

F - BASIC TESTING

1998 Pontiac Bonneville

1998 ENGINE PERFORMANCE

General Motors Corp. - Basic Diagnostic Procedures - 3.8L

Buick; LeSabre
Oldsmobile; LSS, Eighty Eight & Regency
Pontiac; Bonneville

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions during which the problem reportedly occurred.

Before entering self-diagnostics, perform a careful and complete visual inspection. Most engine control problems result from mechanical breakdowns, poor electrical connections or damaged/misrouted vacuum hoses. Before condemning the computerized system, perform each test listed in this article.

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

NOTE: Unless otherwise instructed in test procedures, perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance.

PRELIMINARY INSPECTION & ADJUSTMENTS

VISUAL INSPECTION

Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Ensure vacuum hoses are properly routed and not pinched or cut. If necessary, see M - VACUUM DIAGRAMS article to verify routing and connections. Inspect air induction system for possible vacuum leaks.

MECHANICAL INSPECTION

Compression

Check engine mechanical condition with a compression gauge, vacuum gauge, or an engine analyzer. See engine analyzer manual for specific instructions. For compression specifications, see C - SPECIFICATIONS article.

WARNING: Because fuel injectors on many models are triggered by ignition switch during cranking mode, DO NOT use ignition switch during compression tests. Use a remote starter to crank engine to prevent fire hazard or engine oiling system contamination.

Exhaust System Backpressure

Before replacing any components, check exhaust system for

restrictions. Use a vacuum gauge or a low-pressure (0-5 psi) gauge to check exhaust system.

If a vacuum gauge is used, connect vacuum gauge hose to intake manifold vacuum port and start engine. Observe vacuum gauge. Partially open throttle and hold steady. If vacuum gauge reading slowly drops after stabilizing, exhaust system should be checked for a restriction. If using a low pressure gauge, connect gauge in one of the following manners:

- * Check At AIR Check Valve
Remove AIR check valve. Install backpressure tester in place of AIR check valve.
- * Check At Oxygen Sensor
Remove oxygen sensor. Install backpressure tester in place of oxygen sensor. After test is completed, coat oxygen sensor threads with anti-seize compound before installation.

Diagnosis

1) Start engine and bring to operating temperature. Increase engine speed to 2000-2500 RPM and note gauge. If reading exceeds 1.25 psi (.09 kg/cm²), exhaust system is restricted.

2) Check exhaust system for collapsed pipe, heat distress and possible internal muffler failure. If none of these conditions exist, check for restricted catalytic converter. Replace as required.

NO START DIAGNOSIS

NOTE: Some vehicles are equipped with anti-theft systems (VATS or PASS-Key(R)) which will not allow vehicle to be started if improper starting procedures or improperly coded ignition keys are used. Both fuel injection and cranking systems will be disabled. Loss of fuel enable signal from anti-theft decoder module should set a diagnostic trouble code in PCM memory.

NOTE: For terminal and circuit identification, see L - WIRING DIAGRAMS article.

Definition

No start is defined as engine cranks properly, but does not start. Engine may fire a few times.

NO START - ENGINE CRANKS OKAY (VIN K & 1 WITH C(3)I)

NOTE: Before performing following tests, check battery condition, engine cranking speed and for adequate fuel in tank.

General Inspection

1) Ensure proper starting procedure is being used. Visually check vacuum hoses for splits, kinks and proper connections, as shown on Vehicle Emission Control Information label. Check ignition wires for cracking, hardness and proper connections at both coil pack and spark plugs.

2) Remove spark plugs. Check and replace as necessary. In very cold temperatures, ensure oil is proper viscosity and not contaminated with gasoline.

Ignition System (VIN K & 1)

1) Perform On-Board Diagnostic (OBD) System Check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, select FAILED SINCE

CODE CLEAR function. If Diagnostic Trouble Code (DTC) P0123, P0601, P0602, P1626 or P1629 is present, diagnose DTC(s). See G - TESTS W/CODES article. If DTC(s) is not present, go to next step.

3) Check Ignition Control Module (ICM) ignition feed circuit fuse and fuel injector ignition feed circuit fuse. If either fuse is blown, locate and repair short to ground in suspect ignition feed circuit. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If fuses are okay, go to next step.

4) Using scan tool, observe engine speed display while cranking engine. If RPM is indicated, go to next step. If RPM is not indicated, go to step 24).

5) Turn ignition off. Disconnect injector connector. Install Injector Test Light (J-34730-2A) to injector connector. See L - WIRING DIAGRAMS article. Turn ignition on and observe injector test light. If injector test light illuminates, go to step 17). If injector test light does not illuminate, go to next step.

6) Crank engine and monitor injector test lights. If all injector test lights flash, go to next step. If any injector test light does not flash, go to step 19).

7) Turn ignition off. Install fuel pressure gauge to fitting on fuel rail. Turn ignition on and observe fuel pressure. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²) and hold steady. If fuel pressure is as specified, go to step 9). If fuel pressure is not as specified, go to next step.

8) If fuel pressure is indicated, but not as specified, diagnose fuel system. See BASIC FUEL SYSTEM CHECKS. If fuel pressure is not present, go to FUEL SYSTEM ELECTRICAL CIRCUIT.

9) Check for fuel contamination. If fuel is contaminated, clean fuel system. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If fuel is not contaminated, go to next step.

10) Install Spark Tester (J-26792) to cylinder No. 1, 2 and 3 (one at a time). Connect the spark plug wire of companion cylinder to ground (i.e., 1/4, 2/5, 3/6). Crank engine and observe spark tester. If spark is present, go to next step. If spark is not present, go to step 12).

11) Remove and inspect spark plugs from all cylinders. If spark plugs are okay, go to step 36). If spark plugs shows excessive fouling, check engine for mechanical problems.

12) If spark is present at any ignition wire, go to next step. If spark is not present at any ignition wire, go to step 25).

13) Remove and inspect ignition coil to affected cylinder for cracks or carbon tracking. Replace faulty ignition coil(s) as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If coil(s) are okay, go to next step.

14) Check secondary ignition coil resistance. Resistance should be 5000-8000 ohms. Replace faulty ignition coil(s) as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If resistance is as specified, go to next step.

15) Check resistance of ignition wire associated with cylinder that did not produce a spark. On VIN K, resistance should be 10,000 ohms. On VIN 1, resistance should be 7000 ohms. Replace suspect ignition wire if resistance is greater than specified. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If resistance is as specified, go to next step.

16) Connect test light across Ignition Control Module (ICM) primary circuit (between ICM control terminals) for coils associated with cylinder that did not produce a spark. Crank engine. If test light flashes, go to step 39). If test light does not flash, go to step 40).

17) Turn ignition off. Disconnect Powertrain Control Module

(PCM) connector. Turn ignition on. Observe injector test lights. If injector test lights illuminate, go to next step. If injector test lights does not illuminate, go to step 38).

18) Locate and repair short to ground in injector control circuit(s) to affected injector (test light stayed on). See WIRING DIAGRAMS article. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

19) If any injector test light flashes, go to next step. If no injector test light flashes, go to step 22).

20) Disconnect injector test light that did not flash when engine was being cranked. Turn ignition on. Using a test light connected to ground, probe ignition feed circuit at each injector connector. See L - WIRING DIAGRAMS article. If test light illuminates on all injector connectors, go to next step. If test light does not illuminate on all injector connectors, go to step 34).

21) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Check affected injector circuit driver for an open. See L - WIRING DIAGRAMS article. Repair open circuit as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If circuit is okay, go to step 38).

22) Using a test light connected to ground, probe fuel injector ignition feed terminal at any injector connector. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 34).

23) Install an injector test light to any injector connector. Turn ignition off. Disconnect Ignition Control Module (ICM) connector. Turn ignition on. Using a test light connected to battery voltage, repeatedly touch test light to 3X reference circuit at ICM connector. See L - WIRING DIAGRAMS article. If injector test light flashes, go to next step. If injector test light does not flash, go to step 33).

24) Turn ignition off. Disconnect Ignition Control Module (ICM) connector. Turn ignition on. Using a test light connected to ground, probe ignition control module ignition battery voltage terminal. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 35).

25) Using a fused jumper wire, jumper Crankshaft Position (CKP) sensor ignition battery voltage circuit at ICM connector to battery voltage. Connect a second jumper between ground and CKP sensor ground circuit at ICM connector. Connect DVOM between battery voltage and CKP sync signal circuit at ICM connector. Crank engine and observe DVOM voltage reading. Voltage should be 1-3 volts. If voltage reading is as specified, go to step 29). If voltage reading is not as specified, go to next step.

26) If voltage reading is greater than 3 volts, go to next step. If voltage reading is less than 3 volts, go to step 28).

27) Disconnect CKP sensor connector. Using a test light connected to battery voltage, probe CKP sync signal circuit. See L - WIRING DIAGRAMS article. If test light illuminates, locate and repair short to ground in CKP sync signal circuit. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If test light does not illuminate, go to step 41).

28) Check open or short to voltage in CKP sync signal circuit, open in CKP sensor ground circuit, or open or short to ground in CKP sensor ignition positive voltage circuit. See L - WIRING DIAGRAMS article. Repair as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If no circuit problems are found, go to step 41).

29) Connect DVOM between battery voltage and 18X reference circuit at ICM connector. Crank engine and observe DVOM voltage reading. Voltage should be 5-7 volts. If voltage reading is as specified, go to step 40). If voltage reading is not as specified, go to next step.

30) If voltage reading is greater than 7 volts, go to next

step. If voltage reading is less than 7 volts, go to step 32).

31) Disconnect CKP sensor connector. Using a test light connected to battery positive, probe 18X reference circuit terminal. See L - WIRING DIAGRAMS article. If test light illuminates, locate and repair short to ground in 18X reference circuit. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If circuit is okay, go to step 41).

32) Check for open or short to voltage in 18X reference circuit. Repair as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If circuit is okay, go to step 41).

33) Turn ignition off. Disconnect PCM connector. Check for open or short in 3X reference circuit. Repair as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If circuit is okay, go to step 38).

34) Locate and repair open in fuel injector ignition positive voltage circuit. See L - WIRING DIAGRAMS article. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

35) Locate and repair open in ICM ignition positive voltage circuit. See L - WIRING DIAGRAMS article. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

36) Check for a stuck Throttle Position (TP) sensor, stuck or skewed Manifold Absolute Pressure (MAP) sensor, or faulty Engine Coolant Temperature (ECT) sensor. Repair or replace as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. If sensors are okay, go to next step.

37) Repair engine mechanical problem. Check for bent push rods, faulty or incorrect camshaft, leaking or sticky valves or rings, excessive valve deposits, loose or worn rocker arms, weak valve springs, incorrect valve timing or a leaking head gasket. Repair as necessary. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

38) Replace PCM. Perform PCM relearn procedures. After replacing PCM, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

39) Replace affected ignition coil(s) that did not produce a spark. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

40) Replace ICM. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

41) Replace CKP sensor. After repairs, perform ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.

Fuel System Electrical Circuit (VIN K)

1) Perform On-Board Diagnostic (OBD) System Check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. After performing OBD system check, go to next step.

2) Turn ignition off. Install fuel pressure gauge. Remove fuel pump relay. Using a fused jumper wire, jumper fuel pump feed circuit at fuel pump relay connector to battery voltage. Observe fuel pressure. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²). If fuel pressure is as specified, go to next step. If fuel pressure is not as specified, go to step 10).

3) Disconnect jumper wire from fuel pump relay connector. Connect test light between ignition feed circuit and ground circuit of fuel pump relay connector. See L - WIRING DIAGRAMS article. Turn ignition on and observe test light. If test light illuminates, go to next step. If test light does not illuminate, go to step 9).

4) Turn ignition off. Connect test light between fuel pump relay control circuit and ground circuit of fuel pump relay connector. See L - WIRING DIAGRAMS article. Observe test light while turning ignition on. Test light should illuminate for about 2 seconds. If test

light illuminates for about 2 seconds, go to step 8). If test light does not illuminate for about 2 seconds, go to next step.

5) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using a test light connected to battery voltage, probe PCM connector fuel pump relay control circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 15). If test light does not illuminate, go to next step.

6) Check for continuity in fuel pump relay control circuit between fuel pump relay and PCM. See L - WIRING DIAGRAMS article. If circuit is faulty, repair as necessary. After repairs, go to step 21). If circuit is okay, go to next step.

7) Check fuel pump relay control circuit for poor terminal connection at PCM. See L - WIRING DIAGRAMS article. If connection is faulty, repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 20).

8) Check for poor terminal connection at fuel pump relay. See L - WIRING DIAGRAMS article. If connection is faulty, repair as necessary. After repairs, go to step 21). If circuit is okay, go to step 18).

9) Using a test light connected to ground, probe fuel pump relay connector ignition feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 17). If test light does not illuminate, go to step 16).

10) Remove fuel filler cap and listen for fuel pump running. If fuel pump is running, diagnose fuel system. See BASIC FUEL SYSTEM CHECKS. If fuel pump is not running, go to next step.

11) Using a fused jumper wire, jumper fuel pump feed circuit at fuel pump relay connector to battery voltage. See L - WIRING DIAGRAMS article. Raise and support vehicle. Disconnect fuel sending unit connector at fuel tank. Connect test light between fuel pump feed circuit and fuel pump ground circuit of fuel sending unit connector. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 19). If test light does not illuminate, go to next step.

12) Using a test light connected to chassis ground, probe fuel sending unit connector fuel pump feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 14). If test light does not illuminate, go to next step.

13) Locate and repair open in fuel pump feed circuit. After repairs, go to step 21).

14) Locate and repair open in fuel pump ground circuit. After repairs, go to step 21).

15) Locate and repair short to ground in fuel pump relay control circuit. After repairs, go to step 21).

16) Locate and repair open in ignition feed circuit to fuel pump relay. After repairs, go to step 21).

17) Locate and repair open in ground circuit to fuel pump relay. After repairs, go to step 21).

18) Replace fuel pump relay. After replacing fuel pump relay, go to step 21).

19) Replace fuel pump. After replacing fuel pump, go to step 21).

20) Replace PCM. Perform PCM relearn procedures. After replacing PCM, go to next step.

21) Turn ignition on. Using scan tool, select FP RELAY OUTPUT CONTROL function. Observe fuel pressure gauge while commanding fuel pump on with scan tool. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²). If fuel pressure is not as specified, repeat step 2). If fuel pressure is as specified, system is okay.

Fuel System Electrical Circuit (VIN 1)

1) Perform On-Board Diagnostic (OBD) System Check. See ON-

BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article.
After performing OBD system check, go to next step.

2) If Diagnostic Trouble Code (DTC) P0230 or P1667 is present, diagnose DTC(s). See G - TESTS W/CODES article. If DTC(s) is not present, go to next step.

3) Turn ignition off. Install fuel pressure gauge. Using a scan tool, select FP RELAY OUTPUT CONTROL function. Observe fuel pressure gauge while commanding fuel pump on with scan tool. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²). If fuel pressure is as specified, go to next step. If fuel pressure is not as specified, go to step 5).

4) Start engine. Using a scan tool, select FP SPEED OUTPUT CONTROL function. Observe fuel pressure gauge while commanding fuel pump speed between normal and high with scan tool. Fuel pressure should slightly increase when high fuel pump speed is selected. If fuel pressure increases, system is okay. If fuel pressure does not change, go to step 31).

5) Turn ignition off. Disconnect fuel pump control module connector. Using a fused jumper wire, jumper fuel pump feed circuit of fuel pump control module connector to battery voltage. See L - WIRING DIAGRAMS article. Connect a second jumper wire between fuel pump ground circuit of fuel pump control module connector and ground. See L - WIRING DIAGRAMS article. Observe fuel pressure gauge. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²). If fuel pressure is as specified, go to next step. If fuel pressure is not as specified, go to step 26).

6) Disconnect jumpers from fuel pump control module connector. Connect test light between fuel pump control module feed circuit of fuel pump control module connector and ground. See L - WIRING DIAGRAMS article. Turn ignition on. Using scan tool output controls function, command fuel pump relay on. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

7) Using a test light connected to battery voltage, probe fuel pump control module connector ground circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 25).

8) Turn ignition off. Disconnect Powertrain Control Module (PCM) connector. Using a test light connected to battery voltage, probe PCM connector fuel pump PWM control circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

9) Locate and repair short to ground in fuel pump PWM control circuit. After repairs, go to step 39).

10) Turn ignition off. Reconnect PCM connector. Turn ignition on. Connect DVOM between fuel pump PWM control circuit and ground circuit of fuel pump control module connector. See L - WIRING DIAGRAMS article. Using scan tool output controls function, command fuel pump relay on and off. DVOM should read greater than 8 volts while fuel pump relay is commanded on. If voltage is as specified, go to next step. If voltage is not as specified, go to step 38).

11) Turn ignition off. Reconnect fuel pump control module connector. Turn ignition on. Using test light, backprobe between fuel pump control module connector fuel pump feed circuit and fuel pump ground circuit. See L - WIRING DIAGRAMS article. Using scan tool output controls function, command fuel pump relay on and off while observing test light. Test light should illuminate when fuel pump relay is commanded on. If test light illuminates, go to next step. If test light does not illuminate, go to step 34).

12) Check for poor terminal connection at fuel pump control module. Repair connection as necessary. After repairs, go to step 39). If connection is okay, check PCM and connectors for improper mating, check for rubbed through wire insulation or a wire broken inside

insulation.

13) Turn ignition off. Remove fuel pump relay. Turn ignition on. Using a test light connected to ground, probe fuel pump relay connector ignition feed circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 19).

14) Connect test light between feed circuit and ground circuit of fuel pump relay connector. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 20).

15) Connect test light between control circuit and ground circuit of fuel pump relay connector. See L - WIRING DIAGRAMS article. Using scan tool output controls function, command fuel pump relay on while observing test light. If test light illuminates when fuel pump relay is on, go to next step. If test light does not illuminate, go to step 21).

16) Connect jumper wire between fuel pump relay connector feed circuit and fuel pump control module connector feed circuit. See L - WIRING DIAGRAMS article. Using a test light connected to ground, probe fuel pump control module connector fuel pump control module feed circuit. See L - WIRING DIAGRAMS article. If test light does not illuminate, go to step 24). If test light illuminates, go to next step.

17) Check for poor terminal connection at fuel pump relay. Repair or replace as necessary. After repairs, go to step 39). If terminal connection is okay, go to next step.

18) Replace fuel pump relay. After replacing fuel pump relay, go to step 39).

19) Locate and repair open in fuel pump relay feed circuit. After repairs, go to step 39).

20) Locate and repair open in fuel pump relay ground circuit. After repairs, go to step 39).

21) Turn ignition off. Disconnect PCM connector. Using a test light connected to battery voltage, probe PCM connector fuel pump relay control circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

22) Locate and repair short to ground in fuel pump relay control circuit. After repairs, go to step 39).

23) Check fuel pump relay control circuit for poor connection or open circuit between fuel pump relay and PCM. Repair as necessary. After repairs, go to step 39). If connection and circuit are okay, go to step 38).

24) Locate and repair open in fuel pump control module feed circuit. After repairs, go to step 39).

25) Locate and repair open in fuel pump control module ground circuit. After repairs, go to step 39).

26) Remove fuel filler cap and listen for fuel pump operation. If fuel pump is running, diagnose fuel system. See BASIC FUEL SYSTEM CHECKS. If fuel pump is not running, go to next step.

27) Using fused jumper wires, connect battery voltage to fuel pump feed circuit, and ground to fuel pump ground circuit. See L - WIRING DIAGRAMS article. Raise and support vehicle. Disconnect fuel sending unit connector at fuel tank. Connect test light between fuel sending unit connector fuel pump feed circuit and fuel pump ground circuit. See L - WIRING DIAGRAMS article. If test light illuminates, go to step 36). If test light does not illuminate, go to next step.

28) Using a test light connected to ground, probe fuel sending unit connector fuel pump feed circuit. See L - WIRING DIAGRAMS article. If test light does not illuminate, go to next step. If test light illuminates, go to step 30).

29) Locate and repair open in fuel pump feed circuit. After repairs, go to step 39).

30) Locate and repair open in fuel pump ground circuit. After repairs, go to step 39).

31) Using test light, backprobe between fuel pump control module fuel pump PWM control circuit and fuel pump control module feed circuit. See L - WIRING DIAGRAMS article. Start and idle engine. Using a scan tool, select FP SPEED OUTPUT CONTROL function. Observe test light while switching scan tool between normal and high. Test light should illuminate when normal is selected, and then turn off when high is selected. If test light illuminates as indicated, go to next step. If test light does not illuminate as indicated, go to step 33).

32) Using DVOM, backprobe between fuel pump control module fuel pump ground circuit and fuel pump feed circuit. see L - WIRING DIAGRAMS article. Start and idle engine. Using a scan tool, select FP SPEED OUTPUT CONTROL function. Observe DVOM voltage reading while switching scan tool between normal and high speed. On normal speed, DVOM should read about 8 volts. On high speed, DVOM should read battery voltage. If voltage readings are as specified, go to step 36). If voltage readings are not as specified, go to step 34).

33) Check fuel pump PWM control circuit for poor terminal connection, or an open or short to voltage between fuel pump control module and PCM. Repair terminal or circuit as necessary. After repairs, go to step 39). If circuit or terminal is okay, go to step 38).

34) Check for poor terminal connection at fuel pump control module. Repair or replace as necessary. After repairs, go to step 39). If terminal connection is okay, go to next step.

35) Replace fuel pump control module. After replacing fuel pump control module, go to step 39).

36) Check for poor terminal connection at fuel pump. Repair or replace as necessary. After repairs, go to step 39). If terminal connection is okay, go to next step.

37) Replace fuel pump. After replacing fuel pump, go to step 39).

38) Replace PCM. Ensure PCM relearn procedure is performed. After replacing PCM, go to next step.

39) Turn ignition on. Using a scan tool, select FP RELAY OUTPUT CONTROL function. Observe fuel pressure gauge while commanding fuel pump on with scan tool. Fuel pressure should be 48-55 psi (3.4-3.8 kg/cm²). If fuel pressure is as specified, go to next step. If fuel pressure is not as specified, go to step 5).

40) Start and idle engine. Using scan tool, select FP SPEED CONTROL OUTPUT function. Observe fuel pressure gauge while commanding fuel pump speed between normal and high with scan tool. Fuel pressure should slightly increase when high speed is selected. If fuel pressure does not slightly increase, go to step 31). If fuel pressure increases as specified, system is okay.

BASIC FUEL SYSTEM CHECKS

CAUTION: Begin fuel system trouble shooting and diagnosis with checking fuel injection system pressure. High fuel pressure may be present in fuel lines and component parts. Relieve fuel pressure before disconnecting any fuel system components.

NOTE: For fuel pump circuit testing, see FUEL SYSTEM ELECTRICAL CIRCUIT under NO START DIAGNOSIS.

FUEL SYSTEM PRESSURE RELIEF

Fuel system is under pressure. Pressure must be relieved prior to servicing fuel system. Fuel pressure may be relieved by using one of the following methods.

- * Disconnect negative battery terminal. Loosen fuel filler cap. Install Fuel Pressure Gauge (J-34730-1A) on fuel pressure connector of fuel rail. Wrap shop towel around pressure connection when installing fuel pressure gauge to absorb fuel leakage. Install gauge bleed hose in container. Open bleed valve to bleed fuel pressure.

FUEL SYSTEM PRESSURE TEST

CAUTION: Begin fuel system trouble shooting and diagnosis with checking fuel injection system pressure. High fuel pressure may be present in fuel lines and component parts. Relieve fuel pressure before disconnecting any fuel system components.

1) Perform On-Board Diagnostic (OBD) System Check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in G - TESTS W/CODES article. After performing OBD system check, go to next step.

2) Turn ignition off. Turn A/C system off. Connect Fuel Pressure Gauge (J-34730-1A) to fuel pressure fitting on fuel rail. Place fuel pressure gauge bleed hose into container. Turn ignition on. Bleed air out of fuel pressure gauge. Turn ignition off for 10 seconds. Turn ignition on. Fuel pump should run for about 2 seconds. Cycle ignition to obtain highest fuel pressure possible. Observe fuel pressure with fuel pump running. Fuel pressure should be within specification. See FUEL PRESSURE table. If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, go to step 12).

3) Fuel pressure may vary slightly when fuel pump stops. After fuel pump stops, fuel pressure should stabilize and remain constant. Note fuel pressure when fuel pump stops running. If fuel pressure decreases more than 5 psi (0.3 kg/cm²) in 10 minutes, go to step 10). If fuel pressure does not decrease more than 5 psi (0.3 kg/cm²) in 10 minutes, go to next step.

4) Relieve fuel pressure until pressure is 10 psi (0.7 kg/cm²). If fuel pressure decreases more than 2 psi (0.1 kg/cm²) in 10 minutes, go to step 19). If fuel pressure does not decrease more than 2 psi (0.1 kg/cm²) in 10 minutes, go to next step.

5) If fuel pressure is suspected of decreasing during acceleration, cruise or hard cornering, go to next step. If fuel pressure is not suspected of decreasing during acceleration, cruise or hard cornering, go to step 8).

6) Inspect in-line fuel filter and fuel feed pipe for restriction. If restriction is found, go to step 24). If restriction is not found, go to next step.

7) Remove fuel sending unit assembly. Inspect fuel pump strainer for restriction, fuel pump strainer for proper positioning and installation on fuel sending unit assembly, fuel pump flex pipe for leaks, and ensure fuel pump is proper pump for vehicle. If a problem is found, go to step 24). If a problem is not found, go to step 19).

8) Turn ignition off for 10 seconds. Turn ignition on. Fuel pump should run for about 2 seconds. Cycle ignition to obtain highest fuel pressure possible. Note fuel pressure. Start engine. Allow engine to idle until normal operating temperature is reached. If fuel pressure is less than previously noted pressure by 3-10 psi (0.2-0.7 kg/cm²), see H - TESTS W/O CODES article. If fuel pressure is greater than previously noted pressure by 3-10 psi (0.2-0.7 kg/cm²), go to next step.

9) Disconnect vacuum hose from fuel pressure regulator. With engine idling, apply 12-14" of vacuum to fuel pressure regulator. If fuel pressure decreases by 3-10 psi (0.2-0.7 kg/cm²), go to step 20). If fuel pressure does not decrease by 3-10 psi (0.2-0.7 kg/cm²), go to step 21).

10) Turn ignition off. Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELIEF. Place bleed hose into container. Turn ignition on. Bleed air out of fuel pressure gauge. Using scan tool, pressurize fuel system. DO NOT allow fuel pressure to exceed 65 psi (4.5 kg/cm²). Excess pressure may damage fuel pressure regulator. Wait for fuel pressure to build. Using scan tool, obtain highest fuel pressure possible. Gradually pinch off fuel feed hose. If fuel pressure remains constant, go to step 19). If fuel pressure does not remain constant, go to next step.

11) Gradually unpinch fuel feed hose. Using scan tool, pressurize fuel system. Wait for fuel pressure to build. Gradually pinch off fuel return hose. If fuel pressure remains constant, go to step 21). If fuel pressure does not remain constant, go to step 22).

12) If fuel pressure is greater than specification, go to next step. See FUEL PRESSURE table. If fuel pressure is less than specification, go to step 15).

13) Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELIEF. Disconnect fuel return pipe from fuel rail. Attach a flexible fuel hose to fuel rail return outlet passage. Place other end of flexible hose into container. Turn ignition off for about 10 seconds. Turn ignition on. Observe fuel pressure gauge with fuel pump running. Fuel pressure should be within specification. See FUEL PRESSURE table. If fuel pressure is within specification, go to step 23). If fuel pressure is not within specification, go to next step.

14) Inspect fuel rail outlet passage for restriction. If restriction is found, go to step 24). If restriction is not found, go to step 21).

15) If fuel pressure is greater than zero psi, go to next step. If fuel pressure is zero psi, go to step 17).

16) Turn ignition off. Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELIEF. Place bleed hose into container. Turn ignition on. Bleed air out of fuel pressure gauge. Using scan tool, pressurize fuel system. DO NOT allow fuel pressure to exceed 65 psi (4.5 kg/cm²). Excess pressure may damage fuel pressure regulator. Wait for fuel pressure to build. Using scan tool, obtain highest fuel pressure possible. Gradually pinch off fuel return hose. If fuel pressure increases to greater than specification, go to step 21). See FUEL PRESSURE table. If fuel pressure does not increase to greater than specification, go to step 7).

17) Check fuel pump electrical circuit. See FUEL SYSTEM ELECTRICAL CIRCUIT under NO START DIAGNOSIS. If a problem is found in electrical circuit, go to step 24). If electrical circuit is okay, go to next step.

18) Remove fuel sending unit assembly. Inspect in-line fuel filter for obstructions, fuel feed pipe for a restriction, fuel pump strainer for obstructions, and fuel pump flex pipe for leaks. If a problem is found, go to step 24). If a problem is not found, go to next step.

19) Replace fuel sending unit assembly. After replacing fuel sending unit assembly, go to step 25).

20) Locate and repair loss of vacuum to fuel pressure regulator. After repairing vacuum loss, go to step 25).

21) Replace fuel pressure regulator. After replacing fuel pressure regulator, go to step 25).

22) Locate and replace leaking fuel injector(s). After replacing fuel injector(s), go to step 25).

23) Locate and repair restriction in fuel return pipe. After repairing restriction, go to step 25).

24) Repair problem as necessary. After repairing problem, go to step 25).

25) Turn ignition off. Turn A/C system off. Connect Fuel Pressure Gauge (J-34730-1A) to fuel pressure fitting on fuel rail. Place fuel pressure gauge bleed hose into container. Turn ignition on. Bleed air out of fuel pressure gauge. Turn ignition off for 10 seconds. Turn ignition on. Fuel pump should run for about 2 seconds. Cycle ignition to obtain highest fuel pressure possible. Observe fuel pressure with fuel pump running. Fuel pressure should be within specification. See FUEL PRESSURE table. If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, go to step 11).

26) Fuel pressure may vary slightly when fuel pump stops. After fuel pump stops, fuel pressure should stabilize and remain constant. Note fuel pressure when fuel pump stops running. If fuel pressure decreases more than 5 psi (0.3 kg/cm²) in 10 minutes, go to step 10). If fuel pressure does not decrease more than 5 psi (0.3 kg/cm²) in 10 minutes, system is okay.

FUEL PRESSURE TABLE

Application	psi (kg/cm ²)
3.8L	48-55 (3.4-3.8)

BASIC IGNITION SYSTEM CHECKS

CRANKSHAFT POSITION (CKP) SENSOR RESISTANCE (1) TABLE

Application	Ohms
3.8L	800-1200

(1) - For more testing information,
see G - TESTS W/CODES article.

Crankshaft Position (CKP) Sensor Output Signal

Set DVOM on 2-volt AC scale. Connect DVOM leads to CKP sensor located on side of engine block. Crank engine and observe voltmeter reading. CKP sensor should generate a voltage signal of about 2 volts.

Tach Pulse (RPM) Signal

Connect scan tool to DLC. RPM should be indicated on scan tool when engine is cranked or running. Tach pulse (RPM reference) will be indicated as a voltage signal when a DVOM (with a minimum 10-megohm input impedance connected to ground) is used to backprobe RPM high reference circuit. If tach pulse signal is not present, vehicle will not run. For circuit and terminal identification, see L - WIRING DIAGRAMS article.

C(3)I

Spark

Disconnect tachometer wire (if equipped). A shorted tachometer will prevent vehicle from starting. Disconnect Camshaft Position (CMP) sensor. Attempt to start engine. If engine starts, see CMP sensor DTC in G - TESTS W/CODES article. Using Spark Tester (J-26792), check for adequate spark. Check for spark on plug wires No. 1, 3 and 5 (one at a time). Leave matching plug wire connected while checking for spark. When removing spark plug wire from spark plug,

twist and pull on boot. DO NOT pull on wire.

Ignition Coil Power Source

Turn ignition on. Check for battery voltage on ignition positive voltage circuit to ignition control module. If battery voltage is not present, check for blown ignition fuse. If fuse is not blown, check for open between fuse and ignition control module.

Ignition Coil Resistance

Disconnect ignition coil leads. Using an ohmmeter, check ignition coil resistance. Secondary resistance should be 5000-8000 ohms. If resistance is not as specified, replace ignition coil.

Tach Pulse (RPM) Signal

Connect scan tool to DLC. RPM should be indicated on scan tool when engine is cranked or running. Tach pulse (RPM reference) will be indicated as a voltage signal when a DVOM (with a minimum 10-megohm input impedance connected to ground) is used to backprobe RPM high reference circuit. If tach pulse signal is not present, vehicle will not run. For circuit and terminal identification, see L - WIRING DIAGRAMS article.

IDLE SPEED & IGNITION TIMING

Ensure idle speed and ignition timing are set to specification. For specifications, see C - SPECIFICATIONS article. For adjustment procedures, see D - ADJUSTMENTS article.

SUMMARY

If no faults were found while performing BASIC DIAGNOSTIC PROCEDURES, no trouble codes (or only intermittent ones) were found while performing ON-BOARD DIAGNOSTIC SYSTEM CHECK and driveability problems exist, proceed to appropriate H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO-START, etc.) or intermittent diagnostic procedures.