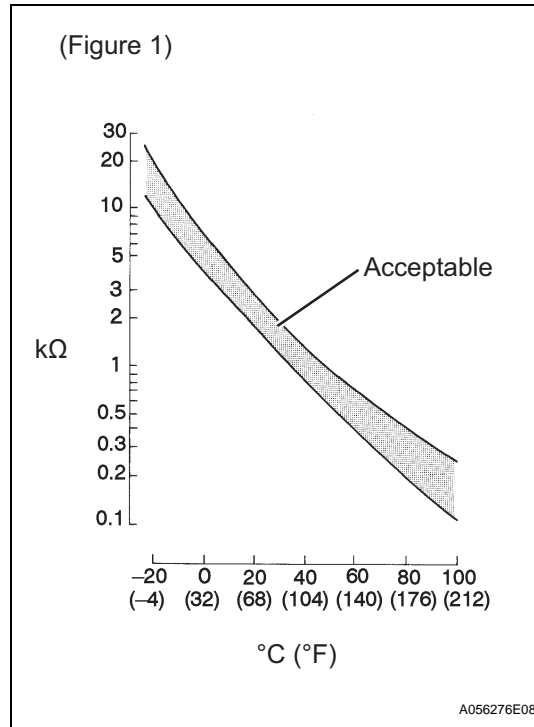


DTC	P0110	Intake Air Temperature Circuit
DTC	P0112	Intake Air Temperature Circuit Low Input
DTC	P0113	Intake Air Temperature Circuit High Input

DESCRIPTION

ES



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 Intake Air Temperature (IAT) sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in IAT sensor circuit IAT sensor (built into MAF meter) ECM
P0112	Step 4	Short in Intake Air Temperature (IAT) sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> Short in IAT sensor circuit IAT sensor (built into MAF meter) ECM
P0113	Step 2	Open in Intake Air Temperature (IAT) sensor circuit for 0.5 seconds (1 trip detection logic)	<ul style="list-style-type: none"> 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 / PRIMARY / INTAKE AIR.

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 more than 4.91 V 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 less than 0.18 V 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.

ES**MONITOR STRATEGY**

Related DTCs	P0110: Intake air temperature sensor open/short (Fluctuating) P0112: Intake air temperature sensor short (Low electrical resistance) P0113: Intake air temperature sensor open (High electrical resistance)
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

Monitor runs whenever following DTCs not present	None
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TYPICAL MALFUNCTION THRESHOLDS**P0110:**

Intake air temperature sensor voltage	Less than 0.18 V, or more than 4.91 V
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P0112:

Intake air temperature sensor voltage	Less than 0.18 V
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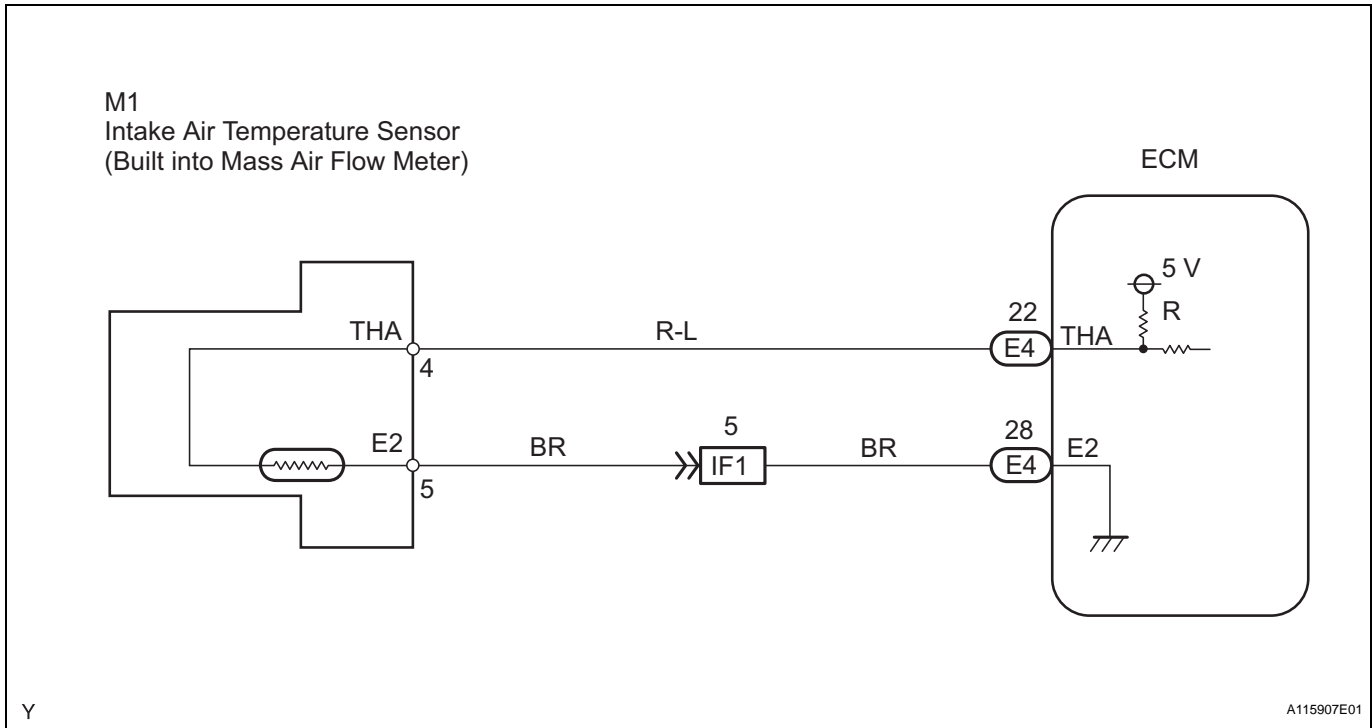
P0113:

Intake air temperature sensor voltage	More than 4.91 V
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COMPONENT OPERATING RANGE

Intake air temperature sensor voltage	0.18 V to 4.91 V
---------------------------------------	------------------

WIRING DIAGRAM



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. Freeze frame data record the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, 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 INTELLIGENT TESTER (INTAKE AIR TEMPERATURE)

- Connect an intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Turn the tester ON.
- Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- Read the value displayed on the tester.

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 indicates -40°C (-40°F).
- If there is a short circuit, the intelligent tester indicates 140°C (284°F) or higher.

B

Go to step 4

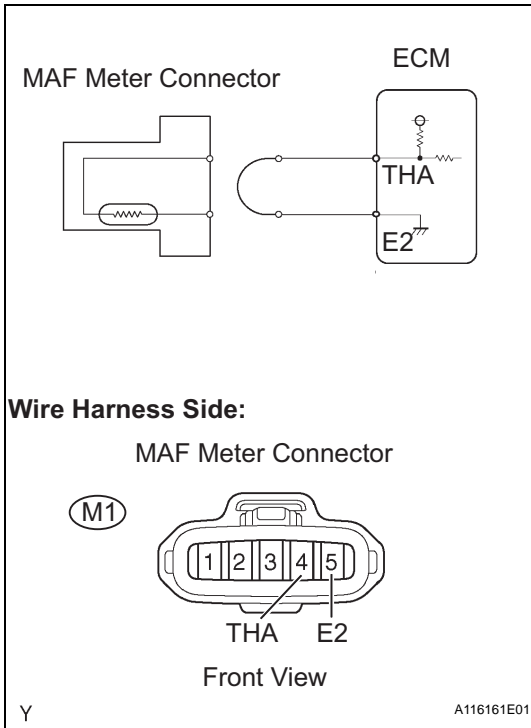
C

CHECK FOR INTERMITTENT PROBLEMS

A

2

READ VALUE OF INTELLIGENT TESTER (CHECK FOR OPEN IN WIRE HARNESS)



- Disconnect the M1 Mass Air Flow (MAF) meter connector.
 - Connect terminals THA and E2 of the MAF meter wire harness side connector.
 - Connect an intelligent tester to the DLC3.
 - Turn the ignition switch ON.
 - Turn the tester ON.
 - Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
 - Read the value displayed on the tester.
- Standard:**
140°C (284°F) or higher
- Reconnect the MAF meter connector.

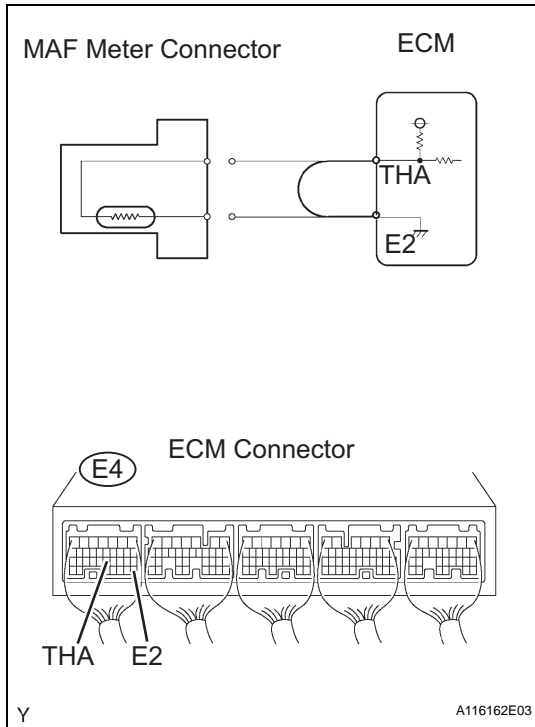
OK

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

NG

ES

3 READ VALUE OF INTELLIGENT TESTER (CHECK FOR OPEN IN ECM)



- (a) Disconnect the M1 MAF meter connector.
- (b) Connect terminals THA and E2 of the E4 ECM connector.
HINT:
Before checking, do visual and contact pressure checks on the ECM connector.
- (c) Connect an intelligent tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Turn the tester ON.
- (f) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (g) Read the value displayed on the tester.
Standard:
140°C (284°F) or higher.
- (h) Reconnect the MAF meter connector.

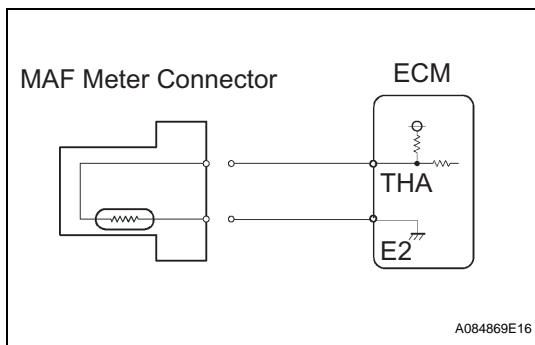
OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

CONFIRM GOOD CONNECTION TO ECM. IF OK, REPLACE ECM

4 READ VALUE OF INTELLIGENT TESTER (CHECK FOR SHORT IN WIRE HARNESS)

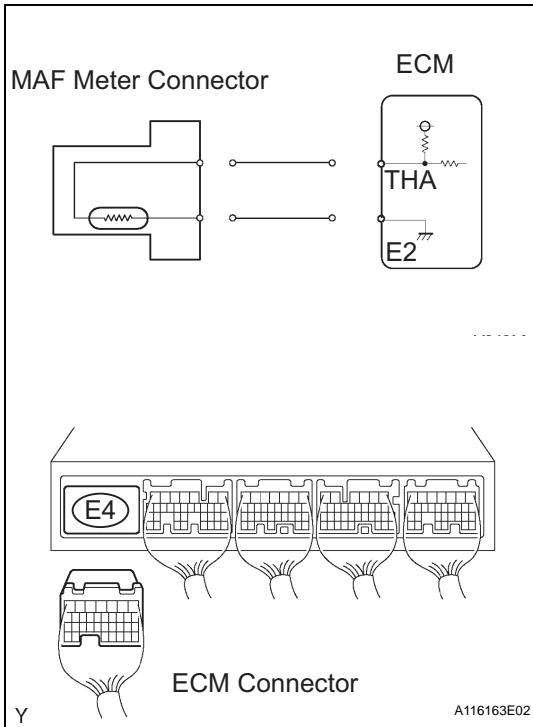


- (a) Disconnect the M1 MAF meter connector.
- (b) Connect an intelligent tester to the DLC3.
- (c) Turn the ignition switch ON.
- (d) Turn the tester ON.
- (e) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (f) Read the value displayed on the tester.
Standard:
-40°C (-40°F)
- (g) Reconnect the MAF meter connector.

OK

REPLACE MASS AIR FLOW METER

NG

5 READ VALUE OF INTELLIGENT TESTER (CHECK FOR SHORT ECM)

- (a) Disconnect the E4 ECM connector.
- (b) Connect an intelligent tester to the DLC3.
- (c) Turn the ignition switch ON.
- (d) Turn the tester ON.
- (e) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (f) Read the value displayed on the tester.
Standard:
-40°C (-40°F)
- (g) Reconnect the ECM connector.

OK

REPAIR OR REPLACE HARNESS OR CONNECTOR

NG

REPLACE ECM

ES