DI4F3-03

DTC	P0171	System too Lean (Fuel Trim) (Bank 1)

DTC	P0172	System too Rich (Fuel Trim) (Bank 1)

DTC	P0174	System too Lean (Fuel Trim) (Bank 2)

DTC	P0175	System too Rich (Fuel Trim) (Bank 2)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short-term fuel trim and long-term fuel trim.

Short-term fuel trim is the short-term fuel compensation used to maintain the air-fuel ratio at its ideal theoretical value.

The signal from the A/F sensor is approximately proportional to the existing air-fuel ratio, and ECM comparing it with the ideal theoretical value, the ECM reduces fuel volume immediately if the air-fuel ratio is rich and increases fuel volume if it is lean.

Long-term fuel trim compensates the deviation from the central value of the short-term fuel trim stored up by each engine tolerance, and the deviation from the central value due to the passage of time and changes of using environment.

If both the short-term fuel trim and long-term fuel trim exceed a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171 P0174	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Gas leakage on exhaust system • Air intake (hose loose) • Fuel line pressure • Injector blockage • Mass air flow meter • Engine coolant temp. sensor • A/F sensors (bank 1, 2 sensor 1)
P0172 P0175	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Gas leakage on exhaust system • Fuel line pressure • Injector leak, blockage • Mass air flow meter • Engine coolant temp. sensor • A/F sensors (bank 1, 2 sensor 1)

HINT:

- When the DTC P0171 or P0174 is recorded, the actual air-fuel ratio is on the lean side. When DTC P0172 or P0175 is recorded, the actual air-fuel ratio is on the rich side.
- If the vehicle runs out of fuel, the air-fuel ratio is lean and DTC P0171 or P0174 is recorded. The MIL then comes on.
- If the total of the short-term fuel trim value and long-term fuel trim value is within ± 35 % (80˚C (176˚F) or more), the system is functioning normally.

- The A/F sensors (bank 1, 2 sensor 1) output voltage and the short-term fuel trim value can be read using the OBD II scan tool or TOYOTA hand-held tester.
- The ECM controls the voltage of AF⊕ and AF⊖ terminals of ECM to the fixed voltage. Therefore, it is impossible to confirm the A/F sensor output voltage without OBD II scan tool or TOYOTA hand-held tester.
- OBD II scan tool (excluding TOYOTA hand-held tester) displays the one fifth of the A/F sensors (bank 1, 2 sensor 1) output voltage which is displayed on the TOYOTA hand-held tester.

INSPECTION PROCEDURE

HINT:

Read freeze frame data using TOYOTA hand-held tester or OBD II scan tool. Because freeze frame records the engine conditions when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

1	**Check air induction system (See page SF-1).**

NG → **Repair or replace.**

OK

2	**Check injector injection (See page SF-26).**

NG → **Replace injector.**

OK

3	**Check mass air flow meter and engine coolant temp. sensor (See pages SF-35 and SF-76).**

NG → **Repair or replace.**

OK

4	Check for spark and ignition (See page IG-1).

NG → Repair or replace.

OK

5	Check fuel pressure (See page SF-6).

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF-1).

OK

6	Check gas leakage on exhaust system.

NG → Repair or replace.

OK

7	Check the output voltage A/F sensors (bank1, 2 sensor1).

PREPARATION:

(a) Connect the OBDII scan tool or TOYOTA hand-held tester to the DLC3.

(b) Warm up the A/F sensors (bank1, 2 sensor1) with the engine at 2,500 rpm for approx. 90 sec.

CHECK:

Read voltage value of A/F sensors (bank1, 2 sensor1) on the screen of OBDII scan tool or TOYOTA hand-held tester when you perform all the following conditions.

HINT:

The voltage of AFR⊕, AFL⊕ terminal of ECM is 3.3 fixed AFR⊖, AFL⊖ terminal is 3.0 V fixed. Therefore, it is impossible to check the A/F sensors (bank1, 2 sensor1) output voltage at the terminals (AFR⊕, AFL⊕/ AFR⊖, AFL⊖) of ECM.

OK:

Condition	A/F Sensor Voltage value
Engine idling	• Not remains at 3.30 V (*0.660 V) • Not remains at 3.8 V (*0.76 V) or more • Not remains at 2.8 V (*0.56 V) or less *: When you use the OBDII scan tool (excluding TOYOTA hand-held tester)
Engine racing	
Driving at engine speed 1,500 rpm or more and vehicle speed 40 km/h (25mph) or more, and operate throttle valve open and close	

HINT:

- During fuel enrichment, there is a case that the output voltage of A/F sensors (bank1, 2 sensor1) is below 2.8 V (*0.56 V), it is normal.
- During fuel cut, there is case that the output voltage of A/F sensors (bank1, 2 sensor1) is above 3.8 V (*0.76 V), it is normal.
- If output voltage of A/F sensors (bank1, 2 sensor1) remains at 3.30 V (*0.660 V) even after performing all the above conditions, A/F sensors (bank1, 2 sensor1) circuit may be open.
- If output voltage of A/F sensors (bank1, 2 sensor1) remains at 3.8 V (*0.76 V) or more, or 2.8 V (*0.56 V) or less even after performing all the above conditions, A/F sensors (bank1, 2 sensor1) circuit may be short.

*: When you use the OBDII scan tool (excluding TOYOTA hand-held tester).

OK → **Go to step 9.**

NG

8	Check for open and short in harness and connector between ECM and A/F sensors (bank1, 2 sensor1) (See page IN-31).

NG → **Repair or replace harness or connector.**

OK

Replace A/F sensors (bank1, 2 sensor1).

9	perform confirmation driving pattern (See page DI-104).

Go

10	Is there DTC P0171, P0172, P0174 or P0175 being output again ?

YES → Check and replace ECM (See page IN-31).

NO

11	Did vehicle runs out of fuel in the past ?

NO → Check for intermittent problems (See page DI-3).

YES

DTC P0171, P0172, P0174 or P0175 is caused by running out of fuel.