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**Document ID# 792395  
2002 Chevrolet Corvette**

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# DTC P0410

## Circuit Description

A secondary air injection (AIR) pump is used on this vehicle in order to lower the tail pipe emissions during start-up. The powertrain control module (PCM) supplies a ground to the AIR pump relay, which energizes the AIR pump.

The PCM monitors the heated oxygen sensor (HO2S) voltages in order to diagnose the AIR system.

During the AIR test, the PCM activates the AIR pump during closed loop operation. When the AIR is activated, the PCM monitors the HO2S voltages, and monitors the short-term fuel trim values for both banks of the engine. If the AIR system is operating correctly, the HO2S voltages should be low, and the short-term fuel trim should be high.

If the PCM determines that the HO2S voltages for both banks did not respond with the expected results during the tests, DTC P0410 sets. If only 1 sensor responded, the PCM sets either DTC P1415 or DTC P1416. The active DTC indicates which bank has the inoperative AIR system.

## Conditions for Running the DTC

- DTCs P0101-P0103, P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0125, P0171-P0175, P0200, P0300, P0335, P0336, P0351-P0358, P0440, P0442, P0443, P0446, P0449, P1120, P1220, P1221, P1258, or P1441 are not set.
- The fuel level is more than 12.5 percent but less than 87.5 percent.
- The engine is running for more than 30 seconds.
- The maximum air flow is 22 g/s.
- The air fuel ratio is 13.125:1.
- The engine load is less than 40 percent.
- The ignition voltage is more than 11.7 volts.
- Vehicle speed is more than 15 km/h (25 mph).
- The engine is not operating in any of the following modes:
  - Power enrichment
  - Decel fuel cut-off mode
  - The catalyst over temperature
- The engine is operating in a closed loop for more than 15 seconds.
- The engine speed is more than 850 RPM.
- The engine coolant temperature (ECT) is between than -10°C to +110°C (14°F-230°F).
- The intake air temperature (IAT) is between -10°C to +100°C (14°F-212°F).
- The fuel system is operating in fuel trim cells 1, 2, 4, 5, or 6.

## Conditions for Setting the DTC

If the AIR pump turns ON during a closed loop operation and the HO2S voltage does not fall below 222 mV for 1.3 seconds.

Or

If the AIR pump turns ON during a closed loop operation and the short-term fuel trim does not change more than a predetermined amount.

#### 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

#### **Important**

- Before you service the PCM or the throttle actuator control (TAC), remove any debris from the module connector surfaces, and from the module connector gaskets. Verify that the gaskets are correctly installed. The gaskets prevent debris from contaminating the modules.
- For any test that requires probing the PCM or probing a component harness connector, use the Connector Test Adapter Kit [J 35616-A](#) . Using this kit prevents damage to the component terminals and to the harness. Refer to [Using Connector Test Adapters](#) in Wiring Systems.

AIR Pump Relay Underhood Electrical Center Terminal Identification			
Front of Vehicle			
Left Side of Vehicle	Ignition	B+	Right Side of Vehicle
	Pump Supply	Control	

- For an intermittent condition, refer to [Intermittent Conditions](#) .
- An intermittent may be caused by any of the following conditions:
  - Low system air flow may cause this DTC to set.
  - Excessive exhaust system back pressure
  - Moisture, water or debris ingested into the AIR pump
  - Pinched, kinked, heat damaged, or deteriorated hoses or vacuum lines
  - Restrictions in the pump inlet, duct, or filter
- An AIR pump that has become inoperative and shows signs of exhaust gases in the outlet port would indicate a check valve failure.
- Thoroughly check any circuitry that is suspected of causing the intermittent complaint. Refer to [Testing for Intermittent and Poor Connections](#) .
- If a repair is necessary, refer to [Wiring Repairs](#) or [Connector Repairs](#) .

#### Test Description

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

3. If DTCs P0412 or P0418 are set, diagnose those DTCs first.
4. Inspects for excess resistance in all of the circuits that are associated with the AIR system.
5. This step tests for the battery voltage at the AIR pump relay.
6. This step tests for power to the AIR pump.
7. This step tests the ground circuit for the AIR pump.
12. This step tests for a grounded circuit between the AIR pump and the AIR pump relay.
22. A restriction in a hose or in a pipe, between the shut-off valve and the point where the system branches to each bank, causes the setting of this DTC . Inspect for kinks or for blockages from the AIR pump to the connection point where the AIR system divides.

Step	Action	Yes	No
<i>Schematic Reference:</i> <a href="#">Engine Controls Schematics</a>			
1	Did you perform the Diagnostic System Check-Engine Controls?	Go to <a href="#">Step 2</a>	Go to <a href="#">Diagnostic System Check - Engine Controls</a>
2	Is the AIR pump fuse or the ENG IGN 1 fuse OK?	Go to <a href="#">Step 3</a>	Go to <a href="#">Step 11</a>
<a href="#">3</a>	Is DTC P0412 or P0418 active?	Go to <a href="#">Diagnostic Trouble Code (DTC) List</a>	Go to <a href="#">Step 4</a>
<a href="#">4</a>	1. Turn ON the ignition, with the engine OFF. 2. Command the AIR pump relay on with the scan tool.  Does the AIR pump turn ON?	Go to <a href="#">Step 8</a>	Go to <a href="#">Step 5</a>
<a href="#">5</a>	1. Turn OFF the ignition. 2. Remove the AIR pump relay. 3. Test the B+ supply circuit of the AIR pump relay coil for an open using a test lamp connected to ground. Refer to Diagnostic Aids for terminal identification.  Does the test lamp illuminate?	Go to <a href="#">Step 6</a>	Go to <a href="#">Step 16</a>
<a href="#">6</a>	1. Install the AIR pump relay. 2. Disconnect the AIR pump electrical connector. Refer to <a href="#">Secondary Air Injection (AIR) Pump Replacement</a> . 3. Connect a test lamp to battery ground. 4. Probe terminal A of the AIR pump electrical connector. Refer to <a href="#">Probing Electrical Connectors</a> in Wiring Systems. 5. Turn ON the ignition, with the engine OFF. 6. Command the AIR system ON with a scan tool.		

	Does the test lamp illuminate?	Go to <a href="#">Step 7</a>	Go to <a href="#">Step 17</a>
<a href="#">7</a>	Test the ground circuit of the AIR pump for an open or poor ground connection using a test lamp connected to B+ and probing the B terminal of the AIR pump electrical.  Is the test lamp illuminated?	  Go to <a href="#">Step 27</a>	  Go to <a href="#">Step 18</a>
8	1. Turn OFF the ignition. 2. Disconnect the AIR pump outlet hose from the AIR pump. 3. Turn ON the ignition, with the engine OFF. 4. Command the AIR system ON with a scan tool.  Is air flow present at the AIR pump outlet?	  Go to <a href="#">Step 9</a>	  Go to <a href="#">Step 10</a>
9	1. Turn OFF the ignition. 2. Disconnect the vacuum hose from the AIR shut off valve. 3. Start the engine. 4. Command the AIR solenoid ON with a scan tool.  Is a vacuum present at the AIR shut-off valve?	  Go to <a href="#">Step 14</a>	  Go to <a href="#">Step 19</a>
10	1. Inspect for a restriction or for a blockage in the AIR Pump inlet hoses and in the AIR Pump inlet pipes. 2. If you find a restriction or a blockage in the AIR hoses and in the pipes, repair the restriction as necessary.  Did you find and correct the condition?	  Go to <a href="#">Step 29</a>	  Go to <a href="#">Step 28</a>
11	1. Turn OFF the ignition. 2. Remove the AIR pump relay. 3. Connect a test lamp to B+. 4. Test the B+ supply to the AIR pump and the AIR pump relay coil at the relay connector for a short to ground using a test lamp. Refer to <a href="#">Probing Electrical Connectors</a> . 5. Refer to Diagnostic Aids for connector terminal identification.  Does the test lamp illuminate?	  Go to <a href="#">Step 23</a>	  Go to <a href="#">Step 12</a>
<a href="#">12</a>	1. Disconnect the AIR pump electrical connector. 2. Connect a test lamp to B+. 3. Test the AIR pump connector terminal A with a test lamp for a short to ground.  Does the test lamp illuminate?	  Go to <a href="#">Step 24</a>	  Go to <a href="#">Step 13</a>
13	1. Install the AIR pump electrical connector. 2. Install a new AIR pump fuse. 3. Install the AIR pump relay. 4. Turn ON the ignition, with the engine OFF.		

	5. Command the AIR system ON with a scan tool.		Go to Diagnostic Aids
	Does the AIR pump fuse open?	Go to <a href="#">Step 28</a>	
14	1. Install the following components: <ul style="list-style-type: none"> <li>○ The AIR pump outlet hose to the AIR pump</li> <li>○ The vacuum hose to the AIR shut-off valve</li> </ul> 2. Disconnect the outlet hose of the AIR shut-off valve. 3. Start and idle the engine. 4. Command the AIR system with a scan tool.		
	Is air present at the outlet of the AIR shut-off valve?	Go to <a href="#">Step 22</a>	Go to <a href="#">Step 15</a>
15	Replace the AIR shut-off valve. Refer to <a href="#">Secondary Air Injection (AIR) Shut-Off Valve Replacement</a> .  Did you complete the action?	Go to <a href="#">Step 29</a>	--
16	Repair the open in the B+ supply circuit to the AIR pump relay connector. Refer to <a href="#">Wiring Repairs</a> in Wiring Systems.  Did you complete the action?	Go to <a href="#">Step 29</a>	--
17	Repair the open in the AIR pump load circuit between the AIR pump relay and the AIR pump connector. Refer to <a href="#">Wiring Repairs</a> in Wiring Systems.  Did you find and correct the condition?	Go to <a href="#">Step 29</a>	Go to <a href="#">Step 25</a>
18	Repair the poor ground connection or the open ground circuit of the AIR pump. Refer to <a href="#">Wiring Repairs</a> in Wiring Systems.  Did you complete the repair?	Go to <a href="#">Step 29</a>	--
19	1. Turn OFF the ignition. 2. Disconnect the source vacuum hose from the AIR Solenoid Valve. Refer to <a href="#">Secondary Air Injection (AIR) Vacuum Control Solenoid Valve Replacement</a> . 3. Start and idle the engine.  Is a vacuum present at the AIR solenoid valve?	Go to <a href="#">Step 20</a>	Go to <a href="#">Step 21</a>
20	1. Turn OFF the ignition. 2. Connect the source vacuum hose to the AIR solenoid valve. 3. Disconnect the vacuum hose to the AIR shut-off valve at the AIR solenoid valve. 4. Start and idle the engine. 5. Command the AIR solenoid valve ON with a scan tool.  Is a vacuum present at the AIR Solenoid Valve outlet?	Go to <a href="#">Step 21</a>	Go to <a href="#">Step 26</a>

21	Repair the restriction, the blockage, or the damage to the vacuum hose.  Did you complete the repair?	Go to <a href="#">Step 29</a>	--
<a href="#">22</a>	Repair the conditions in the AIR hose between the AIR shut-off valve and the point where the system branches to both sides of the engine.  Did you complete the repair?	Go to <a href="#">Step 29</a>	--
23	Repair the short to ground in the ignition positive voltage circuit between the fuse and the relay. Refer to <a href="#">Wiring Repairs</a> in Wiring Systems.  Did you complete the repair?	Go to <a href="#">Step 29</a>	--
24	Repair the short to ground in the circuit between the AIR pump relay and the AIR pump. Refer to <a href="#">Wiring Repairs</a> in Wiring Systems.  Did you complete the repair?	Go to <a href="#">Step 29</a>	--
25	Replace the AIR pump relay.  Did you complete the replacement?	Go to <a href="#">Step 29</a>	--
26	Replace the AIR Solenoid Valve. Refer to <a href="#">Secondary Air Injection (AIR) Vacuum Control Solenoid Valve Replacement</a> .  Did you complete the replacement?	Go to <a href="#">Step 29</a>	--
27	1. Inspect for poor connections at the AIR pump electrical connector. Refer to <a href="#">Testing for Intermittent and Poor Connections</a> in Wiring Systems. 2. If you find a poor connection, repair the terminal as necessary. Refer to <a href="#">Repairing Connector Terminals</a> in Wiring Systems.  Did you find and correct the condition?	Go to <a href="#">Step 29</a>	Go to <a href="#">Step 28</a>
28	Replace the AIR pump. Refer to <a href="#">Secondary Air Injection (AIR) Pump Replacement</a> .  Did you complete the replacement?	Go to <a href="#">Step 29</a>	--
29	1. Clear the DTCs with a scan tool. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.  Does the DTC run, and pass?	Go to <a href="#">Step 30</a>	Go to <a href="#">Step 2</a>
	Use a scan tool in order to observe the stored information in Capture Info.		

30	Does the scan tool display any DTCs that you have not diagnosed?	Go to <a href="#">Diagnostic Trouble Code (DTC) List</a>	System OK
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