Last Modified: 6-2-2008	5.1 C	**From:** 200601
Model Year: 2007	**Model:** Camry	**Doc ID:** RM000000WBY011X
Title: 2GR-FE ENGINE CONTROL SYSTEM: SFI SYSTEM: P0136: Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) (2007 Camry)		

DTC	**P0136**	**Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)**

DTC	**P0137**	**Oxygen Sensor Circuit Low Voltage (Bank 1 Sensor 2)**

DTC	**P0138**	**Oxygen Sensor Circuit High Voltage (Bank 1 Sensor 2)**

DTC	**P0156**	**Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 2)**

DTC	**P0157**	**Oxygen Sensor Circuit Low Voltage (Bank 2 Sensor 2)**

DTC	**P0158**	**Oxygen Sensor Circuit High Voltage (Bank 2 Sensor 2)**

CAUTION / NOTICE / HINT

DESCRIPTION

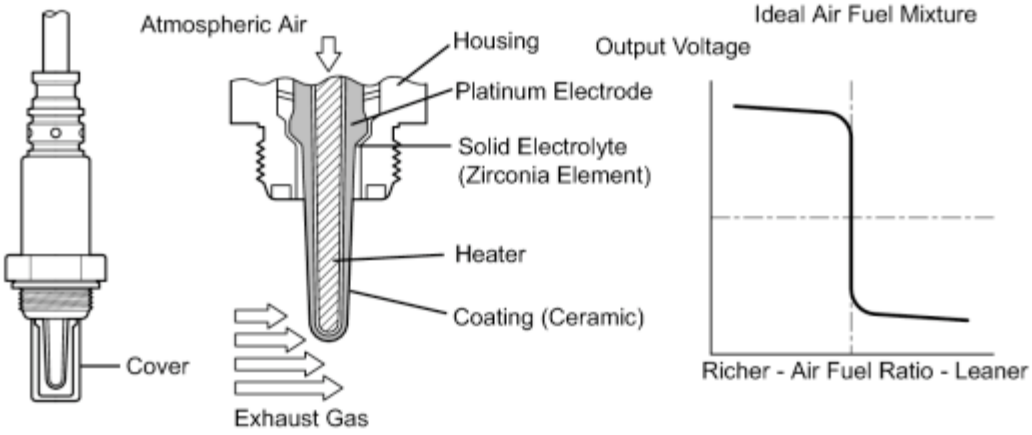
A three-way catalytic converter (TWC) is used in order to convert the carbon monoxide (CO), hydrocarbon (HC), and nitrogen oxide (NOx) into less harmful substances. To allow the TWC to function effectively, it is necessary to keep the air-fuel ratio of the engine near the stoichiometric air-fuel ratio. For the purpose of helping the ECM to deliver accurate air-fuel ratio control, the Heated Oxygen (HO2) sensor is used.

The HO2 sensor is located behind the TWC, and detects the oxygen concentration in the exhaust gas. Since the sensor is integrated with the heater that heats the sensing portion, it is possible to detect the oxygen concentration even when the intake air volume is low (the exhaust gas temperature is low).

When the air-fuel ratio becomes lean, the oxygen concentration in the exhaust gas becomes rich. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is lean (low voltage, i.e. less than 0.45 V).

Conversely, when the air-fuel ratio is richer than the stoichiometric air-fuel level, the oxygen concentration in the exhaust gas becomes lean. The HO2 sensor informs the ECM that the post-TWC air-fuel ratio is rich (high voltage, i.e. more than 0.45 V). The HO2 sensor has the property of changing its output voltage drastically when the air-fuel ratio is close to the stoichiometric level.

The ECM uses the supplementary information from the HO2 sensor to determine whether the air-fuel ratio after the TWC is rich or lean, and adjusts the fuel injection time accordingly. Thus, if the HO2 sensor is working improperly due to internal malfunctions, the ECM is unable to compensate for deviations in the primary air-fuel ratio control.



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DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P0136 P0156	• Abnormal voltage output: During active air-fuel ratio control, following conditions (a) and (b) are met for a certain period of time (2 trip detection logic) (a) Heated Oxygen (HO2) sensor voltage does not decrease to less than 0.2 V (b) HO2 sensor voltage does not increase to more than 0.6 V • Low impedance: Sensor impedance is less than 5 Ω for more than	• Open or short in HO2 sensor (bank 1, 2 sensor 2) circuit • HO2 sensor (bank 1, 2 sensor 2) • HO2 sensor heater (bank 1, 2 sensor 2) • Air-Fuel Ratio (A/F) sensor (bank 1, 2 sensor 1) • Engine room junction block (EFI relay) • Gas leakage from

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	30 seconds when ECM presumes sensor to being warmed up and operating normally (2 trip detection logic)	exhaust system
P0137 P0157	• Low voltage (open): During active air-fuel ratio control, following conditions (a) and (b) are met for a certain period of time (2 trip detection logic) (a) HO2 sensor voltage output less than 0.21 V (b) Target air-fuel ratio rich • High impedance: Sensor impedance is 15 kΩ or more for more than 90 seconds when ECM presumes sensor to being warmed up and operating normally (2 trip detection logic)	• Open in HO2 sensor (bank 1, 2 sensor 2) circuit • HO2 sensor (bank 1, 2 sensor 2) • HO2 sensor heater (bank 1, 2 sensor 2) • Engine room junction block (EFI relay) • Gas leakage from exhaust system
P0138 P0158	• High voltage (short): During active air-fuel ratio control, following conditions (a) and (b) are met for a certain period of time (2 trip detection logic) (a) HO2 sensor voltage output 0.59 V or more (b) Target air-fuel ratio lean • Extremely high voltage (short): HO2 sensor voltage output exceeds 1.2 V for more than 30 seconds (2 trip detection logic)	• Short in HO2 sensor (bank 1, 2 sensor 2) circuit • HO2 sensor (bank 1, 2 sensor 2) • ECM internal circuit malfunction • Air-Fuel Ratio (A/F) sensor (bank 1, 2 sensor 1)

MONITOR DESCRIPTION

1. Active Air-Fuel Ratio Control

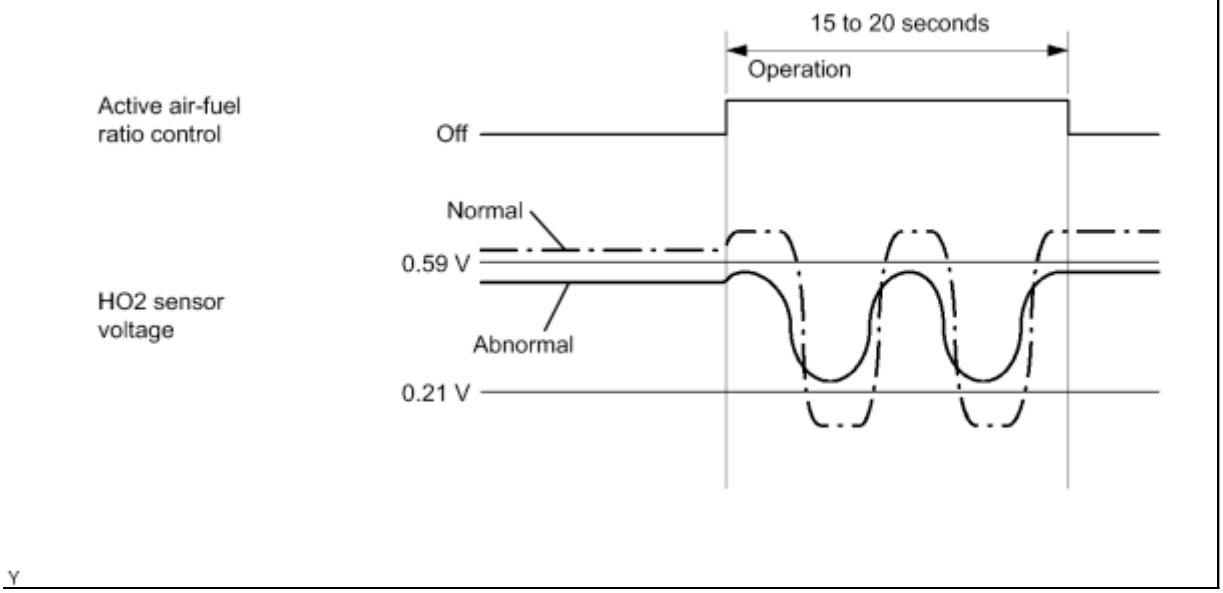
The ECM usually performs air-fuel ratio feedback control so that the Air-Fuel Ratio (A/F) sensor output indicates a near stoichiometric air-fuel level. This vehicle includes active air-fuel ratio control in addition to regular air-fuel ratio control. The ECM performs active air-fuel ratio control to detect any deterioration in the Three-Way Catalytic Converter (TWC) and Heated Oxygen (HO2) sensor malfunctions (refer to the diagram below).

Active air-fuel ratio control is performed for approximately 15 to 20 seconds while driving with a warm engine. During active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become lean or rich by the ECM. If the ECM detects a malfunction, one of the following DTCs is set: DTC P0136 or P0156 (abnormal voltage output), P0137 or P0157 (open circuit) or P0138 or P0158 (short circuit).

2. Abnormal Voltage Output of HO2 Sensor (DTCs P0136 and P0156)

While the ECM is performing active air-fuel ratio control, the air-fuel ratio is forcibly regulated to become rich or lean. If the sensor is not functioning properly, the voltage output variation is small. For example, when the HO2 sensor voltage does not decrease to less than 0.21 V and does not increase to more than 0.59 V during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormal and sets DTCs P0136 and P0156.

HO2 SENSOR CIRCUIT MALFUNCTION (P0136 and P0156: ABNORMAL VOLTAGE):



3. Open or Short in Heated Oxygen (HO2) Sensor Circuit (DTCs P0137 and P0157 or P0138 and P0158)

During active air-fuel ratio control, the ECM calculates the Oxygen Storage Capacity (OSC)* of the Three-Way Catalytic Converter (TWC) by forcibly regulating the air-fuel ratio to become rich or lean.

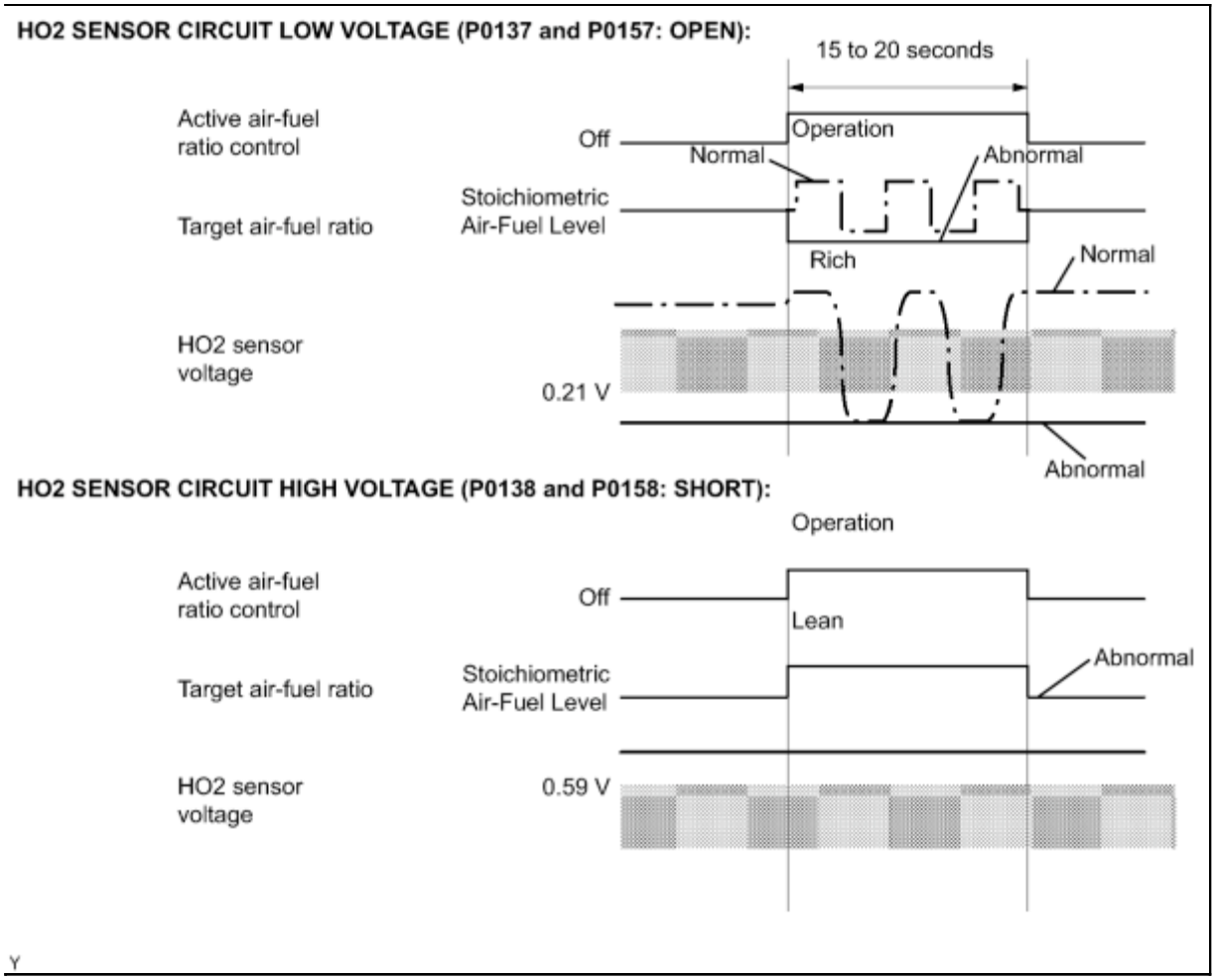
If the HO2 sensor has an open or short circuit, or the voltage output of the sensor noticeably decreases, the OSC indicates an extraordinarily high value. Even if the ECM attempts to continue regulating the air-fuel ratio to become rich or lean, the HO2 sensor output does not change.

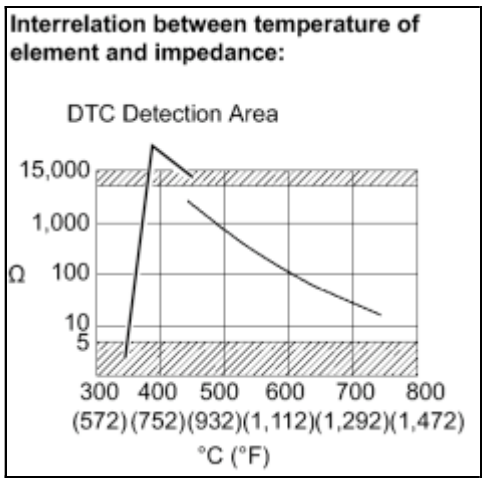
While performing active air-fuel ratio control, when the target air-fuel ratio is rich and the HO2 sensor voltage output is 0.21 V or less (lean), the ECM interprets this as an abnormally low sensor output voltage and sets DTC P0137 or P0157. When the target air-fuel ratio is lean and the voltage output is 0.59 V or more (rich) during active air-fuel ratio control, the ECM determines that the sensor voltage output is abnormally high, and sets DTC P0138 or P0158.

DTC P0138 or P0158 is also set if the HO2 sensor voltage output is more than 1.2 V for 30 seconds or

more.

***: The TWC has the capability to store oxygen. The OSC and the emission purification capacity of the TWC are mutually related. The ECM determines whether the catalyst has deteriorated, based on the calculated OSC value** INFO **.**





4. High or Low Impedance of Heated Oxygen (HO2) Sensor (DTCs P0136 and P0156 or P0137 and P0157)

During normal air-fuel ratio feedback control, there are small variations in the exhaust gas oxygen concentration. In order to continuously monitor the slight variation of the HO2 sensor signal while the engine is running, the impedance* of the sensor is measured by the ECM. The ECM determines that there is a malfunction in the sensor when the measured impedance deviates from the standard range.

*: The effective resistance in an alternating current electrical circuit.

- The impedance cannot be measured using an ohmmeter.
- DTCs P0136 and P0156 indicate the deterioration of the HO2 sensor. The ECM sets the DTCs by calculating the impedance of the sensor when the typical enabling conditions are satisfied (2 driving cycle).
- DTCs P0137 and P0157 indicate an open or short circuit in the HO2 sensor (2 driving cycle). The ECM sets the DTCs when the impedance of the sensor exceeds the threshold of 15 kΩ.