

ARTICLE BEGINNING

2000 ENGINE PERFORMANCE
General Motors Basic Diagnostic Procedures - Cars

Except Metro & Pri z m

MODEL IDENTIFICATION

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AA
Body Code (1) Model

- "C" Park Avenue
- "E" El dorado
- "F" Camaro & Firebird
- "H" Bonneville & LeSabre
- "J" Cavalier & Sunfire, & Saturn ("L" Series)
- "K" DeVille & Seville
- "N" Alero, Grand Am & Malibu
- "V" Catera
- "W" Century, Grand Prix, Impala, Intrigue, Lumina,
Monte Carlo & Regal
- "Y" Corvette
- "Z" Saturn ("S" Series)

(1) - Vehicle body code is fourth character of VIN.
AA

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 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 appropriate 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 appropriate SERVICE & ADJUSTMENT 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 allow it to reach normal 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 necessary.

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 appropriate wiring diagram in 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 (1.9L)

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

General Inspection

1) Using scan tool, attempt communication with BCM and PCM. If communication can be established, go to next step. If communication cannot be established, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article.

2) If BCM or PCM Passlock(R)/security system or BCM communication DTCs (P1630, P1631, U1000, U1064, U1300 or U1301) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article, or appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT. If listed DTCs are not set, go to next step.

3) Using scan tool, monitor IGNITION 1 voltage. If voltage is 2 volts or greater, go to next step. If voltage is not 2 volts or greater, check PCM ignition feed circuit or PCM ground circuits for an open or poor connection. Repair as necessary.

4) If any PCM internal fault DTCs (P0601, P0602, P0603, P0606 or P1621) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTCs are not set, go to next step.

5) If all 4 injector circuit low DTCs (P0261, P0264, P0267 or P0270) are set, repair ignition voltage circuits between underhood junction block and fuel injectors. Check INJ fuse (10-amp) in underhood junction block. Replace if necessary. If listed DTCs are not set, go to next step.

6) If any ignition control DTCs (P0351, P0352, P1351 or P1352) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTCs are not set, go to next step.

7) If DTC P1635 is set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTC is not set, go to next step.

8) If DTCs P0231 or P0232 are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTCs are not set, go to next step.

9) Using scan tool, monitor EGR sensor. If voltage is less than one volt, go to next step. If voltage is not less than one volt,

perform diagnostic procedure for DTC P1404. See appropriate SELF-DIAGNOSTICS article.

10) Using scan tool, monitor CMP resync counter while cranking engine. If counter increments, go to next step. If counter does not increment, see NO RPM DETECTED DIAGNOSIS.

11) Check for spark at plug wires No. 2 and 4. If spark is present at both plug wires, go to next step. If spark is not present at both plug wires, see IGNITION DIAGNOSIS.

12) Check for fouled spark plugs. Repair as necessary. If spark plugs are okay, see FUEL DELIVERY DIAGNOSIS.

No RPM Detected Diagnosis

1) Turn ignition off. Disconnect 80-pin PCM harness connector. Measure resistance between 7X signal high circuit and 7X signal low circuit at PCM harness connector. If resistance is 800-1600 ohms, go to next step. If resistance is less than 800 ohms, go to step 3). If resistance is greater than 1600 ohms, go to step 4).

2) Check CKP sensor for correct torque and terminal tension. Repair as necessary. If CKP sensor and connections are okay, replace PCM. Perform PCM relearn procedures.

3) Disconnect CKP sensor. Check for continuity between 7X signal high circuit and 7X signal low circuit at CKP sensor harness connector. If continuity is present, repair circuits for short together. If continuity is not present, replace CKP sensor.

4) Disconnect CKP sensor. Check for open in 7X signal high circuit or 7X signal low circuit. Repair as necessary. If circuits are okay, CKP sensor or connections are faulty.

Ignition Diagnosis

NOTE: If DTCs P0351, P0352, P1351 or P1352 are set, diagnose these DTCs first. See appropriate SELF-DIAGNOSTICS article.

1) Check for spark at all spark plug wires. If spark is not present on only one wire, replace fault wire. If spark is not present on 2 wires sharing the same ignition coil, replace faulty ignition coil. If spark is not present at any wire, go to next step.

2) Check EIS fuse (10-amp) located in underhood fuse block. Replace if necessary. Turn ignition on. Disconnect EI module harness connector. Using test light connected to ground, probe ignition feed circuit at EI module harness connector. If test light illuminates, go to next step. If test light does not illuminate, repair open in ignition feed circuit.

3) Using test light connected to battery positive terminal, probe ground circuit at EI module harness connector. If test light illuminates, EI module or connections are faulty. If test light does not illuminate, repair open in ground circuit.

Fuel Delivery Diagnosis

1) Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Using scan tool, command fuel pump relay on and off for 3 pulses. If fuel pressure is 38-44 psi (2.7-3.1 kg/cm²), fuel quality may be at fault. If fuel pressure is not as specified, go to next step.

2) If fuel pressure is not present, go to next step. If fuel

pressure is present but not to specification, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article. Repair as necessary.

3) Turn ignition off for at least 10 seconds. Using test light connected to ground, probe FUEL PUMP fuse (10-amp) located in instrument panel fuse block. Turn ignition on. If test light illuminates for 2 seconds and then turns off, go to next step. If test light does not illuminate, go to step 5).

4) Check fuel pump battery feed circuit and fuel pump relay ground circuit for open or poor connections. Repair as necessary. If circuits are okay, fuel pump is faulty.

5) Using scan tool, command fuel pump relay on and off. If relay does not click, replace relay. If relay clicks, check I/P BATT fuse (30-amp) located in underhood fuse block. Replace if necessary. If fuse is okay, repair open in fuel pump relay battery feed circuit.

NO START - ENGINE CRANKS OKAY (2.2L - CAVALIER & SUNFIRE)

NOTE: Before performing the 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 (VECI) label. Check ignition wires for cracking, hardness and proper connections.

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

Ignition Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Using scan tool, check for DTCs. If DTC P0601, P0602, P1621 or P1629 is present, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If DTCs are not present, go to next step.

3) Crank engine. Using scan tool, monitor CKP activity counter. If counter increments, go to next step. If counter does not increment, go to step 9).

4) Turn ignition on. Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, see FUEL PUMP ELECTRICAL CIRCUIT.

5) Turn ignition off. Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. If fuel pressure is 52-58 psi (3.7-4.1 kg/cm²), go to next step. If fuel pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

6) Remove fuel pump relay. Install spark tester on plug wire for cylinder No. 1. Crank engine. Repeat for remaining cylinders. If spark is present for all cylinders, go to next step. If spark is not present for all cylinders, go to step 13).

7) Turn ignition off. Check for faulty spark plugs. Repair as

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necessary. After repairs, go to step 24). If spark plugs are okay, go to next step.

8) Check for basic engine mechanical problems. Repair as necessary. After repairs, go to step 24). If no engine mechanical problems are found, see DIAGNOSTIC AIDS.

9) Turn ignition off. Disconnect ignition control module 2-pin harness connector. Turn ignition on. Measure voltage between harness connector terminals. If battery voltage is present, go to next step. If battery voltage is not present, go to step 19).

10) Disconnect ignition control module 6-pin harness connector. Measure resistance between CKP sensor signal circuit and CKP sensor ground circuit at 6-pin harness connector. If resistance is 700-1300 ohms, leave DVOM connected and go to next step. If resistance is not 700-1300 ohms, go to step 14).

11) Set DVOM to AC scale. Crank engine. If DVOM indicates more than 200 mV, go to next step. If DVOM does not indicate more than 200 mV, go to step 20).

12) Using test light connected to battery voltage, momentarily probe 7X reference signal circuit, and then reference low circuit at 6-pin harness connector. Monitor CKP activity counter on scan tool. If counter increments, go to step 15). If counter does not increment, go to step 17).

CAUTION: Do not leave test light connected to PCM IC circuit for more than 5 seconds. Damage to ignition coil and/or ignition module may result.

13) Turn ignition off. Disconnect PCM. Connect spark tester to spark plug wire with no spark. Turn ignition on. Using test light connected to battery voltage, momentarily probe affected ignition control circuit at PCM harness connector. If spark tester sparks, go to step 16). If spark tester does not spark, go to step 18).

14) Check CKP sensor circuits for short to ground, short to power, faulty connections or opens. Repair as necessary. After repairs, go to step 24). If circuits are okay, go to step 20).

15) Check for faulty connections at ignition control module. Repair as necessary. After repairs, go to step 24). If connections are okay, go to step 21).

16) Check for faulty connections at PCM. Repair as necessary. After repairs, go to step 24). If connections are okay, go to step 23).

17) Check 7X reference signal circuit for short to ground, short to power, open or faulty connection. Repair as necessary. After repairs, go to step 24). If circuit is okay, go to step 23).

18) Check affected ignition control circuit for an open or short. Repair as necessary. After repairs, go to step 24). If circuits are okay, go to step 22).

19) Repair open in ignition feed circuit or ground circuit to ignition control module.

20) Replace CKP sensor. After repairs, go to step 24).

21) Replace ignition control module. After repairs, go to step 24).

22) Replace affected ignition coil. After repairs, go to step 24).

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23) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

24) Attempt to start engine. If engine starts, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. If engine does not start, go to step 2).

Fuel Pump Electrical Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood fuse/relay center. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 21). If test light does not turn on and off, go to step 24).

6) If test light remains illuminated, go to next step. If test light does not illuminate at all, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 28).

8) Disconnect PCM. Check fuel pump relay control circuit for open or short to ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 22).

9) Turn ignition on. If fuel pump operates continuously, go to next step. If fuel pump does not operate continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay. Turn ignition on. If fuel pump operates continuously, go to step 23). If fuel pump does not operate continuously, go to step 27).

11) Check F/P-INJ fuse (20-amp) located in underhood fuse relay center. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Disconnect fuel pump harness connector from rear body harness connector. Check fuel pump power supply circuit for short to ground between fuse and body harness connector. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

13) Lower fuel tank. Check fuel pump harness for damage or grounded circuit. Repair as necessary. After repairs, go to step 29). If harness is okay, go to step 20).

14) Turn ignition off. Disconnect fuel pump relay located in underhood fuse relay center. Turn ignition on. Using test light

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connected to ground, probe fuel pump relay ignition feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 25).

15) Connect fused jumper wire between fuel pump relay ignition feed circuit and fuel pump power supply circuit at relay cavities. If fuel pump operates, go to step 21). If fuel pump does not operate, go to next step.

16) Disconnect fuel pump harness connector from rear body harness. Check fuel pump power supply circuit for open or high resistance between fuel pump relay and rear body harness connector. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

17) Check fuel pump ground circuit for open or high resistance between ground and body pass-through harness connector. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump harness to body pass-through harness connector. Repair as necessary. After repairs, go to step 29). If connections are okay, go to next step.

19) Lower fuel tank. Check fuel pump harness for damage, opens or poor connections. Repair as necessary. After repairs, go to step 29). If harness is okay, go to step 26).

20) Reconnect all components. Install NEW F/P-INJ fuse (20-amp). Using scan tool, command fuel pump on. If fuse blows, go to step 26). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

21) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 29). If connections are okay, go to step 27).

22) Check for poor connections at PCM. Repair as necessary. After repairs, go to step 29). If connections are okay, go to step 28).

23) Repair short to voltage in fuel pump power supply circuit. After repairs, go to step 29).

24) Repair open in fuel pump relay ground circuit. After repairs, go to step 29).

25) Repair fuel pump relay ignition feed circuit. After repairs, go to step 29).

26) Replace fuel pump. After repairs, go to step 29).

27) Replace fuel pump relay. After repairs, go to step 29).

28) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

29) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

Diagnostic Aids

A small amount of resistance in battery feed circuit to PCM may cause a no-start condition. Test battery feed circuit for excessive resistance or corrosion. The PCM grounds will cause a no-start condition only if all are not making good connections. Inspect TP sensor for the following conditions:

* Binding

- * Sticking
- * Intermittent Short
- * Intermittent Open

Refer to DTC P0105 for testing. See appropriate SELF-DIAGNOSTICS article.

The ECT sensor may be skewed within specifications and may not set a DTC. On a cold vehicle, ECT and IAT values should be 5øF or 3øC of each other. On a hot vehicle, let engine cool to ambient temperature, and then test ECT.

The MAP sensor may be skewed within specifications and not set a DTC. Refer to DTC P0105 for testing. See appropriate SELF-DIAGNOSTICS article. If CKP sensor is loose, it may cause an intermittent no-start condition by moving away from the reluctor wheel. Ensure sensor and mating surfaces are clean and tight.

NO START - ENGINE CRANKS OKAY (2.2L - SATURN)

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

General Inspection

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) If any BCM communication or Passlock(R) DTCs (P1630, P1631, P1632, P1626 or U1064) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article, or appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT. If listed DTCs are not set, go to next step.

3) Using scan tool, monitor ignition voltage. If voltage is less than 2 volts, see PCM INPUT CIRCUITS. If voltage is not less than 2 volts, go to next step.

4) If any PCM internal DTCs (P0601 or P0602) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTCs are not set, go to next step.

5) If all 4 injector DTCs (P0201, P0202, P0203 and P0204) are set, repair ignition voltage to injectors. Check INJECTOR fuse (10-amp) located in underhood fuse block. If listed DTCs are not set, go to next step.

6) If any sensor DTCs (P0107, P0108, P0122, P0123, P0530, P0452 or P0453) are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If listed DTCs are not set, go to next step.

7) While cranking engine, monitor CKP active counter with scan tool. If counter increments, go to next step. If counter does not increment, see IGNITION MODULE CIRCUITS.

8) Using scan tool, monitor CAL COMPRESSION OUTPUT. If any 1s are present, go to FUEL SYSTEM CIRCUITS. If no 1s are present, go to IGNITION COIL CIRCUITS.

PCM Input Circuits

1) Check CONTROLS IGN 1 fuse (10-amp) located in underhood

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fuse block. If fuse is okay, go to next step. If fuse is open, check PCM IGN 1 power feed circuit and associated circuits for short to ground. Repair as necessary.

2) Disconnect Blue PCM harness connector. Measure voltage between ground and IGN 1 circuit at PCM harness connector. If battery voltage is present, harness connections or PCM are faulty. If battery voltage is not present, repair open in IGN 1 circuit.

Ignition Module Circuits

1) Disconnect ignition module. Turn ignition on. Measure voltage between ground and ignition module IGN 1 circuit at ignition module harness connector. If battery voltage is present, go to next step. If battery voltage is not present, check EIS fuse (10-amp) located in underhood fuse block, and check IGN 1 circuit for open or short to ground. Repair as necessary.

2) Measure voltage between ignition module IGN 1 circuit and ignition module ground circuit at ignition module harness connector. If battery voltage is present, go to next step. If battery voltage is not present, repair open ground circuit.

3) Using test light connected to 7X reference signal out circuit at ignition module harness connector, momentarily probe negative battery terminal, and then positive battery terminal while monitoring CKP active counter with scan tool. If counter increments, go to next step. If counter does not increment, 7X reference signal out circuit or PCM is faulty. Repair as necessary.

4) Measure resistance between CKP sensor circuits at ignition module. If resistance is 500-900 ohms, go to next step. If resistance is less than 500 ohms, go to step 6). If resistance is greater than 900 ohms, go to step 7).

5) Disconnect CKP sensor. Check for continuity between ground and CKP sensor signal high circuit at CKP sensor harness connector. If continuity is present, repair CKP sensor signal high circuit for short to ground. If continuity is not present, go to step 8).

6) Disconnect CKP sensor. Check for continuity between CKP sensor signal high circuit and low circuit at CKP sensor harness connector. If continuity is present, repair CKP sensor circuits for short together. If continuity is not present, replace CKP sensor.

7) Disconnect CKP sensor. Check for open in CKP sensor signal high circuit and low circuit. Repair as necessary. If circuits are okay, CKP sensor or terminal connections are faulty.

8) Reconnect CKP sensor. Using DVOM set to AC scale, measure voltage between CKP sensor high circuit and low circuit at ignition module harness connector while cranking engine. If AC voltage is greater than 200 mV, ignition module or terminal connections are faulty. If AC voltage is 200 mV or less, check CKP sensor for proper installation. If installation is okay, replace CKP sensor.

Fuel System Circuits

1) Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. If pressure is 50-60 psi (3.5-4.2 kg/cm²), fuel quality may be cause of problem. If fuel pressure is not as specified, go to next step.

2) If pressure is present but not within specification, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM &

COMPONENT TESTING article. If pressure is not present, go to next step.

3) Turn ignition off. Remove fuel pump relay located in left-side instrument panel fuse block. Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at relay cavities. Observe pressure gauge. If pressure is present, go to next step. If pressure is not present, go to step 6).

4) Remove jumper wire. Connect test light between ground and fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump relay on. If test light illuminates, go to next step. If test light does not illuminate, control circuit is shorted to ground or PCM is faulty.

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump relay on. If test light illuminates, replace fuel pump relay. If test light does not illuminate, repair open in fuel pump relay ground circuit.

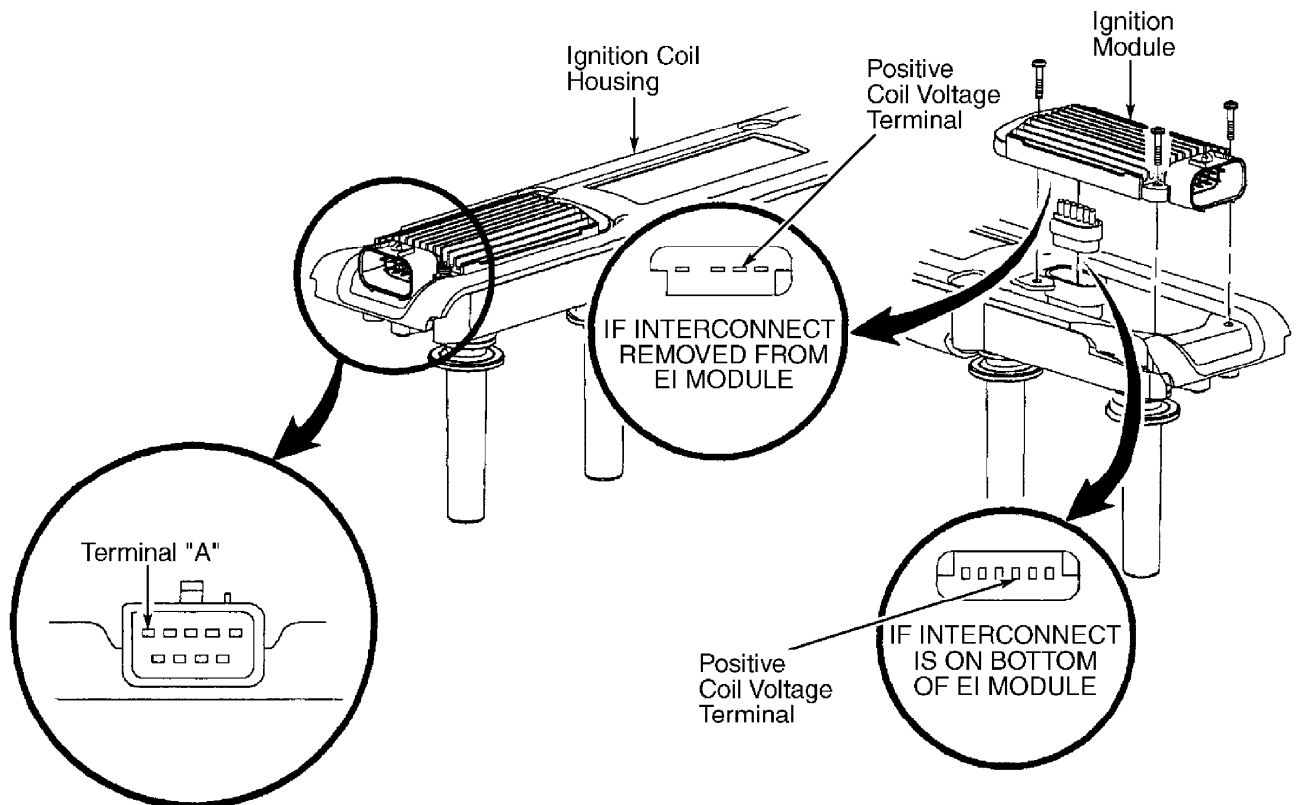
6) Remove jumper wire. Connect test light between ground and fuel pump relay battery feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, check for open FUEL PUMP fuse (15-amp) or battery feed circuit. If fuse is open, check for shorted fuel pump power feed circuit or faulty fuel pump. Repair as necessary.

7) Disconnect fuel pump harness connector. Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at relay cavities. Connect test light between ground and fuel pump power feed circuit at fuel pump harness connector. If test light illuminates, go to next step. If test light does not illuminate, repair open in fuel pump power feed circuit.

8) Connect test light between fuel pump power feed circuit and fuel pump ground circuit at fuel pump harness connector. If test light illuminates, replace fuel pump. If test light does not illuminate, repair open in fuel pump ground circuit.

Ignition Coil Circuits

Turn ignition off. Remove ignition module from ignition coil housing. Measure resistance between terminal "A" of ignition module and positive coil voltage terminal at interconnect on coil housing. See Fig. 1. If continuity is present, replace ignition coil housing. If continuity is not present, terminal connections or ignition module are faulty.



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Fig. 1: Testing Ignition Coil Housing & Ignition Module
Courtesy of General Motors Corp.

NO START - ENGINE CRANKS OKAY (2.4L)

NOTE: Before performing the 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 (VECI) label. Check spark plug boots for cracking, hardness and proper connections.

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

Ignition Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Check for DTCs. If DTC P0601, P0602 or P1629 is present, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If DTCs are not present, go to next step.

3) Crank engine while monitoring CKP activity counter on scan tool. If counter increments, go to next step. If counter does not increment, go to step 9).

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4) Turn ignition on. Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, see FUEL PUMP ELECTRICAL CIRCUIT.

5) Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. If fuel pressure is 52-58 psi (3.7-4.1 kg/cm²), go to next step. If fuel pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

6) Turn ignition off. Remove fuel pump relay located in underhood fuse/relay center. Remove ignition coil/control module assembly. Connect jumper wire between ground and ignition control module assembly. Install Spark Plug Jumper Wire Kit (J 36012-A). Install spark tester on No. 1 spark plug wire. Ground spark plug jumper wire No. 4 (companion cylinder). Crank engine. Repeat for each cylinder, ensuring companion cylinder spark plug jumper wire is grounded for each procedure. If spark is present for all cylinders, go to next step. If spark is not present for all cylinders, go to step 15).

7) Turn ignition off. Check for faulty spark plugs. Repair as necessary. After repairs, go to step 32). If spark plugs are okay, go to next step.

8) Check for basic engine mechanical problems. Repair as necessary. After repairs, go to step 32). If no engine mechanical problems are found, go to step 27).

9) Turn ignition off. Disconnect ignition control module harness connector. Turn ignition on. Measure voltage between ignition control module ground circuit and ignition control module ignition feed circuit at harness connector. If battery voltage is present, go to next step. If battery voltage is not present, go to step 23).

10) Measure voltage between battery ground and CKP sensor ground circuit at ignition control module harness connector. If voltage is present, go to step 25). If voltage is not present, go to next step.

11) Measure resistance between battery negative terminal and CKP sensor ground circuit at ignition control module harness connector. If resistance is infinite, go to next step. If resistance is not infinite, go to step 26).

12) Measure resistance between CKP sensor ground circuit and CKP sensor signal circuit at ignition control module harness connector. If resistance is 500-900 ohms, leave DVOM connected and go to next step. If resistance is not 500-900 ohms, go to step 18).

13) Set DVOM to AC scale. Crank engine. If AC voltage is greater than 200 mV, go to next step. If AC voltage is 200 mV or less, go to step 28).

14) Using test light connected to battery positive terminal, probe 7X reference signal circuit, and then probe reference low circuit at ignition control module harness connector while monitoring CKP activity counter on scan tool. If counter increments, go to step 19). If counter does not increment, go to step 22).

15) Turn ignition off. Remove spark plug jumper wires. Remove ignition coil housing. Disconnect ignition coil connector from ignition control module. Turn ignition on. Measure voltage between ground and coil ignition positive voltage circuit at ignition coil connector. If battery voltage is present, go to next step. If battery

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voltage is not present, go to step 19).

16) Connect test light between battery positive terminal and affected coil circuit at ignition control module. Crank engine. If test light flashes, go to step 24). If test light does not flash, go to next step.

17) Turn ignition off. Disconnect ignition control module harness connector. Connect DVOM between battery positive terminal and affected ignition control output circuit at ignition control module harness connector. If battery voltage is present, go to step 21). If battery voltage is not present, go to step 20).

18) Check CKP sensor circuits for opens or poor connections. Repair as necessary. After repairs, go to step 32). If circuits are okay, go to step 28).

19) Inspect ignition control module harness connector for poor connections. Repair as necessary. After repairs, go to step 32). If connections are okay, go to step 29).

20) Check affected ignition control output circuit for an open or poor connection at PCM. Repair as necessary. After repairs, go to step 32). If circuits are okay, go to step 31).

21) Check affected ignition control input circuit for open or poor connection at ignition control module. Repair as necessary. After repairs, go to step 32). If circuit is okay, go to step 29).

22) Check 7X reference signal circuit for short to ground, short to voltage, open or poor connection. Repair as necessary. After repairs, go to step 32). If circuit is okay, go to step 31).

23) Repair open in ignition control module ground circuit and/or ignition feed circuit. After repairs, go to step 32).

24) Check for open or short to ground in jumper harness between ignition control module and ignition coils. Repair as necessary. After repairs, go to step 32). If jumper harness is okay, go to step 30).

25) Repair short to voltage in CKP sensor ground circuit. After repairs, go to step 32).

26) Repair short to ground in CKP sensor ground circuit. After repairs, go to step 32).

27) Check for the following:

- * Faulty PCM grounds.
- * Stuck TP sensor.
- * Skewed ECT sensor.
- * Skewed or unresponsive MAP sensor.
- * Loose CKP sensor.

Repair as necessary. After repairs, go to step 32).

28) Replace CKP sensor. After repairs, go to step 32).

29) Replace ignition control module. After repairs, go to step 32).

30) Replace both ignition coils. After repairs, go to step 32).

31) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

32) Attempt to start engine. If engine runs, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. If engine does not run, go to

step 2).

Fuel Pump Electrical Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off as commanded, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood fuse/relay center. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at fuel pump relay cavity. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at fuel pump relay cavities. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 21). If test light does not turn on and off, go to step 24).

6) If test light remains illuminated with each scan tool command, go to next step. If test light does not illuminate at all, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 28).

8) Disconnect PCM. Check fuel pump relay control circuit for open or short to ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 22).

9) Turn ignition on. If fuel pump operates continuously, go to next step. If fuel pump does not operate continuously, go to step 27).

10) Turn ignition off. Disconnect fuel pump relay located in underhood fuse relay center. Turn ignition on. If fuel pump operates continuously, go to step 23). If fuel pump does not operate continuously, go to step 27).

11) Check F/P-INJ fuse (15-amp) located in fuse block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Disconnect fuel pump harness connector from rear body harness connector. Check fuel pump power feed circuit between fuse and rear body harness connector for short to ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

13) Lower fuel tank. Check fuel pump harness for damage or grounded circuit. Repair as necessary. After repairs, go to step 29). If harness is okay, go to step 20).

14) Turn ignition off. Disconnect fuel pump relay. Turn ignition on. Using test light connected to ground, probe F/P-INJ fuse voltage circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 25).

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15) Connect fused jumper wire between F/P-INJ fuse voltage circuit and fuel pump power supply circuit at relay cavities. If fuel pump operates, go to step 21). If fuel pump does not operate, go to next step.

16) Disconnect fuel pump harness connector from rear body harness connector. Check fuel pump power supply circuit for open or high resistance between rear body harness connector and fuel pump relay. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

17) Check fuel pump ground circuit for open or high resistance between body pass-through connector and chassis ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump jumper harness to body pass-through connector. Repair as necessary. After repairs, go to step 29). If harness connections are okay, go to next step.

19) Lower fuel tank. Check fuel pump jumper harness for damage, opens or poor connections at fuel pump. Repair as necessary. After repairs, go to step 29). If harness is okay, go to step 26).

20) Reconnect all disconnected components. Install NEW F/P-INJ fuse (15-amp). Using scan tool, command fuel pump on. If fuse blows, go to step 26). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

21) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 29). If connections are okay, go to step 27).

22) Check for poor harness connections at PCM. Repair as necessary. After repairs, go to step 29). If harness connections are okay, go to step 28).

23) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 29).

24) Repair open in fuel pump relay ground circuit. After repairs, go to step 29).

25) Repair fuel pump relay ignition feed circuit. After repairs, go to step 29).

26) Replace fuel pump. After repairs, go to step 29).

27) Replace fuel pump relay. After repairs, go to step 29).

28) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

29) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

NO START - ENGINE CRANKS OKAY (3.0L - CATERA)

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

General Inspection

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Check all fuses in power distribution center located next

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to battery, and FUEL PUMP fuse (20-amp) located in instrument panel fuse block. If any fuses are open, go to step 12). If all fuses are okay, go to next step.

3) Check ECM ground circuit and ground circuit from battery to body for loose connections, corrosion, high resistance or opens. Repair as necessary. After repairs, go to step 13). If circuits are okay, go to next step.

4) Using scan tool, check for DTCs that may cause a no-start condition (theft deterrent, powertrain, engine electrical, etc.). Repair as necessary. If no DTCs are present, go to next step.

5) Using scan tool, monitor theft deterrent status. If status reads CORRECT CODE, go to next step. If status does not read CORRECT CODE, perform SYSTEM OPERATION CHECK. See appropriate DOOR LOCKS & ANTI-THEFT SYSTEMS article.

6) Using scan tool, review data list for MAF, TP, APP, ECT and IAT sensors. Compare sensor values to known good values. If sensor values are normal, go to next step. If sensor values are not normal, diagnose using appropriate DTC diagnostic procedure applicable to faulty sensor. See appropriate SELF-DIAGNOSTICS article.

7) Turn ignition on. Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, see FUEL PUMP ELECTRICAL CIRCUIT.

8) Turn ignition off. Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Using scan tool, command fuel pump on. If pressure is 40-46 psi (2.8-3.2 kg/cm²), go to next step. If pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

9) Check ignition system. See IGNITION CIRCUIT. Repair as necessary. After repairs, go to step 13). If ignition system is okay, go to next step.

10) Check for air leaks in air duct between MAF sensor and throttle body. Check MAF sensor operation by disconnecting sensor and operating engine. If disconnecting sensor corrects no-start condition, replace MAF sensor. After repairs, go to step 13). If no problem is found, go to next step.

11) Check for fouled spark plugs and cause. Check for contaminated fuel, restricted exhaust system or engine mechanical problem. Repair as necessary. After repairs, go to step 13). If no problem is found, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

12) Repair affected fuse related circuit for short to ground. After repairs, go to next step.

13) Using scan tool, clear DTCs. Attempt to start engine. If engine starts, go to next step. If engine does not start, go to step 2).

14) Allow engine to idle and reach normal operating temperature. Using scan tool, check for DTCs. If DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, system is okay.

Fuel Pump Electrical Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

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2) Connect scan tool. Crank engine for several seconds. Check for DTCs. If DTC P0230 is set, diagnose DTC first. See appropriate SELF-DIAGNOSTICS article. If DTC P0230 is not set, go to next step.

3) Using test light connected to ground, probe fuel pump relay battery feed circuit at fuel pump relay harness. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).

4) Ensure fuel pump relay is installed. Turn ignition on. Using test light connected to ground, probe fuel pump power feed circuit at fuel pump relay harness. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 14).

5) Check FUEL PUMP fuse (20-amp) located in fuse block. If fuse is open, go to step 11). If fuse is okay, go to next step.

6) Install FUEL PUMP fuse. Turn ignition on. Using scan tool, command fuel pump relay on. Using test light connected to ground, probe each side of FUEL PUMP fuse. If test light illuminates on each side of fuse, go to next step. If test light does not illuminate on each side of fuse, go to step 12).

7) Turn ignition off. Disconnect fuel pump harness jumper connector. Using test light connected to ground, probe fuel pump power feed circuit at fuel pump harness. Turn ignition on. Using scan tool, command fuel pump relay on. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).

8) Connect test light between fuel pump battery feed circuit and fuel pump ground circuit at fuel pump harness connector (vehicle side). Using scan tool, command fuel pump relay on. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

9) Check condition of circuits in fuel pump jumper harness, and check for poor harness connections at fuel pump and at jumper harness connector. Repair as necessary. After repairs, go to step 16). If harness and connections are okay, go to next step.

10) Ensure all harness connectors are connected. Turn ignition on. Using scan tool, command fuel pump relay on. If fuel pump runs, go to step 16). If fuel pump does not run, go to step 15).

11) Repair short to ground in fuel pump power feed circuit. After repairs, go to step 16).

12) Repair open in fuel pump power feed circuit. After repairs, go to step 16).

13) Repair open in fuel pump ground circuit. After repairs, go to step 16).

14) Replace fuel pump relay. After repairs, go to step 16).

15) Replace fuel pump. After repairs, go to next step.

16) Using scan tool, clear DTCs. Attempt to start engine. If engine starts, go to next step. If engine does not start, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article.

17) Allow engine to idle and reach normal operating temperature. Using scan tool, check for DTCs. If any DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, system is okay.

Ignition Circuit

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1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect harness connector from affected coil pack (if known). Using test light connected to battery positive terminal, probe ground circuit at harness connector. Repeat for other bank if necessary. If test light illuminates, go to next step. If test light does not illuminate, go to step 12).

3) Turn ignition on. Using test light connected to ground, probe coil pack ignition feed circuit at harness connector. Repeat for other bank if necessary. If test light illuminates, go to next step. If test light does not illuminate, go to step 13).

4) Turn ignition off. Remove affected coil pack from engine. Reconnect coil pack harness connector. Disconnect fuel injector harness connector. Install spark tester into one coil, or affected coil (if known). Using scan tool, operate ignition coil. Repeat procedure for each cylinder. If spark is present for each cylinder, go to next step. If spark is not present for each cylinder, go to step 8).

5) Turn ignition off. Remove coil pack. Set DVOM to ohms scale. Connect negative lead to pin No. 1 (coil ground circuit) and positive lead to inside of spark plug boot. Continuity should be present. Reverse test leads. Continuity should not be present. Repeat procedure for both coils. If both coils test as specified, go to next step. If both coils do not test as specified, go to step 14).

6) Measure resistance between pin No. 2 (coil ignition feed circuit) and pins No. 3, 4 and 5 (ignition control circuits) at affected ignition coil. If resistance is .38-.46 ohm for each pin, go to next step. If resistance is not as specified, go to step 14).

7) Check spark plugs for damage or improper gap. If a problem is found, go to step 18). If spark plugs are okay, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

NOTE: Do not substitute a standard test light for an injector test light. Impedance of an injector test light is similar to an ignition coil. The use of a standard test light may produce inaccurate results.

8) Turn ignition off. Disconnect harness connector from affected coil. Connect injector test light between supply voltage circuit and control circuit of affected cylinder. Turn ignition on. If injector test light illuminates, go to step 10). If injector test light does not illuminate, go to next step.

9) Using scan tool, enable ignition coil of affected cylinder. If injector test light flashes, go to step 14). If injector test light does not flash, go to step 11).

10) Turn ignition off. Disconnect ECM harness connector C1. Turn ignition on. If injector test light turns off, go to step 16). If injector test light does not turn off, go to step 15).

11) Test affected ignition control circuit for open or short to voltage. Repair as necessary. After repairs, go to step 19). If circuits are okay, go to step 16).

12) Repair open in ignition coil ground circuit. After

repairs, go to step 19).

13) Repair open or short in coil ignition feed circuit. After repairs, go to step 19).

14) Replace faulty coil pack. After repairs, go to step 19).

NOTE: A short to ground in ignition coil control circuit may damage ignition coil. Test operation of ignition coil after completing circuit repairs.

15) Repair short to ground in ignition coil control circuit. After repairs, go to step 19).

16) Check for faulty ECM harness connections. Repair as necessary. After repairs, go to step 19). If connections are okay, go to next step.

17) Replace ECM. Perform ECM relearn procedures. After repairs, go to step 19).

18) Replace faulty spark plugs. After repairs, go to next step.

19) Start engine and allow it to reach normal operating temperature. Using scan tool, check for DTCs. If DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, system is okay.

NO START - ENGINE CRANKS OKAY (3.0L - SATURN)

NOTE: Before performing the 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 (VECI) label. Check spark plug boots for cracking, hardness and proper connections.

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

ECM Input Circuits

1) Ensure vehicle has adequate fuel. Connect scan tool. Attempt to start engine. If engine starts, go to step 7). If engine does not start, go to next step.

2) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. Attempt to start engine. If engine RPM is detected, go to next step. If engine RPM is not detected, CKP sensor circuit is at fault. Diagnose using diagnostic procedure for DTC P0335. See appropriate SELF-DIAGNOSTICS article.

3) If any injector, EGR solenoid, MAF, fuel pump relay or ECM internal DTCs are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, go to next step.

4) Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Cycle ignition switch. If pressure is 38-44 psi (2.7-3.1 kg/cm²), go to next step. If pressure is not as specified, see FUEL DELIVERY

SYSTEM.

5) Check IGN fuse (15-amp) located in underhood fuse block. Replace as necessary. Remove FUEL PUMP fuse (15-amp) located in underhood fuse block. Crank engine for 5 seconds. Using scan tool, run ignition coil test while listening for spark at appropriate coils. If spark is present at each cylinder, go to next step. If spark is not present at each cylinder, see IGNITION SYSTEM.

6) Check for fouled spark plugs, restricted air intake, restricted exhaust or engine mechanical failure. Repair as necessary.

7) Using scan tool, monitor engine misfire counter. If current misfire counters are counting up, diagnose using diagnostic procedures for specific or random DTCs. See appropriate SELF-DIAGNOSTICS article. If current misfire counters are not counting up, problem is intermittent. See appropriate TROUBLE SHOOTING - NO CODES article.

Fuel Delivery System

1) If fuel pressure is present but out of specification, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is not present, check FUEL PUMP fuse (15-amp) located in underhood junction block. Replace as necessary and retest. If fuse is okay, go to next step. If fuse continuously blows, repair short to ground in fuel pump relay battery feed circuit or fuel pump power feed circuit.

2) Turn ignition on. Remove fuel pump relay located in left-side instrument panel fuse block. Install known-good relay, or jumper fuel pump relay battery feed circuit and fuel pump power feed circuit together at relay cavities. Using scan tool, command fuel pump relay on. If fuel pump runs, terminal connections or fuel pump relay are faulty. If fuel pump does not run, go to next step.

3) Connect test light between fuel pump relay ground circuit and fuel pump relay battery feed circuit at relay cavities in fuse block. If test light illuminates, go to next step. If test light does not illuminate, repair open battery feed circuit.

4) Turn ignition on. Connect scan tool. Raise and support vehicle. Disconnect 8-pin fuel tank unit in-line harness connector. Connect test light between fuel pump power feed circuit and fuel pump ground circuit at in-line harness connector (engine side). Using scan tool, command fuel pump relay on. If test light illuminates, terminal connections, fuel pump harness or fuel pump are faulty. Repair as necessary. If test light does not illuminate, go to next step.

5) Connect test light between chassis ground and fuel pump power feed circuit at fuse block. Using scan tool, command fuel pump relay on. If test light illuminates, repair open in fuel pump ground circuit. If test light does not illuminate, repair open in fuel pump battery feed circuit.

Ignition System

1) If spark is not present at a specific cylinder, go to next step. If spark is not present at all 3 cylinders at a specific ignition coil, go to step 4). If spark is not present at all, go to step 6).

2) Disconnect appropriate ignition control module harness connector. Connect test light between battery positive terminal and

ignition coil control circuit in question. Using scan tool, command appropriate ignition coil on. If test light does not illuminate, go to next step. If test light flashes, terminal connections or ignition control module is faulty. If test light remains illuminated, ignition coil control circuit is shorted to ground, or ECM is faulty.

3) Connect test light between ground and ignition coil control circuit in question. If test light illuminates, control circuit is shorted to voltage. If test light does not illuminate, control circuit is open, or terminal connections or ECM is faulty.

4) Turn ignition off. Disconnect appropriate ignition control module harness connector. Turn ignition on. Connect test light between ignition control module ignition feed circuit and ignition control module ground circuit at ignition control module harness connector. If test light illuminates, go to next step. If test light does not illuminate, repair open in ignition feed circuit.

5) Connect test light between engine ground circuit at ignition control module harness connector and battery positive terminal. If test light illuminates, terminal connections or ignition control module are faulty. If test light does not illuminate, repair open in engine ground circuit.

6) Engine ground circuit or IGN fuse (15-amp) is faulty. If fuse is at fault and continues to blow, an ignition control module is shorted to ground. Repair as necessary.

NO START - ENGINE CRANKS OKAY (3.1L & 3.4L)

NOTE: Before performing the following tests, check battery condition, engine cranking speed and for adequate fuel in tank. After fault is isolated and repairs are completed, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article.

General Inspection

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

NOTE: If any engine or body-related DTCs are set, diagnose them first. See appropriate SELF-DIAGNOSTICS article or appropriate BODY CONTROL MODULE article in ACCESSORIES & EQUIPMENT.

2) Turn ignition on. Using scan tool, command fuel pump on and off. If fuel pump runs when commanded, go to next step. If fuel pump does not run when commanded, see FUEL PUMP ELECTRICAL CIRCUIT.

3) Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. If pressure is 52-59 psi (3.7-4.1 kg/cm²), go to next step. If pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

4) Disconnect CKP sensor harness connector. Using scan tool, monitor 3X CKP sensor parameter while cranking engine. If scan tool indicates 3X signal, go to next step. If scan tool does not indicate 3X signal, see IGNITION SYSTEM.

5) Reconnect CKP sensor harness connector. Remove F/INJR fuse

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(15-amp) located in underhood accessory wiring junction block. Using spark tester, check for spark at each coil tower while cranking engine. If spark is present, go to step 7). If spark is not present, see IGNITION SYSTEM.

6) Reinstall F/INJR fuse. Disconnect fuel injector in-line harness connector. Connect Injector Load Tester (J 34730-380) and Harness Adapter (J 34730-410). Observe load tester while cranking engine. If LEDs flash for all cylinders, go to next step. If LEDs do not flash for all cylinders, test fuel injectors. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

7) Check for air intake or exhaust system leaks or restrictions. Check for engine mechanical problems. Repair as necessary. After repairs, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. If no problems are found, go to step 2).

Ignition System

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Disconnect 24X CKP sensor. Using scan tool, monitor 3X reference parameter while cranking engine. If 3X reference signal is present, go to next step. If 3X reference signal is not present, go to step 10).

3) Reconnect 24X CKP sensor. Using spark tester, check for spark at each cylinder. If any cylinder does not indicate spark, go to next step. If all cylinders indicate spark, go to step 7).

4) Check spark plugs, spark plug wires and ignition coils in question for short to ground or carbon tracking. Repair as necessary. If no problem is found, go to next step.

5) Measure resistance of spark plug wires in question. Resistance should be no greater than 600 ohms per foot. Repair as necessary. If resistance is okay, go to next step.

6) Switch ignition coil in question with known-good ignition coil. If fault follows affected ignition coil, replace ignition coil. If fault does not follow affected ignition coil, go to step 14).

7) Check spark plug wires for proper routing and firing order. Repair as necessary. If no problem is found, go to next step.

8) Using DVOM, check spark plugs for internal short to ground. Repair as necessary. If spark plugs are okay, go to next step.

9) Remove spark plugs. Check for damage and replace as necessary.

10) Reconnect 24X CKP sensor. Disconnect 2-pin ignition control module harness connector. Turn ignition on. Using test light connected to ground, probe ignition control module ignition feed circuit at ignition control module harness connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 16).

11) Connect test light between ignition control module ignition feed circuit and ignition control module ground circuit at ignition control module harness connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 19).

12) Disconnect 7X CKP sensor harness connector from ignition control module. 7X CKP connector is 2-pin with Purple and Yellow

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wires. Using test light connected to battery positive terminal, probe 7X reference high circuit, and then 7X reference low circuit at harness connector. If test light illuminates for either circuit, go to step 17). If test light does not illuminate for either circuit, go to next step.

13) Using test light connected to ground, probe 7X reference high circuit, and then 7X reference low circuit at harness connector. If test light illuminates for either circuit, go to step 18). If test light does not illuminate for either circuit, go to next step.

14) Ensure battery voltage is within specification. Turn ignition off. Using DVOM set to AC duty cycle percent, connect leads between 7X reference high and low circuits at ignition control module harness connector. Monitor DVOM while cranking engine. If AC duty cycle is indicated, go to step 20). If AC duty cycle is not indicated, go to next step.

15) Check 7X CKP sensor circuits for opens or short together. Repair as necessary. If circuits are okay, go to step 21).

16) Repair open or short to ground in ignition control module ignition feed circuit.

17) Repair short to ground in 7X reference circuit which illuminated test light.

18) Repair short to voltage in 7X reference circuit which illuminated test light.

19) Repair open in ignition control module ground circuit.

20) Replace ignition control module.

21) Replace 7X CKP sensor.

Fuel Pump Electrical Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump on. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump on. If test light turns on and off, go to step 19). If test light does not turn on and off, go to step 22).

6) If test light remains illuminated, go to next step. If test light does not remain illuminated, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 26).

8) Disconnect PCM. Check fuel pump relay control circuit for

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open or short to ground. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 20).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. If fuel pump runs continuously, go to step 21). If fuel pump does not run continuously, go to step 25).

11) Check F/PMP fuse (15-amp) located in underhood accessory wiring junction block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Remove fuel pump access panel (if equipped; fuel tank may need to be lowered). Check for short to ground in fuel pump power feed circuit between fuel pump and fuse. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

13) Reconnect all components. Install NEW F/PMP fuse. Using scan tool command fuel pump on. If fuse blows, go to step 24). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. Using test light connected to ground, probe fuel pump relay battery feed circuit at fuel pump relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

15) Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at fuel pump relay cavities. If fuel pump runs, go to step 19). If fuel pump does not run, go to next step.

16) Remove fuel pump access panel. Check fuel pump power feed circuit for open or high resistance between fuel pump and fuel pump relay. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

17) Check fuel pump ground circuit for open or high resistance. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 24).

19) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 25).

20) Check for poor connections at PCM. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 26).

21) Repair short to voltage in fuel pump power supply circuit. After repairs, go to step 27).

22) Repair open in fuel pump relay ground circuit. After repairs, go to step 27).

23) Repair fuel pump relay battery feed circuit. After repairs, go to step 27).

24) Replace fuel pump. Replace F/PMP fuse (15-amp) if necessary. After repairs, go to step 27).

25) Replace fuel pump relay. After repairs, go to step 27).

26) Replace PCM. Perform PCM relearn procedures. After

repairs, go to next step.

27) Operate system and verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

NO START - ENGINE CRANKS OKAY (3.5L)

NOTE: No-start/ignition system diagnosis information is not available. Manufacturer provides no-start/fuel pump electrical circuit diagnosis only.

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

General Inspection

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition on. If MIL is illuminated, go to next step. If MIL is not illuminated, go to step 12).

3) Using scan tool, check for DTCs. If DTCs are set, diagnose DTCs first. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, go to next step.

NOTE: Ensure ignition feed circuits to and from IGN MAIN relay are okay.

4) Check F/INJR fuse (15-amp) and INJR fuse (15-amp) located in underhood accessory wiring junction block. If either fuse is open, go to step 13). If both fuses are okay, go to next step.

5) Using scan tool, check engine coolant temperature. If scan tool reading is close to actual engine coolant temperature, go to next step. If scan tool reading is not close to actual engine coolant temperature, go to step 10).

6) Using scan tool, check TP sensor angle with throttle closed. If TP sensor angle is greater than 2 percent, go to step 11). If TP sensor angle is not greater than 2 percent, go to next step.

7) Turn ignition off. Wait 15 seconds. Turn ignition on. Fuel pump should run for about 2 seconds. If fuel pump runs, go to next step. If fuel pump does not run, see FUEL PUMP ELECTRICAL CIRCUIT.

8) Turn ignition off. Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Check fuel pressure. If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

9) Check for fouled spark plugs. Check for air leaks in air intake system. Repair as necessary. If MAF sensor is at fault, disconnecting MAF sensor will cause PCM to default to calculated airflow. If engine starts with sensor disconnected, replace MAF sensor. After repairs, go to step 14). If no problem is found, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

10) ECT sensor is faulty (shifted). With a completely cool

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engine, ECT and IAT sensor values should be within a few degrees of each other. Replace ECT sensor. After repairs, go to step 14).

11) Check for out-of-range TP sensor. TP sensor value should be near zero percent at closed throttle, and near 100 percent at WOT. TP sensor value should increase smoothly as throttle is opened. Check for poor sensor harness connections and binding linkage. For additional information, refer to diagnostic procedure for DTC P0121. See appropriate SELF-DIAGNOSTICS article. Repair as necessary. After repairs, go to step 14).

12) Repair ignition 1 power circuit to PCM. After repairs, go to step 14).

13) Repair short to ground in circuit with open fuse. After repairs, go to next step.

14) Using scan tool, clear DTCs. Attempt to start engine. If engine starts, go to next step. If engine does not start, check for engine mechanical problems. Repair as necessary.

15) Allow engine to reach normal operating temperature. Using scan tool, check for DTCs. If any DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, system is okay.

Fuel Pump Electrical Circuit

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and ground circuit at relay cavities. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 19). If test light does not turn on and off, go to step 22).

6) If test light remains illuminated with each command, go to next step. If test light does not turn on at all, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 26).

8) Disconnect PCM. Check fuel pump relay control circuit for open or short to ground. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 20).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. If fuel

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pump runs continuously, go to step 21). If fuel pump does not run continuously, go to step 25).

11) Check F/PMP fuse (15-amp) located in underhood accessory wiring junction block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Remove fuel pump access panel. Check for short to ground in fuel pump power feed circuit between fuel pump and fuse. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

13) Reconnect all components. Install NEW F/PMP fuse. Using scan tool, command fuel pump on. If fuse blows, go to step 24). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Turn ignition off. Disconnect fuel pump relay located in underhood accessory wiring junction block. Turn ignition on. Using test light connected to ground, probe fuel pump relay battery feed circuit at fuel pump relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

15) Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at fuel pump relay cavities. If fuel pump runs, go to step 19). If fuel pump does not run, go to next step.

16) Remove fuel pump access panel. Check fuel pump power feed circuit for open or high resistance between fuel pump and fuel pump relay. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

17) Check fuel pump ground circuit for open or high resistance. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 24).

19) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 25).

20) Check for poor connections at PCM. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 26).

21) Repair short to voltage in fuel pump power supply circuit. After repairs, go to step 27).

22) Repair open in fuel pump relay ground circuit. After repairs, go to step 27).

23) Repair fuel pump relay battery feed circuit. After repairs, go to step 27).

24) Replace fuel pump. Replace F/PMP fuse (15-amp) if necessary. After repairs, go to step 27).

25) Replace fuel pump relay. After repairs, go to step 27).

26) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

27) Operate system and verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

NO START - ENGINE CRANKS OKAY (3.8L)

NOTE: Before performing the following tests, check battery condition, engine cranking speed and for adequate fuel in tank. After fault is isolated and repairs are completed, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article.

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 (VECI) 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

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Check ignition control module 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. If fuses are okay, go to next step.

3) Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, see FUEL PUMP ELECTRICAL CIRCUIT (VIN K) or FUEL PUMP ELECTRICAL CIRCUIT (VIN 1).

4) Turn ignition off. Install fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. 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 next step. If fuel pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

5) Turn ignition off. Remove fuel pressure gauge. Connect scan tool. Turn ignition on. Using scan tool, select ENGINE DATA 1. Observe engine RPM while cranking engine. If scan tool indicates engine RPM, go to step 17). If scan tool does not indicate engine RPM, go to next step.

6) Turn ignition off. Disconnect ignition control module harness connector. Turn ignition on. Connect test light between ignition positive feed circuit and ground circuit at ignition control module harness connector. If test light illuminates, go to step 8). If test light does not illuminate, go to next step.

7) Leave ignition control module harness connector disconnected. Using test light connected to ground, probe ignition positive feed circuit at ignition control module harness connector. If test light illuminates, go to step 39). If test light does not illuminate, go to step 40).

8) Turn ignition off. Reconnect ignition control module harness connector. Disconnect 18X CKP sensor harness connector. Turn ignition on. Measure voltage between 18X CKP sensor feed circuit and CKP sensor ground circuit at CKP sensor harness connector. If voltage is near battery voltage, go to next step. If voltage is not near

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battery voltage, go to step 11).

9) Measure voltage between 18X CKP sensor signal circuit and CKP sensor ground circuit at CKP sensor harness connector. If voltage is 6-8 volts, go to next step. If voltage is not 6-8 volts, leave DVOM connected and go to step 14).

10) Check for poor connections at CKP sensor. Repair as necessary. If connections are okay, go to step 41).

11) Measure voltage between engine ground and 18X CKP sensor feed circuit at CKP sensor harness connector. If voltage is near battery voltage, go to next step. If voltage is not near battery voltage, go to step 13).

12) Turn ignition off. Leave CKP sensor harness connector disconnected. Disconnect ignition control module harness connector. Check for open in CKP sensor ground circuit. Repair as necessary. If ground circuit is okay, go to step 38).

13) Turn ignition off. Leave 18X CKP sensor harness connector disconnected. Disconnect ignition control module harness connector. Check 18X CKP sensor feed circuit for open or short to ground. Repair as necessary. If circuit is okay, go to step 38).

14) Turn ignition off. Disconnect ignition control module harness connector. Turn ignition on. If DVOM displays battery voltage, go to next step. If DVOM does not display battery voltage, go to step 16).

15) Locate and repair short to voltage in 18X CKP sensor signal circuit.

16) Turn ignition off. Check 18X CKP sensor signal circuit for open, short to chassis ground or short to sensor ground. Repair as necessary. If signal circuit is okay, go to step 38).

17) Turn ignition off. Disconnect all fuel injector harness connectors. Turn ignition on. Connect fuel injector test light to each fuel injector harness connector. If test light illuminates for any of the injectors, go to next step. If test light does not illuminate for any injector, go to step 19).

18) Leave fuel injector harness connectors disconnected. Turn ignition off. Disconnect PCM. Turn ignition on. Connect fuel injector test light to each fuel injector harness connector. If test light illuminates for any of the injectors, go to step 43). If test light does not illuminate for any injector, go to step 46).

19) Leave fuel injector harness connectors disconnected. Connect fuel injector test light to a fuel injector harness connector and crank engine. Repeat for each fuel injector. If test light flashes for each fuel injector, go to step 24). If test light does not flash for each fuel injector, go to next step.

20) If test light flashed for any fuel injector, go to next step. If test light did not flash for any fuel injector, go to step 22).

21) Turn ignition off. Leave fuel injector harness connectors disconnected. Disconnect PCM. Check for open in fuel injector control circuits associated with fuel injector circuit that did not flash test light. Repair as necessary. If fuel injector circuits are okay, go to step 44).

22) Leave fuel injector harness connectors disconnected. Turn ignition on. Using test light connected to ground, probe ignition positive feed circuit to each fuel injector. If test light

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illuminates, go to step 24). If test light does not illuminate, go to next step.

23) Locate and repair open in ignition positive feed circuit to fuel injector.

24) Turn ignition off. Install Spark Tester (J 26792) to cylinder No. 1, 2 and 3 (one at a time). Connect 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 at all cylinders, go to step 34). If spark is not present at all cylinders, go to next step.

25) If spark is present at any cylinder, go to step 30). If spark is not present at any cylinder, go to next step.

26) Turn ignition off. Disconnect 18X CKP sensor harness connector. Turn ignition on. Measure voltage between ground and CKP sync signal at CKP sensor harness connector. If voltage is 6-8 volts, go to next step. If voltage is not 6-8 volts, go to step 28).

27) Check for poor connections at CKP sensor harness connector. Repair as necessary. If connections are okay, go to step 41).

28) Turn ignition off. Disconnect ignition control module harness connector. Turn ignition on. Check CKP sensor sync signal circuit for short to voltage or short to 18X CKP sensor feed circuit. Repair as necessary. If sync signal circuit is okay, go to next step.

29) Turn ignition off. Check CKP sensor sync signal circuit for short to chassis ground or sensor ground. Repair as necessary. If sync signal circuit is okay, go to step 38).

30) Inspect ignition coils and spark plug wires associated with cylinders that did not indicate spark. Repair as necessary. If ignition coils and spark plug wires are okay, go to next step.

31) Measure ignition coil secondary resistance. If resistance is 5000-8000 ohms, go to next step. If resistance is not 5000-8000 ohms, replace ignition coil.

32) Measure resistance of spark plug wires associated with cylinders that did not indicate spark. If resistance is 1000-1500 ohms per foot, go to next step. If resistance is greater than specified, replace spark plug wires.

33) Remove ignition coils associated with cylinders that did not indicate spark. Connect test light across ignition coil primary circuit associated with cylinders that did not indicate spark. Crank engine and observe test light. If test light flashes continuously, go to step 45). If test light does not flash continuously, go to step 42).

34) Remove spark plugs from all cylinders. Inspect spark plugs for excessive fouling. If spark plugs are fouled, check engine mechanical condition. Repair as necessary. If spark plugs are okay, go to next step.

35) Check for the following:

- * Short between 18X CKP and CKP sync signal inputs to ignition control module.
- * Short between 18X and 3X reference signal inputs to PCM.
- * Stuck TP sensor.
- * Faulty ECT sensor.
- * Unresponsive MAP sensor.

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- * Faulty MAF sensor.
- * Faulty IAC valve.

Repair as necessary. If no problem is found, go to next step.

36) Test fuel for contamination. Clean fuel system if necessary. If fuel is okay, go to next step.

37) 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.

38) Check for poor connections at ignition control module harness connector. Repair as necessary. If no problem is found, go to step 42).

39) Locate and repair open in ignition control module ground circuit.

40) Locate and repair open in ignition feed circuit to ignition control module.

41) Replace 18X CKP sensor.

42) Replace ignition control module.

43) Locate and repair short to ground in fuel injector control circuits associated with test light that remained illuminated.

44) Check for poor connections at PCM. Repair as necessary. If connections are okay, go to step 46).

45) Replace ignition coils associated with cylinders that did not indicate spark.

46) Replace PCM. Perform PCM relearn procedures.

Fuel Pump Electrical Circuit (VIN K)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump relay on. If test light turns on and off, go to step 19). If test light does not turn on and off, go to step 22).

6) If test light remains illuminated with each command, go to next step. If test light does not remain illuminated with each command, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 26).

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8) Disconnect PCM. Check fuel pump relay control circuit for open or short to ground. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 20).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. If fuel pump runs continuously, go to step 21). If fuel pump does not run continuously, go to step 25).

11) Check F/PMP fuse (20-amp) located in underhood fuse block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Remove fuel pump access panel. Check for short to ground in fuel pump power feed circuit between F/PMP fuse and fuel pump. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

13) Reconnect all components. Install NEW F/PMP fuse. Using scan tool, command fuel pump relay on. If fuse blows, go to step 24). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay ignition feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

15) Connect fused jumper wire between fuel pump relay ignition feed circuit and fuel pump power feed circuit at relay cavities. If fuel pump runs, go to step 19). If fuel pump does not run, go to next step.

16) Remove fuel pump access panel. Check for open or high resistance in fuel pump power feed circuit between fuel pump relay and fuel pump. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

17) Check for open or high resistance in fuel pump ground circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 24).

19) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 25).

20) Check for poor connections at PCM. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 26).

21) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 27).

22) Repair open in fuel pump relay ground circuit. After repairs, go to step 27).

23) Repair open in fuel pump relay ignition feed circuit. After repairs, go to step 27).

24) Replace fuel pump. After repairs, go to step 27).

25) Replace fuel pump relay. After repairs, go to step 27).

26) Replace PCM. Perform PCM relearn procedures. After

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repairs, go to next step.

27) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

Fuel Pump Electrical Circuit (VIN 1)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Connect fuse jumper wire between battery positive terminal and fuel pump power feed circuit at relay cavity. Check fuel pressure. If pressure is 41-47 psi (2.9-3.3 kg/cm²), go to next step. If pressure is not as specified, go to step 8).

3) Disconnect jumper wire. Connect test light between fuel pump relay battery feed circuit and fuel pump relay ground circuit at relay cavities. Turn ignition on. If test light illuminates, go to next step. If test light does not illuminate, go to step 7).

4) Using test light connected to ground, probe fuel pump power feed circuit at fuel pump relay cavity. If test light illuminates, go to step 5). If test light does not illuminate, go to step 6).

5) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 13).

6) Check for poor fuel pump relay connections. Repair as necessary. After repairs, go to step 13). If connections are okay, go to step 11).

7) Replace underhood fuse block. After repairs, go to step 13).

8) Leave jumper wire connected. Disconnect fuel pump harness connector. Using test light connected to ground, probe fuel pump power feed circuit at fuel pump harness connector (engine side). If test light illuminates, go to step 10). If test light does not illuminate, go to next step.

9) Check for open or short to ground in fuel pump power feed circuit. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 12).

10) Check for open in fuel pump ground circuit. Repair as necessary. After repairs, go to step 13). If circuit is okay, go to step 12).

11) Replace fuel pump relay. After repairs, go to step 13).

12) Replace fuel pump. After repairs, go to next step.

13) Reconnect all components. Leave fuel pressure gauge connected. Turn ignition on. Check fuel pressure. If pressure is 41-47 psi (2.9-3.3 kg/cm²), system is okay. If pressure is not as specified, go to step 2).

NO START - ENGINE CRANKS OKAY (4.6L)

NOTE: Before performing the 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 (VECI) 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

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) If DTCs P0335, P0340 and P0385 are set, go to next step. If listed DTCs are not set, go to step 4).

3) Check for short to ground in CKP and CMP ignition feed circuits, or shorted CKP or CMP sensors. Repair as necessary. After repairs, go to step 12).

4) Check all fuses supplying ignition voltage to each ignition control assembly and fuel injectors. If a fuse is open, repair short to ground in affected circuit and replace fuse. After repairs, go to step 12). If fuses are okay, go to next step.

5) Using scan tool, check for skewed TP sensor or ECT sensor. Check for skewed or unresponsive MAP sensor. Repair as necessary. After repairs, go to step 12). If sensors are okay, go to next step.

6) Turn ignition off. Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. Check fuel pressure. If pressure is 41-47 psi (2.9-3.3 kg/cm²), go to step 8). If pressure is not as specified, go to next step.

7) If fuel pressure is indicated, check fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is not indicated, see FUEL PUMP ELECTRICAL CIRCUIT.

8) Check for faulty MAF sensor. Replace if necessary. After repairs, go to step 12). If MAF sensor is okay, go to next step.

9) Check for fouled spark plugs. Replace if necessary. After repairs, go to step 12). If spark plugs are okay, go to next step.

10) Check for faulty splice connection in battery feed circuit to both ignition control module assemblies. Repair as necessary. After repairs, go to step 12). If circuit is okay, go to next step.

11) Check for engine mechanical problems. Repair as necessary. After repairs, go to next step. If no problem is found, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

12) Using scan tool, clear DTCs. Attempt to start engine. If engine starts and runs, go to next step. If engine does not start, go to step 2).

13) Allow engine to reach normal operating temperature. Using scan tool, check for DTCs. If any DTCs set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, system is okay.

Fuel Pump Electrical Circuit

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1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in rear fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 19). If test light does not turn on and off, go to step 22).

6) If test light remains illuminated with each command, go to next step. If test light does not illuminate at all, go to step 8).

7) Disconnect PCM. Check for short to voltage in fuel pump relay control circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 26).

8) Disconnect PCM. Check for open or short to ground in fuel pump relay control circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 20).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in rear fuse block. Turn ignition on. If fuel pump runs continuously, go to step 21). If fuel pump does not run continuously, go to step 25).

11) Check F/PMP fuse (20-amp) located in rear fuse block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Remove fuel pump access panel. Check for short to ground in fuel pump power feed circuit between fuel pump and fuse. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

13) Reconnect all components. Install NEW F/PMP fuse. Using scan tool, command fuel pump relay on. If fuse blows, go to step 24). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Turn ignition off. Disconnect fuel pump relay located in rear fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay battery feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

15) Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at relay cavities. If fuel pump runs, go to step 19). If fuel pump does not run, go to next step.

16) Remove fuel pump access panel. Check for open or high resistance in fuel pump power feed circuit between fuel pump relay and

fuel pump. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

17) Check for open, high resistance or poor connection in fuel pump ground circuit at ground splice connector. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 24).

19) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 25).

20) Check for poor PCM harness connections. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 26).

21) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 27).

22) Repair open in fuel pump relay ground circuit. After repairs, go to step 27).

23) Repair open in fuel pump relay battery feed circuit. After repairs, go to step 27).

24) Replace fuel pump. After repairs, go to step 27).

25) Replace fuel pump relay. After repairs, go to step 27).

26) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

27) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

NO START - ENGINE CRANKS OKAY (5.7L)

NOTE: Before performing the 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 (VECI) 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 ("F" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Crank engine for 15 seconds. If any DTCs set, diagnose them first. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, go to next step.

3) Using scan tool, monitor VTD fuel enabled status. If scan tool displays ACTIVE, diagnose using diagnostic procedure for DTC

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P1626. See appropriate SELF-DIAGNOSTICS article. If scan tool does not display ACTIVE, go to next step.

4) Using scan tool, monitor engine speed while cranking engine. If scan tool indicates engine RPM, go to next step. If scan tool does not indicate engine RPM, go to step 6).

5) Turn ignition on. Using test light connected to ground, probe terminals of the following fuses located in underhood electrical center No. 2:

- * A/C CRUISE
- * ENG CTRL
- * ENG SEN
- * INJR1
- * INJR2

If test light illuminates on both sides of all fuses, go to step 9). If test light does not illuminate, diagnose ignition relay circuit. See IGNITION RELAY CIRCUIT (5.7L - "F" BODY) under BASIC IGNITION SYSTEM CHECKS.

6) Disconnect CKP sensor harness connector. Measure voltage between ground and ignition feed circuit at CKP sensor harness connector. If voltage is near battery voltage, go to step 13). If voltage is not near battery voltage, go to next step.

7) Disconnect CMP sensor harness connector. Measure voltage between ground and ignition feed circuit at CMP sensor connector. If voltage is near battery voltage, go to step 14). If voltage is not near battery voltage, go to next step.

8) Check for short to ground in CKP and CMP sensor ignition feed circuits. Repair as necessary. After repairs, go to step 16). If circuits are okay, go to step 15).

9) Using scan tool, monitor engine coolant temperature. If scan tool value is close to actual engine temperature, go to next step. If scan tool value is not close to actual engine temperature, diagnose using diagnostic procedure for DTC P0118. See appropriate SELF-DIAGNOSTICS article.

10) Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, diagnose fuel pump relay circuit. See FUEL PUMP ELECTRICAL CIRCUIT ("F" BODY).

11) Turn ignition off. Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. Check fuel pressure. If pressure is 55-61 psi (3.8-4.2 kg/cm²), go to next step. If pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

12) Check for air leaks in ducts between MAF sensor and throttle body. Ensure throttle angle is zero percent at closed throttle. A faulty MAF sensor may cause no-start or stalling after start condition. Disconnecting MAF sensor will cause PCM to default to speed density (MAP, IAT, RPM) to calculate load and intake airflow. If fault condition is corrected by disconnecting MAF sensor, or connections are okay, replace MAF sensor. Check if spark plugs are gas fouled by a rich condition. Check for engine mechanical failure causing no-start condition (i.e. timing chain, low compression, etc.). Compare MAP/BARO parameters to a similar vehicle and ensure values are similar. If a problem is found and repaired, go to step 16). If no

problem is found, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

13) Replace CKP sensor. After repairs, go to step 16).

14) Replace CMP sensor. After repairs, go to step 16).

15) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

16) Using scan tool, clear DTCs. Attempt to start engine. If engine starts and continues to run, go to next step. If engine does not start, or starts and stalls, go to step 2).

17) Allow engine to reach normal operating temperature. Using scan tool, check for DTCs. If any DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, go to next step.

18) Using scan tool, select CAPTURE INFO, REVIEW INFO function. Check for any additional DTCs that have not been diagnosed. If additional DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no additional DTCs are set, system is okay.

Ignition System ("Y" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition on. Using test light connected to ground, probe terminals of the following fuses, located in underhood electrical center No. 2:

- * A/C
- * ENG IGN1
- * INJR1
- * INJR2
- * THROT CONT

If test light illuminates on both sides of all fuses, go to next step. If test light does not illuminate, diagnose ignition relay circuit. See IGNITION RELAY CIRCUIT (5.7L - "F" BODY) under BASIC IGNITION SYSTEM CHECKS.

3) Using scan tool, check for DTCs. If any DTCs related to Throttle Actuator Control (TAC) system are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If DTCs are not set, go to next step.

4) Using scan tool, check for DTCs. If any DTCs related to vehicle theft deterrent system are set, this indicates a problem with column lock or VTD fuel enable circuit. See appropriate BODY CONTROL MODULE article in ACCESSORIES & EQUIPMENT. If DTC P0230, P0335, P0336, P0601, P0602, P0604 or P0606 is set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If DTCs are not set, go to next step.

5) Using scan tool, check for DTCs while cranking engine. If DTCs set while cranking engine, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs set, go to next step.

6) Using scan tool, monitor engine speed while cranking engine. If engine RPM is indicated on scan tool, go to step 10). If engine RPM is not indicated on scan tool, go to next step.

7) Turn ignition off. Disconnect CKP sensor harness connector. Measure voltage between ground and ignition feed circuit at

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CKP sensor harness connector. If voltage is near battery voltage, go to step 14). If voltage is not near battery voltage, go to next step.

8) Disconnect CMP sensor harness connector. Measure voltage between ground and ignition feed circuit at CMP sensor harness connector. If voltage is near battery voltage, go to step 15). If voltage is not near battery voltage, go to next step.

9) Check for short to ground in CKP sensor and CMP sensor ignition feed circuits. Repair as necessary. After repairs, go to step 17). If circuits are okay, go to step 16).

10) Using scan tool, monitor engine coolant temperature. If scan tool value is close to actual engine temperature, go to next step. If scan tool value is not close to actual engine temperature, diagnose using diagnostic procedure for DTC P0118. See appropriate SELF-DIAGNOSTICS article.

11) Using scan tool, command fuel pump on. If fuel pump runs, go to next step. If fuel pump does not run, diagnose fuel pump relay circuit. See FUEL PUMP ELECTRICAL CIRCUIT ("Y" BODY).

12) Turn ignition off. Connect fuel pressure gauge. See BASIC FUEL SYSTEM CHECKS. Turn ignition on. Check fuel pressure. If pressure is 55-61 psi (3.8-4.2 kg/cm²), go to next step. If pressure is not as specified, diagnose fuel system. See FUEL SYSTEM in appropriate SYSTEM & COMPONENT TESTING article.

13) Check for air leaks in ducts between MAF sensor and throttle body. A faulty MAF sensor may cause a no-start or stalling after start condition. Disconnecting MAF sensor will cause PCM to default to speed density (MAP, IAT, RPM) to calculate load and intake airflow. If fault condition is corrected by disconnecting MAF sensor, or connections are okay, replace MAF sensor. Check if spark plugs are gas fouled by a rich condition. Check for engine mechanical failure causing a no-start condition (i.e. timing chain, low compression, etc.). Compare MAP/BARO parameters to a similar vehicle and ensure values are similar. If a problem is found and repaired, go to step 17). If no problem is found, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Replace CKP sensor. After repairs, go to step 17).

15) Replace CMP sensor. After repairs, go to step 17).

16) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

17) Using scan tool, clear DTCs. Attempt to start engine. If engine starts and continues to run, go to next step. If engine does not start, or starts and stalls, go to step 2).

18) Allow engine to reach normal operating temperature. Using scan tool, check for DTCs. If any DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no DTCs are set, go to next step.

19) Using scan tool, select CAPTURE INFO, REVIEW INFO function. Check for any additional DTCs that have not been diagnosed. If additional DTCs are set, diagnose DTCs. See appropriate SELF-DIAGNOSTICS article. If no additional DTCs are set, system is okay.

Fuel Pump Electrical Circuit ("F" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

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2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 21). If test light does not turn on and off, go to step 24).

6) If test light remains illuminated for each command, go to next step. If test light does not illuminate at all, go to step 8).

7) Disconnect PCM. Check fuel pump relay control circuit for short to voltage. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 28).

8) Disconnect PCM. Check fuel pump relay control circuit for open or short to ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to step 22).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. If fuel pump runs continuously, go to step 23). If fuel pump does not run continuously, go to step 27).

11) Check FUEL PUMP fuse (20-amp) located in underhood junction block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Disconnect fuel pump jumper harness from body pass-through connector. Check for short to ground in fuel pump power feed circuit between fuel pump relay and body pass-through connector. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

13) Lower fuel tank. Check fuel pump jumper harness for damage or grounded circuits. Repair as necessary. After repairs, go to step 29). If jumper harness is okay, go to step 20).

14) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay battery feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 25).

15) Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at relay cavities. If fuel pump runs, go to step 21). If fuel pump does not run, go to next step.

16) Disconnect fuel pump jumper harness from body pass-through connector. Check for open or high resistance in fuel pump power feed circuit between fuel pump relay and body pass-through

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connector. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

17) Check fuel pump ground circuit for open or high resistance between body pass-through connector and chassis ground. Repair as necessary. After repairs, go to step 29). If circuit is okay, go to next step.

18) Check fuel pump jumper harness for poor connections at body pass-through connector. Repair as necessary. After repairs, go to step 29). If connections are okay, go to next step.

19) Lower fuel tank. Check fuel pump jumper harness for damage, open circuits and poor connections. Repair as necessary. After repairs, go to step 29). If jumper harness is okay, go to step 26).

20) Reconnect and install all components. Install NEW fuel pump fuse. Using scan tool, command fuel pump relay on. If fuse blows, go to step 26). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

21) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 29). If connections are okay, go to step 27).

22) Check for poor connections at PCM. Repair as necessary. After repairs, go to step 29). If connections are okay, go to step 28).

23) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 29).

24) Repair open in fuel pump relay ground circuit. After repairs, go to step 29).

25) Repair open in fuel pump relay battery feed circuit. After repairs, go to step 29).

26) Replace fuel pump. After repairs, go to step 29).

27) Replace fuel pump relay. After repairs, go to step 29).

28) Replace PCM. Perform PCM relearn procedures. After repairs, go to next step.

29) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

Fuel Pump Electrical Circuit ("Y" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Connect scan tool. Turn ignition on. Using scan tool, command fuel pump relay on and off. If fuel pump turns on and off, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article. If fuel pump does not turn on and off, go to next step.

3) Using scan tool, command fuel pump relay on and off. If fuel pump relay clicks, go to step 9). If fuel pump relay does not click, go to next step.

4) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay control circuit at relay cavity. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to next step. If test light does not turn on and off, go to step 6).

5) Connect test light between fuel pump relay control circuit

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and fuel pump relay ground circuit at relay cavities. Using scan tool, command fuel pump relay on and off. If test light turns on and off, go to step 19). If test light does not turn on and off, go to step 22).

6) If test light remains illuminated with each command, go to next step. If test light does not illuminate at all, go to step 8).

7) Disconnect PCM. Check for short to voltage in fuel pump relay control circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 26).

8) Disconnect PCM. Check for open or short to ground in fuel pump relay control circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to step 20).

9) Turn ignition on. If fuel pump runs continuously, go to next step. If fuel pump does not run continuously, go to step 11).

10) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. If fuel pump runs continuously, go to step 21). If fuel pump does not run continuously, go to step 25).

11) Check F/PMP fuse (20-amp) located in underhood fuse block. If fuse is open, go to next step. If fuse is okay, go to step 14).

12) Check for short to ground in fuel pump power feed circuit between fuel pump and fuse. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

13) Reconnect all components. Install NEW F/PMP fuse. Using scan tool, command fuel pump relay on. If fuse blows, go to step 24). If fuse does not blow, check for intermittent problem. See appropriate TROUBLE SHOOTING - NO CODES article.

14) Turn ignition off. Disconnect fuel pump relay located in underhood fuse block. Turn ignition on. Using test light connected to ground, probe fuel pump relay battery feed circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 23).

15) Connect fused jumper wire between fuel pump relay battery feed circuit and fuel pump power feed circuit at relay cavities. If fuel pump runs, go to step 19). If fuel pump does not run, go to next step.

16) Check for open or high resistance in fuel pump power feed circuit between fuel pump relay and fuel pump. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

17) Check for open or high resistance in fuel pump ground circuit. Repair as necessary. After repairs, go to step 27). If circuit is okay, go to next step.

18) Check for poor connections at fuel pump. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 24).

19) Check for poor connections at fuel pump relay. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 25).

20) Check for poor PCM harness connections. Repair as necessary. After repairs, go to step 27). If connections are okay, go to step 26).

21) Repair short to voltage in fuel pump power feed circuit. After repairs, go to step 27).

22) Repair open in fuel pump relay ground circuit. After

repairs, go to step 27).

23) Repair open in fuel pump relay battery feed circuit.

After repairs, go to step 27).

24) Replace fuel pump. After repairs, go to step 27).

25) Replace fuel pump relay. After repairs, go to step 27).

26) Replace PCM. Perform PCM relearn procedures. After

repairs, go to next step.

27) Operate system to verify repair. If system operation is okay, testing is complete. If system operation is not okay, go to step 2).

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 appropriate diagnostic procedure under NO START DIAGNOSIS.

FUEL SYSTEM PRESSURE RELIEF (EXCEPT SATURN)

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:

- * On 2.2L and 2.4L, loosen fuel filler cap. Disconnect fuel pump harness connector. Start engine and allow it to run until it stalls. Crank starter for 3 seconds to remove remaining fuel from fuel lines. Turn ignition off. Reconnect fuel pump harness connector. Disconnect negative battery cable to avoid possible fuel discharge in accidental attempt to start engine.
- * On all engines except 2.2L and 2.4L, disconnect negative battery cable. 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 RELIEF (SATURN)

Fuel pressure may be relieved by using one of following methods:

- * Connect scan tool. Start engine. Select SPECIAL TESTS, and then PCM/EC. Select FUEL PUMP under fuel delivery and command fuel pump off. Engine will stall in 3-5 seconds. Turn ignition off.
- * Install Fuel Pressure Gauge (SA9127E) and 90-Degree Adapter (SA9403E) to fuel pressure test port. When

installing fuel pressure gauge, wrap shop towel around pressure connection to absorb fuel leakage. Install gauge bleed hose in container. Open bleed valve to bleed fuel pressure.

FUEL SYSTEM PRESSURE TEST (EXCEPT SATURN)

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 OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition off. Turn A/C system off. On all models except 2.2L and 2.4L, connect Fuel Pressure Gauge (J-34730-1A) to fuel pressure fitting on fuel rail. On 2.2L and 2.4L, install Fuel Pressure Gauge (J-29658-D). This kit modifies fuel pressure gauge so it may be installed in fuel delivery line with quick-connect fittings. On all models, 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 SPECIFICATIONS (EXCEPT SATURN) 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. Repair as necessary. After repairs, go to step 24). If no restriction is found, go to next step.

7) Remove fuel sending unit assembly. Inspect fuel pump strainer for restriction and correct installation. Check fuel pump flex pipe for leaks, and ensure fuel pump is correct for application. Repair as necessary. After repairs, go to step 24). If no problem is 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

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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), check for intermittent problem. See appropriate TROUBLE SHOOTING - NO 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 (EXCEPT SATURN). 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 SPECIFICATIONS (EXCEPT SATURN) table. If fuel pressure is less than specification, go to step 15).

13) Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELIEF (EXCEPT SATURN). Disconnect fuel return pipe from fuel rail. Attach 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 SPECIFICATIONS (EXCEPT SATURN) 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. Repair as necessary. After repairs, go to step 24). If no restriction is 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 (EXCEPT SATURN). 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 SPECIFICATIONS (EXCEPT SATURN) table. If fuel pressure does not increase to greater than specification, go to step 7).

17) Check fuel pump electrical circuit. See appropriate diagnostic procedure under NO START DIAGNOSIS. Repair as necessary.

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After repairs, go to step 24). If no problem is found, go to next step.

18) Remove fuel sending unit assembly. Inspect in-line fuel filter, fuel feed pipe and fuel pump strainer for restrictions. Check fuel pump flex pipe for leaks. Repair as necessary. After repairs, go to step 24). If no problem is found, go to next step.

19) Replace fuel sending unit assembly. After repairs, go to step 24).

20) Locate and repair loss of vacuum to fuel pressure regulator. After repairs, go to step 24).

21) Replace fuel pressure regulator. After repairs, go to step 24).

22) Locate and replace leaking fuel injector(s). After repairs, go to step 24).

23) Locate and repair restriction in fuel return pipe. After repairs, go to step 24).

24) Turn ignition off. Turn A/C system off. On all models except 2.2L and 2.4L, connect Fuel Pressure Gauge (J-34730-1A) to fuel pressure fitting on fuel rail. On 2.2L and 2.4L, install Fuel Pressure Gauge (J-29658-D). This kit modifies fuel pressure gauge so it may be installed in fuel delivery line with quick-connect fittings. On all models, 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 SPECIFICATIONS (EXCEPT SATURN) table. If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, go to step 11).

25) 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 SPECIFICATIONS (EXCEPT SATURN)

AA

Application (1) KOEO - psi (kg/cm²)

2.2L, 3.5L & 4.6L	.....	41-47 (2.9-3.3)
2.4L	.....	52-58 (3.7-4.1)
3.0L	.....	41-47 (2.9-3.3)
3.1L, 3.4L & 3.8L	.....	48-55 (3.4-3.9)
5.7L	.....	55-60 (3.9-4.2)

(1) - KOEO is ignition on and engine off.

AA

FUEL SYSTEM PRESSURE TEST (SATURN)

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: Ensure battery is fully charged when performing test.

1) Remove air induction tube. Relieve fuel pressure. See FUEL SYSTEM PRESSURE RELIEF (SATURN). Install fuel pressure gauge and bleed off any fuel in system into container. Close fuel pressure gauge shutoff valve.

2) Turn ignition on. Using scan tool, command fuel pump on for at least 10 seconds. Allow pressure to stabilize. Record maximum fuel pressure. Ensure fuel pressure is as specified. See FUEL PRESSURE SPECIFICATIONS (SATURN) table.

3) Bleed fuel pressure and repeat test at least 2 more times. If during test, fuel pressure drops more than 8 psi (.56 kg/cm²) during a 5 minute period, isolate fuel supply side of fuel system by closing off return side with fuel pressure gauge shutoff valve.

4) Using scan tool, command fuel pump on. Allow fuel pressure to stabilize. Record maximum fuel pressure. If fuel pressure remains stable, replace fuel pressure regulator. If fuel pressure bleeds off more than 8 psi (.56 kg/cm²), check fuel inlet line and injectors for leaks, and check for faulty fuel pump. Repair as necessary.

FUEL PRESSURE SPECIFICATIONS (SATURN)

AA

Application (1) KOEO - psi (kg/cm²)

1. 9L	40-55 (2.8-3.9)
2. 2L	50-60 (3.1-4.2)
3. 0L	39-49 (2.7-3.4)

(1) - KOEO is ignition on and engine off.

AA

BASIC IGNITION SYSTEM CHECKS

NOTE: For circuit identification, see appropriate wiring diagram in WIRING DIAGRAMS article.

DIS (1.9L, 2.2L, 3.0L, 3.1L, 3.4L, 3.5L, 4.6L & 5.7L)

Spark

1) If factory tachometer is connected to coil tachometer terminal, disconnect tachometer before performing tests. When removing spark plug wire from spark plug, twist and pull on boot. DO NOT pull on wire.

2) Using Spark Tester (J-26792), check for spark at each spark plug wire. Leave other wires connected while checking for spark. Check spark plug wire resistance on suspect wires. See IGNITION SYSTEM in appropriate SERVICE & ADJUSTMENT SPECIFICATIONS article.

Ignition Coil Power Source

Turn ignition on. Check ignition positive voltage circuit at ignition control module for battery voltage. If battery voltage is not

present, check ignition or PCM fuse. If fuse is okay, check for open in circuit between fuse and ignition control module.

Ignition Coil Resistance (Except 1.9L)

If ignition coil is suspected of causing a misfire or no-spark condition, switch coil locations on ignition control module. If problem follows questionable coil, check ignition coil resistance or replace original coil. For ignition coil resistance, see IGNITION COIL RESISTANCE table.

IGNITION COIL RESISTANCE

AA
Application Ohms

Primary	(1)
Secondary	
2.2, 3.1L & 3.4L	5000-8000
3.0L, 3.5L, 4.6L & 5.7L	(1)

(1) - Information is not available from manufacturer.

AA

Ignition Coil Resistance (1.9L)

1) Disconnect ignition coil leads. Measure secondary coil resistance (secondary tower-to-secondary tower). Resistance should be 6500-11,500 ohms. If resistance is not within specification, replace ignition coil.

2) Ignition coil primary resistance value is not available from manufacturer. If ignition coil is suspected of causing a misfire or a no-spark condition, switch coil locations on EI module. If problem follows questionable coil, replace original coil.

Ignition Relay Circuit (5.7L - "F" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition off. Remove IGN relay from underhood electrical center. Using test light connected to ground, probe battery feed circuit at IGN relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

3) Turn ignition on. Using test light connected to ground, probe ignition feed circuit at IGN relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 9).

4) Turn ignition off. Measure resistance between chassis ground and ground circuit at IGN relay cavity. If resistance is less than 2 ohms, go to next step. If resistance is not less than 2 ohms, go to step 10).

5) Turn ignition off. Connect fused jumper wire between IGN relay battery feed circuit and IGN relay load circuit at relay cavities. Using test light connected to ground, probe terminals of the following fuses located in underhood electrical center No. 2:

* A/C CRUISE

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- * ENG CTRL
- * ENG SEN
- * INJR1
- * INJR2

If test light illuminates for all fuses, go to next step. If test light does not illuminate, go to step 11).

6) Check for poor terminal connection at IGN relay. Repair as necessary. If connections are okay, go to next step.

7) Replace IGN relay.

8) Repair open in IGN relay battery feed circuit.

9) Repair IGN relay ignition feed circuit.

10) Repair open or high resistance in IGN relay ground circuit.

11) Repair IGN relay load circuit.

Ignition Relay Circuit (5.7L - "Y" Body)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing OBD system check, go to next step.

2) Turn ignition off. Remove IGN relay from underhood electrical center. Using test light connected to ground, probe battery feed circuit at IGN relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

3) Turn ignition on. Using test light connected to ground, probe ignition feed circuit at IGN relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 9).

4) Using test light connected to battery voltage, probe IGN relay ground circuit at relay cavity. If test light illuminates, go to next step. If test light does not illuminate, go to step 10).

5) Turn ignition off. Connect fused jumper wire between IGN relay battery feed circuit and IGN relay load circuit at relay cavities. Using test light connected to ground, probe terminals of the following fuses located in underhood electrical center:

- * A/C
- * ENG IGN1
- * INJR1
- * INJR2
- * THROT CONT

If test light illuminates for all fuses, go to next step. If test light does not illuminate, go to step 11).

6) Check for poor IGN relay connections. If poor connections are found, go to step 11). If connections are okay, go to next step.

7) Replace IGN relay.

8) Repair open in IGN relay battery feed circuit.

9) Repair IGN relay ignition feed circuit.

10) Repair open in IGN relay ground circuit.

11) Replace underhood electrical center.

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, engine will not run.

IDI (2.4L)

Spark

- 1) Disconnect tachometer wire from IDI module (if equipped). A shorted tachometer will not allow engine to start. Temporarily remove IDI assembly and install Spark Plug Jumper Wires (J-36012).
- 2) Using Spark Tester (J-26792), check for spark at each spark plug wire. Leave other wires connected while checking for spark.

Ignition Coil Power Source

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

Ignition Coil Resistance

- 1) Disconnect ignition coil leads. Measure secondary coil resistance (secondary tower-to-secondary tower). Resistance should be 4000-8000 ohms. If resistance is not within specification, replace ignition coil.
- 2) Ignition coil primary resistance value is not available from manufacturer. If ignition coil is suspected of causing a misfire or a no-spark condition, switch coil locations on ignition control module. If problem follows questionable coil, replace original coil.

Crankshaft Position (CKP) Sensor Short & Resistance Checks

- 1) Set DVOM on 2000-ohm scale. Connect DVOM leads to CKP sensor connector located on side of engine block. Turn ignition off. Disconnect ignition control module harness connectors. Measure resistance between CKP sensor terminals at ignition control module connector.
- 2) CKP sensor resistance should be 500-900 ohms. If resistance is not as specified, replace CKP sensor. If sensor resistance is within specification, go to next step.
- 3) With CKP sensor installed in block, connect one DVOM lead to either sensor terminal at ignition control module. Touch other lead of DVOM to engine block. Continuity should not exist. If continuity exists, CKP sensor or circuit is shorted to ground and must be repaired or replaced.

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 1100-1300 millivolts as crankshaft turns. Ignition control module can be triggered with a voltage signal as low as 200 millivolts.

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, engine will not run.

C3I (3.8L)

Spark

Disconnect tachometer wire (if equipped). A shorted tachometer will prevent engine from starting. Disconnect Camshaft Position (CMP) sensor. Attempt to start engine. If engine starts, see appropriate CMP sensor DTC test in appropriate SELF-DIAGNOSTICS 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 companion cylinder 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 at ignition control module. If battery voltage is not present, check for blown ignition fuse. If fuse is okay, check for open in circuit between fuse and ignition control module.

Ignition Coil Resistance

Disconnect ignition coil leads. Using DVOM, measure 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, engine will not run.

ENGINE CONTROLS CIRCUIT CHECKS

NOTE: For circuit identification, see appropriate wiring diagram in WIRING DIAGRAMS article.

POWER RELAY CIRCUIT (CATERA)

1) Perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article. After performing

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OBD system check, go to next step.

2) Turn ignition off. Disconnect engine controls power relay located in ECM housing. Using test light connected to ground, probe battery feed circuits at relay cavities. If test light illuminates for both circuits, go to next step. If test light does not illuminate for both circuits, go to step 12).

3) Turn ignition off. Disconnect ECM harness connector C2. Using test light connected to ground, probe engine controls power relay control circuit at relay cavity. Turn ignition on. If test light illuminates, go to step 10). If test light does not illuminate, go to next step.

4) Turn ignition off. Using test light connected to battery voltage, probe engine controls power relay control circuit at relay cavity. If test light illuminates, go to step 11). If test light does not illuminate, go to next step.

5) Reconnect engine controls power relay. Using test light connected to ground, probe engine controls power relay circuit at ECM harness connector. If test light illuminates, go to next step. If test light does not illuminate, go to step 8).

6) Using DVOM set to 10-amp scale, measure current between chassis ground and engine controls power relay control circuit at ECM harness connector C2 for 2 minutes. If current draw is 100-200 mA, go to next step. If current draw is not 100-200 mA, go to step 14).

7) Remove DVOM. Using fused jumper wire, jumper engine controls power relay circuit to ground. Using test light connected to ground, probe each ECM switched battery feed circuits (3) at ECM harness connector C2. If test light illuminates for all 3 circuits, go to step 15). If test light does not illuminate for all 3 circuits, go to step 9).

8) Check for open or high resistance in engine controls power relay control circuit. Repair as necessary. After repairs, go to step 18). If circuit is okay, go to step 13).

9) Check for open or high resistance in engine switched battery feed circuits between engine controls power relay and ECM. Repair as necessary. After repairs, go to step 18). If circuits are okay, go to step 13).

10) Repair short to voltage in engine controls power relay control circuit. After repairs, go to step 18).

11) Repair short to ground in engine controls power relay control circuit. After repairs, go to step 18).

12) Repair battery feed circuit. After repairs, go to step 18).

13) Check for faulty connections at engine control power relay. Repair as necessary. After repairs, go to step 18). If connections are okay, go to next step.

14) Replace engine controls power relay. After repairs, go to step 18).

15) Check ignition feed and battery feed circuits to ECM for voltage. Check ECM ground circuit for loose connections, corrosion, open or high resistance. Repair as necessary. After repairs, go to step 18). If circuits are okay, go to next step.

16) Check for faulty ECM harness connections. Repair as necessary. After repairs, go to step 18). If connections are okay, go to next step.

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17) Replace ECM. Perform ECM relearn procedures. After repairs, go to next step.

18) Using scan tool, attempt communication with ECM. If communication is possible, system is okay. If communication is not possible, perform OBD system check. See ON-BOARD DIAGNOSTIC (OBD) SYSTEM CHECK in appropriate SELF-DIAGNOSTICS article.

IDLE SPEED & IGNITION TIMING

Ensure idle speed and ignition timing are set to specification. For specifications and adjustments, see appropriate SERVICE & ADJUSTMENT SPECIFICATIONS and ON-VEHICLE ADJUSTMENTS articles.

SUMMARY

If no faults were found while performing basic diagnostic procedures, or no trouble codes (or only intermittent ones) were found while performing OBD system check, and driveability problems still exist, proceed to appropriate TROUBLE SHOOTING - NO CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO-START, etc.) or intermittent diagnostic procedures.

END OF ARTICLE