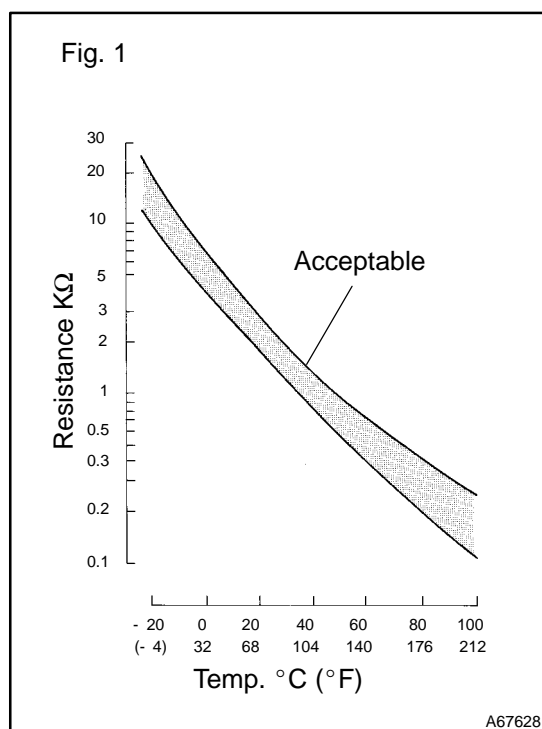


<b>DTC</b>	<b>P0110</b>	<b>INTAKE AIR TEMPERATURE CIRCUIT</b>
<b>DTC</b>	<b>P0112</b>	<b>INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT</b>
<b>DTC</b>	<b>P0113</b>	<b>INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT</b>

## CIRCUIT DESCRIPTION



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 variations in resistance are reflected as changes in voltage applied to the ECM terminal (See Fig. 1).

The IAT sensor is connected to the ECM (see below). The 5 V power source voltage in the ECM is applied to the IAT sensor from terminal THA via resistor R.

That is, the resistor R and the IAT sensor are connected in series. When the resistance value of the IAT sensor changes in accordance with changes in the IAT, the voltage at terminal THA 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 IAT (Intake air temperature) sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> <li>• Open or short in IAT sensor circuit</li> <li>• IAT sensor (built in MAF meter)</li> <li>• ECM</li> </ul>
P0112	Step 4	Short in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> <li>• Open or short in IAT sensor circuit</li> <li>• IAT sensor (built in MAF meter)</li> <li>• ECM</li> </ul>
P0113	Step 2	Open in IAT sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> <li>• Open or short in IAT sensor circuit</li> <li>• IAT sensor (built in MAF meter)</li> <li>• ECM</li> </ul>

### HINT:

After confirming DTC P0110, P0112 or P0113, use the hand-held tester or the OBD II scan tool to confirm the IAT from the ALL menu (to reach the ALL menu: 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 sensor and sets a DTC.

Example:

The sensor voltage output equals to  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ), or more than  $140^{\circ}\text{C}$  ( $284^{\circ}\text{F}$ ), and either condition continue for 0.5 seconds or more.

## MONITOR STRATEGY

Related DTCs	P0110: IAT Sensor Range Check (Chattering) P0112: IAT Sensor Range Check (Low Resistance) P0113: IAT Sensor Range Check (High Resistance)
Required sensors / components (Main)	IAT sensor
Required sensors / components (Related)	-
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence operation	None

## TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present	See page <a href="#">05-377</a>
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## TYPICAL MALFUNCTION THRESHOLDS

### P0110:

IAT sensor resistance	Less than $98.5\ \Omega$ , or more than $156\ \text{k}\Omega$
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### P0112:

IAT sensor resistance [IAT]	Less than $98.5\ \Omega$ [More than $140^{\circ}\text{C}$ ( $284^{\circ}\text{F}$ )]
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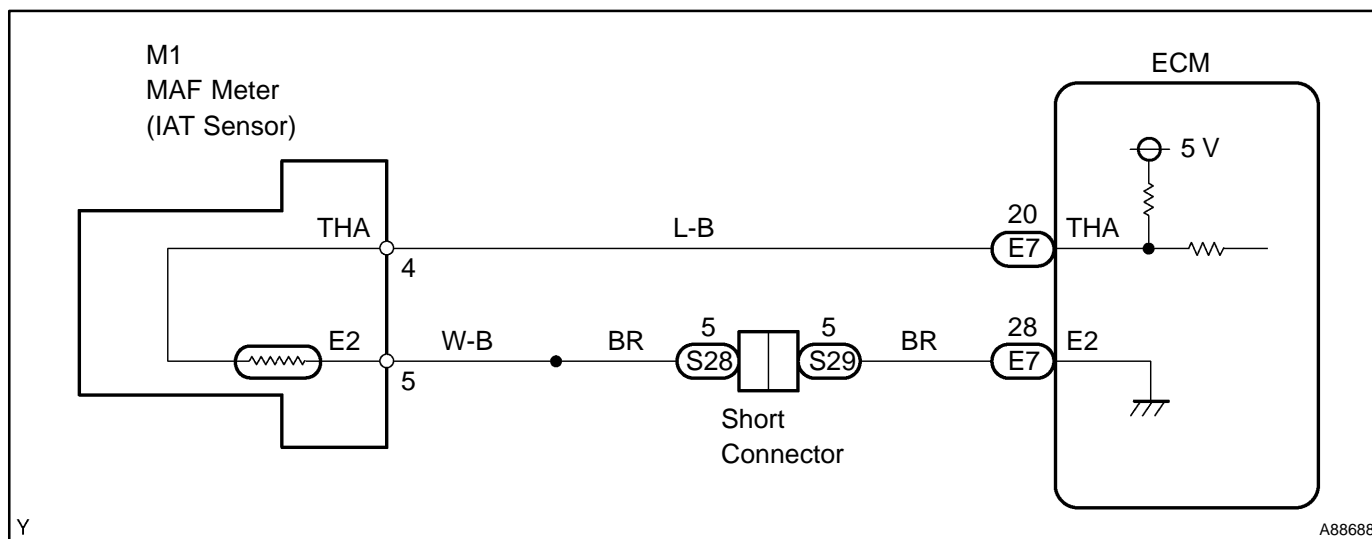
### P0113:

IAT sensor resistance [IAT]	More than $156\ \text{k}\Omega$ [ $-40^{\circ}\text{C}$ ( $-40^{\circ}\text{F}$ )]
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## COMPONENT OPERATING RANGE

IAT sensor resistance [IAT]	$98.5\ \Omega$ to $156\ \text{k}\Omega$ [ $-39$ to $140^{\circ}\text{C}$ ( $-40$ to $284^{\circ}\text{F}$ )]
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## 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 or the OBD II scan tool. 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, and other data from the time the malfunction occurred.

### 1 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (INTAKE AIR TEMPERATURE)

- Connect the hand-held tester or the OBD II scan tool to the DLC3.
- Turn the ignition switch ON. Push the hand-held tester or the OBD II scan tool main switch ON.
- On the hand-held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. Read the values.

**Temperature: Same value as the actual intake air temperature.**

#### Result:

Temperature Displayed	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 or the OBD II scan tool indicates -40 °C (-40 °F).
- If there is a short circuit, the hand-held tester or the OBD II scan tool indicates 140 °C (284 °F) or more.

**B**

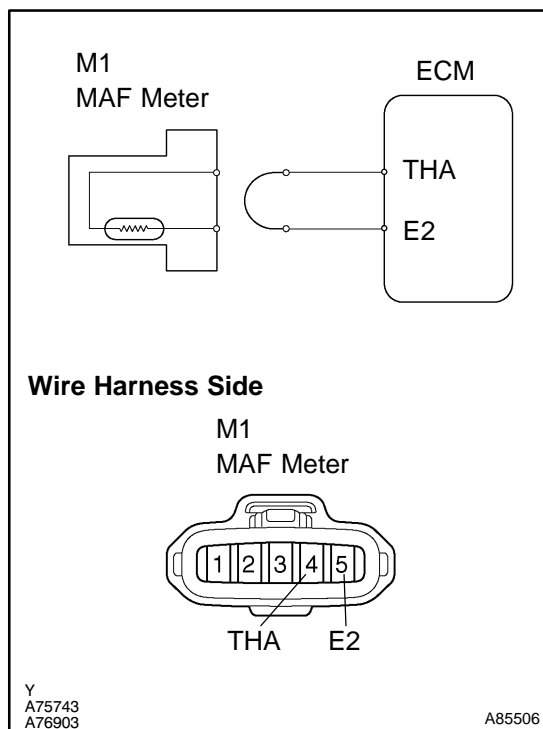
**Go to step 4**

**C**

**CHECK FOR INTERMITTENT PROBLEMS**  
(See page [05-370](#))

**A**

## 2 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN WIRE HARNESS)



- Disconnect the M1 MAF meter connector.
- Connect terminals THA and E2 of the M1 MAF meter wire harness side connector.
- Turn the ignition switch ON.
- On the hand-held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. Read the values.

**OK:**

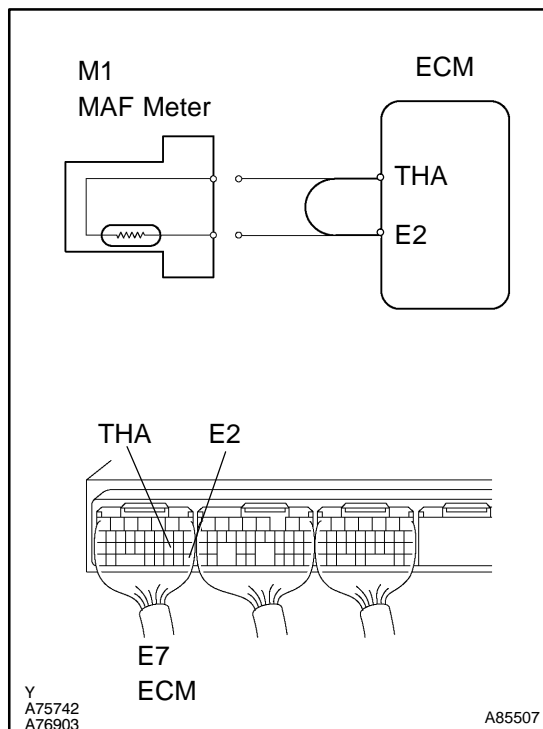
**Temperature value: 140°C (284°F) or more**

**OK**

**CONFIRM GOOD CONNECTION AT SENSOR. IF OK, REPLACE MASS AIR FLOW METER**

**NG**

## 3 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (CHECK FOR OPEN IN ECM)



- Disconnect the M1 MAF meter connector.
  - Connect terminals THA and E2 of the E7 ECM connector.
- HINT:**  
Before checking, do a visual and contact pressure check for the ECM connector.

- Turn the ignition switch ON.
- On the hand-held tester or the OBD II scan tool, enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / ALL / INTAKE AIR. Read the values.

**OK:**

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

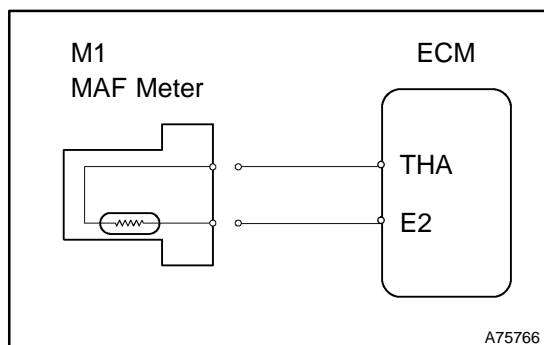
**OK**

**REPAIR OR REPLACE HARNESS AND CONNECTOR**

**NG**

**CONFIRM GOOD CONNECTION AT ECM. IF OK, REPLACE ECM (See page 10-24 )**

**4 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN WIRE HARNESS)**



- Disconnect the M1 MAF meter connector.
- Turn the ignition switch ON.
- Select the item "DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/INTAKE AIR" and read its value displayed on the hand-held tester or the OBD II scan tool.

**OK:**

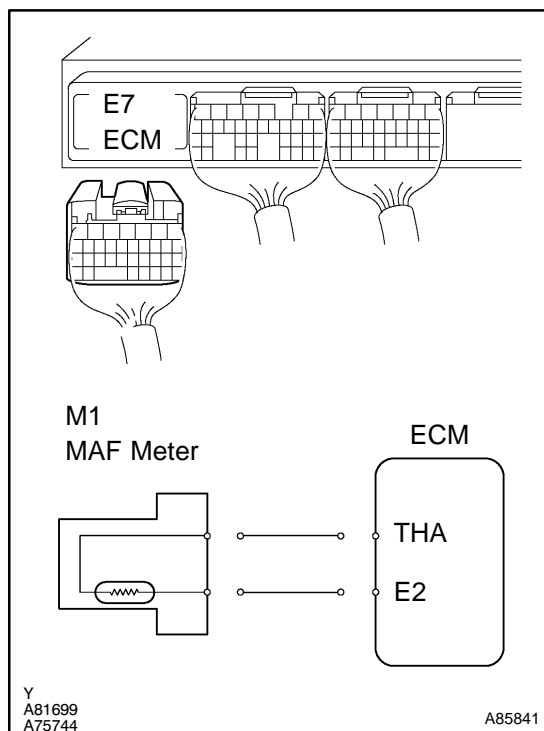
**Temperature value: -40°C (-40°F)**

**OK**

**REPLACE MASS AIR FLOW METER**

**NG**

**5 READ VALUE OF HAND-HELD TESTER OR OBD II SCAN TOOL (CHECK FOR SHORT IN ECM)**



- Disconnect the E7 ECM connector.
- Turn the ignition switch ON.
- Select the item "DIAGNOSIS/ENHANCED OBD II/DATA LIST/ALL/INTAKE AIR" and read its value displayed on the hand-held tester or the OBD II scan tool.

**OK:**

**Temperature value: -40°C (-40°F)**

**OK**

**REPAIR OR REPLACE HARNESS AND CONNECTOR**

**NG**

**REPLACE ECM (See page 10-24 )**