

DTC	P0101	Mass Air Flow Circuit Range / Performance Problem
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## DESCRIPTION

Refer to DTC P0102 .

DTC No.	DTC Detection Condition	Trouble Area
P0101	<p>Conditions (a), (b), (c), (d) and (e) continue for more than 10 seconds (2 trip detection logic):</p> <p>(a) Engine running</p> <p>(b) Engine coolant temperature 70°C (158°F) or higher</p> <p>(c) Throttle position sensor voltage 0.2 to 2 V</p> <p>(d) Average engine load value ratio less than 0.829, or more than 1.153 (varies with estimated engine load)</p> <p>Average engine load value ratio = Average engine load based on mass air flow meter output / Average engine load estimated from driving conditions</p> <p>(e) Average air fuel ratio less than -20%, or more than 20%</p>	<ul style="list-style-type: none"> <li>• Mass air flow meter sub-assembly</li> <li>• Intake system</li> <li>• PCV hose connections</li> <li>• EGR valve assembly</li> </ul>

## MONITOR 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 an 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 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 the mass air flow meter sub-assembly. The voltage level is proportional to the air flow through the sensor, and the ECM uses it to calculate the intake air volume.

The ECM monitors the average engine load value ratio to check the mass air flow meter sub-assembly for malfunctions. The average engine load value ratio is obtained by comparing the average engine load calculated from the mass air flow meter sub-assembly output to the average engine load estimated from the driving conditions, such as the engine speed and the throttle opening angle. If the average engine load value ratio is below the threshold value, the ECM determines that the intake air volume is low, and if the average engine load value ratio is above the threshold value, the ECM determines that the intake air volume is high.

If this is detected in 2 consecutive driving cycles, the MIL is illuminated and the DTC is set.

## MONITOR STRATEGY

Related DTCs	P0101: Mass air flow meter rationality
Required Sensors/Components (Main)	Mass air flow meter sub-assembly
Required Sensors/Components (Related)	Crankshaft position sensor Camshaft position sensor Engine coolant temperature sensor Throttle position sensor
Frequency of Operation	Continuous
Duration	10 times
MIL Operation	2 driving cycles
Sequence of Operation	None

## TYPICAL ENABLING CONDITIONS

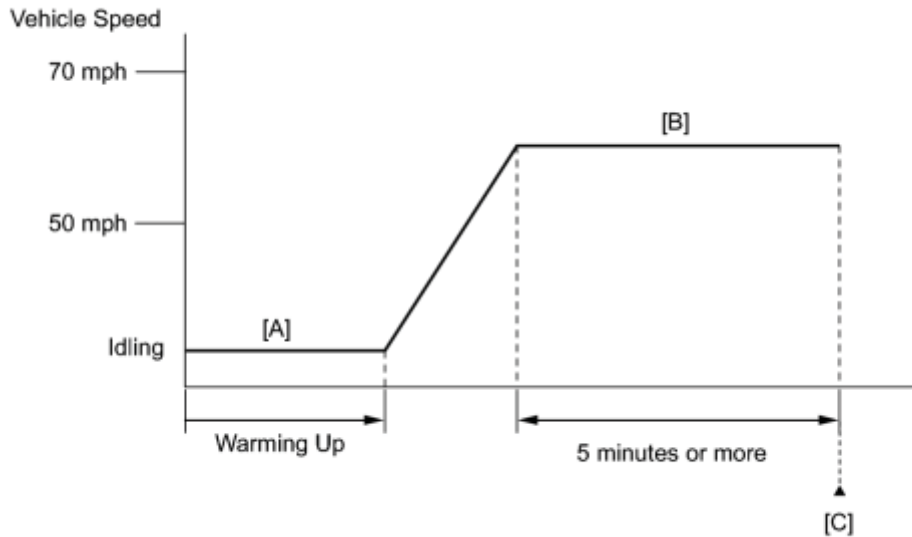
Monitor runs whenever following DTCs are not present	None
Time after engine starts	5 seconds or more
Battery voltage	10.5 V or more
Throttle position (Throttle position sensor voltage)	0.2 to 2 V
Estimated Load	30 to 70%
Engine coolant temperature	70°C (158°F) or more
Mass air flow meter circuit (P0102, P0103)	OK
Intake air temperature sensor circuit (P0112, P0113)	OK
Engine coolant temperature sensor circuit (P0115, P0117, P0118)	OK
Crankshaft position sensor circuit (P0335)	OK
Throttle position sensor circuit (P0120, P0121, P0122, P0123, P0220, P0222, P0223, P2135)	OK
EVAP system pressure sensor circuit (P0452, P0453)	OK
EVAP leak detection pump (P2401, P2402)	OK
EVAP system vent valve (P2419, P2420)	OK

## TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions 1 and 2 are met	-
1. Averaged engine load value ratio	Less than 0.829, or more than 1.153 (varies with estimated engine load)
2. Averaged air fuel ratio	Less than -20%, or more than 20%

## WIRING DIAGRAM

## CONFIRMATION DRIVING PATTERN



1. Connect the Techstream to the DLC3.
2. Turn the power switch on (IG).
3. Turn the Techstream on.
4. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure) INFO.
5. Turn the power switch off and wait for 30 seconds.
6. Turn the power switch on (IG) and turn the Techstream on.
7. Put the engine in inspection mode INFO.
8. Start the engine and warm it up until the engine coolant temperature reaches 70°C (158°F) or higher [A].
9. Drive the vehicle at approximately 50 mph (80 km/h) to 70 mph (112 km/h) for 5 minutes or more [B].

HINT:

Drive while keeping the engine load as stable as possible.

10. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Pending.
11. Read the pending DTC [C].
12. If a pending DTC is output, the system is malfunctioning.

HINT:

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

13. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.
14. Input the DTC: P0101.
15. Check the DTC judgment result.

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

**CAUTION:**

When performing the confirmation driving pattern, obey all speed limits and traffic laws.

**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.

16. Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

17. 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.

18. If the test result is INCOMPLETE or UNKNOWN and no pending 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.

## 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. CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0101)

- (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 P0101 is output	A
DTC P0101 and other DTCs are output	B

HINT:

If any DTCs other than P0101 are output, troubleshoot those DTCs first.

**B** ► GO TO DTC CHART

A  
▼

## 2. CHECK INTAKE SYSTEM

- (a) Check the intake system for vacuum leaks .

OK:

No leaks from the intake system.

**NG** ► REPAIR OR REPLACE INTAKE SYSTEM

OK  
▼

## 3. CHECK PCV HOSE CONNECTIONS

- (a) Check the PCV hose connections.

OK:


PCV hose is connected correctly and is not damaged.

**NG** ► REPAIR OR REPLACE PCV HOSE

OK



4. PERFORM ACTIVE TEST USING TECHSTREAM (CONTROL THE EGR STEP POSITION)

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Turn the Techstream on.
- (d) Put the engine in inspection mode .
- (e) Start the engine and warm it up until the engine coolant temperature reaches 75°C (167°F) or more.

HINT:

The A/C switch and all accessory switches should be off.

- (f) Enter the following menus: Powertrain / Engine and ECT / Active Test / Control the EGR Step Position.
- (g) Confirm the Throttle Idle Position is ON and check the engine idling condition and MAP values in the Data List while performing the Active Test.

HINT:

- Do not leave the EGR valve open for 10 seconds or more during the Active Test.
- Be sure to return the EGR valve to step 0 when the Active Test is completed.
- Do not open the EGR valve 30 steps or more during the Active Test.

OK:

MAP and idling condition change in response to EGR step position when Throttle Idle Position is ON in Data List.

Standard:

-	EGR Step Position (Active Test)	
	0 Steps	0 to 30 Steps
Idling condition	Steady idling	Idling changes from steady to rough idling
MAP (Data List)	MAP value is 20 to 40 kPa (150 to 300 mmHg) (EGR valve is fully closed)	MAP value is at least +10 kPa (75 mmHg) higher than when EGR valve is fully closed

HINT:

During Active Test, if the idling condition does not change in response to EGR step position, then there is probably a malfunction in the EGR valve.

Result:

Result	Proceed to
Outside of standard range	A
Within standard range	B

B ▶ [REPLACE MASS AIR FLOW METER SUB-ASSEMBLY](#)

A

5. INSPECT EGR VALVE ASSEMBLY

(a) Remove the EGR valve assembly .

(b) Check if the EGR valve is stuck open.

OK:

EGR valve is tightly closed.

(c) Reinstall the EGR valve assembly .

NG ▶ [REPLACE EGR VALVE ASSEMBLY](#)

OK

6. REPLACE MASS AIR FLOW METER SUB-ASSEMBLY

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

NEXT

7. CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

(a) Connect the Techstream to the DLC3.


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

(c) Turn the Techstream on.

(d) Clear the DTC .

(e) Turn the power switch off and wait for 30 seconds.

(f) Turn the power switch on (IG) and turn the Techstream on.

(g) Put the engine in inspection mode .

(h) Start the engine and warm it up.

(i) Drive the vehicle in accordance with the driving pattern described in the Confirmation Driving Pattern.

(j) Enter the following menus: Powertrain / Engine and ECT / Utility / All Readiness.

(k) Input the DTC: P0101.

(l) Check the DTC judgment result.

**NEXT**  **END**