

DTC P0411**Diagnostic Instructions**

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor**DTC P0411**

Secondary Air Injection System Incorrect Air Flow Detected

Circuit/System Description

The secondary air injection system aids in the reduction of hydrocarbon emissions during a cold start. The electric air pump forces fresh air into the exhaust stream in order to accelerate the catalyst operation. A pressure sensor for secondary air injection is used to monitor air flow from the secondary air injection pump. The ECM sends a voltage to the 5 V reference circuit and earth to the low reference circuit. The sensor provides a signal voltage to the ECM relative to the pressure changes within the secondary air injection system.

Ignition voltage is supplied directly to the secondary air injection pump relay. The ECM controls the relay by grounding the control circuit, which activates the secondary air injection pump relay. With the relay contacts closed, battery voltage is supplied to the secondary air injection pump.

Conditions for Running the DTC

- DTC P0100, P0101, P0102, P0103, P0111, P0112, P0113, P0114, P0116, P0117, P0118, P0119, P0418, P050C, P2227, P2228, P2229, P2257, or P2258 is not set.
- Greater than 60 min has elapsed since the last cold start.
- The secondary air injection system has been commanded ON and OFF during the ignition cycle.
- The battery voltage is between 10-18 V.
- The engine speed is between 680-3,500 RPM.
- The Intake Air Temperature (IAT) is between -12 to +80°C (10.4-176°F).
- The Engine Coolant Temperature (ECT) is between -10.5 to +69.8°C (13-158°F).
- The Mass Air Flow (MAF) is less than 100 g/s.

- Catalyst heating is active.
- The Barometric Pressure (BARO) is less than 68 kPa (9.9 psi).
- The difference between intake air temp and engine coolant start temp is less than 15°C (27°F).
- DTC P0411 runs once per ignition cycle when the above conditions are met.

Conditions for Setting the DTC

- The ratio of the calculated secondary air mass flow to the modeled secondary air mass flow is less than 0.75 or greater than 1.2.
- DTC P0411 sets within 60 s when the above condition is met.

Action Taken When the DTC Sets

DTC P0411 is a Type B DTC.

Conditions for Clearing the DTC

DTC P0411 is a Type B DTC.

Reference Information

Schematic Reference

[Engine Controls Schematics](#)

Connector End View Reference

[Component Connector End Views](#)

Description and Operation

[Secondary Air Injection System Description](#)

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#) for scan tool information

Circuit/System Verification

Note

Do not run secondary air injection pump for more than 1-2 minutes at a time. Running for an extended period of time without allowing pump to cool may cause damage to the pump.

1. Ignition ON, observe the DTC information with a scan tool. Verify that DTC P2431, P2432, or P2433 is not set.
2. If a DTC is set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for further diagnosis.
3. Observe the scan tool Secondary Air Injection Pressure Sensor voltage parameter. The reading should be between 1.0-4.0 V.
4. Compare the scan tool BARO pressure parameter to the [Altitude Versus Barometric Pressure](#) table. The BARO should be within the specified range displayed in the table for the specific altitude.
5. If not within the specified range, refer to [DTC P2227, P2228, or P2229 \(LAU\)](#) for further diagnosis.
6. Ignition ON, command the Secondary Air Injection Pump Relay ON and OFF with a scan tool. The secondary air injection pump should turn ON and OFF.
7. Engine running, command the Secondary Air Injection Pump Relay ON with a scan tool while observing the Secondary Air Injection Pressure Sensor parameter. The reading should change greater than 10 kPa (1.45 psi).
8. Operate the vehicle within the conditions for running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

Circuit/System Testing

1. Inspect the secondary air injection system for the following conditions:
 - Hoses/pipes for a restriction or blockage
 - Hoses/pipes for being disconnected
 - Plugged secondary air injection pressure sensor port

- Damaged secondary air injection check valve
2. If a condition is found, repair as necessary.
 3. If a condition is not located and the secondary air injection pump operates with no pressure change, replace the G21 secondary air injection pump.
 4. Ignition OFF, remove the KR25 secondary air injection pump relay.
 5. Ignition ON, verify that a test lamp does not illuminate between the controlled output circuit terminal 30 and ground.
 6. If the test lamp illuminates, test the controlled output circuit for a short to voltage.
 7. Verify that a test lamp illuminates between the secondary air injection pump relay switch B+ circuit terminal 87 and ground.
 8. If the test lamp does not illuminate, test the ignition circuit for a short to ground or an open/high resistance. If the circuit tests normal and the relay coil ignition circuit fuse is open, test all components connected to the ignition circuit and replace as necessary.
 9. Connect a 20 A fused jumper wire between the secondary air injection pump relay switch B+ circuit terminal 87 and the controlled output circuit terminal 30. The G21 secondary air injection pump should turn ON.
 10. If the secondary air injection pump does not activate, test the controlled output circuit and the secondary air injection pump ground circuit for an open/high resistance. If the circuits test normal, test or replace the G21 secondary air injection pump.
 11. If all circuits test normal, replace the KR25 secondary air injection pump relay.

Component Testing

1. Ignition OFF, disconnect the KR25 secondary air injection pump relay.
2. Test for 70-110 Ω between terminals 85 and 86.
3. If the resistance is not within the specified range, replace the KR25 secondary air injection pump relay.
4. Test for infinite resistance between the following terminals:
 - 86 and 87
 - 86 and 30
 - 85 and 87

- 87 and 30
5. If not the specified value, replace the KR25 secondary air injection pump relay.
 6. Install a 20 A fused jumper wire between relay terminal 86 and 12 V. Install a jumper wire between relay terminal 85 and ground. Test for less than 2 Ω between terminals 87 and 30.
 7. If greater than the specified range, replace the KR25 secondary air injection pump relay.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- [Relay Replacement \(Attached to Wire Harness\)](#)
- [Secondary Air Injection Pump Replacement](#)