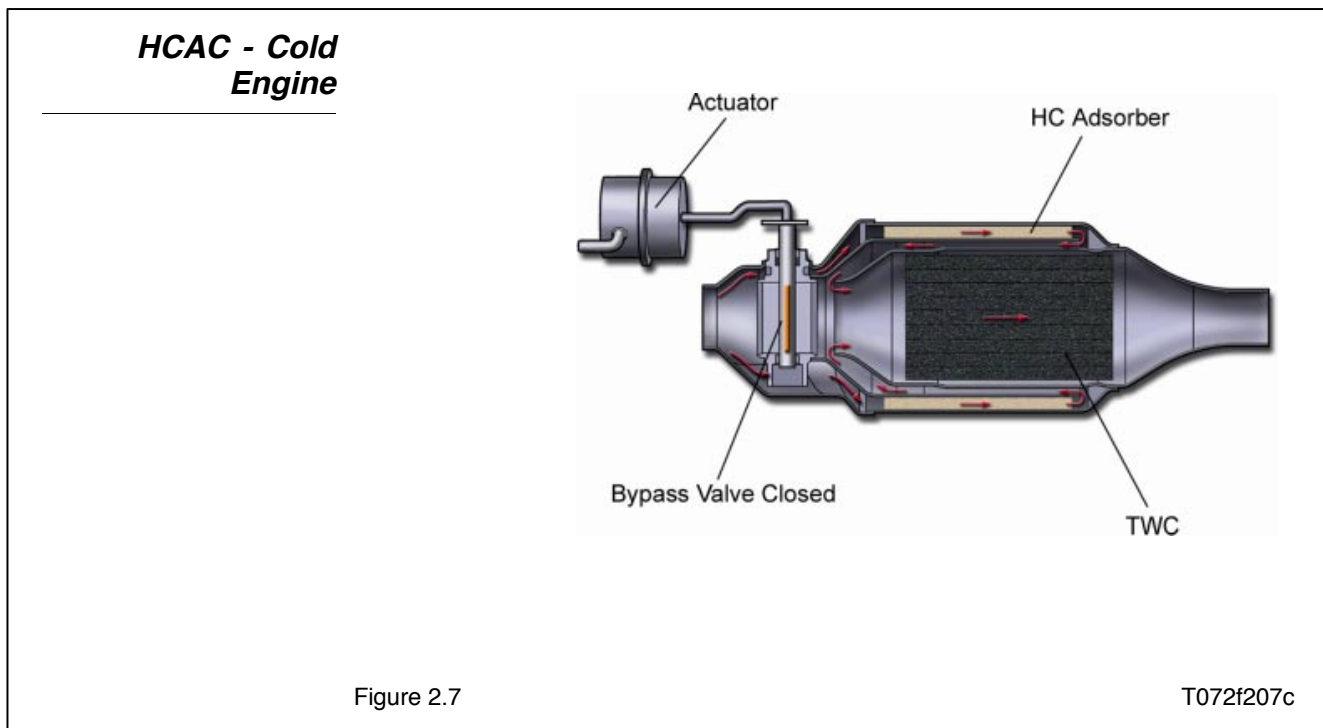


In the front three-way catalytic converter (TWC) the ceramic matrix wall thickness has been reduced and the passage density increased. This decreases thermal mass and speeds the heating of the catalyst.

Operation Before the engine is started, the bypass valve is open. When the engine is started the ECM outputs a signal to the HCAC VSV. Vacuum is applied to the HCAC actuator, closing the bypass valve. Immediately after the engine has started the exhaust gases pass through the HC adsorber where HC is stored until the temperature of the HC adsorber rises. This prevents HC from being emitted when catalyst temperatures are low.

After the TWC has warmed up, the VSV closes and the bypass valve opens. Stored HC is now purged and flows through the TWC where it is oxidized.

During deceleration, the VSV is turned on, closing the bypass valve. This scavenges HC that remains in the HC adsorber.



HCAC - Purge

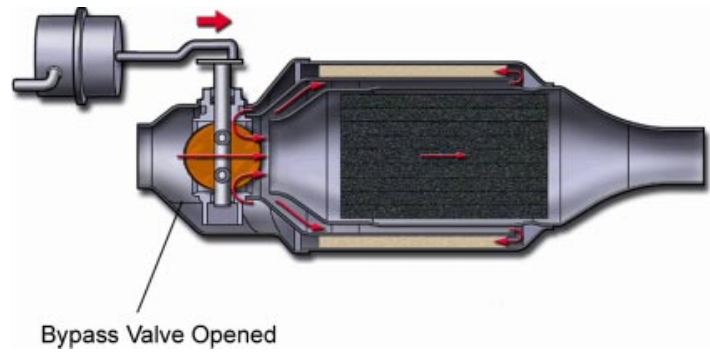


Figure 2.8

T072f208c

**HCAC - Scavenge
During
Deceleration**

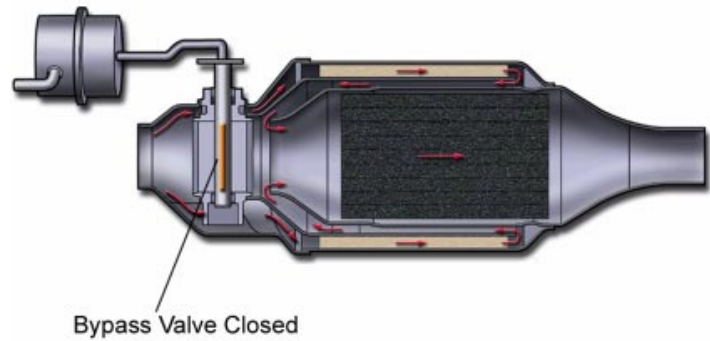


Figure 2.9

T072f209c

**DTC P1436
Bypass Valve
Malfunction**

The system monitors bypass valve operation. DTC P1436 will set if the bypass valve does not perform normally under the following conditions. During a cold start (with coolant and air temperatures starting at -10°C (14°F) to 40°C (104°F) and after coolant temperature has reached at least 45°C (113°F) and the engine load factor exceeds 30%.

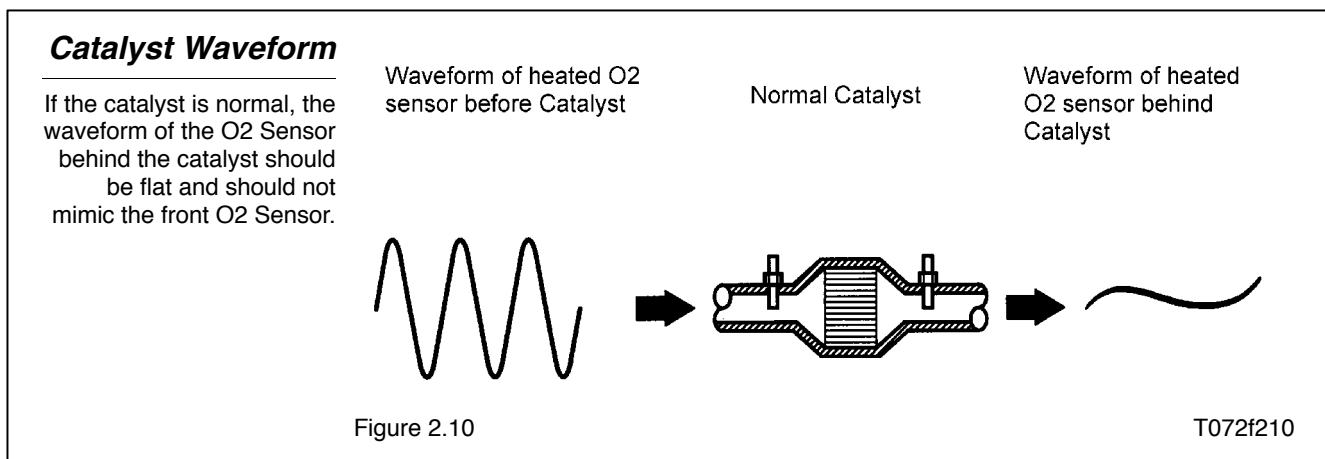
Repair Process Certain 2001 and 2002 model year Prius vehicles that are operated in areas where road salt is used may set DTC P1436. Check the HCAC bypass valve for smooth operation. The front exhaust pipe assembly may have to be replaced if any shaft binding is evident.

DTC P0420 Catalyst System Efficiency The ECM compares the waveform of the O2 Sensor located before the catalyst (Bank 1, Sensor 1) with the waveform of the O2 Sensor located behind the catalyst (Bank 1, Sensor 2) to determine whether or not catalyst performance has deteriorated.

Below Threshold A/F ratio feedback compensation keeps the waveform of the O2 Sensor before the catalyst repeatedly changing back and forth from rich to lean.

If the catalyst is functioning normally, the waveform of the O2 Sensor behind the catalyst should be flat and should not mimic the front O2 Sensor. When both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.

Ask the customer if they have driven through deep water. If the catalyst is submerged, cooling will affect efficiency.



OX Signal Waveform Drive the vehicle at >55 mph for >5 minutes. Confirm that the waveform of O2 Sensor, Bank 1 Sensor 1 (OX1) oscillates around 0.5V during feedback to the ECM and that the waveform of O2 Sensor, Bank 1 Sensor 2 (OX2) is relatively constant at 0.6V to 0.7V.

HINT

There are some cases where even though a malfunction exists the MIL may not illuminate. Normal waveform of OX2 is a smooth line of 0.6V or 0.7V.

Check for an open or short in the harness and connector between both heated O2 Sensors and the ECM. If the problem still occurs replace the three-way catalytic converter.

OX Signal Waveform

If there is a malfunction in the system, the waveform of the O2 Sensor, Bank 1 Sensor 2 (OX2) will look similar to the waveform shown here.

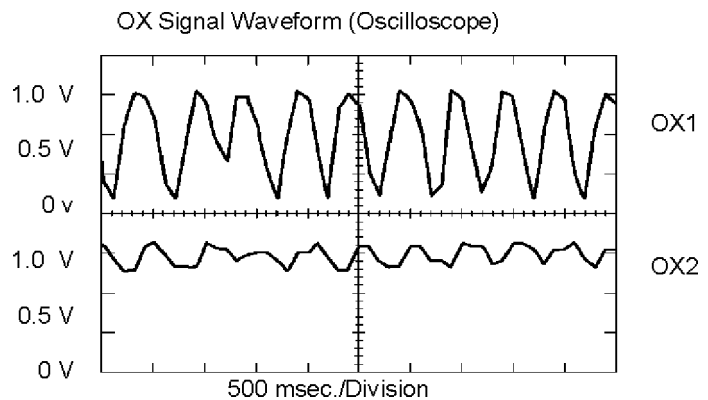


Figure 2.11

T072f211

Normal Engine Operating Conditions

When using the Diagnostic Tester to determine engine control status, refer to the Normal Engine Operation Conditions chart for quick and easy diagnosis. This chart is located in the Appendix of this book.

The values given for “Normal Conditions” are representative values. A vehicle’s engine may still be normal even if its values vary from those listed.

OBDDiagnostic Trouble Codes

The diagnostic system in the Prius performs a variety of functions. The first function is the Diagnostic Trouble Code Check. This test detects malfunctions in the signal circuits connected to the ECU. These malfunctions are stored in ECU memory at the time of the occurrence and are output by the technician during troubleshooting.

Another function is the Input Signal Check which checks to see if signals from various switches are correctly sent to the ECU. By using these check functions the problem areas can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in the Prius.