Understanding Long Term Fuel Trim - a hidden gem that will save you time and money


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Long term fuel trim (LTFT) is a powerful PID in the diagnostic data that is often overlooked or ignored by many technicians.

Here are 2 recent examples of the power of LTFT data that can make early diagnosis a much easier process.First we must understand the information this PID is giving us.

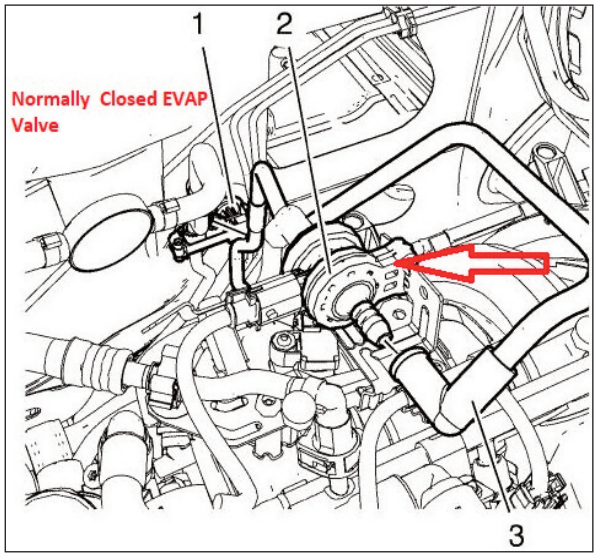
In the basic memory of the engine ECU, the Map is stored. Within this map is the basic correct fueling data.Sometimes this is referred to as the O2 block learn table.

The ECU refers to this table to determine correct fueling each time it starts.During the life of the engine, as components wear, the fueling requirements may require adjustment to compensate for this.

As the ECU monitors the upstream Lambda sensor, it decides if the signal is drifting towards the rich or lean state over a period of time. It can then alter the LTFT figure to shift the basic MAP leaner or richer, according to the engines requirements for correct fueling. This can be monitored as a percentage of plus or minus in the LTFT PID.

As a general rule, a figure of up to 5% is considered not to be a problem. Anything beyond this is a warning of a fault.

Case studies on the benefits of using LTFT as a diagnostic tool



The EVAP Valve in the Astra, at arrow, is normally closed

Case 1: 2010 Astra J Z16XE - MIL illuminating on occasion

The customer complaint was that the MIL would come on intermittently. Their local garage had been chasing a lean P0172 code for some time. They had replaced several components suspected of causing this error, but the fault remained.

The MAF sensor had been replaced, as was the upstream Lambda/O2 sensor and the catalytic convertor.

Finally, I was called for a second opinion on the issue, It was the LTFT that gave the clues to what the issue was.

At +32% at idle, it was obvious the ECM was trying to increase fueling to overcome a lean state, The intake was smoke tested for leaks, but none were found.

The data looked good for all temperature and load info. Fuel pressure and flow were checked, but they were still within specs.

Then when the EVAP system was blocked off, the LTFT dropped instantly to +1%.

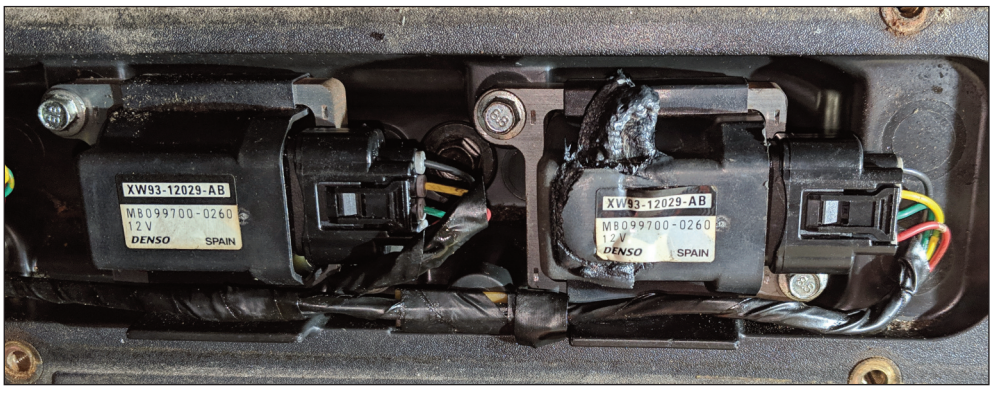
That was it…The purge control solenoid was found to be permanently open, allowing excessive air into the air inlet system of the car and making the engine run always lean.

Case 2: 1999 Jaguar XJ8 3.2 - misfiring cylinder

This Jaguar was running unstable at idle, with an undefined ignition primary/ secondary fault. It was definitely misfiring, but the garage was unsure how to determine which coil, or coils, to replace without going through all eight ignition coils.

I instructed the garage to make a quick check of the LTFT figures. As this was a V8 engine, there were 2 banks to investigate. The data showed that bank 1 was running with a LTFT figure of +7%, adding fuel to compensate for the excess oxygen from a misfire. Bank 2 was at 0%, perfect mixture control.

This narrowed down the diagnosis time to only the right hand bank, halving the test time straight away.



Just one look at the failed coil, on the right, confirmed the diagnosis

Current testing the RH bank of coils identified a coil shorted on the primary side. As the customer did mention the fuse for the ignition coils did occasionally blow, the fault was found and the coil replaced.

LTFT on the RH bank returned to 0% as soon as the vehicle got up to normal operating temperature.

A key to success is remembering that understanding and using LTFT as a diagnostic tool can save much time during the diagnosis.