DTC	P1130/21	A/F SENSOR CIRCUIT RANGE/PERFORMANCE MALFUNCTION(BANK1 SENSOR1)

DTC	P1150/28	A/F SENSOR CIRCUIT RANGE/PERFORMANCE MALFUNCTION(BANK2 SENSOR1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page 05–333.

DTC No.	DTC Detecting Condition	Trouble Area
P1130/21 P1150/28	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 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)	

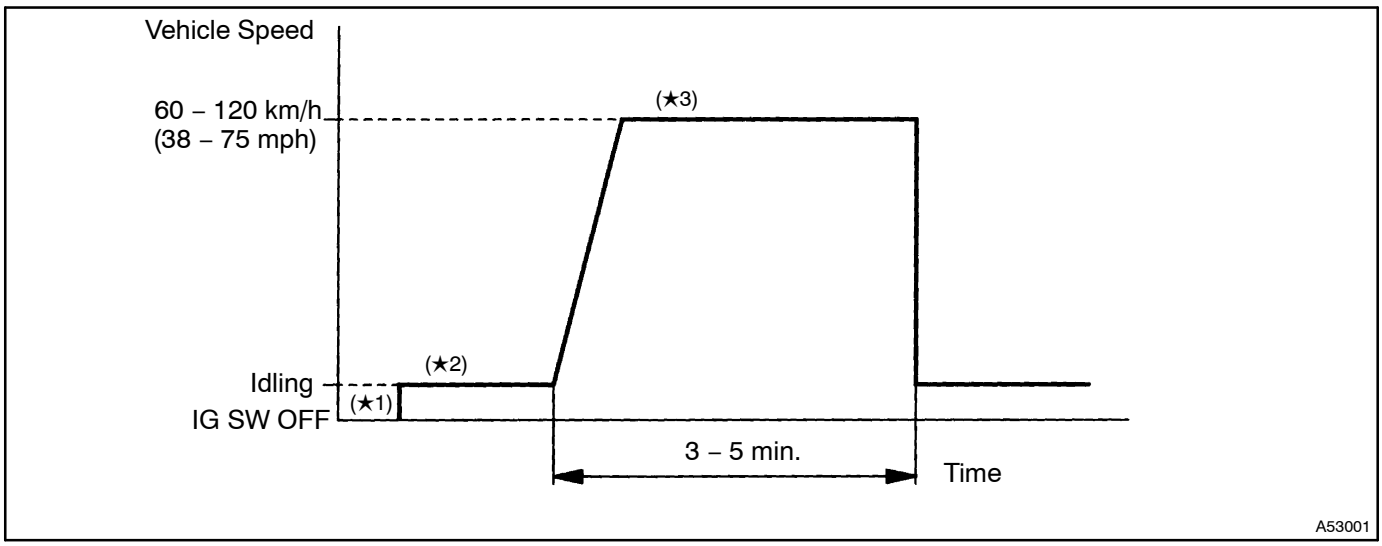
HINT:

- After confirming DTC P1130, 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 AFR+, AFL+, AFR– and AFL– 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.
- Hand–held tester displays the one fifth of the A/F sensor output voltage which is displayed on the hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page 05–333.

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 05–290).(★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 is displayed, check Bank 1 Sensor 1 circuit.
- If DTC P1150 is displayed, check Bank 2 Sensor 1 circuit.
- Read freeze frame data using hand–held tester. Because freeze frame 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	CHECK OTHER DTC OUTPUT(BESIDES DTC P1130,P1150)

(a) Read the DTC using the hand–held tester.

YES → **GO TO RELEVANT DTC CHART**

NO

2	CHECK AIR FUEL RATIO SENSOR(OUTPUT VOLTAGE)

(a) Warm up the A/F sensor with the engine speed at 2,500 rpm for approx. 90 sec.
(b) 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 AFR+ or AFL+ terminal of the ECM is fixed at 3.3 V and the voltage of the AFR– or AFL– terminal is fixed at 3.0 V. Therefore, it is impossible to check the A/F sensor output voltage at the terminals (AFR+, AFL+/AFR–, AFL–) of the ECM.

Result:

Condition	A/F Sensor Voltage Value
Engine idling	• Not remains at 3.30 V (0.660 V*) • Not remains at 3.8 V (0.76 V*) or more • Not remains at 2.8 V (0.56 V*) or less *: When you use the hand–held tester
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 (0.56 V*), it is normal.
- During fuel cut, there is a case that the output voltage of the A/F sensor is above 3.8 V (0.76 V*), it is normally.
- If the output voltage of the A/F sensor remains at 3.30 V (0.660 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 (0.76 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.

*: When you use the hand–held tester.

OK → **Go to step 9**

NG

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

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

OK

4	CHECK AIR FUEL RATIO SENSOR(RESISTANCE) (See page 12–13)

NG → **REPLACE AIR FUEL RATIO SENSOR**

OK

5	CHECK AIR INDUCTION SYSTEM (See page 11–49)

NG → **REPAIR OR REPLACE**

OK

6	CHECK EGR SYSTEM (See page 12–16)

NG → REPLACE EGR SYSTEM

OK

7	CHECK FUEL PRESSURE (See page 11–52)

NG → REPAIR OR REPLACE FUEL SYSTEM

OK

8	INSPECT FUEL INJECTOR ASSY (See page 11–52)

NG → REPLACE FUEL INJECTOR ASSY

OK

REPLACE AIR FUEL RATIO SENSOR

9	PERFORM CONFIRMATION DRIVING PATTERN (See page 05–333)

GO

10	READ OUTPUT DTC(BESIDES DTC P1130,P1150)

YES → CHECK AND REPLACE ECM

NO

11	CONFIRM VEHICLE RUNS OUT OF FUEL IN THE PAST

NO → CHECK FOR INTERMITTENT PROBLEMS

YES

DTC P1130 OR P1150 IS CAUSED BY RUNNING OUT OF FUEL