P0413: SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE A CIRCUIT OPEN

OVERVIEW

Severity	:	Medium
DIY Difficulty Level	:	Intermediate
Repair Cost	:	**$300-$500**
Can I Still Drive?	:	**Yes**

What Does The P0413 Code Mean?

When I have been faced with diagnosing a code P0413, it has meant that the powertrain control module (PCM) has detected a malfunction in a secondary air injection (SAI) system switching valve circuit. This particular switching valve has been given the designation A. The A refers to a particular switching valve in a system that uses multiple switching valves, or the only valve if there is just one switching valve.

In diagnostic terms, the word open could be substituted for disconnected, broken, or cut. Consult a reliable vehicle information source to determine the configuration of the SAI switching valve circuits for the vehicle in question and the exact location of switching valve A. As a method of reducing harmful exhaust emissions, the SAI system pumps ambient air into the engine exhaust system. Most automotive SAI systems use a belt driven pump to draw-in ambient air, compress it slightly, and inject the pressurized air into the engine exhaust manifolds.

One-way valves, switching valves, anti-backfire valves, and bypass valves, controlled by the PCM, are utilized to regulate and distribute air pressure as well as to protect the SAI pump. The PCM receives voltage input signals from strategically placed pressure sensors to monitor fluctuations in SAI system pressure. When the required parameters are reached, the PCM electronically opens the necessary valves and allows secondary air to be pumped into the exhaust system.

Some vehicles are equipped with SAI systems designed with an electronic pump. In this type of

system, the PCM monitors pressure sensors and activates the pump when required.

If the PCM detects a voltage input signal from the SAI switching valve (designated as A) that is too low or non-existent, a code P0413 will be stored and a malfunction indicator lamp may be illuminated.

Other secondary air injection system trouble codes include P0410, P0411, P0412, P0414, P0415, P0416, P0417, P0418, P0419, P041F, P044F, P0491, and P0492.

What Are The Symptoms Of The P0413 Code?

Symptoms of this code may include:

- There are likely to be no symptoms associated with this code
- A hissing or chugging noise from the SAI pipes or pump is possible
- Loud whining from SAI pump

What Are The Potential Causes Of The P0413 Code?

Potential causes for this code to set are:

- Burnt or broken wiring and/or connectors in the SAI system
- Frozen SAI pump (in geographic areas of extreme cold climate)
- Defective SAI pump
- Faulty SAI pump relay
- Bad SAI pressure sensor

How Can You Fix The P0413 Code?

A diagnostic scanner, a digital volt/ohmmeter (DVOM), and a reliable vehicle information source will be required to diagnose a code P0413.

Step 1

I would begin my diagnosis by inspecting system wiring and connectors and the serpentine belt which drives the pump (if applicable). Repair or replace open circuits as required and retest the system. If the pump is belt driven, and the belt is missing or otherwise defective, replace it before proceeding. Make sure that the pump will spin freely by hand before replacing the belt. Pump failure is relatively common in high mileage vehicles. If the SAI pump is driven by an electric motor, I like to check system fuses and relays at this time too.

Step 2

If a visual inspection leads to no obvious malfunctions, connect the scanner to the vehicle

diagnostic port and retrieve all stored codes and freeze frame data. This information may come in handy in my diagnosis, so I like to write it down. Now, clear the codes and test drive the vehicle to see if the P0413 is reset.

Step 3

Consult your vehicle information source to search technical service bulletins (TSB) for entries that match the code/s and symptom/s exhibited by the vehicle in question. Since TSBs are comprised using data from hundreds-of-thousands of repairs, the information contained therein can be very helpful in reaching a successful diagnosis.

In extreme cold weather conditions, belt driven SAI pumps are prone to lockup due to frozen condensation. Typically, a one-way check valve is integrated into the air inlet hose to prevent condensation from reaching the SAI pump. The one-way check valves fail regularly and permit condensation from the exhaust to enter the SAI pump. Once the condensation freezes, the ice either seizes the SAI pump (belt driven) or causes it to bind and blow a fuse (electric pump).

Step 4

Use the scanner to actuate the electric SAI pump. Once the pump has been activated, use the DVOM to test voltage and ground at the SAI pump. If no voltage is detected, suspect a blown fuse or a bad power supply relay. If all fuses and relays are good, use the DVOM to check for an open circuit between the power supply source and the pump. Disconnect all related controllers before using the DVOM to check circuit resistance. If there is no ground detected, use your vehicle information source to locate the appropriate ground source and test voltage drop in the circuit.

Step 5

Test the SAI pressure sensor using the DVOM and specifications located in the vehicle information source that you have chosen.

Additional diagnostic notes:

- Blown fuses are usually a reaction to a shorted circuit and not the source of the malfunction
- Frozen pumps may be allowed to thaw before use to avoid catastrophic pump damage

Severity Description

The SAI system is related only to exhaust emission reduction and is not vital to engine operation. A stored code P0413 should not be considered severe.

Reference Sources

P0413 Secondary Air Injection System A Open, OBD-Codes.