

DTC P0410

DTC P0410 (ENGINE CONTROLS - 3.5L)

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DTC P0410**Circuit Description**

The control module activates the secondary air injection (AIR) system by grounding both the pump relay and the vacuum control solenoid control circuits. This energizes the pump and the vacuum control solenoid. Vacuum is then applied, opening the shut-off valves. The pump then forces filtered fresh air into the exhaust stream in order to accelerate catalyst operation. The control module will run up to three diagnostic tests using the pre-catalyst HO2S voltage and short term FT to diagnose the system. The system can be diagnosed during normal secondary air injection operation or the control module can activate the system specifically for diagnostic purposes. If the system is operating properly, the heated oxygen sensor (HO2S) voltage will decrease and the short term FT will increase when the system is activated. If a system air flow problem is detected, this diagnostic trouble code (DTC) will set. When inactive, the system prevents air flow in either direction.

Conditions for Running the DTC

- DTCs P0030, P0036, P0101, P0102, P0103, P0112, P0117, P0118, P0121, P0122, P0123, P0125, P0131, P0132, P0133, P0134, P0135, P0137, P0138, P0140, P0141, P0171, P0172, P0300, P0440, P0442, P0446, P0449, P0502, P0503, P1111, P1112, P1114, P1115, P1121, P1122, P1133, P1134, P1380, P1381, or P1441 are not set.
- The startup ECT is below 56°C (132°F).
- The engine operates for more than 1 second.
- The engine coolant temperature is between 5–110°C and (41– 230°F).
- The intake air temperature (IAT) is between 5–70°C and (41–158°F).
- The short term fuel trim is between 0.96–1.04.
- The engine load is greater than 0 percent.
- The mass air flow (MAF) is between 0–25 gm/s.
- The engine speed is more than 1,200 RPM.
- The air/fuel ratio is more than 13.0:1.
- The ignition voltage is more than 9 volts.
- The vehicle speed is more than 46 km/h (25 mph).

Conditions for Setting the DTC

- The pre-catalyst HO2S voltage remains above a predetermined lean value during the test.

AND

- The short term FT does not increase a calibrated amount during the test.
- Both conditions above exist for 3 consecutive tests.

Action Taken When the DTC Sets

- The control module illuminates the malfunction indicator lamp (MIL) on the second consecutive ignition cycle that the diagnostic runs and fails.
- The control module records the operating conditions at the time the diagnostic fails. The first time the diagnostic fails, the control module stores this information in the Failure Records. If the diagnostic reports a failure on the second consecutive ignition cycle, the control module records the operating conditions at the time of the failure. The control module writes the operating conditions to the Freeze Frame and updates the Failure Records.

Conditions for Clearing the MIL/DTC

- The control module turns OFF the malfunction indicator lamp (MIL) after 3 consecutive ignition cycles that the diagnostic runs and does not fail.
- A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- A history DTC clears after 40 consecutive warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- Clear the MIL and the DTC with a scan tool.

Diagnostic Aids

Low system airflow can cause an intermittent condition. Inspect for the following conditions:

- Pinched, kinked, restricted, or leaking pipes, hoses, or fittings
- Restricted pump inlet hose/duct/filter

- Pinched, kinked, restricted, or leaking vacuum lines
- Heat damage

Notice: Refer to [Connector Test Adapter Kit J 35616-A Notice](#) in Cautions and Notices.

Notice: Refer to [Continuous Operation of the Air Pump Notice](#) in Cautions and Notices.

If the DTC cannot be duplicated and is determined to be intermittent, reviewing the Failure Records can be useful in determining when the DTC was last set. Also refer to [Intermittent Conditions](#).

Test Description

The numbers below refer to the step numbers on the diagnostic table.

- Other secondary air injection DTCs should be diagnosed first if set. If the HO2S voltage remains below 50 mV for approximately 5 seconds, the system is operating normally.
- Listen for a running motor. Command both the ON and OFF states. Repeat the commands as necessary.
- Listen for an audible click when the device operates. Command both ON and OFF states. Repeat the commands as necessary.
- This step begins eliminating a airflow problem.
- This step tests for a vacuum leak at the valve.
- This step tests the operation of the valve.
- This step tests the control circuit for operation.
- This step bypasses the relay to test pump operation.
- This step tests the control circuit for operation.
- This step eliminates the relay and the control circuit as a cause for continuous pump operation.
- This step tests the control circuit for operation.
- The pump may have failed from another fault. Refer to step 18, if pump operates without a command.
- If the HO2S voltage remains below 50 mV for approximately 5 seconds, the system is operating normally.

Step	Action	Values	Yes	No
Schematic Reference: Engine Controls Schematics				
1	Did you perform A Diagnostic System Check–Engine Controls?	—	Go to Step 2	Go to Diagnostic System Check - Engine Controls
2	<p>Important: If DTC P0412 or P0418 are also set, refer to the applicable DTC first.</p> <ol style="list-style-type: none"> Start the engine. Allow the engine to reach normal operating temperature in Closed Loop. Use a scan tool in order to command the AIR pump and solenoid ON, while observing the pre-catalyst HO2S voltage parameters. <p>Does the scan tool indicate pre-catalyst HO2S voltages are below the specified value for the duration of system operation?</p>	50 mV	Go to Diagnostic Aids	Go to Step 3
3	<p>Important: If heat damage is indicated, replace the shut off valve on the bank that the damage is present.</p>	—	Go to Step 42	Go to Step 4

	<p>Visually inspect for the following:</p> <ul style="list-style-type: none"> • Pinched, kinked, restricted, or leaking pipes, hoses, or fittings • Restricted pump inlet duct/hose/filter • Pinched, kinked, restricted, or leaking vacuum lines • Heat damage <p>Did you find and correct the condition?</p>			
4	<p>1. Turn ON the ignition. 2. Use a scan tool in order to command the AIR pump and solenoid ON and OFF.</p> <p>Does the pump turn ON and OFF with each command?</p>	—	Go to Step 5	Go to Step 11
5	<p>Use a scan tool in order to command the AIR solenoid ON and OFF.</p> <p>Does the solenoid turn ON and OFF with each command?</p>	—	Go to Step 6	Go to Step 14
6	<p>1. Disconnect the pipe and/or hose from the inlets of the shut off valves. 2. Use a scan tool in order to command the AIR pump and solenoid ON.</p> <p>Is airflow present at both hoses?</p>	—	Go to Step 7	Go to Step 16
7	<p>1. Disconnect the vacuum supply line from the solenoid. 2. Connect a vacuum gauge to the vacuum line. 3. Start the engine and idle.</p> <p>Does the vacuum measure above the specified value?</p>	33 kPa (10 in Hg)	Go to Step 8	Go to Step 33
8	<p>Important: Perform this step at each valve.</p> <p>1. Reconnect the vacuum line to the solenoid. 2. Disconnect the vacuum line from the shut off valve. 3. Connect a vacuum gauge to the vacuum line. 4. Start the engine and idle. 5. Use a scan tool in order to command the AIR solenoid ON.</p> <p>Does the vacuum measure above the specified value at both lines when the solenoid is commanded ON?</p>	33 kPa (10 in Hg)	Go to Step 9	Go to Step 26
9	<p>Important: Perform this step at each valve.</p> <p>1. Remove the shut off valve from the vehicle. 2. Install a hand held vacuum pump to the valve. 3. Apply 33 kPa (10 in Hg) to the valve.</p> <p>Does the valve hold vacuum for 1 minute?</p>	—	Go to Step 10	Go to Step 37
10	<p>Important: Perform this step at each valve.</p> <p>1. Leave vacuum applied to the valve. 2. Attempt to blow through the valve from the inlet side.</p> <p>Can you blow freely through the valve?</p>	—	Go to Step 27	Go to Step 37
11	<p>1. Disconnect the pump relay.</p>	—	Go to Step 12	Go to Step 22

	<p>2. Turn ON the ignition. 3. Probe the feed circuits with a test lamp that is connected to a good ground.</p> <p>Does the test lamp illuminate when probing both circuits?</p>			
12	<p>1. Probe the control circuit of the relay with a test lamp that is connected to B+. 2. Use a scan tool in order to command the AIR pump and solenoid ON and OFF.</p> <p>Does the test lamp turn ON and OFF with each command?</p>	—	Go to Step 13	Go to Step 17
13	<p>1. Install a 30-amp jumper wire between the relay switch feed and the pump feed. 2. Turn ON the ignition.</p> <p>Does the pump operate?</p>	—	Go to Step 28	Go to Step 20
14	<p>1. Disconnect the solenoid. 2. Turn ON the ignition. 3. Probe the solenoid feed with a test lamp that is connected to a good ground.</p> <p>Does the test lamp illuminate?</p>	—	Go to Step 15	Go to Step 23
15	<p>1. Probe the solenoid control circuit with a test lamp that is connected to B+. 2. Use a scan tool in order to command the AIR solenoid ON and OFF.</p> <p>Does the test lamp turn ON and OFF with each command?</p>	—	Go to Step 29	Go to Step 17
16	<p>1. Disconnect the outlet pipe and/or hose from the pump. 2. Use a scan tool in order to command the AIR pump and solenoid ON.</p> <p>Is airflow present at the pump outlet?</p>	—	Go to Step 36	Go to Step 40
17	<p>Does the test lamp remain illuminated with each command?</p>	—	Go to Step 24	Go to Step 25
18	<p>1. Ensure the ignition is ON. 2. Disconnect the relay.</p> <p>Does the pump stop operating?</p>	—	Go to Step 19	Go to Step 32
19	<p>1. Probe the relay control circuit with a test lamp that is connected to B+. 2. Use a scan tool in order to command the AIR pump and solenoid ON and OFF.</p> <p>Does the test lamp turn ON and OFF with each command?</p>	—	Go to Step 38	Go to Step 24
20	<p>1. Ensure the ignition is ON. 2. Leave the jumper wire installed. 3. Disconnect the AIR pump. 4. Connect a test lamp between the feed and ground circuits.</p> <p>Does the test lamp illuminate?</p>	—	Go to Step 30	Go to Step 21

21	<p>1. Ensure the ignition is ON. 2. Leave the jumper wire installed. 3. Connect a test lamp between the feed and a good ground.</p> <p>Does the test lamp illuminate?</p>	—	Go to Step 35	Go to Step 34
22	<p>Test the applicable feed circuit for the following;</p> <ul style="list-style-type: none"> • Open between the fuse and the relay • Short to ground between the fuse and the pump <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 40
23	<p>Test the solenoid feed circuit for an open or short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 39
24	<p>Test the control circuit for a short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 41
25	<p>Test the control circuit for an open or short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 31
26	<p>Inspect the vacuum line for a leak or a restriction.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 39
27	<p>Inspect for a leaking or restricted AIR pipe/hose between the shut off valve and the exhaust.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Restricted Exhaust
28	<p>Test for poor connections at the relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 38
29	<p>Test for poor connections at the solenoid. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 39
30	<p>Test for poor connections at the pump. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	—	Go to Step 42	Go to Step 40
31	<p>Test for poor connections at the control module. Refer to Testing for Intermittent Conditions and Poor Connections and</p>	—	Go to Step 42	Go to Step 41

	Connector Repairs in Wiring Systems. Did you find and correct the condition?			
32	Repair the short to voltage in the pump feed circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	—	Go to Step 42	—
33	Repair the vacuum source. Did you complete the repair?	—	Go to Step 42	—
34	Repair the open feed circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	—	Go to Step 42	—
35	Repair the open ground circuit. Refer to Wiring Repairs in Wiring Systems. Did you complete the repair?	—	Go to Step 42	—
36	Repair the AIR pipe and/or hose for a leak or a restriction between the pump and the shut off valve. Did you complete the repair?	—	Go to Step 2	—
37	Replace the shut off valve. Refer to Secondary Air Injection Shutoff Valve Replacement - Bank 1 or Secondary Air Injection Shutoff Valve Replacement - Bank 2 . Did you complete the replacement?	—	Go to Step 42	—
38	Replace the relay. Did you complete the replacement?	—	Go to Step 42	—
39	Replace the solenoid. Refer to Secondary Air Injection Vacuum Control Solenoid Valve Replacement . Did you complete the replacement?	—	Go to Step 42	—
40	<ol style="list-style-type: none"> 1. Replace the AIR pump. Refer to Secondary Air Injection Pump Replacement. 2. Reconnect all devices and replace all fuses. 3. Turn ON the ignition, with the engine OFF. Does the replacement AIR pump run continuously?	—	Go to Step 18	Go to Step 42
41	Replace the PCM control module. Refer to Powertrain Control Module Replacement . Did you complete the replacement?	—	Go to Step 42	—
42	<ol style="list-style-type: none"> 1. Start the engine. 2. Allow the engine to reach normal operating temperature in Closed Loop. 	50 mV	Go to Step 43	Go to Step 3

	<p>3. Use a scan tool in order to command the AIR pump and solenoid ON, while observing the pre-catalyst HO2S voltage parameters.</p> <p>Does the scan tool indicate pre-catalyst HO2S voltages are below the specified value for the duration of system operation?</p>			
43	<p>With a scan tool, observe the stored information, Capture Info.</p> <p>Does the scan tool display any DTCs that you have not diagnosed?</p>	—	<p>Go to Diagnostic Trouble Code (DTC) List</p>	System OK

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