

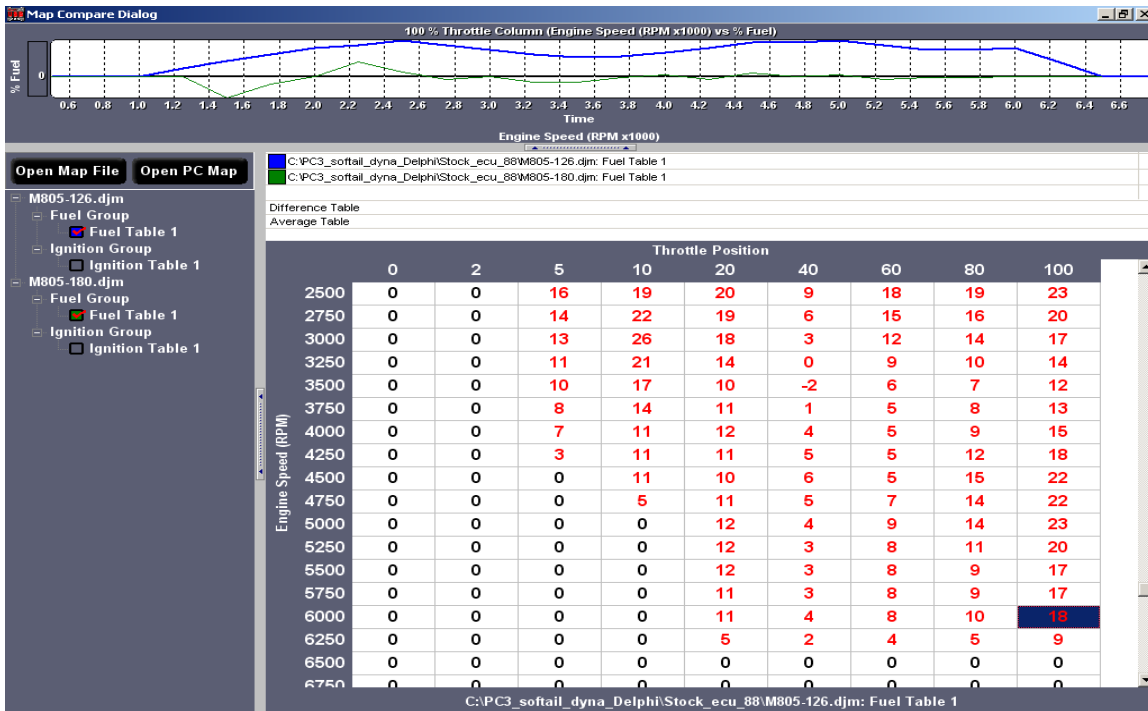
Tuning F.I. Harley's with the PC-III-USB. Part 2

By Dave Bickford aka "ultraboy"

Hopefully, you've read the F.I. Intro Article, and the Part one PC tuning article last time, and are now ready to do some actual tuning, so let's get started!

Select a Map: Ok, so you have your PC-3-USB installed, and you are ready to select a map and load it into your PC-3. As an example, we're going to select a 2004 Softail, with a "stock" ECU, and 88 cubic-inch displacement Twin-Cam. We have just installed a set of V&H "Big Shot Staggered" pipes (with baffles) and a Ness "Big Sucker" air cleaner. The first thing we want to do is go to the Power Commander web site, and look at those maps for TC-88, Softail (or Dyna) and stock ECU. (The M805 or M810 series of maps.) Now, I've got to 'inject' the importance of knowing what configuration your ECU is. Many times, folks will find their exact combo, and load that map, only to have a bike that runs poorly, because they loaded a map for the wrong "Stage" of their ECU. If your ECU is stock, use only "Stock" maps, same for "Stage-1 and Stage-2" maps. The Map databases are divided into three ECU sections, Stock, Stage-1 and Stage-2. If you don't know, or are unsure what your ECU is, you'll need to find out, either by going to the dealer, or by using a device like the Daytona Twin Scan which can read the "ECU Cal" number. Armed with that number, and a list of the HD stage flashes, you'll be able to find out where you are.

OK, in looking over the available maps, we see M805-126. The map comments section shows Vance and Hines staggered Big Shots with baffles (V&H part #17907) Screamin Eagle air filter and Stock ECM. Looks perfect, but let's look further. M805-180 looks like it's perfect as well. Map # 126 says it's for 01-02, and # 180 says 2004 model. Which one to use? With the Power Commander Control Center software loaded and running, click on 'Tools.' The first selection in the drop down menu is 'Map Compare.' Click on that to go to the "Map Compare" screen. From there, click on 'Open Map File' and select M805-126. Click on 'Open Map File' again, and select M805-180. Click on both maps 'Fuel Table 1' boxes. Now click the 100% Throttle Position, at 6000 RPM. The screen should look like this:



The Blue fuel curve line represents the M805-126 Map, and the green line is the M805-180 Map. Map 126 looks like it's much richer across the board.

What's the reason for the difference in these two maps, which are listed for the same combination of parts? Good question, one that has a couple of answers. First, there was a slight change in the ECU's in 2003, and secondly, the Dyno runs used to develop these two maps were done on different bikes, different days, different operators, and different conditions. The reason I wanted to show you this is two-fold. One, no two bikes are ever exactly alike, and two, depending on conditions, and operator mind set, or even rear tire pressure, no two dyno runs are ever the same. Which one to use? Try them both, which is what I did on two bikes, both Softails, one a 2002 and one a 2005, both with the same V&H pipes and same air cleaner, stock TC-88's, stock ECU's. Results? Both bikes had better seat of the pants feel and better mileage with the seemingly leaner of the two maps, M805-126. Plugs looked great with the 126 map, and only a tad rich on the 180 map. Neither of these bikes went on the Dyno to verify A/F ratios or compare HP/TQ readings, only real world testing. Remember that all stock Harley maps are EPA lean. The power commander corrects that, as well as adding fuel for free flowing exhaust and intake modifications. In the Map compare screen, you can actually load three different

maps at once, but you can only look at two curves at the same time. Note also that on the above screen, the numbers are the actual numbers for the selected map. We have Map 126 selected, so the 3000 RPM, 40% TP “cell” actually has a “3” in it. If you highlight the 180 map, just above “Average and Difference” you’ll see that 180 has a “-1” in that cell. Now click on “Average” and the cell changes to 1. (The average of -1 and +3 is 1) Click on “Difference” and the cell changes to 4. (Minus 1 to +3 is 4 steps) Using Map Compare is a good way to combine two maps. You can ‘cut and paste’ from the Map Compare screen into a ‘zero map’ screen and create your own Map.

OK, let’s exit out of the Map Compare screen, and return to the main program, having decided to use Map M805-126 on your bike. With M805-126 loaded on the laptop, connect the USB cable from the laptop to the PC-3. Turn the ignition on, and start/run switch to run. You should see green lights on the PC-3 faceplate. If these lights go out in a few seconds, which happens on late models, you’ll have to connect the 9V adapter as well as have the ignition on. Click on ‘Send Map’ The Map is sent to the power commander, and a successful message is displayed.

PC-3-USB Control Center (Laptop) Software:

The latest version is 3.1.3 and is available for free download from the PC website. This version allows access to the Rev-Extend and Start Fuel enhancements.

Check and set throttle position:

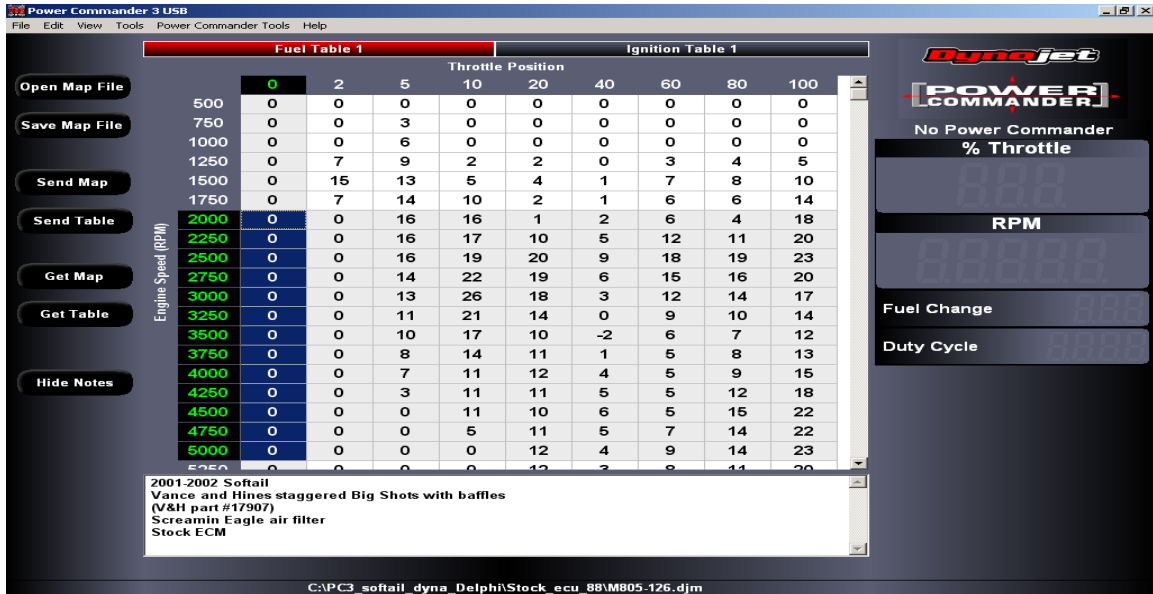
With the bike running, PC and laptop connected and communicating, hit ‘Ctrl – T’ on the keyboard. The TP and RPM cell that the PC is currently using is highlighted in yellow. If your bike is idling at, let’s say 1000 RPM, and the throttle is closed, the yellow highlight box better be at those coordinates on the map! If it’s not, or you want to make sure, click on ‘Power Commander Tools’ ‘Set Throttle Position’ and follow those steps. Once set, you should be able to open the throttle, and the yellow highlighted box will move from cell to cell, as RPM and throttle position change. A properly set TP insures that what the power commander is doing is being done at the correct TP. The yellow highlighted box can also be useful in correcting a certain RPM/TP stumble, which many times can occur at the same point regardless of load. When making these map changes, your bike is just sitting there, so it’s a good idea to have a large box fan blowing some cooling air over the motor, if your map modifications are going to take more than a few minutes.

Changing a Map for specific conditions or anomalies:

The Power Commander can add or subtract fuel in any given cell on the map, same with timing. Let's say you're having a surge or stumble at a certain TP, RPM and load condition. The best thing you can do is (much easier if you have a Tach) mark your throttle grip with tape at 0, 10, 20, 40, 60, 80, and 100% throttle positions. (2% and 5% are so close together; it's not worth marking) With the laptop connected, and software up and running (bike does not need to be running) you can mark 0% and 100% TP, then just watch your TP display on the laptop, twist the throttle, and mark the rest accordingly. On your next ride, make a mental note of what load, RPM and TP exhibits the problem, and you'll know where to start adding or subtracting fuel and or timing. Remember to "blend" the numbers around your problem area.

Decel Popping:

One thing that seems to be common on F.I. Harley's with aftermarket pipes is a popping on deceleration. Annoying to some, embarrassing to others, it's mostly caused by a mixture that is too lean to ignite in the combustion chamber, but rich enough to ignite and "pop-pop-pop" in the hot pipes when the throttle is closed. Deceleration is one of an engines "dirtiest" times of operation, where the engine is in transition from higher RPM and throttle positions to a closed throttle, and decreasing RPM. To solve the popping issue we may need to starve it, flood it, and/or add timing. No matter what rpm range your popping occurs at, the fuel is added or subtracted at 0% TP. Now if it's a muffled popping, its too rich; if you have a loud crack popping, its too lean. To adjust, first make a note of what kind of popping you have, and where the popping is occurring. Let's say from 4000 down to 2000 RPM. So at the 2000 to 4000 rpm range at 0% TP, add more fuel if its a loud crack and take fuel away if it is a muffled pop. Don't be afraid to add or subtract up to 50 units, as there is no rhyme or reason as to which method will work for your combo. Open your map, and highlight all the cells from 2000 RPM up to 4000 (or more) in the 0% throttle position column. Most maps have a "zero" in these cells. Your screen should look like this with these cells highlighted:



Now, hit 'Page up' or 'Page Down' to increase or decrease fuel in the highlighted boxes as needed. Send that map to the PC, and go for a ride to test your changes. As I said, you may need to experiment a bit, as I've seen anything from -50 (minus 50) to +50 required to eliminate the popping. On some bikes, adding some timing in the same area, say +3, in addition to fuel, has been required as well.

Accelerator Pump feature:

This enhancement to the Power Commander's ever-expanding list of features was added to assist with any perceived throttle response anomalies. You can access this feature by downloading the free file 'AccellPumpEnable.exe' from www.powercommander.com. Complete instructions on how to install and adjust the Accelerator pump feature are contained in the PDF file, 'AcceleratorPump.pdf' which is also available on the PC website. You can adjust three parameters:

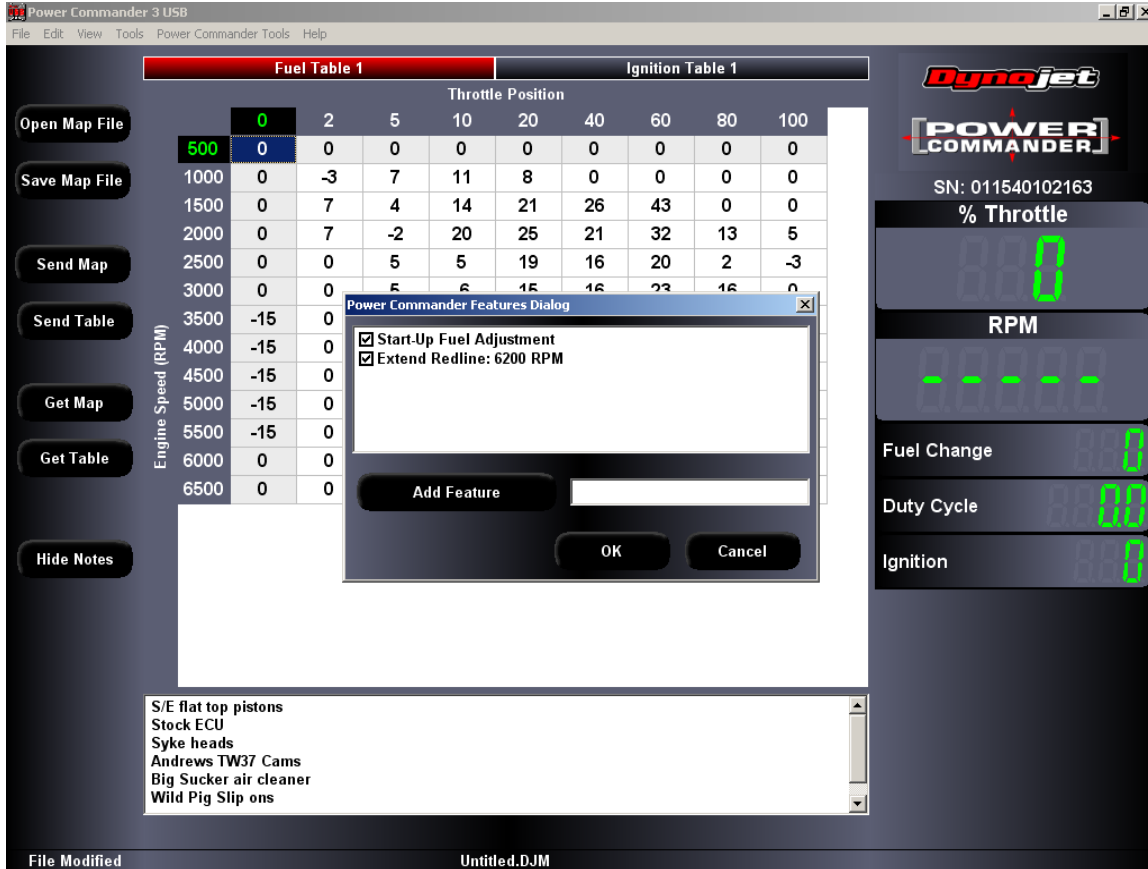
1. Sensitivity. A slide bar adjusts the speed at which the throttle must be opened to activate the accelerator pump. (If you'll recall the F.I. intro article, we talked about the TP sensor and its abilities to sense not only where it is, but also if it's opening or closing, AND how fast it's opening or closing) The more sensitive you make this setting, the slower the throttle movement will be required to trigger the pump. For example, a sensitivity setting of 90% would not require a very fast throttle movement to activate the pump.

2. Fuel Increase. Use this slider bar to select how much extra fuel (in percent) is added to the pump shot. You can equate this to some carburetors that have a fixed or adjustable pump shot, although the “shot” is usually expressed in cc’s. For a street ridden bike, something in the order of 15% might be a good starting point. Like anything else, too much is worse than too little. Unlike a carburetor, this is another area where the PC proves itself to be superior to other devices on the market, as the fuel increase can also be a decrease, if you think you’re already rich, you can make this setting a negative number!
3. Number of Engine Revolutions. Here, you select how many revolutions you want the accelerator pump to be active. Normally, you’ll only need a few, such as 20.

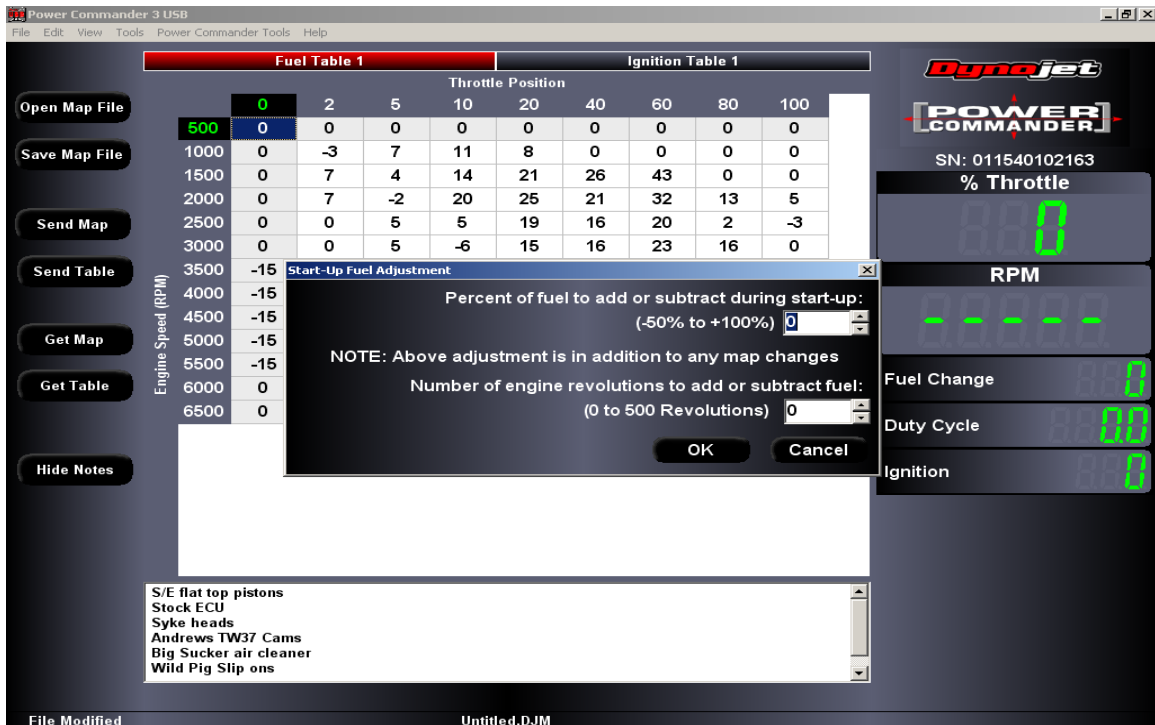
All three parameters of this feature have such a wide range of adjustability that you will have to experiment with the different settings to find what suits you. Some suggestions for a street ridden bike might be: 90% Sensitivity; 15% Fuel increase; 20 Engine revolutions.

Rev-Extend. This was a long awaited feature for those who have a stock ECU. Once enabled, it raises the rev limit to 6200 RPM. This feature can be enabled on Power Commander III USB units with part #801-511, 802-511, 805-511, 807-511, 810-511, and 811-511. V-Rods are excluded. One of the reasons for your buying a Power Commander may have been to not have to pay the dealer for a “Stage-x” ECU flash. Unfortunately, before PC came out with this feature, you were stuck with the stock ECU’s Rev-limit. That stock rev limit, 5800 RPM in most cases, was fine for a stock motor, but once you jump in and start modifying your bike, you’ll quickly grow tired of banging that limit. Believe me, when your bike hits the limiter, fuel and ignition are cut off, and the resultant quick loss of power is a real eye-opener. Enabling this feature requires that your PC-3-USB unit be serial number 060201000001 or higher, or the unit be re-programmed with a firmware update. To get the firmware update, there are a couple of choices. One, you can remove the unit from your bike, and send it back to PC, where for a nominal charge, they will update the unit. Two, you have the option of purchasing a firmware programmer and the necessary software which will allow you to update an unlimited number of units. This package is part #HDREV and can be purchased from Power Commander. There are other options that may be available from an authorized Dyno-Jet tuning Center, most of which

have purchased the #HDREV firmware programmer. As mentioned earlier, you'll have to update your laptop software to Version 3.1.3. With the software communicating to the PC-3, hit 'Ctrl-F'. This brings up the required window.



Start Fuel: Coming in the same package with Rev-extend, is another great feature called Start Fuel. This feature gives you the ability to richen or lean the fuel mixture during start-up, without affecting the base map. Normally this would only be used on highly modified engines that have a hard time starting when cold. On my 95" Andrews-cammed engine, I always had what seemed to be a rich pop or bang when cold starting. I found that leaning it 10% for 150 RPM was just the ticket for smoother starts. This feature is also accessed by hitting 'Ctrl-F', first to enable the start fuel, and then going to 'Power Commander Tools' – 'Start up fuel.' A dialog box will pop up allowing you to set the start fuel parameters. Looks like this:



Promote map to advanced: This feature is used to create a different map for front and rear cylinders, both timing and fuel curves. Normally this is done on a dyno with an O2 sniffer in each pipe, where exact fuel curves can be derived from actual Air Fuel ratio data.

Fine Tuning: Fine tuning your F.I. Harley after engine modifications without a Dyno, requires the same amount of care as jetting a carburetor. You have to do the throttle chops and read your plugs just like any other engine. The difference is you don't have to smell dripping gas, or fumble with jets, shims, and the like when making your adjustments. Just make a note of what you want to do, hook up the laptop, edit the map and save your changes. With map resolution maximized, you've got some 225 "jets" you can adjust, along with a like number of ignition cells.

Rich or Lean?:

Let's assume you know how to read plugs. There are many references available on plug condition reading, which will let you know exactly where you are regarding ignition, mixture, engine condition, and on. Look at it this way, what ever happens in the combustion chamber, is written like a book on the spark plug, and its threads, so let's look into some additional conditions that will give a clue as to how you're running.

Lean running symptoms:

1. Bike hesitates when throttle is increased
2. Engine detonates (knocks) when accelerating
3. Bike runs jerky or surges at steady throttle
4. Engine spits back or coughs through intake
5. Bike runs poorly when cold, runs better as it warms up
6. Exhaust pipe deposits are light gray
7. Fuel consumption low
8. Spark plugs are white

Rich Running Symptoms:

1. Bike emits black exhaust smoke (Note that a little black exhaust smoke is normal when accelerating hard, or operating a cold engine)
2. Engine blubbers when throttle is increased
3. Engine fouls plugs
4. Bike runs well when cold, runs worse as it warms up
5. Exhaust pipe deposits are dark, or black
6. Spark plugs black
7. Engine blubbers at steady throttle
8. Fuel consumption high

Take mental notes of these conditions, make the appropriate corrections to your map, and ride! Once you have your bike running right, put the laptop away. It's just like jetting a carburetor, when you're done you're done.

Some Power Commander Myths:

Let's face it; bikers are no different than anyone else as far as opinions go, so there are plenty of negative opinions and rumors running around about the Power Commander.

Here are some of my favorites:

1. A power commander will void your warranty. Well, it might and it might not. Take a look at the PC website, under "Authorized Tuning Centers" many of them are Harley dealers who not only sell and install them, but dyno-tune as well. I can tell you they won't be voiding any warranty.

2. The power commander will “blow” your computer. This one’s just flat not true. The Power Commander sits between your ECU and the engine, wired up solidly with factory style connectors. Inputs from the engine sensors are passed straight through, and outputs from the ECU are modified as programmed by the map you loaded. In checking several dealer resources, I can find no documented case where a power commander did anything to any bike’s ECU. Remember that once the PC is removed, the bike is instantly returned to stock ECU operation.
3. A Power Commander is not load based. I hear this one all too often. If you believe this one, go back to the J&P web site and re-read the Introduction to Harley F.I. article. The Delphi system itself is not only load based, it’s atmospheric based too, and TP, and RPM, and
4. The Power Commander is not as good as some FI tuning systems. That’s correct, but only in one case. The power commander is not as “good” as the Screamin Eagle Race Tuner, or SERT. See # 5 below for more on that. That said, the Power Commander is the best choice for 99% of F.I. Harley riders, period.
5. My dealer wants me to buy a SERT instead of anything else. Sure he does, but do you, or anyone you know, or the dealer for that matter, know how to use it? The bottom line is that, yes, the SERT is the best available tuning device out there, but it was made for Race Teams, who are always (read constantly) making changes for a wide variety of ever-changing track conditions, engine operating parameters, and other modifications, appropriate to a full-blown Race Team, not for those of us out there who just want to ride a bike that performs decently, is reliable and gets decent mileage. That’s where the Power Commander sits, easy to use, fantastic Tech support, a multitude of available canned maps to choose from, and a system that has proven itself to be reliable. Like that man says, ‘set it and forget it.’

That’s it for now, with the summer riding season upon us, let’s all take the extra care, and be safe, have fun, and get out and ride!

Later, Ultra