

Tuning Fuel Injected Harley's with the Power Commander PC-III-USB Part one

By Dave Bickford aka 'ultraboy'

If you read the article "Introduction to Harley-Davidson® Electronic Sequential Port Fuel Injection (ESPFI)" you'll remember that I mentioned we would be discussing tuning of the system using the Power Commander in a future article, so without further introduction, let's get started.

First of all, this article will deal with the Dyno-Jet Power Commander, PC-III-USB unit. These units all use Maps with a .djm file name extension. These Maps can be downloaded at no charge from the Power Commander web site

www.powercommander.com

I won't attempt to go through installation of the PC-3-usb on your bike, as Power Commander has excellent instructions covering installation. I do have to point out that the Softail and Dyna Power Commanders are the exact same device, and use the same maps. The part number difference between them is because the Softail PC-3 unit comes with a new, deeper ECU tray, which is not needed for the Dyna. While we are talking about those differences, note that Softail Maps are numbered M805-XXX, and Dyna Maps are M810-XXX. Either of these map series can be used on a Softail or 04 – 05 Dyna. The 2006 Dyna's use M811-XXX series maps.

The PC-3-usb exists to overcome the EPA mandated "leanness" found in stock Harley's, and to optimize air/fuel ratios and timing on stock or modified bikes, without having to have your bike's ECU "flashed" every time you make changes or modifications. A PC-3 with a map for a completely stock bike with no other changes, will give you more HP and torque that you will easily be able to detect in the seat of your pants. The PC-3-usb is a 'plug and play' device which requires no wiring changes and sits between the bikes ECU and the outside world, thus 'intercepting' commands issued by the ECU and either adding or subtracting fuel and timing pulses to the injectors and ignition system. Some folks will say that the PC-3-usb unit is not load based, which is, of course, not true. The bikes ECU and it's connected sensors, as we discussed in the Introduction article last time, clearly show that the system itself is load based.

O2 sensor equipped Bikes:

On some 2006 model bikes, O2 sensors in the pipes came as standard equipment. Power Commander has written maps for these bikes, but “O2 eliminators” are required.

Why would you want to get rid of the O2 sensors, you ask? A brief explanation of what an O2 sensor is, and how it operates is in order here.

An Oxygen sensor is a chemical generator. It is constantly making a comparison between the Oxygen inside the exhaust system and air outside the engine. A Zirconium stabilized yttrium oxide ceramic shell is coated with a layer of platinum. When the nose is heated the platinum will begin to react with the exhaust gasses and a voltage potential will form between the inner and outer layers. The sensor does not begin to generate its full output until it reaches about 600 degrees F. Prior to this time the sensor is not conductive. The O2 sensors used in Harley's are four-wire narrow band sensors, which have a voltage output usually between 0 and 1.1 volts. A rich mixture will leave very little free oxygen and the reaction will send out a voltage greater than 0.45 volts. If the engine is running lean, all fuel is burned, and the extra oxygen leaves the cylinder and flows into the exhaust. In this case, the sensor voltage goes lower than 0.45 volts. Usually the output range seen is 0.2 to 0.7 volts. The mid point is about 0.45 volts, which is neither rich nor lean. A fully warm O2 sensor will not spend any time at 0.45 volts. The O2 sensor is constantly in a state of transition between high and low voltage. Manufacturers call this crossing of the 0.45 volt mark ‘O2 cross counts.’ The higher the number of O2 cross counts, the better the sensor and other parts of the computer control system are working. It is important to remember that the O2 sensor is comparing the amount of oxygen inside and outside the engine. If the outside of the sensor should become blocked, or coated with oil, this comparison is not possible. Also if the exhaust side of the sensor has been contaminated by using leaded fuels or gasket sealers, which are not specifically identified as being approved for use with oxygen sensors, the sensor can be permanently damaged.

When the bike is operated at engine speeds between 2500 and 3500 rpm at road speeds in the 40 to 60 mph range under a steady light load (no down grades or steep

upgrades, not decelerating or accelerating) for 30 or so seconds then, and only then, are you operating in “closed-loop” mode, and the O2 sensor inputs will cause a change to the ECU Map programming to attempt to obtain an A/F ratio at or near stoichiometric, or approximately 14.7 parts air to one part fuel. At all other times, the system is in “Open-loop” and the O2 sensors are not being used. With the power Commander, it is easy to program your own ‘cruise mode’ map, so elimination of the O2 sensors on these bikes should not be cause for concern. Perhaps in the future, a true, full time self-tuning ‘closed-loop’ system will be available, but we’re not quite there yet for ‘stock’ bikes.

To fully utilize the features of the PC-3-USB, a computer is required, preferably a laptop, or even a desktop in close proximity to the bike. The PC-3-USB comes with a 2-meter (6 foot) cable, allowing you to connect the device to a standard USB port on your computer. Longer length cables (USB to mini B) can be purchased at an office supply, or computer store, but the maximum length is 3 meters, or about 15 feet, without purchasing an “extender” device. While the PC-3-USB can be removed from the bike and programmed using the supplied 9V battery adaptor at your desk top computer, you won’t be able to check and set your throttle position with the unit off the bike. This is important, as improper Throttle Position set-up is the most common problem I see when troubleshooting a poorly running F.I. bike.

The Power Commander can also be programmed by using the three buttons on the face plate of the device, but this method is time consuming, and will not get you as close as a computer will. Changes made using the Face Plate buttons can only be viewed using a computer and the control center software, under the Tab ‘View’ – ‘Power Commander Info.’ There, you can see how far the buttons have been changed per range, as 2%, 4%, 6%, etc.

Selecting a Map for your combination.

Dyno Jet has made literally thousands of real-time dynamometer runs on bikes with various combinations of both Harley® and aftermarket pipes, air cleaners, engine displacements, cams, and the like, so selecting a Map for your combination is simply a matter of browsing the web site and selecting one that is closest to your selected

combination. In many cases, when someone asks which pipes and air cleaner to select, and the bike is Injected, I'll recommend that they look at the various pre-mapped combinations on the Power Commander website, and select parts from an existing Map's comment section.

If there is no "exact match" then try to select one that is closest to you by pipe length and diameter. On air cleaners, if you have, for example, a Ness "Big Sucker" and the map you are looking at is for a "Screamin Eagle" air cleaner, that's probably as close as you are going to get, and should be fine. Additionally, you can call or email Power Commander for a Map recommendation for your specific combination. Like many others, I have found them to be extremely helpful in responding to any request. Power Commander makes a great product, and their commitment to customer service reflects that.

This article, as well as a follow on article next time, are going to deal with Power Commander users who have decided either not to utilize the services of one of Dyno-Jet's many authorized Tuning centers for one reason or another, and choose to either roll their own, OR those folks who want to refine an existing Map, be it a "canned" one from Power Commander, or one that was custom written for your bike and combination of parts. As of this writing, there are about 350 Dynojet Approved Power Commander Tuning Centers in the U.S. who can optimize your fuel map, or develop a custom fuel map for any specification on their Dynamometer.

These Approved Centers have the latest Model 250 Dynamometer with the real-time air/fuel module, and have completed a special training course at Dynojet. For someone who has made all the changes they plan on, this is the easiest, and perhaps the best way to go, as you will have a map designed just for your bike and combination. There are cases where you may want to refine your custom map, though, and that's where we're going to take you in the next installment.

Till then, keep the shiny side up, ride safe, ride free, and enjoy the ride!

Later,

Ultra