# A L L  Diagnostic Trouble Codes ( DTC ): P Code Charts
# P0102

**2GR-FSE ENGINE CONTROL SYSTEM: SFI SYSTEM: P0102,P0103: Mass or Volume Air Flow Circuit Low Input**

## DESCRIPTION

The Mass Air Flow (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 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.**
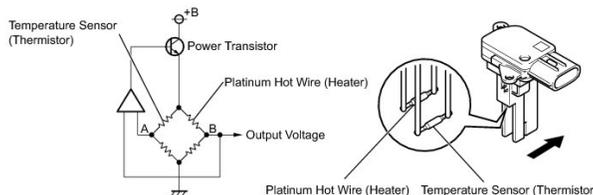


| DTC No. | DTC Detection Condition | Trouble Area |
|---------|-------------------------|--------------|
| P0102 | Open in Mass Air Flow (MAF) meter circuit for 3 seconds (1 trip detection logic: Engine speed is less than 4000 rpm) (2 trip detection logic: Engine speed is 4000 rpm or more) | ● Open in Mass Air Flow (MAF) meter circuit<br>● Short in MAF meter circuit (ground circuit)<br>● MAF meter<br>● ECM |
| P0103 | Short in Mass Air Flow (MAF) meter circuit for 3 seconds (1 trip detection logic: Engine speed is less than 4000 rpm) (2 trip detection logic: Engine speed is 4000 rpm or more) | ● Short in MAF meter circuit (+B circuit)<br>● MAF meter<br>● ECM |

> **HINT**
> **When any of these DTCs are set, check the air-flow rate by selecting the following menu items on the Techstream: Powertrain / Engine / Data List / MAF.**

| Mass Air Flow Rate (g/sec.) | Malfunction |
|------------------------------|-------------|
| Approximately 0.0 | ● Open in Mass Air Flow (MAF) meter power source circuit<br>● Open or short in VG circuit |
| 271.0 or more | Open in E2G 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.

## 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) | MAF meter |
| Required Sensors/Components (Sub) | Crankshaft position sensor |
| Frequency of Operation | Continuous |
| Duration | 3 seconds |
| MIL Operation | Immediately: Engine speed is less than 4000 rpm 2 driving cycles: Engine speed is 4000 rpm or more |
| Sequence of Operation | None |

## TYPICAL ENABLING CONDITIONS

| Monitor runs whenever following DTCs are not present | None |
|---|---|

## TYPICAL MALFUNCTION THRESHOLDS

**P0102:**

| Mass air flow meter voltage | Less than 0.2 V |
|---|---|

**P0103:**

| Mass air flow meter voltage | More than 4.9 V |
|---|---|

## COMPONENT OPERATING RANGE

| Mass air flow meter voltage | Between 0.2 V and 4.9 V |
|---|---|

## CONFIRMATION DRIVING PATTERN
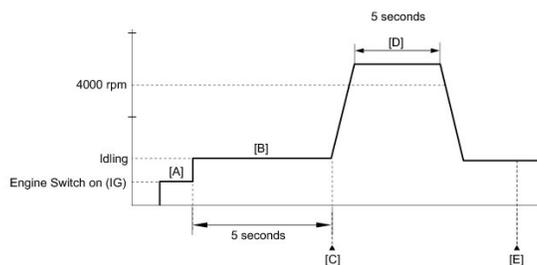


- Connect the Techstream to the DLC3.

- Turn the engine switch on (IG) and turn the Techstream on.

- Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).

- Turn the engine switch off and wait for at least 30 seconds.

- Turn the engine switch on (IG) and turn the Techstream on [A].

- Start the engine.

- Idle the engine for 5 seconds [B].

- Enter the following menus: Powertrain / Engine / Trouble Codes / Pending [C].

- Read the Pending DTCs.

    **HINT**

- **If a pending DTC is output, the system is malfunctioning.**
- **If a pending DTC is not output, perform the following procedure.**
- Run the engine at an engine speed of 4000 rpm or more for 5 seconds [D].

- Enter the following menus: Powertrain / Engine / Trouble Codes / Pending [E].

- Read the Pending DTCs.

  **HINT**
  - **If a pending DTC is output, the system is malfunctioning.**
  - **If a pending DTC is not output, perform the following procedure.**
- Enter the following menus: Powertrain / Engine / Utility / All Readiness.

- Input the DTC: P0102 or P0103.

- Check the DTC judgment result.

| Techstream Display | Description |
|---|---|
| NORMAL | ● DTC judgment completed<br>● System normal |
| ABNORMAL | ● DTC judgment completed<br>● System abnormal |
| INCOMPLETE | ● DTC judgment not completed<br>● Perform driving pattern after confirming DTC enabling conditions |
| UNKNOWN | ● Unable to perform DTC judgment<br>● Number of DTCs which do not fulfill DTC preconditions has reached ECU memory limit |

**HINT**
**If the judgment result shows INCOMPLETE or UNKNOWN, perform steps [B] and [D] again.**

- If the no pending DTC is output, perform a universal trip and check for permanent DTCs    See: Powertrain Management/Computers and Control Systems/Testing and Inspection/Reading and Clearing Diagnostic Trouble Codes/DTC Check / Clear.

  **HINT**
  - **If a permanent DTC is output, the system is malfunctioning.**
  - **If no permanent DTC is output, the system is normal.**

**WIRING DIAGRAM**
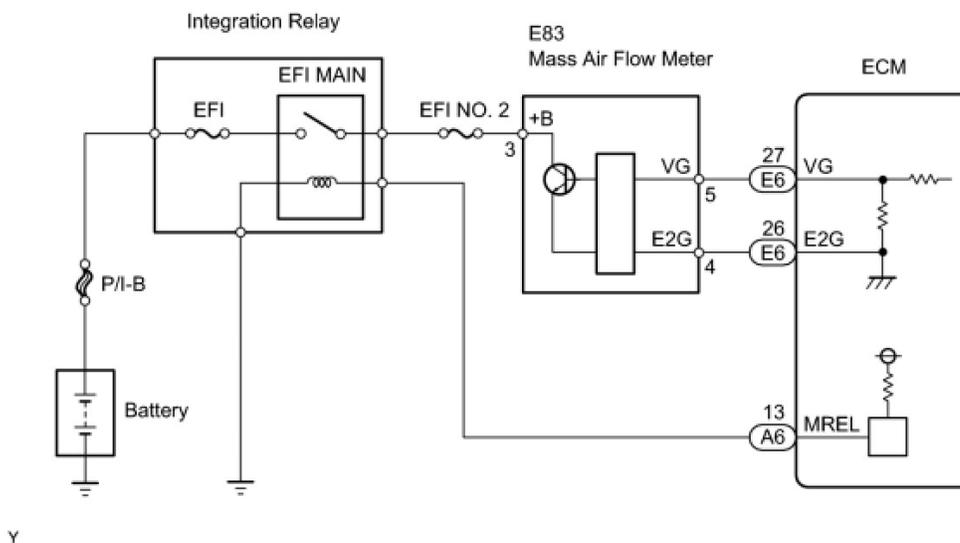


**INSPECTION PROCEDURE**

  **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

**See: Powertrain Management/Computers and Control Systems/Testing and Inspection/Scan Tool Testing and Procedures/Freeze Frame Data.**

## PROCEDURE

1. READ DTC OUTPUT

   (a) Connect the Techstream to the DLC3.

   (b) Turn the engine switch on (IG).

   (c) Turn the Techstream on.

   (d) Enter the following menus: Powertrain / Engine / 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 -- Continue to next step.**

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

   (a) Disconnect the E83 Mass Air Flow (MAF) meter connector.

   

   Wire Harness Side:

   +B (+)

   E83

   MAF Meter Connector

   N
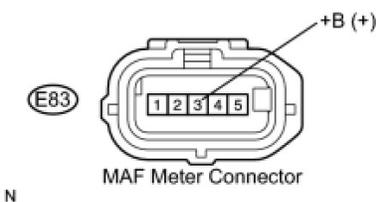
   (b) Turn the engine switch on (IG).

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

   **Standard voltage:**

   | Tester Connection | Specified Condition |
   |---|---|
   | E83-3 (+B) - Body ground | 9 to 14 V |

   (d) Reconnect the MAF meter connector.

   **NG -- REPAIR OR REPLACE HARNESS OR CONNECTOR (MASS AIR FLOW METER - EFI MAIN RELAY)**
   **OK -- Continue to next step.**

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

   (a) Disconnect the E83 MAF meter connector.

   (b) Disconnect the E6 ECM connector.

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

**Standard resistance (Check for open):**

| Tester Connection | Specified Condition |
|---|---|
| E83-5 (VG) - E6-27 (VG) | Below 1 Ω |
| E83-4 (E2G) - E6-26 (E2G) | Below 1 Ω |

**Standard resistance (Check for short):**

| Tester Connection | Specified Condition |
|---|---|
| E83-5 (VG) or E6-27 (VG) - 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 -- Continue to next step.**

4.  INSPECT MASS AIR FLOW METER

(a) Perform On-vehicle Inspection     See: Powertrain Management/Computers and Control Systems/Air Flow Meter/Sensor/Testing and Inspection/On-Vehicle Inspection.
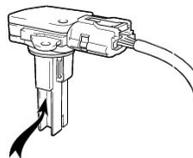


(b) Perform Inspection     See: Powertrain Management/Computers and Control Systems/Air Flow Meter/Sensor/Testing and Inspection/Inspection.

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

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

(2) Connect the Techstream to the DLC3.

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

(4) Turn the Techstream on.

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

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

**OK:**

**The reading changes.**

**NG -- REPLACE MASS AIR FLOW METER** See: Powertrain Management/Computers and Control Systems/Air Flow Meter/Sensor/Service and Repair

**OK -- REPLACE ECM** See: Powertrain Management/Computers and Control Systems/Engine Control Module/Service and Repair/Removal

5.  CHECK HARNESS AND CONNECTOR (SENSOR GROUND)

(a) Disconnect the E83 MAF meter connector.

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

**Standard resistance:**

| Tester Connection | Specified Condition |
|---|---|
| E83-4 (E2G) - Body ground | Below 1 Ω |

(c) Reconnect the MAF meter connector.

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

**OK --  REPLACE MASS AIR FLOW METER**  See: Powertrain Management/Computers and Control Systems/Air Flow Meter/Sensor/Service and Repair

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

(a) Disconnect the E83 MAF meter connector.

(b) Disconnect the E6 ECM connector.

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

**Standard resistance (Check for open):**

| Tester Connection | Specified Condition |
|---|---|
| E83-4 (E2G) - E6-26 (E2G) | Below 1 Ω |

(d) Reconnect the ECM connector.

(e) Reconnect the MAF meter connector.

**NG --  REPAIR OR REPLACE HARNESS OR CONNECTOR**

**OK --  REPLACE ECM**  See: Powertrain Management/Computers and Control Systems/Engine Control Module/Service and Repair/Removal