6.7L POWERSTROKE

ENGINE PERFORMANCE & EMISSIONS

ATG Automotive Training Group
Your Return on Investment Starts Tomorrow.

ATG's new 6.7L Powerstroke seminar is the latest in our Domestic Diesel series, and continues the tradition of collecting best practices and diagnostics tips from high volume specialists around the nation. As always, we've combined this research with our 'High Level Indicator' philosophy to develop simple tests to rule out entire categories of faults, resulting in the shortest possible cause list and a plan for quickly eliminating what remains. This is effective in our gasoline engine seminars, but is even more important for diesels because most procedures require more disassembly, and incorrectly diagnosed faults cost a lot more.

SEMINAR HIGHLIGHTS

This document doesn't list every component and system we cover. Rather, it summarizes some of the systems that cause the most headaches in the field.

EMISSIONS SYSTEMS COVERAGE

6.7L Powerstroke emissions systems don't have 'stuck' code and message problems as in the Cummins & Duramax systems, but there are still plenty of tough codes and diagnostic challenges, including:

- *DPF loading & regeneration issues due to EGT intake leaks*
- *DPF & SCR codes due to EGT sensor faults*
- *Non-sequential EGT numbering (some models)*
- *Fuel System Failures causing false DPF codes*
- *The role of VGT in EGR flow*
- *Finding clogs in the unmonitored DOC*
- *DEF injector, heater & related GPCM faults*

ENGINE MECHANICAL

Besides the earliest engines, the 6.7L Powerstroke is reliable, but problems still occur, and diagnosis can be time consuming. Furthermore, it's hard to get paid for teardown for testing and verification because most serious faults result in long block replacement, not a repair of existing components. Topics include:

- *Collapsed lifters*
- *Exhaust valve failures (early applications)*
- *Glow plug-based damage (early applications)*
- *Injector seal faults acting like engine damage*
- *Common oil & coolant leaks*

LOW & HIGH PRESSURE FUEL SYSTEMS

Diagnosis of low and high pressure systems in the 6.7L Powerstroke is less complicated than on other diesels, but that's only because there are less places to tap into each system for testing. Worse yet, Ford has followed many other manufacturers by creating flow charts that simply list the possible components and systems that need to be checked, creating a huge workload for ay technician tackling these-labor intensive engines. Important fuel system topics include:

- *Determining how much damage fuel contamination has caused (DEF or water)*
- *Quickly finding high pressure system mechanical damage*
- *Disabling injectors for relative compression testing*
- *Disabling fuel injector balance rates to unmask weak cylinders*
- *Efficiently differentiating between real high pressure faults and low pressure starvation of the high pressure pump*

ENGINE BREATHING CODE EXAMPLE

The following pages show a common Powerstroke code – the P2073 for a correlation problem between the MAF/MAP and throttle position. The code really means that the calculated MAF value and the actual MAF PID are not the same. As you'll see (and may have experienced), the flow chart will only find some of the possible causes:

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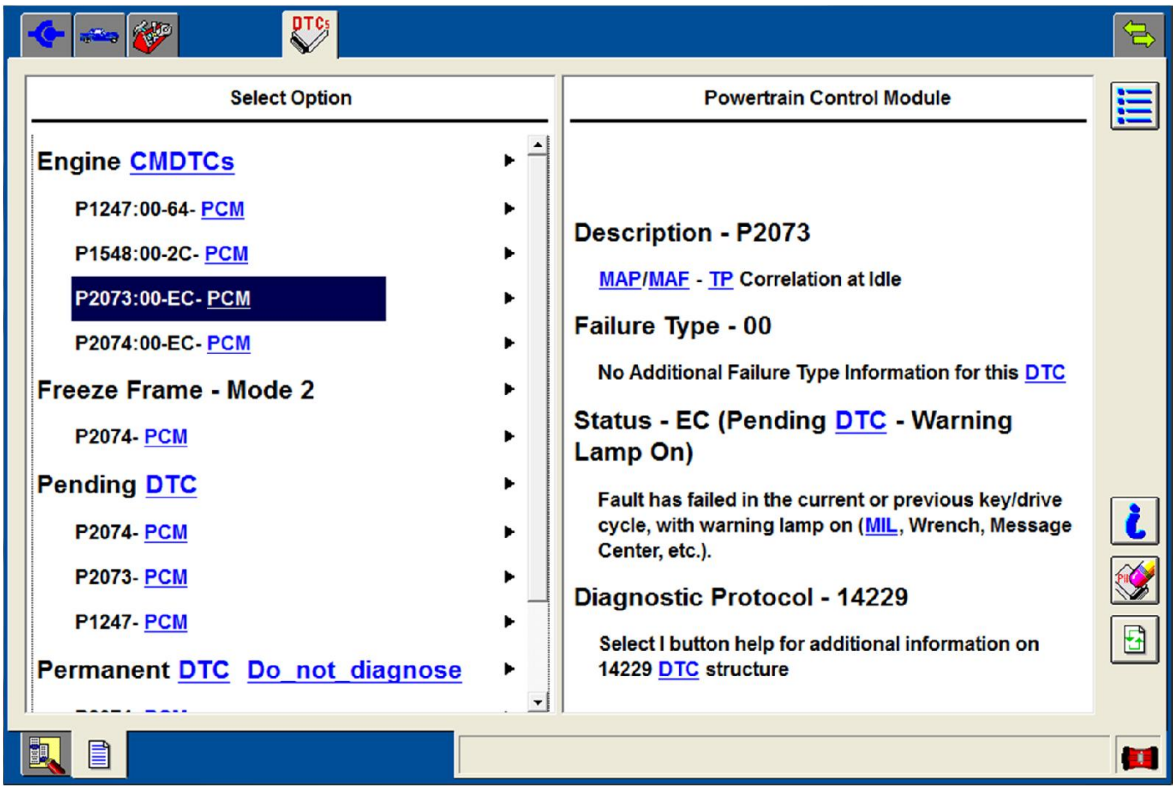
Intake Air Measurement

The Four Year MIL Case Study

A high mileage, but well cared for, F250 came in with a complaint of low power. The technician noticed that the MIL was on and asked the customer how long it had been on. The customer stated that it had been on for four years, although the loss of power was gradual and more recent. The IDS capture below shows four codes, with three of them also setting as Pending codes, meaning they failed recently (during the last trip).

Lots of Good Clues



We have already described our favorite breathing codes, the P2073 and P2074. P1247 sets for low boost pressure, and P1548 sets for an air filter restriction. There's no air filter restriction sensor, so the P1548 sets using similar logic to the P2073 and P2074, and is based primarily on the MAF sensor.

First Step

Based on experience and this combination of codes, the technician first checked the air filter. It looked clean, but was an aftermarket (K&N) filter and housing. This appeared to be the only modification on the vehicle, and seemed to be properly mounted and in good shape.

Stop!

There are a number of good tests later in this section for low boost, and a long list of possible causes could be built for this combination of codes. The technician could have spent hours verifying VGT and wastegate operation, checked for exhaust restrictions, and smoked the intake and ducting for leaks. However, it's a lot easier to just ask the customer when the K&N filter was installed.

"Four years ago." The MIL has been on since the aftermarket filter was installed. Huh.

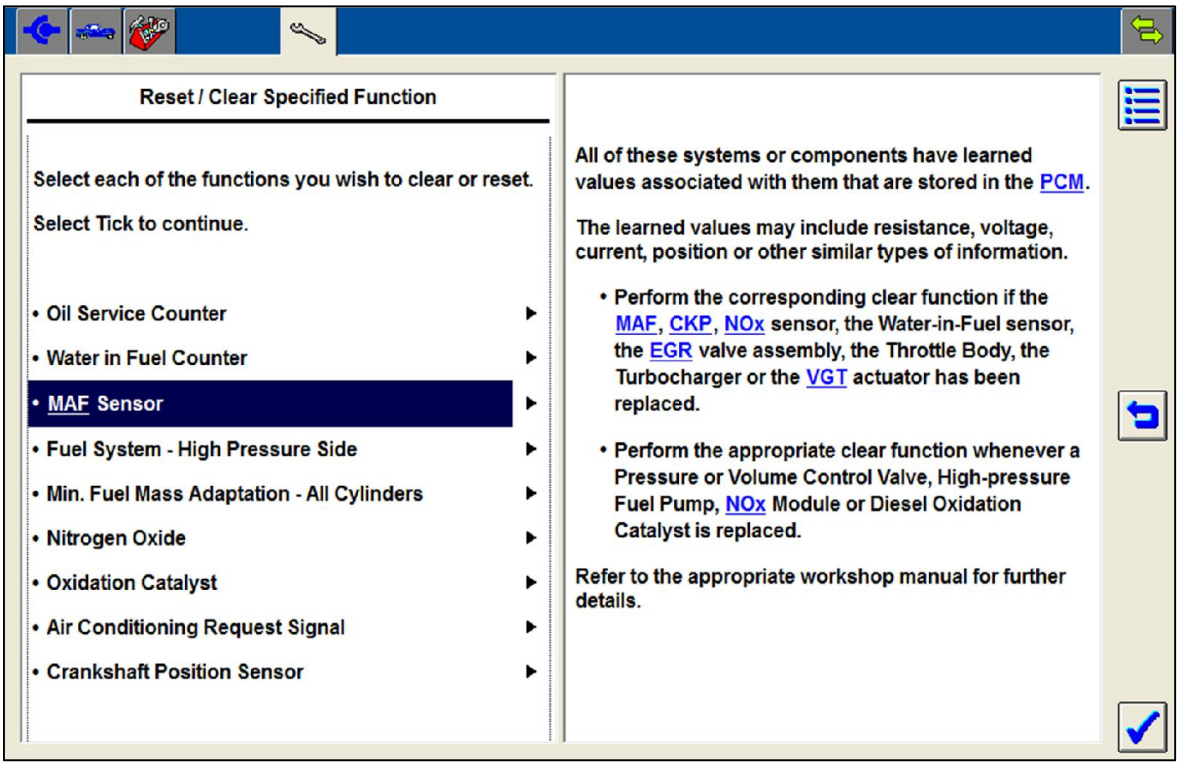
Intake Air Measurement

The Four Year MIL Case Study – Continued

Anyone for a MAF Reset?

Given that the low boost has been progressive and more recent, it's unlikely that resetting the MAF will fix the low boost codes. However, it's silly to continue diagnosing the drivability complaint when it's already clear that there are unresolved breathing codes. The capture below shows the reset function being performed using the IDS Scan Tool.

MAF Sensor Reset



Resolution

The truck was taken on a test drive after the MAF Reset (and codes were cleared). Surprisingly, not only did none of the codes reset, but the power was restored as well! Hours of testing were avoided. The Scan Tool revealed that only permanent codes remain. These codes will clear themselves over time, so they really mean "hasn't passed or failed yet." In the end, there was nothing wrong with the K&N filter, the installation, the MAF or MAP sensors or the throttle plate, and there were no leaks or restrictions.

In fact, the flow chart would never have repaired this vehicle. Only an understanding of the sensitive nature of the PCM's MAF expectations could result in a fix. Any change in the intake system requires a MAF Reset, even if there was nothing wrong before or after the change.