TROUBLE CODE DIAGNOSIS

CLEARING TROUBLE CODES

Notice : To prevent Engine Control Module (ECM) damage, the key must be OFF when disconnecting or reconnecting the power to the ECM (for example battery cable, ECM pigtail connector, ECM fuse, jumper cables, etc.).

When the ECM sets a Diagnostic Trouble Code (DTC), the Malfunction Indicator Lamp (MIL) lamp will be turned on only for type A and B but a DTC will be stored in the ECM's memory for all types of DTC. If the problem is intermittent, the MIL will go out after 10 seconds if the fault is no longer present. The DTC will stay in the ECM's memory until cleared by scan tool. Removing battery voltage for 10 seconds will clear some stored DTCs.

DTCs should be cleared after repairs have been completed. Some diagnostic tables will tell you to clear the codes before using the chart. This allows the ECM to set the DTC while going through the chart, which will help to find the cause of the problem more quickly.

DIAGNOSTIC TROUBLE CODES

DTC	Description	Type	Illuminate MIL
P0106	Manifold Absolute Pressure Rationality	B	Yes
P0107	Manifold Absolute Pressure Low Voltage	A	Yes
P0108	Manifold Absolute Pressure High Voltage	A	Yes
P0112	Intake Air Temperature Low Voltage	A	Yes
P0113	Intake Air Temperature High Voltage	A	Yes
P0117	Engine Coolant Temperature Low Voltage	A	Yes
P0118	Engine Coolant Temperature High Voltage	A	Yes
P0121	Throttle Position Sensor Rationality	B	Yes
P0122	Throttle Position Sensor Low Voltage	A	Yes
P0123	Throttle Position Sensor High Voltage	A	Yes
P0125	Engine Coolant Temperature Insufficient For Closed Loop Fuel Control	B	Yes
P0131	O2 Bank 1 Sensor 1 Low Voltage	A	Yes
P0132	O2 Bank 1 Sensor 1 High Voltage	A	Yes
P0133	O2 Bank 1 Sensor 1 Slow Response	B	Yes
P0134	O2 Bank 1 Sensor 1 No Activity	A	Yes
P0137	O2 Bank 1 Sensor 2 Low Voltage	A	Yes
P0138	O2 Bank 1 Sensor 2 High Voltage	A	Yes
P0140	O2 Bank 1 Sensor 2 No Activity	A	Yes
P0141	O2 Bank 1 Sensor 2 Heater	B	Yes
P0171	Bank 1 System Too Lean	B	Yes
P0172	Bank 1 System Too Rich	B	Yes
P0201	Injector 1 Circuit Fault	A	Yes
P0202	Injector 2 Circuit Fault	A	Yes
P0203	Injector 3 Circuit Fault	A	Yes
P0204	Injector 4 Circuit Fault	A	Yes
P0300	Multiple Cylinder Misfire	B	Yes
P0301	Cylinder 1 Misfire	A	Yes
P0302	Cylinder 2 Misfire	A	Yes
P0303	Cylinder 3 Misfire A Yes	A	Yes
P0304	Cylinder 4 Misfire	A	Yes
P0325	Knock Sensor SNEF Internal Malfunction	B	Yes

DTC	Description	Type	Illuminate MIL
P0327	Knock Sensor Circuit Fault	B	Yes
P0336	58X Crank Position Extra/Missing Pulses	B	Yes
P0337	58X Crank Position No Signal	A	Yes
P0341	Cam Rationality	B	Yes
P0342	Cam Position No Signal	A	Yes
P0351	Ignition Control Circuit A Fault	A	Yes
P0352	Ignition Control Circuit B Fault	A	Yes
P0401	Exhaust Gas Recirculation Insufficient Flow	A	Yes
P0402	Exhaust Gas Recirculation Excessive Flow	A	Yes
P0404	Exhaust Gas Recirculation Open Valve Position Error	B	Yes
P0405	Exhaust Gas Recirculation Pintle Position Low Voltage	A	Yes
P0406	Exhaust Gas Recirculation Pintle Position High Voltage	A	Yes
P0420	Catalyst Bank 1 Low Efficiency	A	Yes
P0440	Evaporative Emission System Large Leak/Low Tank Vacuum	B	Yes
P0442	Evaporative Emission System Small Leak	B	Yes
P0443	Evaporative Emission System Purge Control Circuit	A	Yes
P0446	Evaporative Emission System Vent Control Malfunction	B	Yes
P0449	Evaporative Emission System Vent Solenoid Circuit Fault	A	Yes
P0452	Fuel Tank Pressure Sensor Low Voltage	A	Yes
P0453	Fuel Tank Pressure Sensor High Voltage	A	Yes
P0461	Fuel Level Rationality	D	No
P0462	Fuel Level Low Voltage	D	No
P0463	Fuel Level High Voltage	D	No
P0480	Cooling Fan Relay 1 Fan Control Circuit Fault	D	No
P0481	Cooling Fan Relay 2 Fan Control Circuit Fault	D	No
P0502	Vehicle Speed Sensor (Engine Side) No Signal	B	Yes
P0506	Idle Speed RPM Lower Than Desired Idle Speed	B	Yes
P0507	Idle Speed RPM Higher Than Desired Idle Speed	B	Yes
P0532	A/C Pressure Sensor Low	D	No
P0533	A/C Pressure Sensor High	D	No
P0562	System Voltage (Engine Side) Too Low	D	No
P0563	System Voltage (Engine Side) Too High	B	Yes
P0601	ECM (Engine Side) Checksum Error	A	Yes
P1106	Manifold Absolute Pressure Intermittent High Voltage	D	No
P1107	Manifold Absolute Pressure Intermittent Low Voltage	D	No
P1111	Intake Air Temperature Intermittent High Voltage	D	No
P1112	Intake Air Temperature Intermittent Low Voltage	D	No
P1114	Engine Coolant Temperature Intermittent Low Voltage	D	No
P1115	Engine Coolant Temperature Intermittent High Voltage	D	No
P1121	Throttle Position Sensor Intermittent High Voltage	D	No
P1122	Throttle Position Sensor Intermittent Low Voltage	D	No
P1133	O2 Bank 1 Sensor 1 Too Few Transitions	B	Yes

DTC	Description	Type	Illuminate MIL
P1134	O2 Bank 1 Sensor 1 Transition Ratio	B	Yes
P1171	Fuel Supply System Lean During Power Enrichment	A	Yes
P1336	58X Crank Position Tooth Error Not Learned	A	Yes
P1380	ABS Rough Road Data Invalid	D	No
P1381	ABS Rough Road Serial Data Fault	D	No
P1391	G Sensor Rough Road Rationality	D	No
P1392	G Sensor Rough Road Low Voltage	D	No
P1393	G Sensor Rough Road High Voltage	D	No
P1404	Exhaust Gas Recirculation Closed Valve Pintle Error	B	Yes
P1441	Evaporative Emission Continuous Purge Flow	B	Yes
P1508	Idle Air Control Counts Too Low	D	No
P1509	Idle Air Control Counts Too High	D	No
P1520	Park/Neutral Discrete Fault	D	No
P1546	A/C Clutch Output Circuit Fault	D	No
P1618	ECM Internal SPI Communication	A	Yes
P1625	ECM Internal System Reset	D	No
P1627	ECM A/D Conversion Error	A	Yes
P1635	ECM 5 Volt Reference Line Low	D	No
P1640	ODM Internal SPI Communication	A	Yes

DIAGNOSTIC TROUBLE CODE (DTC) P0106
MANIFOLD ABSOLUTE PRESSURE RATIONALITY

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes, and it converts these into voltage outputs. The ECM can detect if the MAP sensor is not responding to the Throttle Position (TP) changes by comparing the actual MAP change to a predicted MAP change based on the amount of TP change that occurs. If the ECM does not see the expected MAP change or more, DTC P0106 will set.

Conditions for Setting the DTC

- DTCs P0107, P0108, P0117, P0118, P0122, P0123, P0201, P0202, P0203, P0204, P0300, P0351, P0352, P0402, P0404, P0405, P0406, P0443, P0506, P0507, P1404, P1441, P1627 not set.
- Engine running.
- Valid Barometric Pressure (BARO) update.
- A/C steady state.
- No power steering cramp.
- No TP sensor fail conditions present.
- No MAP fail conditions present.
- Change in Idle Air Control (IAC) is less than 4 counts.
- Coolant temperature is greater than 14˚F (–10˚C).
- Change in rpm is less than 200.
- Change in TP sensor is less than 6%.
- The rpm is between 1300 and 4500.
- All of the above are stabilized for 0.6 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a fixed MAP value and use TP to control the fuel delivery. (The scan tool will not show defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same ±0.4 volts.

The MAP sensor vacuum source should be thoroughly checked for restrictions at the intake manifold.

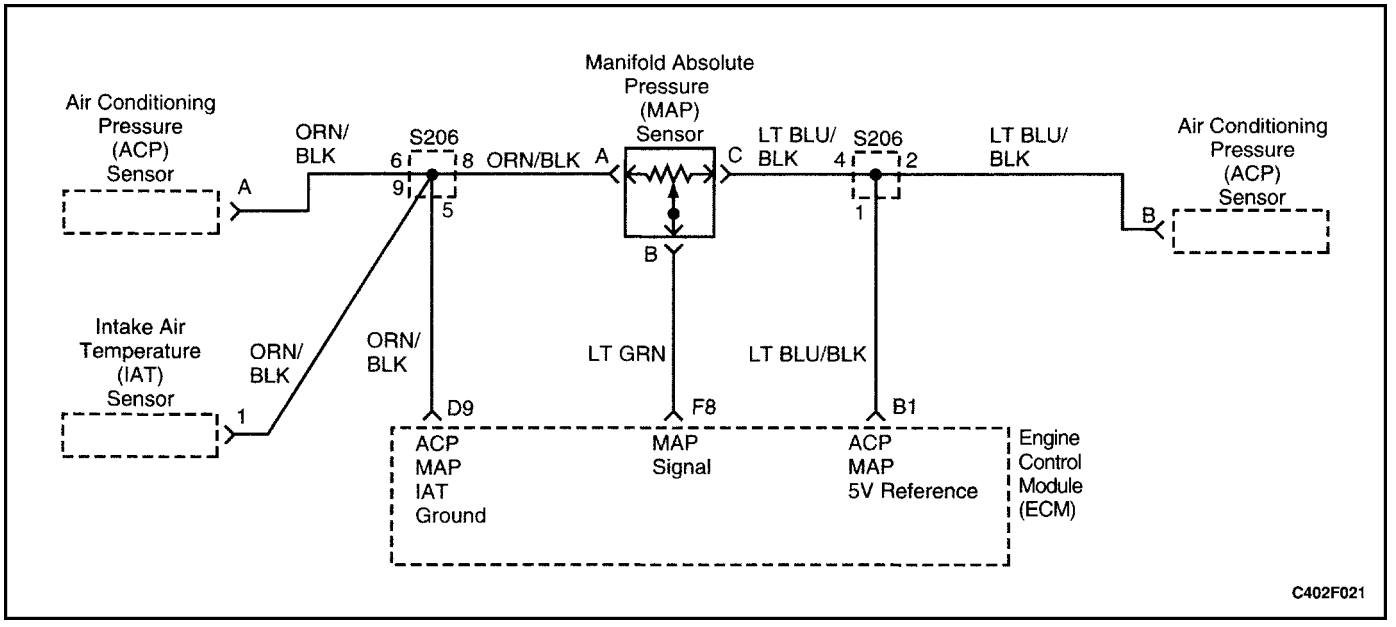
Test Description

Numbers below refer to the step numbers 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.
2. A sensor that displays an ignition ON, engine OFF BARO value that does not appear normal for the altitude the vehicle is in should be considered to be malfunctioning.
3. While starting the engine, the MAP sensor should detect any changes in the manifold pressure. This test is to determine if the sensor is stuck at a value.
4. A normal MAP sensor will react as quickly to the throttle changes as they can be made. A sensor should not appear to be lazy or catch up with the throttle movements.
5. This step checks if the reason for no MAP change was due to a faulty sensor or vacuum source to the sensor.
7. The MAP sensor vacuum source should be thoroughly checked for restrictions. A drill bit can be used to clean out any casting flash that may exist in the vacuum port.
9. The MAP Sensor System Performance diagnostic may have to complete several tests before determining if the diagnostic has passed or failed the last test. Operate the vehicle in the Conditions for Setting the DTC several times to ensure that the diagnostic runs enough tests to pass or fail.
10. If no faults have been found at this point and no additional DTCs are set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0106 Manifold Absolute Pressure Rationality

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool. 2. Turn the ignition switch ON with the engine not running. 3. Compare the Barometric Pressure (BARO) reading with a known good vehicle. Is the BARO reading similar?	0.25 v	Go to *Step 3*	Go to *Step 8*
3	Start the engine while watching the Manifold Absolute Pressure (MAP) sensor value. Does the MAP sensor value change while starting the engine?	4.7 v	Go to *Step 4*	Go to *Step 5*
4	With the engine still running, snap the throttle while watching the MAP sensor display on the scan tool. Does the MAP sensor value change rapidly with the throttle position changes?	0.25 v	Go to *Step 9*	Go to *Step 6*
5	1. Disconnect the MAP sensor vacuum hose and install a vacuum gauge to the MAP sensor. 2. Turn the ignition switch ON, with the engine OFF. 3. Apply 15 in HG to the MAP sensor. Does the MAP sensor value on the scan tool change?		Go to *Step 7*	Go to *Step 8*
6	1. Remove the MAP sensor from the manifold port. 2. Inspect the port and MAP sensor for restrictions and repair as necessary. Is the repair complete?	4.0 v	Go to *Step 9*	Go to *Step 8*
7	Repair the restriction in the MAP sensor vacuum port or hose. Is the repair complete?		Go to *Step 9*	
8	Replace the MAP sensor. Is the repair complete?		Go to *Step 9*	
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0107

MANIFOLD ABSOLUTE PRESSURE LOW VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes, and it converts these into voltage outputs. The ECM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the MAP sensor also changes. By monitoring the MAP sensor output voltage, the ECM knows the manifold pressure. A low pressure (low voltage) output voltage will be about 1.0 to 1.5 volts at idle, while higher pressure (high voltage) output voltage will be about 4.5 to 4.8 volts at Wide Open Throttle (WOT). The MAP sensor is also used, under certain conditions, to measure Barometric Pressure (BARO), allowing the ECM to make adjustments for different altitudes.

Conditions for Setting the DTC

- No Throttle Position (TP) sensor fail conditions present.
- Engine running.
- MAP is less than 12 kPa.
- The TP sensor is greater than or equal to 2.0% if the rpm is less than or equal to 2000.
- The TP sensor is greater than 5.0% if the rpm is greater than 2000.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The Coolant fan turns on.
- The ECM will substitute a fixed MAP value and use TP to control the fuel delivery. (The scan tool will not show defaulted 0.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same ±0.4 volt.

If a DTC P0107 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

Important : After repairs, use the scan tool FUEL TRIM RESET function to reset long–term fuel trim to 128 (0%).

Test Description

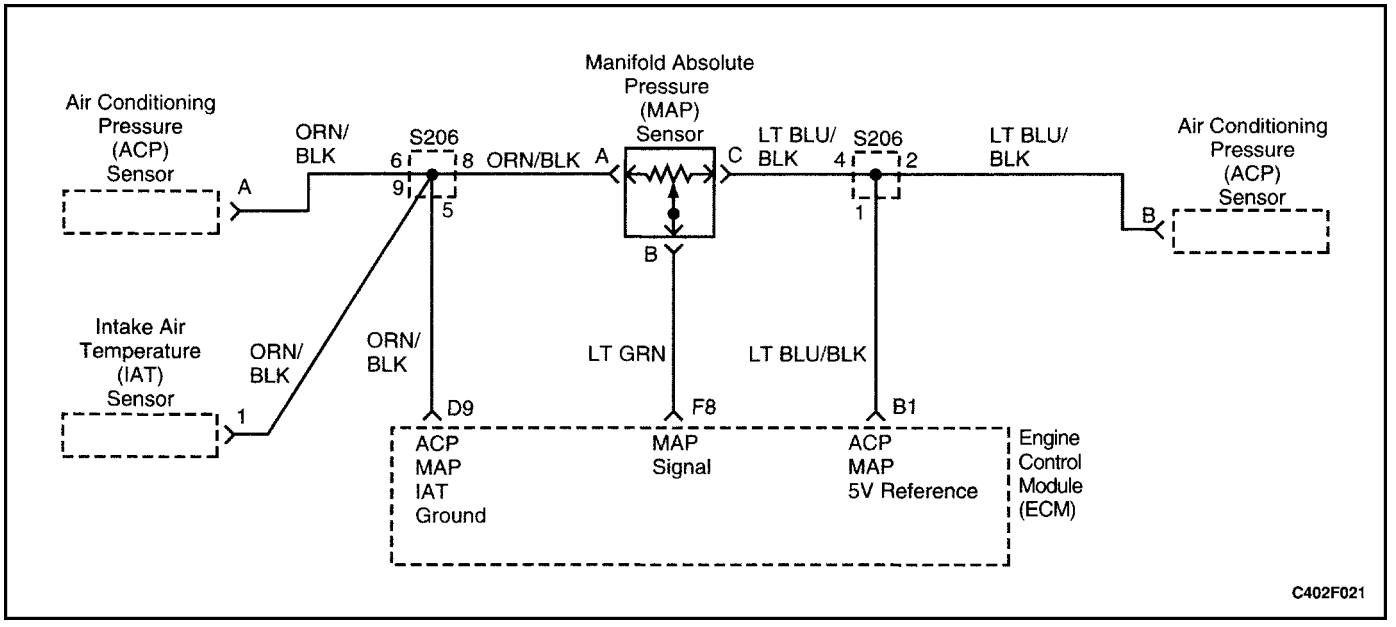
Numbers below refer to the step numbers on the Diagnostic Table.

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.
2. This step will determine if DTC P0107 is the result of a hard failure or an intermittent condition.
3. Jumpering harness terminal B to C (signal circuit to 5 volts) will determine if the sensor is malfunctioning or if there is a problem with the ECM or wiring.
6. The scan tool may not display 5 volts. The important thing is that the ECM recognizes the voltage as more than 4 volts, indicating that the ECM and the signal circuit are OK. A test light that illuminates indicates a short to ground in the signal circuit.
7. A short to ground in the 5 volt reference circuit could also set additional DTCs.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for the ECM reprogramming.

DTC P0107 Manifold Absolute Pressure Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. With engine idling, install a scan tool. 2. Does the scan tool display Manifold Absolute Pressure (MAP) voltage below the specified value?	0.25 v	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition switch OFF. 2. Disconnect the MAP sensor electrical connector. 3. Jumper the MAP signal circuit at terminal B to the 5 volt reference circuit at terminal C. 4. Turn the ignition switch ON. Does the MAP read more than the specified value?	4.7 v	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition switch ON with the engine OFF, review the Freeze Frame data, and note the parameters. 2. Operate the vehicle within the freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool display MAP below the specified value?	12 kPa	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the MAP sensor harness electrical connector terminals for the following conditions: • Poor connections. • Proper contact tension. • Poor terminal to wire connection. Is a problem found?		Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition switch OFF. 2. Remove the jumper wire. 3. Probe the MAP sensor signal circuit terminal F8 with a test light to B+. 4. Turn the ignition switch ON. Does the scan tool read over the specified value?	4.0 v	Go to *Step 7*	Go to *Step 12*
7	Check the MAP sensor 5 volt reference circuit at terminal B1 for an open or short to ground. Is a problem found?		Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
8	Repair the connection terminals as necessary. Is the action complete?		Go to *Step 14*	
9	Replace the MAP sensor. Is the action complete?		Go to *Step 14*	
10	Repair the MAP sensor 5 volt reference circuit. Is the action complete?		Go to *Step 14*	
11	Replace the engine control module (ECM). Is the action complete?		Go to *Step 14*	
12	Check the MAP sensor signal circuit for the following conditions: • Open. • Short to ground. • Short to sensor ground. Is a problem found?		Go to *Step 13*	Go to *Step 11*
13	Repair the MAP sensor signal circuit. Is the action complete?		Go to *Step 14*	
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to "Applicable DTC table"	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0108

MANIFOLD ABSOLUTE PRESSURE HIGH VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes; and converts these into voltage outputs. The ECM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the MAP sensor also changes. By monitoring the MAP sensor output voltage, the ECM knows the manifold pressure. A low pressure (low voltage) output voltage will be about 1.0 to 1.5 volts at idle, while higher pressure (high Voltage) output voltage will be about 4.5 to 4.8 volts at Wide Open Throttle (WOT). The MAP sensor is also used, under certain conditions, to measure barometric pressure, allowing the ECM to make adjustments for different altitudes.

Conditions for Setting the DTC

- No Throttle Position (TP) sensor fail conditions present.
- Engine running.
- MAP is greater than 12 kPa.
- The TP sensor is less than 37% if the rpm is less than or equal to 2500.
- The TP sensor is less than 56% if the rpm is greater than 2500.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Coolant fan turns on.
- The ECM will substitute a fixed MAP value and use TP to control the fuel delivery. (The scan tool will not show defaulted 0.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure, and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same ±0.4 volt.

If a DTC P0108 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

DTC P0108 may set as a result of a misfire. If misfire is present, repair the cause of misfire before using this table. The misfire counters may be used to determine which cylinder(s) is misfiring.

Important : After repairs, use the scan tool FUEL TRIM RESET function to reset long–term fuel trim to 128 (0%).

If DTC P0172 is also set, check the 5 volt reference circuit for a short to voltage.

Test Description

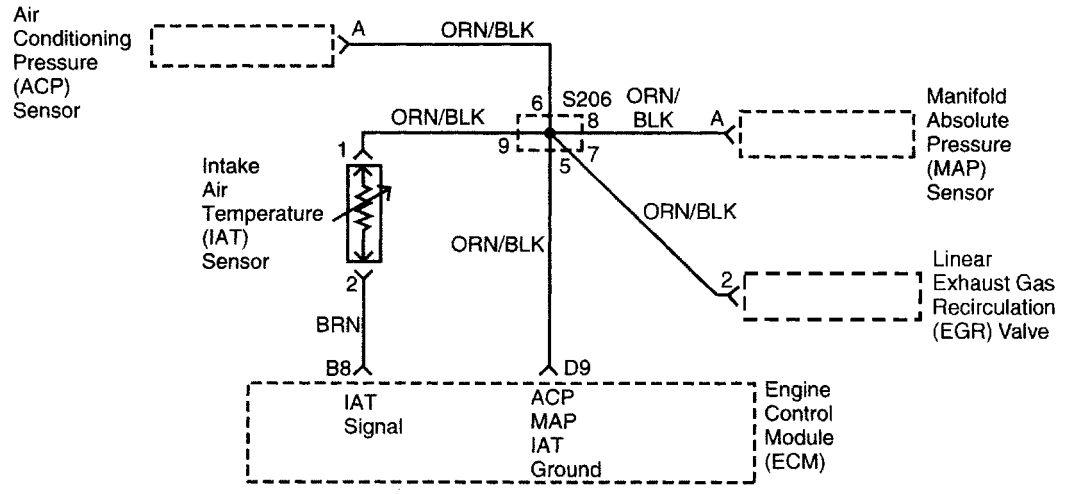
Numbers below refer to the step numbers on the Diagnostic Table.

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.
2. This step will determine if DTC P0108 is the result of a hard failure or an intermittent condition.
3. This step simulates conditions for a DTC P0107. If the ECM recognizes the change, the ECM, the 5 volt reference and the sensor signal circuits are OK.
5. This step also looks for an open in the sensor ground circuit. If the circuit is open, additional DTCs will also be set. If no other DTCs are set and the circuit is found to be open, then the open must be between the MAP sensor and the electrical connector ground splice.
6. When the sensor signal circuit is shorted to battery voltage, the TP will be displayed above 0% at all times and A/C High Side will be displayed high. The vehicle will also remain in Open Loop.
8. The MAP sensor vacuum source should only supply vacuum to the MAP sensor. Check the vacuum port for a restriction caused by casting flash.
9. Disconnect all sensors that use a 5 volt reference one at a time while monitoring the short on the 5 volt reference circuit. Replace any sensor that may have caused the short on the 5 volt reference circuit.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for the ECM reprogramming.

DTC P0108 Manifold Absolute Pressure High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool. 2. Idle the engine. Does the scan tool display a Manifold Absolute Pressure (MAP) voltage of the specified value or less?	4.0 v	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition switch OFF. 2. Disconnect the MAP sensor electrical connector. 3. Turn the ignition switch ON. Does the scan tool display a MAP of the specified value or less?	1.0 v	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition switch ON, with the engine OFF, review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool display a MAP equal to or greater than the specified value?	4.0 v	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Probe the MAP sensor signal ground circuit at terminal F8 with a test light connected to battery voltage. Does the test light illuminate?		Go to *Step 7*	Go to *Step 11*
6	Check the MAP sensor signal circuit at terminal F8 for a short to voltage and repair as necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 12*
7	With a Digital Voltmeter (DVM) connected to ground, probe the 5 volt reference circuit at terminal B1. Does the DVM display near the specified value?	5 v	Go to *Step 8*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
8	Check the MAP sensor vacuum source for being plugged or leaking. Is a problem found?		Go to *Step 10*	Step 13
9	Check the 5 volt reference circuit at terminal B1 for a short to voltage and repair as necessary. Is a repair necessary?		Go to *Step 14*	Step 12
10	Repair the vacuum source as necessary. Is the action complete?		Go to *Step 14*	
11	Check for an open in the MAP sensor ground circuit at terminal D9 and repair as necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 12*
12	Replace the engine control module (ECM). Is the action complete?		Go to *Step 14*	
13	Replace the MAP sensor. Is the action complete?		Go to *Step 14*	
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0112

INTAKE AIR TEMPERATURE LOW VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the air is cold, the resistance is high; therefore the IAT signal voltage will be high. If the intake air is warm, resistance is low; therefore the IAT signal voltage will be low.

Conditions for Setting the DTC

- Engine run time is greater than 3 seconds.
- Vehicles speed is greater than 40 km/h (25 mph).
- DTC P0502 is not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The Coolant fan turns on.
- The ECM will default to 60˚C (140˚F) for intake air temperature. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

If the vehicle is at ambient temperature, compare the IAT sensor to the Engine Coolant Temperature (ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other.

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

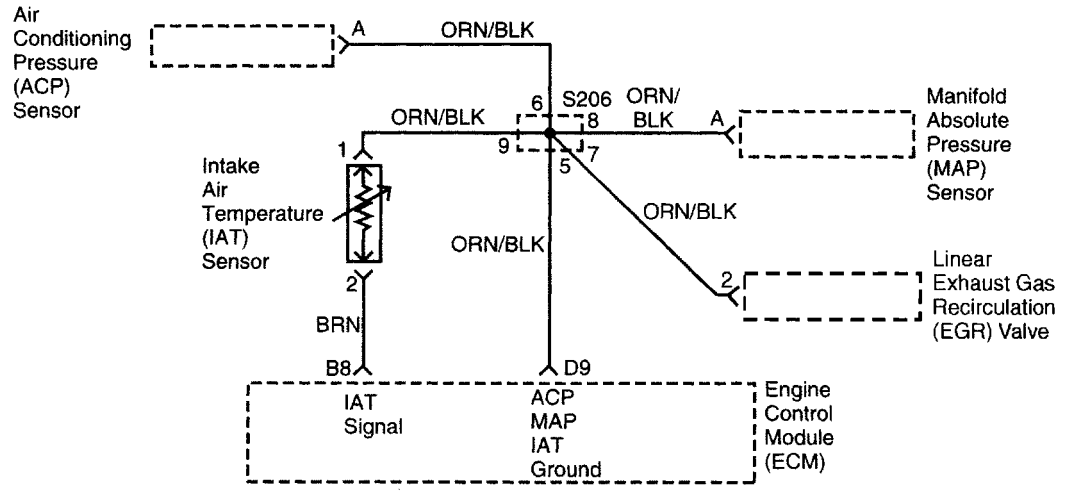
Test Description

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.
4. This step simulates a DTC P0113 condition. If the scan tool displays the specified value, the IAT signal circuit and the ECM are OK.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0112 Intake Air Temperature Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool Is the Intake Air Temperature (IAT) value greater than the specified value?	262˚F (128˚C)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF, review Freeze Frame data, and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the IAT sensor value greater than the specified value?	262˚F (128˚C)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	Disconnect the IAT sensor electrical connector. Is the IAT sensor value below the specified value?	–30˚C (–22˚F)	Go to *Step 5*	Go to *Step 6*
5	Replace the IAT sensor. Is the action complete?		Go to *Step 9*	
6	With a test light connected to B+, probe the IAT sensor signal circuit, terminal 2 at the IAT sensor electrical connector. Does the test light illuminate?		Go to *Step 9*	
7	Repair the short to ground in the IAT sensor signal circuit. Is the action complete?		Go to *Step 13*	Go to *Step 11*
8	Replace the engine control module (ECM). Is the action complete?		Go to *Step 9*	
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?		Go to *Step 10*	Go to *Step 2*
10	Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to the applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0113
INTAKE AIR TEMPERATURE HIGH VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the air is cold, the resistance is high; therefore the IAT signal voltage will be high. If the intake air is warm, resistance is low; therefore the IAT signal voltage will be low.

Conditions for Setting the DTC

- Engine run time is greater than 120 seconds.
- Vehicles speed is less than 113 km/h (70 mph).
- Coolant temperature is greater than –8˚C (17.6˚F) .
- Airflow is less than 30 g/s.
- DTC P0502 is not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.
- The ECM will default to 140˚F (60˚C) for IAT. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn OFF after three consecutive ignition cycles in which the diagnostic runs without a fault.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTCs can be cleared by using the scan tool.

Diagnostic Aids

If the vehicle is at ambient temperature, compare the IAT sensor to the Engine Coolant Temperature (ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other.

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to”Temperature vs. Resistance” in this section.

Test Description

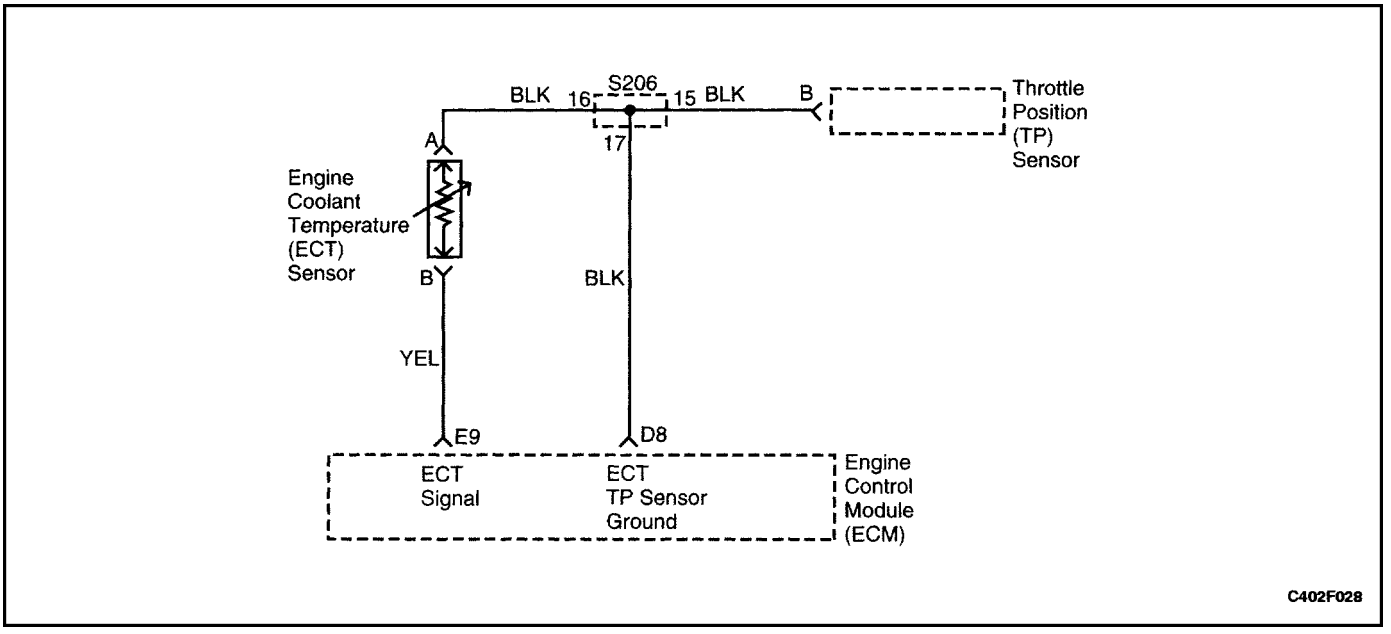
Number(s) below refer to the step number(s) on the Diagnostic Table.

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.
4. This step simulates a DTC P0112. If the ECM senses the change, the ECM and wiring are OK.
5. This step will determine if the reason the ECM did not sense the change was due to a open ground or signal circuit or malfunctioning ECM.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0113 Intake Air Temperature High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool Is the Intake Air Temperature (IAT) value less than the specified value?	–22˚F (–30˚C)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON, with the engine OFF, review Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the IAT sensor value less than the specified value?	–22˚F (–30˚C)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Disconnect the IAT sensor electrical connector. 2. Jumper the IAT sensor signal circuit at terminal 2 and the IAT sensor ground circuit at terminal 1 together at the IAT sensor electrical connector. Is the IAT sensor value greater than the specified value?	130˚C (266˚F)	Go to *Step 6*	Go to *Step 5*
5	Jumper the IAT sensor signal circuit at terminal 2 to ground. Is the IAT sensor value greater than the value specified?	130˚C (266˚F)	Go to *Step 7*	Go to *Step 8*
6	Check for a poor connection at the IAT sensor electrical connector and replace any malfunctioning terminals if necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 10*
7	Check the IAT sensor ground circuit for an open and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 9*
8	Check the IAT sensor signal circuit for an open and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 9*
9	Check for a poor IAT sensor ground circuit at terminal D9 or a poor IAT sensor signal circuit terminal B8 connection at the Engine Control Module (ECM) and repair if necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 11*
10	Replace the IAT sensor. Is the action complete?		Go to *Step 12*	
11	Replace the ECM. Is the action complete?		Go to *Step 12*	

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0117

ENGINE COOLANT TEMPERATURE LOW VOLTAGE

Circuit Description

The Engine Coolant Temperature (ECT) Sensor uses a thermistor to control the signal voltage to the engine control module (ECM). The ECM supplies a voltage on the signal circuit to the sensor. When the air is cold, the resistance is high; therefore the ECT signal voltage will be high.

As the engine warms, the sensor resistance becomes less, and the voltage drops. At normal engine operating temperature, the voltage will be between 1.5 and 2.0 volts at the ECT signal terminal.

The ECT sensor is used to control the following items:

- Fuel delivery.
- Ignition
- Evaporative Emission (EVAP) canister purge valve.
- Idle Air Control (IAC) valve.
- Electric cooling fan.

Conditions for Setting the DTC

- Engine run time is greater than 120 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.
- The ECM will default to 68˚F (20˚C) for the first 60 seconds of engine run time, and then to 198˚F (92˚C). The scan tool may not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

After the engine has started, the ECT should rise steadily to about 194˚F (90˚C) then stabilize when the thermostat opens.

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to”Temperature vs. Resistance” in this section.

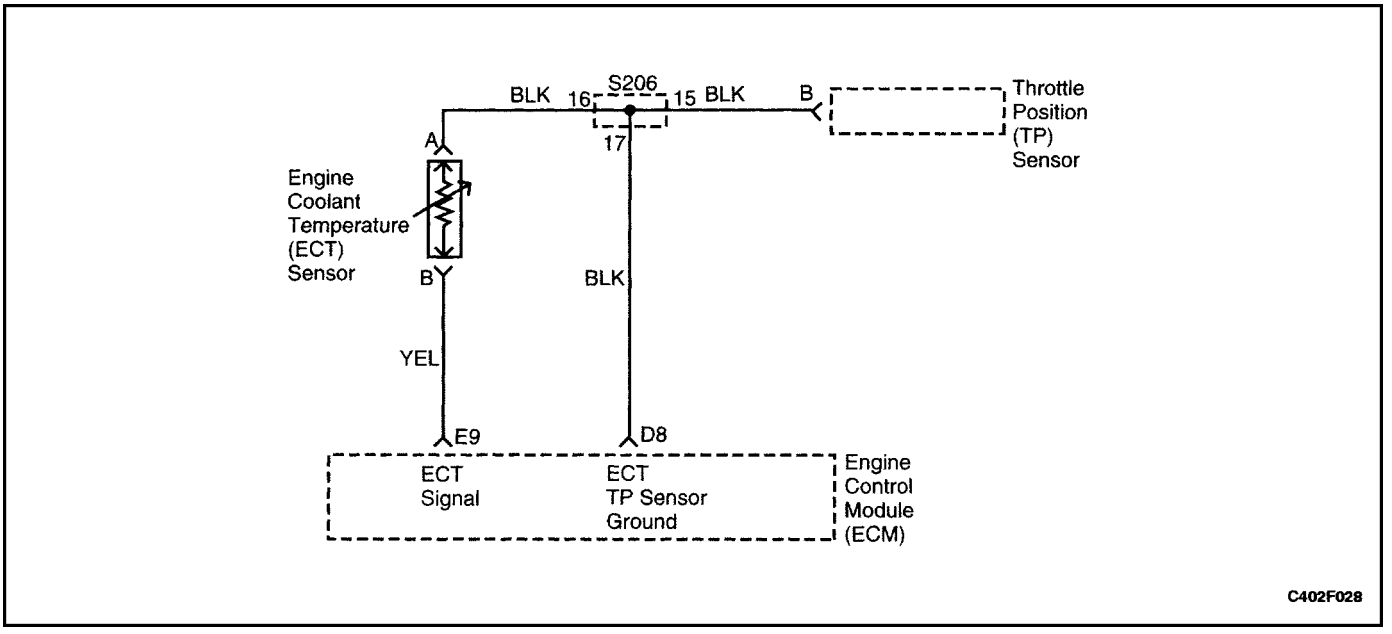
Test Description

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.
4. This step simulates a DTC P0118 condition. If the ECM senses the change, then the ECM and the ECT wiring are OK.
7. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0117 Engine Coolant Temperature Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool Is the engine coolant temperature (ECT) sensor value greater than the specified value?	266˚F (130˚C)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON, with the engine OFF. 2. Review Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the ECT sensor value greater than the specified value?	266˚F (130˚C)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	Disconnect the ECT sensor electrical connector. Is the ECT sensor value less than the specified value?	–22˚F (–30˚C)	Go to *Step 6*	Go to *Step 5*
5	Check the ECT sensor signal circuit at terminal B for a short to ground and repair as necessary. Is a repair necessary?		Go to *Step 8*	Go to *Step 7*
6	Replace the ECT sensor. Is the action complete?		Go to *Step 8*	
7	Replace the engine control module (ECM). Is the action complete?		Go to *Step 8*	
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0118

ENGINE COOLANT TEMPERATURE HIGH VOLTAGE

Circuit Description

The Engine Coolant Temperature (ECT) Sensor uses a thermistor to control the signal voltage to the engine control module (ECM). The ECM supplies a voltage on the signal circuit to the sensor. When the air is cold, the resistance is high; therefore the ECT signal voltage will be high. As the engine warms, the sensor resistance becomes less and the voltage drops. At normal engine operating temperature, the voltage will be between 1.5 and 2.0 volts at the ECT signal terminal.

The ECT sensor is used to control the following items:

- Fuel delivery.
- Ignition.
- Evaporative Emission (EVAP) canister purge valve.
- Idle Air Control (IAC) valve.
- Electric cooling fan.

Conditions for Setting the DTC

- Engine run time is greater 120 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Coolant fan turns on.
- The ECM will default to 68˚F (20˚C) for the first 60 seconds of engine run time, and then to 198˚F (92˚C). The scan tool may show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Normal operating temperature for the engine cooling system is between 194˚F (90˚C) and 203˚F (95˚C).

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to”Temperature vs. Resistance” in this section.

Test Description

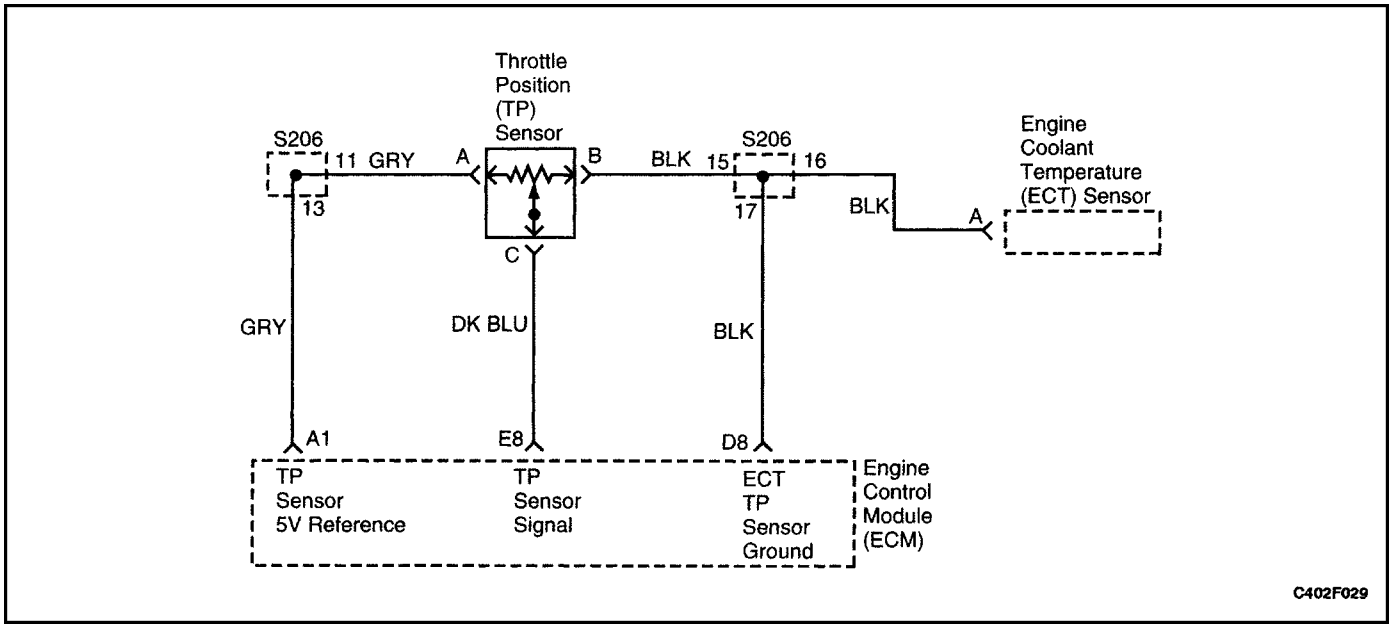
Number(s) below refer to the step number(s) on the Diagnostic Table.

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.
4. This step simulates a DTC P0117 condition. If the ECM senses the change, then the ECM and the ECT wiring are OK.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0118 Engine Coolant Temperature High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool Is the Engine Coolant Temperature (ECT) sensor value less than the specified value?	–22˚F (–30˚C)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF. 2. Review Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the ECT sensor value less than the specified value?	–22˚F (–30˚C)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Disconnect the ECT sensor electrical connector. 2. Jumper the ECT sensor signal circuit at terminal and the ECT sensor ground circuit at terminal A together at the ECT electrical connector. Is the ECT sensor value greater than the specified value?	130˚C (266˚F)	Go to *Step 6*	Go to *Step 5*
5	Jumper the ECT sensor signal circuit at terminal B to chassis ground. Is the ECT sensor value greater than the specified value?	130˚C (266˚F)	Go to *Step 7*	Go to *Step 8*
6	Check for poor connections at the ECT sensor and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 10*
7	Check the ECT sensor ground circuit for an open and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 9*
8	Check the ECT sensor signal circuit for an open and repair as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 9*
9	Check for a poor ECT sensor ground circuit at terminal D8 or a poor ECT sensor signal circuit at terminal E9 connection at the Engine Control Module (ECM) and replace the terminals if necessary. Do any of the terminal(s) need to be replaced?		Go to *Step 12*	Go to *Step 11*
10	Replace the ECT sensor. Is the action complete?		Go to *Step 12*	
11	Replace the ECM. Is the action complete?		Go to *Step 12*	

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0121

THROTTLE POSITION SENSOR RATIONALITY

Circuit Description

The engine control module (ECM) supplies a 5 volt reference signal and a ground to the Throttle Position (TP) sensor. The TP sensor sends a voltage signal back to the ECM relative to the throttle plate opening. The voltage signal will vary from approximately 0.45 volts at closed throttle, to over 4.5 volts at wide open throttle (WOT). The ECM can detect if the TP sensor is out of range while cruising by waiting for a Manifold Air Pressure (MAP) change and then checks if the TP sensor has also changed as expected by calculating what the TP signal should be at a given rpm and engine load. During idle conditions, the ECM verifies that the engine is stable and at idle and ensures that the TP signal is below a given percent. The TP sensor is considered stuck when the MAP is low (< 40 kPa) while the TP sensor position is greater than a certain value which will cause MAP to exceed the low.

Conditions for Setting the DTC

- DTC(s) P0107, P0108, P0117, P0118, P0122, P0123, P0201, P0202, P0203, P0204, P0300, P0351, P0352, P0402, P0404, P0405, P0406, P0443, P0506, P0507, P1404, P1441 and P1627 are not set.
- Engine running.
- Change in MAP is less than 10 kPa for greater than or equal to 2 seconds prior to first enable or less than 8 kPa cycle to cycle.
- IAC is between 30 and 100 counts.
- Coolant temperature is greater than 14˚F (–10˚C).

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared using the scan tool.

Diagnostic Aids

A TP sensor that is stuck will attempt to auto zero itself every time the engine runs. It will not display as high a percentage as it would normally when it has auto zeroed at a higher than normal voltage.

A normal TP sensor that displays 0% will not display higher than 1 volt and is possibly stuck.

If DTC P0121 cannot be duplicated, the information included in the Freeze Frame/Failure Records data can be useful. Use the scan tool DTC information data to determine the status of the DTC.

A DTC P0121 may set while attempting to start a vehicle that has run out of fuel.

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

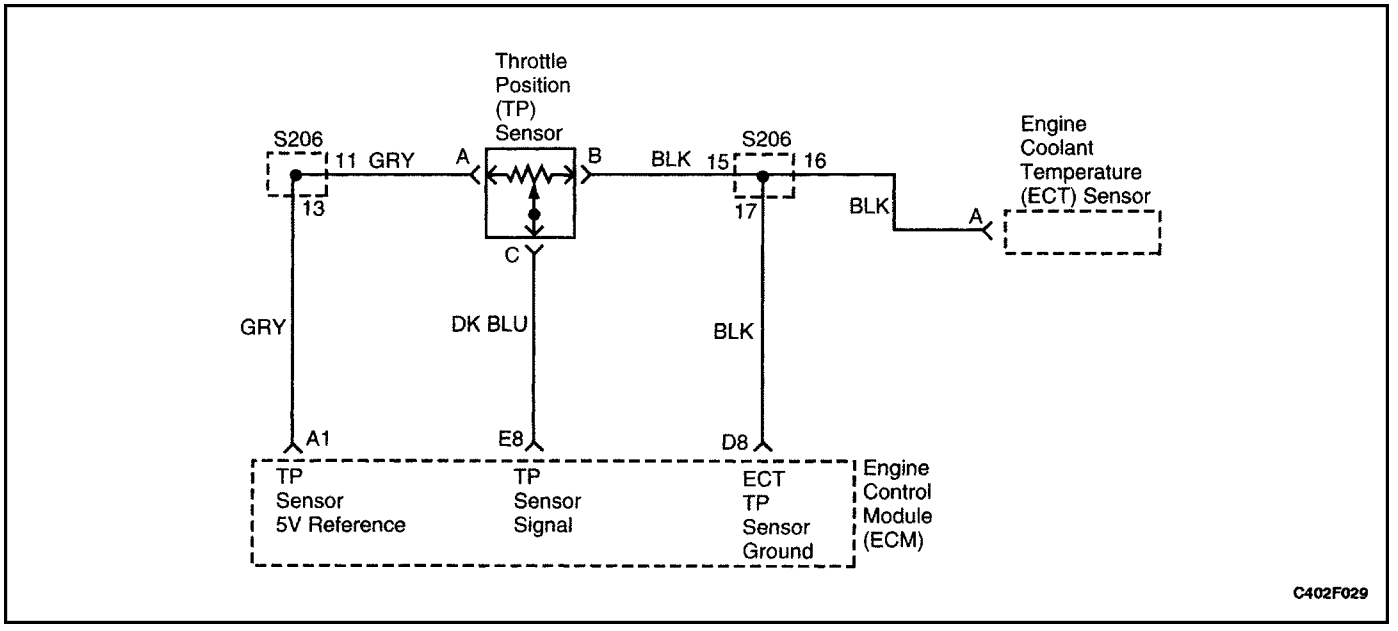
creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

2. The TP sensor has an auto zeroing feature. If the voltage reading is between 0.2 to 0.9 volts, the ECM will assume the TP sensor is at a closed throttle position (0%). If the reading is out of the auto zeroing range at closed throttle, look for a binding or damaged linkage.
3. Normal TP voltage when the throttle plates are fully closed is near 0.5 volts. A sensor will display a higher voltage when the sensor is stuck or a circuit is faulty.
5. A disconnected TP sensor should not display a voltage reading on the scan tool. An amount less than the specified value is normal.
6. When the test light is connected to the ground circuit, the light should glow brightly if the ground circuit is OK but could have a small amount of resistance in the circuit. The voltmeter is used to detect the small amounts of resistance using the voltage drop method. If the test light glows dimly or not at all, then resistance in the circuit is present and using the voltmeter is not necessary.
7. In order for DTC P0121 to set with a short to voltage in the TP signal circuit, the voltage must be minimal enough to not set a DTC P0123 and must be more than 0.5 volts.
13. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
15. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0121 Throttle Position Sensor Rationality

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch ON, with the engine OFF. 2. Install a scan tool. 3. Select the Throttle Position (TP) angle parameter on the scan tool. 4. Monitor the scan tool while pressing the accelerator pedal to the floor and then slowly releasing the pedal. (Repeat the procedure several times.) Does the TP angle value increase steadily when the accelerator pedal is pressed to greater than the specified value and decrease steadily when the pedal is released to less than the specified value?	98% 1%	Go to *Step 3*	Go to *Step 5*
3	Does the scan tool display a TP voltage below the specified value when the throttle is fully closed?	0.80 v	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch ON with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the TP angle vs. rpm value greater than the specified value in the Conditions for Setting The DTC?		Go to *Step 5*	Go to *Step 12*
5	Disconnect the TP sensor electrical connector. Is the TP sensor voltage less than the specified value?	0.5 v	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
6	1. Connect a test light to the ground circuit and B+ at terminal B. 2. Connect a voltmeter to the ground circuit and ground. Does the voltmeter read a voltage greater than the specified value?	0.5 v	Go to *Step 8*	Go to *Step 9*
7	Check the TP sensor signal circuit, terminal C for a short to voltage and repair as necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 13*
8	Check the TP sensor ground circuit, terminal B for a poor connection or resistance at the TP sensor connector and repair as necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 13*
9	With a digital voltmeter (DVM) connected to ground, probe the 5 volt reference circuit at terminal A1. Does the DVM display a voltage near the specified value?	5 v	Go to *Step 13*	Go to *Step 10*
10	Check for a short to voltage in the 5 volt reference circuit, terminal A1 and repair if necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 13*
11	Replace the TP sensor. Is the action complete?		Go to *Step 14*	
12	Check the engine control module (ECM) electrical connectors for a poor connection or resistance and repair as necessary. Is a repair necessary?		Go to *Step 14*	Go to *Step 13*
13	Replace the ECM. Is the action complete?		Go to *Step 14*	
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0122

THROTTLE POSITION SENSOR LOW VOLTAGE

Circuit Description

The engine control module (ECM) supplies a 5 volt reference signal and a ground to the Throttle Position (TP) sensor. The TP sensor sends a voltage signal back to the ECM relative to the throttle plate opening. The voltage signal will vary from approximately 0.1 volts at closed throttle, to over 4.9 volts at wide open throttle (WOT).

Conditions for Setting the DTC

- Ignition ON.
- TP sensor is less than 0.14 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The Coolant fan turns on.
- The TP angle will default to 0% when the vehicle speed is less than 2 mph (3 km/h) and 10% when the vehicle speed is greater than 2 mph (3 km/h). (The scan tool will display the defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared using the scan tool.

Diagnostic Aids

If a DTC P0122 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use the scan tool information data to determine the status of the DTC. If the DTC occurs intermittently, using the Diagnostic table may help isolate the problem.

Test Description

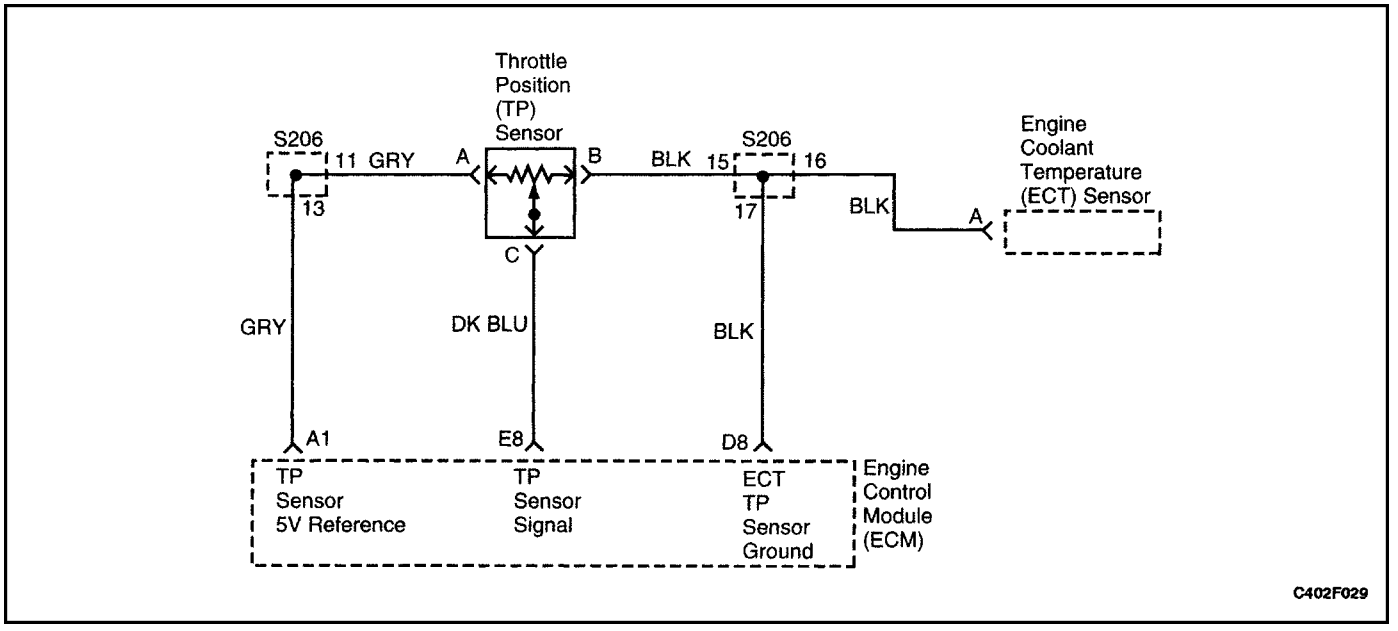
Number(s) below refer to the step number(s) on the Diagnostic Table.

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.
2. The TP sensor has an auto zeroing feature. If the voltage reading is between 0.2 to 0.9 volts, the ECM will assume the TP sensor is at a closed throttle position (0%).
4. Simulates a high voltage signal which will identify an open in the signal circuit.
5. If additional DTCs are set, check the 5 volt reference circuits for a short to ground.
6. If the test light illuminates while probing the TP signal circuit, then the TP signal circuit is shorted to ground.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
11. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0122 Throttle Position Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch ON with the engine OFF. 2. Install a scan tool. Is the Throttle Position (TP) sensor voltage below the specified value?	0.20 v	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the TP sensor voltage below the specified value?	0.20 v	Go to *Step 4*	Go to *Step 12*
4	1. Disconnect the TP sensor electrical connector. 2. Jumper the 5 volt reference circuit, terminal A and the TP sensor signal circuit, terminal C together at the TP sensor electrical connector. Is the TP sensor voltage over the specified value?		Go to *Step 10*	Go to *Step 5*
5	Connect a test light between B+ and the TP sensor signal circuit at terminal C. Is the TP sensor voltage greater than the specified value?	4.0 v	Go to *Step 6*	Go to *Step 8*
6	Check the 5 volt reference circuit for an open or short to ground and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 7*
7	Check the 5 volt reference circuit for a poor connection at the Engine Control Module (ECM), terminal A1 and repair the terminal as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 11*
8	Check the TP sensor signal circuit, terminal E8 for an open or a short to ground and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 9*
9	Check the TP sensor signal circuit, terminal E8 for a poor connection at the ECM and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 11*
10	Replace the TP sensor. Is the repair complete?		Go to *Step 12*	
11	Replace the ECM. Is the repair complete?		Go to *Step 12*	

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?		Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0123
THROTTLE POSITION SENSOR HIGH VOLTAGE

Circuit Description

The engine control module (ECM) supplies a 5 volt reference signal and a ground to the Throttle Position (TP) sensor. The TP sensor sends a voltage signal back to the ECM relative to the throttle plate opening. The voltage signal will vary from approximately 0.1 volts at closed throttle, to over 4.9 volts at wide open throttle (WOT).

Conditions for Setting the DTC

- The ignition is ON.
- TP sensor voltage is greater than 4.9 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The Coolant fan turns on.
- The TP angle will default to 0% when the vehicle speed is less than 3 km/h (2 mph) and 10% when the vehicle speed is greater than 3 km/h (2 mph). (The scan tool will display the defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

If a DTC P0123 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use the scan tool information data to determine the status of the DTC. If the DTC occurs intermittently, using the diagnostic table may help isolate the problem.

With the ignition ON and the throttle at closed position, the voltage should read between 0.20 v and 0.90 v and increase steadily to over 4.5 v at WOT.

DTCs P0123 and P0113 stored at the same time could be the result of an open sensor ground circuit.

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.
2. With the throttle closed, the TP sensor voltage should read less than 0.90 volts. If the TP sensor voltage does not read less than 0.90 volts, check for a binding or sticking throttle cable.
4. With the TP sensor disconnected, the TP sensor voltage should be less than 0.20 volts if the ECM and wiring are OK.
5. Probing the ground circuit with a test light checks the circuit for high resistance which will cause a DTC P0123 to set.
7. A shorted 5 volt reference circuit will also set additional DTCs.

11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0123 Throttle Position Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (OBD II) System Check. Is the system check complete?		Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch ON with the engine OFF. 2. Install a scan tool. Is the Throttle Position (TP) sensor voltage greater than the specified value?	1.0 v	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the TP sensor voltage greater than the specified value?	3.9 v	Go to *Step 4*	Go to *Step 12*
4	Disconnect the TP sensor electrical connector. Is the TP sensor voltage less than the specified value?	0.2 v	Go to *Step 5*	Go to *Step 6*
5	Probe the TP sensor ground circuit, terminal B at the TP sensor harness connector with a test light connected to B+. Does the test light illuminate?		Go to *Step 7*	Go to *Step 9*
6	Check the TP sensor signal circuit, terminal C for a short to voltage and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 11*
7	Check the 5 v reference circuit, terminal A1 for a short to B+ and repair as necessary. Is the repair complete?		Go to *Step 12*	Go to *Step 8*
8	Check the TP sensor electrical connector for a poor connection and repair the terminals as necessary. Is a repair necessary?		Go to *Step 12*	Go to *Step 10*
9	Check the TP sensor ground circuit for an open and repair as necessary?. Is a repair necessary?		Go to *Step 12*	Go to *Step 11*
10	Replace the TP sensor. Is the action complete?		Go to *Step 12*	
11	Replace the engine control module (ECM). Is the action complete?		Go to *Step 12*	

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has ran and passed?		Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to ”Applicable DTC table”	System OK