DTC P0171, P0172, P0174, or P0175

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DTC Descriptors

DTC P0171: Fuel Trim System Lean Bank 1

DTC P0172: Fuel Trim System Rich Bank 1

DTC P0174: Fuel Trim System Lean Bank 2

DTC P0175: Fuel Trim System Rich Bank 2

Circuit/System Description

The engine control module (ECM) controls the air/fuel metering system in order to provide the best possible combination of driveability, fuel economy, and emission control. Fuel delivery is controlled differently during Open Loop and Closed Loop (CL). During Open Loop, the ECM determines fuel delivery based on sensor signals without heated oxygen sensor (HO2S) input. During CL, the ECM adds HO2S inputs and level of purge to calculate the short and long term fuel trim (FT) adjustments. If the HO2S indicates a lean condition, the fuel trim values will be above 0 percent. If the HO2S indicates a rich condition, the FT values will be below 0 percent. The short term FT values change rapidly in response to the HO2S voltage signals. The long term FT makes coarse adjustments in order to maintain an optimum air/fuel ratio. A block of cells contain information arranged in combinations of engine RPM and engine load for a full range of vehicle operating conditions. The long term FT diagnostic is based on an average of cells currently being used. The ECM selects the cells based on the engine speed and load. The FT diagnostic will conduct a test to determine if a rich failure actually exists or if excessive vapor from the evaporative emission (EVAP) canister is causing a rich condition.

If the ECM detects an excessively lean condition, DTC P0171 or P0174 sets. If the ECM detects an excessively rich condition, DTC P0172 or P0175 sets.

Conditions for Running the DTC

- DTCs P0030, P0036, P0068, P0101, P0102, P0103, P0106, P0107, P0108, P0117, P0118, P0120, P0121, P0128, P0130, P0131, P0132, P0133, P0134, P0135, P0136, P0137, P0138, P0140, P0141, P0201-P0208, P0220, P0300, P0301-P0304, P0442, P0443, P0446, P0449, P0452, P0453, P0455, P0496, P1106, P1107, P1114, P1115, P1133, P1516, P2101, P2119, P2120, P2125, P2135, P2138, P2176 are not set.
- The engine is in Closed Loop status.
- The engine coolant temperature (ECT) is between -40 and +150°C (-40 and +302°F).

- The intake air temperature (IAT) is between -20 and +150°C (-4 and +302°F).
- The manifold absolute pressure (MAP) is between 10-255 kPa (1.45-37 psi).
- The vehicle speed is less than 134 km/h (83 mph).
- The engine speed is between 375-7,000 RPM.
- The mass air flow (MAF) is between 1-510 g/s.
- The barometric pressure (BARO) is more than 70 kPa (10.2 psi).
- The fuel level is more than 10 percent.
- This diagnostic runs continuously when the above conditions have been met.

Conditions for Setting the DTC

- The average long term FT weighted average value is more or less than a calibrated value.
- The above condition is present for approximately 3 minutes after the Conditions for Running the DTC have been met.

Action Taken When the DTC Sets

The ECM records the operating conditions at the time the diagnostic fails. The first time the diagnostic fails, the ECM stores this information in the Failure Records. If the diagnostic reports a failure on the second ignition cycle the ECM records the operating conditions at the time of the failure. The ECM writes the operating conditions to the Freeze Frame and updates the Failure Records. The ECM illuminates the malfunction indicator lamp (MIL) when one of the following occur:

- The ECM detects the same fuel trim failure during 2 consecutive trips.
- The ECM detects any fuel trim failure during any subsequent trip if the conditions at the time of failure meet the following criteria:
  - The engine load is within 20 percent of the previous test that failed.
  - The engine speed is within 375 RPM of the previous test that failed.
  - The engine coolant temperature is in the same range of the previous test that failed.

Conditions for Clearing the MIL/DTC

- The ECM turns OFF the malfunction indicator lamp (MIL) at the beginning of the fourth ignition cycle, after 3 ignition cycles that the diagnostic runs and does not fail.
- A current DTC, Last Test Failed, clears when the diagnostic runs and passes.
- A history DTC and related Freeze Frame data clears after 40 warm-up cycles, if no failures are reported by this or any other emission related diagnostic.
- Clear the MIL and the DTC with a scan tool.

Reference Information

Electrical Information Reference

- Circuit Testing

- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

- Disregard any transmission symptoms, antilock brake system (ABS) indicators, and traction control system (TCS) indicators until any fuel trim faults are repaired. A fuel trim fault may cause default actions such as harsh shifts and illumination of the ABS/TCS indicators.
- E85 compatible engine only--Over estimation of the ethanol content will result in a rich shift of fuel trim values, and under-estimation will result in a lean shift of fuel trim values. A fuel trim DTC may set if the learned alcohol content, Fuel Alcohol Content parameter on the scan tool, is different than the measured alcohol content in the vehicle such that fuel trim values exceed failure threshold values.
- Verify that other DTCs are not set.

  If any DTCs are set, refer to Diagnostic Trouble Code (DTC) List - Vehicle.
- Allow the engine to reach operating temperature. With the engine running, observe the HO2S parameter with a scan tool. The HO2S value should vary from approximately 40 mV to approximately 900 mV, and respond to fueling changes.

  If the value does not vary from approximately 40 mV to approximately 900 mV, refer to DTC P0131, P0132, P0137, or P0138 , DTC P0133, P0134, P0140, P1133, P2270, or P2271 , DTC P0153, P0154, P0160, P1153, P2272, or P2273 , or DTC P0153, P0154, P0160, P1153, P2272, or P2273.

Important: EVAP purge enablement may cause the FT to be momentarily outside the normal range.

- The normal Short Term FT parameter should be between +10 percent and -10 percent, with near 0 percent the optimum, with the engine running at operating temperature.
- The Long Term FT parameter should be between +10 percent and -10 percent, with near 0 percent the optimum, with the engine running at operating temperature.
- Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

Circuit/System Testing

P0171 or P0174

Allow the engine to reach operating temperature. With the engine running, observe the affected Long Term FT parameter with a scan tool. The reading should be between 0-19 percent.

If not within the specified range, inspect for the following:

- With the ignition ON and the engine OFF, observe the manifold absolute pressure (MAP) sensor parameter. The MAP sensor pressure should be within the range specified for your altitude. Refer to Altitude Versus Barometric Pressure.
  - Refer to DTC P0106 if the MAP sensor does not indicate the correct barometric pressure.
- With the engine idling, observe the mass air flow (MAF) sensor parameter. The MAF sensor parameter should be within 2-6 g/s at idle.
  - Refer to DTC P0101 or P1101 or DTC P0102 or P0103 if the MAF sensor parameter is not within 2-6 g/s at idle.
- Vacuum hoses for splits, kinks, and improper connections
- Insufficient fuel in the tank
- Low fuel pressure--Refer to Fuel System Diagnosis.
- Fuel contamination--Refer to Alcohol/Contaminants-in-Fuel Diagnosis.
- Malfunctioning fuel injectors--Refer to Fuel Injector Diagnosis.
- Missing, loose, or leaking exhaust components from the HO2S forward--Refer to Symptoms - Engine Exhaust.
- Vacuum leaks at the intake manifold, the throttle body, and the injector O-rings
- The air induction system and the air intake ducts for leaks or for a missing air filter element
- A cracked EVAP canister
- Evaporative pipes obstructed or leaking--Refer to Fuel Hose/Pipes Routing Diagram.
- The crankcase ventilation system for leaks
- The HO2S for improper installation and for electrical wires or connectors that may have contacted the exhaust system
- The HO2S signal circuit open, shorted to ground, or shorted to the low reference circuit
- Malfunctioning engine components--Refer to Symptoms - Engine Mechanical.

P0172 or P0175

Allow the engine to reach operating temperature. With the engine running, observe the affected Long Term FT parameter with a scan tool. The reading should be between -19 and 0 percent.

If not within the specified range, inspect for the following:

- With the engine idling and the transmission in the Park or Neutral position, observe the manifold absolute pressure (MAP) sensor parameter. The MAP sensor parameter should be between 19-42 kPa.
  - Refer to DTC P0106 if the MAP sensor parameter is not between 19-42 kPa.
- With the engine idling, observe the mass air flow (MAF) sensor parameter. The MAF sensor parameter should be within 2-6 g/s at idle.
  - Refer to DTC P0101 or P1101 or DTC P0102 or P0103 if the MAF sensor parameter is not within 2-6 g/s at idle.
- Vacuum hoses for splits, kinks, and improper connections
- The air intake duct for being collapsed or restricted
- The air filter for being dirty or restricted
- Objects blocking the throttle body
- Excessive fuel in the crankcase due to leaking fuel injectors