

DTC	P0102	Mass or Volume Air Flow Circuit Low Input
DTC	P0103	Mass or Volume Air Flow Circuit High Input

DESCRIPTION

The mass air flow meter sub-assembly 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 the appropriate air fuel ratio.

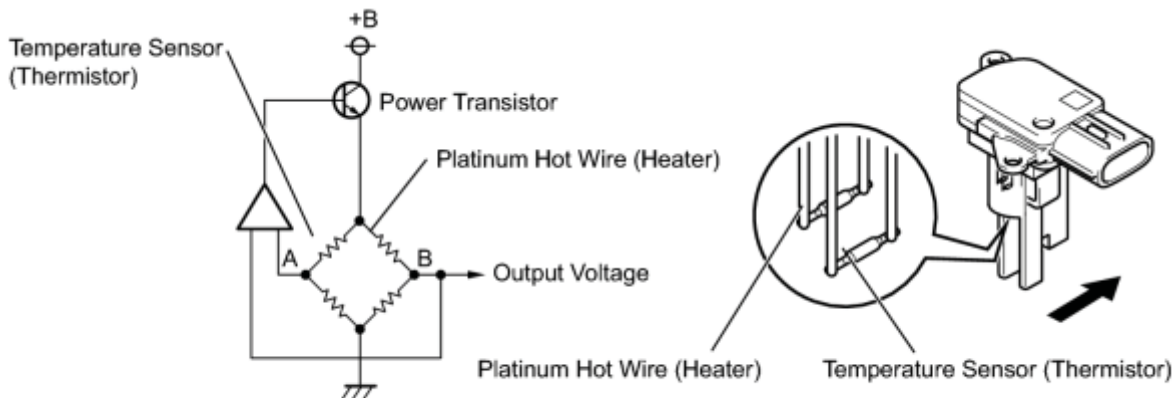
Inside the mass air flow meter sub-assembly, there is a heated platinum wire which is exposed to the flow of intake air by applying a specific electrical current to the wire.

The flow of incoming air cools both the wire and an internal thermistor, affecting their resistance. To maintain a constant temperature value of the hot wire, current is applied to these components in the mass air flow meter sub-assembly. 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 create 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 either 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 speed and throttle valve position. Fail-safe mode continues until a pass condition is detected.



DTC No.	DTC Detection Condition	Trouble Area
P0102	Mass air flow meter voltage less than 0.2 V for 3 seconds (1 trip detection logic)	<ul style="list-style-type: none"> Open or short in mass air flow meter sub-assembly circuit Mass air flow meter sub-assembly ECM

DTC No.	DTC Detection Condition	Trouble Area
P0103	Mass air flow meter voltage more than 4.9 V for 3 seconds (1 trip detection logic)	<ul style="list-style-type: none"> • Open or short in mass air flow meter sub-assembly circuit • Mass air flow meter sub-assembly • ECM

HINT:

When any of these DTCs are set, check the air-flow rate by entering the following menus: Powertrain / Engine and ECT / Data List / MAF.

Mass Air Flow Rate (gm/sec)	Malfunction
Approximately 0.0	<ul style="list-style-type: none"> • Open in mass air flow meter sub-assembly power source circuit • Open or short in VG circuit
271.0 or more	Open in E2G circuit

MONITOR DESCRIPTION

If there is a defect in the mass air flow meter sub-assembly 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 mass air flow meter sub-assembly circuit 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.

MONITOR STRATEGY

Related DTCs	P0102: Mass air flow meter range check (Low voltage) P0103: Mass air flow meter range check (High voltage)
Required Sensors/Components (Main)	Mass air flow meter sub-assembly
Required Sensors/Components (Related)	Crankshaft position sensor Throttle position sensor
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediately: Engine speed less than 4000 rpm 2 driving cycles: Engine speed 4000 rpm or more

Sequence of Operation	None
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TYPICAL ENABLING CONDITIONS

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

P0102:

Mass air flow meter voltage	Less than 0.2 V
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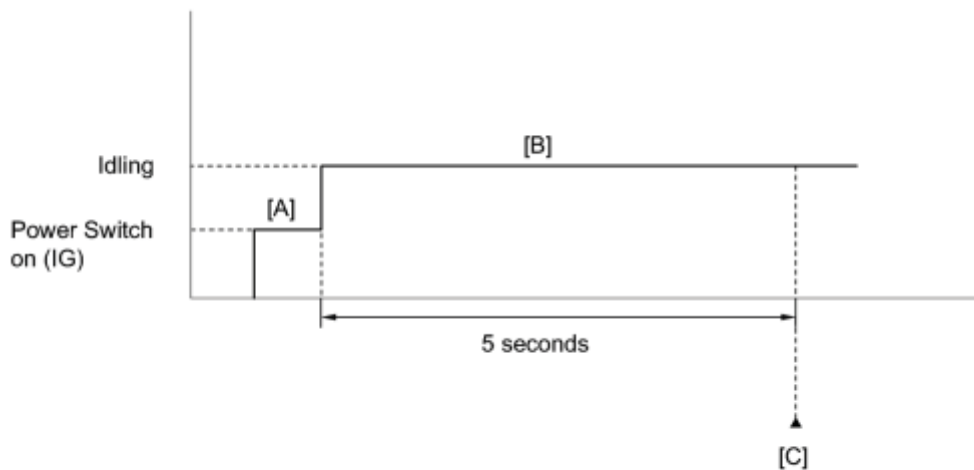
P0103:

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

Mass air flow meter voltage	Between 0.2 V and 4.9 V
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CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG) and turn the Techstream on.
3. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure) INFO.
4. Turn the power switch off and wait for 30 seconds.
5. Turn the power switch on (IG) and turn the Techstream on [A].

6. Put the engine in inspection mode .
7. Start the engine.
8. Idle the engine for 5 seconds [B].
9. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.
10. Read the DTC [C].
11. If a DTC is output, the system is malfunctioning.

HINT:

If a DTC is not output, perform the following procedure.


12. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
13. Input the DTC: P0102 or P0103.
14. Check the DTC judgment result.

Techstream Display	Description
NORMAL	<ul style="list-style-type: none"> ○ DTC judgment completed ○ System normal
ABNORMAL	<ul style="list-style-type: none"> ○ DTC judgment completed ○ System abnormal
INCOMPLETE	<ul style="list-style-type: none"> ○ DTC judgment not completed ○ Perform driving pattern after confirming DTC enabling conditions
UNKNOWN	<ul style="list-style-type: none"> ○ Unable to perform DTC judgment ○ Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit

HINT:

- If the judgment result shows ABNORMAL, the system has a malfunction.
 - If the judgment result shows NORMAL, the system is normal.
 - If the judgment result shows INCOMPLETE or UNKNOWN, perform step [B] again.
15. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
 16. Check the judgment result.

HINT:

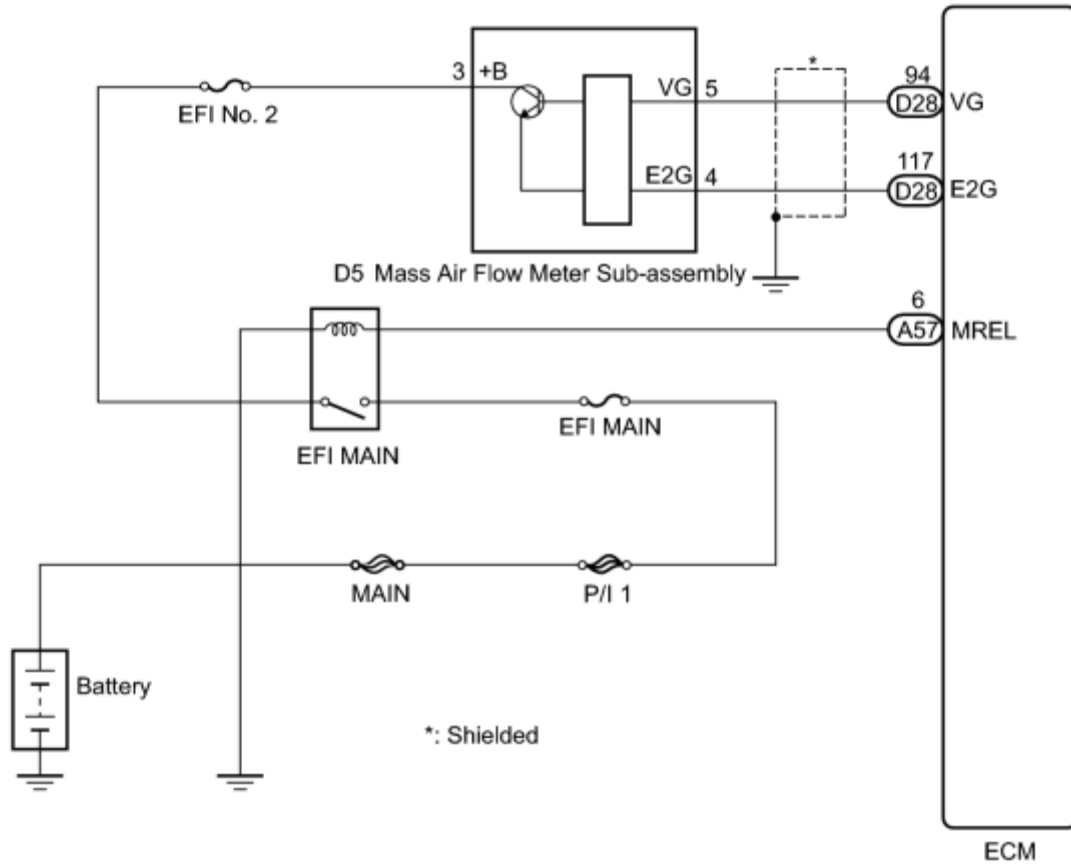
- If the judgment result shows ABNORMAL, the system has a malfunction.
 - If the judgment result shows NORMAL, the system is normal.
17. If the test result is INCOMPLETE or UNKNOWN and no DTC is output, perform a universal trip and check for permanent DTCs .

HINT:

- If a permanent DTC is output, the system is malfunctioning.

- If no permanent DTC is output, the system is normal.

WIRING DIAGRAM



c

INSPECTION PROCEDURE

NOTICE:

Inspect the fuses for circuits related to this system before performing the following inspection procedure.

HINT:

Read freeze frame data using the Techstream. 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.

PROCEDURE

1. READ DTC OUTPUT

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Turn the Techstream on.
- (d) Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.
- (e) Read the DTCs.

Result:

Result	Proceed to
DTC P0102 is output	A
DTC P0103 is output	B

B ▶ CHECK HARNESS AND CONNECTOR (SENSOR GROUND)

A
▼

2.	INSPECT MASS AIR FLOW METER SUB-ASSEMBLY (POWER SOURCE VOLTAGE)
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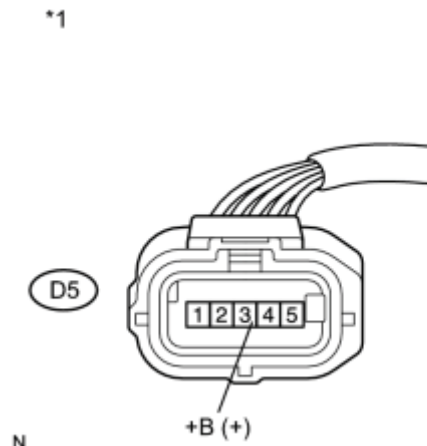
- (a) Disconnect the mass air flow meter sub-assembly connector.
- (b) Turn the power switch on (IG).
- (c) Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
D5-3 (+B) - Body ground	Power switch on (IG)	11 to 14 V

Text in Illustration

*1	Front view of wire harness connector (to Mass Air Flow Meter Sub-assembly)
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- (d) Reconnect the mass air flow meter sub-assembly connector.

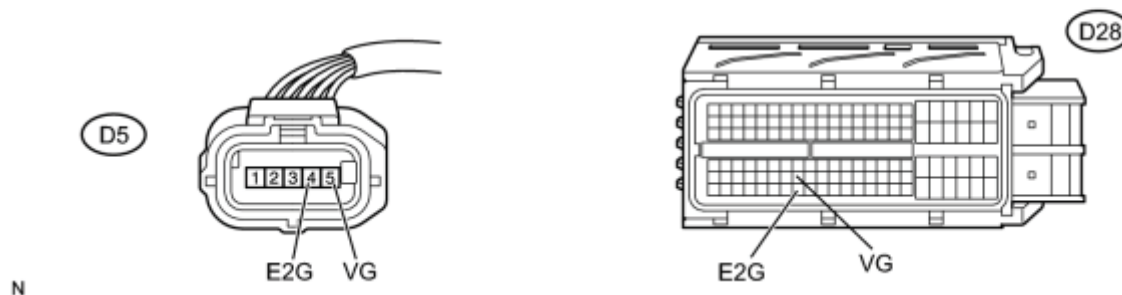
NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR (EFI MAIN RELAY - MASS AIR FLOW METER SUB-ASSEMBLY)

OK
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3.	CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)
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*1

*2



- (a) Disconnect the mass air flow meter sub-assembly connector.
- (b) Disconnect the ECM connector.
- (c) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Condition	Specified Condition
D5-5 (VG) - D28-94 (VG)	Always	Below 1 Ω
D5-4 (E2G) - D28-117 (E2G)		

Standard Resistance (Check for Short):

Tester Connection	Condition	Specified Condition
D5-5 (VG) or D28-94 (VG) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	Front view of wire harness connector (to Mass Air Flow Meter Sub-assembly)	*2	Front view of wire harness connector (to ECM)
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- (d) Reconnect the mass air flow meter sub-assembly connector.
- (e) Reconnect the ECM connector.

NG ▶ REPAIR OR REPLACE HARNESS OR CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)

OK



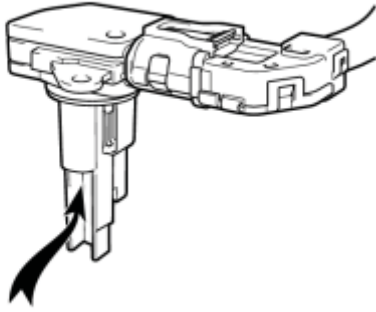
4.	INSPECT MASS AIR FLOW METER SUB-ASSEMBLY
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(a) Perform On-vehicle inspection **INFO**.

(b) Perform Inspection **INFO**.

(c) Inspect the function of the mass air flow meter sub-assembly.

(1) Remove the mass air flow meter sub-assembly with the connector connected.



(2) Connect the Techstream to the DLC3.

(3) Turn the power switch on (IG).

(4) Turn the Techstream on.

(5) Enter the following menus: Powertrain / Engine and ECT / Data List / MAF.

(6) Blow air to the mass air flow meter sub-assembly and check that the intake air amount reading changes.

OK:

The reading changes.

NG **▶ REPLACE MASS AIR FLOW METER SUB-ASSEMBLY**

OK **▶ REPLACE ECM**

5. CHECK HARNESS AND CONNECTOR (SENSOR GROUND)

(a) Disconnect the mass air flow meter meter sub-assembly connector.

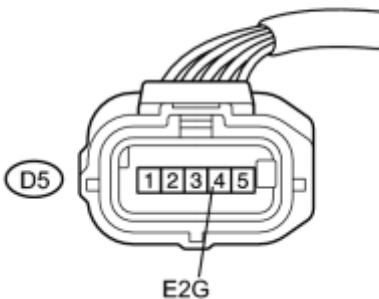
(b) Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
D5-4 (E2G) - Body ground	Always	Below 1 Ω

Text in Illustration

*1	Front view of wire harness connector (to Mass Air Flow Meter Sub-assembly)
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(c) Reconnect the mass air flow meter sub-assembly connector.

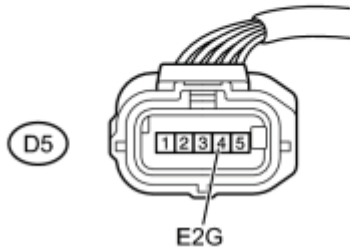
NG **▶ CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)**

OK **▶ REPLACE MASS AIR FLOW METER SUB-ASSEMBLY**

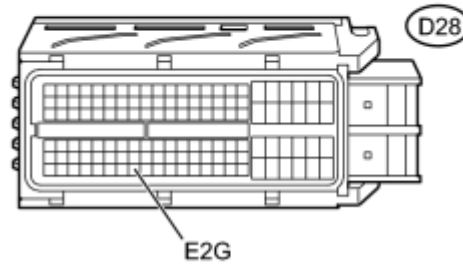
6. CHECK HARNESS AND CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)

(a) Disconnect the mass air flow meter sub-assembly connector.

*1



*2



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(b) Disconnect the ECM connector.

(c) Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Condition	Specified Condition
D5-4 (E2G) - D28-117 (E2G)	Always	Below 1 Ω

Text in Illustration

*1	Front view of wire harness connector (to Mass Air Flow Meter Sub-assembly)	*2	Front view of wire harness connector (to ECM)
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(d) Reconnect the mass air flow meter sub-assembly connector.

(e) Reconnect the ECM connector.

NG ► REPAIR OR REPLACE HARNESS OR CONNECTOR (MASS AIR FLOW METER SUB-ASSEMBLY - ECM)

OK ► REPLACE ECM