

### Example of Diagnostic Display

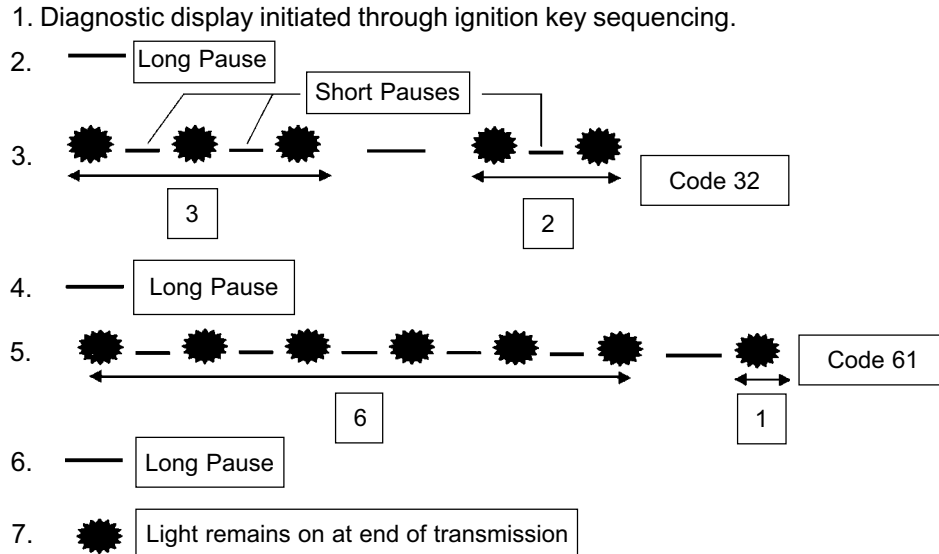


Figure 5B-43.

After the problem has been corrected, the fault codes may be cleared as follows.

1. Disconnect the negative (-) battery cable from battery terminal, or remove the main fuse for the ECU for approximately 1 minute.
2. Reconnect the cable and tighten securely, or reinstall the main fuse. Start the engine and allow it to run for several minutes. The MIL should remain off if the problem was corrected, and the fault codes should not reappear (codes 31, 32, 33, and 34 may require 10-15 minutes of running to reappear).

The following chart lists the fault codes, what they correspond to, and what the visual indications will be. Following the chart is a list of the individual codes with an explanation of what triggers them, what symptoms might be expected, and the probable causes.

### Diagnostic Code Summary

Blink Code	OBD2 P-Code Applicable to: "32 Pin" (MSE 1.1) ECU/System Only	Connection or Failure Description	"35 Pin" (MA 1.7) Metal-Cased ECU/System	"24 Pin" (MSE 1.0) Plastic-Cased ECU/System	"32 Pin" (MSE 1.1) Plastic-Cased ECU/System	Note
-	-	No RPM Signal	Y	Y	Y	
21	P0335	Loss of Synchronization	Y	Y	Y	
22	P0120	TPS - Signal Implausible	N	N	N	2
22	P0122	TPS - Open or Short Circuit to Ground	Y	Y	Y	
22	P0123	TPS - Short Circuit to Battery	Y	Y	Y	
23	P0601	Defective ECU	Y	Y	Y	
24		Engine Speed Sensor	Y	Y	Y	9
31	P0174	System too Lean	Y	Y	Y	6

cont. on next page

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Blink Code	OBD2 P-Code Applicable to: "32 Pin" (MSE 1.1) ECU/System Only	Connection or Failure Description	"35 Pin" (MA 1.7) Metal-Cased ECU/System	"24 Pin" (MSE 1.0) Plastic-Cased ECU/System	"32 Pin" (MSE 1.1) Plastic-Cased ECU/System	Note
31	P0132	O <sub>2</sub> Sensor Circuit: Shorted to Battery	Y	N	Y	3
32	P0134	O <sub>2</sub> Sensor Circuit: No Activity Detected	N	N	N	8
33	P0175	System too Rich	Y	Y	Y	7,8
33	P0020	O <sub>2</sub> Sensor Control at Upper Limit	Y	Y	Y	8
34	P0171	Maximum Adaption Limit Reached	Y	Y	Y	8
34	P0172	Minimum Adaption Limit Reached	Y	Y	Y	8
42	P0117	Temperature Sensor Circuit: Shorted to Ground	Y	Y	Y	
42	P0118	Temperature Sensor Circuit: Open Circuit or Short to Battery	Y	Y	Y	
43	N/A	Failure Completing Autolearn - TPS Offset below minimum allowable limit	N/A	N/A	Y	
44	N/A	Failure Completing Autolearn - TPS offset above maximum allowable limit	N/A	N/A	Y	
51	P1260	Injector 1 - Open Circuit	N/A	N/A	Y	
51	P0261	Injector 1 - Short Circuit to Ground	N/A	N/A	Y	
51	P0262	Injector 1 - Short Circuit to Battery	N/A	N/A	Y	
52	P1263	Injector 2 - Open Circuit	N/A	N/A	Y	
52	P0264	Injector 2 - Short Circuit to Ground	N/A	N/A	Y	
52	P0265	Injector 2 - Short Circuit to Battery	N/A	N/A	Y	
55	P1651	Diagnostic Lamp - Open Circuit	N/A	N/A	Y	
55	P1652	Diagnostic Lamp - Short Circuit to Ground	N/A	N/A	Y	
55	P1653	Diagnostic Lamp - Short Circuit to Battery	N/A	N/A	Y	
56	P1231	Pump Relay - Open Circuit	N/A	N/A	Y	
56	P1232	Pump Relay - Short Circuit to Ground	N/A	N/A	Y	
56	P1233	Pump Relay - Short Circuit to Battery	N/A	N/A	Y	
61		End of Code Transmission	Y	Y	Y	

#### Note:

1. Idle Switch not used.
2. Diagnostic of "TPS - Signal Implausible" is disabled in code.
3. "O<sub>2</sub> Sensor Short to Battery" diagnostic detection is disabled with SAS fuel-cutoff calibrated out.
4. Air Temperature Sensor not used.
5. "Temperature Sensor Signal Implausible": diagnostic detection is calibrated out, with TPLAUS set to -50°C.
6. System too Lean used to be "O<sub>2</sub> Sensor - Short to Ground (P0131)."
7. "System too Rich" used to be "O<sub>2</sub> Sensor Control at Lower Limit (P0019)."
8. Obtainable only with ECU 24 584 28-S or later.
9. Will not blink out.

**Code:** 21  
**Source:** Engine Speed Sensor  
**Explanation:** ECU receiving inconsistent tooth count signals from speed sensor.  
**Expected Engine Response:** Possible misfire as ECU attempts to resynchronize, during which time fuel and spark calculations are not made.

**Possible Causes:**

1. Engine Speed Sensor Related
  - a. Sensor connector or wiring.
  - b. Sensor loose or incorrect air gap.
  - c. Flywheel key sheared.
2. Speed Sensor Ring Gear Related
  - a. Damaged teeth.
  - b. Varying gap (gear loose/out of alignment).
3. Engine Wiring Harness Related  
**“35 Pin” (MA 1.7) Metal-Cased ECU:**
  - a. Pin circuits 3 and/or 21 wiring or connectors.
  - b. Shielding for pin circuits 3 and/or 21 damaged or not properly grounded.
  - c. Poor or improper grounds in system (battery, ECU, oxygen sensor, shielding, fuel pump, ignition output).
  - d. Pin circuits 3 and/or 21 routed near noisy electrical signals (coils, spark plug lead, plug connector).
3. Engine Wiring Harness Related  
**“24 Pin” (MSE 1.0) Plastic-Cased ECU:**
  - a. Pin circuits 9 and/or 10 wiring or connectors.
  - b. Shielding for pin circuits 9 and/or 10 damaged or not properly grounded.
  - c. Poor or improper grounds in system (battery, ECU oxygen sensor, shielding, fuel pump, ignition output).
  - d. Pin circuits 9 and/or 10 routed near noisy electrical signals (coils, spark plug lead, plug connector).
3. Engine Wiring Harness Related  
**“32 Pin” (MSE 1.1) Plastic-Cased ECU:**
  - a. Pin circuits 9 and/or 10 wiring or connectors.
  - b. Shielding for pin circuits 9 and/or 10 damaged or not properly grounded.
  - c. Poor or improper grounds in system (battery, ECU, oxygen sensor, shielding, fuel pump, ignition output).
  - d. Pin circuits 9 and/or 10 routed near noisy electrical signals (coils, spark plug lead, plug connector).

4. ECU/Harness Related
  - a. ECU-to-harness connection problem.
5. Ignition System Related
  - a. Non-resistor spark plug(s) used.

**Code:** 22  
**Source:** Throttle Position Sensor (TPS)  
**Explanation:** Unrecognizable signal is being sent from sensor (too high, too low, inconsistent).  
**Expected Engine Response:** A “limp-home” operating mode occurs, with an overall decrease in operating performance and efficiency. Fuel delivery is based upon the oxygen sensor and five mapped values only. Rich running (black smoke) will occur until “closed loop” operation is initiated. A stumble or misfire on hard acceleration and/or erratic operation may be exhibited.

**Possible Causes:**

1. TPS Sensor Related
  - a. Sensor connector or wiring.
  - b. Sensor output affected or disrupted by dirt, grease, oil, wear, or breather tube position (must be to side opposite the TPS).
  - c. Sensor loose on throttle body manifold.
2. Throttle Body Related
  - a. Throttle shaft or bearings worn/damaged.
3. Engine Wiring Harness Related  
**“35 Pin” (MA 1.7) Metal-Cased ECU:**
  - a. Pin circuits 12, 25 and/or 27 damaged (wiring or connectors).
  - b. Pin circuits 12, 25 and/or 27 routed near noisy electrical signal (coils, alternator).
  - c. Intermittent 5 volt source from ECU (pin circuit 25).
3. Engine Wiring Harness Related  
**“24 Pin” (MSE 1.0) Plastic-Cased ECU:**
  - a. Pin circuits 4, 8, and/or 14 damaged (wiring, connectors).
  - b. Pin circuits 4, 8, and/or 14 routed near noisy electrical signal (coils, alternator).
  - c. Intermittent 5 volt source from ECU (pin circuit 14).

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3. Engine Wiring Harness Related  
**“32 Pin” (MSE 1.1) Plastic-Cased ECU:**
  - a. Pin circuits 4, 8, and/or 18 damaged (wiring, connectors).
  - b. Pin circuits 4, 8, and/or 18 routed near noisy electrical signal (coils, alternator).
  - c. Intermittent 5 volt source from ECU (pin circuit 18).
4. ECU/Harness Related
  - a. ECU-to-harness connection problem.

**Code:** 23  
**Source:** ECU  
**Explanation:** ECU is unable to recognize or process signals from its memory.

**Expected Engine Response:** Engine will not run.

**Possible Causes:**

1. ECU (internal memory problem).
  - a. Diagnosable only through the elimination of all other system/component faults.

**Code:** 24 (Will not blink out)  
**Source:** Engine Speed Sensor  
**Explanation:** No tooth signal from speed sensor. MIL light will not go out when cranking.

**Expected Engine Response:** None-engine will not start or run as ECU is unable to estimate speed.

**Possible Causes:**

1. Engine Speed Sensor Related
  - a. Sensor connector or wiring.
  - b. Sensor loose or air gap incorrect.
2. Speed Sensor Wheel Related
  - a. Damaged teeth.
  - b. Gap section not registering.
3. Engine Wiring Harness Related
  - a. Pin circuit wiring or connectors.  
Pin(s) 3 and/or 21 for **“35 Pin” (MA 1.7) Metal-Cased ECU.**  
Pin(s) 9 and/or 10 for **“24 Pin” (MSE 1.0) Plastic-Cased ECU.**  
Pin(s) 9 and/or 10 for **“32 Pin” (MSE 1.1) Plastic-Cased ECU.**
4. ECU/Harness Related
  - a. ECU-to-harness connection problem.

**Code:** 31  
**Source:** Fuel Mixture or Oxygen Sensor  
**Explanation:** “System too lean.” Oxygen sensor not sending expected voltage to ECU.

**Expected Engine Response:** System operates under “open loop” control only. Until fault is detected and registered by ECU, engine will run rich if oxygen sensor is shorted to ground or lean if it is shorted to battery voltage. After fault is detected, performance can vary, depending on cause. If performance is pretty good, the problem is probably with the oxygen sensor, wiring, or connectors. If the engine is still running rich (laboring, short on power) or lean (popping or misfiring), the fuel mixture is suspect, probably incorrect TPS initialization or low fuel pressure.

**Possible Causes:**

1. TPS Initialization Incorrect
  - a. Lean condition (check oxygen sensor signal with VOA and see Oxygen Sensor section).
2. Engine Wiring Harness Related
  - a. Pin circuit wiring or connectors.  
Pin 10 for **“35 Pin” (MA 1.7) Metal-Cased ECU.**  
Pin 11 for **“24 Pin” (MSE 1.0) Plastic-Cased ECU.**  
Pin 20 for **“32 Pin” (MSE 1.1) Plastic-Cased ECU.**
3. Low Fuel Pressure
4. Oxygen Sensor Related
  - a. Sensor connector or wiring problem.
  - b. Exhaust leak.
  - c. Poor ground path to engine (sensor is case grounded).
5. Poor system ground from ECU to engine, causing rich running while indicating lean.

**Code:** 32  
**Source:** Oxygen Sensor  
**Explanation:** No change in the sensor output signal.  
**Expected Engine Response:** "Open loop" operation only, may cause a drop in system performance and fuel efficiency.

**Possible Causes:**

1. Engine Wiring Harness Related
  - a. Pin circuit wiring or connectors.  
Pin 10 for "**35 Pin**" (**MA 1.7**) **Metal-Cased ECU**.  
Pin 11 for "**24 Pin**" (**MSE 1.0**) **Plastic-Cased ECU**.  
Pin 20 for "**32 Pin**" (**MSE 1.1**) **Plastic-Cased ECU**.
2. Oxygen Sensor Related
  - a. Sensor connector or wiring problem.
  - b. Sensor contaminated or damaged.
  - c. Sensor below the minimum operating temperature (375°C, 709°F).
  - d. Poor ground path from sensor to engine (sensor grounds through shell, see Oxygen Sensor section).
3. TPS Sensor Related
  - a. Throttle plate position incorrectly set or registered during "Initialization."
  - b. TPS problem or malfunction.
4. Engine Wiring Harness Related
  - a. Difference in voltage between sensed voltage (pin circuit 17 for metal-cased ECU, pin circuit 2 for plastic-cased ECU) and actual injector voltage (circuit 45/45A).
5. Systems Related
  - a. Ignition (spark plug, plug wire, ignition coil).
  - b. Fuel (fuel type/quality, injector, fuel pump, fuel pressure).
  - c. Combustion air (air cleaner dirty/restricted, intake leak, throttle bores).
  - d. Base engine problem (rings, valves).
  - e. Exhaust system leak.
  - f. Fuel in the crankcase oil.
  - g. Blocked or restricted fuel return circuit to tank.
6. ECU/Harness Related
  - a. ECU-to-harness connection problem.

**Code:** 33  
**Source:** Oxygen Sensor/Fuel System  
**Explanation:** "System too rich." Temporary fuel adaptation control is at the upper limit.  
**Expected Engine Response:** Erratic performance. Will run rich (smoke).

**Possible Causes:**

1. Fuel Supply Related (nothing lean – only rich)
  - a. Restricted return line causing excessive fuel pressure.
  - b. Fuel inlet screen plugged (in-tank fuel pump only).
  - c. Incorrect fuel pressure at fuel rail.
2. Oxygen Sensor Related
  - a. Sensor connector or wiring problem.
  - b. Sensor contaminated or damaged.
  - c. Exhaust leak.
  - d. Poor ground path.
  - e. Pin circuit wiring or connectors.  
Pin 10 for "**35 Pin**" (**MA 1.7**) **Metal-Cased ECU**.  
Pin 11 for "**24 Pin**" (**MSE 1.0**) **Plastic-Cased ECU**.  
Pin 20 for "**32 Pin**" (**MSE 1.1**) **Plastic-Cased ECU**.

**Code:** 34  
**Source:** Oxygen Sensor/Fuel System Components  
**Explanation:** Long term fuel adaptation control is at the upper or lower limit.  
**Expected Engine Response:** System operates "closed loop." No appreciable performance loss as long as the temporary adaptation can provide sufficient compensation.

**Possible Causes:**

1. Oxygen Sensor Related
  - a. Sensor connector or wiring problem.
  - b. Sensor contaminated or damaged.
  - c. Exhaust leak.
  - d. Poor ground path.
  - e. Pin circuit wiring or connectors.  
Pin 10 for "**35 Pin**" (**MA 1.7**) **Metal-Cased ECU**.  
Pin 11 for "**24 Pin**" (**MSE 1.0**) **Plastic-Cased ECU**.  
Pin 20 for "**32 Pin**" (**MSE 1.1**) **Plastic-Cased ECU**.
2. TPS Sensor Related
  - a. Throttle plate position incorrect during "Initialization" procedure.
  - b. TPS problem or malfunction.

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3. Engine Wiring Harness Related
  - a. Difference in voltage between sensed voltage (pin circuit 17 for metal-cased ECU, pin circuit 2 for plastic-cased ECU) and actual injector voltage (circuit 45/45A).
  - b. Problem in wiring harness.
  - c. ECU-to-harness connection problem.
4. Systems Related
  - a. Ignition (spark plug, plug wire, ignition coil).
  - b. Fuel (fuel type/quality, injector, fuel pressure, fuel pump).
  - c. Combustion air (air cleaner dirty/restricted, intake leak, throttle bores).
  - d. Base engine problem (rings, valves).
  - e. Exhaust system leak (muffler, flange, oxygen sensor mounting boss, etc.).
  - f. Fuel in the crankcase oil.
  - g. Altitude.
  - h. Blocked or restricted fuel return circuit to tank.

**Code:** 42

**Source:** Engine (Oil) Temperature Sensor

**Explanation:** Not sending proper signal to ECU.

**Expected Engine**

**Response:** Engine may be hard to start because ECU can't determine correct fuel mixture.

#### Possible Causes:

1. Temperature Sensor Related
  - a. Sensor wiring or connection.
2. Engine Wiring Harness Related  
**"35 Pin" (MA 1.7) Metal-Cased ECU:**
  - a. Pin circuits 14 and/or 27A damaged (wires, connectors) or routed near noisy signal (coils, alternator, etc.).
  - b. ECU-to-harness connection problem.
2. Engine Wiring Harness Related  
**"24 Pin" (MSE 1.0) Plastic-Cased ECU:**
  - a. Pin circuits 4, 6 and/or 4A damaged (wires, connectors) or routed near noisy signal (coils, alternator, etc.).
  - b. ECU-to-harness connection problem.
2. Engine Wiring Harness Related  
**"32 Pin" (MSE 1.1) Plastic-Cased ECU:**
  - a. Pin circuits 4, 6 and/or (4A) damaged (wires, connectors) or routed near noisy signal (coils, alternator, etc.).
  - b. ECU-to-harness connection problem.

3. System Related
  - a. Engine is operating above the 176°C (350°F) temperature sensor limit.

**Code:** 43 and 44      **"32 Pin" (MSE 1.1) Plastic-Cased ECU only.**

**Source:** TPS "Auto-Learn" initialization function failed, throttle angle out of learning range.

**Explanation:** While performing the TPS "Auto-Learn" function, the measured throttle angle was not within acceptable limits.

**Expected Engine**

**Response:** MIL illuminated. Engine will continue to run but not properly. Upon restart TPS Auto-Learn function will run again unless voltage to ECU disconnected to clear memory.

#### Possible Causes:

1. TPS Related
  - a. TPS rotated on throttle shaft assembly beyond allowable range.
  - b. TPS bad.
2. Engine Wiring Harness Related
  - a. Broken or shorted wire in harness.  
ECU pin 18 to TPS pin 1.  
ECU pin 4 to TPS pin 2.  
ECU pin 8 to TPS pin 3.
3. Throttle Body Related
  - a. Throttle shaft inside TPS worn, broken, or damaged.
  - b. Throttle plate loose or misaligned.
  - c. Throttle plate bent or damaged allowing extra airflow past, or restricting movement.
4. ECU Related
  - a. Circuit providing voltage or ground to TPS damaged.
  - b. TPS signal input circuit damaged.
5. Oxygen Sensor/Harness Related.
  - a. Oxygen sensor bad.
  - b. Wiring problem to oxygen sensor.
  - c. Muffler leak (causing O<sub>2</sub> sensor to falsely indicate a lean condition).
  - d. Bad ground between ECU and Engine.

**Code:** 51 "32 Pin" (MSE 1.1) Plastic-Cased ECU only.

**Source:** Injector #1 circuit open, shorted to ground, or shorted to battery.

**Explanation:** Injector #1 is not functioning because the circuit is open, shorted to ground, or shorted to battery.

**Expected Engine Response:** Engine will run very poorly with only one cylinder functioning.

**Possible Causes:**

1. Injector Related
  - a. Injector coil shorted or opened.
2. Engine Wiring Harness Related
  - a. Broken or shorted wire in harness. ECU pin 14 to injector pin 2. ECU pin 28 to fuel pump relay pin 86. Note: after key-off then key-on code 56 would be set also. Fuel pump relay pin 87 to injector pin 1.
  - b. Open main fuse F1.
3. Fuel Pump Relay Related
  - a. Bad fuel pump relay. Primary side functional but pin 30 to pin 87 remains open. Primary side pin 85 to pin 86 is either open, or shorted during engine operation. Note: after key-off then key-on code 56 would be set also.
4. ECU Related
  - a. Circuit controlling injector #1 damaged.
  - b. Circuit controlling fuel pump relay damaged.

**Code:** 52 "32 Pin" (MSE 1.1) Plastic-Cased ECU only.

**Source:** Injector #2 circuit open, shorted to ground, or shorted to battery.

**Explanation:** Injector #2 is not functioning because the circuit is open, shorted to ground, or shorted to battery.

**Expected Engine Response:** Engine will run very poorly with only one cylinder functioning.

**Possible Causes:**

1. Injector Related
  - a. Injector coil shorted or opened.

2. Engine Wiring Harness Related
  - a. Broken or shorted wire in harness. ECU pin 15 to injector pin 2. ECU pin 28 to fuel pump relay pin 86. Note: after key-off then key-on code 56 would be set also. Fuel pump relay pin 87 to injector pin 1.
  - b. Opened main fuse F1.
3. Fuel Pump Relay Related
  - a. Bad fuel pump relay. Primary side functional, but pin 30 to pin 87 remains open. Primary side pin 85 to pin 86 is open or shorted during engine operation. Note: after key-off then key-on code 56 would be set also.
4. ECU Related
  - a. Circuit controlling injector #2 damaged.
  - b. Circuit controlling fuel pump relay damaged.

**Code:** 55 "32 Pin" (MSE 1.1) Plastic-Cased ECU only.

**Source:** MIL (Diagnostic lamp) circuit open, shorted to ground, or shorted to battery.

**Explanation:** MIL is not functioning because the circuit is open, shorted to ground, or shorted to battery.

**Expected Engine Response:** Engine will run normally if no other errors are present.

**Possible Causes:**

1. MIL (diagnostic lamp) Related
  - a. MIL element opened or element shorted to ground.
  - b. Lamp missing.
2. Engine Wiring Harness Related
  - a. Broken or shorted wire in harness. ECU pin 29 to lamp open or shorted.
3. Vehicle Wiring Harness Related
  - a. Broken or shorted wire in harness. Power lead to MIL open or shorted.
4. ECU Related
  - a. Circuit controlling lamp damaged.

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**Code:** 56 "32 Pin" (MSE 1.1) Plastic-Cased ECU only.

**Source:** Fuel pump relay circuit open, shorted to ground, or shorted to battery

**Explanation:** Fuel pump, ignition coils, and fuel injectors will not function because the fuel pump relay circuit is either open, shorted to ground, or may be "on" continuously if shorted to battery.

**Expected Engine Response:** Engine will not run, or fuel pump will continue to run when switch is off.

**Possible Causes:**

1. Fuel Pump Relay Related
  - a. Bad fuel pump relay.  
Primary side open or shorted.
2. Fuel Pump Related
  - a. Fuel pump open or shorted internally.
3. Engine Wiring Harness Related
  - a. Fuel pump fuse F1 open.
  - b. Broken or shorted wire in harness.  
ECU pin 28 to fuel pump relay pin 86.  
Ignition switch to fuel pump relay pin 85.
4. ECU Related
  - a. Circuit controlling fuel pump relay damaged.

**Code:** 61

**Source:**

**Explanation:** Denotes the end of fault codes. If signaled first, no other fault codes are present.

### Troubleshooting Flow Chart

The following flow chart (on page 5B.43) provides an alternative method of troubleshooting the EFI system. The chart will enable you to review the entire system in about 10-15 minutes. Using the chart, the accompanying diagnostic aids (listed after the chart), and any signaled fault codes, you should be able to quickly locate any problems within the system.