DI1LO–02

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

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 heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.

Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

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

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 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 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 ± 25 %, the system is functioning normally.

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	**Ask customer whether runs out of fuel.**

YES → **DTC P0171 was recorded because the vehicle runs out of fuel.**

NO

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

NG → **Repair or replace.**

OK

3	**Check for heated oxygen sensor (bank 1, 2 sensor 1) data.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temperature.

CHECK:

Read the heated oxygen sensor (bank 1, 2 sensor 1) output voltage and short–term fuel trim.

HINT:

Read the values for the same bank.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about –20 %
3	Except 1 and 2	

3 → **Check for heated oxygen sensor (bank 1, 2 sensor 1) (See page DI–50).**

1, 2

4	Check fuel pressure (See page SF–7).

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

OK

5	Check injector injection (See page SF–24).

NG → Replace injector.

OK

6	Check mass air flow meter and engine coolant temp. sensor (See pages SF–34 and SF–51).

NG → Repair or replace.

OK

7	Check for spark and ignition (See page IG–1).

NG → Repair or replace.

OK

8	Check gas leakage on exhaust system.

NG → Repair or replace.

OK

Check and replace ECM (See page IN–34).