DTC	P1130/21	A/F SENSOR CIRCUIT RANGE/PERFORMANCE MALFUNCTION (BANK 1 SENSOR 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125/91 on page 05–173.

DTC No.	DTC Detecting Condition	Trouble Area
P1130/21	Voltage output* of A/F sensor remains at 3.8 V or more, or 2.8 V or less, during engine running after the engine is warmed up (2 trip detection logic) *: Output value changes at the inside of ECM only	• Open or short in A/F sensor circuit • A/F sensor • Air induction system • Fuel pressure • Injector • ECM
	Voltage output* of A/F sensor does not change from 3.30 V, during engine running after the engine is warmed up (2 trip detection logic) *: Output value changes at the inside of ECM only	
	Open or short in A/F sensor circuit (2 trip detection logic)	

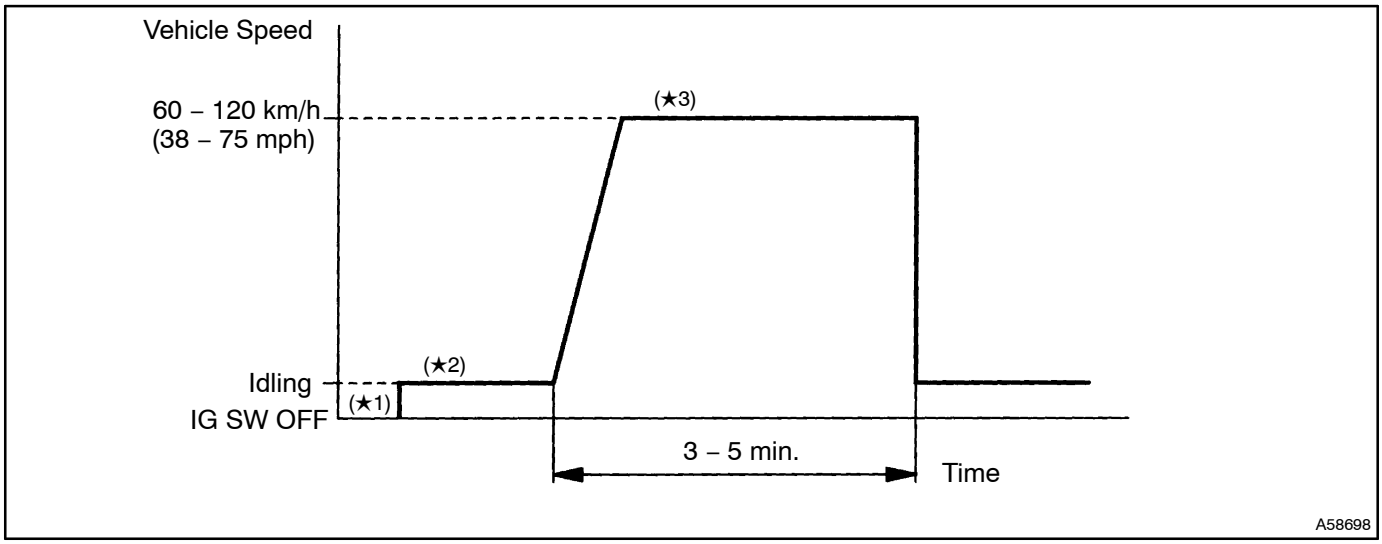
HINT:

- After confirming DTC P1130/21, use the hand–held tester to confirm voltage output of A/F sensor (AFS B1 S1/O2S B1 S1) from the CURRENT DATA.
- The A/F sensor's output voltage and the short–term fuel trim value can be read using the hand–held tester.
- The ECM controls the voltage of the AF1A+ AF1A– terminals of the ECM to the fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without the hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125/91 on page 05–173.

CONFIRMATION DRIVING PATTERN



1. Connect the hand–held tester to the DLC3. (★1)
2. Switch the hand–held tester from the normal mode to the check mode (See page 05–135). (★1)
3. Start the engine and warm it up with all the accessory switches OFF. (★2)
4. Drive the vehicle at 60 – 120 km/h (38 – 75 mph) and engine speed at 1,400 – 3,200 rpm for 3 – 5 min. (★3)

HINT:
If a malfunction exists, the MIL will light up during step (★3).
NOTICE:
If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a hand–held tester, turn the ignition switch OFF after performing steps (★2) and (★3), then perform steps (★2) and (★3) again.

INSPECTION PROCEDURE

HINT:
- If DTC P1130/21 is displayed, check bank 1 sensor 1 circuit.
- Read freeze frame data using the hand–held tester, as freeze frame data records the engine conditions when the malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, the air–fuel ratio was lean or rich, etc. at the time of the malfunction.

1	READ OUTPUT DTC

RESULT:

	A	B
RESULT	Only P1130/21 is output.	P1130/21 and other codes are output.

HINT:
If any codes besides P1130/21 is output, perform the troubleshoot on that DTC before.

B → GO TO RELEVANT DTC CHART

A

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

(a) Connect the hand–held tester to the DLC3.
(b) Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
(c) Read the voltage value of the A/F sensor on the screen of hand–held tester when you perform all the following conditions.

HINT:
The voltage of the AF1A+ terminal of the ECM is fixed at 3.3 V and the voltage of the AF1A– terminal is fixed at 3.0 V. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AF1A+ AF1A–) of the ECM.

Condition	A/F Sensor Voltage Value
Engine idling	• Not remains at 3.30 V • Not remains at 4.5 V or more
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25 mph) or more, and operate throttle valve open and close	

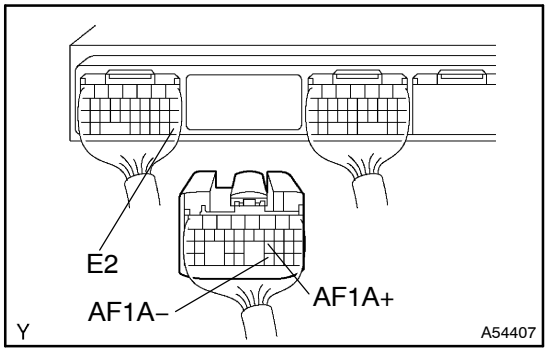
HINT:

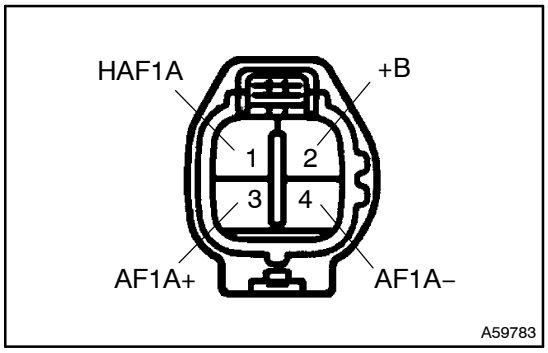
- During fuel enrichment, there is a case that the output voltage of the A/F sensor is below 2.8 V, it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 4.5 V, it is normally.
- If the output voltage of the A/F sensor remains at 3.30 V even after performing all the above conditions, the A/F sensor circuit may be open.
- If the output voltage of the A/F sensor remains at 3.8 V or more, or 2.8 V (0.56 V*) or less even after performing all the above conditions, the A/F sensor circuit may be short.

OK → **Go to step 9**

NG

3	CHECK WIRE HARNESS OR CONNECTOR(ECM–A/F SENSOR)





(a) Disconnect the A/F sensor connector.
(b) Disconnect the ECM E9 connector.
(c) Check continuity between the terminals AF1A+ of the ECM connector and AF1A+ of the A/F sensor connector.
Resistance: 1 Ω or less
(d) Check for short between the terminals AF1A+ and E2 of the ECM connector.
Resistance: 1 MΩ or more
(e) Check continuity between the terminals AF1A– of the ECM connector and AF1A– of the A/F sensor connector.
Resistance: 1 Ω or less
(f) Check for short between the terminals AF1A– and E2 of the ECM connector.
Resistance: 1 MΩ or more

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

OK

4	CHECK AIR FUEL RATIO SENSOR (See page 10–7)

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

5	CHECK AIR INDUCTION SYSTEM (See page 10–7)

NG → **REPAIR OR REPLACE**

OK

6	CHECK FUEL PRESSURE (See page 11–29)

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

7	CHECK INJECTOR INJECTION (See page 11–29)

NG → REPLACE FUEL INJECTOR ASSY

OK

REPLACE AIR FUEL RATIO SENSOR

8	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–173)

GO

9	READ OUTPUT DTC

Result:

	A	B
RESULT	P1130/21 is not output.	P1130/21 is output.

B → CHECK AND REPLACE ECM

A

10	CONFIRM VEHICLE RUNS OUT OF FUEL IN PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC IS CAUSED RUNNING OUT OF FUEL