Last Modified: 7-27-2016	6.6 C	**Doc ID:** RM000000WBY030X
Model Year Start: 2008	**Model:** GX470	**Prod Date Range:** [07/2007 -]
Title: 2UZ-FE ENGINE CONTROL SYSTEM: SFI SYSTEM: P0136-P0138,P0156-P0158; Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2); 2008 MY GX470 [07/2007 -]		

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)**

DESCRIPTION

HINT:

Sensor 2 refers to the sensor mounted behind the Three-Way Catalyst Converter (TWC) and located far from the engine assembly.

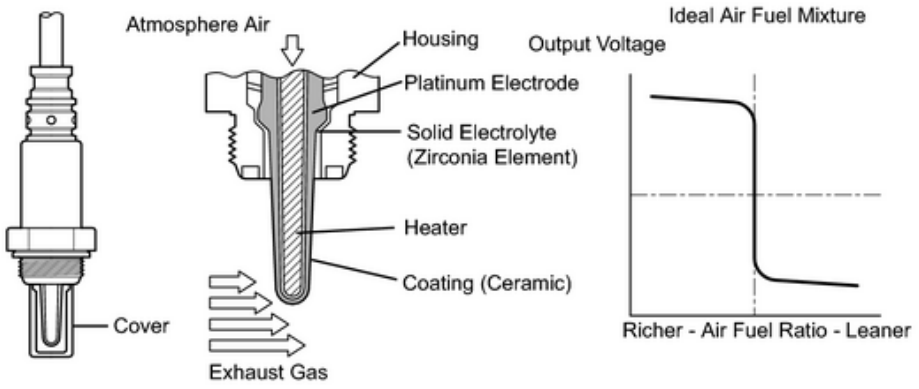
In order to obtain a high purification rate of the carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) components in the exhaust gas, a TWC is used. For the most efficient use of the TWC, the air fuel ratio must be precisely controlled so that it is always close to the stoichiometric air fuel level. For the purpose of helping the ECM to deliver accurate air fuel ratio control, a 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 is 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 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.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
	 P	

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
P0136 P0156	During active air fuel ratio control, following conditions (a) and (b) are met for certain period of time (2 trip detection logic): (a) Heated Oxygen (HO2) sensor voltage does not decrease to less than 0.21 V (b) HO2 sensor voltage does not increase to more than 0.59 V	• Open or short in Heated Oxygen (HO2) sensor (bank 1, 2 sensor 2) circuit • Heated Oxygen (HO2) sensor (bank 1 sensor 2) • Heated Oxygen (HO2) sensor heater (bank 1, 2 sensor 2) • Air Fuel Ratio (A/F) sensor (bank 1, 2 sensor 1) • EFI relay • Gas leakage from exhaust system
P0136 P0156	Sensor impedance less than 5 Ω for more than 30 seconds when ECM presumes sensor to being warmed up and operating normally (2 trip detection logic)	
P0137 P0157	During active air fuel ratio control, following conditions (a) and (b) are met for certain period of time (2 trip detection logic): (a) HO2 sensor voltage output less than 0.21 V (b) Target air fuel ratio rich	• 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) • EFI relay • Gas leakage from exhaust system
P0137 P0157	High impedance: Sensor impedance 15 kΩ or more for more than 90 seconds when ECM presumes sensor to being warmed up and operating normally (2 trip detection logic)	
P0138 P0158	During active air fuel ratio control, following conditions (a) and (b) are met for certain period of time (2 trip detection logic): (a) HO2 sensor voltage output 0.59 V or more (b) Target air fuel ratio lean	• 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)
P0138 P0158	HO2 sensor voltage output 1.2 V or more for more than 30 seconds (2 trip detection logic)	

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).

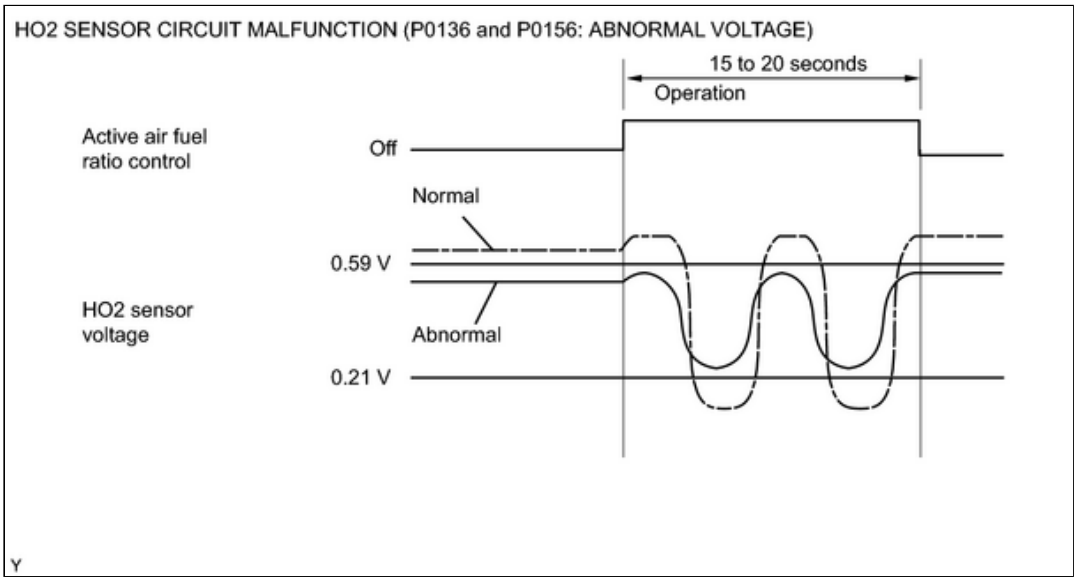
Active air fuel ratio control is performed for approximately 15 to 20 seconds while driving with a warm engine.

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, P0156 (abnormal voltage output), P0137, P0157 (open circuit) and P0138, P0158 (short circuit).

2. Abnormal Voltage Output of HO2 Sensor (DTC 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 DTC P0136.



3. Open or short in the Heated Oxygen (HO2) Sensor Circuit (DTC P0137, P0157, P0138 or 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.

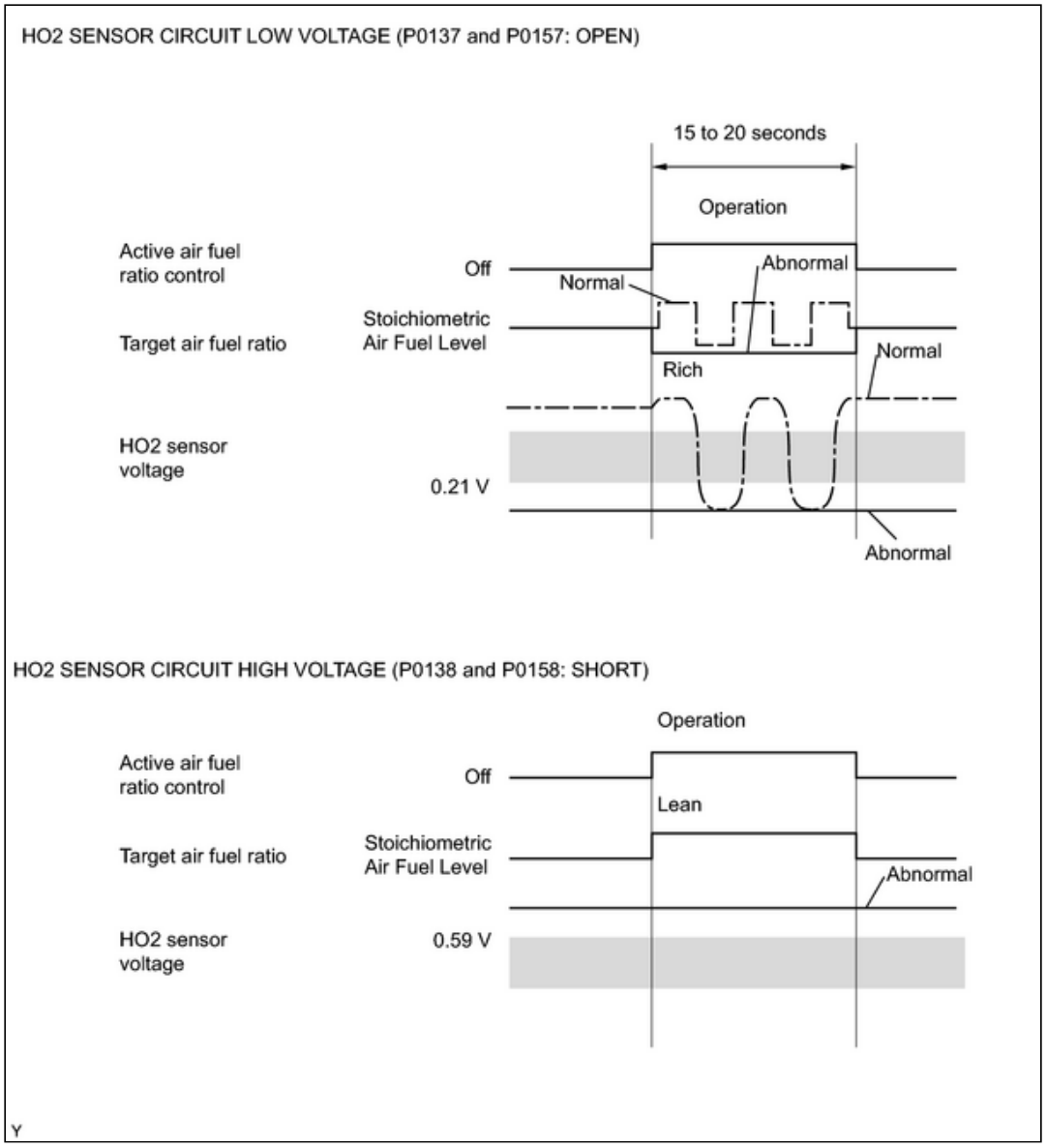
If the HO2 sensor has an open or short, or the voltage output of the sensor noticeably decreases, the OSC indicates an extraordinarily high value. Even if the ECM attempts to continue regulating the air fuel ratio to become rich or lean, the HO2 sensor output does not change.

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.

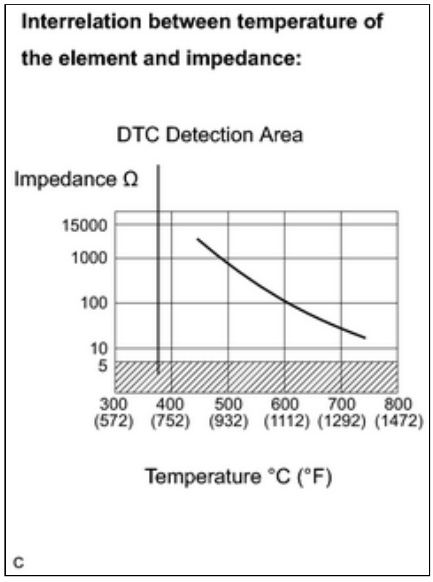
HINT:

DTC P0138 or P0158 is also set if the HO2 sensor voltage output is 1.2 V or more 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 (DTC P0136, P0156, P0137 or 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.

HINT:

- *: The effective resistance in an alternating current electrical circuit.
- The impedance cannot be measured using an ohmmeter.

- DTC P0136 or P0156 indicates the deterioration of the HO2 sensor. The ECM sets the DTC by calculating the impedance of the sensor when the typical enabling conditions are satisfied (2 driving cycle).
- DTC P0137 or P0157 indicates an open circuit in the HO2 sensor (2 driving cycle). The ECM sets this DTC when the impedance of the sensor exceeds the threshold 348.1 MΩ.

MONITOR STRATEGY

Related DTCs	P0136: Heated oxygen sensor (Bank 1) output voltage (Output voltage) P0136: Heated oxygen sensor (Bank 1) impedance (Low) P0137: Heated oxygen sensor (Bank 1) output voltage (Low voltage) P0137: Heated oxygen sensor (Bank 1) impedance (High) P0138: Heated oxygen sensor (Bank 1) output voltage (High voltage) P0138: Heated oxygen sensor (Bank 1) output voltage (Extremely high) P0156: Heated oxygen sensor (Bank 2) output voltage (Output voltage) P0156: Heated oxygen sensor (Bank 2) impedance (Low) P0157: Heated oxygen sensor (Bank 2) output voltage (Low voltage) P0157: Heated oxygen sensor (Bank 2) impedance (High) P0158: Heated oxygen sensor (Bank 2) output voltage (High voltage) P0158: Heated oxygen sensor (Bank 2) output voltage (Extremely high)
Required Sensors/Components (Main)	Heated oxygen sensor
Required Sensors/Components (Related)	Mass air flow meter
Frequency of Operation	Once per driving cycle: Active air-fuel ratio control detection Continuous: Others
Duration	20 seconds: Heated oxygen sensor output (Output voltage, High voltage, Low voltage) 30 seconds: Heated oxygen sensor impedance (Low) 90 seconds: Heated oxygen sensor impedance (High) 10 seconds: Heated oxygen sensor output voltage (Extremely high)
MIL Operation	2 driving cycles
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present	P0031, P0032, P0051, P0052 (A/F sensor heater - Sensor 1) P0037, P0038, P0057, P0058 (O2 sensor heater - Sensor 2) P0100 - P0103 (MAF meter) P0110 - P0113 (IAT sensor) P0115 - P0118 (ECT sensor) P0120 - P0223, P2135 (TP sensor) P0125 (Insufficient ECT for closed loop) P0171, P0172 (Fuel system) P0300 - P0308 (Misfire) P0335 (CKP sensor) P0455, P0456 (EVAP system) P0500 (VSS) P2196, P2198 (A/F sensor - rationality) P2237, P2240 (A/F sensor - open) P2440 (AIR control valve stuck open) P2441 (AIR control valve stuck close) P2444 (AIP stuck ON) P2445 (AIP stuck OFF) P2A00, P2A03 (A/F sensor - slow response)

Heated oxygen sensor output voltage (Output voltage, High voltage, Low voltage):

Active air-fuel ratio control	Executing
Active air-fuel ratio control being when all of following conditions are met:	-
Battery voltage	11 V or more

Engine coolant temperature	75°C (167°F) or more
Idle	OFF
Engine RPM	Less than 3200 rpm
A/F sensor status	Activated
Fuel system status	Closed loop
Fuel-cut	OFF
Engine load	10 to 70 %
Shift position	4th or more

Heated oxygen sensor impedance (Low):

Battery voltage	11 V or higher
Estimated oxygen sensor temperature	Lower than 700°C (1292°F)
ECM monitor	Completed
P0606	Not set

Heated oxygen sensor impedance (High):

Battery voltage	11 V or more
Estimated oxygen sensor temperature	450 to 750°C (842 to 1382°F)
P0606	Not set

Heated oxygen sensor output voltage (Extremely high):

Battery voltage	11 V or more
Time after engine start	2 seconds or more

TYPICAL MALFUNCTION THRESHOLDS

Heated oxygen sensor output voltage (Output voltage):

Either of the following conditions is met:	Condition 1 or 2
1. All of the following conditions are met:	Conditions (a), (b) and (c)
(a) Commanded air-fuel ratio	14.3 or less
(b) Rear HO2S voltage	0.21 to 0.59 V
(c) OSC (Oxygen Storage Capacity of catalyst)	3 g or more
2. All of the following conditions are met:	Conditions (a), (b) and (c)
(a) Commanded air-fuel ratio	14.9 or more
(b) Rear HO2S voltage	0.21 to 0.59 V
(c) OSC (Oxygen Storage Capacity of catalyst)	3 g or more

Heated oxygen sensor output voltage (Low voltage):

All of the following conditions are met:	Conditions 1, 2 and 3
1. Commanded air-fuel ratio	14.3 or less
2. Rear HO2S voltage	Less than 0.21 V
3. OSC (Oxygen Storage Capacity of catalyst)	3 g or more

Heated oxygen sensor output voltage (High voltage):

All of the following conditions are met:	Conditions 1, 2 and 3

1. Commanded air-fuel ratio	14.9 or more
2. Rear HO2S voltage	More than 0.59 V
3. OSC (Oxygen Storage Capacity of catalyst)	3 g or more

Heated oxygen sensor impedance (Low):

Duration of the following condition	30 seconds or more
Heated oxygen sensor impedance	Less than 5 Ω

Heated oxygen sensor impedance (High):

Duration of the following condition	90 seconds or more
Heated oxygen sensor impedance	15 kΩ or more

Heated oxygen sensor output voltage (Extremely high):

Duration of the following condition	10 seconds or more
Heated oxygen sensor voltage	1.2 V or more

COMPONENT OPERATING RANGE

Heated Oxygen sensor voltage	Varies between 0.1 and 0.9 V

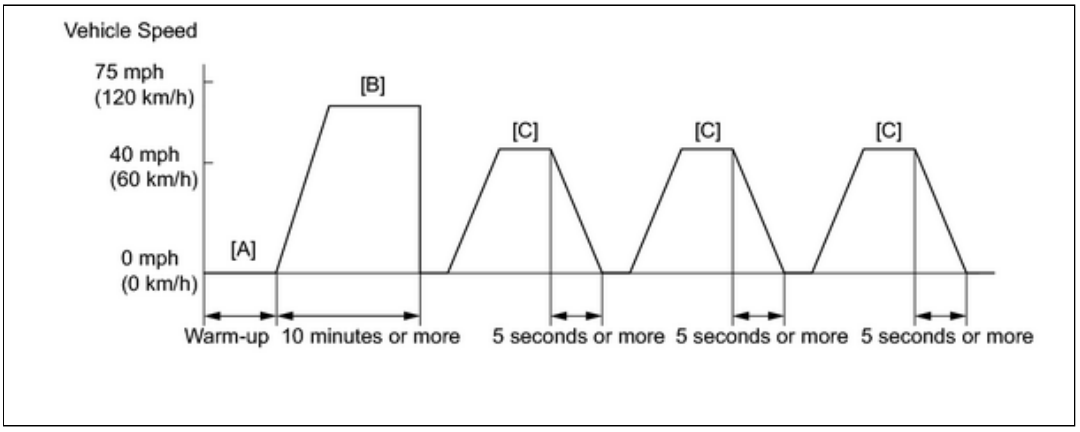
MONITOR RESULT

Refer to CHECKING MONITOR STATUS INFO .

WIRING DIAGRAM

Refer to DTC P0037 INFO .

CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the ignition switch ON.
3. Warm up the engine until the engine coolant temperature is 75°C (167°F) or more [A].
4. Drive the vehicle at 40 to 75 mph (60 to 120 km/h) for 10 minutes or more [B].
5. Drive the vehicle 40 mph (60 km/h) or more and decelerate the vehicle for 5 seconds or more. Perform this 3 times [C].
6. Turn the tester ON.
7. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
8. Input DTCs: P0136, P0137, P0138, P0156, P0157 and P0158.
9. Check that STATUS is NORMAL. If STATUS is INCOMPLETE, perform the drive pattern increasing the vehicle speed and using the second gear to decelerate the vehicle.

INSPECTION PROCEDURE

HINT:

CASE	A/F SENSOR (SENSOR 1) OUTPUT VOLTAGE	HO2 SENSOR (SENSOR 2) OUTPUT VOLTAGE	MAIN SUSPECTED TROUBLE AREA

Techstream only:

Malfunctioning areas can be identified by performing the Control the Injection Volume for A/F sensor function provided in the Active Test. The Control the Injection Volume for A/F sensor function can help to determine whether the Air Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the Control the Injection Volume for A/F sensor operation using the Techstream.

1. Connect the Techstream to the DLC3.
2. Start the engine and turn the tester ON.
3. Warm up the engine at an engine speed of 2500 rpm for approximately 90 seconds.
4. On the tester, enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Injection Volume for A/F sensor.
5. Perform the Control the Injection Volume for A/F sensor operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
6. Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 and O2S B1S2 or AFS B2S1 and O2S B2S2) displayed on the tester.

HINT:

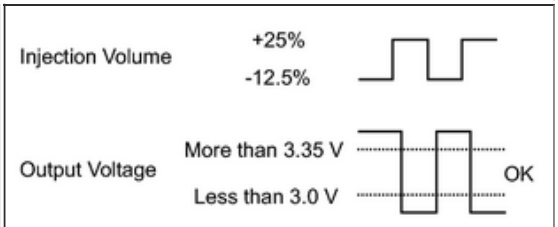
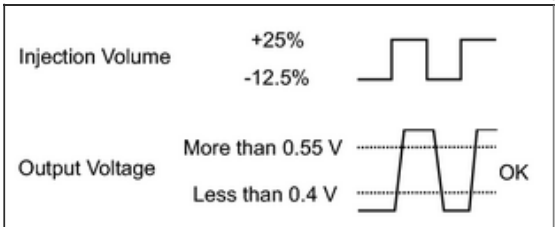
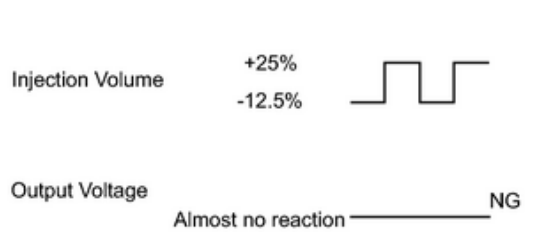
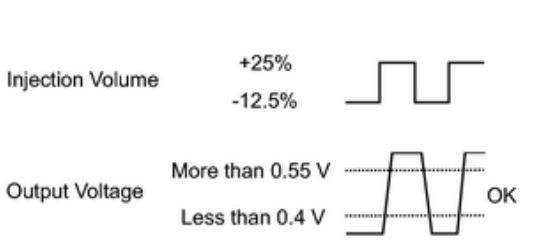
- The Control the Injection Volume for A/F sensor operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases in the fuel injection volume.

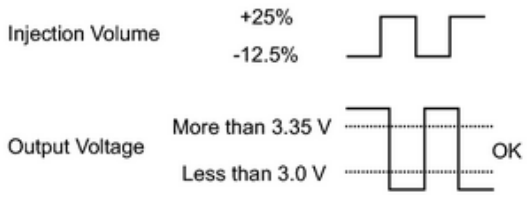
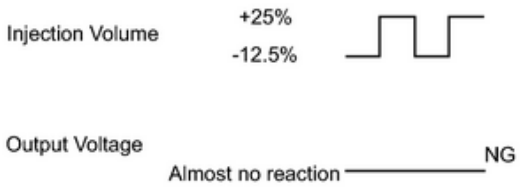
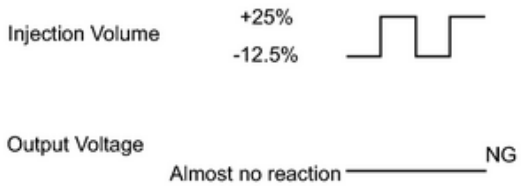
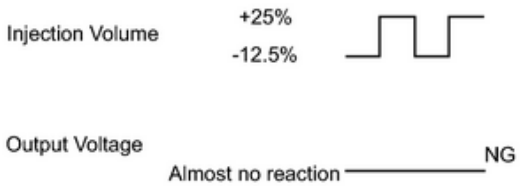
Standard:

TESTER DISPLAY (SENSOR)	INJECTION VOLUME	STATUS	VOLTAGE
AFS B1S1 or AFS B2S1 (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 or AFS B2S1 (A/F)	-12.5 %	Lean	More than 3.35
O2S B1S2 or O2S B2S2 (HO2)	+25 %	Rich	More than 0.5
O2S B1S2 or O2S B2S2 (HO2)	-12.5 %	Lean	Less than 0.4

NOTICE:

The Air Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

CASE	A/F SENSOR (SENSOR 1) OUTPUT VOLTAGE	HO2 SENSOR (SENSOR 2) OUTPUT VOLTAGE	MAIN SUSPECTED TROUBLE AREA
1			-
2			• A/F sensor • A/F sensor heater • A/F sensor circuit

CASE	A/F SENSOR (SENSOR 1) OUTPUT VOLTAGE	HO2 SENSOR (SENSOR 2) OUTPUT VOLTAGE	PROCEED TO
	DISPLAY (DTC OUTPUT)		MAIN SUSPECTED TROUBLE AREA
3			• HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4			• Injector • Fuel pressure • Gas leakage from exhaust system (Air-fuel ratio extremely rich or lean)

- Following the Control the Injection Volume for A/F sensor procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Injection Volume for A/F Sensor / A/F Control System / AFS B1 S1 and O2S B1 S2 or AFS B2 S1 and O2S B2 S2.

HINT:

- If other DTCs relating to different systems that have terminal E2 as the ground terminal are output simultaneously, terminal E2 may have an open circuit.
- Read freeze frame data using the Techstream. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.
- If the OX1B wire from the ECM connector is short-circuited to the +B wire, DTC P0136 will be set.
- If the OX2B wire from the ECM connector is short-circuited to the +B wire, DTC P0156 will be set.

PROCEDURE

1.	**CHECK OTHER DTC OUTPUT**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch ON and turn the tester ON.

(c) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

(d) Read DTCs.

DISPLAY (DTC OUTPUT)	PROCEED TO
P0138 or P0158	A
P0137 or P0157	B
P0136 or P0156	C

B ▶ **GO TO STEP 8**

C ▶ **GO TO STEP 6**

TESTER CONNECTION	TESTER DISPLAY	SPECIFIED CONDITION	RESULT

A

2.	READ VALUE USING TECHSTREAM (OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Connect the Techstream to the DLC3.

(b) After warming up the engine, run the engine at 2500 rpm for 3 minutes.

(c) Enter the following menus: Powertrain / Engine and ECT / Data List / A/F Control System / O2S B1 S2 or O2S B2 S2.

(d) Allow the engine to idle.

(e) Read the Heated Oxygen (HO2) sensor output voltage while idling.

OK:

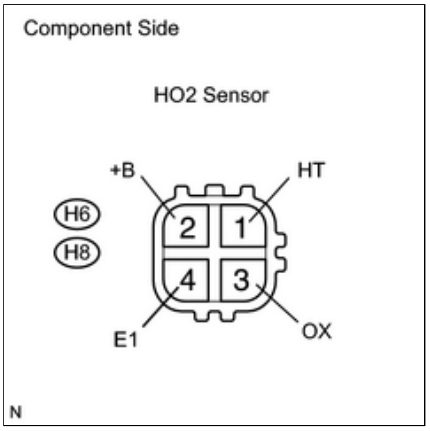
TESTER DISPLAY	RESULT
O2S B1S2 or O2S B2S2	Less than 1.0 V

OK ▶ **GO TO STEP 5**

NG ▶ **GO TO STEP 3**

3.	INSPECT HEATED OXYGEN SENSOR (CHECK FOR SHORT)

(a) Disconnect the H6 or H8 Heated Oxygen (HO2) sensor connector.



(b) Measure the resistance of the HO2 sensor connector.

Standard resistance (Bank 1, 2 sensor 2):

TESTER CONNECTION	SPECIFIED CONDITION
HT (1) - +B (2)	11 to 16 Ω at 20°C (68°F)
HT (1) - E1 (4)	10 kΩ or higher

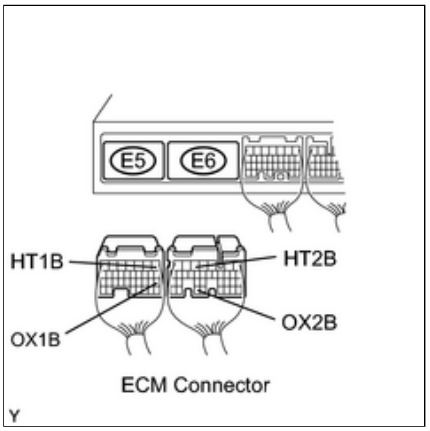
(c) Reconnect the HO2 sensor connector.

NG ▶ **REPLACE HEATED OXYGEN SENSOR**

OK

4.	CHECK HARNESS AND CONNECTOR (CHECK FOR SHORT)	
	TESTER CONNECTION	SPECIFIED CONDITION

(a) Turn the ignition switch OFF and wait for 5 minutes.



(b) Disconnect the E5 and E6 ECM connectors.

(c) Check the resistance.

Standard resistance:

TESTER CONNECTION	SPECIFIED CONDITION
HT1B (E5-1) - OX1B (E5-18)	10 kΩ or higher
HT2B (E6-5) - OX2B (E6-33)	10 kΩ or higher

(d) Reconnect the ECM connector.

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE ECM**

5.	CHECK AIR FUEL RATIO SENSOR

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch ON and turn the tester ON.

(c) Enter the following menus: Powertrain / Engine and ECT / Monitor / O2 Sensor / Details.

(d) Check that RANGE B1S1 and RANGE B2S1 are either Pass or Fail.

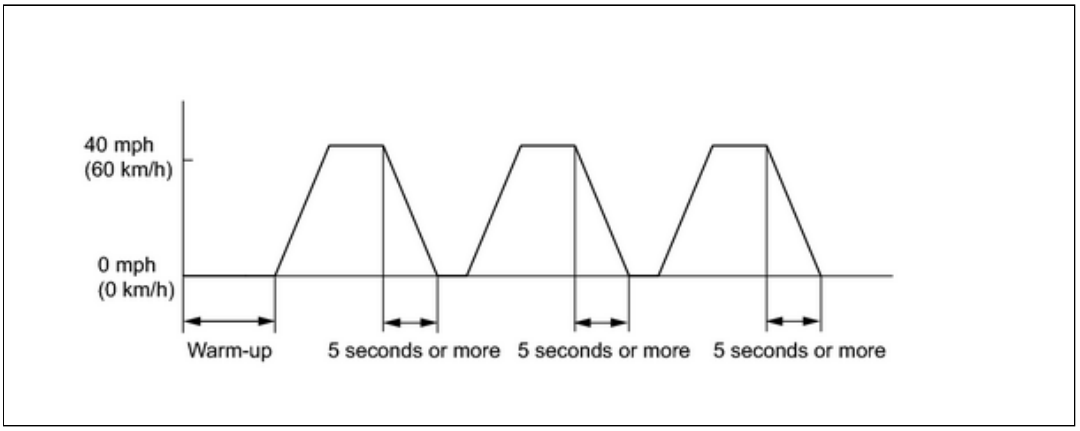
If the tester shows Incomplete, re-check RANGE B1S1 and RANGE B2S1 after performing the drive pattern as listed below.

(e) Select RANGE B1S1 or RANGE B2S1 and press ENTER.

(f) Read the value.

Standard current:
Less than 3.0 mA

(g) Perform the drive pattern as listed below.



(1) Warm up the engine until the engine coolant temperature is 75°C (167°F) or more.

(2) Drive the vehicle at 40 mph (60 km/h) or more and decelerate the vehicle for 5 seconds or more.

Perform this 3 times.

HINT:

If the tester shows Incomplete again, add the vehicle speed and use the second gear to decelerate the vehicle.

OK ▶ **GO TO STEP 12**

NG ▶ **GO TO STEP 14**

6.	READ VALUE USING TECHSTREAM (OUTPUT VOLTAGE OF HEATED OXYGEN SENSOR)

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch ON and turn the tester ON.

(c) Start the engine.

(d) Enter the following menus: Powertrain / Engine and ECT / Data List / A/F Control System / O2S B1 S2 or O2S B2 S2.

(e) After warming up the engine, run the engine at an engine speed of 2500 rpm for 3 minutes.

(f) Read the output voltage of the HO2 sensor when the engine rpm is suddenly increased.

HINT:

Quickly accelerate the engine to 4000 rpm 3 times using the accelerator pedal.

Standard voltage:

Fluctuates between 0.4 V or less and 0.5 V or more.

NG ▶ **GO TO STEP 8**

OK ▼

7.	PERFORM ACTIVE TEST USING TECHSTREAM (INJECTION VOLUME)

(a) Connect the Techstream to the DLC3.

(b) Start the engine and turn the tester ON.

(c) Warn up the engine.

(d) Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the Injection Volume.

(e) Change the injection volume using the tester, monitoring the voltage output of Air Fuel Ratio (A/F) and HO2 sensors displayed on the tester.

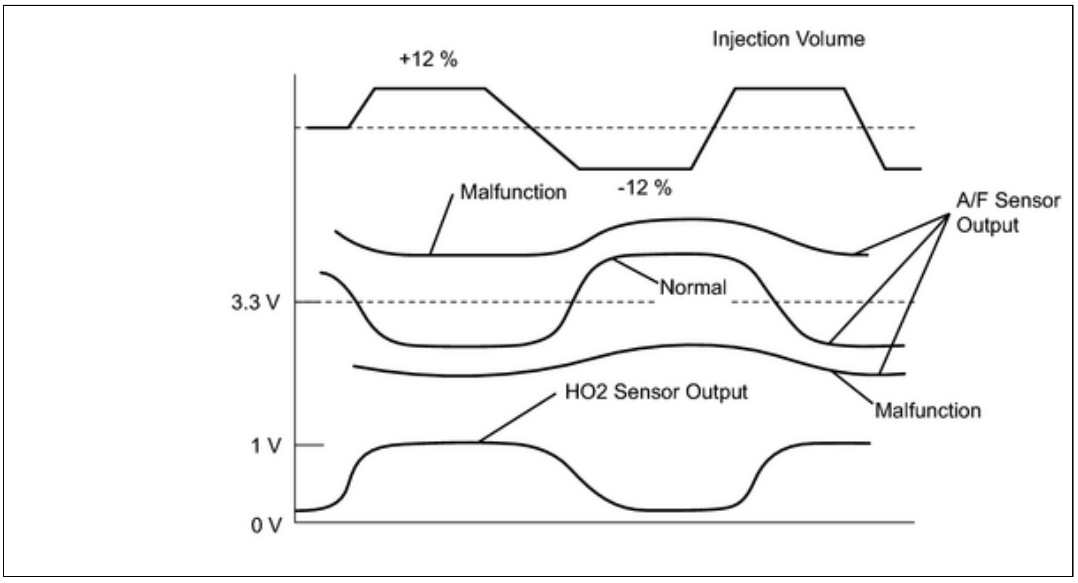
HINT:

- Change the fuel injection volume within the range of -12 % and +12 %. The injection volume can be changed in 1 % graduations within the range.
- The A/F sensor is displayed as AFS B1S1 (AFS B2S1), and the HO2 sensor is displayed as O2S B1S2 (O2S B2S2) on the Techstream.

TESTER DISPLAY (SENSOR)	VOLTAGE VARIATIONS	PROCEED TO
AFS B1S1 (AFS B2S1) (A/F)	Alternates between more than 3.3 V and less than 3.3 V	OK
AFS B1S1 (AFS B2S1) (A/F)	Remains at more than 3.3 V	NG
AFS B1S1 (AFS B2S1) (A/F)	Remains at less than 3.3 V	NG

HINT:

A normal HO2 sensor voltage (O2S B1S2 or O2S B2 S2) reacts in accordance with increases and decreases in fuel injection volumes. When the A/F sensor voltage remains at either less than 3.3 V or more than 3.3 V despite the HO2 sensor indicating a normal reaction, the A/F sensor is malfunctioning.



NG ▶ **GO TO STEP 14**

OK ▶ **CHECK EXTREMELY RICH OR LEAN ACTUAL AIR FUEL RATIO AND REPAIR CAUSE (INJECTOR, FUEL PRESSURE, GAS LEAKAGE FROM EXHAUST SYSTEM)**

8.	**CHECK FOR EXHAUST GAS LEAK**

(a) Check for exhaust gas leakage from the exhaust manifold and pipe.

OK:

No exhaust gas leakage.

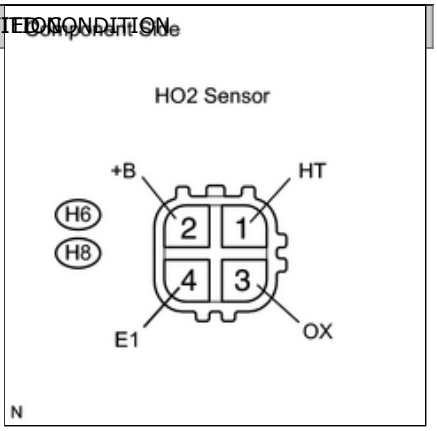
NG ▶ **REPAIR OR REPLACE EXHAUST GAS LEAKAGE POINT**

OK ▼

9.	**INSPECT HEATED OXYGEN SENSOR (HEATER RESISTANCE)**

TESTER CONNECTION	SPECIFIED CONDITION

(a) Disconnect the H6 or H8 HO2 sensor connector.



(b) Measure the resistance of the HO2 sensor connector.

Standard resistance (Bank 1, 2 sensor 2):

TESTER CONNECTION	SPECIFIED CONDITION
HT (1) - +B (2)	11 to 16 Ω at 20°C (68°F)
HT (1) - E1 (4)	10 kΩ or higher

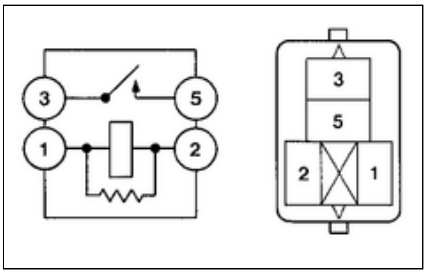
(c) Reconnect the HO2 sensor connector.

NG ▶ **REPLACE HEATED OXYGEN SENSOR**

OK ▼

10.	**INSPECT EFI RELAY**

(a) Remove the EFI relay from the engine room relay block.



(b) Measure the resistance of the EFI relay.

Standard resistance:

TESTER CONNECTION	SPECIFIED CONDITION
3 - 5	10 kΩ or higher
3 - 5	Below 1 Ω (when battery voltage is applied to terminals 1 and 2)

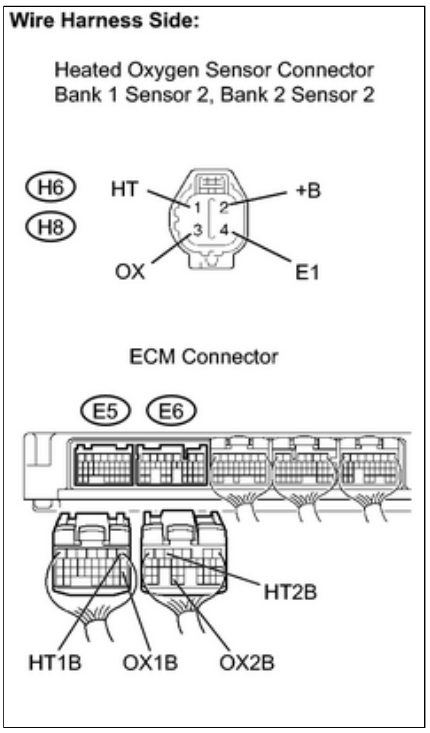
(c) Reinstall the EFI relay.

NG ▶ **REPLACE EFI RELAY**

OK ▼

	TESTER CONNECTION	SPECIFIED CONDITION
11.	**CHECK HARNESS AND CONNECTOR (ECM - HEATED OXYGEN SENSOR)**	

(a) Disconnect the heated oxygen sensor connector.

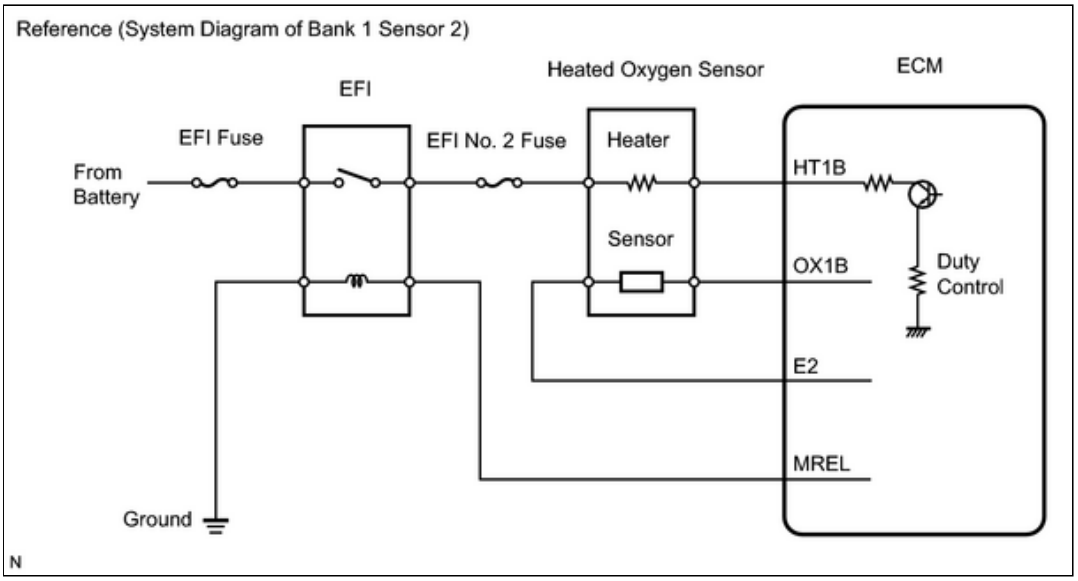


(b) Disconnect the E5 and E6 ECM connector.

(c) Measure the resistance between the wire harness side connectors.

Standard resistance:

TESTER CONNECTION	SPECIFIED CONDITION
OX (H6-3) - OX1B (E5-18)	Below 1 Ω
HT (H6-1) - HT1B (E5-1)	Below 1 Ω
OX (H8-3) - OX2B (E6-33)	Below 1 Ω
HT (H8-1) - HT2B (E6-5)	Below 1 Ω
OX (H6-3) or OX1B (E5-18) - Body ground	10 kΩ or higher
HT (H6-1) or HT1B (E5-1) - Body ground	10 kΩ or higher
OX (H8-3) or OX2B (E6-33) Body ground	10 kΩ or higher
HT (H8-1) or HT2B (E6-5) - Body ground	10 kΩ or higher



NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK
▼

12.	**REPLACE HEATED OXYGEN SENSOR**

(a) Replace the heated oxygen sensor INFO .

NEXT
▼

13.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch ON.

(c) Warm up the engine until the engine coolant temperature is 75°C (167°F) or more.

(d) Drive the vehicle at 40 to 75 mph (60 to 120 km/h) for 10 minutes.

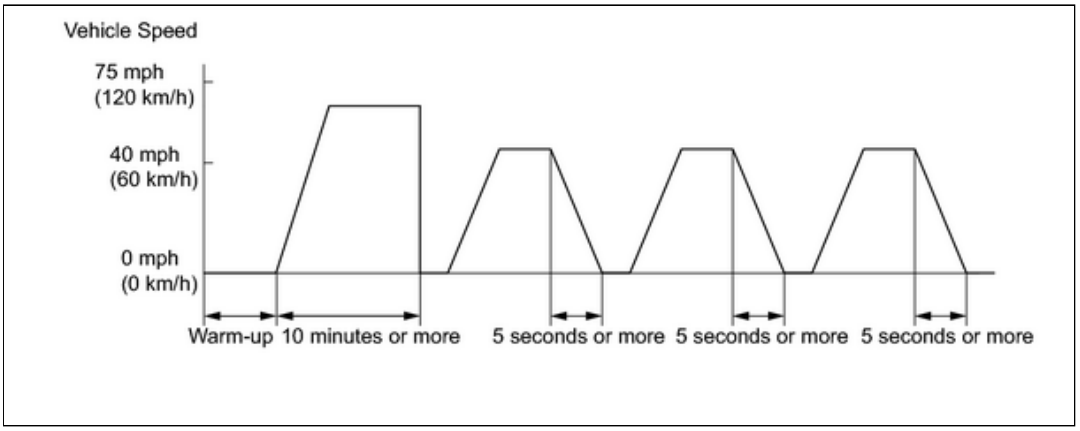
(e) Drive the vehicle at 40 mph (60 km/h) or more and decelerate the vehicle for 5 seconds or more. Perform this 3 times.

(f) Turn the tester ON.

(g) Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

(h) Input DTCs: P0136, P0137, P0138, P0156, P0157 and P0158.

(i) Check that STATUS is NORMAL. If STATUS is INCOMPLETE, perform the drive pattern adding the vehicle speed and using the second gear to decelerate the vehicle.



NG ▶ **REPLACE AIR FUEL RATIO SENSOR**

OK ▶ **END**

14.	**REPLACE AIR FUEL RATIO SENSOR**

(a) Replace the air fuel ratio sensor.

NEXT ▼

15.	**PERFORM CONFIRMATION DRIVING PATTERN**

(a) Connect the Techstream to the DLC3.

(b) Turn the ignition switch ON.

(c) Clear the DTCs.

(d) Switch the ECM from normal mode to check mode using the tester.

(e) Warm up the engine until the engine coolant temperature is 75°C (167°F) or more.

(f) Drive the vehicle at 40 to 75 mph (60 to 120 km/h) for 10 minutes.

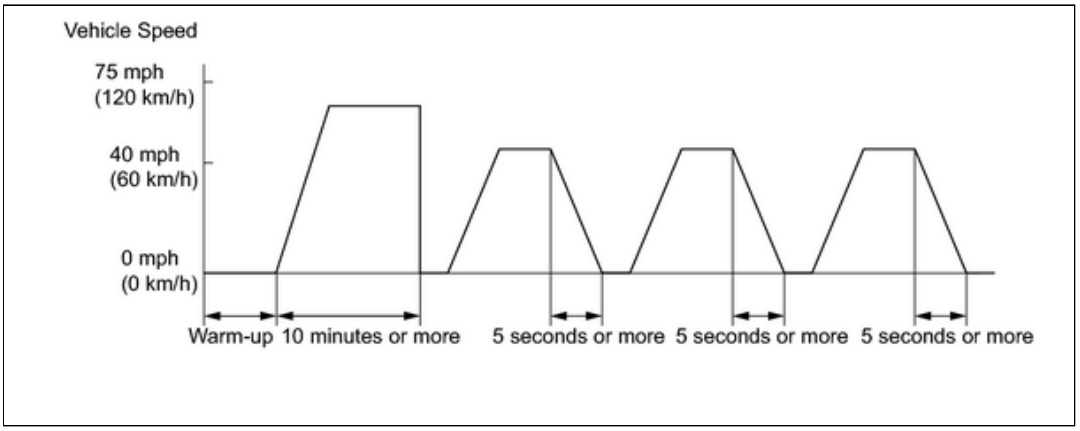
(g) Drive the vehicle 40 mph (60 km/h) or more and decelerate the vehicle for 5 seconds or more. Perform this 3 times.

(h) Turn the tester ON.

(i) Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

(j) Input DTCs: P0136, P0137, P0138, P0156, P0157 and P0158.

(k) Check that STATUS is NORMAL. If STATUS is INCOMPLETE, perform the drive pattern adding the vehicle speed and using the second gear to decelerate the vehicle.



NG ▶ **REPLACE HEATED OXYGEN SENSOR**

OK ▶ **END**