DIA80−03

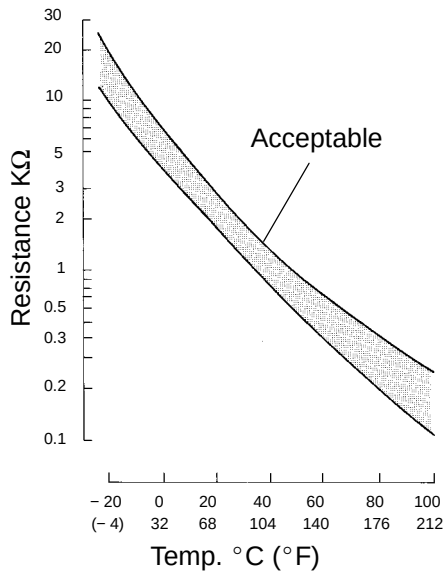
DTC	P0110	Intake Air Temperature Circuit

DTC	P0112	Intake Air Temperature Circuit Low Input

DTC	P0113	Intake Air Temperature Circuit High Input

CIRCUIT DESCRIPTION

(Fig.1)



The intake air temperature (IAT) sensor, mounted on the mass air flow (MAF) meter, monitors the intake air temperature. The IAT sensor has a thermistor that varies its resistance depending on the temperature of the intake air. When the air temperature is low, the resistance in the thermistor increases. When the temperature is high, the resistance drops. The resistance varies as voltage changes to the ECM terminal.
(See Fig. 1).
The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from terminal THA (THAR) via resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the voltage at terminal THA (THAR) also changes. Based on this signal, the ECM increases the fuel injection volume to improve the driveability during cold engine operation.

DTC No.	Proceed to	DTC Detection Condition	Trouble Area
P0110	Step 1	Open or short in intake air temperature sensor circuit for 0.5 sec.	• Open or short in intake air temperature sensor circuit • Intake air temperature sensor (built in mass air flow meter) • ECM
P0112	Step 4	Short in intake air temperature sensor circuit for 0.5 sec.	
P0113	Step 2	Open in intake air temperature sensor circuit for 0.5 sec.	

HINT:
After confirming DTC ”P0110, P0112 or P0113”, use the hand−held tester to confirm the intake air temperature in the ”DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL”.

Temperature Displayed	Malfunction
−40˚C (−40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

MONITOR DESCRIPTION

The ECM monitors the sensor voltage and uses this value to calculate the intake air temperature. When the sensor output voltage deviates from the normal operating range, the ECM interprets this as a fault in the IAT (Intake Air Temperature) sensor and sets a DTC.
Example:
When the sensor voltage output is equal to −40°C (−40°F), or more than 140°C (284°F).

MONITOR STRATEGY

Related DTCs	P0110	Intake air temperature sensor range check (Fluttering)
	P0112	Intake air temperature sensor range check (Low voltage)
	P0113	Intake air temperature sensor range check (High voltage)
Required sensors/components	Intake air temperature sensor	
Frequency of operation	Continuous	
Duration	0.5 sec.	
MIL operation	Immediate	
Sequence of operation	None	

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	See page DI−437
The typical enabling condition is not available	−

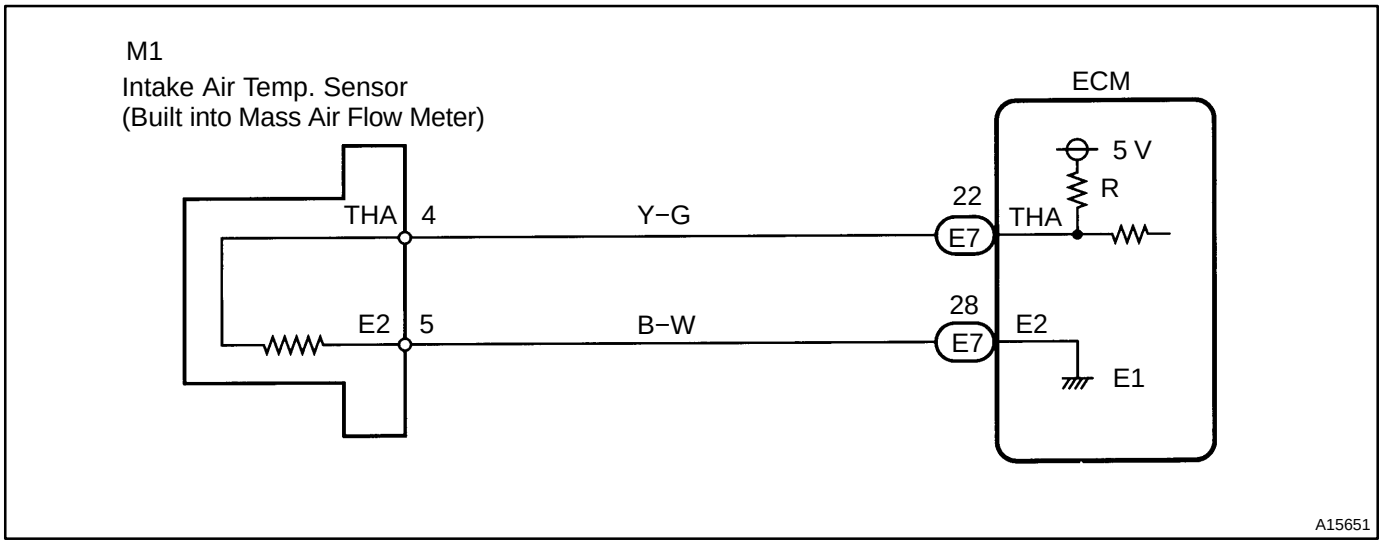
TYPICAL MALFUNCTION THRESHOLDS

Detection Criteria	Threshold
P0110:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V or more than 4.91 V (More than 140°C (284°F), or less than −40°C (−40°F))
P0112:	
Intake air temperature sensor voltage (Intake air temperature)	Less than 0.18 V (More than 140°C (284°F))
P0113:	
Intake air temperature sensor voltage (Intake air temperature)	More than 4.91 V (Less than −40°C (−40°F))

COMPONENT OPERATING RANGE

Parameter	Standard Value
Intake air temperature sensor voltage	0.18 V (140°C (284°F)) to 4.91 V (−40°C (−40°F))

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

- If DTCs related 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 hand−held tester. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air−fuel ratio was lean or rich, as well as other data from the time when a malfunction occurred.

1	**Connect hand−held tester, and read value of intake air temperature.**

PREPARATION:

(a) Connect the hand−held tester to the DLC3.
(b) Turn the ignition switch ON and push the hand−held tester main switch ON.
(c) When using hand−held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand−held tester.

OK:

Same as actual intake air temperature.

RESULT:

Displayed Temperature	Proceed to
−40°C (−40°F)	A
140°C (284°F) or more	B
OK (Same as present temperature)	C

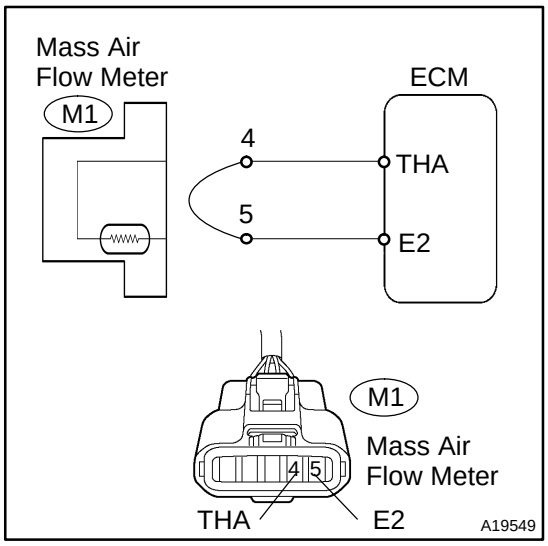
HINT:

- If there is an open circuit, the hand−held tester indicates −40°C (−40°F).
- If there is a short circuit, the hand−held tester indicates 140°C (284°F) or more.

B	**Go to step 4.**
C	**Check for intermittent problems (See page DI−430).**

A

2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the M1 mass air flow meter connector.
(b) Connect terminals 4 and 5 of the mass air flow meter wire harness side connector.
(c) Turn the ignition switch ON.
(d) When using hand−held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand−held tester.

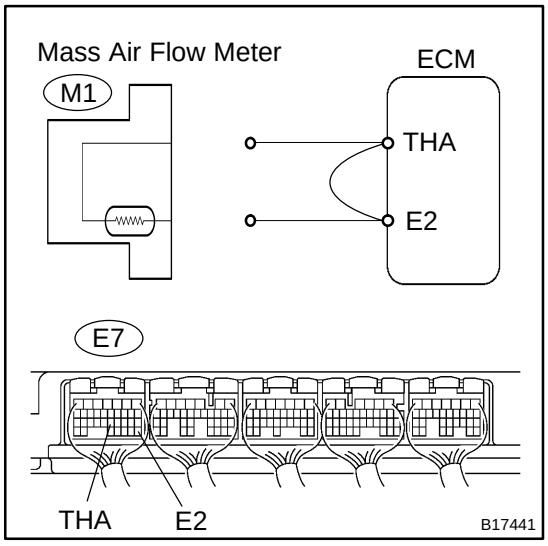
OK:

Standard: Temperature value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Connect terminals THA and E2 of the E7 ECM connector.

HINT:

Before checking, do a visual and contact pressure check for the ECM connector.

(b) Turn the ignition switch ON.
(c) When using hand−held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand−held tester.

OK:

Standard: Temperature value: 140°C (284°F) or more

OK	Repair or replace harness or connector.

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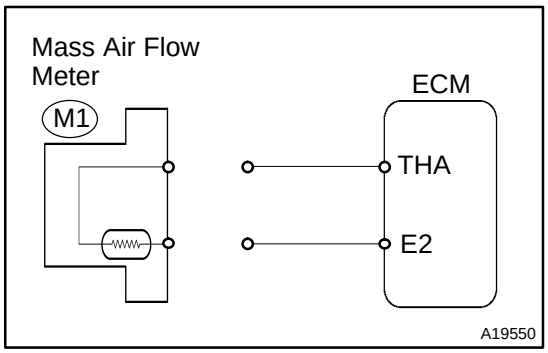
Confirm good connection at ECM. If OK, replace ECM (See page SF−82).

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the M1 mass air flow meter connector.
(b) Turn the ignition switch ON.
(c) When using hand−held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand−held tester.

OK:

Standard: Temperature value: −40°C (−40°F)

OK	Replace mass air flow meter.

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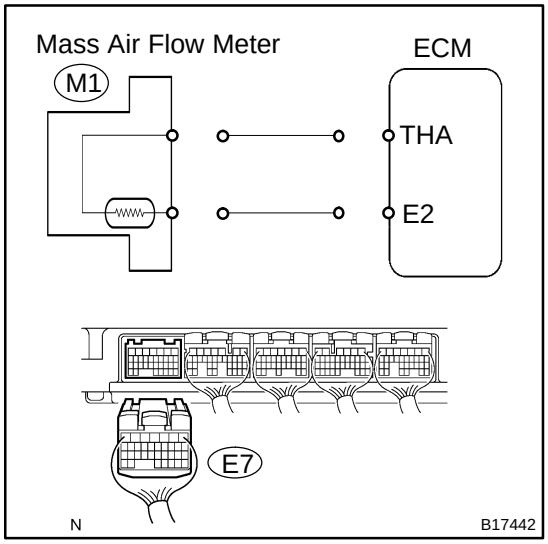
5	Check for short in harness or ECM.



PREPARATION:

(a) Disconnect the E7 ECM connector.
(b) Turn the ignition switch ON.
(c) When using hand−held tester, enter the following menu: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR.

CHECK:

Read the temperature value on the hand−held tester.

OK:

Standard: Temperature value: −40°C (−40°F)

OK	Repair or replace harness or connector.

NG

Replace ECM (See page SF−82).