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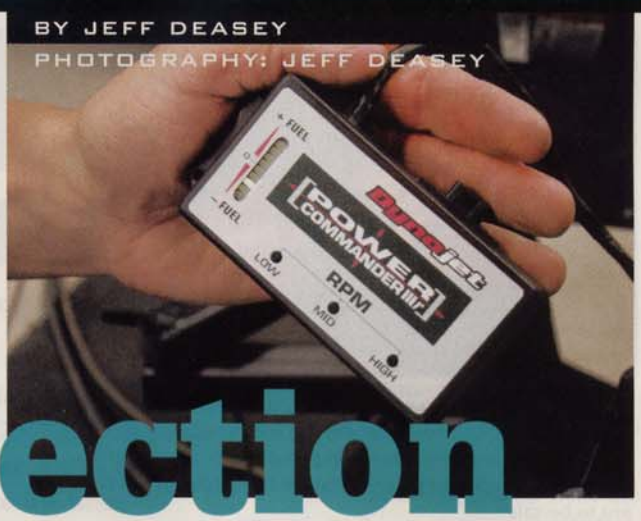
Take Command of Your Fuel Injection System



Dial it in With a DynoJet Power Commander

Electronic Fuel Injection (EFI) is going to be the standard fuel delivery system on all bikes in the not-so-distant future. The Federal Government has already made its plans public to cut motorcycle emissions by up to 80 percent over the next few years. Engine management systems, as we currently know them, will begin to look very different, as fuel injection becomes commonplace by the end of the decade.

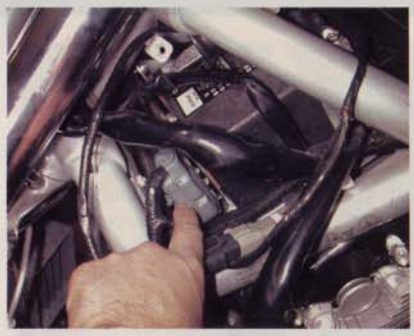
Some people have been a bit hesitant to make the switch to EFI, citing lack of aftermarket support and difficulty with tuning, as their main reasons for shying away and buying a new bike with a tried-and-true

1 We made a few runs on a Dynojet 250 dyno to get a baseline peak horsepower and torque number on this '02 Harley V-Rod. Since the V-Rod has solid wheels like a Fat Boy, Schaller had to use a special extension strap to go around the back of the tire to secure the front of the bike.

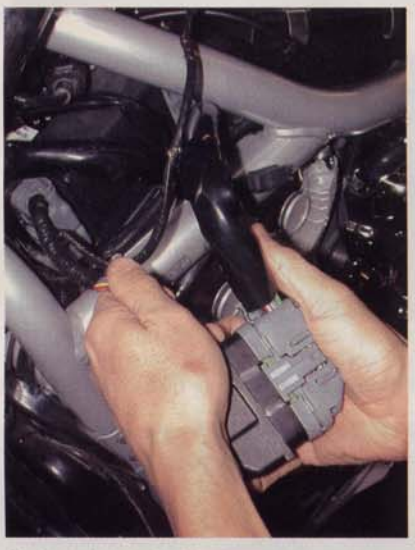
2 Proper rear tire air pressure is critical in the dyno room and must be checked for safety.

3 After double-checking all the straps, Schaller fired up the V-Rod and slowly brought it up to operating temperature, which he verified with this Scanalyzer.

4 Schaller made a few passes and our best had a peak of 104.12 hp and 74.53 lb-ft of torque. The bike had a Screamin' Eagle air cleaner, a set of Samson slip-on mufflers, and the ECU still has the stock flash. Even with this level of power, the bike was sputtering as the throttle was rolled on at the start of the runs and popped like crazy during deceleration.

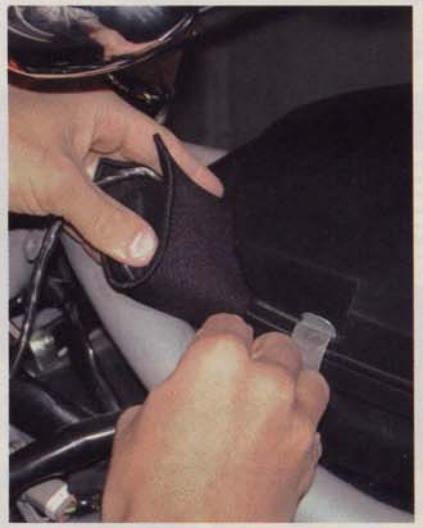


5 It was time to install the PCIIIr Power Commander. This was the connector that was attached to the ECU. We unplugged this and plugged in the harness coming from the PCIIIr.

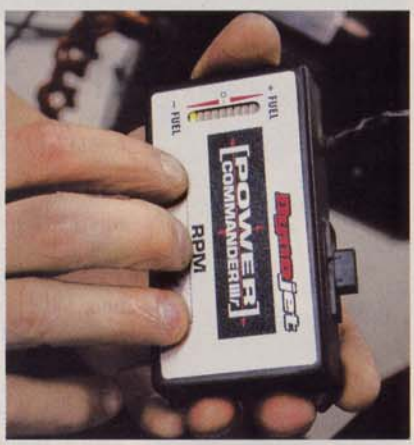


6 The other end of the harness was connected and that was as hard as the installation got.

7 You are very limited when it comes to places to mount the PCIIIr in a V-Rod, but...



8 ...Dynojet found that this area just ahead of the airbox worked very nicely. For a little extra protection, the PCIIIr got slipped into a protective boot that is part of the kit.



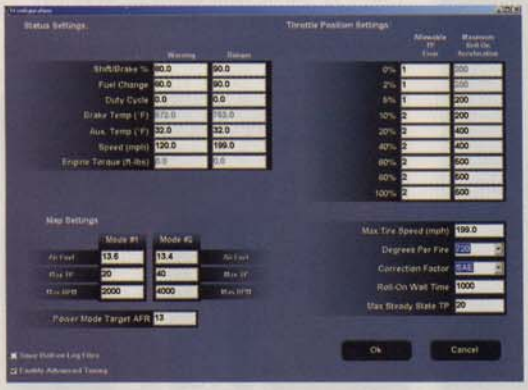
9 Schaller wanted to show us how easy it was to get the bike running well by using nothing but the buttons on the face of the PCIIIr. While he held down all three buttons, the ignition switch was turned on to put the unit into button program mode.

10 You have to work quickly because the unit will go back into its standard working mode in a few seconds. Schaller wanted to fatten up the bottom a little, the mid-range just a bit more, and add a small amount to the top end. Here we see him working with the mid-range button. After holding the three buttons and turning on the ignition, Schaller tapped the mid-range button to raise it up about two LEDs to start. Each LED represented a 2-percent change in fuel delivery. Zero percent is the starting point, with LEDs above zero indicating the addition of fuel and the LEDs below zero representing removal of fuel. Holding the button in instead of tapping it while in program mode, will activate the LEDs below zero and remove fuel. After Schaller made a few adjustments with nothing more than the buttons, the V-Rod was fired up, and all signs of popping and hesitation were gone.▶

carburetor. They also worry about having another computer and a bunch of sensors, that may fail and leave them stranded miles from home. The truth is, ECM failure is almost unheard of, and sensor failures are just as rare with the newest components on the market, but many of the other points made by the skeptics are valid. In comparison to the automotive world, the American motorcycle market is few years behind, but we're gaining ground each and every day. The bigger problem is education at the service level. The truth is that there really aren't enough qualified EFI technicians to keep up with the demand.

Dynojet has been working hard to bring service bays all around the world up to speed with EFI tuning products and training seminars. Dynojet's dynos are found in more shops than any other brand in the country. They also were pioneers in developing motorcycle fuel injection tuning products like the Power Commander, that allows any qualified technician to tune a bike to perfection, no matter what the engine configuration. All a tech would need would be a dyno, an air-to-fuel ratio monitor, and a

11 The bike ran very well on the dyno and sounded great as we ran it through the gears. We were satisfied that anyone could dial in the Power Commander to make his or her bike run reasonably well with just a few minutes of fiddling with the buttons, after getting familiarized with the unit. Most people would probably be happy riding the V-Rod around in its current state, but Schaller wanted to show-off Dynojet's Tuning Link software. Tuning Link, when used in conjunction with a Dynojet dyno and a Power Commander, allows a trained tech to tune a bike to run at its peak, in very little time.

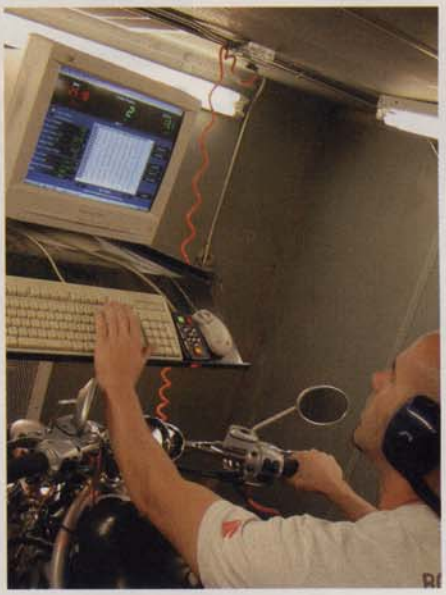


12 This is a cool screen-shot of a few of the numerous functions that are monitored by the Tuning Link program. The Tuning Link uses Dynojet's dyno-braking system and the input from the items shown in this shot, such as speed, fuel change, duty cycle, throttle position, and more, to mimic road conditions to aid in the computer-assisted tuning operation.

13 A quick roll-on run was done and Schaller showed us how lean the fuel curve was near the center of the rpm band. The lowest point of the curve was 13.5:1, which is pretty good, but there was a huge bulge in the center of the curve that peaked at an unacceptable 16.8:1. An engine running this lean in the Las Vegas area during the summer will ping like crazy and most likely suffer serious overheating problems.

14 Now it was time for Tuning Link to do its thing. Schaller started the tuning in the 100-percent throttle range by working in an ascending order in 500rpm increments. We worked our way down to the 5-percent throttle position, and as you can see, the fuel cell at 4,500 rpm at 5-percent throttle being sampled by the Tuning Link software. Notice that the beginning reading for the air/fuel ratio was 14.9:1. That was just a little bit too lean for us to get our peak horsepower from the V-Rod.

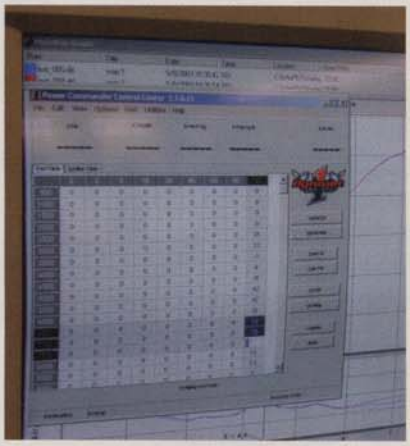
15 In this photo you can see that the Tuning Link has sampled and changed the value of the fuel cell, to change our air fuel ratio to meet our target of 13.2:1. This can be done without the Tuning Link by using the dyno and air/fuel analyzer alone, but it would take many more hours and would be much harder on your bike's engine.



16 The V-Rod was running great at this point, but Schaller wanted to go in and touch up a couple of spots, to make his new map perfect for a few specific cruising rpm/engine load positions. With the keyboard positioned close to the front of the bike...

computer hooked to the Power Commander, to tweak your bike for that last bit of power.

But, what most people don't know is probably the best-kept secret in the industry. You can dial-in your bike to run quite well using nothing more than just the buttons found on the front face of the Power Commander unit. You won't get it dialed all across the powerband as well as the guy at your local Dynojet Tuning Center, but you can get it running well enough that you might not care. People do it everyday and their bikes run great. We've even had a chance to do this ourselves a few times, and it really works well. Dustin Schaller will show us how to set up the Power Commander using nothing but the buttons to prove that it can be done, and then he'll fine-tune it using Dynojet's Tuning Link program.



17 ...Schaller highlighted a couple of areas and increased their values. A few cells in the upper rpm band at full throttle were bumped up to prevent pinging during a typical 100-degree-plus Las Vegas summer day.

18 Schaller felt like messing with the Scanalyzer one more time before putting it away. There were no stored error codes and all systems checked out, so everything was put back together and our final dyno passes were made. ▶

Before we get into the minutia of tuning the Power Commander, it would probably be best to let you know a little bit about how they work. As smart as they are, fuel injection systems must be drug around by the hand like a child when it comes to telling them what to make the fuel injectors do. Carburetors only need to be dialed in close enough and then gravity and atmospheric pressure take over. When you hit the throttle on a carbureted engine, vacuum naturally draws in a little extra fuel to get things going just like they're supposed to. Fuel injectors only

19 The red curve represents our power before the PCIIIr was added and the blue line shows our power increase by the end of the day. Peak horsepower jumped from 104.12 to 108.5, and the nasty dip that we had in the graph between 4,000 and 5,000 rpm was completely gone.

20 The torque curve was cleaned up between 3,500 and 6,500 rpm, and went from 74.53 to 78.10 lb-ft.

squirt fuel when told to do so, and the systems used by Harley must be mapped for each and every possible throttle position/rpm/load combination to work properly. If your EFI is tuned correctly, there isn't a carburetor on the planet that can do as good of a job when it comes to handling changes in temperature and altitude. When Harley introduced its first EFI bikes in the mid '90s, they worked pretty well, provided that you kept them completely stock and never tampered with them. Many owners found that they could never get their bikes to run properly after a cam swap or simply changing their pipes and air cleaner, and switched over to a carburetor out of frustration. When Dynojet designed the first Power Commander for Harley-Davidsons a few years back, the public had their first real solution to adjusting their injection systems to make their stock or hopped-up bikes run much better.

Dynojet's first Harley EFI tuner was called the Power Commander PCII. The PCII took information coming in from the engine temperature sensor, cam sensor, throttle position sensor, intake air temperature sensor, and Manifold Absolute Pressure (MAP) sensor, and then altered that information before it was sent to the Electronic Control

Unit (ECU) to fool it into making the fuel supply changes necessary to make the bike run right. It worked well, but the PCII had four separate tables for tuning and didn't start to work until your bike reached running temperature. The current model, the Power Commander PCIIIr, was introduced in 2001 and is a huge improvement over the PCII. The PCIIIr is much simpler to tune than the PCII and is mounted after the ECU in the system, rather than between it and the input sensors.

The PCIIIr takes direct control over the fuel injectors and only has two tuning tables that need attention. One is the fuel map table and the other is the ignition advance table. Another benefit of the PCIIIr is that it provides a much greater range of fuel delivery tweaking than the previous model, and the latest ones even allow for slight variations of adjustment between the front and rear cylinders. All the techno-highlights aside, the PCIIIr can still be set up well in your own garage, using nothing but the three buttons built into the faceplate.

We dropped in to visit Dynojet at its North Las Vegas R&D center to learn a little more. After Vice President Paul Langley and Director of Fuel-Injection Mike Belcher went over a little bit of Dynojet's history and its plans for the future, we were placed in the hands of Schaller who would guide us through the installation and adjustment of the PCIIIr on an '02 V-Rod. HRE

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