

Optimizing an EFI-equipped H-D

Zippers serves up a drama-free upgrade

Here's the scenario: you own an EFI-equipped bike that's stock for the most part. Maybe you've installed a Stage 1 kit, maybe you've snuck on a pair of slip-ons or a nice intake/air cleaner and have gotten away without updating your ECM. Maybe your stock engine is running hot or hesitates a bit. Whatever the situation, you feel your machine can run better: smoother, cooler, more responsive, but you don't want to spring for

big dollars to beef up your engine or pay for a series of dyno pulls.

Zippers to the rescue! The pros at Zippers have come up with a neat and easy way to get your machine running better, without a lot of drama or invasive engine surgery; enter ThunderMax with Auto-Tune. As Zippers states, the benefits of this upgrade are:

1. Increased horsepower, torque, and fuel economy

2. No dyno is required to tune

3. It adapts to aftermarket upgrades: exhaust and intake mods, large throttle bodies, cams and big bore kits

Dan Pike, owner of FTF Cycles in Randolph, Massachusetts, and his main man Dave installed the ThunderMax with Auto-Tune unit on a 2009 Road King that had some minor updates, but had an annoying tendency to stumble a little when pulling away from a stop. It just didn't have the

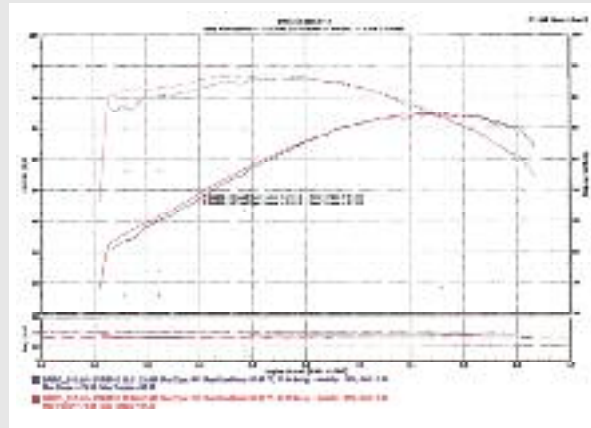


Deciphering Dyno Data

torque snap that we're accustomed to. It also had the annoying habit of farting and popping on deceleration. To boot, roasted thighs were regularly served on the menu—the bike was a cooker. Something had to be done.

Knowing the bike needed some EFI tuning work, Dan was eager to try the ThunderMax. Installing the unit and its sensors presents little in the way of challenge, but routing the cabling should be done carefully, especially on a rubbermount because of the possibility of chafing and pulling. One handy tool that's needed to install the new O2 sensors is a line socket as the sensors have a wire that is attached preventing the use of a conventional socket. This "socket with a slot" is the same type that

Dyno sheets are great. The squiggly lines go up and down, very cool. But what the hell does it mean in layman's terms? Like an X-ray or any kind of medical test, they need to be evaluated, analyzed, and translated into English so we novices know what the heck it all means. Dan translated these dyno sheets for us.

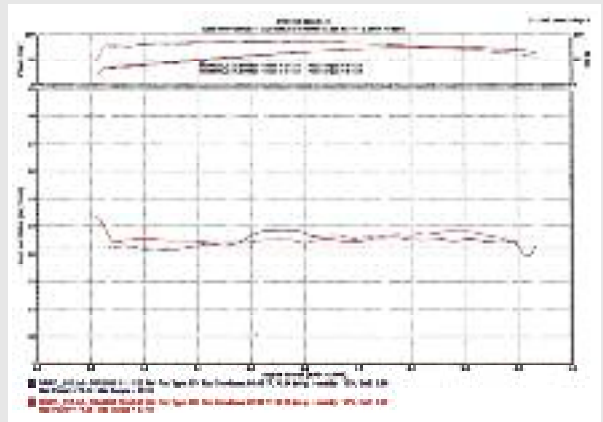


"Dyno 1" shows the initial run in blue and the ThunderMax in red. What this is showing is higher torque down low as well as a smoother power curve. The overall torque is only increased by 1ft lb but pay particular attention to what's happening between 2000 and 4000 rpms (where most street Harley riders live). At initial

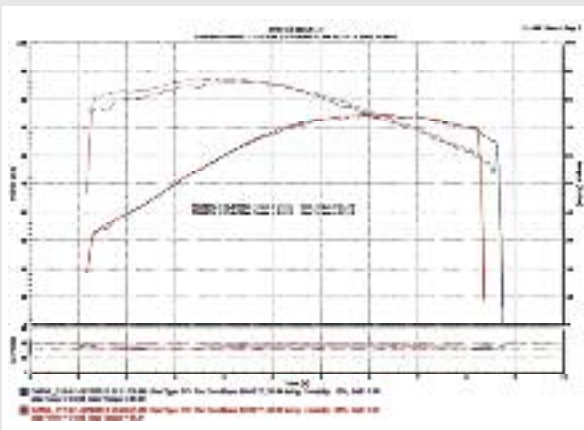
snap, the torque is higher by 4-5 ft lbs and it maintains an increase down low where you want it for street riding. This is because of greatly improved throttle response and it translates to a much more powerful feel by the rider, but doesn't necessarily increase the overall numbers by much.

"Dyno AF" graphs

Air/Fuel ratios compared to rpms. We see how smooth the ThunderMax is (in red) compared to the baseline run (in blue). The difference is that the ThunderMax is hitting its target AF ratios faster and more consistently than the stock ECM, making more consistent power and a smoother transition throughout the rpm



range. Under power, the stock ECU initially drops down to about 13.1:1 and then suddenly leans out to almost 14:1 between 3500 and 4000 rpm. This will cause a noticeable flat spot within those rpms.



"Dyno Time" compares HP and TQ to time in seconds. What this shows is how quickly the engine went from 2000 to 6000 rpms in seconds. The ThunderMax (in red) completed the pull approximately half a second faster than stock (in blue) which doesn't sound like much until you run it through 6 gears.

Because mechanical advantage is greater in lower gears, you would have the most noticeable difference in lower gears (once again where most Harley street riders live) and overall it would be fair to conservatively estimate that this would translate to a second or two in the quarter mile.



is used to tighten the spotlights on an FL. Get it, because there really is no other way to install the O2 sensors as easily. This type of socket is known as an O2 sensor socket and there's also a crowsfoot type O2 socket that works well.

With the unit installed on the bike, it was time to get scholarly and *carefully* read the detailed instructions provided

by Zippers. Dan connected the ECM (with a cable that was provided with the kit) to a laptop to check that it had the latest maps and updates from Zippers. This really wasn't a necessary step because Zippers had already loaded the right map on the unit for us, as they will do for you if you ask. In any event, we had the right map. We initialized the unit

Dan Pike's Top 10...

...things to keep in mind about installing ThunderMax with AutoTune

1. Prior to installing your unit, visit ThunderMax.com to view support videos. It's not necessary, but sometimes seeing things in action makes life easier.

2. The Thunder Max is a total replacement ECU but it still depends on the factory sensors to give it the proper information (with the exception of the replacement O2 sensors that are part of the kit). If you have a check engine light on or a mechanical issue, diagnose and repair them before you install the Thunder Max. Faulty sensors provide poor data and will stop you from getting a good tune.

3. Follow the installation instructions. Take particular care when it comes to O2 sensor lead routing. Excessive heat will melt your harness, and rubber-mounted drivetrains can tear a harness apart if installed improperly.

4. Always check for software and firmware updates using the provided link in the ThunderMax software before you write a map to your module.

5. When selecting a map file, engine size and throttle body/injector size are most crucial. When choosing the exhaust, select by type rather than brand. ie: slip on, true dual, or 2 into 1.

6. If there are multiple maps available for your configuration, always select the map with the latest build date available.

7. If you decide to try a different map, save your edited maps to your hard drive using the "Save As" command for future reference.

8. Any time you disconnect battery power or remove the ECM fuse, you must initialize the ECM per the installation instructions. Zipper's provides a warning label to remind you of this. Place it in a conspicuous place near the battery.

9. If you run into any snags while installing or programming your Thunder Max, the "Help" menu contains a comprehensive tuning manual as well as links to E-mail support and links to the ThunderMax.com website.

10. If you order your Thunder Max from a Zipper's/ThunderMax dealer, it can be pre-programmed for you so all you have to do is install your ThunderMax, initialize and ride!

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according to the instructions and started the bike. It fired right up and purred like a kitten—ha!

Dan followed the instructions to let the unit acquire data and then went for a series of rides over two days, putting the recommended mileage on the bike to let it “learn” and tune itself.

Dan’s Riding Impression before:

Engine runs well, makes good power comes on gradually. The throttle is jerky, transitioning from idle to part throttle (1200 thru 2000 RPM) making rolling off and on the throttle in traffic annoying. Engine heat is a leg roaster. Exhaust pops when decelerating and coming down off a high RPM pull or an aggressive downshift.

Dan’s Riding Impression after installing the ThunderMax with AutoTune:

Engine feels comparable power-wise but the throttle is far more responsive. Part throttle transitions are smooth as silk making the throttle feel more like a well tuned carb than an electronic on off switch. Engine heat is better and livable. Decel popping has been eliminated.

Dan later got back to us with this: Steve, the owner, Daryl, gave me some great feedback as well. “The bike runs like I thought it should have in the first place. Every time I go for the throttle, it’s there! Love it, love it, love it!”

Bottom Line: The ThunderMax with AutoTune is a good way for you to avoid the use and potential abuse of dyno pulls and gives you the opportunity to update your EFI system with new maps easily yourself. The system will learn with your bike (and not become obsolete or require replacement) as you make changes to carb, cams, pipes, and throttle body. In essence the ThunderMax can “grow” with your bike as you change it, negating the need for visits to the dealer or tuner for a new flash or dyno tuning session to dial in a new combo. **IV**

*** RESOURCES**

FTF Cycles
Randolph, MA
781-961-9100
www.ftfcycles.com/



RAW Motorsport (dyno testing)
Swansea, MA
509-678-9865



Zipper's Performance Products
Elkridge, MD
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