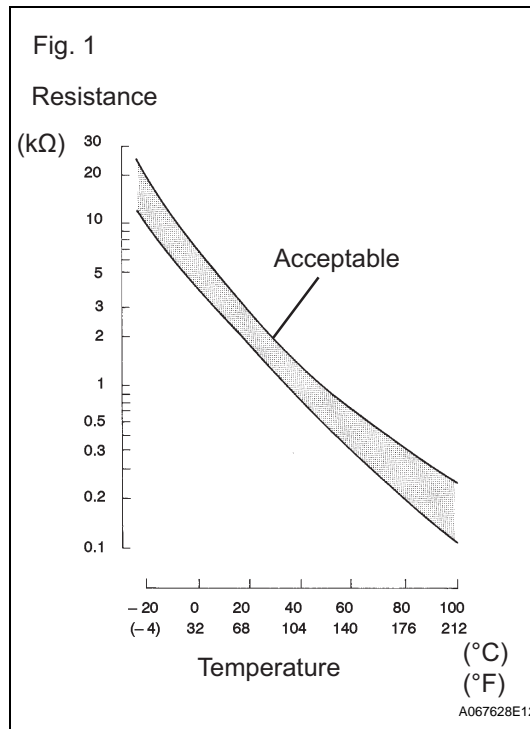


| | | |
|-----|-------|--|
| DTC | P0110 | Intake Air Temperature Circuit Malfunction |
| DTC | P0112 | Intake Air Temperature Circuit Low Input |
| DTC | P0113 | Intake Air Temperature Circuit High Input |

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. | DTC Detection Conditions | Trouble Areas |
|---------|--|---|
| P0110 | Open or short in 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 | Short in 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 | Open in 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 the 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 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 output voltage 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 output voltage 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.

MONITOR STRATEGY

| | |
|---------------------------------------|--|
| Related DTCs | P0110: IAT sensor range check (Fluctuating) P0112: IAT sensor range check (Low voltage) P0113: IAT sensor range check (High voltage) |
| Required Sensors/Components (Main) | 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 |
|--|------|

TYPICAL MALFUNCTION THRESHOLDS**P0110:**

| | |
|--------------------|---------------------------------------|
| IAT sensor voltage | Less than 0.18 V, or more than 4.91 V |
|--------------------|---------------------------------------|

P0112:

| | |
|--------------------------|--|
| IAT sensor voltage [IAT] | Less than 0.18 V [More than 140°C (284°F)] |
|--------------------------|--|

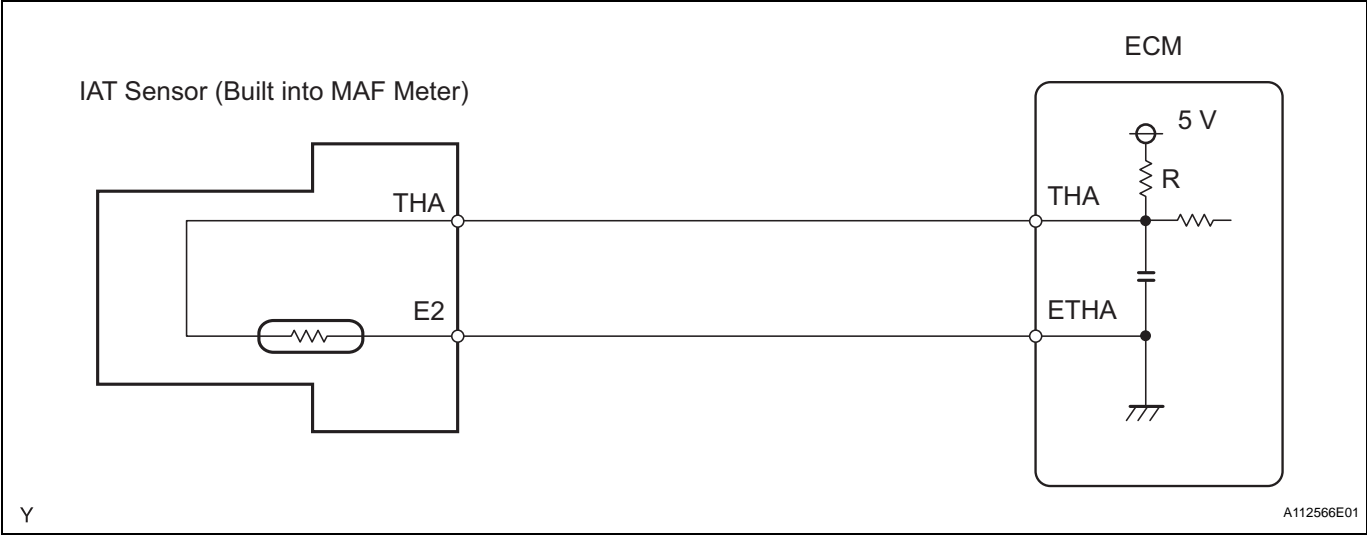
P0113:

| | |
|--------------------------|--|
| IAT sensor voltage [IAT] | More than 4.91 V [Less than -40°C (-40°F)] |
|--------------------------|--|

COMPONENT OPERATING RANGE

| | |
|--------------------------|--|
| IAT sensor voltage [IAT] | 0.18 to 4.91 V [-40°C to 140°C (-40°F to 284°F)] |
|--------------------------|--|

WIRING DIAGRAM



ES

INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester. Freeze frame data records 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 OUTPUT DTC

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON and turn the intelligent tester ON.
- (c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read DTCs.

Result

| Display (DTC Output) | Proceed to |
|----------------------|------------|
| P0110 | A |
| P0112 | B |
| P0113 | C |

B

Go to step 6

C

Go to step 3

A

2

READ VALUE USING INTELLIGENT TESTER (INTAKE AIR TEMPERATURE)

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Turn the tester ON.

- (d) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (e) 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 |

ES

- 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 5

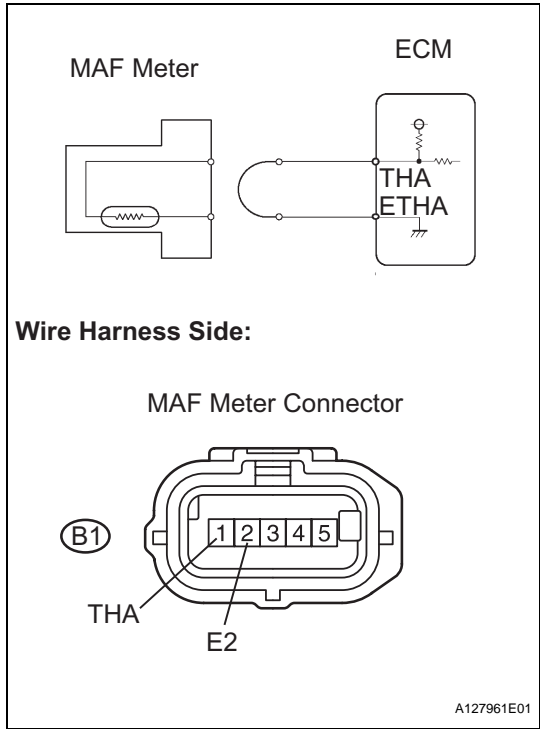
C

CHECK FOR INTERMITTENT PROBLEMS

A

3

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

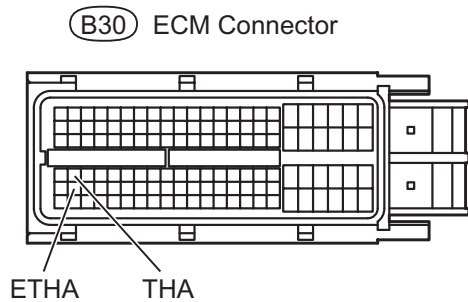
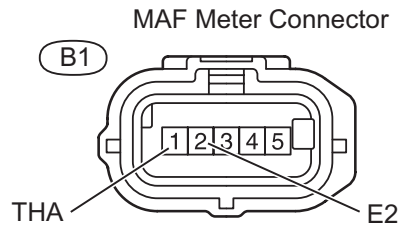


- (a) Disconnect the B1 Mass Air Flow (MAF) meter connector.
- (b) Connect terminals THA and E2 of the MAF meter wire harness side connector.
- (c) Connect the intelligent tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) Turn the tester ON.
- (f) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
- (g) Read the value displayed on the tester.
- Standard value:
- 140°C (284°F) or higher
- (h) Reconnect the MAF meter connector.

OK

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

NG

4 CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)**Wire Harness Side:**

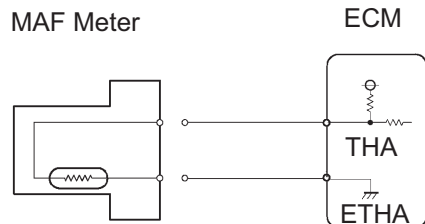
A127959E04

- Disconnect the B1 MAF meter connector.
- Disconnect the B30 ECM connector.
- Measure the resistance.

Standard resistance

| Tester Connections | Specified Conditions |
|---------------------------|----------------------|
| B1-1 (THA) - B30-65 (THA) | Below 1 Ω |
| B1-2 (E2) - B30-88 (ETHA) | Below 1 Ω |

- Reconnect the MAF meter connector.
- Reconnect the ECM connector.

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****ES****OK****CONFIRM GOOD CONNECTION TO ECM. IF OK, REPLACE ECM****5 READ VALUE USING INTELLIGENT TESTER (CHECK FOR SHORT IN WIRE HARNESS)**

A084869E25

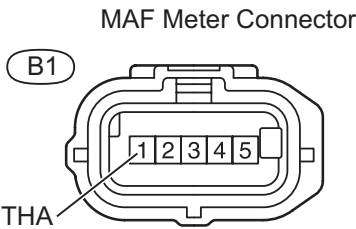
- Disconnect the B1 MAF meter connector.
 - Connect the intelligent tester to the DLC3.
 - Turn the ignition switch ON.
 - Turn the tester ON.
 - Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / INTAKE AIR.
 - Read the value displayed on the tester.
- Standard value:**
-40°C (-40°F)
- Reconnect the MAF meter connector.

OK**REPLACE MASS AIR FLOW METER****NG**

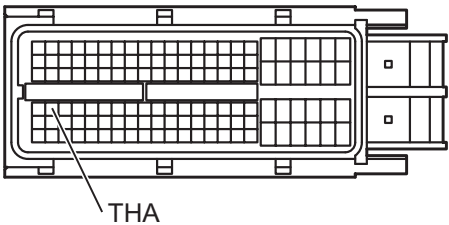
6

CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ECM)

Wire Harness Side:



B30 ECM Connector



A127959E05

- (a) Disconnect the B1 MAF meter connector.
- (b) Disconnect the B30 ECM connector.
- (c) Measure the resistance.

Standard resistance

| Tester Connections | Specified Conditions |
|--|----------------------|
| B1-1 (THA) or B30-65 (THA) - Body ground | 10 kΩ or higher |

- (d) Reconnect the MAF meter connector.
- (e) Reconnect the ECM connector.

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM