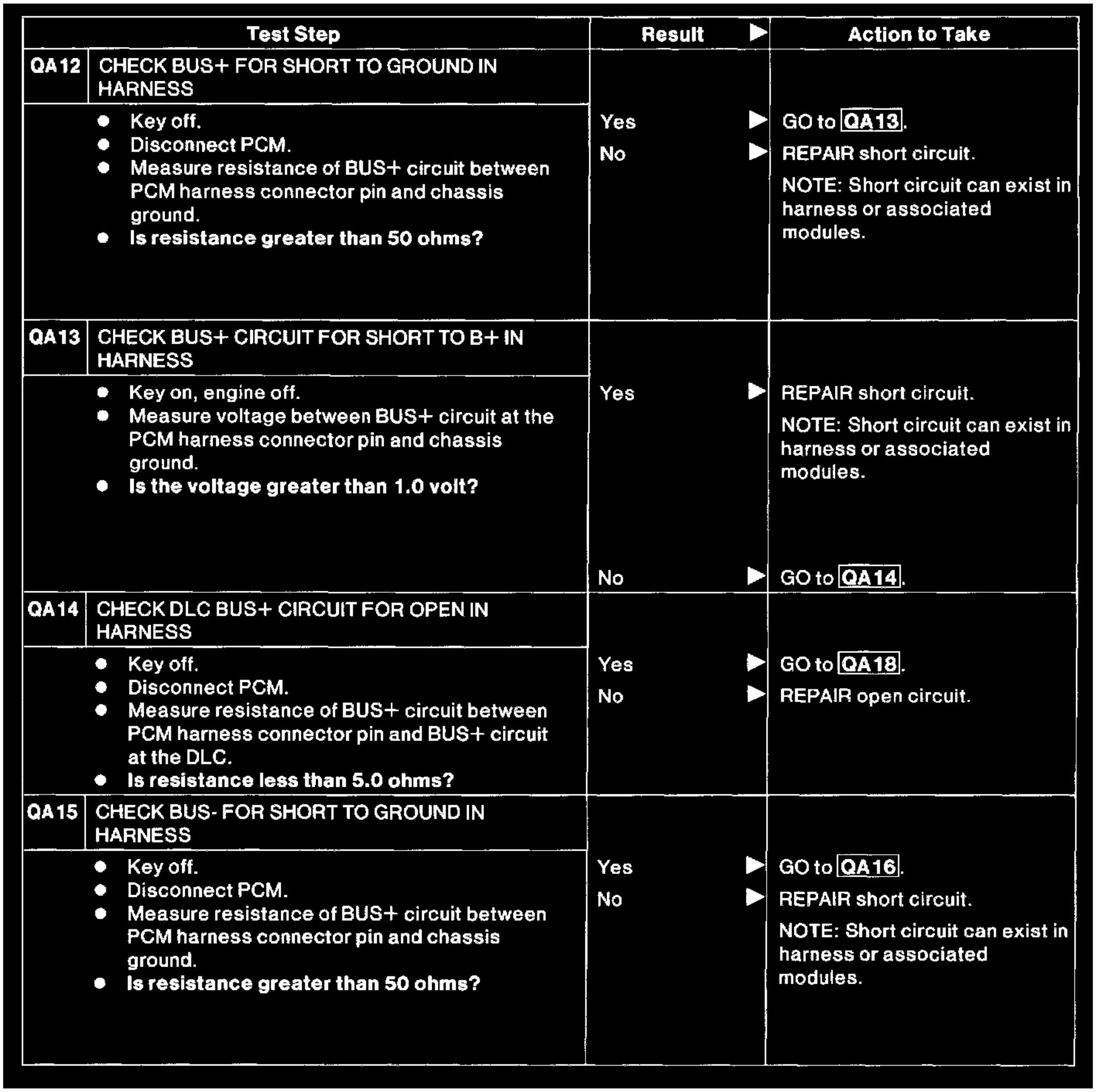
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **QA1** | VERIFY SELF-TEST PROCEDURE | | |
| | This pinpoint test addresses the following concerns:<br>— Unable to access Continuous Memory DTCs.<br>— Unable to activate KOEO Self-Test.<br>— Unable to activate KOER Self-Test.<br>— Scan tool communication concern.<br>— DTC displayed by scan tool not listed.<br>— Power Take Off (PTO), if equipped.<br>— DTC P1001 KOER Self-Test cannot be completed.<br>Possible causes:<br>— Damaged DLC.<br>— Incorrect Self-Test procedure.<br>— VREF is not in specification.<br>— Idle rpm out of specification.<br>— Open in DLC harness circuit.<br>— Short in DLC harness circuit or associated modules.<br>— Damaged PCM power relay circuit.<br>— Damaged PCM.<br>— PTO circuit, if equipped.<br>● Disconnect scan tool from DLC. Inspect vehicle and scan tool DLC for damage. Repair as necessary.<br>● PTO switch / actuator in OFF position.<br>● Verify that the correct procedure was used to activate CONT, KOEO or KOER Self-Test for the scan tool.<br>● **Was the correct Self-Test procedure used?** | Yes ▶ | Correct procedure was used for activating Self-Test. GO to QA2. |
| | | No ▶ | Correct procedure was not used for activating Self-Test. COMPLETE Self-Test using the correct procedure. |
| **QA2** | CHECK VREF VOLTAGE TO TP SENSOR | | |
| | ● Disconnect throttle position sensor.<br>● Key on, engine off.<br>● Measure voltage between VREF and SIG RTN circuits at the TP sensor harness connector.<br>● **Is the voltage between 4.0 and 6.0 volts?** | Yes ▶ | Voltage is in specification. RECONNECT the TP sensor. GO to QA3. |
| | | No ▶ | Voltage is not in specification. RECONNECT the TP sensor. GO to Pinpoint Test Step C1. |
| **QA3** | ABILITY TO ACCESS CONTINUOUS MEMORY DTCs | | |
| | ● **Can Continuous Memory DTCs be accessed?** | Yes ▶ | GO to QA4. |
| | | No ▶ | UNABLE to access Continuous Memory DTCs. KEY OFF. GO to QA7. |
| **QA4** | ABILITY TO ACTIVATE KOEO SELF-TEST | | |
| | ● **Can KOEO Self-Test be activated?** | Yes ▶ | GO to QA5. |
| | | No ▶ | UNABLE to activate KOEO Self-Test. GO to QA6. |



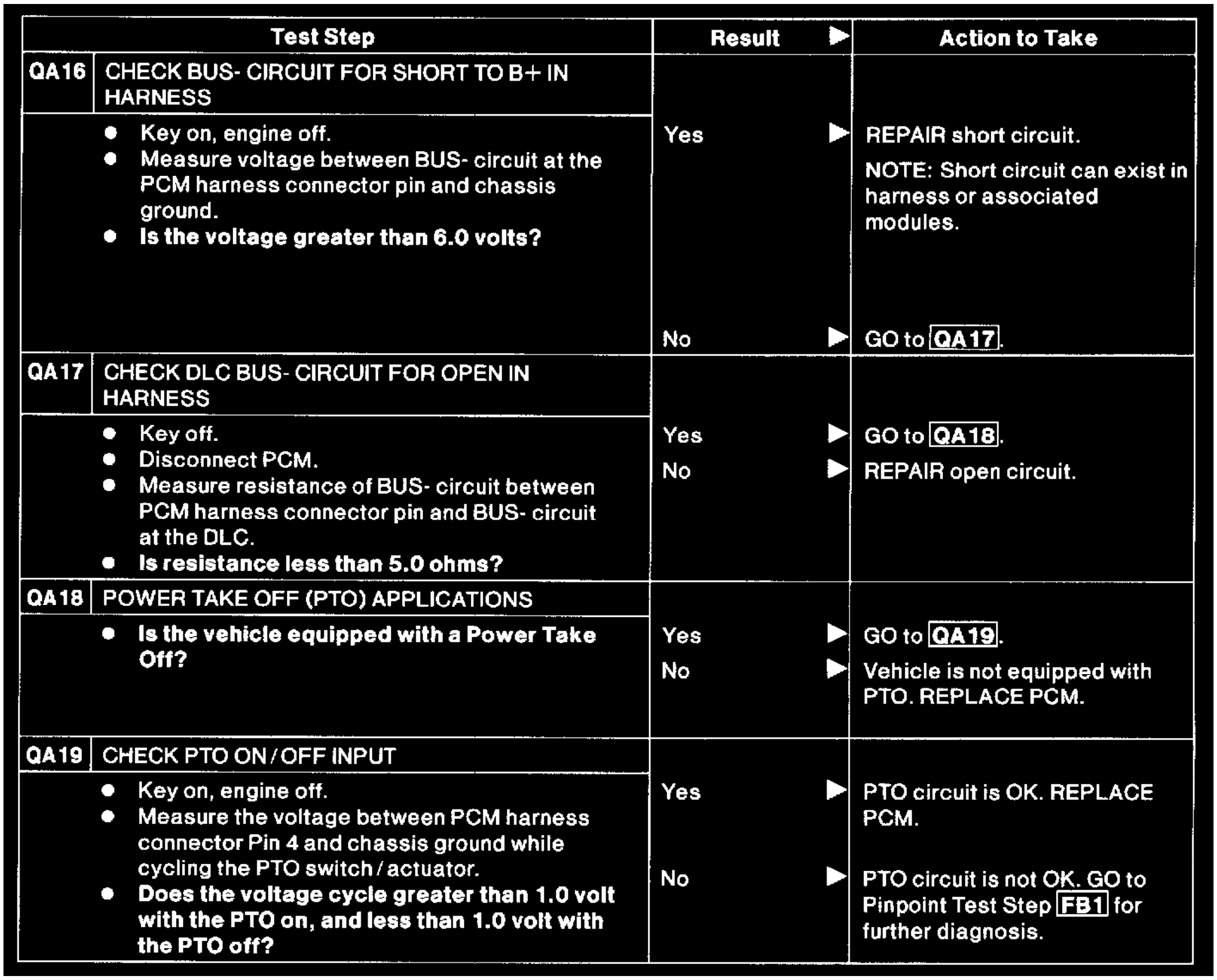
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **QA5** | ABILITY TO ACTIVATE KOER SELF-TEST | | |
| | • **Can KOER Self-Test be completed?** | Yes ▶ | If here for P1001 and other KOER DTCs are present, GO to the DTC Charts and Description for Pinpoint Test direction. Begin diagnosis with the first KOER DTC outputted. If the DTC is not listed in the (DTC) Charts, CHECK that the correct PCM is installed on the vehicle. Also CHECK for a Technical Service Bulletin (TSB) that indicates a PCM change or calibration (flash) update. |
| | | No ▶ | UNABLE to activate or complete KOER Self-Test. GO to QA6. |
| **QA6** | RETRIEVE ANY CONTINUOUS MEMORY DTCs | | |
| | NOTE 1: If failures are present in the following components or systems, this can prevent the Electronic EC strategy from completing Self-Test or cause the PCM to generate a scan tool communication error message: idle speed control; EGR system; fuel control system; electronic secondary air system; vehicle speed sensor circuits; mass air flow sensor circuits; transmission range sensor circuits.<br>NOTE 2: For information on retrieving MIL and non-MIL DTCs, refer to Quick Test, Continuous Memory Self-Test.<br>• Key on, engine off.<br>• Retrieve and record all Continuous Memory DTCs (MIL and non-MIL).<br>• Key off.<br>• **Were any Continuous Memory DTCs present?** | Yes ▶ | Continuous Memory DTCs are present. GO to DTC Charts for Pinpoint Test direction. |
| | | No ▶ | UNABLE to retrieve any Self-Test DTCs. GO to QA7. |
| **QA7** | CHECK B+ VOLTAGE TO DATA LINK CONNECTOR (DLC) | | |
| | • Disconnect scan tool from DLC.<br>• Inspect the DLC for damage. Repair as necessary.<br>• Measure voltage between B+ circuit cavity at the DLC and ground.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶ | GO to QA8. |
| | | No ▶ | REPAIR open in DLC B+ circuit. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QA8 | CHECK DLC CHASSIS GROUND CIRCUIT FOR OPEN HARNESS | | |
| | - Measure resistance between chassis ground circuit at the DLC and chassis ground.<br>- **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to QA9.<br>REPAIR open circuit. |
| QA9 | CHECK DLC PWR GND CIRCUIT FOR OPEN IN HARNESS | | |
| | - Measure resistance between PWR GND circuit at the DLC and battery negative post.<br>- **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to QA10.<br>REPAIR open circuit. |
| QA10 | DATA LINK DIAGNOSTIC NETWORK TEST | | |
| | - Connect scan tool.<br>- Key on, engine off.<br>- Run Data Link Diagnostics.<br>- **Are any of the following messages displayed:**<br>**PCM: NO RESPONSE / NOT EQUIPPED**<br>**PCM: NO RESPONSE CKT914 (BUS-)**<br>**PCM: NO RESPONSE CKT915 (BUS+)** | Yes ▶<br>No ▶ | GO to QA11.<br>Data Link passed. RERUN Quick Test. |
| QA11 | NETWORK TEST RESULTS - CIRCUIT 914 AND CIRCUIT 915 | | |
| | - Check the DATA LINK DIAGNOSTIC Network Test Results.<br>- **Are the following messages displayed:**<br>**CKT914=ALL MODULE NO RESP/NOT EQUIP or**<br>**CKT915=ALL MODULE NO RESP/NOT EQUIP?** | Yes ▶ | Only CKT914=ALL MODULE NO RESP/NOT EQUIP, GO to QA12.<br>Only CKT915=ALL MODULE NO RESP/NOT EQUIP, GO to QA15.<br>Both CKT 914 and 915=ALL MODULE NO RESP/NOT EQUIP, REPAIR open to both BUS+/- or short circuit between BUS- and BUS+ and all associated modules. |
| | | No ▶ | CKT914=SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON CKT914 (BUS+), GO to QA14.<br>CKT915=SOME MODULE NO RESP/NOT EQUIP, PCM: NO RESPONSE ON CKT915 (BUS-), GO to QA17. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QA12 | CHECK BUS+ FOR SHORT TO GROUND IN HARNESS | | |
| | • Key off.<br>• Disconnect PCM.<br>• Measure resistance of BUS+ circuit between PCM harness connector pin and chassis ground.<br>• **Is resistance greater than 50 ohms?** | Yes ▶ | GO to QA13. |
| | | No ▶ | REPAIR short circuit.<br>NOTE: Short circuit can exist in harness or associated modules. |
| QA13 | CHECK BUS+ CIRCUIT FOR SHORT TO B+ IN HARNESS | | |
| | • Key on, engine off.<br>• Measure voltage between BUS+ circuit at the PCM harness connector pin and chassis ground.<br>• **Is the voltage greater than 1.0 volt?** | Yes ▶ | REPAIR short circuit.<br>NOTE: Short circuit can exist in harness or associated modules. |
| | | No ▶ | GO to QA14. |
| QA14 | CHECK DLC BUS+ CIRCUIT FOR OPEN IN HARNESS | | |
| | • Key off.<br>• Disconnect PCM.<br>• Measure resistance of BUS+ circuit between PCM harness connector pin and BUS+ circuit at the DLC.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to QA18. |
| | | No ▶ | REPAIR open circuit. |
| QA15 | CHECK BUS- FOR SHORT TO GROUND IN HARNESS | | |
| | • Key off.<br>• Disconnect PCM.<br>• Measure resistance of BUS+ circuit between PCM harness connector pin and chassis ground.<br>• **Is resistance greater than 50 ohms?** | Yes ▶ | GO to QA16. |
| | | No ▶ | REPAIR short circuit.<br>NOTE: Short circuit can exist in harness or associated modules. |

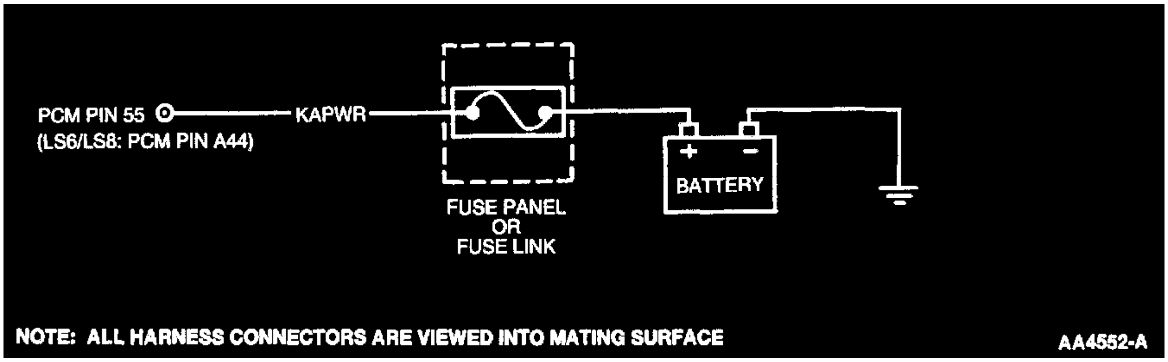


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QA16 | CHECK BUS- CIRCUIT FOR SHORT TO B+ IN HARNESS | | |
| | ● Key on, engine off.<br>● Measure voltage between BUS- circuit at the PCM harness connector pin and chassis ground.<br>● **Is the voltage greater than 6.0 volts?** | Yes ▶ | REPAIR short circuit.<br>NOTE: Short circuit can exist in harness or associated modules. |
| | | No ▶ | GO to QA17. |
| QA17 | CHECK DLC BUS- CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Key off.<br>● Disconnect PCM.<br>● Measure resistance of BUS- circuit between PCM harness connector pin and BUS- circuit at the DLC.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶ | GO to QA18. |
| | | No ▶ | REPAIR open circuit. |
| QA18 | POWER TAKE OFF (PTO) APPLICATIONS | | |
| | ● **Is the vehicle equipped with a Power Take Off?** | Yes ▶ | GO to QA19. |
| | | No ▶ | Vehicle is not equipped with PTO. REPLACE PCM. |
| QA19 | CHECK PTO ON/OFF INPUT | | |
| | ● Key on, engine off.<br>● Measure the voltage between PCM harness connector Pin 4 and chassis ground while cycling the PTO switch/actuator.<br>● **Does the voltage cycle greater than 1.0 volt with the PTO on, and less than 1.0 volt with the PTO off?** | Yes ▶ | PTO circuit is OK. REPLACE PCM. |
| | | No ▶ | PTO circuit is not OK. GO to Pinpoint Test Step FB1 for further diagnosis. |

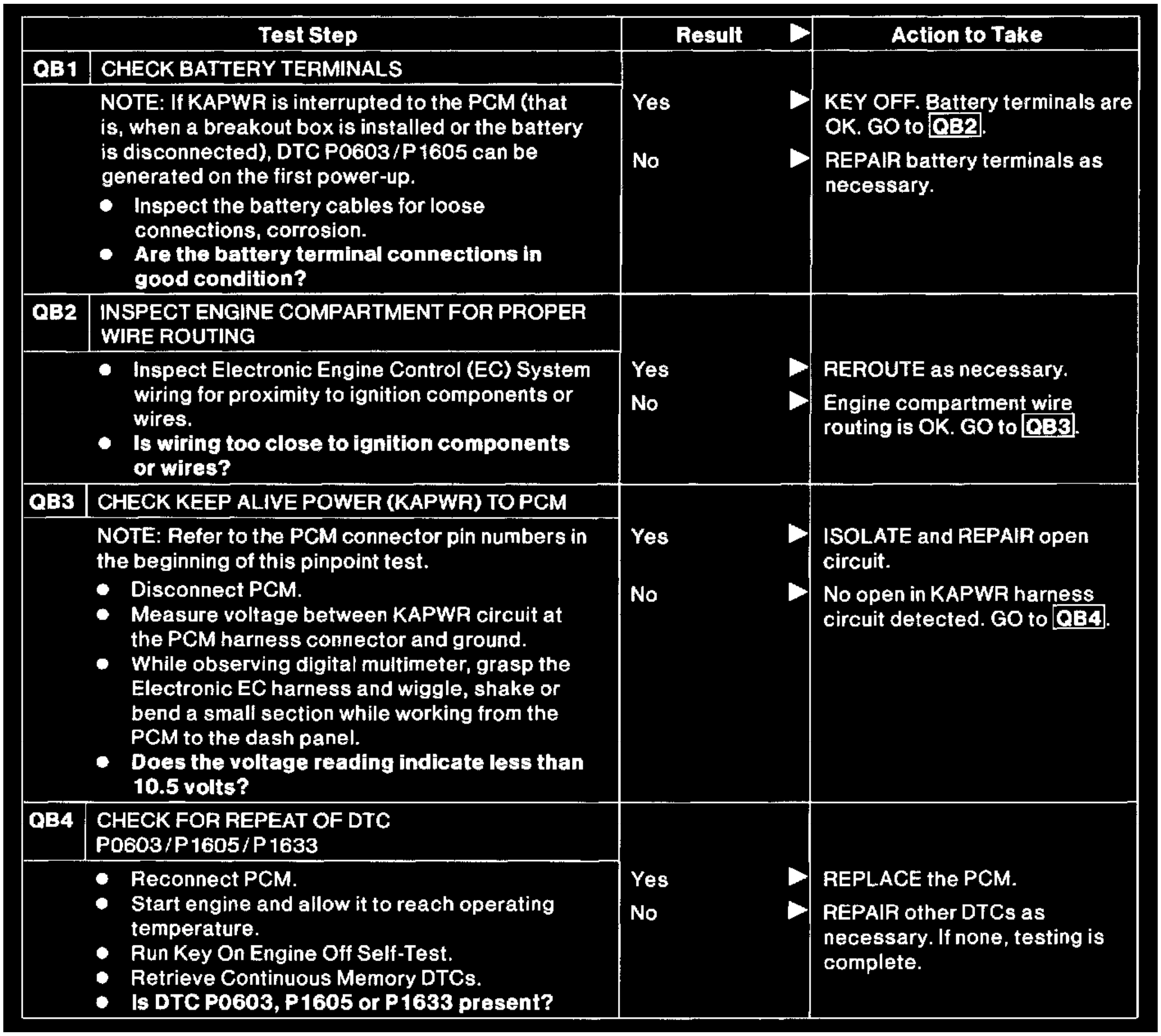
# Test Notes

This Pinpoint Test is intended to diagnose the following:

- Battery terminal condition
- Keep Alive Power **(KAPWR)** wire routing
- Harness circuit: KAPWR
- Powertrain Control Module **(PCM)**



NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QB1 | CHECK BATTERY TERMINALS | | |
| | NOTE: If KAPWR is interrupted to the PCM (that is, when a breakout box is installed or the battery is disconnected), DTC P0603/P1605 can be generated on the first power-up.<br>● Inspect the battery cables for loose connections, corrosion.<br>● **Are the battery terminal connections in good condition?** | Yes ▶<br>No ▶ | KEY OFF. Battery terminals are OK. GO to QB2.<br>REPAIR battery terminals as necessary. |
| QB2 | INSPECT ENGINE COMPARTMENT FOR PROPER WIRE ROUTING | | |
| | ● Inspect Electronic Engine Control (EC) System wiring for proximity to ignition components or wires.<br>● **Is wiring too close to ignition components or wires?** | Yes ▶<br>No ▶ | REROUTE as necessary.<br>Engine compartment wire routing is OK. GO to QB3. |
| QB3 | CHECK KEEP ALIVE POWER (KAPWR) TO PCM | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Measure voltage between KAPWR circuit at the PCM harness connector and ground.<br>● While observing digital multimeter, grasp the Electronic EC harness and wiggle, shake or bend a small section while working from the PCM to the dash panel.<br>● **Does the voltage reading indicate less than 10.5 volts?** | Yes ▶<br>No ▶ | ISOLATE and REPAIR open circuit.<br>No open in KAPWR harness circuit detected. GO to QB4. |
| QB4 | CHECK FOR REPEAT OF DTC P0603/P1605/P1633 | | |
| | ● Reconnect PCM.<br>● Start engine and allow it to reach operating temperature.<br>● Run Key On Engine Off Self-Test.<br>● Retrieve Continuous Memory DTCs.<br>● **Is DTC P0603, P1605 or P1633 present?** | Yes ▶<br>No ▶ | REPLACE the PCM.<br>REPAIR other DTCs as necessary. If none, testing is complete. |

# Test Notes

It is not necessary to clear DTC P1000 from the PCM by driving the vehicle unless it is requested by the customer to pass an inspection/maintenance test.

Inform the customer of the need for additional driving when required to pass an inspection/maintenance test.

Diagnostic Trouble Code **(DTC)** P1000 indicates that not all of the On Board Diagnostic II (OBD II) monitors have completed. In some states, this DTC must be cleared to pass an inspection/maintenance test. The customer should be informed that the law specifies additional city and highway driving must be done to complete the check of the On Board Diagnostic system. This additional driving must occur before the vehicle is tested at the inspection/maintenance station. The amount of driving required varies with individual driving patterns. To complete this requirement in the shortest amount of time, refer to Drive Cycles.

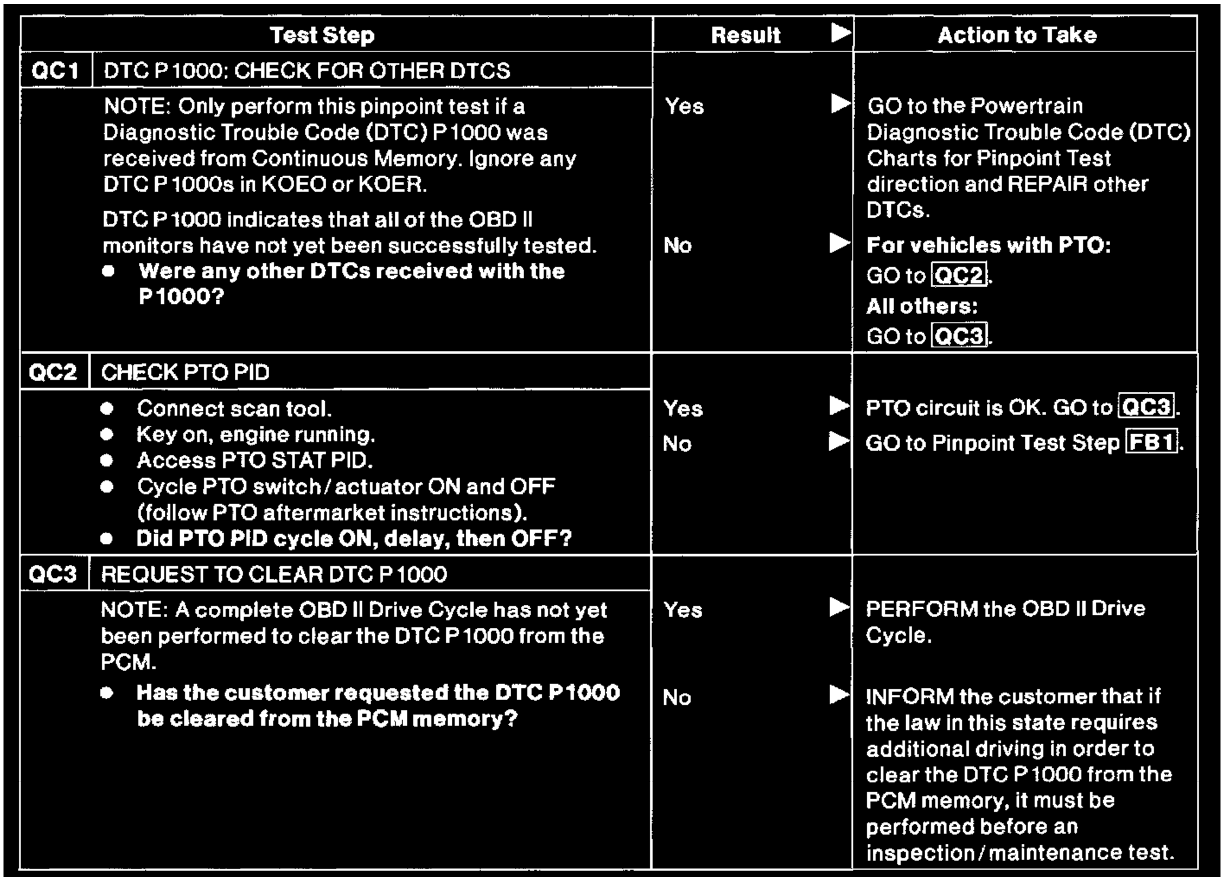
The only way a DTC P1000 can be removed from memory is when all the OBD II monitors have successfully completed.

DTC P1000 is set by the PCM with any of the following conditions:

- The vehicle is new from the factory and has not yet completed an OBD II Drive Cycle.
- The battery or PCM has been disconnected.
- An OBD II monitor failure had occurred before completion of an OBD II Drive Cycle.
- The PCM DTCs have been cleared with a scan tool as part of a repair process.

DTC P1000 cannot be cleared from the PCM when:

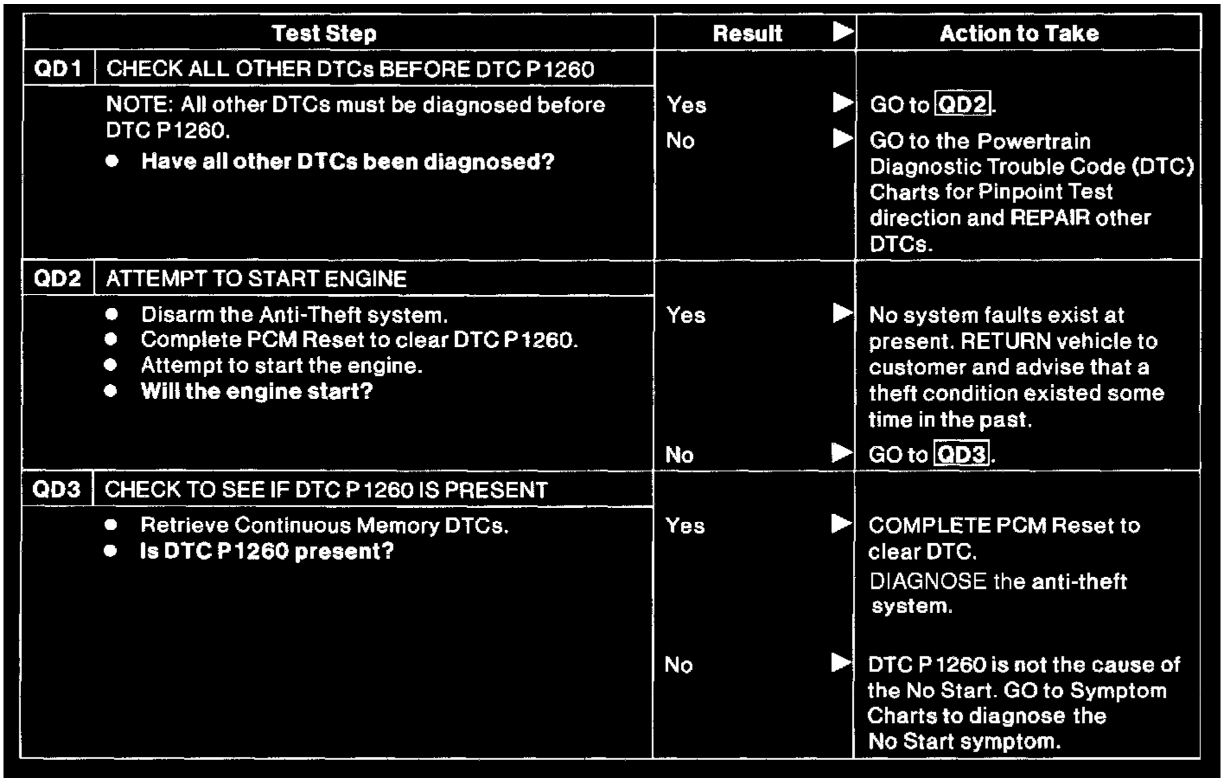
- The vehicle has a PTO and the circuit is shorted to VPWR or B+ or the PTO is on during testing.



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QC1 | DTC P1000: CHECK FOR OTHER DTCS | | |
| | NOTE: Only perform this pinpoint test if a Diagnostic Trouble Code (DTC) P1000 was received from Continuous Memory. Ignore any DTC P1000s in KOEO or KOER.<br>DTC P1000 indicates that all of the OBD II monitors have not yet been successfully tested.<br>● **Were any other DTCs received with the P1000?** | Yes ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts for Pinpoint Test direction and REPAIR other DTCs. |
| | | No ▶ | **For vehicles with PTO:**<br>GO to QC2.<br>**All others:**<br>GO to QC3. |
| QC2 | CHECK PTO PID | | |
| | ● Connect scan tool.<br>● Key on, engine running.<br>● Access PTO STAT PID.<br>● Cycle PTO switch/actuator ON and OFF (follow PTO aftermarket instructions).<br>● **Did PTO PID cycle ON, delay, then OFF?** | Yes ▶ | PTO circuit is OK. GO to QC3. |
| | | No ▶ | GO to Pinpoint Test Step FB1. |
| QC3 | REQUEST TO CLEAR DTC P1000 | | |
| | NOTE: A complete OBD II Drive Cycle has not yet been performed to clear the DTC P1000 from the PCM.<br>● **Has the customer requested the DTC P1000 be cleared from the PCM memory?** | Yes ▶ | PERFORM the OBD II Drive Cycle. |
| | | No ▶ | INFORM the customer that if the law in this state requires additional driving in order to clear the DTC P1000 from the PCM memory, it must be performed before an inspection/maintenance test. |

## Test Notes

This Pinpoint Test is intended to diagnose DTC P1260.



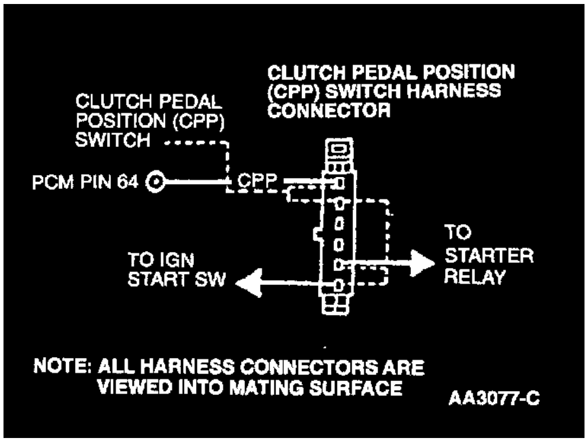
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| QD1 | CHECK ALL OTHER DTCs BEFORE DTC P1260 | | |
| | NOTE: All other DTCs must be diagnosed before DTC P1260.<br>● **Have all other DTCs been diagnosed?** | Yes ▶ | GO to QD2. |
| | | No ▶ | GO to the Powertrain Diagnostic Trouble Code (DTC) Charts for Pinpoint Test direction and REPAIR other DTCs. |
| QD2 | ATTEMPT TO START ENGINE | | |
| | ● Disarm the Anti-Theft system.<br>● Complete PCM Reset to clear DTC P1260.<br>● Attempt to start the engine.<br>● **Will the engine start?** | Yes ▶ | No system faults exist at present. RETURN vehicle to customer and advise that a theft condition existed some time in the past. |
| | | No ▶ | GO to QD3. |
| QD3 | CHECK TO SEE IF DTC P1260 IS PRESENT | | |
| | ● Retrieve Continuous Memory DTCs.<br>● **Is DTC P1260 present?** | Yes ▶ | COMPLETE PCM Reset to clear DTC.<br>DIAGNOSE the anti-theft system. |
| | | No ▶ | DTC P1260 is not the cause of the No Start. GO to Symptom Charts to diagnose the No Start symptom. |

## Test Notes

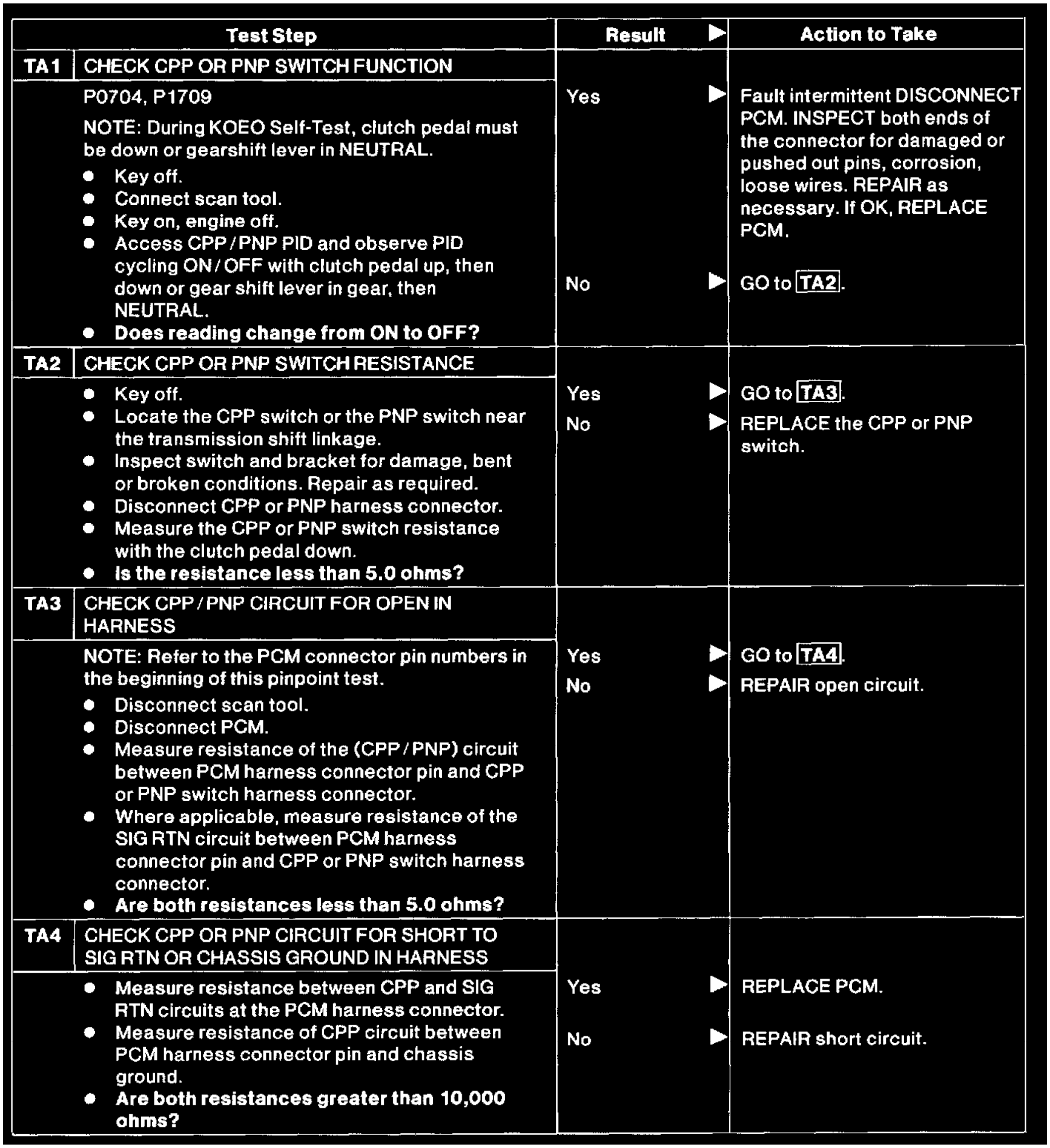
This Pinpoint Test is intended to diagnose the following:

- Clutch Pedal Position Switch
- Park Neutral Position Switch
- Harness circuits: CPP, PNP and SIG RTN

- Powertrain Control Module **(PCM)**

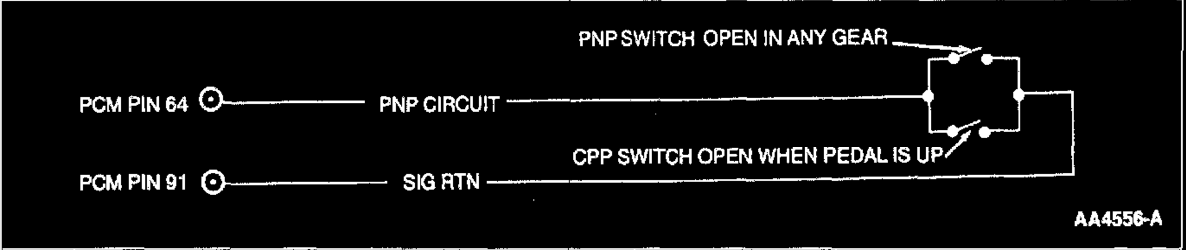


NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **TA1** | CHECK CPP OR PNP SWITCH FUNCTION | | |
| | P0704, P1709<br>NOTE: During KOEO Self-Test, clutch pedal must be down or gearshift lever in NEUTRAL.<br>● Key off.<br>● Connect scan tool.<br>● Key on, engine off.<br>● Access CPP / PNP PID and observe PID cycling ON / OFF with clutch pedal up, then down or gear shift lever in gear, then NEUTRAL.<br>● **Does reading change from ON to OFF?** | Yes ▶ | Fault intermittent DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion, loose wires. REPAIR as necessary. If OK, REPLACE PCM. |
| | | No ▶ | GO to TA2. |
| **TA2** | CHECK CPP OR PNP SWITCH RESISTANCE | | |
| | ● Key off.<br>● Locate the CPP switch or the PNP switch near the transmission shift linkage.<br>● Inspect switch and bracket for damage, bent or broken conditions. Repair as required.<br>● Disconnect CPP or PNP harness connector.<br>● Measure the CPP or PNP switch resistance with the clutch pedal down.<br>● **Is the resistance less than 5.0 ohms?** | Yes ▶ | GO to TA3. |
| | | No ▶ | REPLACE the CPP or PNP switch. |
| **TA3** | CHECK CPP / PNP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect scan tool.<br>● Disconnect PCM.<br>● Measure resistance of the (CPP / PNP) circuit between PCM harness connector pin and CPP or PNP switch harness connector.<br>● Where applicable, measure resistance of the SIG RTN circuit between PCM harness connector pin and CPP or PNP switch harness connector.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶ | GO to TA4. |
| | | No ▶ | REPAIR open circuit. |
| **TA4** | CHECK CPP OR PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS | | |
| | ● Measure resistance between CPP and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance of CPP circuit between PCM harness connector pin and chassis ground.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPAIR short circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **TA5** | CHECK CPP / PNP SWITCH FUNCTION | | |
| | P0704, P1705, P1709<br>NOTE: During Self Test, clutch pedal must be down and gearshift lever in NEUTRAL.<br>● Key off.<br>● Connect scan tool.<br>● Key on, engine off.<br>● Look for CPP / PNP PID cycling ON / OFF with:<br>— Transmission in NEUTRAL, then shift into gear and the clutch pedal up.<br>— Transmission in GEAR and the clutch pedal up then down.<br>● **Does reading change from ON to OFF for both switches?** | Yes ▶<br>No ▶ | Fault intermittent DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion and loose wires. REPAIR as necessary. If OK, REPLACE PCM.<br>GO to TA6. |

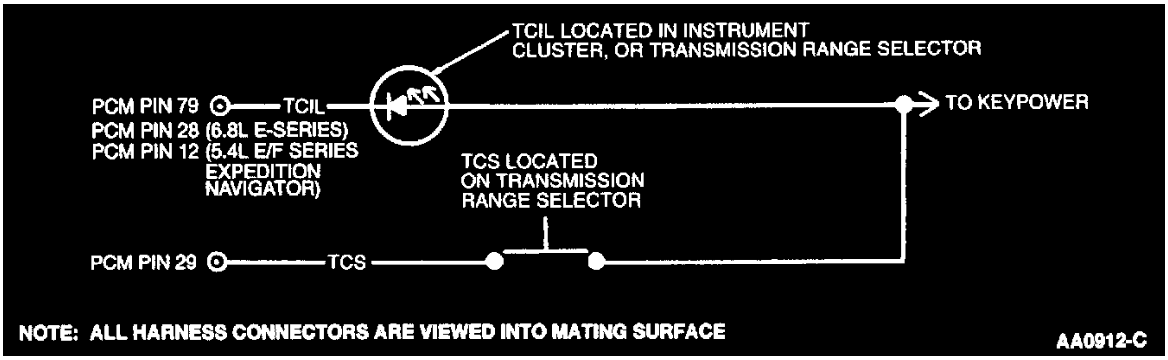


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **TA6** | CHECK CPP / PNP SWITCHES RESISTANCE | | |
| | ● Located the CPP switch near the clutch pedal and the PNP switch near the transmission shift linkage.<br>● Inspect both switches and brackets for damage. Repair as required.<br>● Disconnect CPP and PNP harness connector.<br>● Measure CPP switch resistance with the clutch pedal down.<br>● Measure PNP switch resistance with the shift lever in NEUTRAL.<br>● **Is the resistance less than 5.0 ohms for both switches?** | Yes ▶<br>No ▶ | GO to TA7.<br>REPLACE damaged CPP or PNP switch. |
| **TA7** | CHECK CPP / PNP CIRCUIT FOR OPEN IN HARNESS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect scan tool.<br>● Disconnect PCM.<br>● Measure resistance of the SIG RTN circuit between PCM harness connector pin and CPP or PNP switch harness connector.<br>● Measure resistance of the CPP / PNP circuit between PCM harness connector pin and CPP or PNP switch harness connector.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to TA8.<br>REPAIR open circuit. |
| **TA8** | CHECK CPP / PNP CIRCUIT FOR SHORT TO SIG RTN OR CHASSIS GROUND IN HARNESS | | |
| | ● Measure resistance between CPP / PNP and SIG RTN circuits at the PCM harness connector.<br>● Measure resistance of CPP / PNP circuit between the PCM harness connector pin and chassis ground.<br>● **Are both resistances greater than 10,000 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR short circuit. |

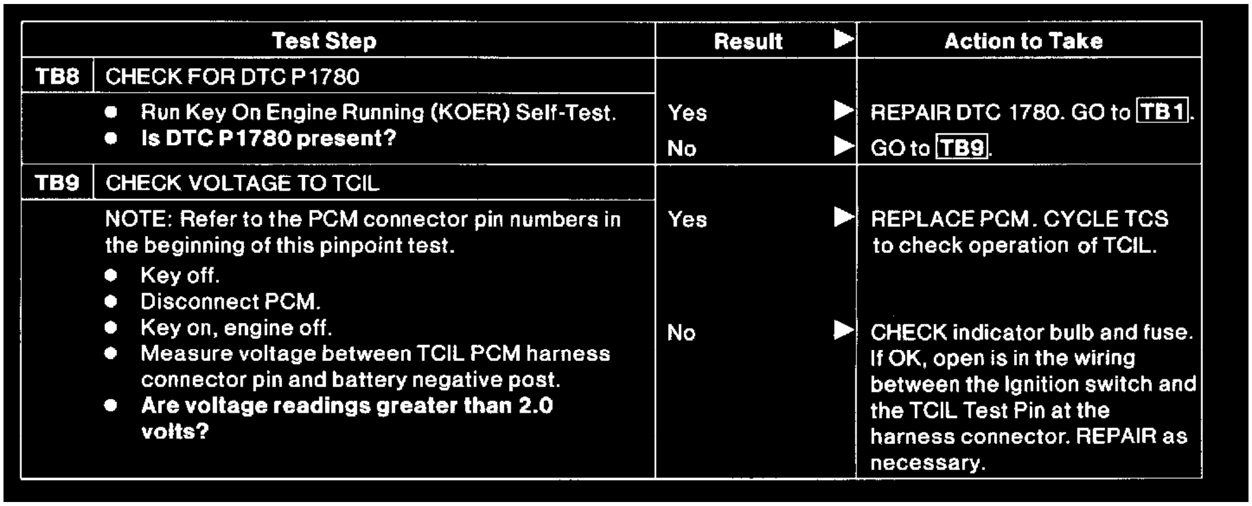
## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Harness circuits: Transmission Control Indicator Lamp **(TCIL)** and transmission Control Switch **(TCS)**
- Powertrain Control Module **(PCM)**


TCIL LOCATED IN INSTRUMENT CLUSTER, OR TRANSMISSION RANGE SELECTOR
PCM PIN 79
TCIL
PCM PIN 28 (6.8L E-SERIES)
PCM PIN 12 (5.4L E/F SERIES EXPEDITION NAVIGATOR)
TO KEYPOWER
TCS LOCATED ON TRANSMISSION RANGE SELECTOR
PCM PIN 29
TCS
NOTE: ALL HARNESS CONNECTORS ARE VIEWED INTO MATING SURFACE
AA0912-C

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **TB1** | CHECK TCS FUNCTION | | |
| | DTC P1780<br>● Key on, engine off.<br>● Access the TCS PID.<br>● Cycle the TCS switch button, then hold it depressed.<br>● Key off.<br>● **Did TCS PID reading switch from ON to OFF, and did reading indicate ON when button was depressed?** | Yes ▶ | RERUN KOER Self-Test to cycle TCS. |
| | | No ▶ | GO to TB2. |
| **TB2** | CHECK VOLTAGE TO TCS | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● Measure the voltage between the PCM harness connector pin and battery negative post while cycling the TCS several times.<br>● Key off.<br>● **Did the voltage cycle?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | GO to TB3. |
| **TB3** | CHECK TCS CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect TCS.<br>● Measure the resistance between PCM harness connector pin and battery negative post.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | GO to TB4. |
| | | No ▶ | REPAIR short circuit. |
| **TB4** | CHECK TCS CIRCUIT FOR OPEN IN HARNESS | | |
| | ● Measure the resistance of the TCS keypower between fuse junction panel and power side of the TCS harness connector.<br>● Measure resistance of TCS circuit between PCM harness connector pin and the transmission control switch harness connector.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶ | GO to TB5. |
| | | No ▶ | REPAIR open circuit. |
| **TB5** | CHECK TCS CIRCUIT FOR SHORTS TO POWER IN HARNESS | | |
| | ● Measure the resistance between TCS and VPWR circuits at the PCM harness connector.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE damaged transmission control switch. |
| | | No ▶ | REPAIR short circuit. |
| **TB6** | CHECK TCIL FUNCTION | | |
| | ● Key on, engine off.<br>● Cycle the transmission control switch (TCS).<br>● **Did the TCIL lamp change state?** | Yes ▶ | GO to Pinpoint Test Step Z1 to check for an intermittent fault. |
| | | No ▶ | GO to TB7. |
| **TB7** | CHECK TCIL CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Key off.<br>● Disconnect PCM.<br>● Key on, engine off.<br>● **Did the TCIL lamp change state?** | Yes ▶ | TCIL turns off when PCM is disconnected. REPLACE PCM. |
| | | No ▶ | REPAIR short circuit between bulb and the TCIL Test Pin. VERIFY a symptom no longer exists. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **TB8** | CHECK FOR DTC P1780 | | |
| | - Run Key On Engine Running (KOER) Self-Test.<br>- **Is DTC P1780 present?** | Yes ▶<br>No ▶ | REPAIR DTC 1780. GO to **TB1**.<br>GO to **TB9**. |
| **TB9** | CHECK VOLTAGE TO TCIL | | |
| | NOTE: Refer to the PCM connector pin numbers in the beginning of this pinpoint test.<br>- Key off.<br>- Disconnect PCM.<br>- Key on, engine off.<br>- Measure voltage between TCIL PCM harness connector pin and battery negative post.<br>- **Are voltage readings greater than 2.0 volts?** | Yes ▶<br>No ▶ | REPLACE PCM. CYCLE TCS to check operation of TCIL.<br>CHECK indicator bulb and fuse. If OK, open is in the wiring between the Ignition switch and the TCIL Test Pin at the harness connector. REPAIR as necessary. |

# TH - Reverse Switch (RS)

## TH: REVERSE SWITCH (RS)

### TH - DTC P0812 Check RS Switch Function

**NOTE:** During KOEO Self-Test, gearshift lever in NEUTRAL.

Key on, engine off.

Access RS PID and observe PID cycling ON/OFF with gear shift lever in and out of REVERSE.

Does reading change from ON to OFF?

**YES** KEY OFF. Fault intermittent. DISCONNECT PCM. INSPECT both ends of the connector for damaged or pushed out pins, corrosion, loose wires. REPAIR as necessary. If OK, REPLACE PCM.

**NO** KEY OFF. GO to TH2.

### TH2 - Check RS Switch Resistance

Locate the reverse switch (RS) near the transmission shift linkage.

Inspect switch and bracket for damage, bent or broken conditions. Repair as required.

Disconnect RS harness connector.

Measure the resistance between the reverse switch terminals with the shift lever in reverse.

Is the resistance less than 5.0 ohms?

**YES** GO to TH3.

**NO** REPLACE the RS switch.

### TH3 - Check RS Circuit For Open In Harness

Disconnect scan tool.

Disconnect PCM.

Measure resistance of the RS circuit between PCM harness connector pin and RS harness connector.

Where applicable, measure resistance of the SIG RTN circuit between PCM harness connector pin and RS harness connector.

Are both resistances less than 5.0 ohms?

**YES** GO to TH4.

NO REPAIR open circuit.

### TH4 - Check RS Circuit For Short To SIG RTN Or Chassis Ground In Harness

Measure resistance between RS and SIG RTN circuits at the PCM harness connector.

Measure resistance between RS circuit at the PCM harness connector and chassis ground.

Are both resistances greater than 10,000 ohms?

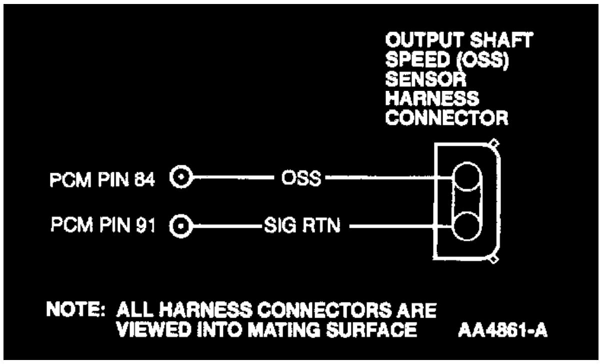
**YES** REPLACE PCM.

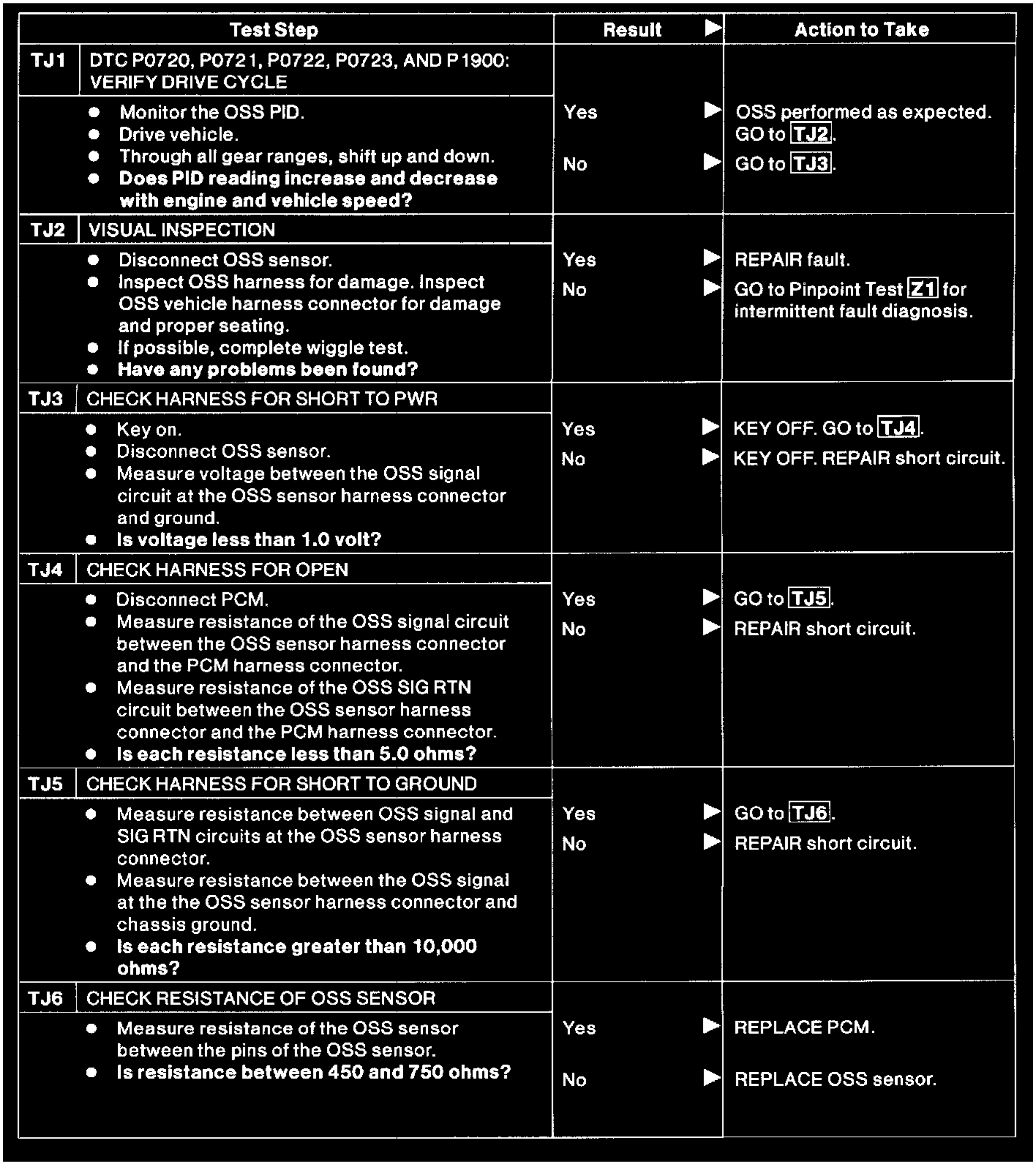
**NO** REPAIR short circuit.

## Test Notes

This Pinpoint Test is intended to diagnose the following:

- OSS harness circuits OSS and SIG RTN
- OSS Sensor
- PCM



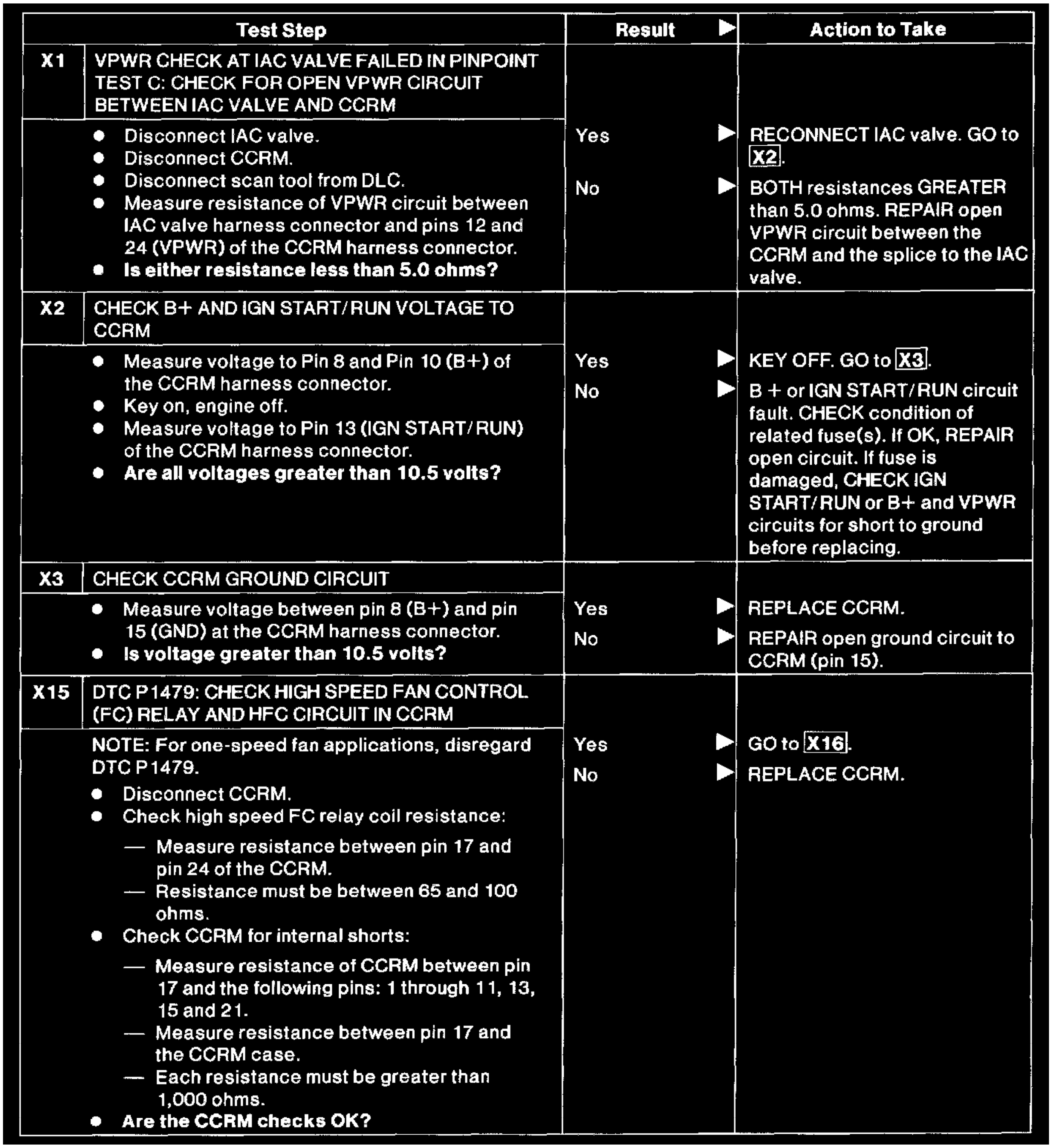


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| TJ1 | DTC P0720, P0721, P0722, P0723, AND P1900: VERIFY DRIVE CYCLE<br>● Monitor the OSS PID.<br>● Drive vehicle.<br>● Through all gear ranges, shift up and down.<br>● **Does PID reading increase and decrease with engine and vehicle speed?** | Yes ▶<br>No ▶ | OSS performed as expected. GO to TJ2.<br>GO to TJ3. |
| TJ2 | VISUAL INSPECTION<br>● Disconnect OSS sensor.<br>● Inspect OSS harness for damage. Inspect OSS vehicle harness connector for damage and proper seating.<br>● If possible, complete wiggle test.<br>● **Have any problems been found?** | Yes ▶<br>No ▶ | REPAIR fault.<br>GO to Pinpoint Test Z1 for intermittent fault diagnosis. |
| TJ3 | CHECK HARNESS FOR SHORT TO PWR<br>● Key on.<br>● Disconnect OSS sensor.<br>● Measure voltage between the OSS signal circuit at the OSS sensor harness connector and ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to TJ4.<br>KEY OFF. REPAIR short circuit. |
| TJ4 | CHECK HARNESS FOR OPEN<br>● Disconnect PCM.<br>● Measure resistance of the OSS signal circuit between the OSS sensor harness connector and the PCM harness connector.<br>● Measure resistance of the OSS SIG RTN circuit between the OSS sensor harness connector and the PCM harness connector.<br>● **Is each resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to TJ5.<br>REPAIR short circuit. |
| TJ5 | CHECK HARNESS FOR SHORT TO GROUND<br>● Measure resistance between OSS signal and SIG RTN circuits at the OSS sensor harness connector.<br>● Measure resistance between the OSS signal at the the OSS sensor harness connector and chassis ground.<br>● **Is each resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to TJ6.<br>REPAIR short circuit. |
| TJ6 | CHECK RESISTANCE OF OSS SENSOR<br>● Measure resistance of the OSS sensor between the pins of the OSS sensor.<br>● **Is resistance between 450 and 750 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE OSS sensor. |

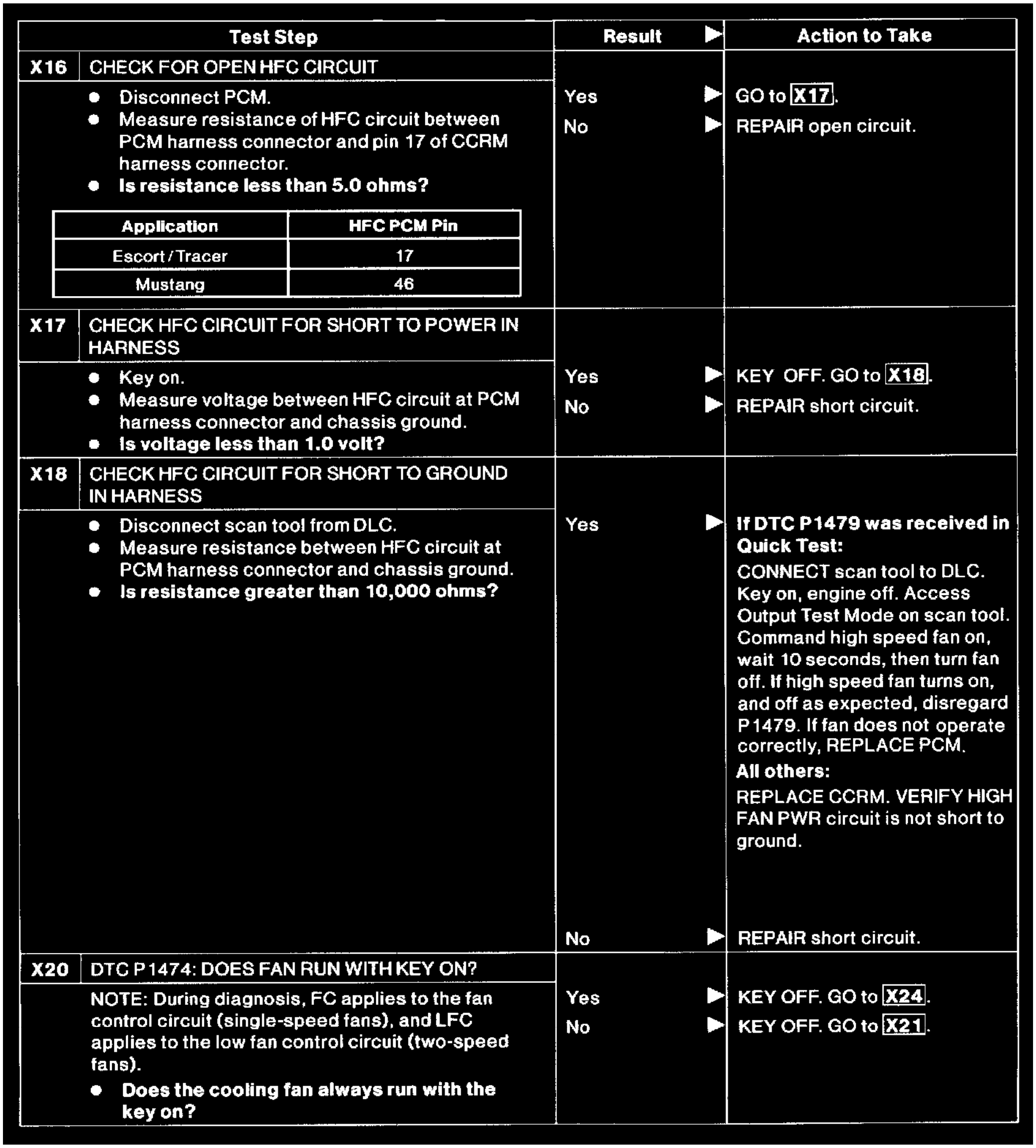
## Test Notes

This Pinpoint Test is intended to diagnose the following:

- Constant Control Relay Module **(CCRM)**
- Harness circuits: B+, FC, LFC, HFC, ACCS, WAC, VPWR (TO CCRM), A/C Clutch PWR, (Low/High) Fan PWR, GND
- Powertrain Control Module **(PCM)**



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X1** | VPWR CHECK AT IAC VALVE FAILED IN PINPOINT TEST C: CHECK FOR OPEN VPWR CIRCUIT BETWEEN IAC VALVE AND CCRM | | |
| | ● Disconnect IAC valve.<br>● Disconnect CCRM.<br>● Disconnect scan tool from DLC.<br>● Measure resistance of VPWR circuit between IAC valve harness connector and pins 12 and 24 (VPWR) of the CCRM harness connector.<br>● **Is either resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | RECONNECT IAC valve. GO to X2.<br>BOTH resistances GREATER than 5.0 ohms. REPAIR open VPWR circuit between the CCRM and the splice to the IAC valve. |
| **X2** | CHECK B+ AND IGN START/RUN VOLTAGE TO CCRM | | |
| | ● Measure voltage to Pin 8 and Pin 10 (B+) of the CCRM harness connector.<br>● Key on, engine off.<br>● Measure voltage to Pin 13 (IGN START/RUN) of the CCRM harness connector.<br>● **Are all voltages greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to X3.<br>B + or IGN START/RUN circuit fault. CHECK condition of related fuse(s). If OK, REPAIR open circuit. If fuse is damaged, CHECK IGN START/RUN or B+ and VPWR circuits for short to ground before replacing. |
| **X3** | CHECK CCRM GROUND CIRCUIT | | |
| | ● Measure voltage between pin 8 (B+) and pin 15 (GND) at the CCRM harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPLACE CCRM.<br>REPAIR open ground circuit to CCRM (pin 15). |
| **X15** | DTC P1479: CHECK HIGH SPEED FAN CONTROL (FC) RELAY AND HFC CIRCUIT IN CCRM | | |
| | NOTE: For one-speed fan applications, disregard DTC P1479.<br>● Disconnect CCRM.<br>● Check high speed FC relay coil resistance:<br>— Measure resistance between pin 17 and pin 24 of the CCRM.<br>— Resistance must be between 65 and 100 ohms.<br>● Check CCRM for internal shorts:<br>— Measure resistance of CCRM between pin 17 and the following pins: 1 through 11, 13, 15 and 21.<br>— Measure resistance between pin 17 and the CCRM case.<br>— Each resistance must be greater than 1,000 ohms.<br>● **Are the CCRM checks OK?** | Yes ▶<br>No ▶ | GO to X16.<br>REPLACE CCRM. |



<table>
<tr><th colspan="2">Test Step</th><th>Result ▶</th><th>Action to Take</th></tr>
<tr><td><b>X16</b></td><td>CHECK FOR OPEN HFC CIRCUIT<br>● Disconnect PCM.<br>● Measure resistance of HFC circuit between PCM harness connector and pin 17 of CCRM harness connector.<br>● <b>Is resistance less than 5.0 ohms?</b><table><tr><th>Application</th><th>HFC PCM Pin</th></tr><tr><td>Escort / Tracer</td><td>17</td></tr><tr><td>Mustang</td><td>46</td></tr></table></td><td>Yes ▶<br>No ▶</td><td>GO to X17.<br>REPAIR open circuit.</td></tr>
<tr><td><b>X17</b></td><td>CHECK HFC CIRCUIT FOR SHORT TO POWER IN HARNESS<br>● Key on.<br>● Measure voltage between HFC circuit at PCM harness connector and chassis ground.<br>● <b>Is voltage less than 1.0 volt?</b></td><td>Yes ▶<br>No ▶</td><td>KEY OFF. GO to X18.<br>REPAIR short circuit.</td></tr>
<tr><td><b>X18</b></td><td>CHECK HFC CIRCUIT FOR SHORT TO GROUND IN HARNESS<br>● Disconnect scan tool from DLC.<br>● Measure resistance between HFC circuit at PCM harness connector and chassis ground.<br>● <b>Is resistance greater than 10,000 ohms?</b></td><td>Yes ▶<br>No ▶</td><td><b>If DTC P1479 was received in Quick Test:</b><br>CONNECT scan tool to DLC. Key on, engine off. Access Output Test Mode on scan tool. Command high speed fan on, wait 10 seconds, then turn fan off. If high speed fan turns on, and off as expected, disregard P1479. If fan does not operate correctly, REPLACE PCM.<br><b>All others:</b><br>REPLACE CCRM. VERIFY HIGH FAN PWR circuit is not short to ground.<br>REPAIR short circuit.</td></tr>
<tr><td><b>X20</b></td><td>DTC P1474: DOES FAN RUN WITH KEY ON?<br>NOTE: During diagnosis, FC applies to the fan control circuit (single-speed fans), and LFC applies to the low fan control circuit (two-speed fans).<br>● <b>Does the cooling fan always run with the key on?</b></td><td>Yes ▶<br>No ▶</td><td>KEY OFF. GO to X24.<br>KEY OFF. GO to X21.</td></tr>
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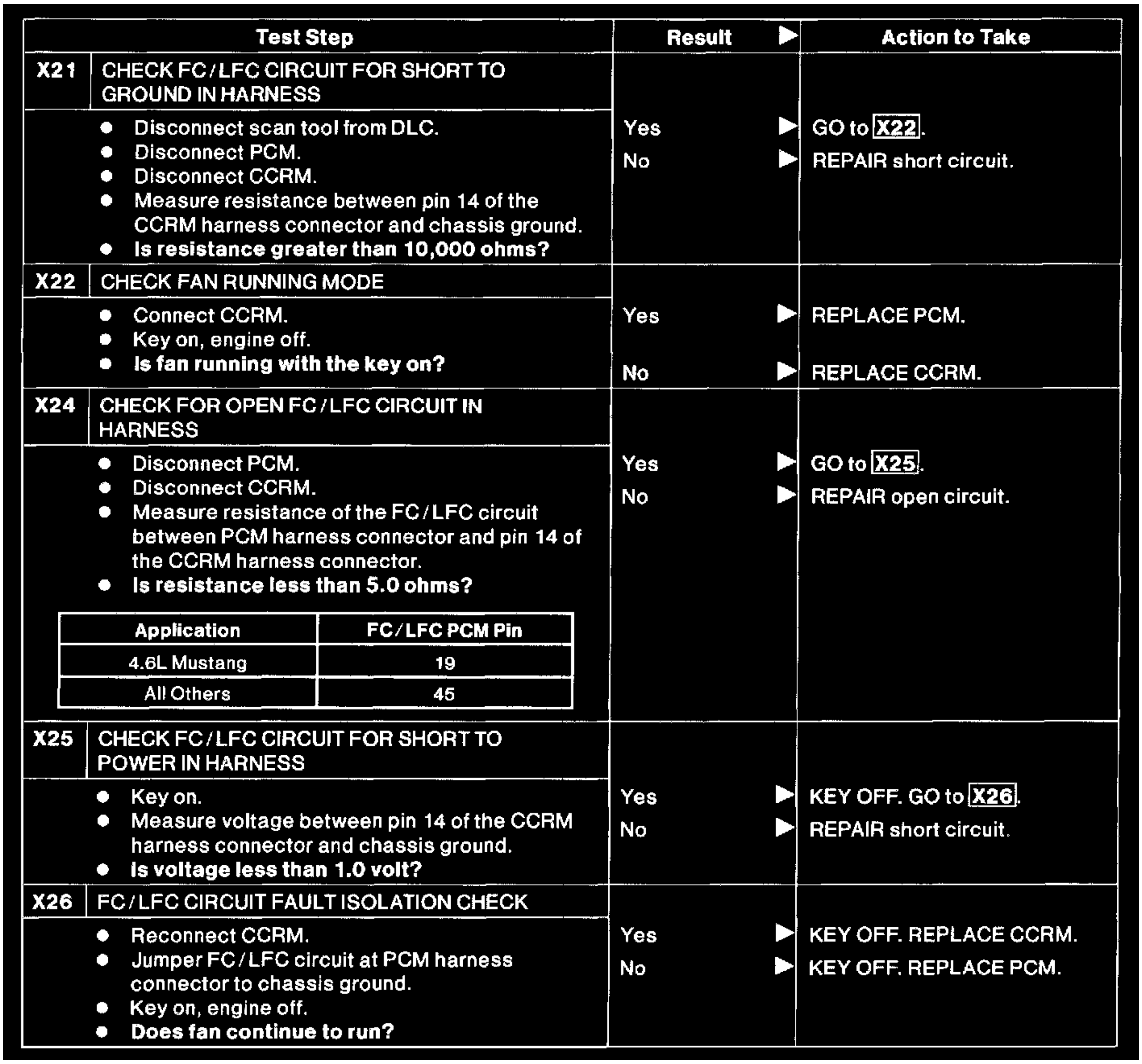
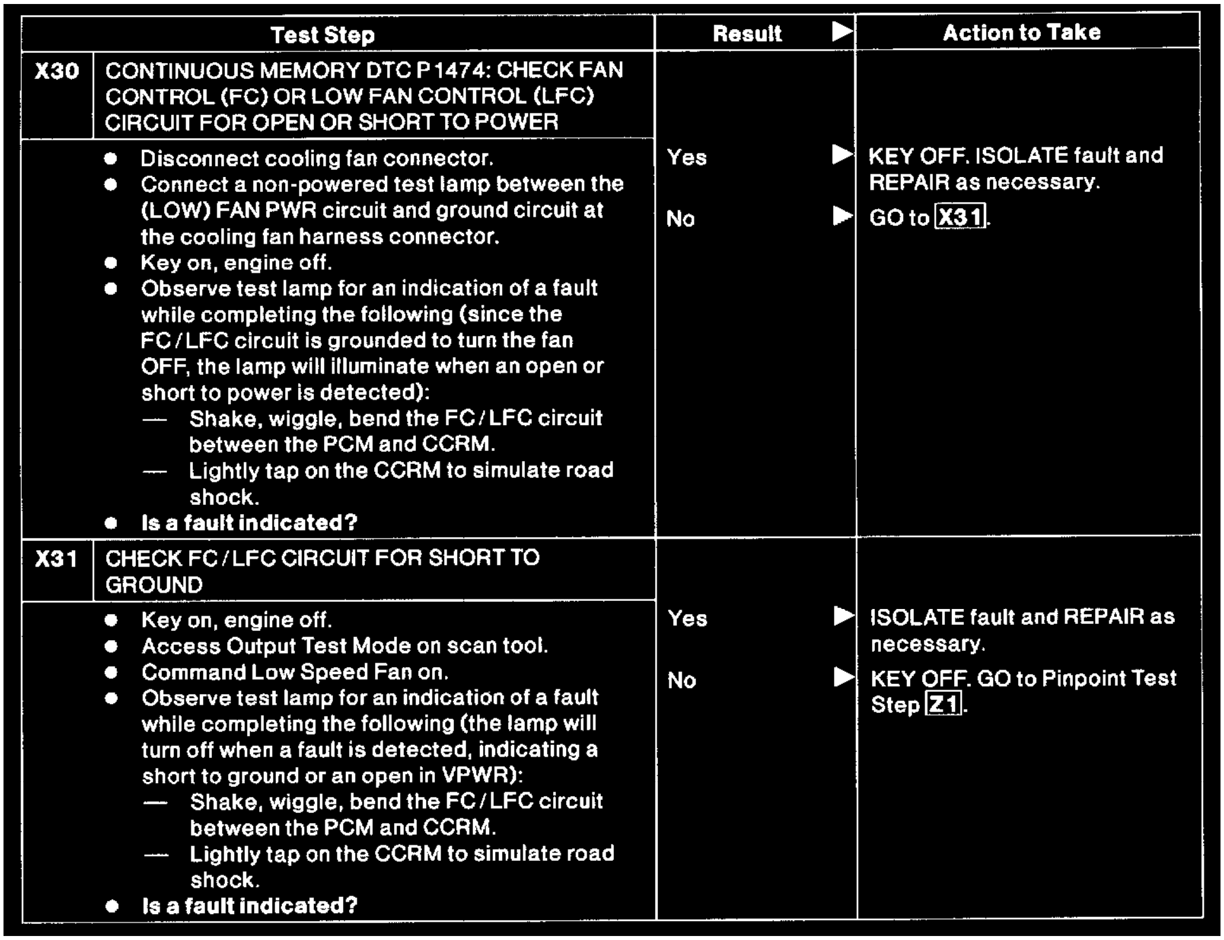


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X21** | CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Disconnect CCRM.<br>● Measure resistance between pin 14 of the CCRM harness connector and chassis ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to X22.<br>REPAIR short circuit. |
| **X22** | CHECK FAN RUNNING MODE | | |
| | ● Connect CCRM.<br>● Key on, engine off.<br>● **Is fan running with the key on?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPLACE CCRM. |
| **X24** | CHECK FOR OPEN FC/LFC CIRCUIT IN HARNESS | | |
| | ● Disconnect PCM.<br>● Disconnect CCRM.<br>● Measure resistance of the FC/LFC circuit between PCM harness connector and pin 14 of the CCRM harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to X25.<br>REPAIR open circuit. |

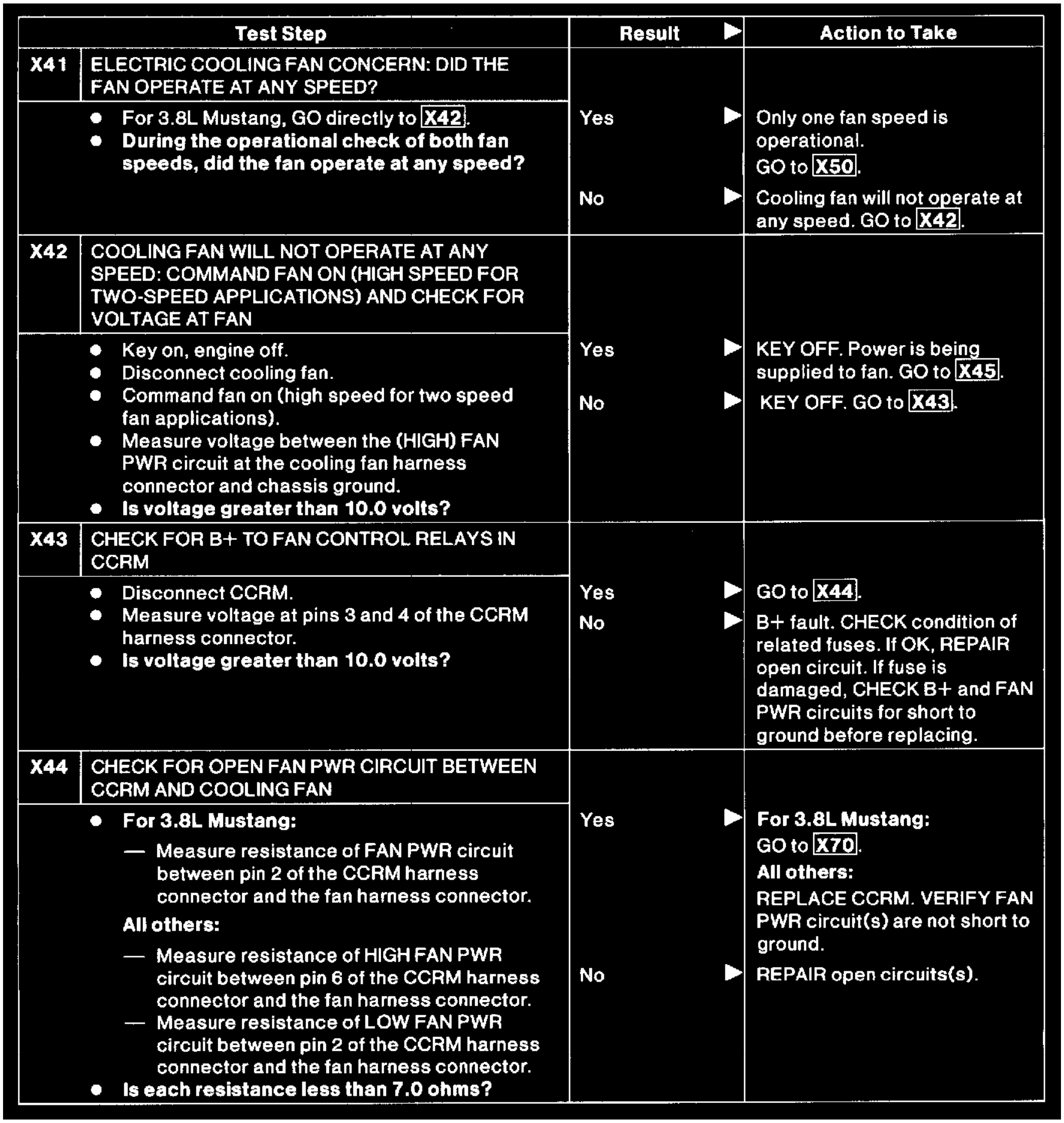
| Application | FC/LFC PCM Pin |
|---|---|
| 4.6L Mustang | 19 |
| All Others | 45 |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X25** | CHECK FC/LFC CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Key on.<br>● Measure voltage between pin 14 of the CCRM harness connector and chassis ground.<br>● **Is voltage less than 1.0 volt?** | Yes ▶<br>No ▶ | KEY OFF. GO to X26.<br>REPAIR short circuit. |
| **X26** | FC/LFC CIRCUIT FAULT ISOLATION CHECK | | |
| | ● Reconnect CCRM.<br>● Jumper FC/LFC circuit at PCM harness connector to chassis ground.<br>● Key on, engine off.<br>● **Does fan continue to run?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE CCRM.<br>KEY OFF. REPLACE PCM. |

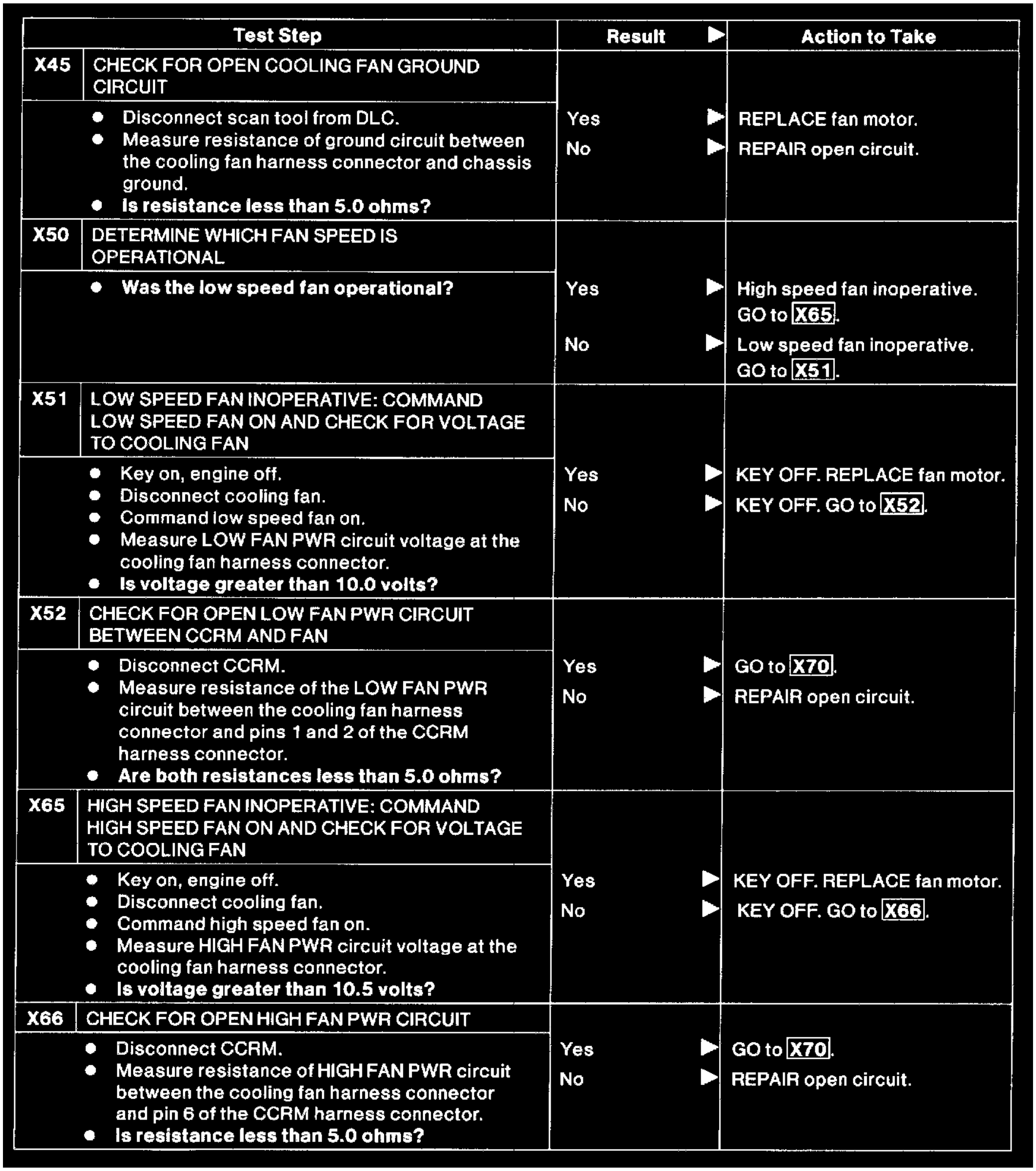


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| X30 | CONTINUOUS MEMORY DTC P1474: CHECK FAN CONTROL (FC) OR LOW FAN CONTROL (LFC) CIRCUIT FOR OPEN OR SHORT TO POWER | | |
| | ● Disconnect cooling fan connector.<br>● Connect a non-powered test lamp between the (LOW) FAN PWR circuit and ground circuit at the cooling fan harness connector.<br>● Key on, engine off.<br>● Observe test lamp for an indication of a fault while completing the following (since the FC/LFC circuit is grounded to turn the fan OFF, the lamp will illuminate when an open or short to power is detected):<br>— Shake, wiggle, bend the FC/LFC circuit between the PCM and CCRM.<br>— Lightly tap on the CCRM to simulate road shock.<br>● **Is a fault indicated?** | Yes ▶ | KEY OFF. ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | GO to X31. |
| X31 | CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND | | |
| | ● Key on, engine off.<br>● Access Output Test Mode on scan tool.<br>● Command Low Speed Fan on.<br>● Observe test lamp for an indication of a fault while completing the following (the lamp will turn off when a fault is detected, indicating a short to ground or an open in VPWR):<br>— Shake, wiggle, bend the FC/LFC circuit between the PCM and CCRM.<br>— Lightly tap on the CCRM to simulate road shock.<br>● **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step Z1. |

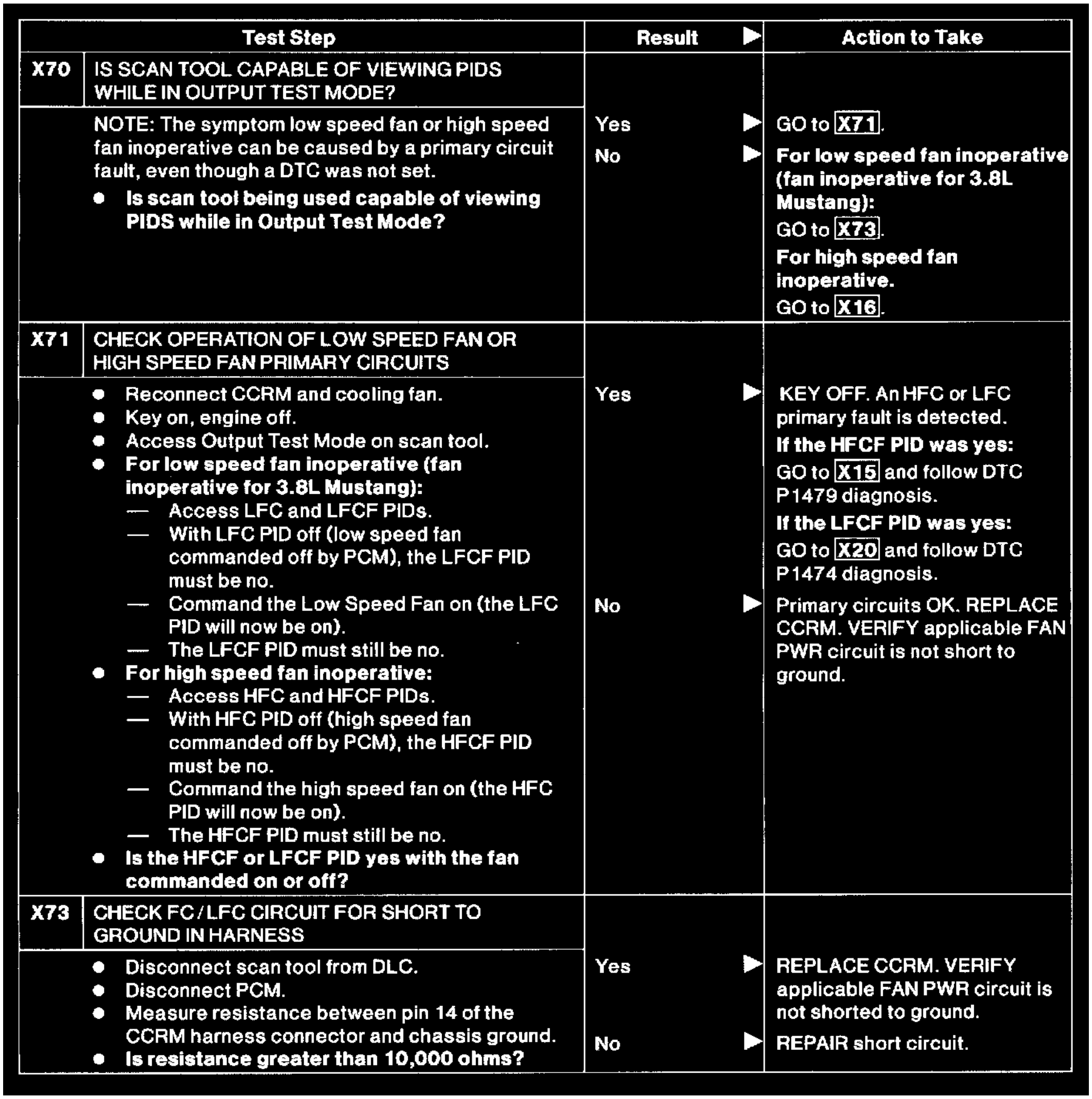
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X35** | DTC P1479: CHECK HIGH FAN CONTROL (HFC) CIRCUIT FOR OPEN OR SHORT TO POWER | | |
| | NOTE: For one-speed fan applications, disregard DTC P1479.<br>● Disconnect cooling fan connector. Inspect connector for damaged or pushed out pins, corrosion and loose wires. Repair as necessary.<br>● Connect a non-powered test lamp between the HIGH FAN PWR circuit and ground circuit at the cooling fan harness connector.<br>● Key on, engine off.<br>● Access Output Test Mode on scan tool.<br>● Command high speed fan on.<br>● Observe test lamp for an indication of a fault while completing the following (the lamp will turn off when a fault is detected, indicating an open or short to power):<br>— Shake, wiggle, bend the HFC circuit between the PCM and CCRM.<br>— Lightly tap on the CCRM to simulate road shock.<br>● **Is a fault indicated?** | Yes ▶ | KEY OFF. ISOLATE fault and REPAIR as necessary. |
| | | No ▶ | GO to X36. |
| **X36** | CHECK HFC CIRCUIT FOR SHORT TO GROUND | | |
| | ● Key on, engine off.<br>● Command high speed fan off.<br>● Observe test lamp for an indication of a fault while completing the following (the lamp will turn on when a fault is detected, indicating a short to ground):<br>— Shake, wiggle, bend the HFC circuit between the PCM and CCRM.<br>— Lightly tap on the CCRM to simulate road shock.<br>● **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. RESTORE vehicle. |
| | | No ▶ | KEY OFF. GO to Pinpoint Test Step Z1. |
| **X40** | ELECTRIC COOLING FAN FUNCTIONAL CHECK | | |
| | NOTE: For the proper results of these pinpoint tests, no DTCs must have been present during PCM Quick Test.<br>● Key on, engine off.<br>● Access Output Test Mode on scan tool.<br>● Command of the cooling fan on and check for fan operation. For two speed fan applications, check both fan speeds (wait 30 seconds after commanding high speed fan on).<br>● **Does the fan operate (all speeds)?** | Yes ▶ | KEY OFF. Cooling fan circuits OK. RETURN to Symptom Charts. |
| | | No ▶ | COMMAND cooling fan off. REMAIN in Output Test Mode. GO to X41. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X41** | ELECTRIC COOLING FAN CONCERN: DID THE FAN OPERATE AT ANY SPEED? | | |
| | ● For 3.8L Mustang, GO directly to X42.<br>● **During the operational check of both fan speeds, did the fan operate at any speed?** | Yes ▶ | Only one fan speed is operational. GO to X50. |
| | | No ▶ | Cooling fan will not operate at any speed. GO to X42. |
| **X42** | COOLING FAN WILL NOT OPERATE AT ANY SPEED: COMMAND FAN ON (HIGH SPEED FOR TWO-SPEED APPLICATIONS) AND CHECK FOR VOLTAGE AT FAN | | |
| | ● Key on, engine off.<br>● Disconnect cooling fan.<br>● Command fan on (high speed for two speed fan applications).<br>● Measure voltage between the (HIGH) FAN PWR circuit at the cooling fan harness connector and chassis ground.<br>● **Is voltage greater than 10.0 volts?** | Yes ▶ | KEY OFF. Power is being supplied to fan. GO to X45. |
| | | No ▶ | KEY OFF. GO to X43. |
| **X43** | CHECK FOR B+ TO FAN CONTROL RELAYS IN CCRM | | |
| | ● Disconnect CCRM.<br>● Measure voltage at pins 3 and 4 of the CCRM harness connector.<br>● **Is voltage greater than 10.0 volts?** | Yes ▶ | GO to X44. |
| | | No ▶ | B+ fault. CHECK condition of related fuses. If OK, REPAIR open circuit. If fuse is damaged, CHECK B+ and FAN PWR circuits for short to ground before replacing. |
| **X44** | CHECK FOR OPEN FAN PWR CIRCUIT BETWEEN CCRM AND COOLING FAN | | |
| | ● **For 3.8L Mustang:**<br>— Measure resistance of FAN PWR circuit between pin 2 of the CCRM harness connector and the fan harness connector.<br>**All others:**<br>— Measure resistance of HIGH FAN PWR circuit between pin 6 of the CCRM harness connector and the fan harness connector.<br>— Measure resistance of LOW FAN PWR circuit between pin 2 of the CCRM harness connector and the fan harness connector.<br>● **Is each resistance less than 7.0 ohms?** | Yes ▶ | **For 3.8L Mustang:**<br>GO to X70.<br>**All others:**<br>REPLACE CCRM. VERIFY FAN PWR circuit(s) are not short to ground. |
| | | No ▶ | REPAIR open circuits(s). |



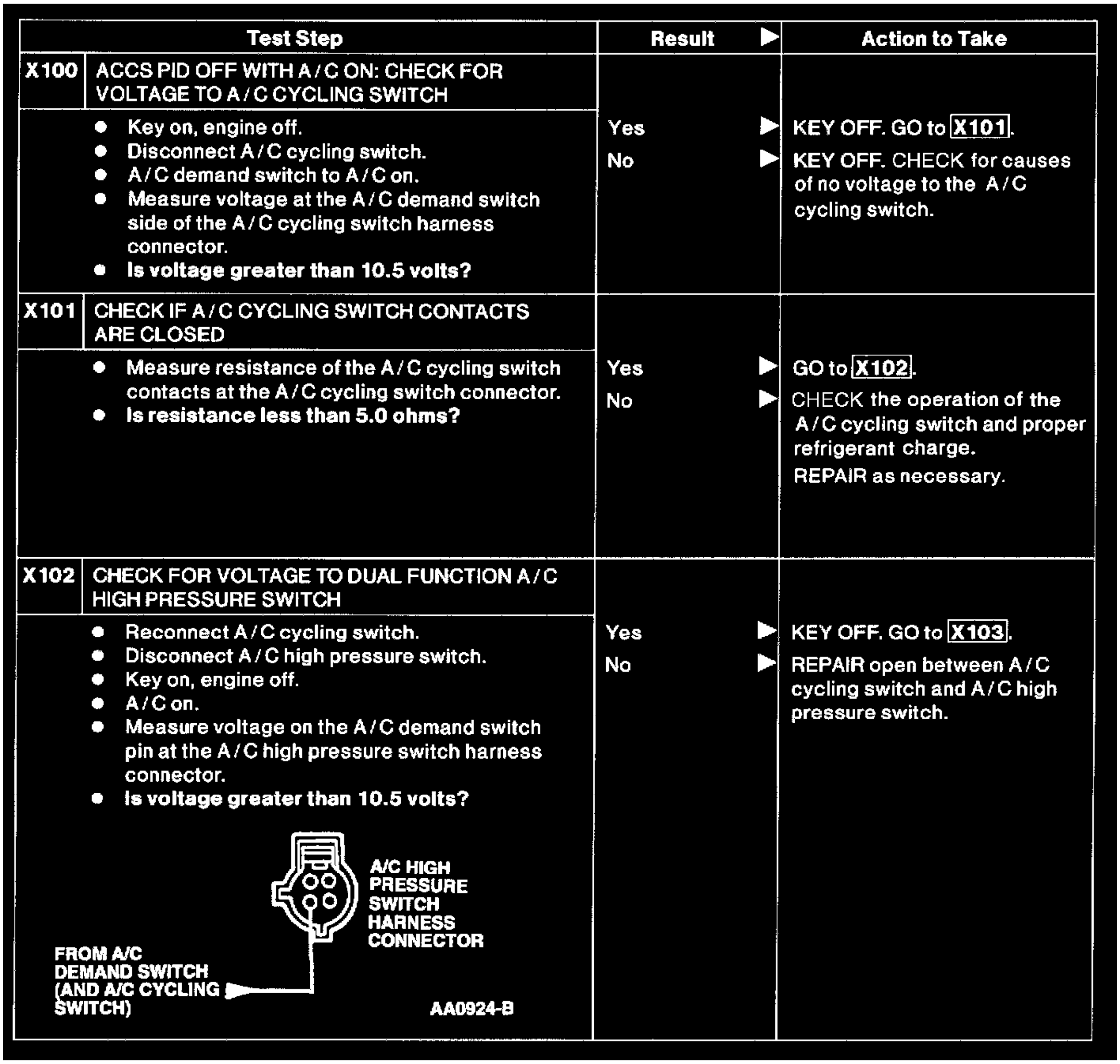
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X45** | CHECK FOR OPEN COOLING FAN GROUND CIRCUIT | | |
| | • Disconnect scan tool from DLC.<br>• Measure resistance of ground circuit between the cooling fan harness connector and chassis ground.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE fan motor.<br>REPAIR open circuit. |
| **X50** | DETERMINE WHICH FAN SPEED IS OPERATIONAL | | |
| | • **Was the low speed fan operational?** | Yes ▶<br>No ▶ | High speed fan inoperative. GO to X65.<br>Low speed fan inoperative. GO to X51. |
| **X51** | LOW SPEED FAN INOPERATIVE: COMMAND LOW SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN | | |
| | • Key on, engine off.<br>• Disconnect cooling fan.<br>• Command low speed fan on.<br>• Measure LOW FAN PWR circuit voltage at the cooling fan harness connector.<br>• **Is voltage greater than 10.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE fan motor.<br>KEY OFF. GO to X52. |
| **X52** | CHECK FOR OPEN LOW FAN PWR CIRCUIT BETWEEN CCRM AND FAN | | |
| | • Disconnect CCRM.<br>• Measure resistance of the LOW FAN PWR circuit between the cooling fan harness connector and pins 1 and 2 of the CCRM harness connector.<br>• **Are both resistances less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to X70.<br>REPAIR open circuit. |
| **X65** | HIGH SPEED FAN INOPERATIVE: COMMAND HIGH SPEED FAN ON AND CHECK FOR VOLTAGE TO COOLING FAN | | |
| | • Key on, engine off.<br>• Disconnect cooling fan.<br>• Command high speed fan on.<br>• Measure HIGH FAN PWR circuit voltage at the cooling fan harness connector.<br>• **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. REPLACE fan motor.<br>KEY OFF. GO to X66. |
| **X66** | CHECK FOR OPEN HIGH FAN PWR CIRCUIT | | |
| | • Disconnect CCRM.<br>• Measure resistance of HIGH FAN PWR circuit between the cooling fan harness connector and pin 6 of the CCRM harness connector.<br>• **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to X70.<br>REPAIR open circuit. |



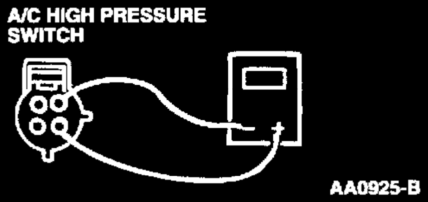
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X70** | IS SCAN TOOL CAPABLE OF VIEWING PIDS WHILE IN OUTPUT TEST MODE? | | |
| | NOTE: The symptom low speed fan or high speed fan inoperative can be caused by a primary circuit fault, even though a DTC was not set.<br>● **Is scan tool being used capable of viewing PIDS while in Output Test Mode?** | Yes ▶ | GO to X71. |
| | | No ▶ | **For low speed fan inoperative (fan inoperative for 3.8L Mustang):**<br>GO to X73.<br>**For high speed fan inoperative.**<br>GO to X16. |
| **X71** | CHECK OPERATION OF LOW SPEED FAN OR HIGH SPEED FAN PRIMARY CIRCUITS | | |
| | ● Reconnect CCRM and cooling fan.<br>● Key on, engine off.<br>● Access Output Test Mode on scan tool.<br>● **For low speed fan inoperative (fan inoperative for 3.8L Mustang):**<br>— Access LFC and LFCF PIDs.<br>— With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must be no.<br>— Command the Low Speed Fan on (the LFC PID will now be on).<br>— The LFCF PID must still be no.<br>● **For high speed fan inoperative:**<br>— Access HFC and HFCF PIDs.<br>— With HFC PID off (high speed fan commanded off by PCM), the HFCF PID must be no.<br>— Command the high speed fan on (the HFC PID will now be on).<br>— The HFCF PID must still be no.<br>● **Is the HFCF or LFCF PID yes with the fan commanded on or off?** | Yes ▶ | KEY OFF. An HFC or LFC primary fault is detected.<br>**If the HFCF PID was yes:**<br>GO to X15 and follow DTC P1479 diagnosis.<br>**If the LFCF PID was yes:**<br>GO to X20 and follow DTC P1474 diagnosis. |
| | | No ▶ | Primary circuits OK. REPLACE CCRM. VERIFY applicable FAN PWR circuit is not short to ground. |
| **X73** | CHECK FC/LFC CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Measure resistance between pin 14 of the CCRM harness connector and chassis ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE CCRM. VERIFY applicable FAN PWR circuit is not shorted to ground. |
| | | No ▶ | REPAIR short circuit. |

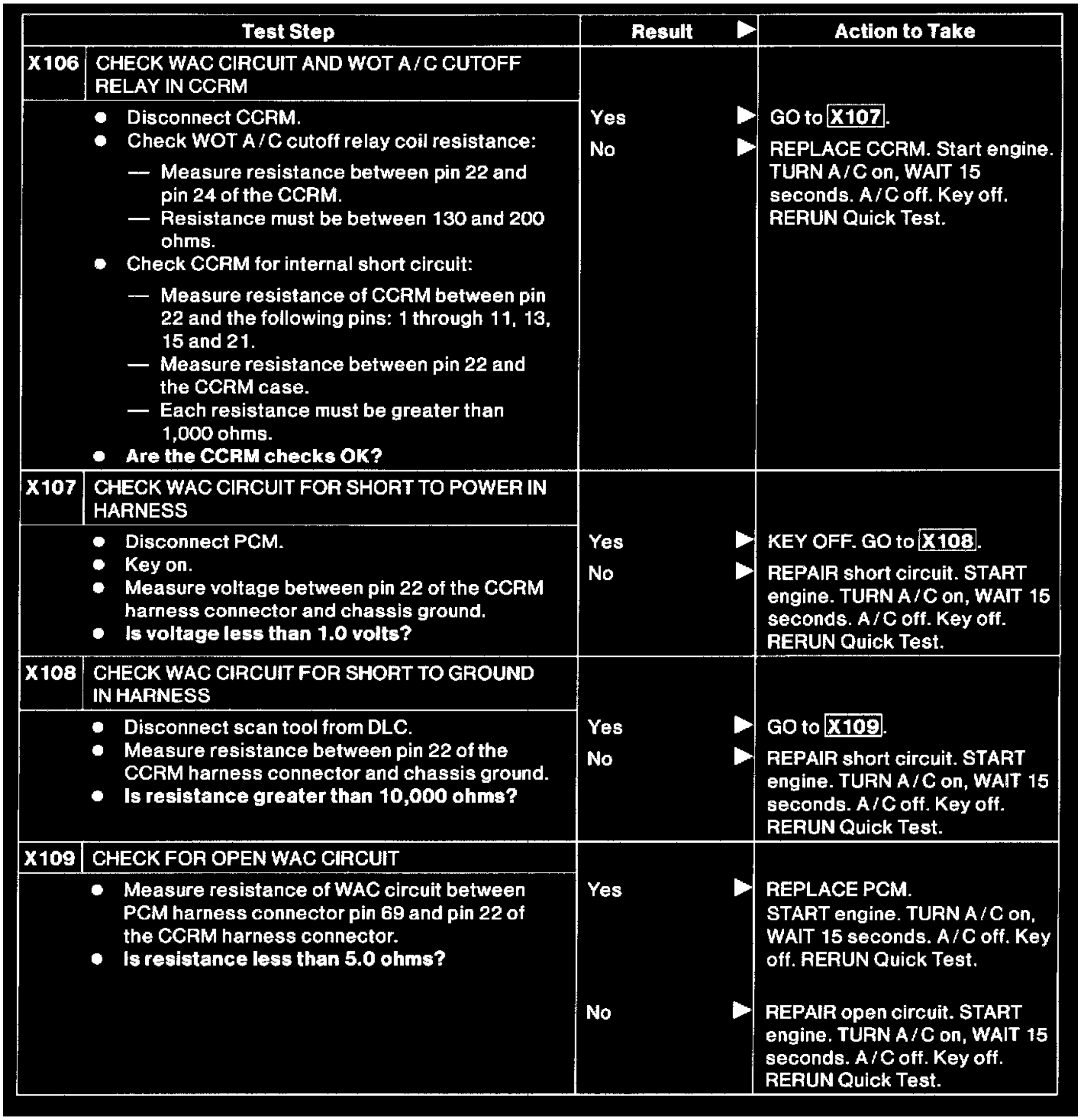
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X80** | LOW AND / OR HIGH SPEED COOLING FAN ALWAYS RUNS (NO DTCS): VERIFY FAN IS NOT ON BECAUSE OF A / C HIGH PRESSURE SWITCH INPUT TO PCM | | |
| | ● Start engine.<br>● Access ACP PID.<br>● **Is the ACP PID "CLOSED"?** | Yes ▶ | The PCM will turn the cooling fan on when the A / C high pressure switch input is "closed". Leave engine running. GO to X81. |
| | | No ▶ | Input OK. GO to X82. |
| **X81** | CHECK A / C HIGH PRESSURE SWITCH (THE MEDIUM PRESSURE, NORMALLY OPEN CONTRACTS) | | |
| | ● Disconnect A / C high pressure switch.<br>● Again, view the ACP PID on scan tool.<br>● **Is the ACP PID still "CLOSED"?** | Yes ▶ | KEY OFF. GO to X135 (to check A / C high pressure switch input to PCM). |
| | | No ▶ | KEY OFF. RECONNECT A / C high pressure switch.<br>CHECK for proper A / C high pressure switch function, over-pressurized A / C. |
| **X82** | DISCONNECT CCRM AND CHECK IF FAN STILL RUNS | | |
| | ● Accessories off (A / C, blower, lamps).<br>● Key on, verify cooling fan always on symptom.<br>● Key off.<br>● Disconnect CCRM.<br>● Key on, engine off.<br>● **Is cooling fan still on?** | Yes ▶ | KEY OFF.<br>**For 3.8L Mustang:**<br>REPAIR FAN PWR circuit short to power.<br>**For all others:**<br>GO to X83. |
| | | No ▶ | Key off. GO to X84. |
| **X83** | CHECK LOW FAN PWR AND HIGH FAN PWR CIRCUITS FOR SHORT TO POWER | | |
| | ● Disconnect cooling fan.<br>● Key on, engine off.<br>● Check for voltage on both the LOW FAN PWR and HIGH FAN PWR circuits at the cooling fan harness connector.<br>● **Are both voltages less than 1.0 volt?** | Yes ▶ | KEY OFF. No fault is indicated at this time. VERIFY results of previous test steps. If OK, RECONNECT all components and RETURN to Symptom Charts for further diagnosis of this or any other symptom. |
| | | No ▶ | REPAIR short circuit. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X84** | CHECK OPERATION OF LOW SPEED FAN OR HIGH SPEED FAN PRIMARY CIRCUITS | | |
| | NOTE: The symptom cooling fan always runs can be caused by a primary circuit fault, even though a DTC was not set. This step will check the primary circuit operation.<br>● Reconnect CCRM.<br>● Key on, engine off.<br>● **For 3.8L Mustang, or if fan stops running with the low speed FC relay disconnected:**<br>— Access LFC and LFCF PIDs.<br>— With LFC PID off (low speed fan commanded off by PCM), the LFCF PID must be no.<br>**If fan stops running with the high speed FC relay disconnected:**<br>— Access HFC and HFCF PIDs.<br>— With HFC PID off (high speed fan commanded off by PCM), the HFCF PID must be no.<br>● **Is the HFCF or LFCF PID yes with the fan commanded off?** | Yes ▶ | KEY OFF. An HFC or LFC primary circuit fault is detected.<br>**If the HFCF PID was yes:**<br>GO to X15 and follow DTC P1479 diagnosis.<br>**If the LFCF PID was yes:**<br>GO to X20 and follow DTC P1474 diagnosis. |
| | | No ▶ | Primary circuits OK. REPLACE CCRM. |
| **X98** | LACK OF COOLING (A/C)/A/C NOT FUNCTIONING: CHECK FOR VOLTAGE TO A/C CLUTCH | | |
| | NOTE: If the A/C clutch will engage, follow the "YES" Action to Take of this test step. If not, or unsure, continue this test step.<br>● Key off.<br>● Disconnect A/C cycling switch.<br>● Install a jumper wire in the A/C cycling switch harness connector (to complete the circuit).<br>● Disconnect A/C clutch.<br>● Connect digital multimeter between the power pin and ground pin at the A/C clutch vehicle harness connector.<br>● Start engine.<br>● Turn A/C on, wait 15 seconds.<br>● Check voltage reading.<br>● After testing, turn key off and reconnect A/C clutch.<br>● **Was voltage greater than 10.5 volts?** | Yes ▶ | REMOVE jumper. RECONNECT A/C cycling switch.<br>**For symptom "poor A/C system performance in hot ambient temperature":**<br>Go to Pinpoint Test KM55 to check A/C high pressure switch input to PCM.<br>**All others:**<br>DIAGNOSE Climate Control System. |
| | | No ▶ | No voltage to A/C clutch. GO to X99. |
| **X99** | CHECK ACCS INPUT TO PCM WITH A/C ON | | |
| | ● Start engine.<br>● A/C on.<br>● Access and view ACCS PID.<br>● After testing, remove jumper reconnect A/C cycling switch and turn key OFF.<br>● **Was the ACCS PID "ON"?** | Yes ▶ | GO to X110. |
| | | No ▶ | The PCM is not receiving the ACCS signal, and as a result will not allow the A/C to turn on. GO to X100. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X100** | ACCS PID OFF WITH A/C ON: CHECK FOR VOLTAGE TO A/C CYCLING SWITCH | | |
| | - Key on, engine off.<br>- Disconnect A/C cycling switch.<br>- A/C demand switch to A/C on.<br>- Measure voltage at the A/C demand switch side of the A/C cycling switch harness connector.<br>- **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to X101.<br>KEY OFF. CHECK for causes of no voltage to the A/C cycling switch. |
| **X101** | CHECK IF A/C CYCLING SWITCH CONTACTS ARE CLOSED | | |
| | - Measure resistance of the A/C cycling switch contacts at the A/C cycling switch connector.<br>- **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | GO to X102.<br>CHECK the operation of the A/C cycling switch and proper refrigerant charge. REPAIR as necessary. |
| **X102** | CHECK FOR VOLTAGE TO DUAL FUNCTION A/C HIGH PRESSURE SWITCH | | |
| | - Reconnect A/C cycling switch.<br>- Disconnect A/C high pressure switch.<br>- Key on, engine off.<br>- A/C on.<br>- Measure voltage on the A/C demand switch pin at the A/C high pressure switch harness connector.<br>- **Is voltage greater than 10.5 volts?**<br>A/C HIGH PRESSURE SWITCH HARNESS CONNECTOR<br>FROM A/C DEMAND SWITCH (AND A/C CYCLING SWITCH)<br>AA0924-B | Yes ▶<br>No ▶ | KEY OFF. GO to X103.<br>REPAIR open between A/C cycling switch and A/C high pressure switch. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X103** | CHECK RESISTANCE OF A/C HIGH PRESSURE SWITCH HIGH PRESSURE CONTACTS | | |
| | ● Measure resistance of the normally closed A/C high pressure switch high pressure contacts.<br>● **Is resistance less than 5.0 ohms?**<br><br> | Yes ▶<br>No ▶ | GO to X104.<br>CHECK for overpressurized A/C system, etc. If OK, REPLACE A/C high pressure switch. |
| **X104** | CHECK FOR VOLTAGE TO PCM ON ACCS CIRCUIT | | |
| | ● Reconnect A/C high pressure switch.<br>● Disconnect PCM.<br>● Key on.<br>● A/C ON.<br>● Measure voltage at PCM harness connector pin 41.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | REPLACE PCM.<br>REPAIR open circuit between the A/C high pressure switch. |
| **X105** | KOEO/KOER DTC P1460: VERIFY ACCS PID IS OFF | | |
| | NOTE: Verify A/C and Defrost were off during KOEO/KOER Self-Test. If vehicle is not equipped with A/C, the WAC circuit is not used and the DTC P1460 can be ignored.<br>● Start engine.<br>● A/C and defroster off.<br>● Access ACCS PID.<br>● **Is the ACCS PID off?** | Yes ▶<br>No ▶ | KEY OFF. GO to X106.<br>KEY OFF. GO to X125 (to check A/C circuits for short to power). |

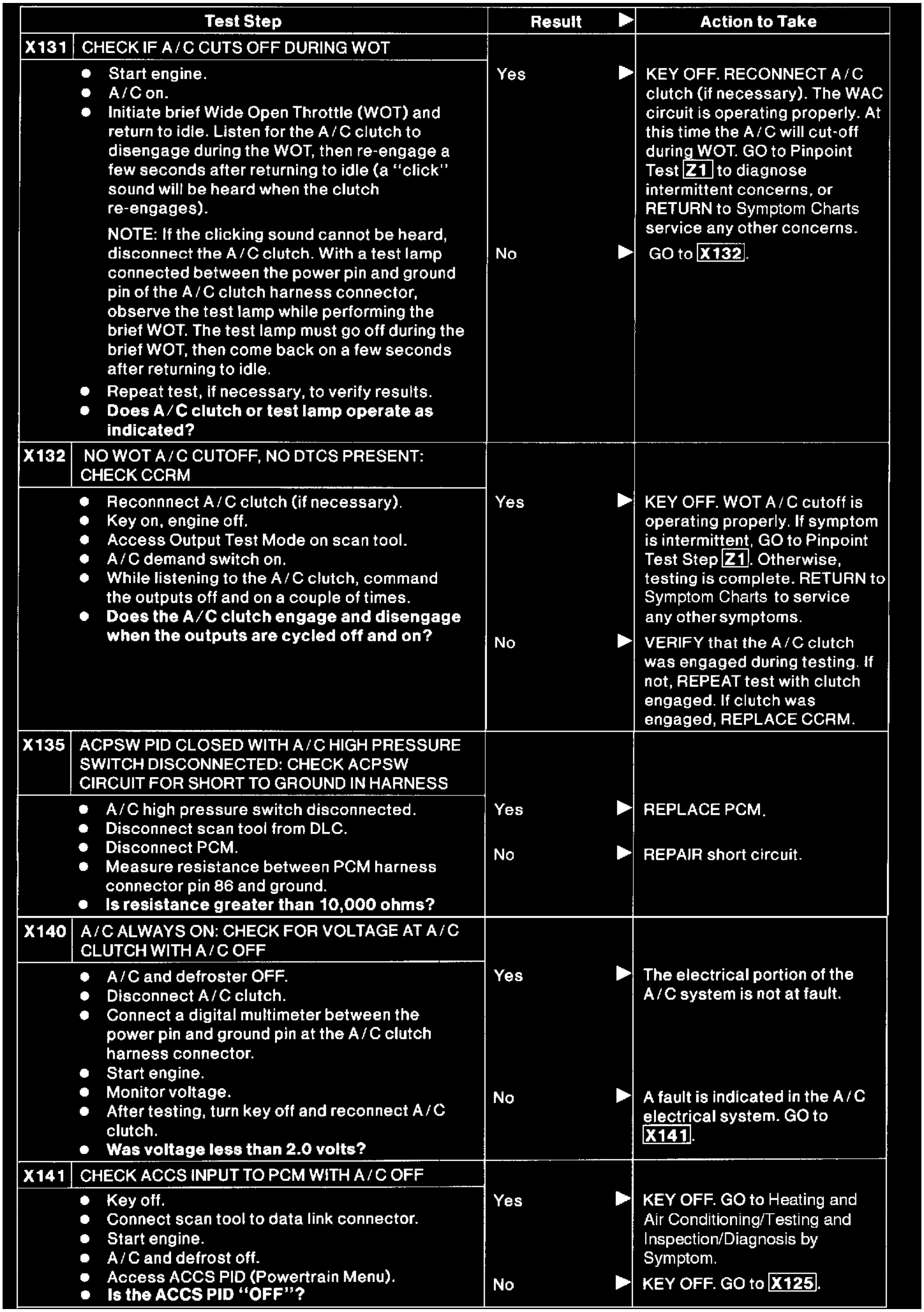


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X106** | CHECK WAC CIRCUIT AND WOT A/C CUTOFF RELAY IN CCRM | | |
| | ● Disconnect CCRM.<br>● Check WOT A/C cutoff relay coil resistance:<br>— Measure resistance between pin 22 and pin 24 of the CCRM.<br>— Resistance must be between 130 and 200 ohms.<br>● Check CCRM for internal short circuit:<br>— Measure resistance of CCRM between pin 22 and the following pins: 1 through 11, 13, 15 and 21.<br>— Measure resistance between pin 22 and the CCRM case.<br>— Each resistance must be greater than 1,000 ohms.<br>● **Are the CCRM checks OK?** | Yes ▶<br>No ▶ | GO to X107.<br>REPLACE CCRM. Start engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| **X107** | CHECK WAC CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | ● Disconnect PCM.<br>● Key on.<br>● Measure voltage between pin 22 of the CCRM harness connector and chassis ground.<br>● **Is voltage less than 1.0 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to X108.<br>REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| **X108** | CHECK WAC CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| | ● Disconnect scan tool from DLC.<br>● Measure resistance between pin 22 of the CCRM harness connector and chassis ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶<br>No ▶ | GO to X109.<br>REPAIR short circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| **X109** | CHECK FOR OPEN WAC CIRCUIT | | |
| | ● Measure resistance of WAC circuit between PCM harness connector pin 69 and pin 22 of the CCRM harness connector.<br>● **Is resistance less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test.<br>REPAIR open circuit. START engine. TURN A/C on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X110** | NO/LOW VOLTAGE TO A/C CLUTCH (ACCS PID IS ON WITH A/C ON AND NO DTCS, OR DIRECTED HERE FROM PINPOINT TEST DS): CHECK FOR A/C VOLTAGE TO CCRM | | |
| | ● Disconnect CCRM.<br>● Key on.<br>● A/C demand switch to A/C on.<br>● Measure voltage to pin 21 of the CCRM harness connector.<br>● **Is voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF, A/C OFF. GO to X111.<br>REPAIR open in A/C demand circuit between CCRM and ACCS circuit splice to PCM. |
| **X111** | CHECK FOR OPEN A/C CLUTCH PWR AND A/C CLUTCH GROUND CIRCUITS | | |
| | ● Disconnect A/C clutch.<br>● Disconnect scan tool from DLC.<br>● Measure resistance of A/C clutch PWR circuit between pin 23 of the CCRM harness connector and the A/C clutch harness connector.<br>● Measure resistance of A/C clutch ground circuit between pin 16 of the CCRM harness connector and the A/C clutch harness connector.<br>● **Are both resistances less than 5.0 ohms?** | Yes ▶<br>No ▶ | REPLACE CCRM. VERIFY A/C Clutch PWR circuit is not shorted to ground.<br>REPAIR open circuit. |
| **X115** | DTC P1469: CHECK FOR CAUSES OF FAST A/C COMPRESSOR CLUTCH CYCLING | | |
| | ● Test the A/C compressor clutch cycle times, and to check causes of fast A/C compressor clutch cycling.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | REPAIR as required. COMPLETE PCM Reset to clear DTC(s). START engine and turn A/C on for about 2 minutes. Engine off, A/C off. RERUN Quick Test.<br>GO to X116 to CHECK for intermittent electrical concern. |
| **X116** | CHECK FOR INTERMITTENT OPEN IN ACCS CIRCUIT | | |
| | ● Key on.<br>● Access ACCS PID.<br>● A/C on.<br>● Observe ACCS PID for an indication of a fault while completing the following (the ACCS PID will turn off and on quickly when a fault is detected, indicating an intermittent open):<br>— Shake, wiggle, bend the ACCS circuit between the PCM and the source of the circuit (such as A/C switch, EATC module).<br>— Lightly tap any pressure switches in the circuit to simulate road shock.<br>● Disconnect and inspect the A/C cycling switch connector.<br>● **Is a fault indicated?** | Yes ▶<br>No ▶ | KEY OFF. ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTC(s). START engine and TURN A/C on for about two minutes. Engine off, A/C off. RERUN Quick Test.<br>UNABLE to duplicate fault at this time. COMPLETE PCM Reset to clear DTC(s). RETURN to Symptom Charts to service any additional symptoms. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **X120** | DTC P1460: CHECK FOR INTERMITTENT OPEN OR SHORT IN WAC CIRCUIT | | |
| | NOTE: If vehicle is not equipped with A/C, the WAC circuit is not used and the DTC P1460 can be ignored.<br>● Disconnect A/C cycling switch.<br>● Install a jumper wire in the A/C cycling switch vehicle harness connector (to complete the circuit).<br>● Key on, engine off.<br>● For Mustang, A/C demand switch on.<br>● For Escort/Tracer:<br>— Access Output Test Mode on scan tool.<br>— Turn outputs on (this will engage the A/C clutch).<br>● Check WAC circuit for open or short to power while completing the following (the A/C clutch will click on (off for Escort/Tracer)) when a fault is detected):<br>— Shake, wiggle, bend the WAC circuit from the CCRM to the PCM.<br>— Lightly tap the CCRM to simulate road shock.<br>● Access Output Test Mode on the scan tool.<br>● Turn outputs off.<br>● Check WAC circuit for short to ground while completing the following (the A/C clutch will click off (on for Escort/Tracer) when a fault is detected):<br>— Shake, wiggle, bend the WAC circuit from the CCRM to the PCM.<br>— Lightly tap the CCRM to simulate road shock.<br>● Key off, A/C off.<br>● **Is a fault indicated?** | Yes ▶ | ISOLATE fault and REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. START engine. TURN AC on, WAIT 15 seconds. A/C off. Key off. RERUN Quick Test. |
| | | No ▶ | REMOVE jumper wire. GO to Pinpoint Test Step Z1. |
| **X124** | DTC P1464: CHECK ACCS PID | | |
| | NOTE: Verify A/C and defrost were off during Self-Test. If A/C or defrost were on, turn off and rerun Self-Test.<br>● Key on, engine off.<br>● A/C and defrost off.<br>● Access ACCS PID.<br>● **Is ACCS PID on?** | Yes ▶ | GO to X125. |
| | | No ▶ | The ACCS PID indicates that the ACCS input to the PCM is low. VERIFY test results. With A/C and defrost off, RERUN Self-Test where DTC P1464 was received. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| X125 | ACCS PID ON: DISCONNECT A/C CYCLING SWITCH AND CHECK IF ACCS PID TURNS OFF | | |
| | - Disconnect A/C cycling switch.<br>- Key on, engine off.<br>- Access ACCS PID.<br>- **Is ACCS PID off?** | Yes ▶ | KEY OFF. VERIFY operation of A/C demand switch. If OK, REPAIR short to power in A/C demand circuit to A/C cycling switch. |
| | | No ▶ | KEY OFF.<br>**For Escort/Tracer:**<br>GO to X127.<br>**All others:**<br>GO to X126. |
| X126 | CHECK A/C CLUTCH PWR CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | - Disconnect CCRM.<br>- Key on.<br>- Measure voltage between pin 23 of the CCRM harness connector and ground.<br>- **Is voltage less than 1.0 volt?** | Yes ▶ | KEY OFF. GO to X127. |
| | | No ▶ | REPAIR short circuit. RESTORE vehicle. VERIFY a symptom no longer exists. |
| X127 | CHECK ACCS CIRCUIT FOR SHORT TO POWER IN HARNESS | | |
| | - Key off.<br>- A/C cycling switch and CCRM (except Escort/Tracer) disconnected.<br>- Disconnect PCM.<br>- Key on.<br>- Measure voltage between PCM harness connector pin 41 and ground.<br>- **Is voltage less than 1.0 volt?** | Yes ▶ | **For Escort/Tracer:**<br>REPLACE PCM.<br>**All others:**<br>KEY OFF. GO to X128. |
| | | No ▶ | REPAIR short circuit. |
| X128 | CHECK ACCS CIRCUIT VOLTAGE TO PCM WITH CCRM CONNECTED | | |
| | - Reconnect CCRM.<br>- Key on.<br>- Again, measure voltage between PCM harness connector pin 41 and ground.<br>- **Is voltage less than 1.0 volt?** | Yes ▶ | REPLACE PCM. |
| | | No ▶ | REPLACE CCRM. |
| X130 | DOES THE A/C TURN OFF WHEN THE A/C DEMAND SWITCH IS TURNED OFF? | | |
| | - **Does the A/C turn off when the A/C demand switch is turned off?** | Yes ▶ | GO to X131. |
| | | No ▶ | GO to X140. |

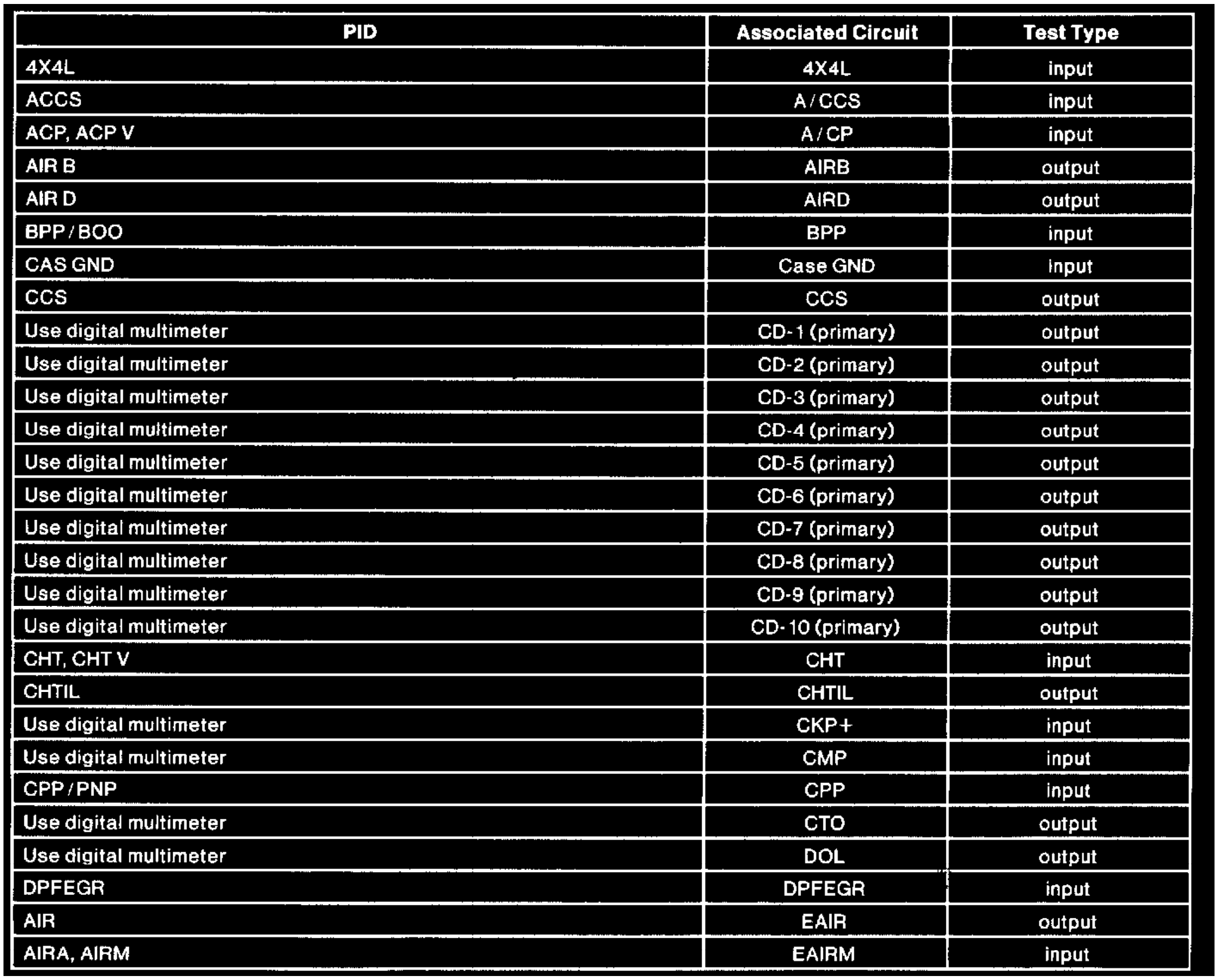


| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **X131** CHECK IF A/C CUTS OFF DURING WOT | | |
| ● Start engine.<br>● A/C on.<br>● Initiate brief Wide Open Throttle (WOT) and return to idle. Listen for the A/C clutch to disengage during the WOT, then re-engage a few seconds after returning to idle (a "click" sound will be heard when the clutch re-engages).<br>NOTE: If the clicking sound cannot be heard, disconnect the A/C clutch. With a test lamp connected between the power pin and ground pin of the A/C clutch harness connector, observe the test lamp while performing the brief WOT. The test lamp must go off during the brief WOT, then come back on a few seconds after returning to idle.<br>● Repeat test, if necessary, to verify results.<br>● **Does A/C clutch or test lamp operate as indicated?** | Yes ▶ | KEY OFF. RECONNECT A/C clutch (if necessary). The WAC circuit is operating properly. At this time the A/C will cut-off during WOT. GO to Pinpoint Test Z1 to diagnose intermittent concerns, or RETURN to Symptom Charts service any other concerns. |
| | No ▶ | GO to X132. |
| **X132** NO WOT A/C CUTOFF, NO DTCS PRESENT: CHECK CCRM | | |
| ● Reconnnect A/C clutch (if necessary).<br>● Key on, engine off.<br>● Access Output Test Mode on scan tool.<br>● A/C demand switch on.<br>● While listening to the A/C clutch, command the outputs off and on a couple of times.<br>● **Does the A/C clutch engage and disengage when the outputs are cycled off and on?** | Yes ▶ | KEY OFF. WOT A/C cutoff is operating properly. If symptom is intermittent, GO to Pinpoint Test Step Z1. Otherwise, testing is complete. RETURN to Symptom Charts to service any other symptoms. |
| | No ▶ | VERIFY that the A/C clutch was engaged during testing. If not, REPEAT test with clutch engaged. If clutch was engaged, REPLACE CCRM. |
| **X135** ACPSW PID CLOSED WITH A/C HIGH PRESSURE SWITCH DISCONNECTED: CHECK ACPSW CIRCUIT FOR SHORT TO GROUND IN HARNESS | | |
| ● A/C high pressure switch disconnected.<br>● Disconnect scan tool from DLC.<br>● Disconnect PCM.<br>● Measure resistance between PCM harness connector pin 86 and ground.<br>● **Is resistance greater than 10,000 ohms?** | Yes ▶ | REPLACE PCM. |
| | No ▶ | REPAIR short circuit. |
| **X140** A/C ALWAYS ON: CHECK FOR VOLTAGE AT A/C CLUTCH WITH A/C OFF | | |
| ● A/C and defroster OFF.<br>● Disconnect A/C clutch.<br>● Connect a digital multimeter between the power pin and ground pin at the A/C clutch harness connector.<br>● Start engine.<br>● Monitor voltage.<br>● After testing, turn key off and reconnect A/C clutch.<br>● **Was voltage less than 2.0 volts?** | Yes ▶ | The electrical portion of the A/C system is not at fault. |
| | No ▶ | A fault is indicated in the A/C electrical system. GO to X141. |
| **X141** CHECK ACCS INPUT TO PCM WITH A/C OFF | | |
| ● Key off.<br>● Connect scan tool to data link connector.<br>● Start engine.<br>● A/C and defrost off.<br>● Access ACCS PID (Powertrain Menu).<br>● **Is the ACCS PID "OFF"?** | Yes ▶ | KEY OFF. GO to Heating and Air Conditioning/Testing and Inspection/Diagnosis by Symptom. |
| | No ▶ | KEY OFF. GO to X125. |

## Test Notes

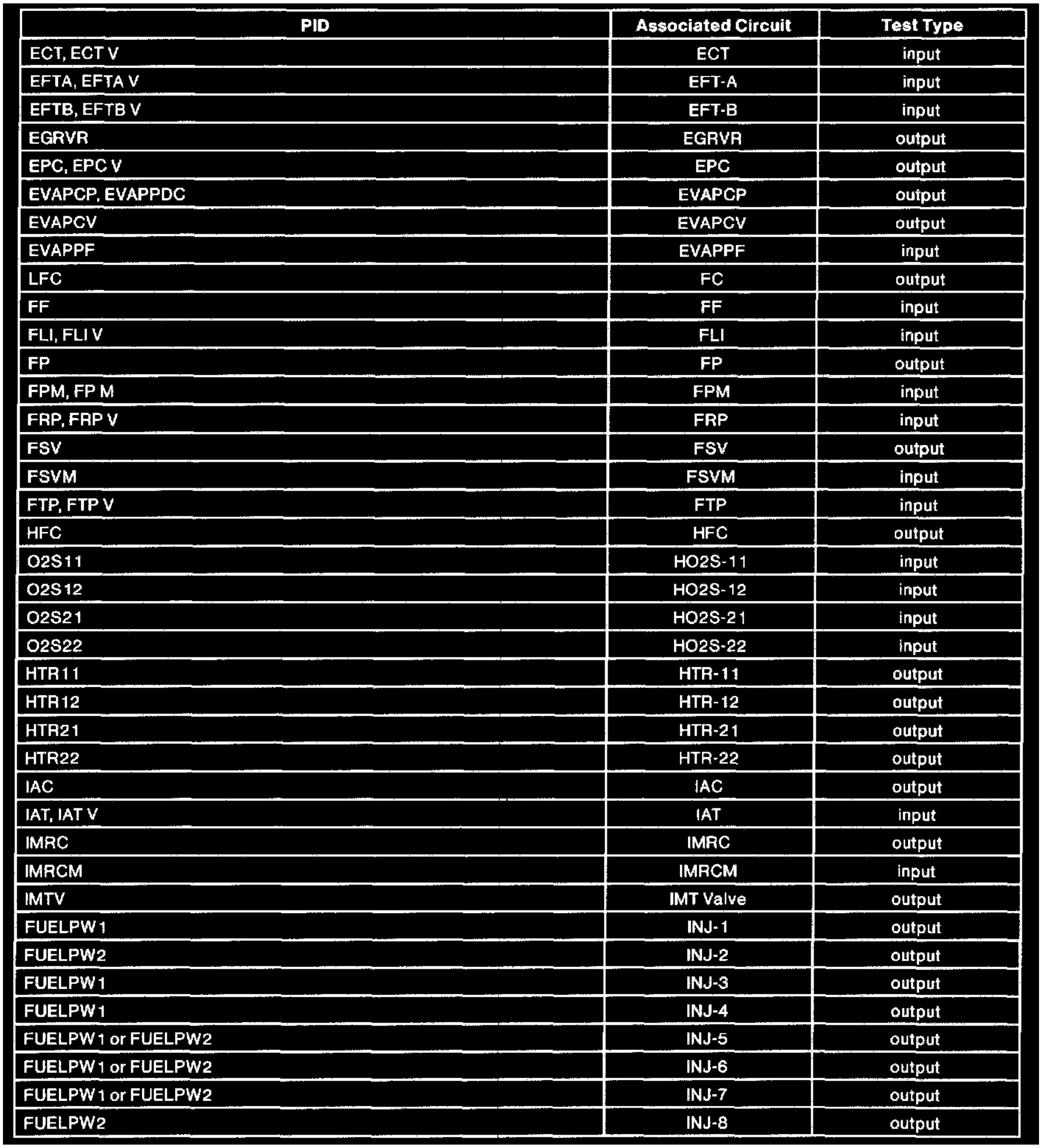
This Pinpoint Test is intended to diagnose and isolate intermittent concerns for the following:

- All Electronic EC subsystems.
- Coil Pack ignition systems using the Distributorless Ignition System Tester **(DIST)**.



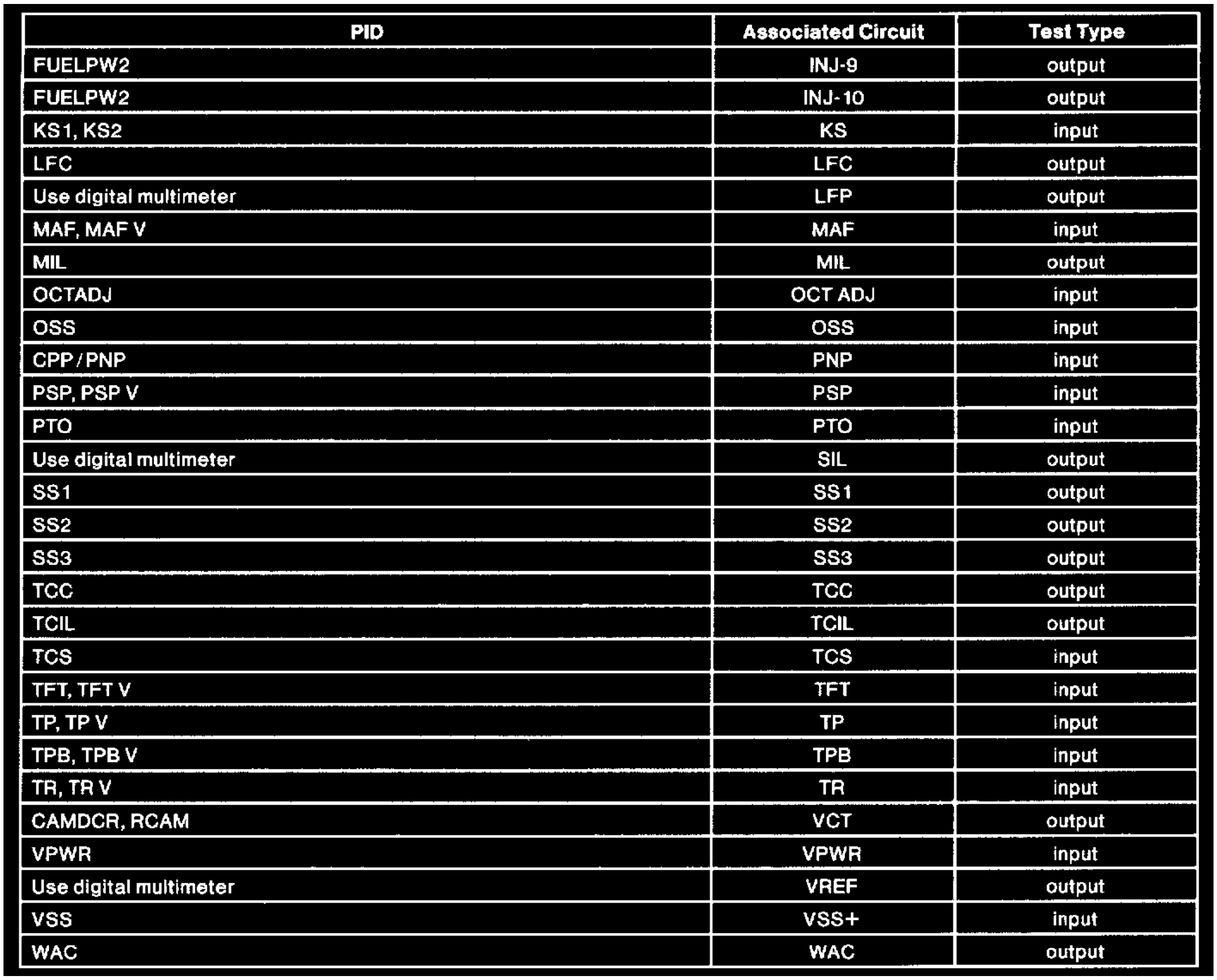
| PID | Associated Circuit | Test Type |
|---|---|---|
| 4X4L | 4X4L | input |
| ACCS | A/CCS | input |
| ACP, ACP V | A/CP | input |
| AIR B | AIRB | output |
| AIR D | AIRD | output |
| BPP/BOO | BPP | input |
| CAS GND | Case GND | input |
| CCS | CCS | output |
| Use digital multimeter | CD-1 (primary) | output |
| Use digital multimeter | CD-2 (primary) | output |
| Use digital multimeter | CD-3 (primary) | output |
| Use digital multimeter | CD-4 (primary) | output |
| Use digital multimeter | CD-5 (primary) | output |
| Use digital multimeter | CD-6 (primary) | output |
| Use digital multimeter | CD-7 (primary) | output |
| Use digital multimeter | CD-8 (primary) | output |
| Use digital multimeter | CD-9 (primary) | output |
| Use digital multimeter | CD-10 (primary) | output |
| CHT, CHT V | CHT | input |
| CHTIL | CHTIL | output |
| Use digital multimeter | CKP+ | input |
| Use digital multimeter | CMP | input |
| CPP/PNP | CPP | input |
| Use digital multimeter | CTO | output |
| Use digital multimeter | DOL | output |
| DPFEGR | DPFEGR | input |
| AIR | EAIR | output |
| AIRA, AIRM | EAIRM | input |

Intermittent Test Chart



| PID | Associated Circuit | Test Type |
|---|---|---|
| ECT, ECT V | ECT | input |
| EFTA, EFTA V | EFT-A | input |
| EFTB, EFTB V | EFT-B | input |
| EGRVR | EGRVR | output |
| EPC, EPC V | EPC | output |
| EVAPCP, EVAPPDC | EVAPCP | output |
| EVAPCV | EVAPCV | output |
| EVAPPF | EVAPPF | input |
| LFC | FC | output |
| FF | FF | input |
| FLI, FLI V | FLI | input |
| FP | FP | output |
| FPM, FP M | FPM | input |
| FRP, FRP V | FRP | input |
| FSV | FSV | output |
| FSVM | FSVM | input |
| FTP, FTP V | FTP | input |
| HFC | HFC | output |
| O2S11 | HO2S-11 | input |
| O2S12 | HO2S-12 | input |
| O2S21 | HO2S-21 | input |
| O2S22 | HO2S-22 | input |
| HTR11 | HTR-11 | output |
| HTR12 | HTR-12 | output |
| HTR21 | HTR-21 | output |
| HTR22 | HTR-22 | output |
| IAC | IAC | output |
| IAT, IAT V | IAT | input |
| IMRC | IMRC | output |
| IMRCM | IMRCM | input |
| IMTV | IMT Valve | output |
| FUELPW1 | INJ-1 | output |
| FUELPW2 | INJ-2 | output |
| FUELPW1 | INJ-3 | output |
| FUELPW1 | INJ-4 | output |
| FUELPW1 or FUELPW2 | INJ-5 | output |
| FUELPW1 or FUELPW2 | INJ-6 | output |
| FUELPW1 or FUELPW2 | INJ-7 | output |
| FUELPW2 | INJ-8 | output |

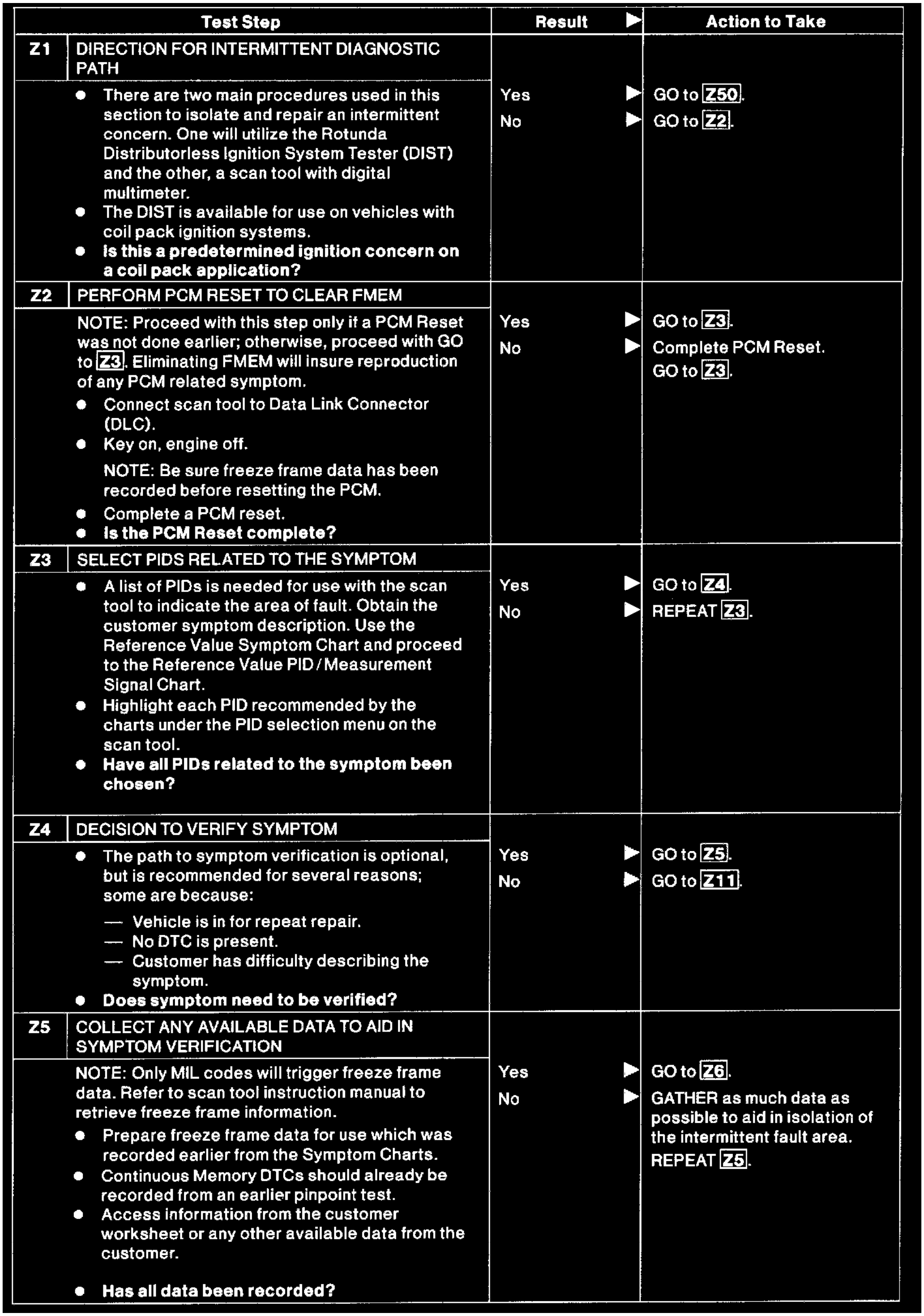
Intermittent Test Chart



| PID | Associated Circuit | Test Type |
|---|---|---|
| FUELPW2 | INJ-9 | output |
| FUELPW2 | INJ-10 | output |
| KS1, KS2 | KS | input |
| LFC | LFC | output |
| Use digital multimeter | LFP | output |
| MAF, MAF V | MAF | input |
| MIL | MIL | output |
| OCTADJ | OCT ADJ | input |
| OSS | OSS | input |
| CPP / PNP | PNP | input |
| PSP, PSP V | PSP | input |
| PTO | PTO | input |
| Use digital multimeter | SIL | output |
| SS1 | SS1 | output |
| SS2 | SS2 | output |
| SS3 | SS3 | output |
| TCC | TCC | output |
| TCIL | TCIL | output |
| TCS | TCS | input |
| TFT, TFT V | TFT | input |
| TP, TP V | TP | input |
| TPB, TPB V | TPB | input |
| TR, TR V | TR | input |
| CAMDCR, RCAM | VCT | output |
| VPWR | VPWR | input |
| Use digital multimeter | VREF | output |
| VSS | VSS+ | input |
| WAC | WAC | output |

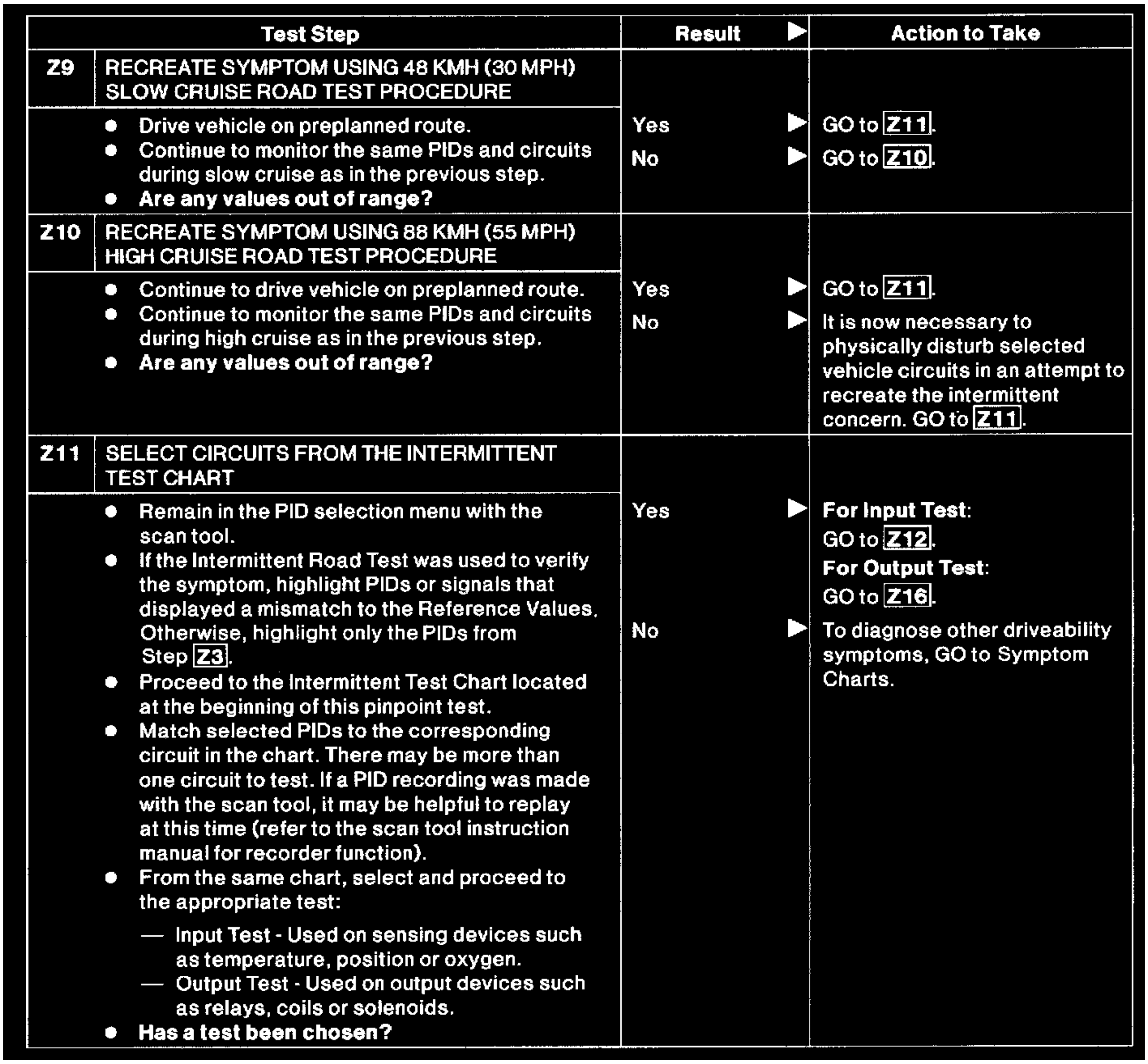
Intermittent Test Chart

This chart is used to determine which test to run for the suspect circuit. Corresponding PIDs to each circuit are listed. Some circuits do not have an associated PID and will be measured with a digital multimeter. If the vehicle is a coil pack system with no start, perform the ignition test with the distributorless ignition system tester.



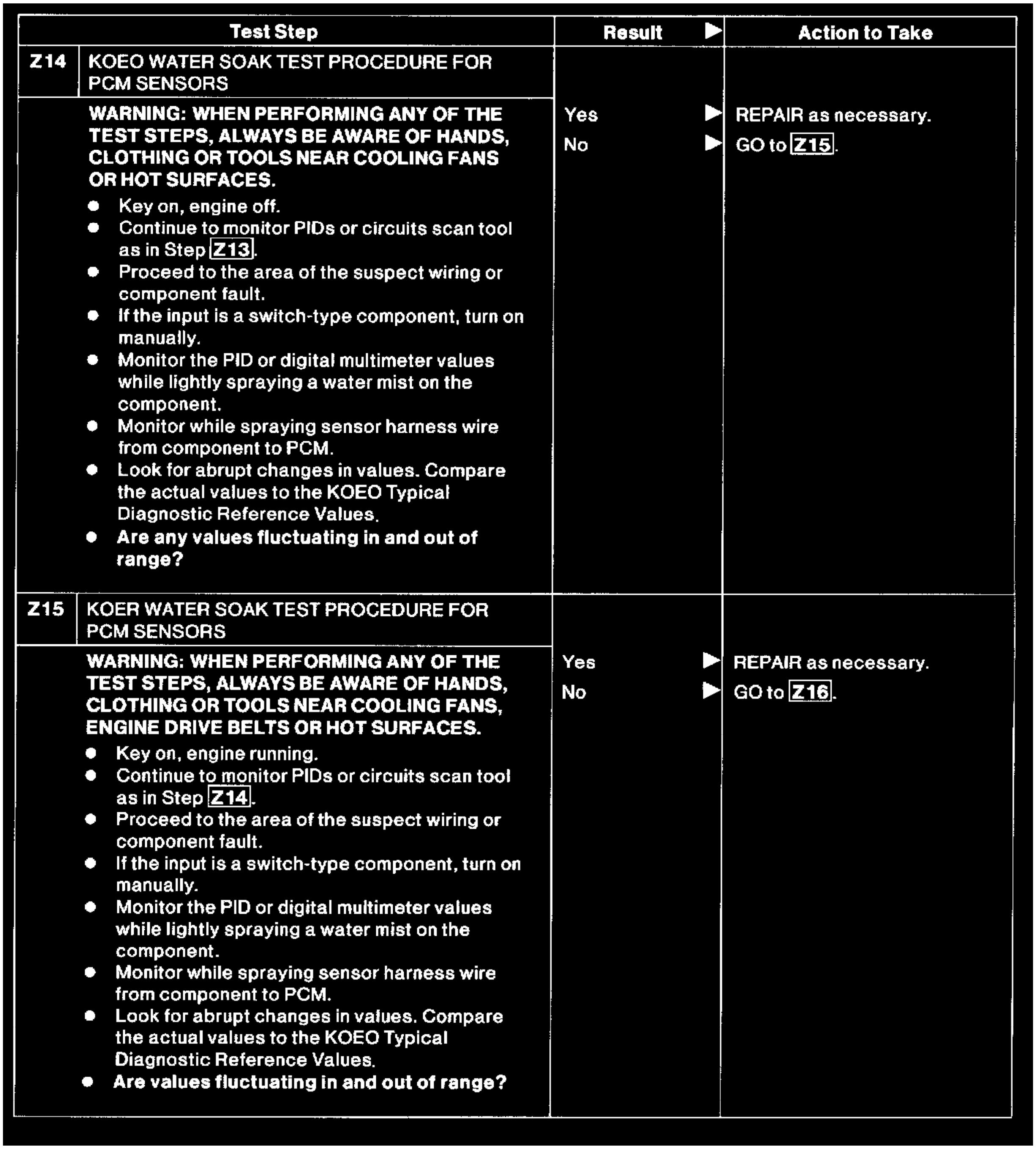
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z1** | DIRECTION FOR INTERMITTENT DIAGNOSTIC PATH | | |
| | ● There are two main procedures used in this section to isolate and repair an intermittent concern. One will utilize the Rotunda Distributorless Ignition System Tester (DIST) and the other, a scan tool with digital multimeter.<br>● The DIST is available for use on vehicles with coil pack ignition systems.<br>● **Is this a predetermined ignition concern on a coil pack application?** | Yes ▶<br>No ▶ | GO to Z50.<br>GO to Z2. |
| **Z2** | PERFORM PCM RESET TO CLEAR FMEM | | |
| | NOTE: Proceed with this step only if a PCM Reset was not done earlier; otherwise, proceed with GO to Z3. Eliminating FMEM will insure reproduction of any PCM related symptom.<br>● Connect scan tool to Data Link Connector (DLC).<br>● Key on, engine off.<br>NOTE: Be sure freeze frame data has been recorded before resetting the PCM.<br>● Complete a PCM reset.<br>● **Is the PCM Reset complete?** | Yes ▶<br>No ▶ | GO to Z3.<br>Complete PCM Reset. GO to Z3. |
| **Z3** | SELECT PIDS RELATED TO THE SYMPTOM | | |
| | ● A list of PIDs is needed for use with the scan tool to indicate the area of fault. Obtain the customer symptom description. Use the Reference Value Symptom Chart and proceed to the Reference Value PID / Measurement Signal Chart.<br>● Highlight each PID recommended by the charts under the PID selection menu on the scan tool.<br>● **Have all PIDs related to the symptom been chosen?** | Yes ▶<br>No ▶ | GO to Z4.<br>REPEAT Z3. |
| **Z4** | DECISION TO VERIFY SYMPTOM | | |
| | ● The path to symptom verification is optional, but is recommended for several reasons; some are because:<br>— Vehicle is in for repeat repair.<br>— No DTC is present.<br>— Customer has difficulty describing the symptom.<br>● **Does symptom need to be verified?** | Yes ▶<br>No ▶ | GO to Z5.<br>GO to Z11. |
| **Z5** | COLLECT ANY AVAILABLE DATA TO AID IN SYMPTOM VERIFICATION | | |
| | NOTE: Only MIL codes will trigger freeze frame data. Refer to scan tool instruction manual to retrieve freeze frame information.<br>● Prepare freeze frame data for use which was recorded earlier from the Symptom Charts.<br>● Continuous Memory DTCs should already be recorded from an earlier pinpoint test.<br>● Access information from the customer worksheet or any other available data from the customer.<br>● **Has all data been recorded?** | Yes ▶<br>No ▶ | GO to Z6.<br>GATHER as much data as possible to aid in isolation of the intermittent fault area. REPEAT Z5. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z6 | RECREATE SYMPTOM USING ALL DATA | | |
| | NOTE: Vehicle may require some driving to proceed with this test step. The concern must be verified by recreating the conditions that originally set the DTC.<br>● With the scan tool, select and monitor the same PIDs as displayed in freeze frame along with the previous highlighted PIDs from Step Z3. Using freeze frame data recorded earlier, recreate the conditions described by each freeze frame PID. Pay special attention to ECT, LOAD, RPM and VSS. Also, use any available customer data to aid in producing the correct conditions for recreating the symptom.<br>● When the symptom occurs, press trigger to begin recording (Refer to the scan tool instruction manual for recorder function).<br>● **Could symptom be reproduced?** | Yes ▶<br>No ▶ | GO to Z11.<br>GO to Z7. |
| Z7 | RECREATE SYMPTOM USING KOEO ROAD TEST PROCEDURE | | |
| | ● The road test is the last attempt to locate the area of concern before physically disturbing vehicle circuits.<br>NOTE: PIDs for outputs in the Reference Value Charts represent commanded values only. Circuit measurements with digital multimeter indicate actual output status. Therefore, in the case of a fault, the PID and circuit reading on the vehicle may not correspond with each other. PIDs for PCM inputs with a mismatch to the circuit measurement indicate a possible PCM concern.<br>● The Intermittent Road Test Procedure is a set of instructions for monitoring PIDs with a scan tool of circuit measurements with a digital multimeter. This is done under four different conditions - KOEO, HOT IDLE, 48 and 88 kmh (30 and 55 mph). Use the Typical Diagnostic Reference Values from Reference Values to compare with the actual vehicle values. For 48 and 88 kmh (30 and 55 mph) procedures, a planned route with passenger is required.<br>● Locate the corresponding Reference Value chart.<br>● Set vehicle up to measure circuits with a digital multimeter and scan tool.<br>● Connect scan tool to DLC.<br>● Key on, engine off.<br>● With the scan tool, select and monitor PIDs and also measure circuits shown in the Reference Value Chart.<br>● Compare the scan tool PIDs and digital multimeter values to the Reference Value Charts.<br>● **Are any values out of range?** | Yes ▶<br>No ▶ | GO to Z11.<br>GO to Z8. |
| Z8 | RECREATE SYMPTOM USING HOT IDLE ROAD TEST PROCEDURE | | |
| | ● Key on, engine running and at least 87°C (195°F).<br>● Continue to monitor the same PIDs and circuits as in the previous step at hot idle.<br>● **Are any values out of range?** | Yes ▶<br>No ▶ | GO to Z11.<br>GO to Z9. |



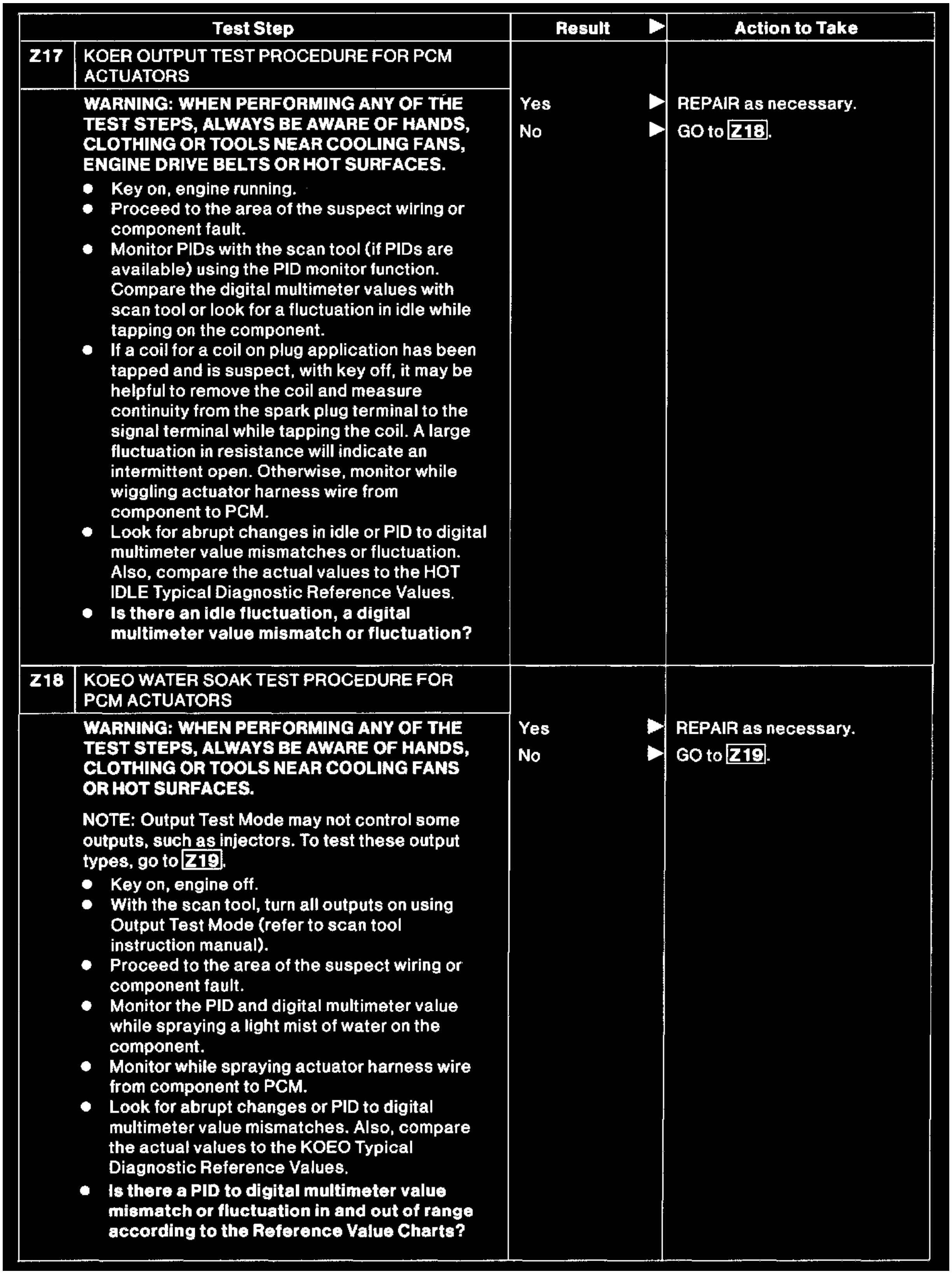
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z9** | RECREATE SYMPTOM USING 48 KMH (30 MPH) SLOW CRUISE ROAD TEST PROCEDURE | | |
| | • Drive vehicle on preplanned route.<br>• Continue to monitor the same PIDs and circuits during slow cruise as in the previous step.<br>• **Are any values out of range?** | Yes ▶ | GO to Z11. |
| | | No ▶ | GO to Z10. |
| **Z10** | RECREATE SYMPTOM USING 88 KMH (55 MPH) HIGH CRUISE ROAD TEST PROCEDURE | | |
| | • Continue to drive vehicle on preplanned route.<br>• Continue to monitor the same PIDs and circuits during high cruise as in the previous step.<br>• **Are any values out of range?** | Yes ▶ | GO to Z11. |
| | | No ▶ | It is now necessary to physically disturb selected vehicle circuits in an attempt to recreate the intermittent concern. GO to Z11. |
| **Z11** | SELECT CIRCUITS FROM THE INTERMITTENT TEST CHART | | |
| | • Remain in the PID selection menu with the scan tool.<br>• If the Intermittent Road Test was used to verify the symptom, highlight PIDs or signals that displayed a mismatch to the Reference Values. Otherwise, highlight only the PIDs from Step Z3.<br>• Proceed to the Intermittent Test Chart located at the beginning of this pinpoint test.<br>• Match selected PIDs to the corresponding circuit in the chart. There may be more than one circuit to test. If a PID recording was made with the scan tool, it may be helpful to replay at this time (refer to the scan tool instruction manual for recorder function).<br>• From the same chart, select and proceed to the appropriate test:<br>— Input Test - Used on sensing devices such as temperature, position or oxygen.<br>— Output Test - Used on output devices such as relays, coils or solenoids.<br>• **Has a test been chosen?** | Yes ▶ | **For Input Test**:<br>GO to Z12.<br>**For Output Test**:<br>GO to Z16. |
| | | No ▶ | To diagnose other driveability symptoms, GO to Symptom Charts. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z12 | KOEO INPUT TEST PROCEDURE FOR PCM SENSORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, OR HOT SURFACES.**<br>● Using circuits chosen from the Intermittent Test Chart, select only the recommended PID(s) to monitor with the scan tool. If a PID is not available for the circuit, use a digital multimeter.<br>● Proceed to the area of the suspect wiring or component fault.<br>● Key on, engine off.<br>● If the input is a switch-type component, turn on manually.<br>● Monitor the PID or digital multimeter values while tapping on component.<br>● Monitor while wiggling sensor harness wire from component to PCM.<br>● Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values.<br>● **Are values fluctuating in and out of range?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z13. |
| Z13 | KOER INPUT TEST PROCEDURE FOR PCM SENSORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES.**<br>● Key on, engine running.<br>● Continue to monitor PIDs or circuits as in Step Z12.<br>● Proceed to the area of the suspect wiring or component fault.<br>● If the input is a switch-type component, turn on manually.<br>● Monitor the PID or digital multimeter values while tapping on component.<br>● Monitor while wiggling sensor harness wire from component to PCM.<br>● Look for abrupt changes in values. Compare the actual values to the HOT IDLE Typical Diagnostic Reference Values.<br>● **Are any values fluctuating in and out of range?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z14. |

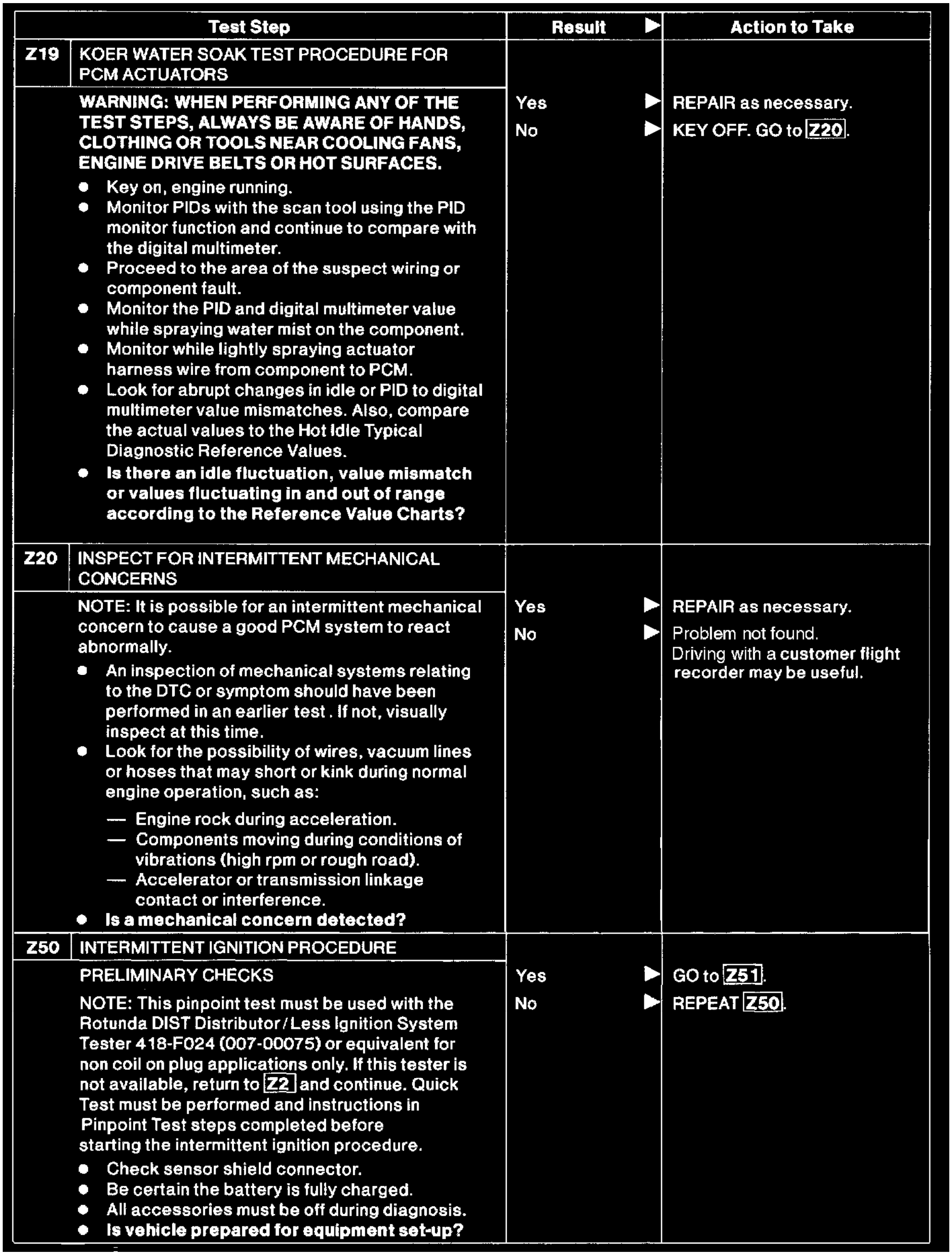


| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z14** | KOEO WATER SOAK TEST PROCEDURE FOR PCM SENSORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES.**<br>● Key on, engine off.<br>● Continue to monitor PIDs or circuits scan tool as in Step Z13.<br>● Proceed to the area of the suspect wiring or component fault.<br>● If the input is a switch-type component, turn on manually.<br>● Monitor the PID or digital multimeter values while lightly spraying a water mist on the component.<br>● Monitor while spraying sensor harness wire from component to PCM.<br>● Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values.<br>● **Are any values fluctuating in and out of range?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z15. |
| **Z15** | KOER WATER SOAK TEST PROCEDURE FOR PCM SENSORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES.**<br>● Key on, engine running.<br>● Continue to monitor PIDs or circuits scan tool as in Step Z14.<br>● Proceed to the area of the suspect wiring or component fault.<br>● If the input is a switch-type component, turn on manually.<br>● Monitor the PID or digital multimeter values while lightly spraying a water mist on the component.<br>● Monitor while spraying sensor harness wire from component to PCM.<br>● Look for abrupt changes in values. Compare the actual values to the KOEO Typical Diagnostic Reference Values.<br>● **Are values fluctuating in and out of range?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z16. |

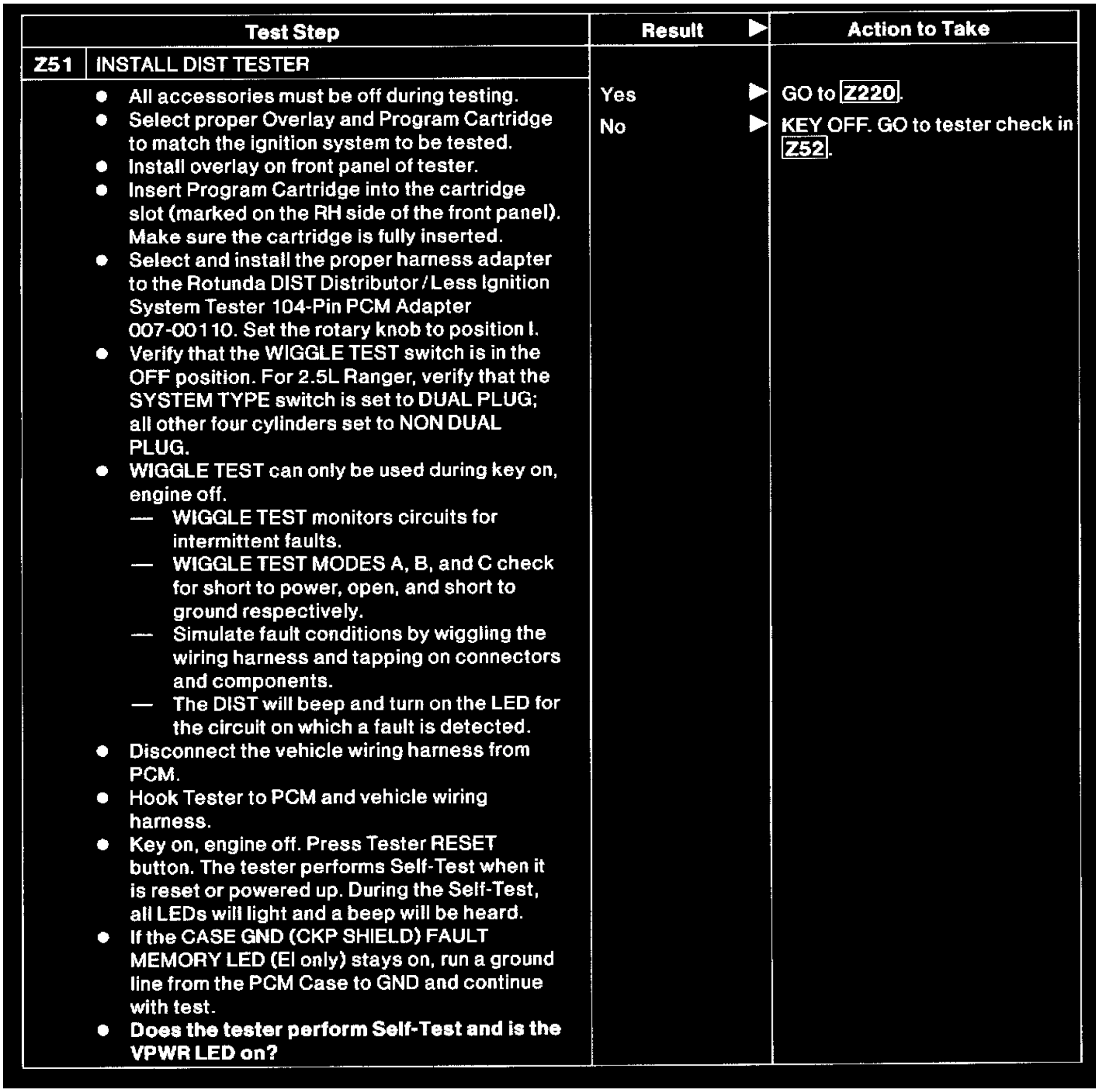
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z16** | KOEO OUTPUT TEST PROCEDURE FOR PCM ACTUATORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES.**<br>NOTE: PIDs selected from the Intermittent Test Chart will display commanded values only. Digital multimeter measurements will display actual values.<br>● Using circuits chosen from the Intermittent Test Chart, select the recommended PID(s) to monitor using the scan tool. Also, use a digital multimeter to compare circuit values with the scan tool PID values. If PIDs are not available for a particular circuit, look for a digital multimeter fluctuation to occur when doing any of the following tests.<br>NOTE: Output Test Mode may not control some outputs, such as injectors and ignition coils. To test these output types, go to Z17. Caution must be used for the next steps. Cooling fans or fuel pump may turn on.<br>● Key on, engine off.<br>● With the scan tool, turn all outputs on using Output Test Mode (refer to scan tool instruction manual).<br>● Proceed to the area of the suspect wiring or component fault.<br>● Monitor the PID and digital multimeter values while tapping on component.<br>● Monitor while wiggling actuator harness wire from component to PCM.<br>● Look for abrupt changes or PID to digital multimeter value mismatches. Also, compare the actual values to the KOEO Typical Diagnostic Reference Values.<br>● **Is there a mismatch or are any values fluctuating in and out of range on the Reference Value Charts?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z17. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z17** | KOER OUTPUT TEST PROCEDURE FOR PCM ACTUATORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES.**<br>● Key on, engine running.<br>● Proceed to the area of the suspect wiring or component fault.<br>● Monitor PIDs with the scan tool (if PIDs are available) using the PID monitor function. Compare the digital multimeter values with scan tool or look for a fluctuation in idle while tapping on the component.<br>● If a coil for a coil on plug application has been tapped and is suspect, with key off, it may be helpful to remove the coil and measure continuity from the spark plug terminal to the signal terminal while tapping the coil. A large fluctuation in resistance will indicate an intermittent open. Otherwise, monitor while wiggling actuator harness wire from component to PCM.<br>● Look for abrupt changes in idle or PID to digital multimeter value mismatches or fluctuation. Also, compare the actual values to the HOT IDLE Typical Diagnostic Reference Values.<br>● **Is there an idle fluctuation, a digital multimeter value mismatch or fluctuation?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z18. |
| **Z18** | KOEO WATER SOAK TEST PROCEDURE FOR PCM ACTUATORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS OR HOT SURFACES.**<br>NOTE: Output Test Mode may not control some outputs, such as injectors. To test these output types, go to Z19.<br>● Key on, engine off.<br>● With the scan tool, turn all outputs on using Output Test Mode (refer to scan tool instruction manual).<br>● Proceed to the area of the suspect wiring or component fault.<br>● Monitor the PID and digital multimeter value while spraying a light mist of water on the component.<br>● Monitor while spraying actuator harness wire from component to PCM.<br>● Look for abrupt changes or PID to digital multimeter value mismatches. Also, compare the actual values to the KOEO Typical Diagnostic Reference Values.<br>● **Is there a PID to digital multimeter value mismatch or fluctuation in and out of range according to the Reference Value Charts?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>GO to Z19. |



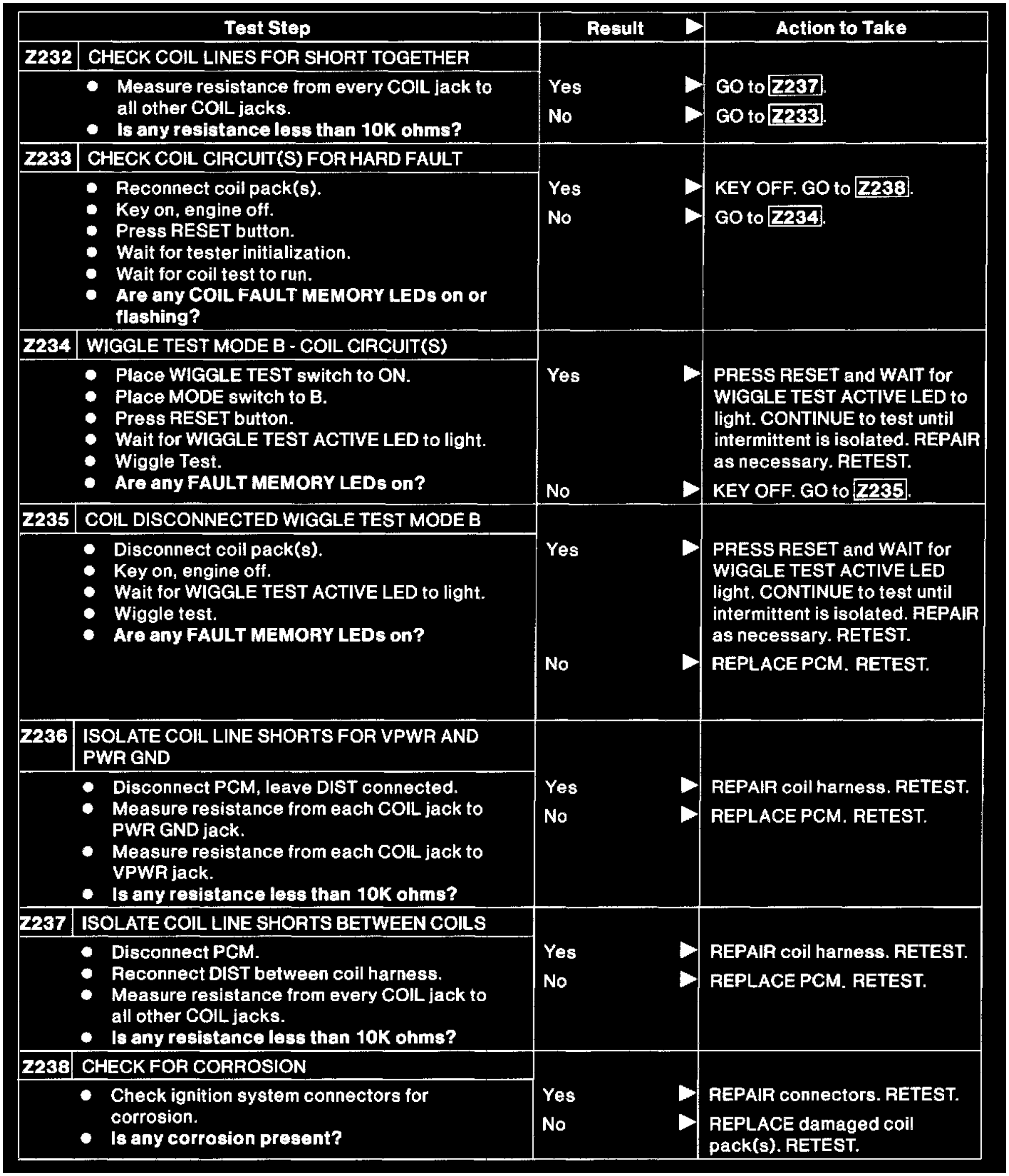
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z19 | KOER WATER SOAK TEST PROCEDURE FOR PCM ACTUATORS | | |
| | **WARNING: WHEN PERFORMING ANY OF THE TEST STEPS, ALWAYS BE AWARE OF HANDS, CLOTHING OR TOOLS NEAR COOLING FANS, ENGINE DRIVE BELTS OR HOT SURFACES.**<br>● Key on, engine running.<br>● Monitor PIDs with the scan tool using the PID monitor function and continue to compare with the digital multimeter.<br>● Proceed to the area of the suspect wiring or component fault.<br>● Monitor the PID and digital multimeter value while spraying water mist on the component.<br>● Monitor while lightly spraying actuator harness wire from component to PCM.<br>● Look for abrupt changes in idle or PID to digital multimeter value mismatches. Also, compare the actual values to the Hot Idle Typical Diagnostic Reference Values.<br>● **Is there an idle fluctuation, value mismatch or values fluctuating in and out of range according to the Reference Value Charts?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>KEY OFF. GO to Z20. |
| Z20 | INSPECT FOR INTERMITTENT MECHANICAL CONCERNS | | |
| | NOTE: It is possible for an intermittent mechanical concern to cause a good PCM system to react abnormally.<br>● An inspection of mechanical systems relating to the DTC or symptom should have been performed in an earlier test. If not, visually inspect at this time.<br>● Look for the possibility of wires, vacuum lines or hoses that may short or kink during normal engine operation, such as:<br>— Engine rock during acceleration.<br>— Components moving during conditions of vibrations (high rpm or rough road).<br>— Accelerator or transmission linkage contact or interference.<br>● **Is a mechanical concern detected?** | Yes ▶<br>No ▶ | REPAIR as necessary.<br>Problem not found. Driving with a customer flight recorder may be useful. |
| Z50 | INTERMITTENT IGNITION PROCEDURE | | |
| | PRELIMINARY CHECKS<br>NOTE: This pinpoint test must be used with the Rotunda DIST Distributor/Less Ignition System Tester 418-F024 (007-00075) or equivalent for non coil on plug applications only. If this tester is not available, return to Z2 and continue. Quick Test must be performed and instructions in Pinpoint Test steps completed before starting the intermittent ignition procedure.<br>● Check sensor shield connector.<br>● Be certain the battery is fully charged.<br>● All accessories must be off during diagnosis.<br>● **Is vehicle prepared for equipment set-up?** | Yes ▶<br>No ▶ | GO to Z51.<br>REPEAT Z50. |



| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z51 | INSTALL DIST TESTER | | |
| | ● All accessories must be off during testing.<br>● Select proper Overlay and Program Cartridge to match the ignition system to be tested.<br>● Install overlay on front panel of tester.<br>● Insert Program Cartridge into the cartridge slot (marked on the RH side of the front panel). Make sure the cartridge is fully inserted.<br>● Select and install the proper harness adapter to the Rotunda DIST Distributor/Less Ignition System Tester 104-Pin PCM Adapter 007-00110. Set the rotary knob to position I.<br>● Verify that the WIGGLE TEST switch is in the OFF position. For 2.5L Ranger, verify that the SYSTEM TYPE switch is set to DUAL PLUG; all other four cylinders set to NON DUAL PLUG.<br>● WIGGLE TEST can only be used during key on, engine off.<br>— WIGGLE TEST monitors circuits for intermittent faults.<br>— WIGGLE TEST MODES A, B, and C check for short to power, open, and short to ground respectively.<br>— Simulate fault conditions by wiggling the wiring harness and tapping on connectors and components.<br>— The DIST will beep and turn on the LED for the circuit on which a fault is detected.<br>● Disconnect the vehicle wiring harness from PCM.<br>● Hook Tester to PCM and vehicle wiring harness.<br>● Key on, engine off. Press Tester RESET button. The tester performs Self-Test when it is reset or powered up. During the Self-Test, all LEDs will light and a beep will be heard.<br>● If the CASE GND (CKP SHIELD) FAULT MEMORY LED (EI only) stays on, run a ground line from the PCM Case to GND and continue with test.<br>● **Does the tester perform Self-Test and is the VPWR LED on?** | Yes ▶<br>No ▶ | GO to Z220.<br>KEY OFF. GO to tester check in Z52. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z52 | TESTER CHECK | | |
| | ● Disconnect tester from vehicle.<br>● Connect a jumper wire from VPWR jack to vehicle battery POS (+) terminal.<br>● Connect a jumper wire from PWR GND jack to vehicle battery NEG (-) terminal.<br>● If tester performs Self-Test, reconnect tester to vehicle and Go to Z190.<br>● If tester does not perform Self-Test, refer to tester manual.<br>● If LEDs do not light or beep is not heard during Self-Test, refer to tester manual.<br>● **Does tester pass Self-Test?** | Yes ▶<br>No ▶ | GO to Z220.<br>DIST tester does not pass Self-Test. REFER to Warranty supplied with DIST tester. |
| Z190 | CHECK VPWR CIRCUIT FOR OPEN | | |
| | ● Key on, engine off.<br>● Measure the voltage from VPWR jack to the battery GND(-) terminal.<br>● **Is the reading greater than 6 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z191.<br>KEY OFF. REPAIR open in VPWR circuit harness to PCM. RETURN to Z51. |
| Z191 | CHECK PWR GND CIRCUIT FOR OPEN BETWEEN PCM AND B- | | |
| | ● Measure the resistance between PWR GND jack and B-.<br>● **Is resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to Z192.<br>REPAIR open circuit. RETURN to Z51. |
| Z192 | WIGGLE TEST MODE B - POWER CIRCUIT | | |
| | ● Connect a jumper wire from PWR GND jack to the battery GND(-) terminal.<br>● Key on, engine off.<br>● WIGGLE TEST switch ON.<br>● Place MODE switch to B.<br>● Wiggle Test.<br>● **Does the tester reset?** | Yes ▶<br>No ▶ | KEY OFF. REPAIR open in VPWR circuit harness to PCM. RETURN to Z51.<br>KEY OFF. REPAIR open in PWR GND circuit harness to PCM. RETURN to Z51. |
| Z220 | CHECK FOR COIL FAULTS | | |
| | ● Press RESET button and wait for tester to initialize.<br>● **Are any COIL FAULT MEMORY LEDs on or flashing?** | Yes ▶<br>No ▶ | GO to Z229.<br>GO to Z221. |
| Z221 | CHECK CASE GND / CKP SHIELD | | |
| | ● **Is the CASE GND / CKP SHD FAULT MEMORY LED on or flashing?** | Yes ▶<br>No ▶ | GO to Z253.<br>GO to Z222. |
| Z222 | CKP BIAS CHECK | | |
| | ● **Is the CKP BIAS SYSTEM STATUS LED on?** | Yes ▶<br>No ▶ | GO to Z223.<br>KEY OFF. GO to Z243. |

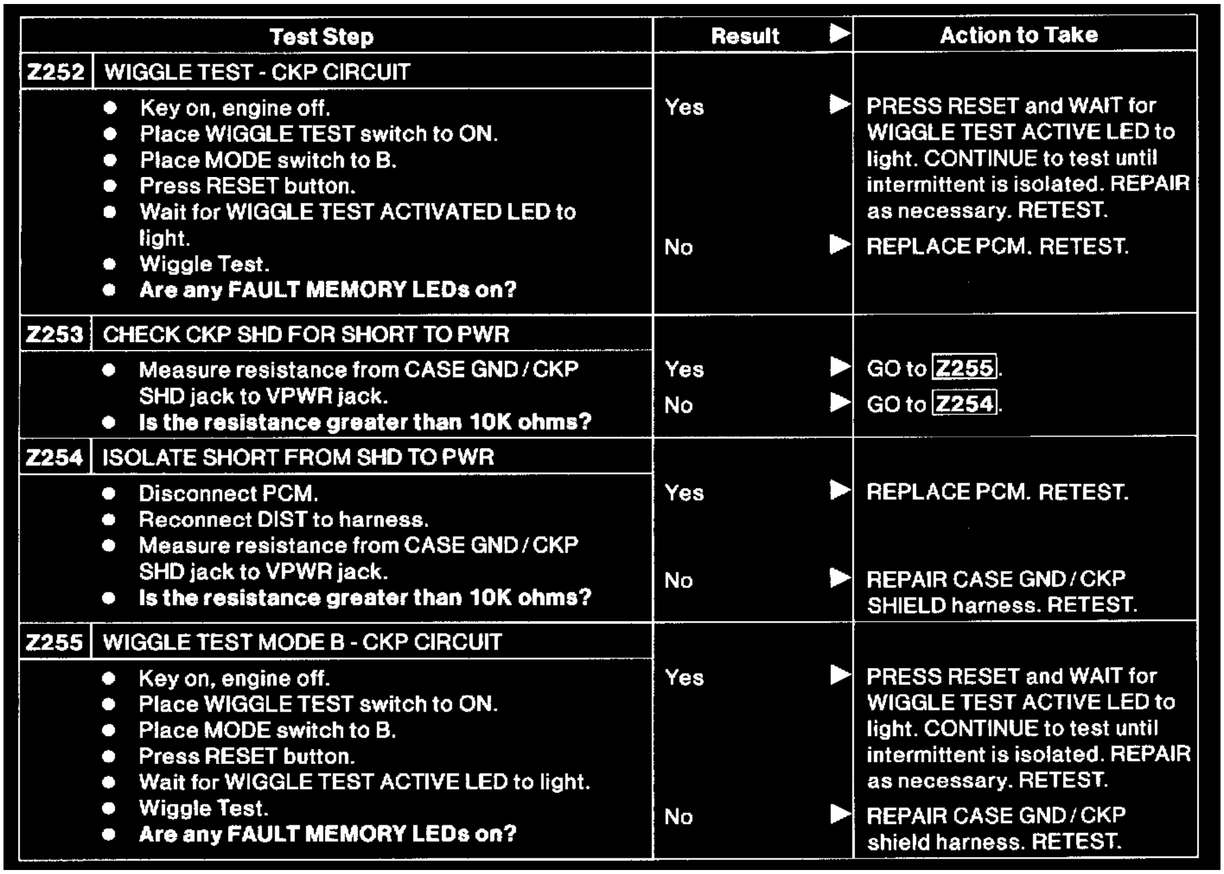
| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| Z223 | CHECK FOR COIL FAULT | | |
| | - With the DIST connected to the vehicle, try to recreate the fault by test driving the vehicle. If the vehicle is a No Start, crank engine for 5 to 10 seconds.<br>- **Are any COIL FAULT MEMORY LEDs on during crank or engine run?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z229.<br>GO to Z224. |
| Z224 | CASE GND / CKP SHIELD FAULT | | |
| | - Key on, engine running or key on, engine cranking as described in Z223.<br>- **Is the CASE GND / CKP SHIELD FAULT MEMORY LED on during crank or engine run?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z253.<br>GO to Z225. |
| Z225 | CHECK CKP STATUS | | |
| | - Key on, engine running or key on, engine cranking as described in Z223.<br>- **Is the CKP SYSTEM STATUS SIGNAL LED on during crank or engine run?** | Yes ▶<br>No ▶ | GO to Z226.<br>GO to Z247. |
| Z226 | CHECK FOR CTO FAULT | | |
| | - Key on, engine running or key on, engine cranking as described in Z223.<br>- **Is the CTO FAULT MEMORY LED on during crank or engine run?** | Yes ▶<br>No ▶ | KEY OFF. GO to to Z239.<br>GO to Z227. |
| Z227 | CHECK FOR CKP SIGNAL | | |
| | - Key on, engine running or key on, engine cranking as described in Z223.<br>- **Is the CKP SIGNAL SYSTEM STATUS LED on during crank or engine run?** | Yes ▶<br>No ▶ | Fault is not related to ignition system. RETURN to Z1.<br>KEY OFF. GO to Z247. |
| Z229 | CHECK COIL IGN START / RUN CIRCUIT FOR OPEN | | |
| | - Disconnect coil pack(s).<br>- Key on, engine off.<br>- Measure voltage from IGN Start / Run at coil pack connector(s) to PWR GND jack.<br>- **Is the voltage greater than 10.5 volts?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z230.<br>SERVICE VPWR harness(es) to coil pack(s). RETEST. |
| Z230 | CHECK COIL DRIVER CIRCUITS FOR SHORT TO VPWR AND PWR GND | | |
| | - Measure resistance from COIL jacks to PWR GND jack.<br>- Measure resistance from COIL jacks to VWPR jack.<br>- **Is any resistance less than 6K ohms?** | Yes ▶<br>No ▶ | GO to Z236.<br>GO to Z231. |
| Z231 | CHECK COIL CIRCUIT FOR OPEN IN HARNESS | | |
| | - Measure resistance from each COIL jack to its pin in the coil harness connector.<br>- **Is each resistance less than 5 ohms?** | Yes ▶<br>No ▶ | GO to Z232.<br>REPAIR coil harness. RETEST. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **Z232** CHECK COIL LINES FOR SHORT TOGETHER | | |
| • Measure resistance from every COIL jack to all other COIL jacks.<br>• **Is any resistance less than 10K ohms?** | Yes ▶<br>No ▶ | GO to Z237.<br>GO to Z233. |
| **Z233** CHECK COIL CIRCUIT(S) FOR HARD FAULT | | |
| • Reconnect coil pack(s).<br>• Key on, engine off.<br>• Press RESET button.<br>• Wait for tester initialization.<br>• Wait for coil test to run.<br>• **Are any COIL FAULT MEMORY LEDs on or flashing?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z238.<br>GO to Z234. |
| **Z234** WIGGLE TEST MODE B - COIL CIRCUIT(S) | | |
| • Place WIGGLE TEST switch to ON.<br>• Place MODE switch to B.<br>• Press RESET button.<br>• Wait for WIGGLE TEST ACTIVE LED to light.<br>• Wiggle Test.<br>• **Are any FAULT MEMORY LEDs on?** | Yes ▶<br>No ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST.<br>KEY OFF. GO to Z235. |
| **Z235** COIL DISCONNECTED WIGGLE TEST MODE B | | |
| • Disconnect coil pack(s).<br>• Key on, engine off.<br>• Wait for WIGGLE TEST ACTIVE LED to light.<br>• Wiggle test.<br>• **Are any FAULT MEMORY LEDs on?** | Yes ▶<br>No ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST.<br>REPLACE PCM. RETEST. |
| **Z236** ISOLATE COIL LINE SHORTS FOR VPWR AND PWR GND | | |
| • Disconnect PCM, leave DIST connected.<br>• Measure resistance from each COIL jack to PWR GND jack.<br>• Measure resistance from each COIL jack to VPWR jack.<br>• **Is any resistance less than 10K ohms?** | Yes ▶<br>No ▶ | REPAIR coil harness. RETEST.<br>REPLACE PCM. RETEST. |
| **Z237** ISOLATE COIL LINE SHORTS BETWEEN COILS | | |
| • Disconnect PCM.<br>• Reconnect DIST between coil harness.<br>• Measure resistance from every COIL jack to all other COIL jacks.<br>• **Is any resistance less than 10K ohms?** | Yes ▶<br>No ▶ | REPAIR coil harness. RETEST.<br>REPLACE PCM. RETEST. |
| **Z238** CHECK FOR CORROSION | | |
| • Check ignition system connectors for corrosion.<br>• **Is any corrosion present?** | Yes ▶<br>No ▶ | REPAIR connectors. RETEST.<br>REPLACE damaged coil pack(s). RETEST. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z239** | CHECK CTO CIRCUIT FOR SHORTS TO VPWR AND PWR GND | | |
| | ● Measure resistance from CTO to VPWR jack.<br>● Measure resistance from CTO to PWR GND jack.<br>● **Is any resistance less than 1K ohm?** | Yes ▶<br>No ▶ | GO to Z240.<br>GO to Z241. |
| **Z240** | ISOLATE CTO SHORTS | | |
| | ● Disconnect PCM.<br>● Reconnect DIST to harness.<br>● Measure resistance from CTO to VPWR jack.<br>● Measure resistance from CTO to PWR GND jack.<br>● **Is any resistance less than 1K ohm?** | Yes ▶<br>No ▶ | REPAIR CTO harness/tachometer. RETEST.<br>REPLACE PCM. RETEST. |
| **Z241** | WIGGLE TEST MODE B - CTO CIRCUIT | | |
| | ● Key on, engine off.<br>● Place WIGGLE TEST switch to ON.<br>● Place MODE switch to B.<br>● Press RESET button.<br>● Wait for WIGGLE TEST ACTIVE LED to light.<br>● Wiggle test.<br>● **Are any FAULT MEMORY LEDs on?** | Yes ▶<br>No ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST.<br>GO to Z242. |
| **Z242** | WIGGLE TEST - CHECK FOR FAULT | | |
| | ● 6 or 4 cylinder: Set MODE switch to A.<br>● 8 cylinder: Set MODE switch to C.<br>● Press RESET button.<br>● Wait for WIGGLE TEST ACTIVE LED to light.<br>● Wiggle Test.<br>● **Are any FAULT MEMORY LEDs on?** | Yes ▶<br>No ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST.<br>REPLACE PCM. RETEST. |
| **Z243** | CHECK CKP BIAS | | |
| | ● Disconnect harness from CKP sensor.<br>● Key on, engine off.<br>● Press RESET button and wait for tester to initialize.<br>● **Is the CKP BIAS SYSTEM STATUS LED on?** | Yes ▶<br>No ▶ | KEY OFF. GO to Z245.<br>KEY OFF. GO to Z244. |
| **Z244** | ISOLATE SHORT TO VPWR AND PWR GND FOR CKP+ CIRCUIT | | |
| | ● Disconnect PCM.<br>● Reconnect DIST to harness.<br>● Measure resistance from CKP+ jack to VPWR jack.<br>● Measure resistance from CKP+ jack to PWR GND jack.<br>● **Are both resistances greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. RETEST.<br>REPAIR CKP harness. RETEST. |

| Test Step | | Result ▶ | Action to Take |
|---|---|---|---|
| **Z245** | CHECK CKP- CIRCUIT FOR SHORTS TO VPWR AND PWR GND | | |
| | ● Measure resistance from CKP- jack to PWR GND jack.<br>● Measure resistance from CKP- jack to VPWR jack.<br>● **Are both resistances greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE CKP sensor. RETEST.<br>GO to Z246. |
| **Z246** | ISOLATE SHORTS TO VPWR AND PWR GND FOR CKP- CIRCUIT | | |
| | ● Disconnect PCM.<br>● Reconnect DIST to harness.<br>● Measure resistance from CKP- jack to PWR GND jack.<br>● Measure resistance from CKP- jack to VPWR jack.<br>● **Are both resistances greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. RETEST.<br>REPAIR CKP harness. RETEST. |
| **Z247** | CHECK FOR CKP SIGNAL | | |
| | ● Press RESET button and wait for tester to initialize.<br>● Crank or start engine.<br>● **Is the CKP SIGNAL SYSTEM STATUS LED on during crank or engine run?** | Yes ▶<br>No ▶ | GO to Z252.<br>KEY OFF. GO to Z248. |
| **Z248** | CHECK FOR CKP CIRCUIT RESISTANCE | | |
| | ● Disconnect CKP sensor.<br>● Measure resistance from CKP+ jack to CKP+ pin in harness sensor connector.<br>● Measure resistance from CKP- jack to CKP- pin in harness sensor connector.<br>● **Are both resistances less than 5 ohms?** | Yes ▶<br>No ▶ | GO to Z249.<br>REPAIR CKP harness. RETEST. |
| **Z249** | CHECK FOR CKP+ SHORT | | |
| | ● Measure resistance from CKP+ jack to CKP- jack, PWR GND jack and VPWR jack.<br>● **Are all resistances greater than 10K ohms?** | Yes ▶<br>No ▶ | GO to Z251.<br>GO to Z250. |
| **Z250** | ISOLATE SHORT FOR CKP+ | | |
| | ● Disconnect PCM.<br>● Reconnect DIST to harness.<br>● Measure resistance from CKP+ jack to CKP- jack, PWR GND jack and VPWR jack.<br>● **Are all resistances greater than 10K ohms?** | Yes ▶<br>No ▶ | REPLACE PCM. RETEST.<br>REPAIR harness as needed. RETEST. |
| **Z251** | CHECK FOR PHYSICAL DAMAGE | | |
| | ● Inspect CKP sensor and pulse wheel for misalignment, incorrect air gap and physical damage.<br>● **Are the sensor and data wheel OK?** | Yes ▶<br>No ▶ | REPLACE CKP sensor. RETEST.<br>REPAIR as needed. RETEST. |



| Test Step | Result ▶ | Action to Take |
|---|---|---|
| **Z252** WIGGLE TEST - CKP CIRCUIT | | |
| ● Key on, engine off.<br>● Place WIGGLE TEST switch to ON.<br>● Place MODE switch to B.<br>● Press RESET button.<br>● Wait for WIGGLE TEST ACTIVATED LED to light.<br>● Wiggle Test.<br>● **Are any FAULT MEMORY LEDs on?** | Yes ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. |
| | No ▶ | REPLACE PCM. RETEST. |
| **Z253** CHECK CKP SHD FOR SHORT TO PWR | | |
| ● Measure resistance from CASE GND / CKP SHD jack to VPWR jack.<br>● **Is the resistance greater than 10K ohms?** | Yes ▶ | GO to Z255. |
| | No ▶ | GO to Z254. |
| **Z254** ISOLATE SHORT FROM SHD TO PWR | | |
| ● Disconnect PCM.<br>● Reconnect DIST to harness.<br>● Measure resistance from CASE GND / CKP SHD jack to VPWR jack.<br>● **Is the resistance greater than 10K ohms?** | Yes ▶ | REPLACE PCM. RETEST. |
| | No ▶ | REPAIR CASE GND / CKP SHIELD harness. RETEST. |
| **Z255** WIGGLE TEST MODE B - CKP CIRCUIT | | |
| ● Key on, engine off.<br>● Place WIGGLE TEST switch to ON.<br>● Place MODE switch to B.<br>● Press RESET button.<br>● Wait for WIGGLE TEST ACTIVE LED to light.<br>● Wiggle Test.<br>● **Are any FAULT MEMORY LEDs on?** | Yes ▶ | PRESS RESET and WAIT for WIGGLE TEST ACTIVE LED to light. CONTINUE to test until intermittent is isolated. REPAIR as necessary. RETEST. |
| | No ▶ | REPAIR CASE GND / CKP shield harness. RETEST. |