

Adaptive Fuel Diagnostic Trouble Code (DTC) Diagnostic Techniques

The Adaptive Fuel DTC Diagnostic Techniques help isolate the root cause of the adaptive fuel concern. Before proceeding, attempt to verify if any driveability concerns are present. These diagnostic aids are meant as a supplement to the pinpoint test steps in Section 5. For a description of fuel trim, refer to Section 1, [Powertrain Control Software](#), Fuel Trim.

Obtain Freeze Frame Data

Freeze frame data is helpful in duplicating and diagnosing adaptive fuel concerns. The data (a snapshot of certain PID values recorded at the time the DTC is stored in continuous memory) is helpful to determine how the vehicle was being driven when the concern occurred, and is especially useful on intermittent concerns. Freeze frame data, in many cases, helps isolate possible areas of concern as well as rule out others. Refer to [Freeze Frame Data](#) in this section for a more detailed description of this data.

Using the LONGFT1 and LONGFT2 (Dual Bank Engines) PIDs

The LONGFT1 and LONGFT2 PIDs are useful for diagnosing fuel trim concerns. A negative PID value indicates fuel is being reduced to compensate for a rich condition. A positive PID value indicates fuel is being increased to compensate for a lean condition. It is important to know there is a separate LONGFT value used for each RPM and load point of engine operation. When viewing the LONGFT1 and LONGFT2 PIDs, the values may change a great deal as the engine is operating at different RPM and load points. This is because the fuel system may have learned corrections for fuel delivery concerns that can change as a function of engine RPM and load. The LONGFT1 and LONGFT2 PIDs display the fuel trim currently being used at that RPM and load point. Observing the changes in LONGFT1 and LONGFT2 can help when diagnosing fuel system concerns. For example:

- A contaminated mass airflow (MAF) sensor results in matching LONGFT1 and LONGFT2 correction values that are negative at idle (reducing fuel), but positive (adding fuel) at higher RPM and loads.
- LONGFT1 values that differ greatly from LONGFT2 values rule out concerns that are common for both banks (for example, fuel pressure concerns, MAF sensor, etc. can be ruled out).
- Vacuum leaks result in large rich corrections (positive LONGFT1 and LONGFT2 values) at idle, but little or no correction at higher RPM and loads.
- A plugged fuel filter results in no correction at idle, but large rich corrections (positive LONGFT1 and LONGFT2 values) at high RPM and load.

Resetting Long Term Fuel Trims

Long term fuel trim corrections are reset by resetting the keep alive memory (KAM). Refer to [Resetting The Keep Alive Memory \(KAM\)](#) in this section. After making a fuel system repair, reset the KAM. For example, if dirty or plugged injectors cause the engine to run lean and generate rich long term corrections, installing new injectors and not resetting the KAM causes the engine to run very rich. The rich correction eventually leans out during closed loop operation, but the vehicle may have poor driveability and high carbon monoxide (CO) emissions while it is learning.

DTCs P0171 and P0174 System Too Lean Diagnostic Aids

Note: *If the system is lean at certain conditions, then the LONGFT PID would be a positive value at those conditions, indicating that increased fuel is needed.*

The ability to identify the type of lean condition causing the concern is crucial to diagnosis.

Air Measurement System

With this condition, the engine runs rich or lean of stoichiometry 14.7 to 1 (9 to 1 E100) air to fuel ratio, if the PCM is not able to compensate enough to correct for the condition.

For example, the MAF sensor measurement is inaccurate due to a corroded connector, contaminated or dirty connector. A contaminated MAF sensor typically results in a rich system at low airflows (PCM reduces fuel) and a lean system at high airflows (PCM increases fuel).

Vacuum Leaks and Unmetered Air