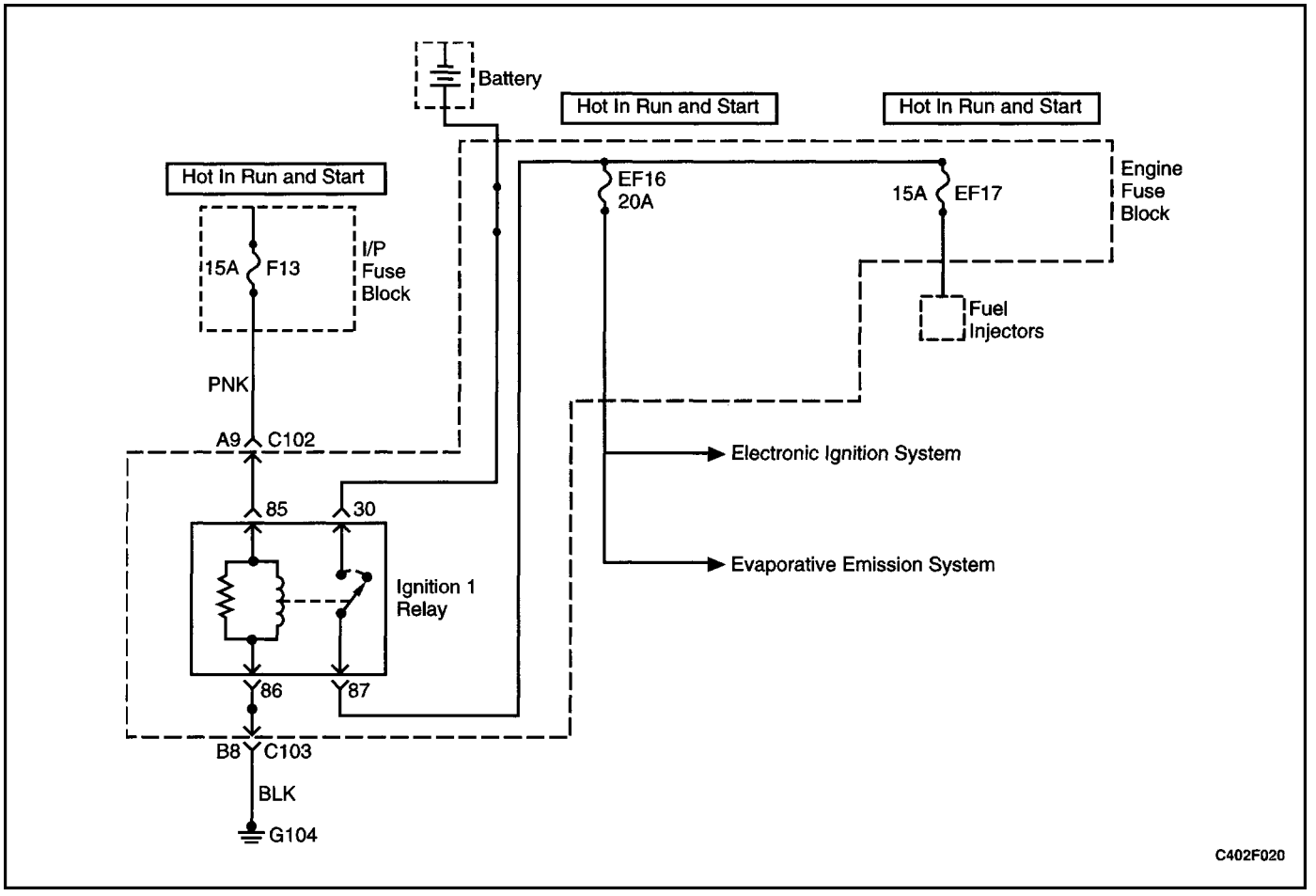


IGNITION 1 RELAY CIRCUIT CHECK

Circuit Description

When the ignition is turned ON or to the START position, the ignition 1 relay is energized. The ignition 1 relay then supplies voltage to the engine fuse box fuse EF16 and the engine fuse box fuse EF17. The Electronic Ignition (EI) system ignition coil, and the evaporative emission canister purge solenoid are supplied voltage through the engine fuse box fuse EF16. The fuel injectors are supplied voltage through the engine fuse box fuse EF17.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.
- A faulty ignition 1 relay will cause a no start condition. There will be no voltage supplied to the EI system ignition coil, or the fuel injectors. Without voltage supplied to these components, they will not operate.

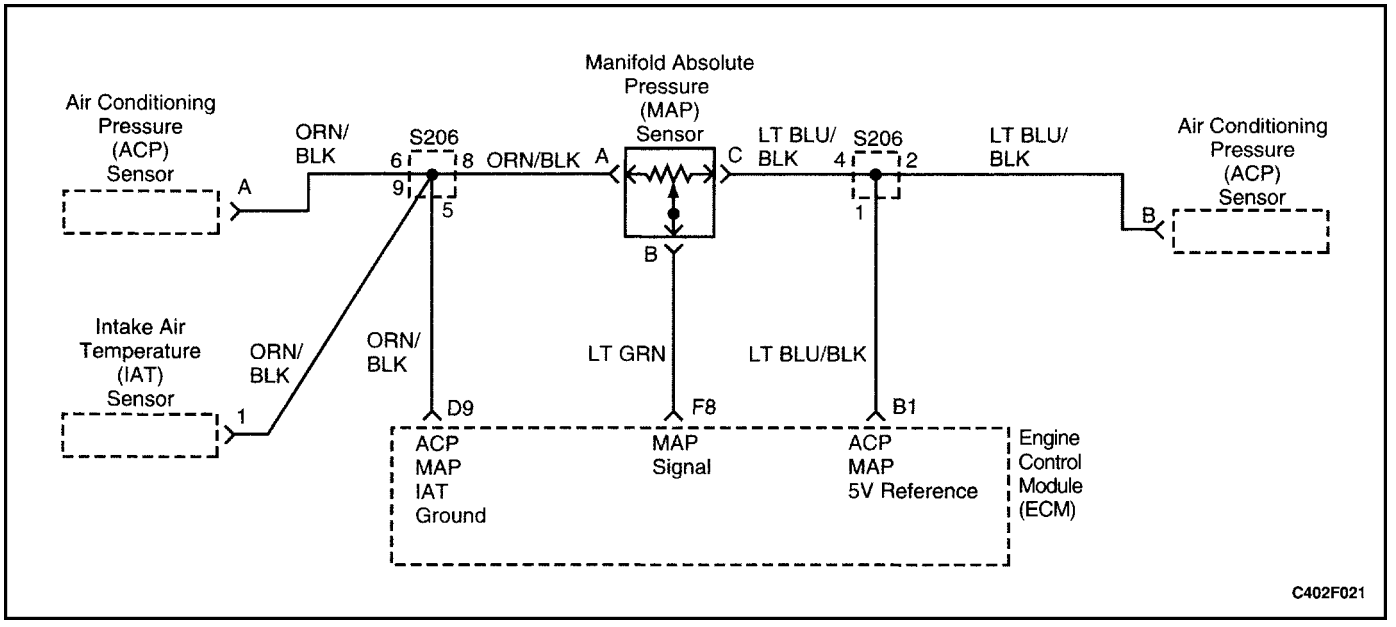
Test Description

The number(s) below refer to specific step(s) on the diagnostic table.

1. If the test light is on at both of the fuse terminals, the ignition 1 relay is OK.
5. This step, along with steps 6, 7, and 8, checks for correct voltage and ground to the ignition 1 relay terminals.
14. After confirming correct voltage and ground to the ignition 1 relay terminals, it can be determined that the ignition 1 relay is faulty.

Ignition 1 Relay Circuit Check

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Disconnect the engine fuse block fuses EF16 and EF17. 3. Turn the ignition ON. 4. With a test light connected to ground, probe the fuse terminals nearest the ignition 1 relay for fuses EF16 and EF17. Is the test light on at both terminals?		System OK	Go to*Step 2*
2	Check the test light. Is the test light on at only one terminal?		Go to*Step 9*	Go to*Step 3*
3	Check the test light. Is the test light off at both terminals?		Go to*Step 4*	
4	1. Turn the ignition OFF. 2. Inspect the instrument panel fuse block fuse F13. Is the fuse OK?		Go to*Step 5*	Go to*Step 10*
5	1. Disconnect the ignition 1 relay. 2. Connect a test light between the ignition 1 relay connector terminal 85 and ground. 3. Turn the ignition ON. Is the test light on?		Go to*Step 6*	Go to*Step 11*
6	Connect a test light between the ignition 1 relay connector terminal 86 and battery voltage. Is the test light on?		Go to*Step 7*	Go to*Step 12*
7	Connect a test light between the ignition 1 relay connector terminal 30 and ground. Is the test light on?		Go to*Step 8*	Go to*Step 13*
8	Check for an open in the wiring between the ignition 1 relay connector terminal 87 and the engine fuse block terminals for fuses EF16 and EF17. Is the problem found?		Go to*Step 9*	Go to*Step 14*
9	Repair the open in the wiring between the ignition 1 relay connector terminal 87 and the engine fuse block terminal(s) for fuses EF16 and EF17. Is the repair complete?		System OK	
10	Replace the instrument panel fuse block fuse F13. Is the repair complete?		System OK	
11	Repair the open in the wiring between the ignition 1 relay connector terminal 85 and the ignition switch. Is the repair complete?		System OK	
12	Repair the open in the wiring between the ignition 1 relay connector terminal 86 and ground. Is the repair complete?		System OK	
13	Repair the open in the wiring between the ignition 1 relay connector terminal 30 and the battery. Is the repair complete?		System OK	
14	Replace the ignition 1 relay. Is the repair complete?		System OK	



MANIFOLD ABSOLUTE PRESSURE CHECK

Circuit Description

The Manifold Absolute Pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and rpm changes. The MAP sensor converts these changes into a voltage output. The Engine Control Module (ECM) sends a 5–volt reference voltage to the MAP sensor. As the intake manifold pressure changes, the output voltage of the MAP sensor also changes. A low voltage (high vacuum) output of 1 to 2 volts is present at idle. A high voltage (low vacuum) output of 4.0 to 4.8 volts is present at wide open throttle. The MAP sensor is also used under certain conditions to measure barometric pressure. This allows the ECM to make adjustments for altitude changes. The ECM uses the MAP sensor for fuel delivery and ignition timing changes.

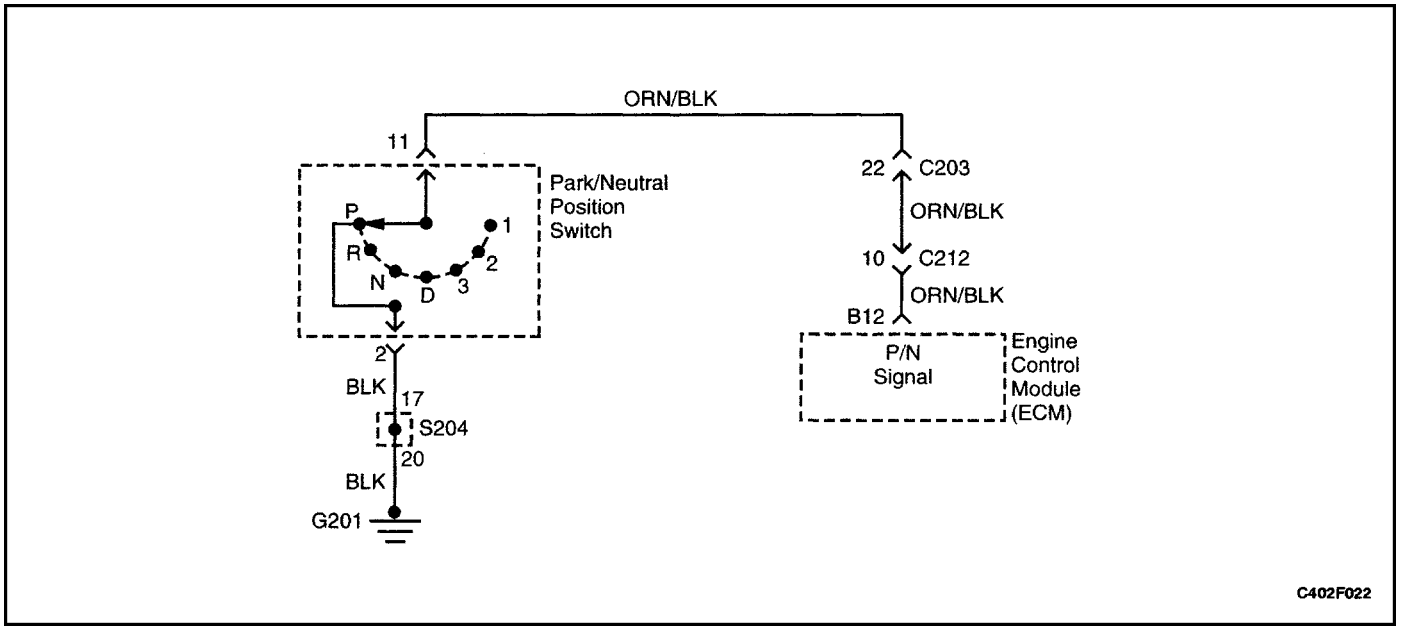
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Applying 34 kPa (10 inches Hg) of vacuum to the Manifold Absolute Pressure (MAP) sensor should cause the voltage to change. Subtract the second voltage reading from the first. That voltage value should be more than 1.5 volts. When applying vacuum to the MAP sensor, the change in the voltage should happen instantly. A slow voltage change indicates a faulty MAP sensor.
3. Disconnect the MAP sensor from the bracket and twist the MAP sensor. Output changes more than 0.1 volt indicate a faulty connector or connection.

Manifold Absolute Pressure Check

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Connect a scan tool to the Data Link connector (DLC). 3. Turn the ignition ON. 4. Compare the Manifold Absolute Pressure (MAP) sensor voltage reading from the scanner with that from a known good vehicle. Is the difference in the two voltage readings less than the value specified?	0.4 v	Go to *Step 2*	Go to *Step 5*
2	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 3. Disconnect the MAP sensor vacuum line. 4. Connect a hand vacuum pump to the MAP sensor. 5. Turn the ignition ON. 6. Note the MAP sensor voltage. 7. Apply 34 kPa (10 in. Hg) of vacuum to the MAP sensor and note the voltage change. Is the difference in voltage readings more than the value specified?	1.5 v	System OK	Go to *Step 3*
3	Inspect the MAP sensor connector terminals. Is the problem found?		Go to *Step 4*	Go to *Step 5*
4	Repair the MAP sensor connector terminals as needed. Is the repair complete?		System OK	
5	Replace the manifold absolute pressure sensor. Is the repair complete?		System OK	



PARK/NEUTRAL POSITION SWITCH

Circuit Description

The Park/Neutral Position (PNP) switch contacts are a part of the shift control lever switch. The contacts are closed to ground in park and open in the drive and neutral ranges.

The Engine Control Module (ECM) supplies ignition voltage through a current limiting resistor to the signal wire and senses a closed switch when the voltage on the signal wire drops to less than 1 volt. The ECM uses the PNP signal as one of the inputs to control idle air and spark timing.

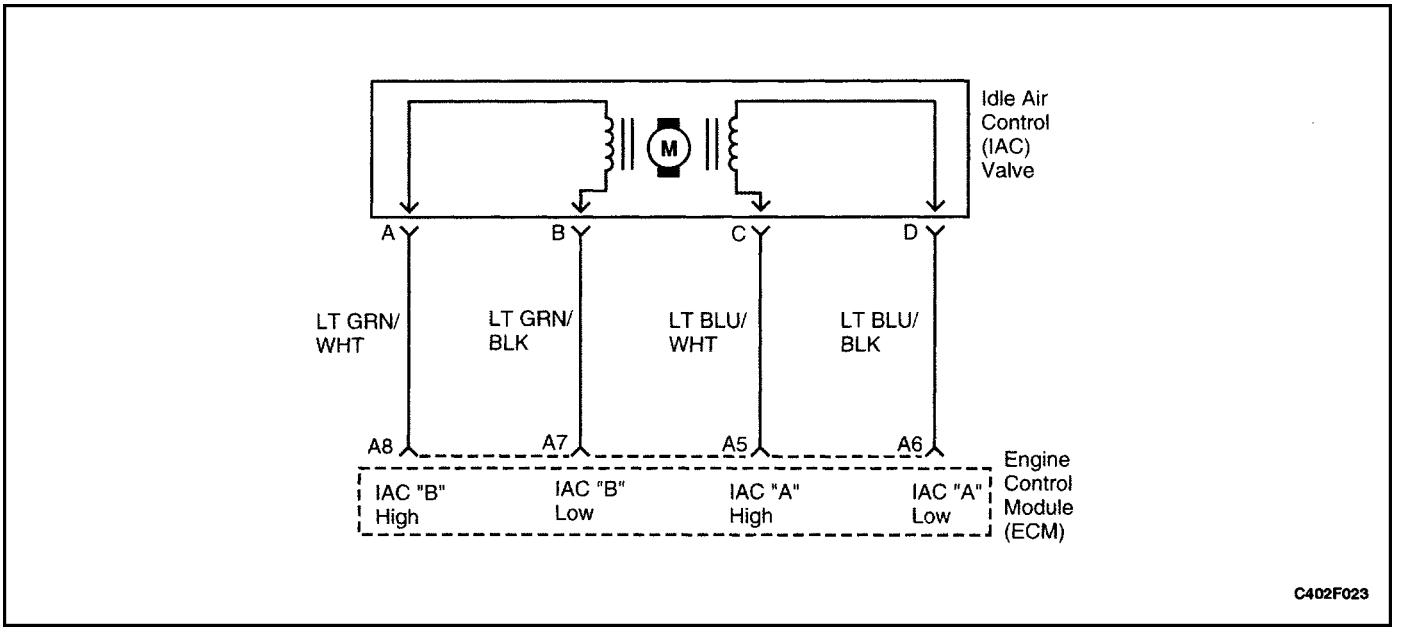
Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. Checks for the Park/Neutral Position (PNP) switch closed to ground in the park position. Different makes of scan tools will read park/neutral differently. Refer to the tool operations manual for the type of display used.
2. Checks for an open PNP switch in the drive range.

Park/Neutral Position Switch

Step	Action	Value(s)	Yes	No
1	1. Connect a scan tool to the data link connector (DLC). 2. Place the transaxle in P (Park). 3. Turn the ignition ON. Does the scan tool indicate park or neutral?		Go to *Step 2*	Go to *Step 10*
2	Place the transaxle in D (Drive). Does the scan tool indicate drive?		System OK	Go to *Step 3*
3	Disconnect the park/neutral position (PNP) switch. Does the scan tool indicate drive?		Go to *Step 4*	Go to *Step 7*
4	Check the PNP switch adjustment. Is the problem found?		Go to *Step 5*	Go to *Step 6*
5	Adjust the PNP switch. Is the repair complete?		System OK	
6	Replace the PNP switch. Is the repair complete?		System OK	
7	Check for an open or short to ground in the wire between the PNP switch connector terminal 11 and the Engine Control Module (ECM) connector terminal B12. Is the problem found?		Go to *Step 8*	Go to *Step 9*
8	Repair the open or short to ground in the wire between the PNP switch connector terminal 11 and the ECM connector terminal B12. Is the repair complete?		System OK	
9	Replace the ECM. Is the repair complete?		System OK	
10	1. Disconnect the PNP switch. 2. Jumper the PNP switch connector terminals 11 and 2. 3. Turn the ignition ON. Does the scan tool indicate park?		Go to *Step 4*	Go to *Step 11*
11	Jumper the PNP switch connector terminal 11 to ground. Does the scan tool indicate park?		Go to *Step 12*	Go to *Step 7*
12	Repair the open wire between the PNP switch connector terminal 2 and ground. Is the repair complete?		System OK	



IDLE AIR CONTROL SYSTEM CHECK

Circuit Description

The engine control module (ECM) controls the engine idle speed with the idle air control (IAC) valve. To increase the idle speed, the ECM pulls the IAC pintle away from its seat, allowing more air to pass by the throttle bore. To decrease the idle speed, it extends the IAC valve pintle toward its seat, reducing bypass air flow. A scan tool will read the ECM commands to the IAC valve in counts. The higher counts indicate more air bypass (higher idle). The lower counts indicate less air is allowed to bypass (lower idle).

Diagnostic Aids

If the idle is too high, stop the engine. Fully extend the idle air control (IAC) valve with a IAC tester. Start the engine. If the idle speed is above 800 rpm, locate and repair the vacuum leak. Also, check for a binding throttle plate or throttle linkage or an incorrect base idle setting.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. The Idle Air Control (IAC) valve is extended and retracted by the IAC driver. IAC valve movement is verified by an engine speed change. If no change in engine speed occurs, the valve can be removed from the throttle body and tested. Connect the IAC driver to the removed IAC valve and turn the ignition ON. Do not start the engine.
5. This step checks the quality of the IAC valve movement in step 2. Fully extending the IAC valve may cause an engine stall. This may be normal.
6. Steps 2 and 5 verify proper IAC valve operation. This step checks the IAC circuit for a wiring or Engine Control Module (ECM) fault.

Idle Air Control Valve Reset Procedure

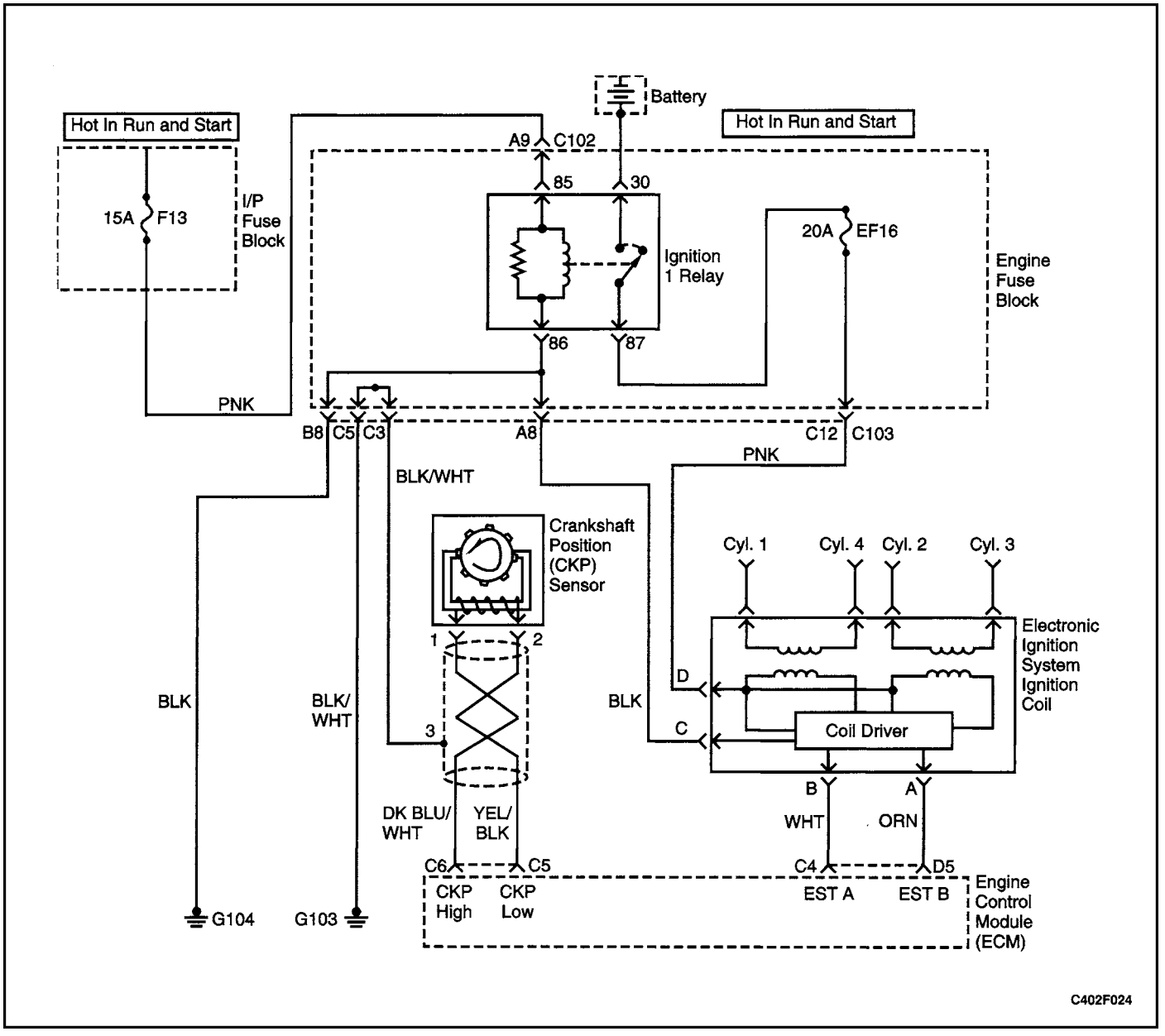
Whenever the battery cable or the Engine Control Module (ECM) connector or the ECM fuse EF22 is disconnected or replaced, the following idle learn procedure must be performed:

1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 10 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral.
5. Allow the engine to run until the engine coolant is above 185˚F (85˚C).
6. Turn the A/C ON for 10 seconds, if equipped.
7. Turn the A/C OFF for 10 seconds, if equipped.
8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in D (drive).
9. Turn the A/C ON for 10 seconds, if equipped.
10. Turn the A/C OFF for 10 seconds, if equipped.
11. Turn the ignition OFF. The idle learn procedure is complete.

Idle Air Control System Check

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Was the check performed?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Connect the idle air control driver to the idle air control (IAC) valve. 3. Connect a scan tool to the Data Link Connector (DLC). 4. Start the engine. 5. With the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the engine rpm change?		Go to *Step 5*	Go to *Step 3*
3	1. Remove the IAC valve. 2. Inspect the IAC passages for restrictions. Is the problem found?		Go to *Step 4*	Go to *Step 19*
4	Clean the IAC passages. Is the repair complete?		System OK	
5	1. Turn the ignition OFF. 2. Start the engine. 3. Using the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the rpm change smoothly within the value specified with each flash of the IAC driver?	700–1500 rpm	Go to *Step 6*	Go to *Step 3*
6	1. Turn the ignition OFF. 2. Connect the IAC driver to the IAC valve. 3. Install an IAC node light to the IAC valve connector. 4. Start the engine. 5. Cycle the IAC driver. 6. Watch the node lights of the IAC driver. Do both lights cycle red and green but never off as the rpm is changed?		Go to *Step 7*	Go to *Step 9*
7	1. Measure the resistance of the IAC valve between terminals A and B. 2. Measure the resistance of the IAC valve between terminals C and D. Does the resistance measure within the value specified?	40–80 Ω	Go to *Step 8*	Go to *Step 19*
8	1. Measure the resistance of the IAC valve between terminals B and C. 2. Measure the resistance of the IAC valve between terminals A and D. Does the ohmmeter show the specified value?	∞	Go to ”Diagnostic Aids”	Go to *Step 19*
9	Inspect the IAC connector terminals. Is the problem found?		Go to *Step 10*	Go to*Step 11*

Step	Action	Value(s)	Yes	No
10	Repair or replace the IAC connector terminals as needed. Is the repair complete?		System OK	
11	Check for an open or short in the wire between the IAC connector terminal A and the Engine Control Module (ECM) connector terminal A8. Is the problem found?		Go to *Step 15*	Go to *Step 12*
12	Check for an open or short in the wire between the IAC connector terminal B and the ECM connector terminal A7. Is the problem found?		Go to *Step 15*	Go to *Step 13*
13	Check for an open or short in the wire between the IAC connector terminal C and the ECM connector terminal A5. Is the problem found?		Go to *Step 15*	Go to *Step 14*
14	Check for an open or short in the wire between the IAC connector terminal D and the ECM connector terminal A6. Is the problem found?		Go to *Step 15*	Go to *Step 16*
15	Repair the wire as needed. Is the repair complete?		System OK	
16	Inspect the ECM connector terminals. Is the problem found?		Go to *Step 17*	Go to *Step 18*
17	Repair the ECM connector terminals as needed. Is the repair complete?		System OK	
18	Replace the ECM. Is the repair complete?		System OK	
19	Replace the idle air control valve. Is the repair complete?		System OK	



IGNITION SYSTEM CHECK

Circuit Description

The Electronic Ignition (EI) system uses a waste spark method of spark distribution. In this type of EI system, the Crankshaft Position (CKP) sensor is mounted to the oil pump near a slotted wheel that is a part of the crankshaft pulley. The CKP sensor sends reference pulses to the Engine Control Module (ECM). The ECM then triggers the EI system ignition coil. Once the ECM triggers the EI system ignition coil, both of the connected spark plugs fire at the same time. One cylinder is on its compression stroke at the same time that the other is on the exhaust stroke, resulting in lower energy needed to fire the spark plug in the cylinder on its exhaust stroke. This leaves the remainder of the high voltage to be used to fire the spark plug in the cylinder on its compression stroke. Since the CKP sensor is in a fixed position, timing adjustments are not possible or needed.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. It is important to check for the presence of spark to all of the cylinders to isolate the problem to either Electronic Ignition (EI) system ignition coil inputs or outputs.
5. In checking the Engine Control Module (ECM) outputs for the electronic spark timing signal, it recommended to use an oscilloscope to view the varying

voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.

6. After confirming ECM inputs for the electronic spark timing to the EI system ignition coil are OK, it can be determined that a faulty EI system ignition coil is at fault.
11. After confirming proper crankshaft position sensor inputs to the ECM and no wiring problems present, it can be determined that the ECM is at fault.
24. This step, along with step 25, checks for battery voltage and a ground to the EI system ignition coil.
26. If the wiring between the EI system ignition coil and the ignition 1 relay connector terminal 87 is OK, the problem is in the ignition 1 relay circuit.

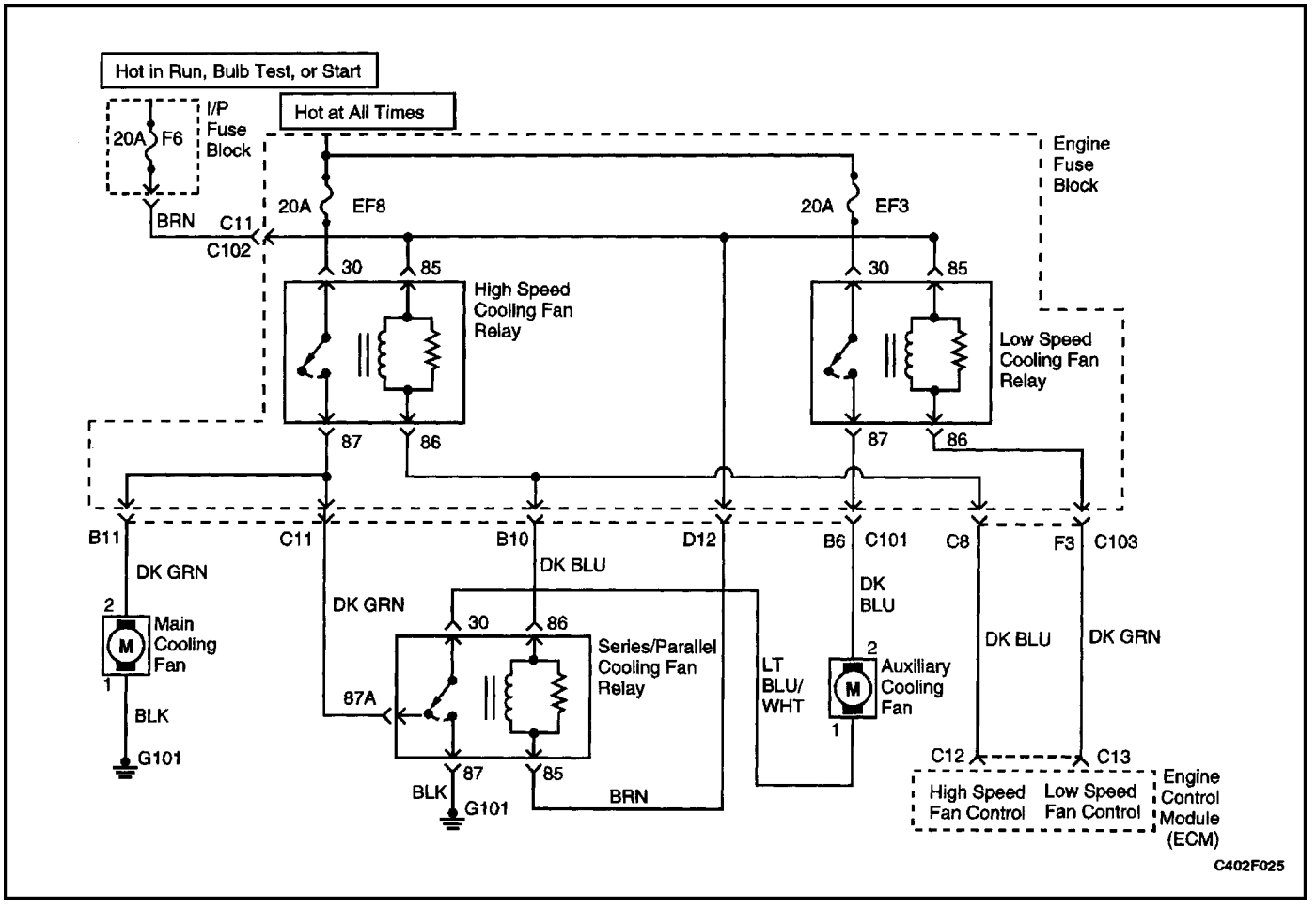
Ignition System Check

CAUTION : Use only electrically insulated pliers when handling ignition wires with the engine running to prevent an electrical shock.

Step	Action	Value(s)	Yes	No
1	1. Remove the spark plugs. 2. Inspect for wet spark plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. 3. Replace the spark plugs as needed. Is the repair complete?		System OK	Go to *Step 2*
2	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?		System OK	Go to *Step 3*
3	1. Measure the resistance of the ignition wires. 2. Replace any ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 Ω	System OK	Go to *Step 4*
4	Is spark present from at least one of the ignition wires, but not all of the ignition wires?		Go to *Step 5*	Go to *Step 12*
5	1. Turn the ignition OFF. 2. Disconnect the Electronic Ignition (EI) system ignition coil connector. 3. While cranking the engine, measure the voltage at the EI system ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to *Step 6*	Go to *Step 7*
6	While cranking the engine, measure the voltage at the EI system ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to *Step 10*	Go to *Step 8*
7	Check for an open in the wire from the EI system ignition coil connector terminal B to the Engine Control Module (ECM) connector terminal C4. Is the problem found?		Go to *Step 9*	Go to *Step 11*
8	Check for an open in the wire from the EI system ignition coil connector terminal A to the ECM connector terminal D5. Is the problem found?		Go to *Step 9*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
9	1. Repair the wiring as needed. 2. Connect the EI system ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?		System OK	
10	1. Replace the EI system ignition coil. 2. Connect the EI system ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?		System OK	
11	1. Replace the ECM. 2. Connect the EI system ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?		System OK	
12	1. Turn the ignition OFF. 2. Disconnect the crankshaft position (CKP) sensor connector. 3. Measure the resistance between the CKP sensor terminals 1 and 2. Is the resistance within the value specified?	400–600 Ω	Go to *Step 13*	Go to *Step 28*
13	1. Measure the resistance between the CKP sensor terminals 1 and 3. 2. Measure the resistance between the CKP sensor terminals 2 and 3. Is the resistance infinite (open circuit)?		Go to *Step 14*	Go to *Step 28*
14	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 1 and 3. Is the voltage within the value specified?	0.95–1.10 v	Go to *Step 20*	Go to *Step 15*
15	Measure the voltage between the CKP sensor connector terminal 1 and ground. Is the voltage within the value specified?	0.95–1.10 v	Go to *Step 17*	Go to *Step 16*
16	Check the wire between the CKP sensor connector terminal 1 and the ECM connector terminal C6 for an open or short. Is the problem found?		Go to *Step 18*	Go to *Step 11*
17	Check the wire between the CKP sensor connector terminal 3 and ground for an open or short. Is the problem found?		Go to *Step 19*	Go to *Step 11*
18	Repair the wire between the CKP sensor connector terminal 1 and the ECM connector terminal C6. Is the repair complete?		System OK	
19	Repair the wire between the CKP sensor connector terminal 3 and ground. Is the repair complete?		System OK	
20	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 2 and 3. Is the voltage within the value specified?	0.95–1.10 v	Go to *Step 24*	Go to *Step 21*

Step	Action	Value(s)	Yes	No
21	Measure the voltage between the CKP sensor connector terminal 2 and ground. Is the voltage within the value specified?	0.95–1.10 v	Go to *Step 17*	Go to *Step 22*
22	Check the wire between the CKP sensor connector terminal 2 and the ECM connector terminal C5 for an open or short. Is the problem found?		Go to *Step 23*	Go to *Step 11*
23	Repair the wire between the CKP sensor connector terminal 2 and the ECM connector terminal C5. Is the repair complete?		System OK	
24	1. Turn the ignition OFF. 2. Connect a test light between the EI system ignition coil connector terminal D and ground. 3. Turn the ignition ON. Is the test light on?		Go to *Step 25*	Go to *Step 26*
25	Connect a test light between the EI system ignition coil connector terminal C and battery positive. Is the test light on?		Go to *Step 5*	Go to *Step 27*
26	Check for an open in the wiring between the EI system ignition coil connector, terminal D and the ignition 1 relay connector terminal 87. Is the problem found?		Go to *Step 29*	Go to ”Ignition 1 Relay Circuit Check”
27	Repair the wire between the EI system ignition coil connector terminal C and ground. Is the repair complete?		System OK	
28	Replace the crankshaft position sensor. Is the repair complete?		System OK	
29	Repair the open in the wiring between the EI system ignition coil connector terminal D and the ignition 1 relay connector terminal 87. Is the repair complete?		System OK	



ENGINE COOLING FAN CIRCUIT CHECK

Circuit Description

The engine cooling fan circuit operates the main cooling fan and the auxiliary cooling fan. The cooling fans are controlled by the Engine Control Module (ECM) based on inputs from the Engine Coolant Temperature (ECT) sensor and the Air Conditioning Pressure (ACP) sensor. The ECM controls the low speed cooling fan operation by internally grounding the ECM connector terminal C13. This energizes the low speed cooling fan relay and operates the main cooling fan and the auxiliary cooling fan at low speed as the cooling fans are connected in a series circuit. The ECM controls the high speed cooling fan operation by internally grounding the ECM connector terminal C13 and the ECM connector terminal C12 at the same time. This energizes the low speed cooling fan relay, the high speed cooling fan relay, and the series/parallel cooling fan relay resulting in high speed fan operation as the cooling fans are now connected in a parallel circuit.

Diagnostic Aids

- If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the engine coolant temperature gauge indicated overheating. If the engine is overheating and the cooling fans are on, the cooling system should be checked.
- If the engine fuse block fuses EF3 or EF8 become open (blown) immediately after installation, inspect for a short to ground in the wiring of the appropriate circuit. If the fuses become open (blown) when the cooling fans are to be turned on by the Engine Control Module (ECM), suspect a faulty cooling fan motor.
- The ECM will turn the cooling fans on at low speed when the coolant temperature is 199˚F (93˚C). The ECM will turn the cooling fans off when the coolant temperature is 194˚F (90˚C).
- The ECM will turn the cooling fans on at high speed when the coolant temperature is 207˚F (97˚C). The ECM will change the cooling fans from high speed to low speed when the coolant temperature is 201˚F (94˚C).
- The ECM will turn the cooling fans on at low speed when the A/C system is on. The ECM will change the cooling fans from low speed to high speed when the high side A/C pressure is 269 psi (1,859 kPa) then return to low speed when the high side A/C pressure is 210 psi (1,449 kPa).
- The cooling fan circuit can be checked quickly by disconnecting the ECM white connector and grounding the connector terminal C13. This should create low speed cooling fan operation with the

ignition ON. By grounding the ECM connector terminals C13 and C12 and turning the ignition ON, high speed cooling fan operation should be achieved.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step, along with step 5, checks for the ability of the Engine Control Module (ECM) to operate the cooling fans.
8. This step, along with step 9, checks for the ability of the ECM to operate the cooling fans in response to A/C pressure readings.
16. After confirming battery voltage and the ECM supplying a ground to the coil side of the low speed cooling fan relay, by jumpering connector terminals 30 and 87 it will be determined if the relay is at fault or a wiring problem is present.
31. This step checks for the presence of battery voltage to the main cooling fan when the A/C is on. If battery voltage is present and the cooling fans are not operating, the problem is in the ground side of the cooling fan circuit.
37. By directly grounding the ECM connector terminals C13 and C12, the main and auxiliary cooling fans should run at high speed.

Engine Cooling Fan Circuit Check

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Was the check performed?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Check the engine fuse block fuse EF3. 2. Replace the fuse as needed. Is the fuse OK?		Go to *Step 3*	Go to ”Diagnostic Aids”
3	1. Check the engine fuse block fuse EF8. 2. Replace the fuse as needed. Is the fuse OK?		Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the Data Link Connector (DLC). 4. Start the engine. 5. The cooling fans should run at low speed when the coolant temperature reaches 93˚C (199˚F). Do the cooling fans run at low speed?		Go to *Step 5*	Go to *Step 10*
5	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the DLC. 4. Start the engine. 5. The cooling fans should run at high speed when the coolant temperature reaches 207˚F (97˚C). Do the cooling fans run at high speed?		Go to *Step 6*	Go to *Step 33*
6	1. Turn the ignition OFF. 2. Start the engine. 3. Turn the A/C switch ON. Does the A/C compressor clutch engage?		Go to *Step 8*	Go to *Step 7*
7	1. Diagnose the A/C compressor clutch circuit. 2. Repair the A/C compressor clutch circuit as needed. 3. Start the engine. 4. Turn the A/C switch ON. Does the A/C compressor clutch engage?		Go to *Step 8*	

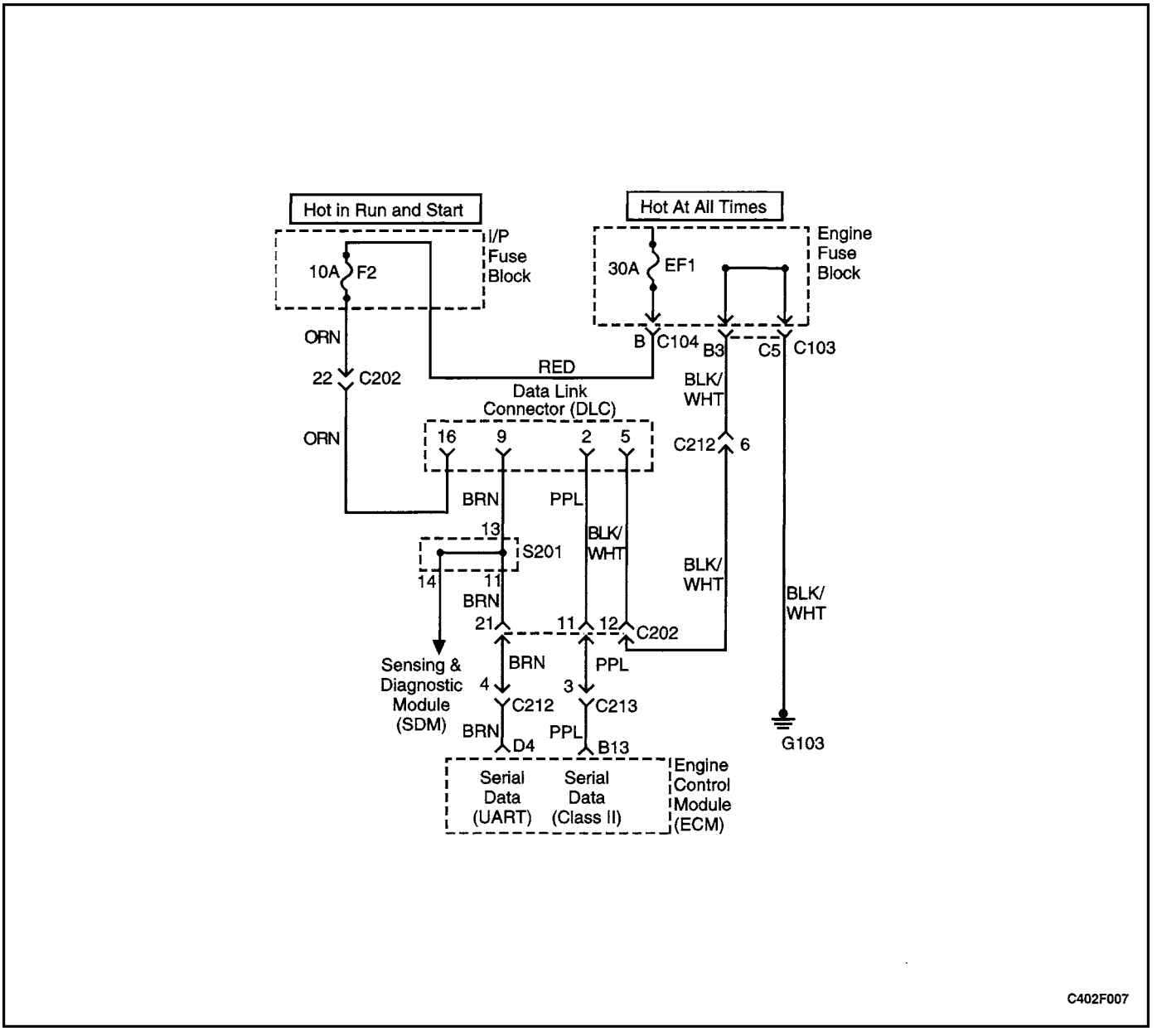
Step	Action	Value(s)	Yes	No
8	Do the cooling fans run at low speed?		Go to *Step 9*	Go to *Step 31*
9	1. Turn the ignition OFF. 2. Connect the A/C pressure gauges. 3. Start the engine. 4. Turn the A/C switch ON. 5. The cooling fans should run at high speed when the high side A/C pressure reaches 273 psi (1 882 kPa). Do the cooling fans run at high speed?		System OK	
10	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 3. The coolant temperature should be above 199˚F (93˚C). 4. Disconnect the auxiliary cooling fan connector. 5. Turn the ignition ON. 6. Connect a test light between the auxiliary cooling fan connector terminal 2 and ground. Is the test light on?		Go to *Step 11*	Go to *Step 12*
11	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 3. The coolant temperature should be above 199˚F (93˚C). 4. Disconnect the auxiliary cooling fan connector. 5. Connect a test light between the auxiliary cooling fan connector terminal 1 and battery positive. Is the test light on?		Go to *Step 28*	Go to *Step 17*
12	1. Turn the ignition OFF. 2. Disconnect the low speed cooling fan relay. 3. Connect a test light between the low speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?		Go to *Step 13*	Go to *Step 24*
13	1. Turn the ignition OFF. 2. Connect the low speed cooling fan relay. 3. Disconnect the Engine Control Module (ECM) red connector. 4. Connect a fused jumper between the ECM connector terminal C13 and ground. 5. Turn the ignition ON. Do the cooling fans run at low speed?		Go to *Step 30*	Go to *Step 14*
14	Check for an open wire between the low speed cooling fan relay connector terminal 86 and the ECM connector terminal C13. Is the problem found?		Go to *Step 25*	Go to *Step 15*
15	1. Turn the ignition OFF. 2. Disconnect the low speed cooling fan relay. 3. Connect a test light between the low speed cooling fan relay connector terminal 30 and ground. Is the test light on?		Go to *Step 16*	Go to *Step 23*

Step	Action	Value(s)	Yes	No
16	Connect a fused jumper between the low speed cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?		Go to *Step 26*	Go to *Step 17*
17	1. Disconnect the series/parallel cooling fan relay. 2. Connect a fused jumper between the low speed cooling fan relay connector terminals 30 and 87. 3. Connect a fused jumper between the series/ parallel cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?		Go to *Step 27*	Go to *Step 18*
18	Check the wire between the low speed cooling fan relay connector terminal 87 to the auxiliary cooling fan connector terminal 2 for an open. Is the problem found?		Go to *Step 22*	Go to *Step 19*
19	Check the wire between the auxiliary cooling fan connector terminal 1 and the series/parallel cooling fan relay connector terminal 30 for an open. Is the problem found?		Go to *Step 22*	Go to *Step 20*
20	Check the wire between the series/parallel cooling fan relay connector terminal 87 and the main cooling fan connector terminal 2 for an open. Is the problem found?		Go to *Step 22*	Go to *Step 21*
21	Check for an open wire between the main cooling fan connector terminal 1 and ground. Is the problem found?		Go to *Step 22*	Go to *Step 29*
22	Repair the open wire as needed. Is the repair complete?		System OK	
23	Repair the open between the low speed cooling fan relay connector terminal 30 and the battery. Is the repair complete?		System OK	
24	Repair the open between the low speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?		System OK	
25	Repair the open wire between the low speed cooling fan relay connector terminal 86 and the ECM connector terminal C13. Is the repair complete?		System OK	
26	Replace the low speed cooling fan relay. Is the repair complete?		System OK	
27	Replace the series/parallel cooling fan relay. Is the repair complete?		System OK	
28	Replace the auxiliary cooling fan. Is the repair complete?		System OK	
29	Replace the main cooling fan. Is the repair complete?		System OK	
30	Replace the ECM. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
31	1. Turn the ignition OFF. 2. Disconnect the auxiliary cooling fan connector. 3. Connect a test light between the auxiliary cooling fan connector terminal B and ground. 4. Turn the A/C switch ON. 5. Start the engine. Is the test light on?		Go to *Step 32*	Go to *Step 12*
32	1. Turn the ignition OFF. 2. Connect a test light between the main cooling fan connector terminal A and battery positive. 3. Turn the A/C switch ON. 4. Start the engine. Is the test light on?		Go to *Step 28*	Go to *Step 17*
33	1. Turn the ignition OFF. 2. Disconnect the high speed cooling fan relay. 3. Connect a test light between the high speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?		Go to *Step 34*	Go to *Step 44*
34	1. Turn the ignition OFF. 2. Connect a test light between the high speed cooling fan relay connector terminal 30 and ground. Is the test light on?		Go to *Step 35*	Go to *Step 45*
35	1. Disconnect the series/parallel cooling fan relay. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 85 and ground. 3. Turn the ignition ON. Is the test light on?		Go to *Step 36*	Go to *Step 46*
36	1. Turn the ignition OFF. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 87 and battery positive. Is the test light on?		Go to *Step 37*	Go to *Step 47*
37	1. Connect the auxiliary cooling fan connector. 2. Connect the high speed cooling fan relay. 3. Connect the series/parallel cooling fan relay. 4. Disconnect the ECM white connector. 5. Connect a fused jumper between the ECM connector terminal C13 and ground. 6. Connect a fused jumper between the ECM connector terminal C12 and ground. 7. Turn the ignition ON. Do the cooling fans run at high speed?		Go to *Step 30*	Go to *Step 38*
38	1. Turn the ignition OFF. 2. Check for an open wire between the high speed cooling fan relay connector terminal 86 and the ECM connector terminal C12. Is the problem found?		Go to *Step 22*	Go to *Step 39*

Step	Action	Value(s)	Yes	No
39	1. Disconnect the high speed cooling fan relay. 2. Connect a test light between the high speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?		Go to *Step 40*	Go to *Step 48*
40	1. Disconnect the ECM red connector. 2. Connect a fused jumper between the ECM connector terminal C12 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a test light between the series/parallel cooling fan relay connector terminal 86 and battery positive. Is the test light on?		Go to *Step 41*	Go to *Step 49*
41	1. Connect the series/parallel cooling fan relay. 2. Connect a fused jumper between the ECM connector terminal C12 and ground. 3. Disconnect the high speed cooling fan relay. 4. Connect a fused jumper between the high speed cooling fan relay connector terminals 30 and 87. 5. Disconnect the low speed cooling fan relay. 6. Connect a fused jumper between the low speed cooling fan relay connector terminals 30 and 87. 7. Turn the ignition ON. Do the cooling fans run at high speed?.		Go to *Step 43*	Go to *Step 42*
42	1. Turn the ignition OFF. 2. Connect a fused jumper between the ECM connector terminal C12 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a fused jumper between the series/parallel cooling fan relay connector terminals 30 and 87. 5. Connect a fused jumper between the low speed cooling fan relay connector terminals 30 and 87. 6. Turn the ignition ON. Do the cooling fans run at high speed?.		Go to *Step 27*	
43	Replace the high speed cooling fan relay. Is the repair complete?		System OK	
44	Repair the open wire between the high speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?		System OK	
45	Repair the open wire between the high speed cooling fan relay connector terminal 30 and the battery. Is the repair complete?		System OK	
46	Repair the open wire between the series/parallel cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
47	Repair the open wire between the series/parallel cooling fan relay connector terminal 87 and ground. Is the repair complete?		System OK	
48	Repair the open wire between the high speed cooling fan relay connector terminal 87 and the main cooling fan connector terminal 2. Is the repair complete?		System OK	
49	Repair the open wire between the series/parallel cooling fan relay connector terminal 86 and the ECM connector terminal C12. Is the repair complete?		System OK	



DATA LINK CONNECTOR DIAGNOSIS

Circuit Description

The provision for communicating with the Engine Control Module (ECM) is the Data Link Connector (DLC). It is located under the instrument panel. The DLC is used to connect the scan tool. Battery power and ground is supplied for the scan tool through the DLC. The Class II serial data circuit to the DLC allows the ECM to communicate with the scan tool. A Universal Asynchronous Receiver Transmitter (UART) serial data line is used to communicate with the other modules such as the Electronic Brake Control Module (EBCM), the Supplemental Inflatable Restraint (SIR) system and the Instrument Panel Cluster (IPC).

Diagnostic Aids

Ensure that the correct application (model line, car year, etc.) has been selected on the scan tool. If communication still cannot be established, try the scan tool on another vehicle to ensure that the scan tool or cables are not the cause of the condition.

An intermittent may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Any circuitry that is suspected of causing an intermittent complaint should be thoroughly checked for the following conditions:

- Backed–out terminals.
- Improper mating of terminals.
- Broken locks.
- Improperly formed or damaged terminals.
- Poor terminal–to–wiring connection.
- Physical damage to the wiring harness.
- Corrosion.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (OBD II) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. Unlike the UART serial data circuit, the only time a Class II serial data circuit has any voltage on it is when a scan tool asks the ECM for information and sends the information out.
8. Locate and repair any shorts that may have caused the fuse to open before replacement, if the no voltage condition was due to an open fuse.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming. The scan tool or associated cables could be malfunctioning.
16. The scan tool or associated cables could be malfunctioning. Refer to the scan tool's manual for repair information.

Data Link Connector Diagnosis

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Was the check performed?		Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition ON, engine OFF. 2. Install the scan tool. Does the scan tool power up?		Go to *Step 3*	Go to *Step 4*
3	1. Disconnect the scan tool. 2. With a test light connected to ground, probe the Class II serial data terminal 2 at the Data Link Connector (DLC). Does the test light remain OFF?		Go to *Step 5*	Go to *Step 6*
4	With the test light connected to ground, probe the DLC battery feed circuit terminal 16. Does the test light remain OFF?		Go to *Step 7*	Go to *Step 8*
5	With the test light connected to B+, probe the Class II serial data terminal 2 at the DLC. Does the test light remain OFF?		Go to *Step 9*	Go to *Step 10*
6	Check the Class II serial data circuit for a short to voltage and repair as necessary. Is a repair necessary?		Go to *Step 17*	Go to *Step 11*
7	With the test light connected to B+, probe the DLC ground circuit terminals 4. Does the test light illuminate for both circuits?		Go to *Step 15*	Go to *Step 12*
8	Repair the open or short to ground in the DLC battery feed circuit. Is the repair complete?		Go to *Step 17*	
9	Check the Class II serial data circuit for an open or a poor connection and repair as necessary. Is a repair necessary?		Go to *Step 17*	Go to *Step 13*
10	Check the Class II serial data circuit for short to ground and repair as necessary. Is a repair necessary?		Go to *Step 17*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
11	Replace the Engine Control Module (ECM). Is the repair complete?		Go to *Step 17*	
12	Repair the open or poor connection(s) in the DLC ground circuit(s). Is the repair complete?		Go to *Step 17*	
13	Reinstall the scan tool. Can the scan tool communicate with the ECM?		Go to *Step 17*	Go to *Step 14*
14	Install the scan tool on another vehicle with a Class II serial data terminal and check for proper operation. Does the scan tool work properly on a different vehicle?		Go to *Step 11*	Go to *Step 16*
15	Check the DLC electrical terminals for proper tension or excessive resistance and repair as necessary. Is a repair necessary?		Go to *Step 17*	Go to *Step 16*
16	1. The scan tool is malfunctioning. 2. Refer to the scan tool's manual for repair. Is the repair complete?		Go to *Step 17*	
17	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Attempt to start the engine. Does the engine start and continue to run?		Go to *Step 18*	Go to *Step 1*
18	1. Allow the engine to idle until normal operation temperature is reached. 2. Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to "Applicable DTC table"	System OK

FUEL INJECTOR BALANCE TEST

A fuel injector tester is used to energize the injector for a precise amount of time, thus spraying a measured amount of fuel into the intake manifold. This causes a drop in the fuel rail pressure that can be recorded and used to compare each of the fuel injectors. All of the fuel injectors should have the same pressure drop 10 kPa (1.5 psi).

Injector Balance Test Example

Cylinder	1	2	3	4
First Reading	43 psi (296 kPa)	43 psi (296 kPa)	43 psi (296 kPa)	43 psi (296 kPa)
Second Reading	19 psi (131 kPa)	17 psi (117 kPa)	18 psi (124 kPa)	21 psi (145 kPa)
Amount Of Drop	24 psi (165 kPa)	26 psi (179 kPa)	25 psi (172 kPa)	22 psi (151 kPa)
Average Range: 22.5–25.5 psi (156–176 kPa)	Injector OK	Faulty Injector – Too Much Pressure Drop	Injector OK	Faulty Injector – Too Little Pressure Drop

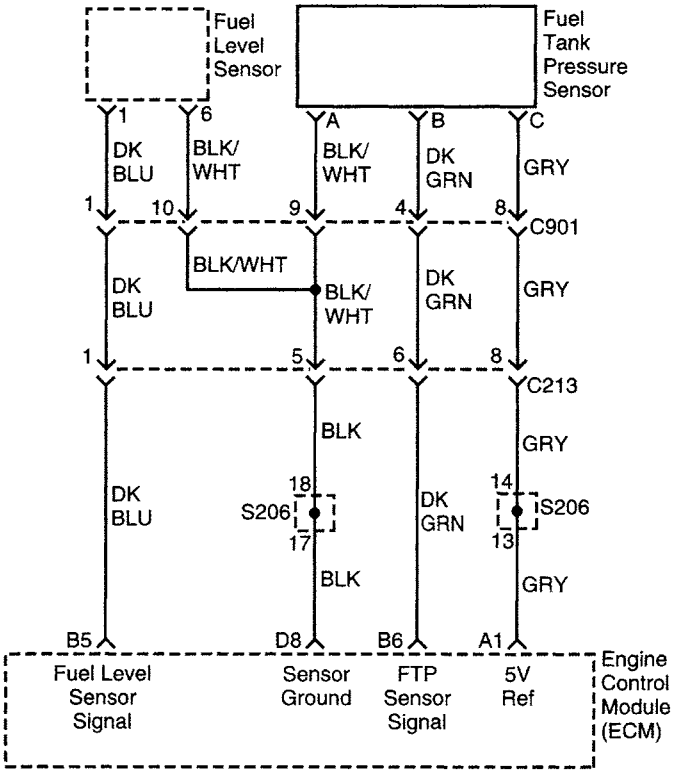
CAUTION : The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

CAUTION : Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.

Notice : In order to prevent flooding of the engine, do not perform the Injector Balance Test more than once (including any retest on faulty fuel injectors) without running the engine.

Test

1. An engine cool down period of 10 minutes is necessary in order to avoid irregular readings due to hot soak fuel boiling.
2. Connect the fuel pressure gauge carefully to avoid any fuel spillage.
3. The fuel pump should run about 2 seconds after the ignition is turned to the ON position.
4. Insert a clear tube attached to the vent valve of the fuel pressure gauge into a suitable container.
5. Bleed the air from the fuel pressure gauge and hose until all of the air is bled from the fuel pressure gauge.
6. The ignition switch must be in the OFF position at least 10 seconds in order to complete the Engine Control Module (ECM) shutdown cycle.
7. Turn the ignition ON in order to get the fuel pressure to its maximum level.
8. Allow the fuel pressure to stabilize and then record this initial pressure reading. Wait until there is no movement of the needle on the fuel pressure gauge.
9. Follow the manufacturer's instructions for the use of the adapter harness. Energize the fuel injector tester once and note the fuel pressure drop at its lowest point. Record this second reading. Subtract it from the first reading to determine the amount of the fuel pressure drop.
10. Disconnect the fuel injector tester from the fuel injector.
11. After turning the ignition ON, in order to obtain maximum pressure once again, make a connection at the next fuel injector. Energize the fuel injector tester and record the fuel pressure reading. Repeat this procedure for all the injectors.
12. Retest any of the fuel injectors that the pressure drop exceeds the 1.5 psi (10 kPa) of the average pressure drop value.
13. Replace any of the fuel injectors that fail the retest.
14. If the pressure drop of all of the fuel injectors is within 1.5 psi (10 kPa) of the average pressure drop value, then the fuel injectors are flowing normally and no replacement should be necessary.
15. Reconnect the fuel injector harness and review the symptom diagnostic tables.



EVAP CONTROL SYSTEM DIAGNOSIS

Circuit Description

The Evaporative Emission (EVAP) system is checked by applying vacuum to the EVAP system and monitoring for a vacuum decay. The Engine Control Module (ECM) monitors the vacuum level through the fuel tank pressure sensor signal. At an appropriate time, the EVAP canister purge valve and the EVAP vent solenoid are turned on, allowing the engine to draw a small vacuum on the entire evaporative emission system. After the desired vacuum level has been achieved, the EVAP canister purge valve is turned off, sealing the system. A leak is detected by monitoring for a decrease in vacuum level over a given time period, when all other variables remain constant. A leak, blockage or faulty component in the system will cause a Diagnostic Trouble Code (DTC) to be set.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for the following conditions:
  - Backed–out terminals.
  - Improper mating.
  - Broken locks.
  - Damaged terminals.
  - Poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears to be OK, observe the Fuel Tank Vacuum Pressure display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.
- Incorrect purge or vacuum source line routing. Verify that the source vacuum and purge lines to the EVAP canister purge valve are not switched.

EVAP Control System Diagnosis

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install the scan tool. 3. Turn the ignition ON. Are any Diagnostic Trouble Codes (DTCs) set?		Go to ”Applicable DTC table”	Go to *Step 3*
3	1. Disconnect the fuel tank pressure sensor electrical connector. 2. Using a digital voltmeter (DVM), measure the voltage between the 5 volt reference circuit and the sensor ground circuit at the fuel tank pressure sensor harness connector. Is the voltage near the specified value?	5 v	Go to *Step 6*	Go to *Step 4*
4	Check the 5 volt reference circuit for a poor terminal connection at the Engine Control Module (ECM). Is a problem found?		Go to *Step 12*	Go to *Step 5*
5	Check for an open 5 volt reference circuit to the fuel tank pressure sensor harness connector. Is a problem found?		Go to *Step 11*	Go to *Step 9*
6	1. Remove the fuel cap. 2. Connect a jumper between terminal A at the fuel tank pressure sensor pigtail and terminal A at the harness connector on the ECM side. 3. Connect a jumper between terminal C at the fuel tank pressure sensor pigtail and terminal C at the harness connector on the ECM side. 4. Using a DVM, measure voltage at terminal B at the fuel tank pressure sensor pigtail. Is the voltage between the specified values?	1.3–1.7 v	Go to *Step 7*	Go to *Step 14*
7	Check the fuel tank pressure sensor signal circuit for a poor terminal connection at the ECM and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 8*
8	Check the fuel tank pressure sensor signal circuit between the fuel tank pressure sensor connector and the ECM for an open, short to ground, or short to voltage and repair as necessary. Is a repair necessary?		Go to *Step 13*	Go to *Step 15*
9	Check the sensor ground circuit for a poor terminal connection at the ECM and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 10*
10	Check for an open in the sensor ground circuit. Is a problem found?		Go to *Step 13*	Go to *Step 15*
11	Check for a poor circuit terminal connection at the fuel tank pressure sensor connector and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
12	Replace the malfunctioning harness connector terminals. Is the repair complete?		System OK	
13	Locate and repair the open/short circuit in the wiring harness. Is the repair complete?		System OK	
14	Replace the fuel tank pressure sensor. Is the repair complete?		System OK	
15	Replace the ECM. Is the repair complete?		System OK	