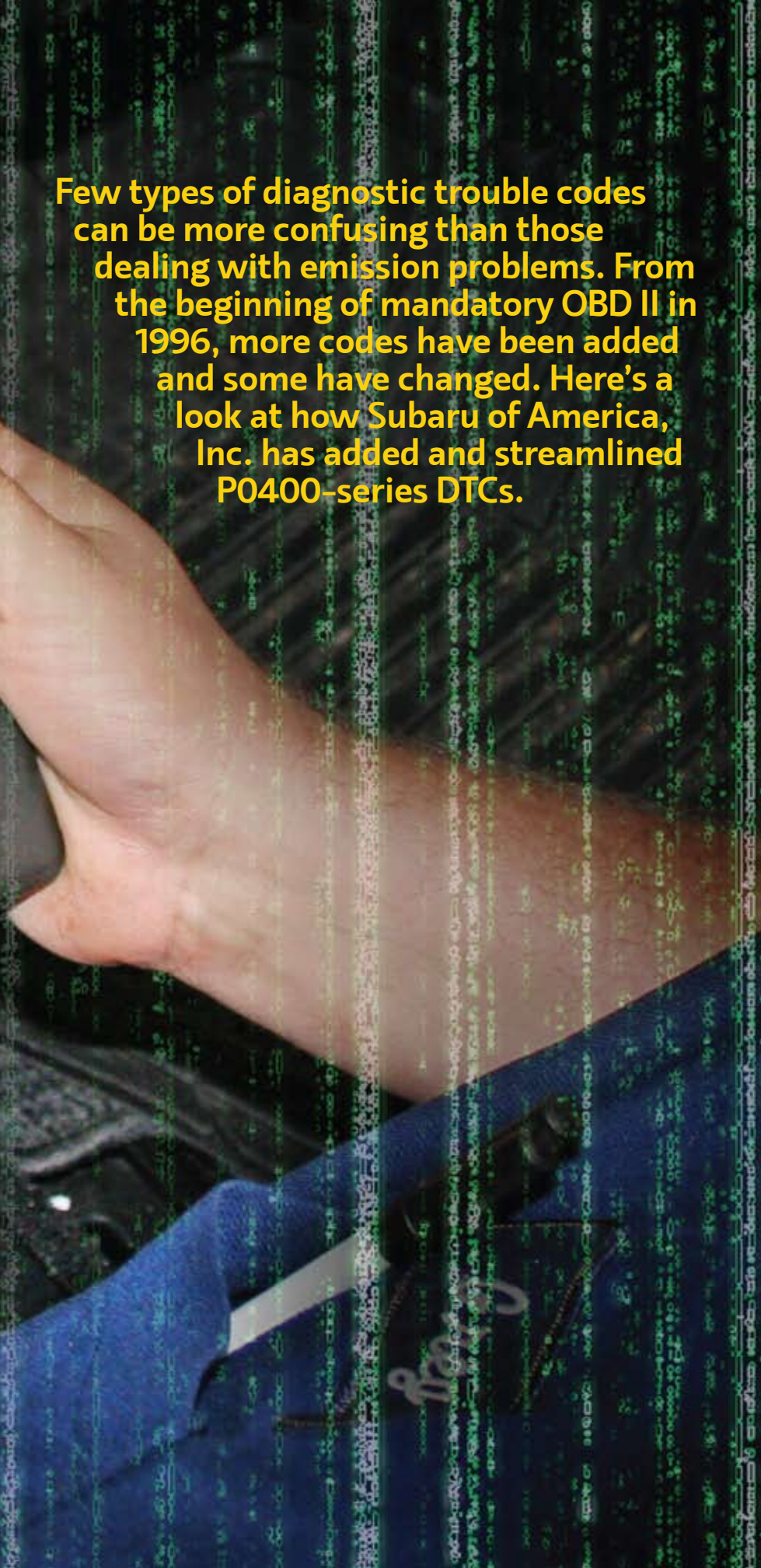


P0400 Codes Revealed





Few types of diagnostic trouble codes can be more confusing than those dealing with emission problems. From the beginning of mandatory OBD II in 1996, more codes have been added and some have changed. Here's a look at how Subaru of America, Inc. has added and streamlined P0400-series DTCs.

Emissions-related OBD II diagnostic trouble codes (DTCs) have evolved over the last dozen years to more precisely pinpoint the problems in automotive systems. The handful of emissions codes used for On-Board Diagnostic (OBD) systems on the late 1980s and early 1990s has grown to nearly a hundred today. Over that time, many DTCs have been modified to more accurately reflect the cause, while others have been added to the list to address issues with advancing technology.

In order to understand how these factors affect Subaru vehicles, it's necessary to first look at the history of emissions control, on-board diagnostics and the DTC coding system.

How We Got Here

The history of automotive emissions monitoring and control began over forty years ago. The skies over major urban areas were becoming polluted with an unhealthy combination of industrial and automotive exhaust gases, which formed a smoky fog, dubbed "smog." The State of California took steps to reduce these pollutants by forming commissions and administrations to regulate the sources of these pollutants. In 1966, California required basic emission control devices on all passenger cars and light trucks sold within the state. The Federal government followed a couple of years later, but enforcement was difficult to maintain.

The U. S. Congress passed the Clean Air Act in 1970 and created the

Environmental Protection Agency to regulate and police the problem of air pollution (among other things), but the huge bureaucracy needed to research, form standards, regulate and inspect was still not in place.

In the early 1980s, a few on-board computer modules began to appear on passenger vehicles as a way to control fuel injection and emission controls. These systems were implemented mainly for inspection and testing at the end of assembly lines to make sure vehicles left the factory in compliance with California and EPA regulations.

The California Air Resources Board (CARB) mandated that all

new vehicles sold in the state in 1988 be equipped with basic on-board diagnostic (OBD) emissions controls. Automakers complied, but each used its own proprietary designs of control modules, data link connectors, sensors, software and actuation devices. Vehicles could only be serviced with that company's tools and service information, causing much confusion and restricting service by the independent aftermarket.

To begin the road toward uniformity, the Society of Automotive Engineers (SAE) called for standardization, beginning with the data link connector (DLC) and

diagnostic test signals. For the next few years, progress was slowly but steadily made toward standardizing the emissions-related portions of OBD, while leaving the rest of the diagnostics to proprietary discretion of the manufacturer.

In 1994, CARB issued a complete set of required diagnostic parameters for vehicles sold in California for the 1996 model year. These new "OBD II" standards, including the standardized DLC and Diagnostic Trouble Codes (DTCs), were adopted by the U.S. government for vehicles sold in all states for 1996.

Automobile manufacturers were allowed to establish or keep their

own proprietary codes, but were mandated to also align those dealing with emissions as OBD II DTCs.

It is at that point that we begin our look at how Subaru vehicles use OBD II codes and how the systems have developed up to 2008.

NOTE: This article will deal only with OBD II diagnostics which were mandated in all vehicles starting with 1996 models. For On-Board Diagnostics (OBD) trouble codes and diagnostic procedures on most 1995 and prior Subaru vehicles, refer to the Subaru Technical Information Systems website at <http://techinfo.subaru.com> and search under the appropriate vehicle and model year.

Decoding the Codes

One of the main reasons that emissions codes have been confusing is because, as emission systems evolved over the last dozen years, more codes have been added to cover newer and more complex devices.

OBD II diagnostic trouble codes (DTCs) are identified by a standardized system. Each letter or digit in the 5-place system represents a factor that tells a portion of the total story.

Let's look at an example.

The DTC P0442 can be decoded using the following system:

- The first place "P" in the P0442 code tells in which subsystem the fault is occurring:
 - P = Powertrain
 - B = Body
 - C = Chassis
 - U = Network Communication

Now, we know that the problem is in the powertrain.

- The second place "0" in the P0442 code tells whether the DTC is a generic OBD II fault as standardized by the Society of Automotive Engineers (SAE) or one developed by the vehicle manufacturer:

0 = SAE

1 = Manufacturer

OK, it's a standard OBD II DTC.

- The third place "4" in the P0442 code indicates the affected subsystem:

1 = Air/Fuel Control

2 = Fuel System (Injectors)

3 = Ignition System/Misfire

4 = Auxiliary Emission Controls (EGR/AIR/CAT/EVAP)

5 = Vehicle Speed/Idle Control and Auxiliary Inputs

6 = Computer System (PCM or Communications)

7 = Transaxle/Transmission

8 = Transaxle/Transmission

The problem lies in the emission control systems, but further information will be required to pinpoint the problem.

- The fourth and fifth places "42" in the P0442 code will give the specific location of the faulty circuit or component. These digits vary by subsystem, but referring to DTC charts or reading with a quality scan tool will identify the exact problem.

In this case, the "42" indicates: Evaporative Emission Control System Malfunction (Small Leak - 1 mm/ 0.04 in).

In many 2001 and prior models, a P0442 DTC may be caused by a loose gas cap. In 2002, the DTC P0457 was added to differentiate between an EVAP system leak and a loose gas cap.

Subaru OBD II Diagnostic Trouble Codes.

Here is a chronological list of OBD II DTCs used in Subaru vehicles:

1995 Impreza, Legacy, Outback, Outback Sport

P0400

Exhaust Gas Recirculation Flow Malfunction

P0403

Exhaust Gas Recirculation Malfunction

P0420

Catalyst System Efficiency Below Threshold

P0441

Evaporative Emission Control System Incorrect Purge Flow

P0443

Evaporative Emission Control System Incorrect Purge Control Valve Circuit Malfunction

1996 (Full OBD II)

P0410

Secondary Air Injection System Malfunction

P0412

Secondary Air Injection System Switching Valve "A" Circuit Malfunction

P0440

Evaporative Emission Control
System Malfunction

P0446

Evaporative Emission Control System Vent Control Malfunction

P0450

Evaporative Emission Control System Pressure Sensor Malfunction

P0451

Evaporative Emission Control System Pressure
Sensor Range/Performance Problem

P0461

Fuel Level Sensor Circuit Range/Performance Problem

1997

P0452

Evaporative Emission Control System Pressure Sensor Low Input

P0453

Evaporative Emission Control System Pressure
Sensor High Input

P0462

Fuel Level Sensor Circuit Low Input

P0463

Fuel Level Sensor Circuit High Input

1998

P0480

Cooling Fan Relay 1 Circuit Low Input

P0483

Cooling Fan Function Problem

2001

The 2001 model year saw the addition of more DTCs and clarification of some existing DTCs to further focus on the problems of leaks and incomplete purging.

P0442

Evaporative Emission Control System
Malfunction (Small Leak - 1 mm/0.04 in.)

P0444

Evaporative Emission Control System
Purge Control Valve Circuit Low Input

P0445

Evaporative Emission Control System
Purge Control Valve Circuit High Input

P0447

Evaporative Emission Control System
Vent Control Low Input

P0448

Evaporative Emission Control System
Vent Control High Input

P0456

Evaporative Emission Control System
Malfunction (Very Small Leak
- .05 mm/.02 in.)

P0464

Fuel Level Sensor Intermittent Input

2002

P0457

Evaporative Emission Control System
Malfunction (Fuel Cap Loose/Off)

P0458

Evaporative Emission Control System
Purge Control Valve Circuit Low Input

P0459

Evaporative Emission Control System
Purge Control Valve Circuit High Input

2005

P0400

Exhaust Gas Recirculation Flow

P0420

Catalyst System Efficiency Below
Threshold (Bank 1)

P0442

Evaporative Emission Control System
Leak Detected (Small Leak)

P0447

Evaporative Emission Control System
Vent Control Circuit Open

P0448

Evaporative Emission Control System
Vent Control Circuit Shorted

P0451

Evaporative Emission Control System
Pressure Sensor Range/Performance

P0452

Evaporative Emission Control System
Pressure Sensor Low Input

P0453

Evaporative Emission Control System
Pressure Sensor High Input

P0456

Evaporative Emission Control System
Leak Detected (Very Small Leak)

P0457

Evaporative Emission Control System
Leak Detected (Fuel Cap Loose/Off)

P0458

Evaporative Emission Control System
Purge Control Valve Circuit Low

P0459

Evaporative Emission Control System
Purge Control Valve Circuit High

P0461

Fuel Level Sensor Circuit Range/
Performance

P0462

Fuel Level Sensor Circuit Low Input

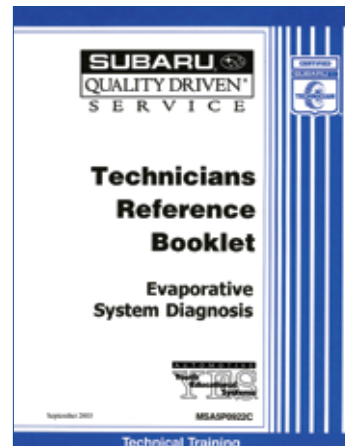
P0463

Fuel Level Sensor Circuit High Input

✓ On Board Diagnostics
- II (OBD II) Technicians
Reference Booklet.



✓ Evaporative Systems
Diagnosis Technicians
Reference Booklet.



P0464

Fuel Level Sensor Circuit Intermittent

P0483

Cooling Fan Rationality Check

2006

P0410

Secondary Air Injection System

P0411

Secondary Air Injection System Incorrect Flow Detected

P0413

Secondary Air Injection System Switching Valve “A” Circuit Open

P0414

Secondary Air Injection System Switching Valve “A” Circuit Shorted

P0416

Secondary Air Injection System Switching Valve “B” Circuit Open

P0417

Secondary Air Injection System Switching Valve “B” Circuit Shorted

P0418

Secondary Air Injection System Control “A” Circuit Open

You can learn more about Subaru emissions-related diagnostic trouble codes and how to service them by logging onto the Subaru Technical Information Systems website at <http://techinfo.subaru.com> and purchasing or downloading the following Technicians Reference Booklets:

On Board Diagnostics – II (OBD II) Technicians Reference Booklet, Module 407; P/N MSA5P0162C

Evaporative Systems Diagnosis Technicians Reference Booklet; P/N MSA5P0922C.

Always refer to the Subaru Technical Information Systems website at <http://techinfo.subaru.com> for the correct information for the Subaru vehicle you are servicing. <