FUEL INJECTION

Source: www.grapeaperacing.com

MANIFOLD SELECTION

There were a lot of manifolds to choose from. All stock EFI systems were out of the question, they could not flow anywhere near the amount of air I needed. I could have converted any 4 barrel manifold to EFI, but I could not find one with a large enough plenum for what I wanted to do. In order to get what I wanted out of a single plane manifold, I'd need at least a 1" spacer to gain plenum volume. There just wasn't enough room for that under the hood.

I then started looking into TPI systems. They don't flow well at all, but there are many aftermarket manifolds, runners and throttle bodies to help that. The big problem with them was the runners were too long for the rpm range I wanted. The Lingenfelter Super Ram system was based from the GM TPI, but had runners that were about 4" shorter and a larger plenum, just what I was looking for. The manifold and runners were also cast very thick, so I can have them extrude honed for the airflow I needed. So I bought the Super Ram system with the LPE 58mm 1000 cfm throttle body.

This picture shows the size of the manifold runners after they were extrude honed. Anyone who has seen a stock TPI manifold can see that they are huge in comparison.

With the heads, manifold and runners installed, the total runner length is a little over 14", which is perfect for the rpm range I'm building this engine for.

Installing the manifold was a process. The lower manifold was your basic 12 bolts just like any other small-block Chevy manifold. The runners then had to be set in place with just the lower bolts in a few threads so the hung out of the way of the injector and fuel rail. The injector had to be clipped to the fuel rail and put in place with the 6 mounting bolts. The wiring harness had to be plugging into all the injectors before the plenum was put on or you'll play hell trying to get them on later. Once the injectors, fuel rail and injector harness in place, the runners can then be tightened in place. There are two rocker arms on each side that must be roved to get at the lower bolts of the runners. This time around I installed the manifold before the rockers to avoid that problem.

The plenum was the biggest pain in the ass. It wasn't really hard, but very time consuming. There are 16 mounting bolts, 4 of which are really hard to get at. What makes it even harder is that hex head bolts don't fit, you need to use bolts in the kit with smaller 12 point heads on them. You cannot use an open end wrench, only a 12 point box end. The bolts go up trough the plenum, so you need to use sealer on them as well. It is obvious that John Lingenfelter designed this system with performance in mind not maintenance. Although I think that some small design changes to make the manifold

easier to install and remove could have been done without sacrificing any performance.

INJECTORS

My ECM has 8 peak & hold injector drivers, so running low-impedance injectors was a no brainer. I went with 65 lb/hr injectors, which will give me enough for about 900 hp. If I need more for the dry nitrous kit I can always up fuel pressure as high as 65 psi with this pump. A 65 lb/hr injector will flow 78 lbs/hr at 65 psi, so I have plenty of room to grow. Peak & hold injectors also have a faster response time than saturated injectors, which really helps the idle when using big injectors. High impedance injectors generally are very inconsistent at pulse widths under about 1.7mS. Low-impedance can go as low at 1.2mS.

ECU

Allmost factory and many aftermarket ECM's only have 4 injector drivers, so on a V8 you have no choice but to run high impedance injectors unless you buy an aftermarket add on driver. The Holley commander system looked like a really nice system, but the downfall was only 4 injector drivers. I went with a F.A.S.T. system (Fuel Air Spark Technologies) because it has 8 peak & hold driver and all the features I wanted.

My other choice was the Accel Generation 7 ECU, but Accel has been advertising it for over a year at the time and it was still not released. Accel gave the 1st release date for the new ECU and almost 2 years later it was available. This was typical of Accel and I personally do not like them as a company. Every time an Accel part was on back order for me, I could never get an honest straight answer from them on a shipping date. After 2 or 3 dates came and went, I'd just cancel may order. Accel has some good products, just some really poor management and customer service.

Ok, enough rating about Accel, back the F.A.S.T. ECU. I opted for the wide band option to help me tune for boost a little safer. The wide band O2 allows the ECM to run closed loop at wide open throttle and correct to air/fuel ratio table. The helps you tune by telling you how much the ECU is adding or taking out. It also helps by adding fuel if you're too lean under boost, which would normally quickly hurt an engine. You still need to tune the base fuel map right, wide band will not do that for you, but it does help a lot in getting right. The ECM also has the ability to control up to 4 stages of nitrous, mine can control up to 2. I'd have to send it back for a modification if I ever wanted, but I'll never use more than 2 stages.

The system had a lot of wiring, but it was all labeled nicely and it was very easy to install. I put the ECU under the right side of the dash behind the glove compartment. I also put my MSD 6AL box there as well, since the ECU was going to control the ignition curve, it was easy to wire them together when they were right next to each other. There is also very little chance of RF interference to the MSD box with only 6" of wire from the ECU. All the secondary ignition wiring is under the hood, so there is little chance that it wall cause any interference either.

The main power leads are support to be connected directly to the battery positive post, but that's not an option on a car with a kill switch. I had to run the power to the kill switch so all power gets cut when the switch is flipped, which works fine. Since the battery and fuel pump are in the back of the car, there was no sense getting power for the fuel pump relay from the fuse panel, when it's so close to the battery. I installed the fuel pump relay in the truck and power it directly from the kill switch.

The Nitrous system is control by the ECU through a relay, so I had to do was use the ECU to ground a relay to turn on the system. There is an arming input to the ECM that needs +12v to arm the system with is just a matter of wring in an arming switch and putting it where you want it. If the arming switch is on, the nitrous system will activate when all the parameters are met then the nitrous control screen. There are also other outputs that can control things like coolant fan relays and such, the instruction are clear and it's all easy to hook up.

FUEL SYSTEM

I used a 16 gallon pro-street fuel cell in the trunk with a GM fuel sending unit. The Cell has two ½ outlets where a pair of -10AN lines go to a Perma-Cool high flow spin on pre-filter with a water separator built in. I currently have one block outlet blocked off, which is for future use if I need another pump to keep up with the nitrous system. I'd rather run a separate pump for the nitrous so that it only runs when the system is armed if I need to. From the other outlet, I ran -10AN hose to an Aeromotive A1000 pump rated at 600 lbs/hr. This pump should feed more than enough fuel feed the engine at 15 psi and a 100 hp dry nitrous system. From the pump I

ran ½" ridged line to a Bosch EFI filter. The ridged line stops at the right front motor mount and a -8AN hose goes to the fuel rail. The return line is a -6AN hose to the frame and a 3/8" ridged line brings it back to the fuel cell.

Source: www.grapeaperacing.com