DTC	P2195	OXYGEN (A/F) SENSOR SIGNAL STUCK LEAN (BANK 1 SENSOR 1)

DTC	P2196	OXYGEN (A/F) SENSOR SIGNAL STUCK RICH (BANK 1 SENSOR 1)

DTC	P2197	OXYGEN (A/F) SENSOR SIGNAL STUCK LEAN (BANK 2 SENSOR 1)

DTC	P2198	OXYGEN (A/F) SENSOR SIGNAL STUCK RICH (BANK 2 SENSOR 1)

HINT:

- Although the DTC titles say oxygen sensor, these DTCs relate to the Air–Fuel Ratio (A/F) sensor.
- Sensor 1 refers to the sensor mounted in front of the Three–Way Catalytic Converter (TWC) and located near the engine assembly.

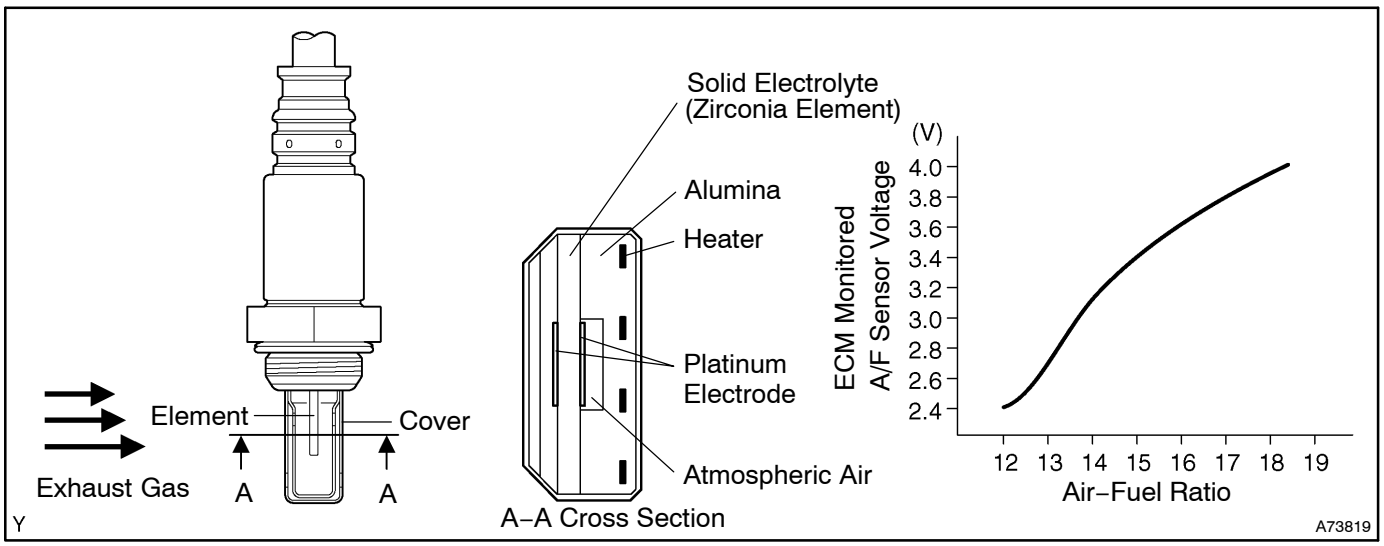
CIRCUIT DESCRIPTION

The A/F sensor generates a voltage* that corresponds to the actual air–fuel ratio. This sensor voltage is used to provide the ECM with feedback so that it can control the air–fuel ratio. The ECM determines the deviation from the stoichiometric air–fuel ratio level, and regulates the fuel injection time. If the A/F sensor malfunctions, the ECM is unable to control the air–fuel ratio accurately.

The A/F sensor is the planar type and is integrated with the heater, which heats the solid electrolyte (zirconia element). This heater is controlled by the ECM. When the intake air volume is low (the exhaust gas temperature is low), a current flows into the heater to heat the sensor, in order to facilitate accurate air–fuel ratio detection. In addition, the sensor and heater portions are narrower than the conventional type. The heat generated by the heater is conducted to the solid electrolyte though the alumina, therefore the sensor activation is accelerated.

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 level.

*: Value changes inside the ECM. Since the A/F sensor is the current output element, a current is converted to a voltage inside the ECM. Any measurements taken at the A/F sensor or ECM connectors will show a constant voltage.



DTC No.	DTC Detection Conditions	Trouble Areas
P2195 P2197	While fuel–cut operation (during vehicle deceleration), air–fuel ratio sensor current is 3.6 mA or more for 1 seconds.	• A/F sensor (Sensor 1) • ECM
P2195	Conditions (a) and (b) continue for 2 seconds or more: (2 trip detection logic) (a) Air–Fuel Ratio (A/F) sensor voltage more than 3.8 V (b) Heated Oxygen (HO2) sensor voltage 0.15 V or more	• Open or short in A/F sensor (Sensor 1) circuit • A/F sensor (Sensor 1) • A/F sensor (Sensor 1) heater • EFI relay • A/F sensor heater and relay circuits • Air induction system • Fuel pressure • Injector • ECM
P2196 P2198	While fuel–cut operation (during vehicle deceleration), air–fuel ratio sensor current is less than 1.4 mA for 1 seconds.	• A/F sensor (Sensor 1) • ECM
P2196	Conditions (a) and (b) continue for 2 seconds or more: (2 trip detection logic) (a) A/F sensor voltage less than 2.8 V (b) HO2 sensor voltage less than 0.6 V	• Open or short in A/F sensor (Sensor 1) circuit • A/F sensor (Sensor 1) • A/F sensor (Sensor 1) heater • EFI relay • A/F sensor heater and relay circuits • Air induction system • Fuel pressure • Injector • ECM

HINT:

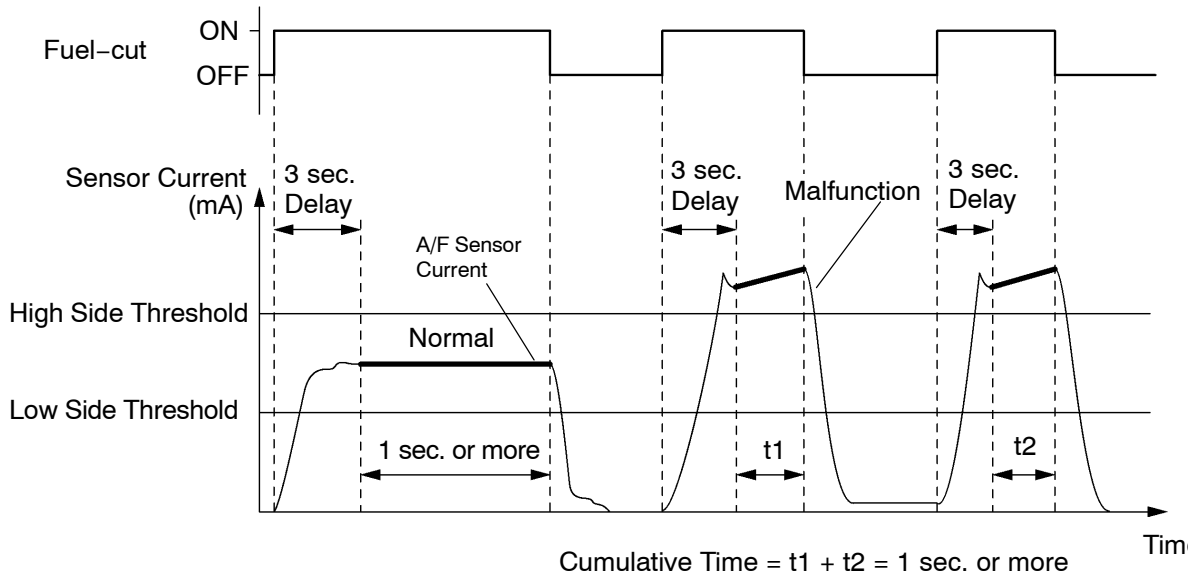
- When any of these DTCs are set, check the A/F sensor voltage output by selecting the following menu items on the hand—held tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / AFS B1S1.
- Short—term fuel trim values can also be read using a hand—held tester.
- The ECM regulates the voltage at the A1A+ and A1A– terminals of the ECM at a constant level. Therefore, the A/F sensor voltage output cannot be confirmed without using a hand–held tester.
- If the A/F sensor functional malfunction is detected, the ECM sets this DTC.

MONITOR DESCRIPTION

- Sensor voltage detection monitor:
  Under the air–fuel ratio feedback control, if the A/F sensor voltage output indicates rich or lean for a certain period of time, the ECM determines that there is a malfunction in the A/F sensor. The ECM illuminates the MIL and sets a DTC.
  Example:
  If the A/F sensor voltage output is less than 2.8 V (very rich condition) for 15 seconds, despite the HO2 sensor voltage output being less than 0.6 V, the ECM sets DTC P2196. Alternatively, if the A/F sensor voltage output is more than 3.8 V (very lean condition) for 15 seconds, despite the HO2 sensor voltage output being 0.15 V or more, DTC P2195 or P2197 is set.

- Sensor current detection monitor:
  A rich air–fuel mixture causes a low air–fuel ratio sensor current, and a lean air fuel mixture causes a high air–fuel ratio sensor current. Therefore, the sensor output becomes high during acceleration, and the sensor becomes low during deceleration.
  The ECM monitors the air–fuel ratio sensor current during fuel–cut and detects unusual current value. If the cumulative time sensor output exceeds 1 seconds, the ECM interprets a malfunction in the air–fuel ratio sensor and sets a DTC.

Air–fuel Ratio Sensor Current Monitor:



MONITOR STRATEGY

Related DTCs	P2195: A/F sensor (Bank 1) signal stuck lean P2195: A/F sensor (Bank 1) current (high side) P2196: A/F sensor (Bank 1) signal stuck rich P2196: A/F sensor (Bank 1) current (low side) P2197: A/F sensor (Bank 2) signal stuck lean P2197: A/F sensor (Bank 2) current (high side) P2198: A/F sensor (Bank 2) signal stuck rich P2198: A/F sensor (Bank 2) current (low side)
Required sensors/Components	A/F sensor
Frequency of operation	Once per driving cycle
Duration	15 sec.: A/F sensor signal stuck lean/rich 1 sec.: A/F sensor current (high/low side)
MIL operation	2 driving cycles
Sequence operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever this DTC is not present	See page 05–20

P2195, P2197 (A/F sensor signal stuck lean):

Duration while all of following conditions are met	2 sec. or more
Rear HO2S voltage	0.15 V or more
Time after engine start	30 sec. or more
A/F sensor status	Activated
Fuel system status	Closed–loop
Engine	Running

P2196, P2198 (A/F sensor signal stuck rich):

Duration while all of following conditions are met	2 sec. or more
Rear HO2S voltage	Less than 0.6 V
Time after engine start	30 sec. or more
A/F sensor status	Activated
Fuel system status	Closed–loop
Engine	Running

P2195, P2197 (A/F sensor current (High side)):

Battery voltage	11 V or more
ECT	75°C (167°F) or more
Atmospheric pressure/760 mmHg	0.75 or more
A/F sensor status	Activated
Continuous time of fuel–cut	3 to 10 sec.

P2196, P2198 (A/F sensor current (Low side)):

Battery voltage	11 V or more
ECT	75°C (167°F) or more
Atmospheric pressure/760 mmHg	0.75 or more
A/F sensor status	Activated
Continuous time of fuel–cut	3 to 10 sec.

TYPICAL MALFUNCTION THRESHOLDS

P2195, P2197 (A/F sensor signal stuck lean):

A/F sensor voltage	More than 3.8 V for 15 sec.

P2196, P2198 (A/F sensor signal stuck rich):

A/F sensor voltage	Less than 2.8 V for 15 sec.

P2195, P2197 (A/F sensor current (High side)):

Duration of the following condition	1 sec. or more
A/F sensor current	3.6 mA or more

P2196, P2198 (A/F sensor current (Low side)):

Duration of the following condition	1 sec. or more
A/F sensor current	Less than 1.4 mA

MONITOR RESULT

Refer to page 05–28 for detailed information.

The test value and test limit information are described as shown in the following table. Check the monitor result and test values after performing the monitor driving pattern (refer to ”Confirmation Monitor”).

- MID (Monitor Identification Data) is assigned to each emissions–related component.
- TID (Test Identification Data) is assigned to each test value.
- Scaling is used to calculate the test value indicated on generic OBD II scan tools.

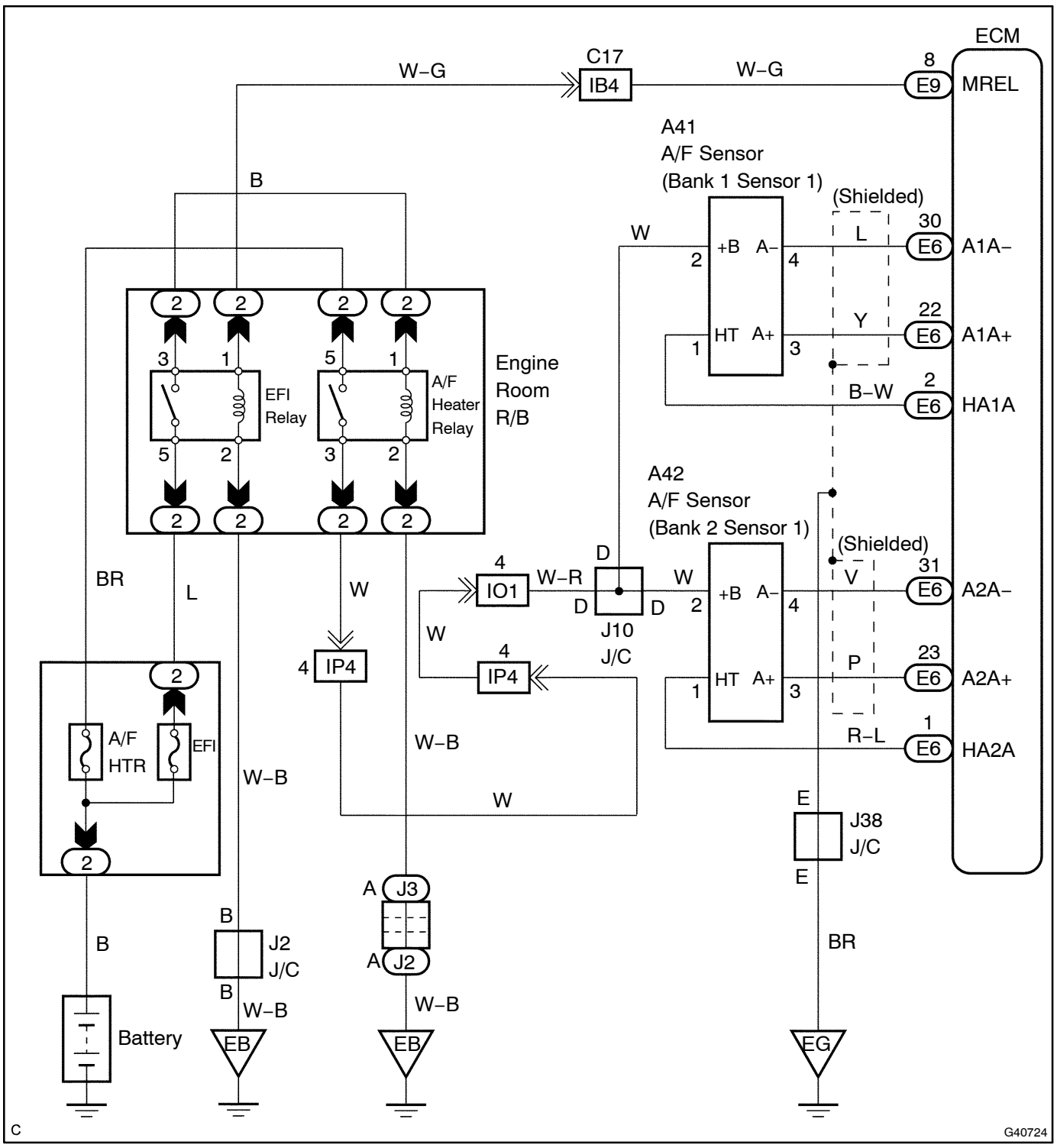
A/F sensor bank 1 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
$01	$91	Multiply by 0.003906 (mA)	A/F current	Minimum test limit	Maximum test limit

A/F sensor bank 2 sensor 1

MID	TID	Scaling	Description of Test Value	Minimum Test Limit	Maximum Test Limit
$05	$91	Multiply by 0.003906 (mA)	A/F current	Minimum test limit	Maximum test limit

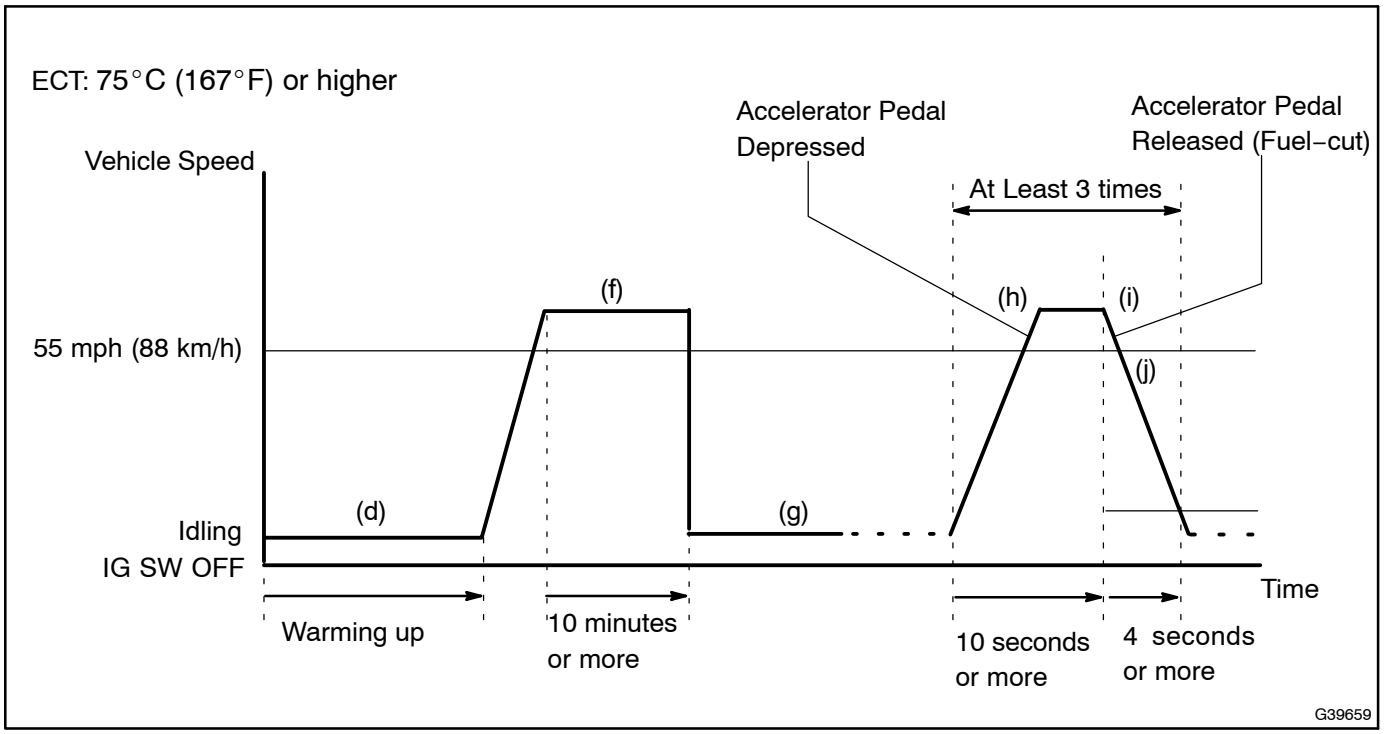
WIRING DIAGRAM



CONFIRMATION DRIVING PATTERN

HINT:

This confirmation driving pattern is used in steps 4, 7, 17 and 21 of the following diagnostic troubleshooting procedure when using a hand–held tester.



(a) Connect the hand–held tester to DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Clear DTCs (see page 05–44).
(d) Start the engine, and warm it up until the ECT reaches 75°C (167°F) or higher.
(e) On the hand–held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/DATA LIST/FC IDL.
(f) Drive the vehicle at 55 mph (88 km/h) or more for at least 10 minutes.
(g) Change the transmission to 2nd gear.
(h) Drive the vehicle at an appropriate speed to perform fuel–cut operation.

HINT:

Fuel–cut is performed when the following conditions are met:

- Accelerator pedal is fully released.
- Engine speed is 2,500 rpm or more (fuel injection returns at 1,000 rpm).

(i) Accelerate the vehicle to 55 mph (88 km/h) or more by depressing the accelerator pedal for at least 10 seconds.
(j) Soon after performing step (i) above, release the accelerator pedal for at least 4 seconds without depressing the brake pedal, in order to execute fuel–cut control.
(k) Stop the vehicle and allow the engine to idle for 10 seconds or more.
(l) Allow the vehicle to decelerate until the vehicle speed declines to less than 6 mph (10 km/h).
(m) Repeat steps from (i) through (l) above at least 3 times in one driving cycle.

HINT:

Completing all A/F sensor monitors are required to change the value in TEST RESULT.

CAUTION:

Strictly observe the posted speed limits, traffic laws, and road conditions when performing these driving patterns.

INSPECTION PROCEDURE

HINT:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL 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 A/F CONTROL operation using a hand–held tester.

(1) Connect a hand–held tester to the DLC3.
(2) Start the engine and turn the tester ON.
(3) Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
(4) On the tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
(5) Perform the A/F CONTROL 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 (AFS B2S1) and OS2 B1S2 (O2S B2S2)) displayed on the tester.

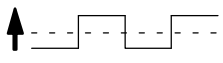
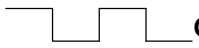
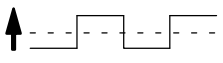
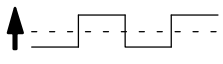
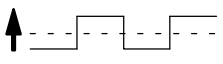
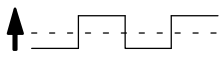
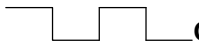
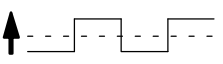
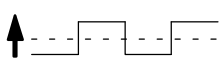
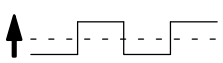
HINT:

- The A/F CONTROL operation lowers the fuel injection volume by 12.5 % or increases the injection volume by 25 %.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

Standard:

Tester Display (Sensor)	Injection Volumes	Status	Voltages
AFS B1S1 (AFS B2S1) (A/F)	+25 %	Rich	Less than 3.0
AFS B1S1 (AFS B2S1) (A/F)	–12.5 %	Lean	More than 3.35
O2S B1S2 (O2S B2S2) (HO2)	+25 %	Rich	More than 0.55
O2S B1S2 (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 Areas
1	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0 V  **OK**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	—
2	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage More than 0.55 V Less than 0.4V  **OK**	• A/F sensor • A/F sensor heater • A/F sensor circuit
3	Injection volume +25 % –12.5 %  Output voltage More than 3.35 V Less than 3.0V  **OK**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	• HO2 sensor • HO2 sensor heater • HO2 sensor circuit
4	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	Injection volume +25 % –12.5 %  Output voltage Almost no reaction **NG**	• Injector • Fuel pressure • Gas leakage from exhaust system (Air–fuel ratio extremely lean or rich)

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2, and press the YES button and then the ENTER button followed by the F4 button.

HINT:

- Read freeze frame data using a hand–held tester or OBD II scan tool. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air–fuel ratio was lean or rich, and other data, from the time the malfunction occurred.
- A low A/F sensor voltage could be caused by a rich air–fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air–fuel mixture. Check for conditions that would cause the engine to run lean.

1	CHECK ANY OTHER DTCS OUTPUT(IN ADDITION TO P2195, P2196, P2197 OR P2198)

(a) Connect a hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
(d) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
P2195, P2196, P2197 or P2198 and other DTCs	B

HINT:
If any DTCs other than P2195, P2196, P2197 or P2198 are output, troubleshoot those DTCs first.

B → **GO TO DTC CHART (See page 05–60)**

A

2	READ VALUE USING HAND–HELD TESTER(TEST VALUE OF A/F SENSOR)

(a) Connect a hand–held tester to the DLC3.
(b) Turn the ignition switch to ON and turn the tester ON.
(c) Clear DTCs (see page 05–44).
(d) On the hand–held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/MONITOR STATUS.
(e) Check that the status of O2S MON is COMPL.
(f) On the hand–held tester, select the following menu items: DIAGNOSIS/ENHANCED OBD II/MONITOR INFO/TEST RESULT/RANGE BISI and B2S1.
(g) Check the test value of the air–fuel ratio sensor output current during fuel–cut.

Result:

Test Value	Proceed to
Out of normal range (1.4 mA or more, and less than 3.6 mA)	A
Within normal range (Less than 1.4 mA, or 3.6 mA or more)	B

B → **Go to step 20**

A

3	READ VALUE USING HAND–HELD TESTER(OUTPUT VOLTAGE OF A/F SENSOR)

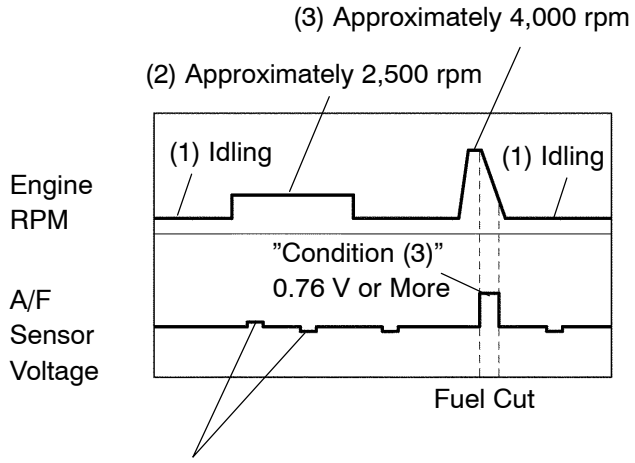
(a) Connect the hand–held tester to the DLC3.
(b) Start the engine and turn the scan tool ON.
(c) Warm up the Air–Fuel Ratio (A/F) sensor at an engine speed of 2,500 rpm for 90 seconds.
(d) Using the tester, check the A/F sensor voltage 3 times, once when the engine is in each of the following conditions:
  (1) While idling (check for at least 30 seconds)
  (2) At an engine speed of approximately 2,500 rpm (without any sudden changes in engine speed)
  (3) Raise the engine speed to 4,000 rpm and then quickly release the accelerator pedal so that the throttle valve is fully closed.

Standard:

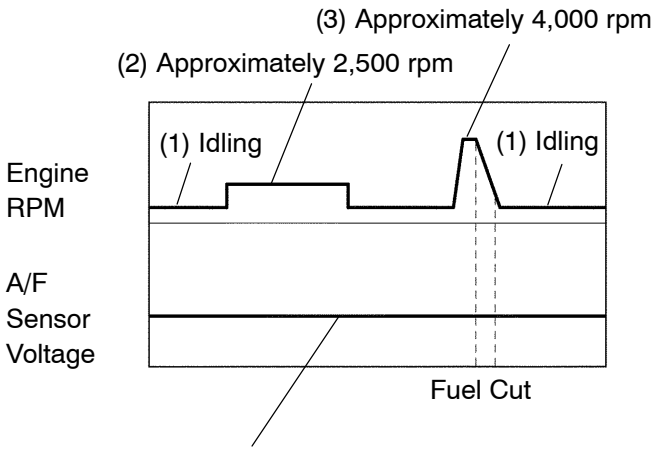
Conditions	A/F Sensor Voltage Variations	Reference
(1) and (2)	Changes at approx 0.66 V	Between 0.62 V and 0.7 V
(3)	Increases to 0.76 V or more	This occurs during engine deceleration (when fuel–cut performed)

For more information, see the diagrams below.

Normal Condition:



Malfunction Condition:



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HINT:

- If the output voltage of the A/F sensor remains at approximately 0.66 V (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have an open circuit. (This will also happen if the A/F sensor heater has an open circuit.)
- If the output voltage of the A/F sensor remains at either approximately 0.76 V or more, or 0.56 V or less (see Malfunction Condition diagram) under any conditions, including those above, the A/F sensor may have a short circuit.
- The ECM stops fuel injection (fuel cut) during engine deceleration. This causes a lean condition and results in a momentary increase in the A/F sensor output voltage.
- The ECM must establish a closed throttle valve position learning value to perform fuel cut. If the battery terminal has been reconnected, the vehicle must be driven over 10 mph (16 km/h) to allow the ECM to learn the closed throttle valve position.

- When the vehicle is driven:
  The output voltage of the A/F sensor may be below 0.56 V during fuel enrichment. For the vehicle, this translates to a sudden increase in speed with the accelerator pedal fully depressed when trying to overtake another vehicle. The A/F sensor is functioning normally.
- The A/F sensor is a current output element; therefore, the current is converted into a voltage inside the ECM. Measuring the voltage at the connectors of the A/F sensor or ECM will show a constant voltage result.

NG → **Go to step 9**

OK

4	PERFORM CONFIRMATION DRIVING PATTERN

NEXT

5	CHECK WHETHER DTC OUTPUT RECURS(DTC P2195, P2196, P2197 OR P2198)

(a) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
(b) Read DTCs.
Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B → **Go to step 5**

A

6	REPLACE AIR FUEL RATIO SENSOR

NEXT

7	PERFORM CONFIRMATION DRIVING PATTERN

NEXT

8	CHECK WHETHER DTC OUTPUT RECURS(DTC P2195, P2196, P2197 OR P2198)

(a) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.
(b) Read DTCs.
Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B → **Go to step 5**

A

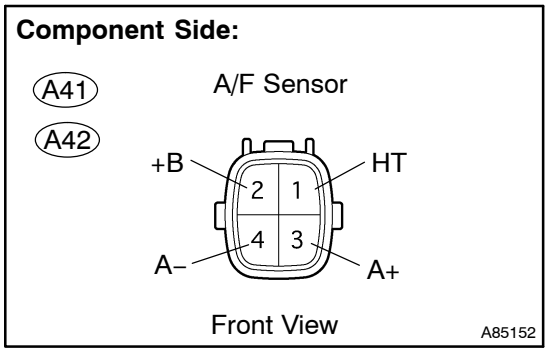
9	CONFIRM WHETHER VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC CAUSED BY RUNNING OUT OF FUEL

10	INSPECT AIR FUEL RATIO SENSOR(HEATER RESISTANCE)



(a) Disconnect the A41 or A42 air–fuel ratio (A/F) sensor connector.

(b) Measure resistance between the terminals of the A/F sensor connector.

Standard:

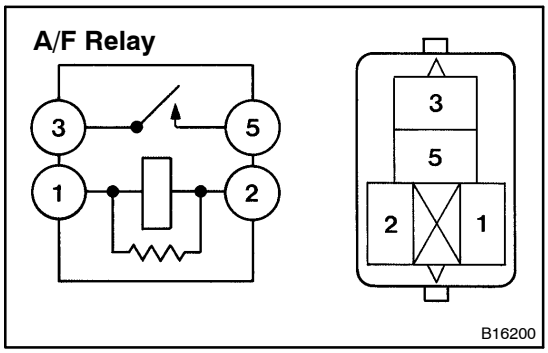
Tester Connection	Specified Condition
HT (1) – +B (2)	Between 1.8 Ω and 3.4 Ω at 20°C (68°F)
HT (1) – A– (4)	10 kΩ or higher

(c) Reconnect the A/F sensor connector.

NG → REPLACE AIR FUEL RATIO SENSOR

OK

11	INSPECT AIR FUEL RATIO SENSOR HEATER RELAY



(a) Remove the A/F sensor heater relay from the engine room R/B.

(b) Inspect the A/F sensor heater relay.

Standard:

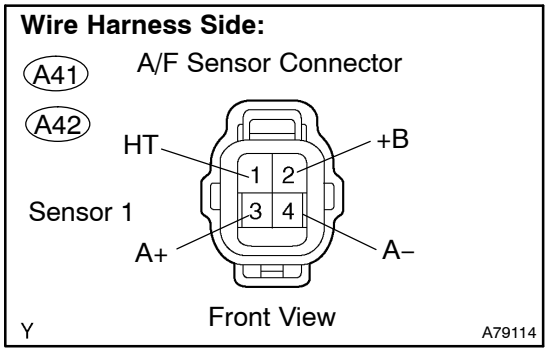
Terminal No.	Condition	Specified Condition
3 – 5	Always	10 KΩ or higher
3 – 5	Apply B+ between terminals 1 and 2	Below 1 Ω

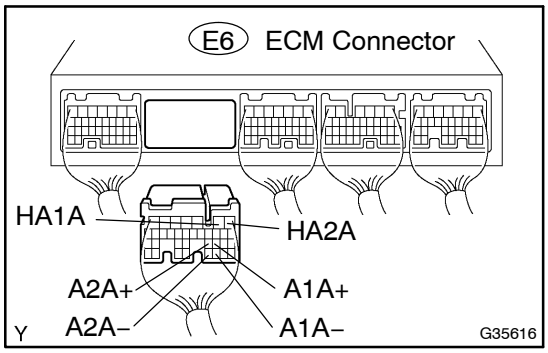
(c) Reconnect the A/F sensor heater relay.

NG → REPLACE AIR FUEL RATIO SENSOR HEATER RELAY

OK

12 CHECK HARNESS AND CONNECTOR(A/F SENSOR – ECM)





(a) Disconnect the A41 or A42 A/F sensor connector.
(b) Turn the ignition switch to ON.
(c) Measure the voltage between the +B terminal of the A/F sensor connector and body ground.

Standard:

Tester Connections	Specified Conditions
+B (2) – Body ground	Between 9 V and 14 V

(d) Turn the ignition switch to OFF.
(e) Disconnect the E6 ECM connector.
(f) Check the resistance.

Standard (Check for open):

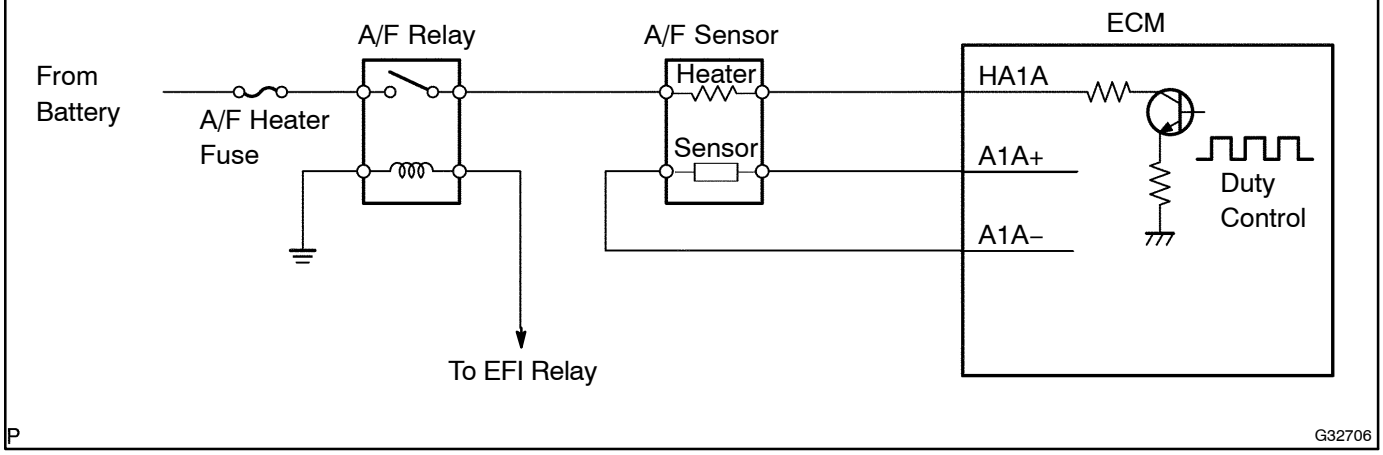
Tester Connections	Specified Conditions
HT (A41–1) – HA1A (E6–2) HT (A42–1) – HA2A (E6–1)	Below 1 Ω
A+ (A41–3) – A1A+ (E6–22) A+ (A42–3) – A2A+ (E6–23)	Below 1 Ω
A– (A41–4) – A1A– (E6–30) A– (A42–4) – A2A– (E6–31)	Below 1 Ω

Standard (Check for short):

Tester Connections	Specified Conditions
HT (A41–1) or HA1A (E6–2) – Body ground HT (A42–1) or HA2A (E6–1) – Body ground	10 kΩ or higher
A+ (A41–3) or A1A+ (E6–22) – Body ground A+ (A42–3) or A2A+ (E6–23) – Body ground	10 kΩ or higher
A– (A41–4) or A1A– (E6–30) – Body ground A– (A42–4) or A2A– (E6–31) – Body ground	10 kΩ or higher

(g) Reconnect the A/F sensor connector.
(h) Reconnect the ECM connector.

Reference (Bank 1 Sensor 1 System Drawing):



NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

13	CHECK AIR INDUCTION SYSTEM

(a) Check the air induction system for vacuum leaks.

NG → REPAIR OR REPLACE AIR INDUCTION SYSTEM

OK

14	CHECK FUEL PRESSURE (See page 11–8)

(a) Check the fuel pressure (high or low pressure).

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

15	INSPECT FUEL INJECTOR ASSY (See page 11–8)

NG → REPLACE FUEL INJECTOR ASSY

OK

16	REPLACE AIR FUEL RATIO SENSOR

NEXT

17	PERFORM CONFIRMATION DRIVING PATTERN

NEXT

18	CHECK WHETHER DTC OUTPUT RECURS(DTC P2195, P2196, P2197 OR P2198)

(a) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

(b) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198	A
No output	B

B → REPLACE ECM (See page 10–16) AND PERFORM CONFIRMATION DRIVING PATTERN

A

19	CONFIRM WHETHER VEHICLE HAS RUN OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS (See page 05–13)

YES

DTC CAUSED BY RUNNING OUT OF FUEL

20	REPLACE AIR FUEL RATIO SENSOR

NEXT

21	PERFORM CONFIRMATION DRIVING PATTERN

NEXT

22	CHECK WHETHER DTC OUTPUT RECURS(DTC P2195, P2196, P2197 OR P2198)

(a) On the hand–held tester, select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / PENDING CODES.

(b) Read DTCs.

Result:

Display (DTC Output)	Proceed To
P2195, P2196, P2197 or P2198 (A/F sensor pending DTCs)	A
No output	B

B → **REPLACE ECM (See page 10–16)**

A

END