

DTC	P0110	Intake Air Temperature Circuit
DTC	P0112	Intake Air Temperature Circuit Low Input
DTC	P0113	Intake Air Temperature Circuit High Input

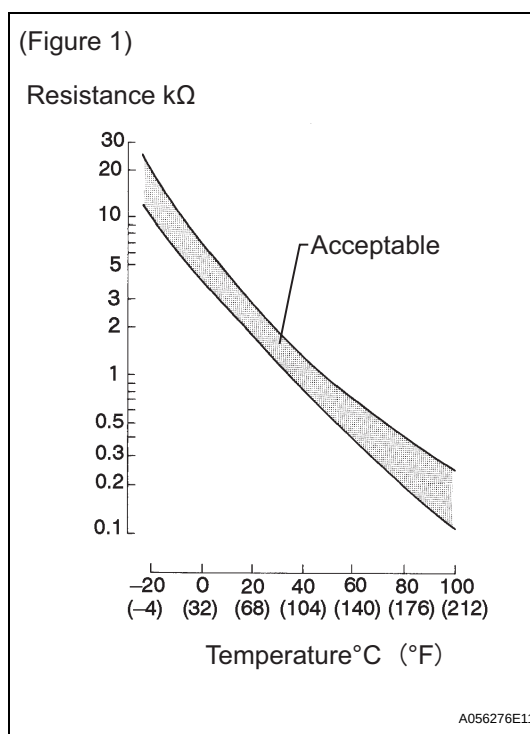
DESCRIPTION

The Intake Air Temperature (IAT) sensor, mounted on the Mass Air Flow (MAF) meter, monitors the IAT. The IAT sensor has a built in thermistor with a resistance that varies according to the temperature of the intake air. When the IAT is low, the resistance of the thermistor increases. When the temperature is high, the resistance drops. These variations in resistance are transmitted to the ECM as voltage changes (see Fig. 1)

The IAT sensor is powered by a 5 V supply from the THA terminal of the ECM, via resistor R.

Resistor R and the IAT sensor are connected in series. When the resistance value of the IAT sensor changes, according to changes in the IAT, the voltage at terminal THA also varies.

Based on this signal, the ECM increases the fuel injection volume when the engine is cold to improve drivability.



HINT:

When any of DTCs P0110, P0112 and P0113 are set, the ECM enters fail-safe mode. During fail-safe mode, the IAT is estimated to be 20°C (68°F) by the ECM. Fail-safe mode continues until a pass condition is detected.

DTC No.	Proceed To	DTC Detection Conditions	Trouble Areas
P0110	Step 1	Open or short in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	- Open or short in IAT sensor circuit - IAT sensor (built into MAF meter) - ECM
P0112	Step 4	Short in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	- Short in IAT sensor circuit - IAT sensor (built into MAF meter) - ECM
P0113	Step 2	Open in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	- Open in IAT sensor circuit - IAT sensor (built into MAF meter) - ECM

HINT:

When any of these DTCs are set, check the IAT by selecting the following menu items on an intelligent tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. If using an OBD II scan tool, refer to the instruction manual.

Temperature Displayed	Malfunctions
-40°C (-40°F)	Open circuit
140°C (284°F) or higher	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the Intake Air Temperature (IAT). When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a malfunction in the IAT sensor and sets a DTC.

Example:

If the sensor voltage output is -40°C (-40°F) for 0.5 seconds or more, the ECM determines that there is an open in the IAT sensor circuit, and sets DTC P0113. Conversely, if the voltage output is more than 140°C (284°F) for 0.5 seconds or more, the ECM determines that there is a short in the sensor circuit, and sets DTC P0112.

If the malfunction is not repaired successfully, a DTC is set 0.5 seconds after the engine is next started.

MONITOR STRATEGY

Related DTCs	P0110: Intake air temperature sensor range check (Fluctuating) P0112: Intake air temperature sensor range check (Low voltage) P0113: Intake air temperature sensor range check (High voltage)
Required Sensors/Components (Main)	Intake Air Temperature (IAT) sensor
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	0.5 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
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TYPICAL MALFUNCTION THRESHOLDS**P0110:**

IAT sensor voltage	Less than 0.18 V, or more than 4.91 V
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P0112:

IAT sensor voltage [Intake air temperature]	Less than 0.18 V [More than 140°C (284°F)]
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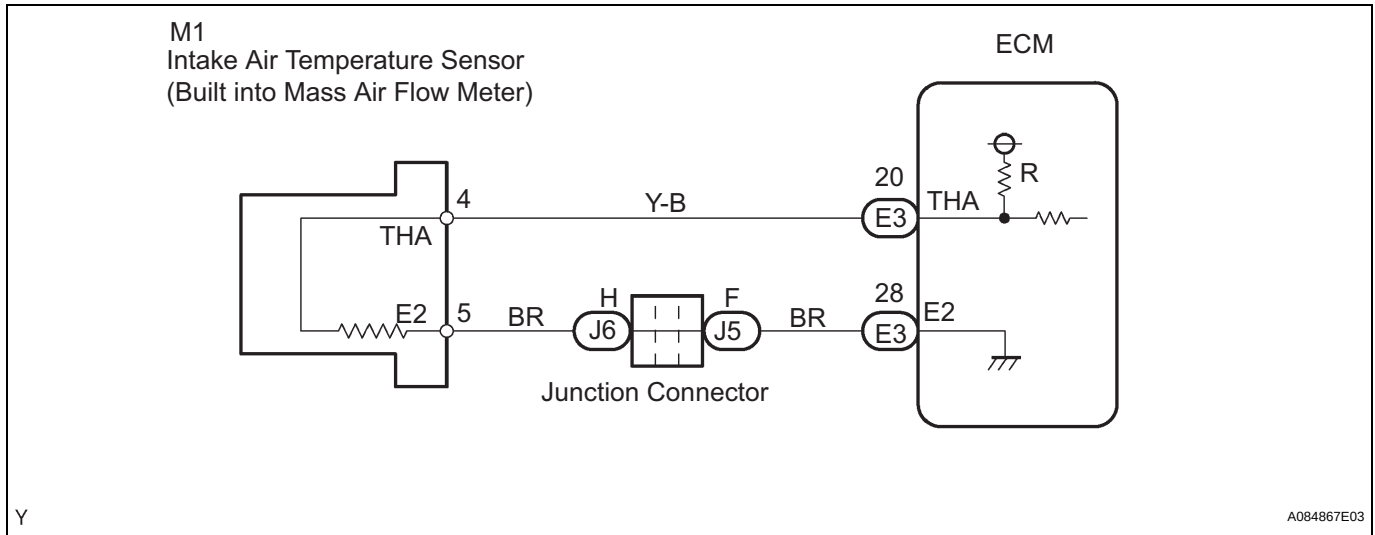
P0113:

IAT sensor voltage [Intake air temperature]	More than 4.91 V [Less than -40°C (-40°F)]
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COMPONENT OPERATING RANGE

IAT sensor voltage [Intake air temperature]	0.18 to 4.91 V [-40 to 140°C (-40 to 284°F)]
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WIRING DIAGRAM



INSPECTION PROCEDURE

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 an intelligent tester or OBD II scan tool. 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.

1

READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (INTAKE AIR TEMPERATURE)

- Connect an intelligent tester or OBD II scan tool to the DLC3.
- Turn the ignition switch to ON.
- Turn the tester or scan tool ON.
- On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- Read the value displayed on the tester.
- If using an OBD II scan tool, refer to the instruction manual.

Standard:

Same as actual Intake Air Temperature (IAT).

Result

Temperature Displayed	Proceed to
-40°C (-40°F)	A
140°C (284°F) or higher	B
Same as actual IAT	C

HINT:

- If there is an open circuit, the intelligent tester or OBD II scan tool indicates -40°C (-40°F).

- If there is a short circuit, the intelligent tester or OBD II scan tool indicates 140°C (284°F) or higher.

B

Go to step 4

C

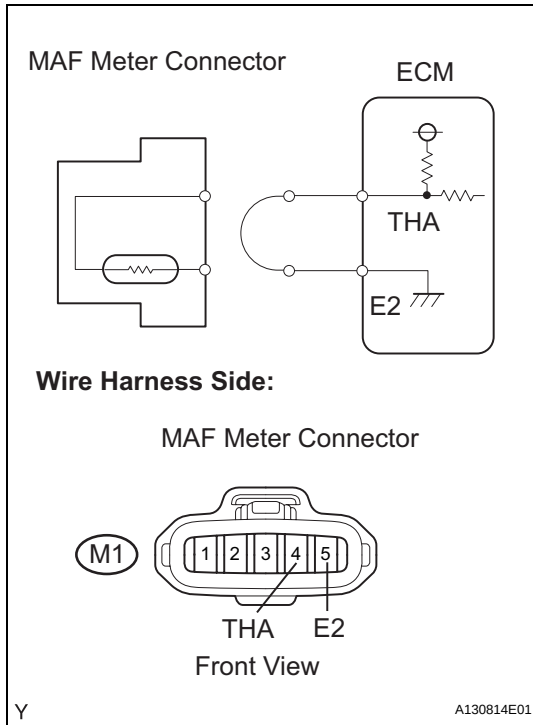
CHECK FOR INTERMITTENT PROBLEMS

A

2

READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN WIRE HARNESS)

ES

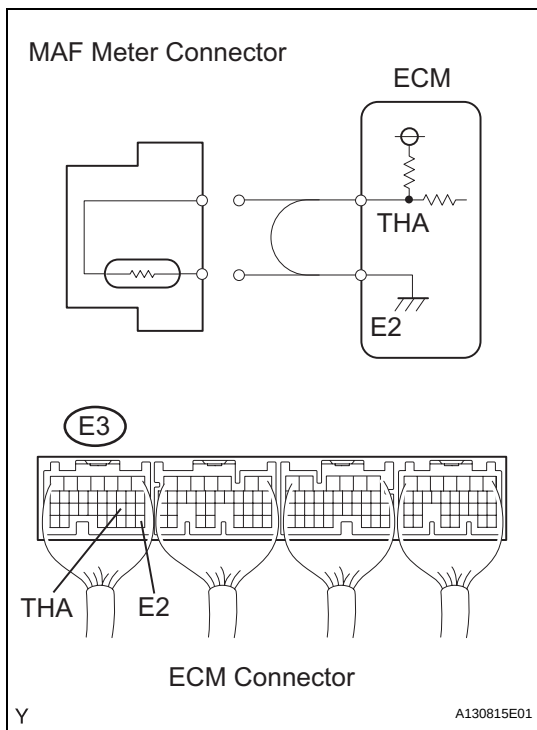


- Confirm connector connecting condition.
 - Disconnect the M1 Mass Air Flow (MAF) meter connector.
 - Connect terminals THA and E2 of the MAF meter wire harness side connector.
 - Connect the intelligent tester or OBD II scan tool to the DLC3.
 - Turn the ignition switch to ON.
 - Turn the tester or scan tool ON.
 - On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
 - Read the value displayed on the tester.
 - If using an OBD II scan tool, refer to the instruction manual.
- Standard:**
140°C (284°F) or higher
- Reconnect the MAF meter connector.

OK

REPLACE MASS AIR FLOW METER

NG

3**READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN ECM)**

- (a) Confirm connector connecting condition.
- (b) Disconnect the M1 MAF meter connector.
- (c) Connect terminals THA and E2 of the E3 ECM connector.

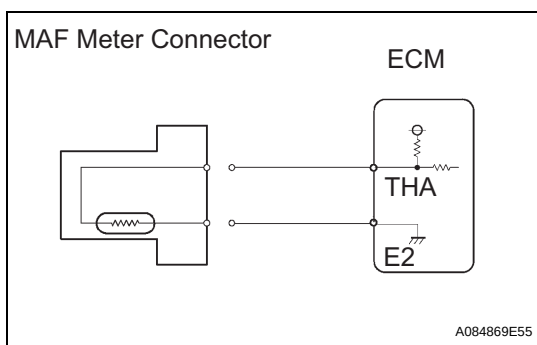
HINT:

Before checking, do visual and contact pressure checks on the ECM connector.

- (d) Connect the intelligent tester or OBD II scan tool to the DLC3.
- (e) Turn the ignition switch to ON.
- (f) Turn the tester or scan tool ON.
- (g) On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- (h) Read the value displayed on the tester.
- (i) If using an OBD II scan tool, refer to the instruction manual.

Standard:**140°C (284°F) or higher**

- (j) Reconnect the MAF meter connector.

OK**REPAIR OR REPLACE HARNESS OR CONNECTOR****NG****REPLACE ECM****4****READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN WIRE HARNESS)**

- (a) Disconnect the M1 MAF meter connector.
- (b) Connect the intelligent tester or OBD II scan tool to the DLC3.
- (c) Turn the ignition switch to ON.
- (d) Turn the tester or scan tool ON.
- (e) On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- (f) Read the value displayed on the tester.
- (g) If using an OBD II scan tool, refer to the instruction manual.

Standard:**-40°C (-40°F)**

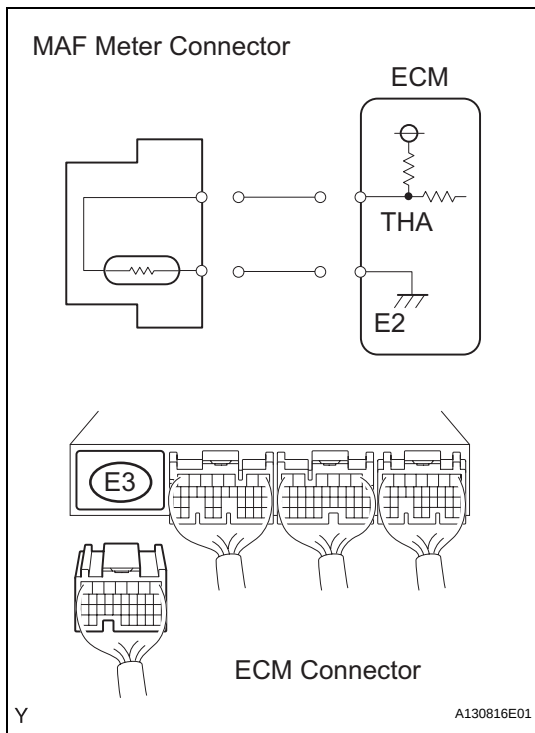
- (h) Reconnect the MAF meter connector.

OK**REPLACE MASS AIR FLOW METER****ES**

NG

5

READ VALUE OF INTELLIGENT TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN ECM)



- (a) Disconnect the E3 ECM connector.
- (b) Connect the intelligent tester or OBD II scan tool to the DLC3.
- (c) Turn the ignition switch to ON.
- (d) Turn the tester or scan tool ON.
- (e) On the tester, select the following menu items:
DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.
- (f) Read the value displayed on the tester.
- (g) If using an OBD II scan tool, refer to the instruction manual.
- Standard:**
-40°C (-40°F)
- (h) Reconnect the ECM connector.

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM