

<b>DTC</b>	<b>P0100</b>	<b>Mass or Volume Air Flow Circuit</b>
<b>DTC</b>	<b>P0102</b>	<b>Mass or Volume Air Flow Circuit Low Input</b>
<b>DTC</b>	<b>P0103</b>	<b>Mass or Volume Air Flow Circuit High Input</b>

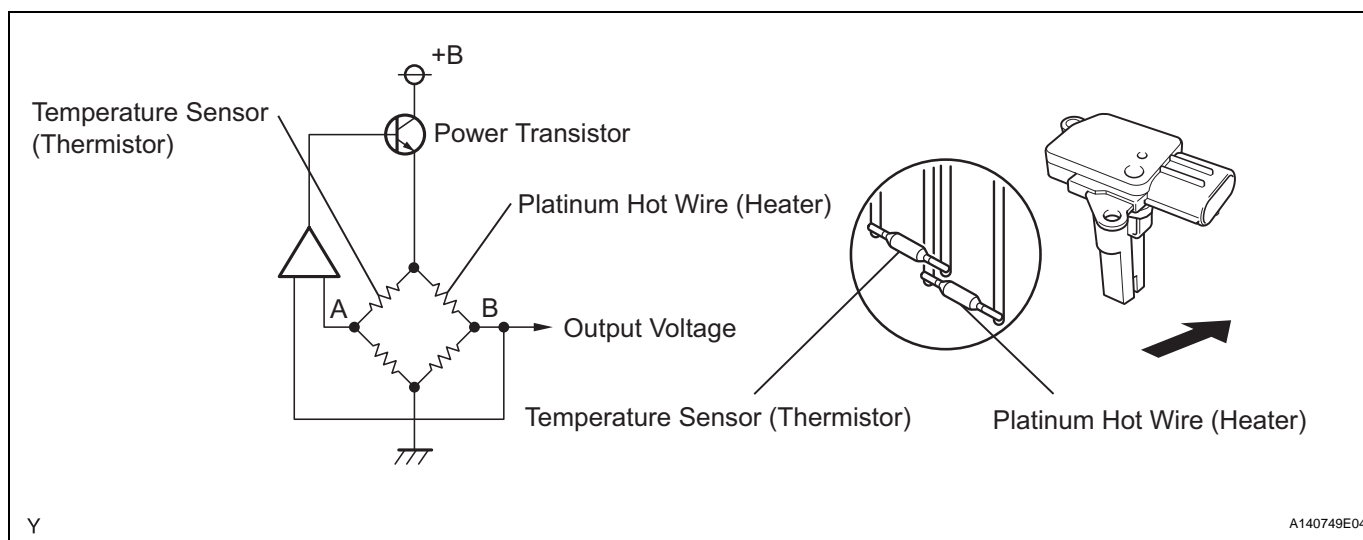
## DESCRIPTION

The Mass Air Flow (MAF) meter is a sensor that measures the amount of air flowing through the valve. The ECM uses this information to determine the fuel injection time and to provide appropriate air-fuel ratio. Inside the MAF meter, there is a heated platinum wire which is exposed to the flow of intake air. By applying a specific electrical current to the wire, the ECM heats it to a given temperature. The flow of incoming air cools both the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the airflow through the sensor, and the ECM uses it to calculate the intake air volume.

The circuit is constructed so that the platinum hot wire and the temperature sensor provide a bridge circuit, and the power transistor is controlled so that the potentials of A and B remain equal to maintain the predetermined temperature.

### HINT:

When any of these DTCs are set, the ECM enters fail-safe mode. During fail-safe mode, the ignition timing is calculated by the ECM, according to the engine RPM and throttle valve position. Fail-safe mode continues until a pass condition is detected.



DTC No.	DTC Detection Condition	Trouble Area
P0100	Open or short in Mass Air Flow (MAF) meter circuit for 3 seconds	<ul style="list-style-type: none"> <li>Open or short in MAF meter circuit</li> <li>MAF meter</li> <li>ECM</li> </ul>
P0102	Open in Mass Air Flow (MAF) meter circuit for 3 seconds	<ul style="list-style-type: none"> <li>Open in MAF meter circuit</li> <li>Short in MAF meter circuit</li> <li>MAF meter</li> <li>ECM</li> </ul>
P0103	Short in Mass Air Flow (MAF) meter circuit for 3 seconds	<ul style="list-style-type: none"> <li>Short in MAF meter circuit (+B circuit)</li> <li>MAF meter</li> <li>ECM</li> </ul>

**HINT:**

When any of these DTCs are set, check the air-flow rate by entering the following menus on the intelligent tester: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / MAF.

Mass Air Flow Rate (gm/s)	Malfunctions
Approximately 0.0	<ul style="list-style-type: none"> <li>• Open in Mass Air Flow (MAF) meter power source circuit</li> <li>• Open or short in VG circuit</li> </ul>
271.0 or more	Open in EVG circuit

**MONITOR DESCRIPTION**

If there is a defect in the MAF meter or an open or short circuit, the voltage level deviates from the normal operating range. The ECM interprets this deviation as a malfunction in the MAF meter and sets a DTC.

**Example:**

When the sensor output voltage remains less than 0.2 V, or more than 4.9 V, for more than 3 seconds, the ECM sets a DTC.

If the malfunction is not repaired successfully, a DTC is set 3 seconds after the engine is next started.

**ES****MONITOR STRATEGY**

Related DTCs	P0100: Mass air flow meter range check (Fluctuating) P0102: Mass air flow meter range check (Low voltage) P0103: Mass air flow meter range check (High voltage)
Required Sensors/Components (Main)	MAF meter
Required Sensors/Components (Sub)	Crankshaft position sensor
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate: Engine RPM less than 4,000 rpm 2 driving cycles: Engine RPM 4,000 rpm or more
Sequence of Operation	None

**TYPICAL ENABLING CONDITIONS**

Monitor runs whenever following DTCs are not present	None
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**TYPICAL MALFUNCTION THRESHOLDS****P0100:**

Mass air flow meter voltage	Less than 0.2 V, or more than 4.9 V
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**P0102:**

Mass air flow meter voltage	Less than 0.2 V
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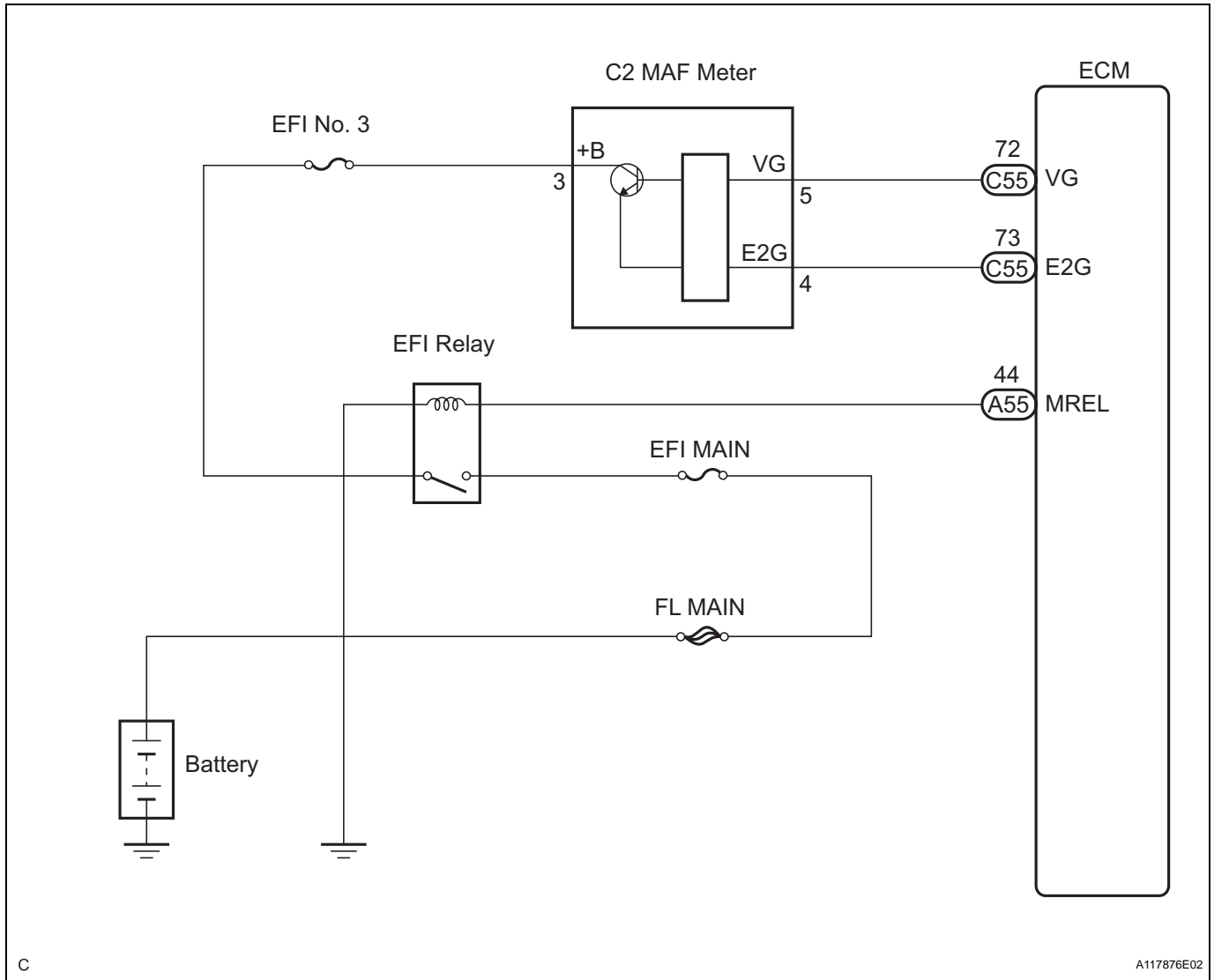
**P0103:**

Mass air flow meter voltage	More than 4.9 V
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**COMPONENT OPERATING RANGE**

Mass air flow meter voltage	Between 0.4 V and 2.2 V
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## WIRING DIAGRAM



ES

## INSPECTION PROCEDURE

## HINT:

Read freeze frame data using the intelligent tester. 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 (See page [ES-45](#)).

1

## READ VALUE OF MASS AIR FLOW METER (MAF)

- (a) Connect the intelligent tester to the DLC3.
- (b) Start the engine.
- (c) Turn the tester on.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST / PRIMARY / MAF.
- (e) Read the values displayed on the tester.

**Result**

Mass Air Flow Rate (gm/s)	Proceed to
0.0	A
271.0 or more	B
Between 1.0 and 270.0 (*1)	C

\*1: The value must be changed when the throttle valve is open or closed.

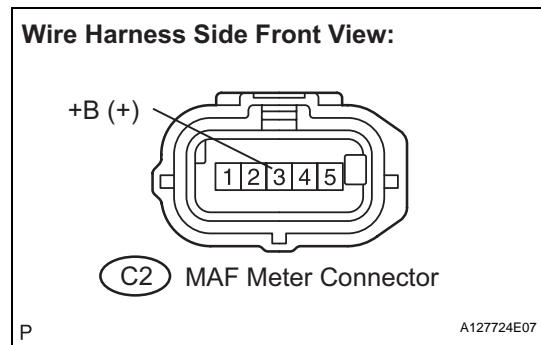
**B** → **Go to step 8**

**C** → **CHECK FOR INTERMITTENT PROBLEMS (See page ES-33)**

**A**

**ES**

**2 INSPECT MASS AIR FLOW METER (POWER SOURCE VOLTAGE)**



- (a) Disconnect the C2 mass air flow (MAF) meter connector.
- (b) Turn the ignition switch on (IG).
- (c) Measure the voltage according to the value(s) in the table below.

**Standard voltage**

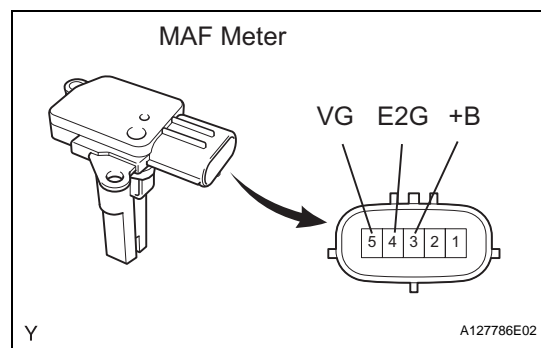
Tester Connection	Specified Condition
+B (C2-3) - Body ground	9 to 14 V

- (d) Reconnect the MAF meter connector.

**NG** → **Go to step 5**

**OK**

**3 INSPECT MASS AIR FLOW METER (VG VOLTAGE)**



- (a) Inspect the output voltage.
  - (1) Apply battery voltage across terminals +B and E2G.
  - (2) Connect the positive (+) tester probe to terminal VG, and negative (-) tester probe to terminal E2G.
  - (3) Measure the voltage between the terminals.

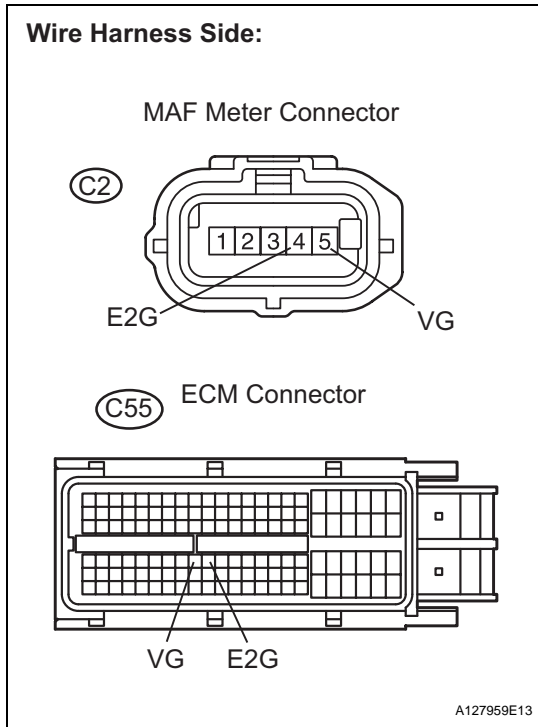
**Standard voltage**

Tester Connection	Specified Condition
5 (VG) - 4 (E2G)	0.2 to 4.9 V

**NG** → **REPLACE MASS AIR FLOW METER**

**OK**

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



- (a) Disconnect the C2 MAF meter connector.
- (b) Disconnect the C55 ECM connector.
- (c) Measure the resistance between the terminals.

**Standard resistance (Check for open)**

Tester Connection	Specified Condition
VG (C55-72) - VG (C2-5)	Below 1 Ω
E2G (C55-73) - E2G (C2-4)	Below 1 Ω

**Standard resistance (Check for short)**

Tester Connection	Specified Condition
VG (C55-72) or VG (C2-5) - Body ground	10 kΩ or higher
E2G (C55-73) or E2G (C2-4) - Body ground	10 kΩ or higher

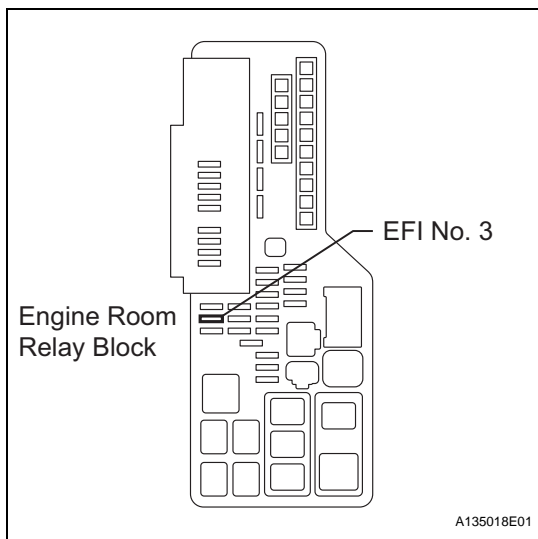
- (d) Reconnect the MAF meter connector.
- (e) Reconnect the ECM connector.

**NG REPAIR OR REPLACE HARNESS OR CONNECTOR**

**OK**

**REPLACE ECM**

**5 INSPECT FUSE (EFI NO. 3)**



- (a) Remove the EFI No. 3 fuse from the engine room R/B.
- (b) Measure the EFI No. 3 fuse resistance.

**Standard resistance:**

**Below 1 Ω**

- (c) Reinstall the EFI No. 3 fuse.

**NG REPLACE EFI NO. 3 FUSE**

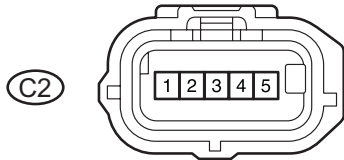
**OK**

**ES**

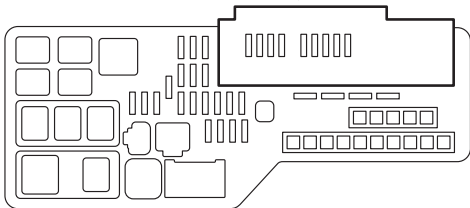
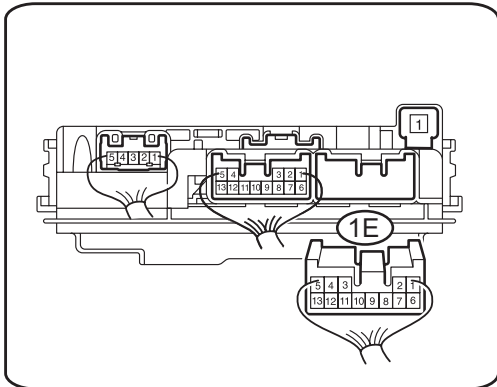
**6 CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER - ENGINE ROOM JUNCTION BLOCK)**

Wire Harness Side:

MAF Meter Connector



Engine Room Junction Block



Engine Room Relay Block

A140657E01

- (a) Disconnect the C2 MAF meter connector.
- (b) Remove the engine room junction block from the engine room R/B.
- (c) Measure the resistance between the terminals.  
**Standard resistance (Check for open)**

Tester Connection	Specified Condition
+B (C2-3) - 1E-6 (Engine room R/B)	Below 1 Ω

**Standard resistance (Check for short)**

Tester Connection	Specified Condition
+B (C2-3) or 1E-6 (Engine room R/B) - Body ground	10 kΩ or higher

- (d) Reinstall the engine room junction block.
- (e) Reconnect the C2 MAF meter connector.

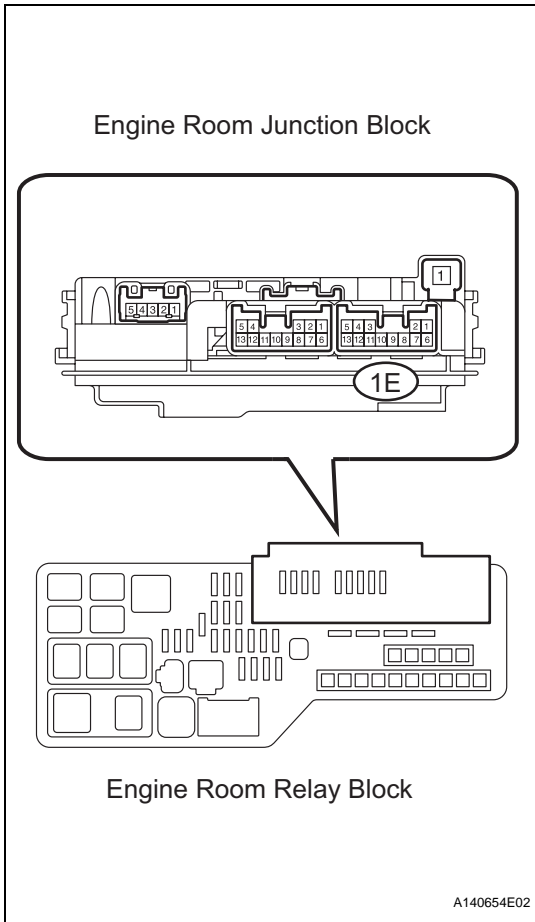
**NG**

**REPAIR OR REPLACE HARNESS OR CONNECTOR**

**OK**

**ES**

**7 INSPECT ENGINE ROOM JUNCTION BLOCK (EFI RELAY)**



- (a) Remove the engine room junction block from the engine room R/B.
- (b) Inspect the EFI relay.
  - (1) Measure the EFI relay resistance.

**Standard resistance**

Tester Connection	Specified Condition
1E-12 - 1E-6	10 kΩ or higher
1E-12 - 1E-6	Below 1 Ω (Apply battery voltage between terminals 1E-9 and 1E-10)

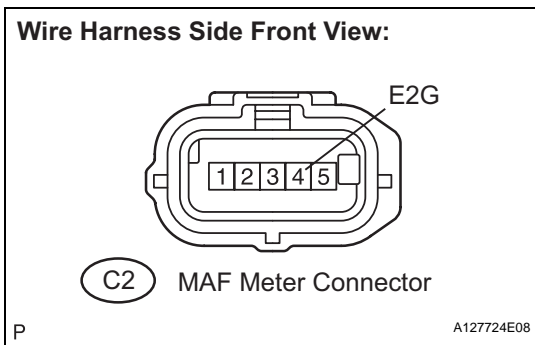
- (c) Reinstall the engine room junction block.

**NG** → **REPLACE ENGINE ROOM JUNCTION BLOCK**

**OK**

**CHECK ECM POWER SOURCE CIRCUIT (See page ES-432)**

**8 CHECK HARNESS AND CONNECTOR (SENSOR GROUND)**



- (a) Disconnect the C2 MAF meter connector.
- (b) Measure the resistance between the terminals.

**Standard resistance**

Tester Connection	Specified Condition
E2G (C2-4) - Body ground	Below 1 Ω

- (c) Reconnect the MAF meter connector.

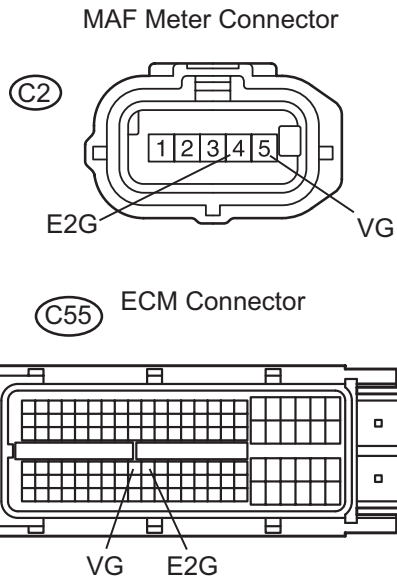
**OK** → **REPLACE MASS AIR FLOW METER (See page ES-477)**

**NG**

**ES**

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

Wire Harness Side:



A127959E13

- (a) Disconnect the C2 MAF meter connector.
- (b) Disconnect the C55 ECM connector.
- (c) Measure the resistance between the terminals.

**Standard resistance (Check for open)**

Tester Connection	Specified Condition
VG (C55-72) - VG (C2-5)	Below 1 Ω
E2G (C55-73) - E2G (C2-4)	Below 1 Ω

**Standard resistance (Check for short)**

Tester Connection	Specified Condition
VG (C55-72) or VG (C2-5) - Body ground	10 kΩ or higher
E2G (C55-73) or E2G (C2-4) - 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 (See page ES-518)**

**ES**



DTC

P0101

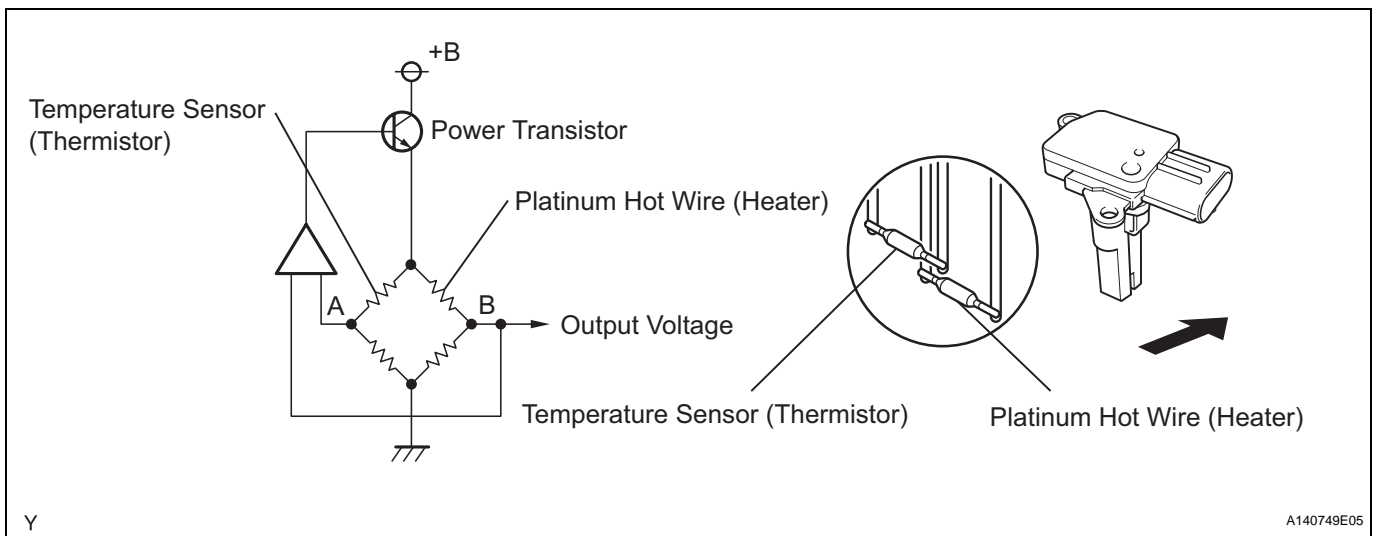
**Mass Air Flow Circuit Range / Performance Problem****DESCRIPTION**

The Mass Air Flow (MAF) meter is a sensor that measures the amount of air flowing through the valve. The ECM uses this information to determine the fuel injection time and to provide appropriate air-fuel ratio. Inside the MAF meter, there is a heated platinum wire which is exposed to the flow of intake air. By applying a specific electrical current to the wire, the ECM heats it to a given temperature. The flow of incoming air cools both the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the airflow through the sensor, and the ECM uses it to calculate the intake air volume.

The circuit is constructed so that the platinum hot wire and the temperature sensor provide a bridge circuit, and the power transistor is controlled so that the potentials of A and B remain equal to maintain the predetermined temperature.

**HINT:**

When any of these DTCs are set, the ECM enters fail-safe mode. During fail-safe mode, the ignition timing is calculated by the ECM, according to the engine RPM and throttle valve position. Fail-safe mode continues until a pass condition is detected.



DTC No.	DTC Detection Condition	Trouble Area
P0101	Test value calculated with engine load and fuel trim are out of specified threshold under the following conditions (2 trip detection logic): <ul style="list-style-type: none"> <li>– Engine load is 30 % or more and constant</li> <li>– Engine coolant temperature is 70°C (158°F) or higher</li> </ul>	MAF meter

ES

Y

A140749E05

## MONITOR DESCRIPTION

The MAF meter is a sensor that measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and to provide an appropriate air-fuel ratio. Inside the MAF meter, there is a heated platinum wire which is exposed to the flow of intake air. By applying a specific electrical current to the wire, the ECM heats it to a specific temperature. The flow of incoming air cools both the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components of the MAF meter. The voltage level is proportional to the airflow through the sensor, and the ECM uses it to calculate the intake air volume. If there is a defect in the sensor, or an open or short in the circuit, the voltage level deviates from the normal operating range. The ECM interprets this deviation as a malfunction in the MAF meter and sets the DTC.

Example:

If the voltage is more than 2.2 V, or less than 1.48 V while idling, the ECM determines that there is a malfunction in the MAF meter and sets the DTC.

ES

## MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter rationality
Required Sensors/Components (Main)	Mass air flow meter
Required Sensors/Components (Sub)	Crankshaft position sensor, engine coolant temperature sensor and throttle position sensor
Frequency of Operation	Continuous
Duration	10 seconds
MIL Operation	2 driving cycles
Sequence of Operation	None

## TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs are not present	P0115 - P0118 (ECT sensor) P0120 - P0223, P2135 (TP sensor) P0125 (Insufficient ECT for closed loop) P0335 (CKP sensor) P0340, P0341 (CMP sensor)
TP (Throttle position) sensor voltage	0.24 V or more
Engine	Running
Battery voltage	10.5 V or more
ECT	70°C (158°F) or more
IAT sensor circuit	OK
ECT sensor circuit	OK
CKP sensor circuit	OK
TP sensor circuit	OK
FTP sensor circuit	OK
EVAP leak detection pump	OK
EVAP vent valve	OK

## TYPICAL MALFUNCTION THRESHOLDS

Average engine load	Less than 0.838 %, or more than 1.287 %
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## WIRING DIAGRAM

Refer to DTC P0100 (See page [ES-127](#)).

**INSPECTION PROCEDURE****HINT:**

Read freeze frame data using the intelligent tester. 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 (See page [ES-45](#)).

**1****CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0101)**

- (a) Connect the intelligent tester to the DLC3.
- (b) Turn the ignition switch on (IG).
- (c) Turn the tester on.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

**Result**

Display (DTC Output)	Proceed to
P0101 and other DTCS	A
P0101	B

- (e) Read the DTCS.  
HINT:  
If any DTCS other than P0101 are output, troubleshoot those DTCS first.

**B**

**REPLACE MASS AIR FLOW METER (See page [ES-477](#))**

**A**

**GO TO DTC CHART (See page [ES-63](#))**

**ES**