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CRATE MOTORS AND BOLT-ON EFIS MAKE THINGS EASY

BY ROBIN LAWRENCE
PHOTOGRAPHY: ROBIN LAWRENCE

Our GM Performance Parts Crate 502ci HO on the stand at Don West's dyno in Geneseo, Illinois. Don has been doing this for many years with multiple projects. Like us, Don loves to play and learn new things on the dyno. Other than the lift plate, the engine is very complete.

BIG BIG BLOCK FUEL INJECTING

While looking through the GM Performance Parts catalogue for our '69 GMC pickup, we started thinking that it would be a great place to drop in a 502ci Crate engine. After looking at the different crate 502s we decided on the 502 HO. We could have gone conservatively with the 502 HT, but we could not resist the 550 lb-ft of torque of the HO. But we wanted some modern performance mixed in with our good old big block. We were looking for more torque, fuel economy and uninterrupted performance when climbing hills, so naturally a fuel-injection kit was looked at.

Our plan was to run the rat motor on Don West's Stuska Dyno. We would run the engine with two different GMPP Holley carburetors calibrated for the 502ci. Once the engine was broken in on the dyno, we would make a few baseline pulls with the carburetors. After that, we would install the Holley TBI and Commander 950 Fuel Management computer system. We wanted to see how well the Holley TBI would perform against the 502 Specific Holley carbs.

In our first test we installed a 770 CFM Vacuum Secondary Carb. Initial numbers were strong and the EGT's and air/fuel ratio were very safe. One observation was that manifold vacuum was over 2 inches. This indicated to Don that the carb might be a little restrictive. In the truck, a smaller carb might work better, but hey, we are testing on the dyno! We then installed a GMPP 850 Mechanical Secondary Holley Carb. We wanted to stay with a vacuum secondary 870 CFM carb but we were concerned about the secondary opening with the load on the dyno. With the added air flow we saw an increase in horsepower and torque across the entire power band. As the numbers got closer to peak power it was only about a 10-hp increase. Our manifold vacuum at WOT was down to about 1 inch. This is more in line with what Don observes on most well matched engines. Our air/fuel ratio was a point richer than with the 770 Carb. We probably could have taken a couple of jets sizes out of the 850 and picked up a little bit of power. We decided to forgo any tuning as we wanted to get the Holley TBI installed.

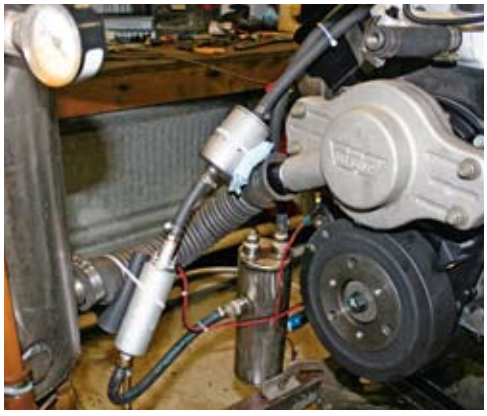
Once the TBI system had been installed, we had Don make a couple of sweeps with the dyno while monitoring the A/F on the Commander 950 software. Initial pulls were lean at loads greater than 50 percent. After increasing the numbers in the fuel map by about 6, another pull showed that while still

▲ We started the testing with a Holley 770 CFM Vacuum Secondary Carburetor. It is a GM Performance Parts unit calibrated for a 502. We added 5 quarts of 10W-30 to break in the engine. The numbers were strong right out of the box. If you notice we didn't have breathers in the valve covers. The grommets were too small for the breathers that we had. We were surprised that during all of the testing we didn't see any vapors or blow by from the open holes in the valve covers.

◄ We started the testing using Don's big block dyno headers. They are equipped with holes for EGT's and also have bungs in the collectors for wide band Oxygen sensors. The headers are Hooker 2 3/8-inch primaries with 4-inch collectors.

▲ The TBI throttle body uses the same linkage as our Holley carbs. The Idle Air Control, Intake Air temp sensor, fuel pressure regulator and throttle position sensor are part of the unit. We installed a water temp sensor in the manifold and a 1 bar map sensor. Our TBI is rated at 950 CFM and uses four 72-pound injectors. This is enough to support 600 horsepower.

◄ The Commander 950 Computer worked very well. While the system is dated it worked well in our application. It can log data and is user configurable. We were able to choose our trigger method. This will enable the user to use different type of distributors.



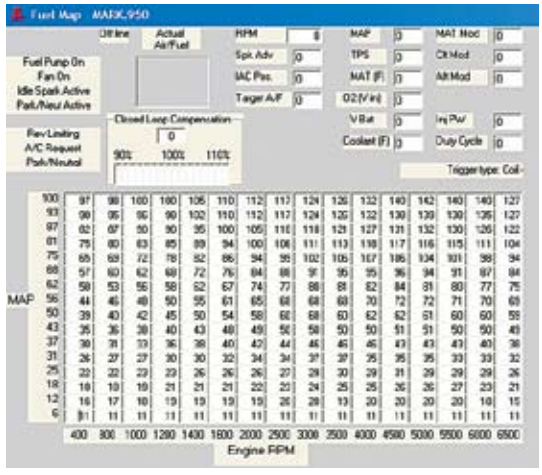
◄ We tie-strapped the supplied Walbro fuel pump to the lower coolant hose. For a small pump we saw good fuel flow. To get Brake Specific Fuel Consumption numbers we used a recirculating tank. We would draw fuel for the pressure side and return the fuel at the top of the tank.

◄ We used the wide band oxygen sensor option. It is an add-on that is worth the extra cost. The supplied 02 sensor is a narrow band unit. We ran it against the wide band that Don uses and found it right on the money. It makes getting up on the tune a lot easier.

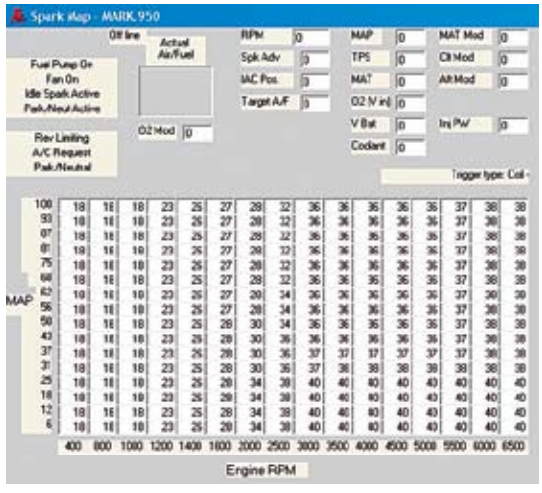
▲ We installed the Hooker 1 7/8-inch headers that we will use in Mark's GMC. We were surprised that they actually made a little more power than Don's dyno headers. Most times Don's customers' test headers loose power against his monster dyno headers. We feel that this engine better reflects the design of the headers. It's not often that we see a slight improvement with the headers we will run in the chassis.

◄ The connections were simple. One 3/8-inch hose from the fuel pump and a 5/16-inch hose for a return line. We had one ground wire, a keep-alive power wire, an ignition "on" wire and one wire to the tach signal on the HEI distributor. There are connections for other types of trigger types should they be required.

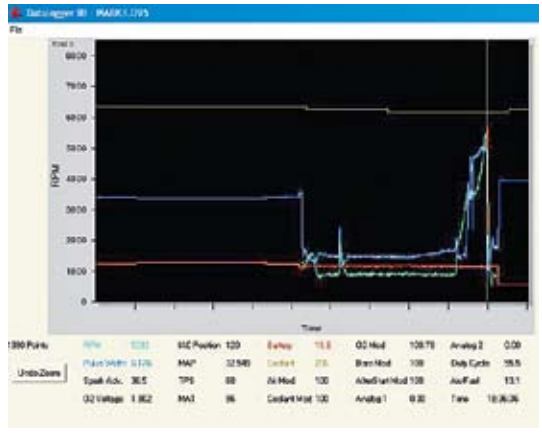
Big Big-Block Fuel Injecting



► This is our Fuel Map in the Commander 950 software. We can monitor the air/fuel ratio while tuning on individual cells in the map. The software also has a trace function the highlights the cells that you use in various load situations. With the optional wide band we can tune on the fly or log-and-tune off line. We used a pre loaded map from the software and tuned on that for our 502. Once wired and plugged in the engine fired right up with the program that we used.



► Like the fuel map the base ignition tables are very easy to use. The system uses a GM map sensor and RPM as the axis points. The lower left corner would be high vacuum and low RPM. As the engine RPM and load increase the systems reads cells in the middle to upper right area of the map. Generally at idle with 10 inches of vacuum the referenced cell is near the middle of map.



► This is the data logging screen of the Commander 950. While the instructions said we could log without a laptop we had our laptop attached during the dyno pulls. We liked the fact that you could drive the car and datalog then revise your tables off line on a saved version of you maps.

► This is Mark's project truck before the most recent paint job. Since that time there have been three different engines under the hood. Mark had installed a 400 Pontiac, a 468 Chevy big-block and then a 350 crate engine. It has been upgraded to '81 front and rear axles as well as a New Process 205 transfer case.

lean we were headed in the right direction. We then added another six numbers again. The next pull we showed the fuel flow moving closer to our previous fuel flow with the 850 Holley. A look at the power numbers indicated that we were right-on the power numbers with the 850 carb. Our A/F was still a little on the lean side but not enough to worry about.

We had made all of the initial pulls using Don's dyno headers. Since we were close on the tune we felt that we should make a header change. We installed the Hooker 1 7/8-inch to 2 ½-inch collector headers intended for our application. We were surprised that we didn't lose any power. The dyno headers were Hooker 2 3/8-inch to a 4-inch collector. Don prefers to use them because they are equipped with bungs for a wide band as well as holes for EGT sensors. This thing is going to a lot of fun! OR

How Do We Like It?

We have a few observations to share. The power fell off sharply at 5400 RPM. With the cam and components we felt that was a little early. Don observed that our GM HEI has bone stock Don felt that the stock HEI units are good for about 5500 RPM. We are used to using MSD distributors and coils. Next time we will compare another distributor and coil.

We have heard various complaints about the Holley computer and software. While a bit dated we found the software and hardware very easy to use. Because it has been around it lacks some of the bells and whistles found in the latest fuel management systems. If a system is able to function under the circumstances you require any extra's are useless. The addition of a wide band verses a narrow band O2 makes this system meet all our needs for this application. I must admit to being a little bias about TBI. I mean they only came on mid seventies clunkers. Well this one bolted up to the manifold on our 502 and performed as well as a 850 Carburetor. The combination averaged 500 foot pounds from 3600 to 5400 RPM. The horsepower average was 430 through the same range. We can't wait to get the 502 in the GMC.

Sources

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www.Gmperformanceparts.com

HOLLEY
www.Holley.com

MSD
www.msdignition.com

WEST RACING HEADS
www.westracingheads.com