

| | | |
|--|---------------------|--------------------------------|
| Last Modified: 6-2-2008 | 5.1 C | From: 200601 |
| Model Year: 2007 | Model: Camry | Doc ID: RM00000221B001X |
| Title: 2GR-FE ENGINE CONTROL SYSTEM: SFI SYSTEM: P0171: System Too Lean (Bank 1) (2007 Camry) | | |

| | | |
|------------|--------------|---------------------------------|
| DTC | P0171 | System Too Lean (Bank 1) |
|------------|--------------|---------------------------------|

| | | |
|------------|--------------|---------------------------------|
| DTC | P0172 | System Too Rich (Bank 1) |
|------------|--------------|---------------------------------|

| | | |
|------------|--------------|---------------------------------|
| DTC | P0174 | System Too Lean (Bank 2) |
|------------|--------------|---------------------------------|

| | | |
|------------|--------------|---------------------------------|
| DTC | P0175 | System Too Rich (Bank 2) |
|------------|--------------|---------------------------------|

DESCRIPTION

The fuel trim is related to the feedback compensation value, not to the basic injection time. The fuel trim consists of both the short-term and long-term fuel trims.

The short-term fuel trim is fuel compensation that is used to constantly maintain the air-fuel ratio at stoichiometric levels. The signal from the Air-Fuel Ratio (A/F) sensor indicates whether the air-fuel ratio is rich or lean compared to the stoichiometric ratio. This triggers a reduction in the fuel injection volume if the air-fuel ratio is rich and an increase in the fuel injection volume if it is lean.

Factors such as individual engine differences, wear over time and changes in operating environment cause short-term fuel trim to vary from the central value. The long-term fuel trim, which controls overall fuel compensation, compensates for long-term deviations in the fuel trim from the central value caused by the short-term fuel trim compensation.

If both the short-term and long-term fuel trims are lean or rich beyond predetermined values, it is interpreted as a malfunction, and the ECM illuminates the MIL and sets a DTC.

| DTC NO. | DTC DETECTION CONDITIONS | TROUBLE AREAS |
|----------------|---|---|
| P0171 P0174 | With warm engine and stable air-fuel ratio feedback, fuel trim considerably in error to lean side (2 trip | <ul style="list-style-type: none"> • Air induction system • Injector blockage |

| DTC NO. | DTC DETECTION CONDITIONS | TROUBLE AREAS |
|----------------|--|---|
| | detection logic) | <ul style="list-style-type: none"> • Mass Air Flow (MAF) meter • Engine Coolant Temperature (ECT) sensor • Fuel pressure • Gas leakage from exhaust system • Open or short in A/F sensor (bank 1, 2 sensor 1) circuit • A/F sensor (bank 1, 2 sensor 1) • A/F sensor heater (bank 1, 2 sensor 1) • A/F sensor heater relay • A/F sensor heater and A/F sensor heater relay circuits • PCV valve and hose • PCV hose connections • ECM |
| P0172 P0175 | With warm engine and stable air-fuel ratio feedback, fuel trim considerably in error to rich side (2 trip detection logic) | <ul style="list-style-type: none"> • Injector leakage or blockage • MAF meter • ECT sensor • Ignition system • Fuel pressure • Gas leakage from exhaust system • Open or short in A/F sensor (bank 1, 2 sensor 1) circuit • A/F sensor (bank 1, 2 sensor 1) • A/F sensor heater (bank 1, 2 sensor 1) • A/F sensor heater relay • A/F sensor heater and A/F sensor heater relay circuits • ECM |

HINT:

- When DTC P0171 or P0174 is set, the actual air-fuel ratio is on the lean side. When DTC P0172 or P0175 is set, 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 may be set. The MIL is then illuminated.

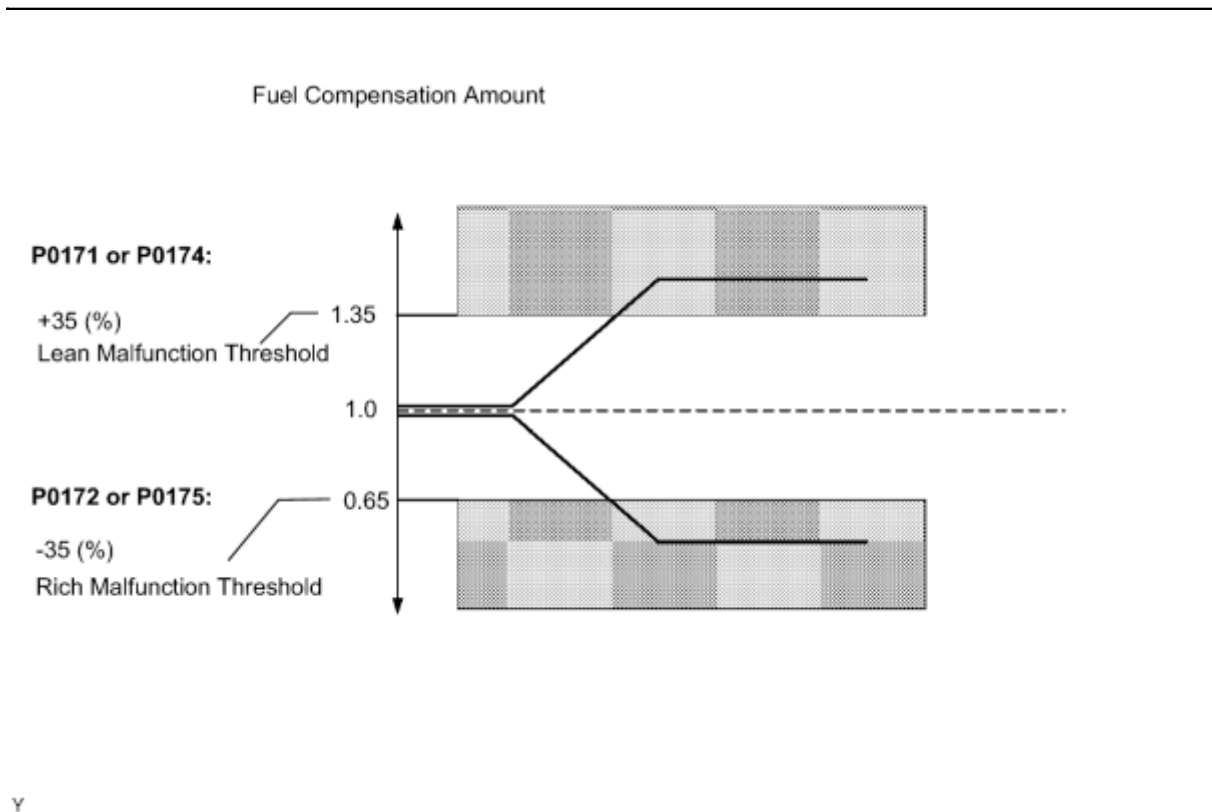
- When the total of the short-term and long-term fuel trim values is within the malfunction threshold (and the engine coolant temperature is more than 75°C [167°F]), the system is functioning normally.

MONITOR DESCRIPTION

Under closed-loop fuel control, fuel injection volumes that deviate from those estimated by the ECM cause changes in the long-term fuel trim compensation value. The long-term fuel trim is adjusted when there are persistent deviations in the short-term fuel trim values. Deviations from the ECM's estimated fuel injection volumes also affect the average fuel trim learning value, which is a combination of the average short-term fuel trim (fuel feedback compensation value) and the average long-term fuel trim (learning value of the air-fuel ratio). If the average fuel trim learning value exceeds the malfunction thresholds, the ECM interprets this as a fault in the fuel system and sets a DTC.

Example:

The average fuel trim learning value is more than +35% or less than -35%, the ECM interprets this as a fuel system malfunction.



MONITOR STRATEGY

| | |
|--------------|--|
| Related DTCs | P0171: Fuel trim Lean (Bank 1) P0172: Fuel trim Rich (Bank 1) |
|--------------|--|

| | |
|---|--|
| | P0174: Fuel trim Lean (Bank 2) P0175: Fuel trim Rich (Bank 2) |
| Required Sensors / Components (Main) | Fuel system |
| Required Sensors / Components (Related) | A/F sensor, Mass air flow meter, Crankshaft position sensor |
| Frequency of Operation | Continuous |
| Duration | Less than 10 seconds |
| MIL Operation | 2 driving cycles |
| Sequence of Operation | None |

TYPICAL ENABLING CONDITIONS

Fuel-trim:

| | |
|--|---|
| The monitor will run whenever these DTCs are not present | P0010, P0020 (VVT VSV1, 2), P0011, P0012 (VVT System-Advance, Retard), P0021, P0022(VVT System2-Adavance, Retard), P0031, P0031, P0032, P0051, P0052 (A/F Sensor heater Sensor 1), P0100, P0101, P0102, P0103 (MAF Sensor), P0115, P0116, P0117, P0118 (ECT Sensor), P0120, P0121, P0122, P0123, P0220, P0222, P0223 , P2135 (TP Sensor), P0125 (Insufficient ECT for Closed Loop), P0335 (CKP Sensor), P0340, P0342, P0343, P0345 (VVT Sensor 1, 2), P0351, P0352, P0353, P0354, P0356 (Ignitor), P0500 (VSS), |
| Fuel system status | Closed-loop |
| Battery voltage | 11 V or more |
| Either of following conditions is met | Condition 1 or 2 |
| 1. Engine RPM | Less than 1,100 rpm |
| 2. Intake air amount per revolution | 0.22 g/rev or more |


TYPICAL MALFUNCTION THRESHOLDS

Fuel trim:

| | |
|----------------|-----------|
| EVAP purge-cut | Executing |
|----------------|-----------|

| | |
|---|-------------------------------------|
| Either of following conditions met | Condition 1 or 2 |
| 1. Average between short-term fuel trim and long-term fuel trim | 35% or more at 80°C (176°F) of ECT |
| 2. Average between short-term fuel trim and long-term fuel trim | -35% or less at 80°C (176°F) of ECT |

WIRING DIAGRAM

Refer to DTC P2195  .

INSPECTION PROCEDURE

For use of the intelligent tester only:

Malfunctioning areas can be identified by performing the A/F CONTROL function provided in the ACTIVE TEST. The A/F CONTROL function can help to determine whether the Air-Fuel Ratio (A/F) sensor, Heated Oxygen (HO2) sensor and other potential trouble areas are malfunctioning.

The following instructions describe how to conduct the A/F CONTROL operation using the intelligent tester.

1. Connect the intelligent tester to the DLC3.
2. Start the engine and turn the tester on.
3. Warm up the engine at an engine speed of 2,500 rpm for approximately 90 seconds.
4. Select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL.
5. Perform the A/F CONTROL operation with the engine in an idling condition (press the RIGHT or LEFT button to change the fuel injection volume).
6. Monitor the voltage outputs of the A/F and HO2 sensors (AFS B1S1 and O2S B1S2 or AFS B2S1 and O2S B2S2) displayed on the tester.

HINT:

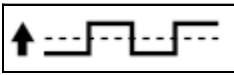
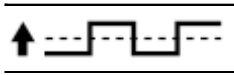
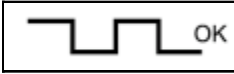

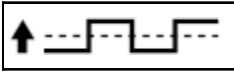
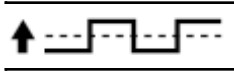
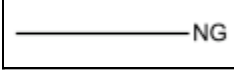

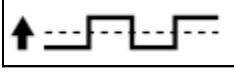
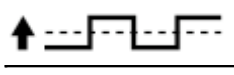
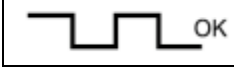
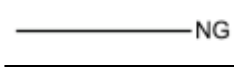
- The A/F CONTROL operation lowers the fuel injection volume by 12.5% or increases the injection volume by 25%.
- Each sensor reacts in accordance with increases and decreases in the fuel injection volume.

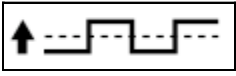
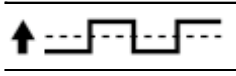
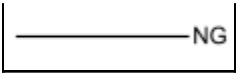
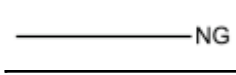
Standard voltage:

| TESTER DISPLAY (SENSOR) | INJECTION VOLUMES | STATUS | VOLTAGES |
|----------------------------|-------------------|--------|----------------|
| AFS B1S1 or AFS B2S1 (A/F) | +25% | Rich | Less than 3.0 |
| AFS B1S1 or AFS B2S1 (A/F) | -12.5% | Lean | More than 3.35 |
| O2S B1S2 or O2S B2S2 (HO2) | +25% | Rich | More than 0.55 |
| O2S B1S2 or O2S B2S2 (HO2) | -12.5% | Lean | Less than 0.4 |

The Air-Fuel Ratio (A/F) sensor has an output delay of a few seconds and the Heated

Oxygen (HO2) sensor has a maximum output delay of approximately 20 seconds.

| CASE | A/F SENSOR (SENSOR 1) OUTPUT VOLTAGE | | HO2 SENSOR (SENSOR 2) OUTPUT VOLTAGE | | MAIN SUSPECTED TROUBLE AREA |
|------|---|---|---|--|---|
| 1 | Injection Volume +25% -12.5% |  | Injection Volume +25% -12.5% |  | |
| | Output Voltage More than 3.35 V Less than 3.0 V |  | Output Voltage More than 0.55 V Less than 0.4 V |  | |
| 2 | Injection Volume +25% -12.5% |  | Injection Volume +25% -12.5% |  | <ul style="list-style-type: none"> ◦ A/F sensor ◦ A/F sensor heater ◦ A/F sensor circuit |
| | Output Voltage Almost no reaction |  | Output Voltage More than 0.55 V Less than 0.4 V |  | |
| 3 | Injection Volume +25% -12.5% |  | Injection Volume +25% -12.5% |  | <ul style="list-style-type: none"> ◦ HO2 sensor ◦ HO2 sensor heater ◦ HO2 sensor circuit |
| | Output Voltage More than 3.35 V Less than 3.0 V |  | Output Voltage Almost no reaction |  | |
| 4 | Injection volume | | Injection Volume | | <ul style="list-style-type: none"> ◦ Injector ◦ Fuel |

| CASE | A/F SENSOR (SENSOR 1) OUTPUT VOLTAGE | HO2 SENSOR (SENSOR 2) OUTPUT VOLTAGE | MAIN SUSPECTED TROUBLE AREA |
|------|--|---|---|
| | +25% -12.5%  | +25% -12.5%  | pressure • Gas leakage from exhaust system (Air-fuel ratio extremely lean or rich) |
| | Output Voltage Almost no reaction  | Output Voltage Almost no reaction  | |

- Following the A/F CONTROL procedure enables technicians to check and graph the voltage outputs of both the A/F and HO2 sensors.
- To display the graph, select the following menu items on the tester: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / A/F CONTROL / USER DATA / AFS B1S1 and O2S B1S2 or AFS B2S1 and O2S B2S2. Press the YES button and then the ENTER button. Then press the F4 button.

HINT:

- Read freeze frame data using the intelligent tester. 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.
- A low A/F sensor voltage could be caused by a rich air-fuel mixture. Check for conditions that would cause the engine to run rich.
- A high A/F sensor voltage could be caused by a lean air-fuel mixture. Check for conditions that would cause the engine to run lean.

PROCEDURE

| | |
|-----------|--|
| 1. | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0171, P0172, P0174 OR P0175) |
|-----------|--|

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch on (IG) and turn the tester on.

(c) Select the following menu items: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.

(d) Read the DTCs.

Result:

| DISPLAY (DTC OUTPUT) | PROCEED TO |
|---|------------|
| P0171, P0172, P0174 or P0175 | A |
| P0171, P0172, P0174 or P0175 and other DTCs | B |

If any DTCs other than P0171, P0172, P0174 or P0175 are output, troubleshoot those DTCs first.

B  **GO TO DTC CHART**

A



| | |
|-----------|-----------------------------------|
| 2. | CHECK PCV HOSE CONNECTIONS |
|-----------|-----------------------------------|

OK:

PCV hose is connected correctly and is not damaged.

NG  **REPAIR OR REPLACE PCV HOSE**

OK



| | |
|-----------|-----------------------------------|
| 3. | CHECK AIR INDUCTION SYSTEM |
|-----------|-----------------------------------|

(a) Check the air induction system for vacuum leakage.

OK:

No leakage from the air induction system.

NG  **REPAIR OR REPLACE AIR INDUCTION SYSTEM**



