

<b>DTC</b>	<b>P0171</b>	<b>System too Lean (Except California Spec.)</b>
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<b>DTC</b>	<b>P0172</b>	<b>System too Rich (Except California Spec.)</b>
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## CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared to 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 the overall fuel compensation carried out over the long-term to compensate for continual deviation of the short-term fuel trim from the central value due to individual engine differences, wear overtime 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 warming up engine, fuel trim is considerably in error on RICH side (2 trip detection logic)	<ul style="list-style-type: none"> <li>• Air induction system</li> <li>• Injector blockage</li> <li>• Mass air flow meter</li> <li>• Engine coolant temp. sensor</li> <li>• Fuel pressure</li> <li>• Gas leakage on exhaust system</li> <li>• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit</li> <li>• Heated oxygen sensor (bank 1 sensor 1)</li> <li>• ECM</li> </ul>
P0172	When air fuel ratio feedback is stable after warming up engine, fuel trim is considerably in error on LEAN side (2 trip detection logic)	<ul style="list-style-type: none"> <li>• Injector leak, blockage</li> <li>• Mass air flow meter</li> <li>• Engine coolant temp. sensor</li> <li>• Ignition system</li> <li>• Fuel pressure</li> <li>• Gas leakage on exhaust system</li> <li>• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit</li> <li>• Heated oxygen sensor (bank 1 sensor 1)</li> <li>• ECM</li> </ul>

### 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  $\pm 25\%$ , 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 was warmed up or not, the air-fuel ratio was 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-20).**

NG

Replace injector.

OK

**3 Check mass air flow meter (See page SF-27) and engine coolant temperature sensor (See page SF-47).**

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-5).**

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

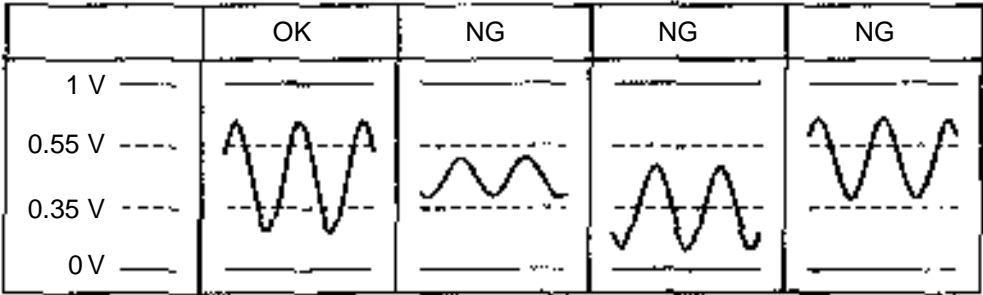
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Check output voltage of heated oxygen sensor (bank 1 sensor 1) during idling.

**PREPARATION:**  
Warm up the heated oxygen sensor with the engine speed at 2,500 rpm for approx. 90 sec.

**CHECK:**  
Use the OBD II scan tool or TOYOTA hand-held tester to read the output voltage of the heated oxygen sensor during idling.

**OK:**  
Heated oxygen sensor output voltage:  
Alternates repeatedly between less than 0.35 V and more than 0.55 V (See the following table).



A00292

OK

Go to step 9.

NG

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Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN-28).

**NG****Repair or replace harness or connector.****OK****Replace heated oxygen sensor.****9****Perform confirmation driving pattern (See page [DI-234](#)).****Go****10****Is there DTC P0171 or P0172 being output again?****YES****Check and replace ECM (See page [IN-28](#)).****NO****11****Did vehicle runs out of fuel in past?****NO****Check for intermittent problems (See page [DI-182](#)).****YES****DTC P0171 or P0172 is caused by running out of fuel.**