

JACK'S STAND

HOME GROWN 4.6-L CONVERSION IN A PANTERA, Part 1

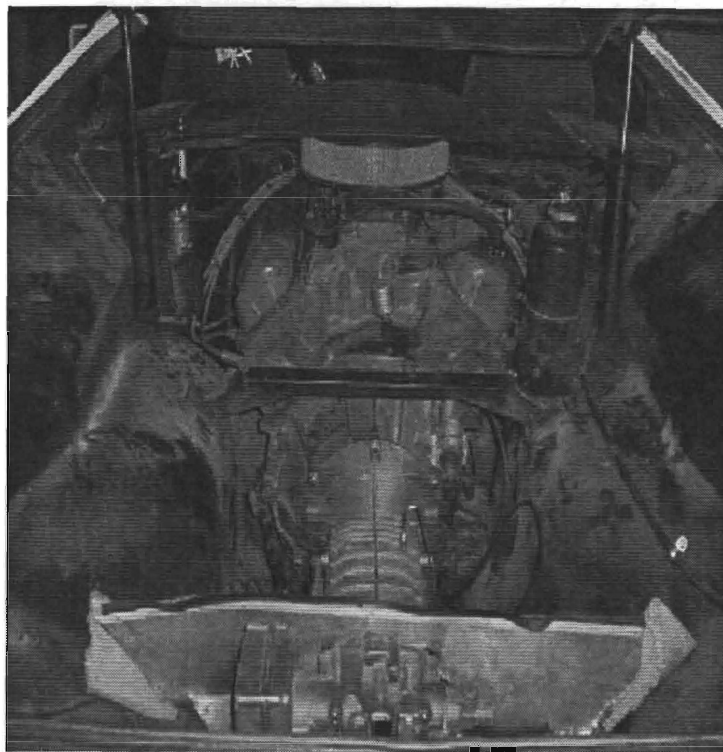
by Dave Doddek

Several years ago, a fellow Pantera owner and I started talking about his old, tired stock engine. We threw around several options, such as a rebuilt Cleveland, and using the 4.6 SOHC engine. We both leaned toward the 4.6 for long term reliability and fuel mileage. The disadvantage of the 4.6 was its lack of torque at low rpms compared to the 5.7 Cleveland, which the owner really liked. We thought of supercharging the 4.6 to restore the lost low end torque, but blowers were just too expensive.

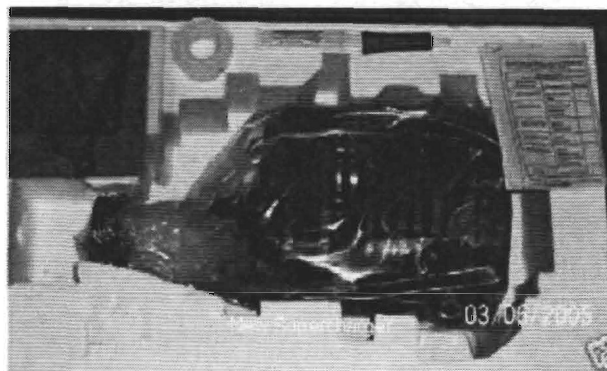
Later while browsing the Web, I came across a web site for Allen Superchargers, and discovered they were using Eaton M-90 Thunderbird superchargers. This blower has also been used by Saleen and by Ford Motorsport on the SOHC 4.6. I discovered the Lincoln Mk 8 engine shares this block and heads with the '97 Mustang Cobra, which can support up to 900 horsepower with the right crank, rods and pistons.

The Lincoln engine has weaker internal parts than the Cobra, but is still good for up to about 450 horses. The M-90 blower can make 6-9 psi in an otherwise stock 4.6, and is affordable. We thus decided to go this route. And so it began....

Our work began in finding an engine, and we found a 4.6 from a '98 Lincoln Mk8 at a local junkyard & bought it along with its alternator, computer and wiring harness for \$1100. This model has the coil-on-plug ignition. Then we bought a set of headers for the 4.6-in-a-Pantera from Collectors Choice in WI. And then, the parts sat around for a couple of years before I found time to accumulate the rest of the stuff to make this work. E-Bay helped with different injectors, MAF, the blower, blower pulleys and even metal for fabrication of parts.



Above, this is what we started with- probably one of the last totally stock Pantera engines. It even had the stock iron intake and stock Ford carb, and still ran reasonably well. Except for the carb leaking and causing one fire... As can be seen, this car is a driver, not a beauty queen.

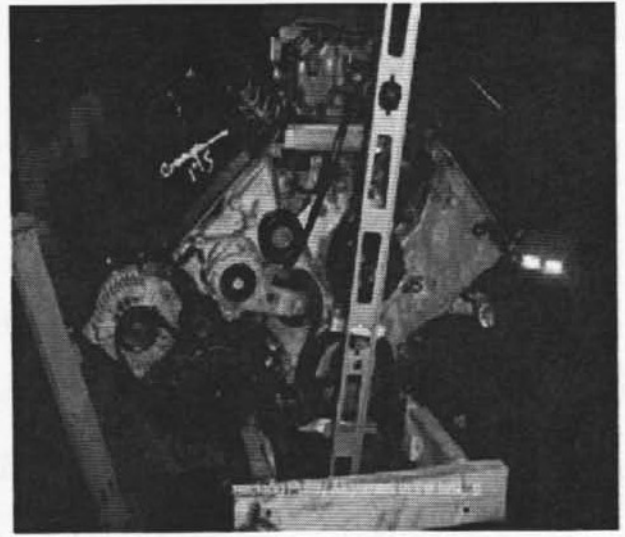


Above, the new blower & its gaskets etc

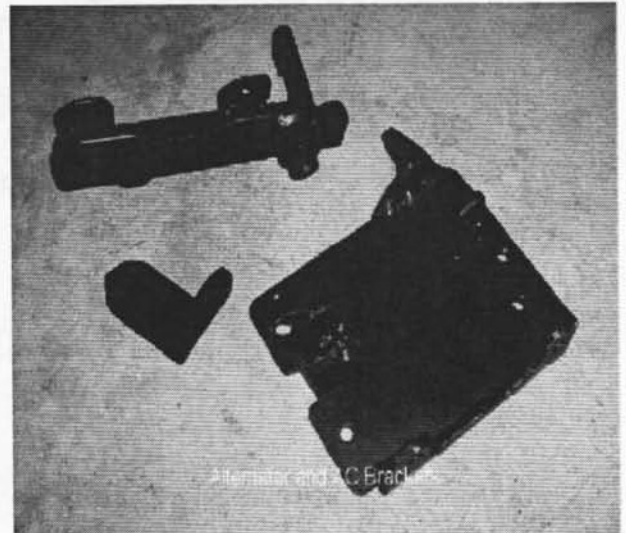
I started actual fabrication in Jan '06 and first got it running Aug '06. The whole project was a huge learning experience. The #1 job was getting the engine ready for installation; I had to do quite a bit of planning to mount all the components including the blower and drive belt. The blower position needed to be where the alternator was so the alt was moved. Keeping the alt in its original mount between the cylinder heads meant raising the blower, which caused other problems. The final design located the alt on the right side of the engine, above the A/C compressor, just like with the old 351-C.

And even then, I wound up using a slightly shorter Sanden 507 A/C compressor instead of the more commonly used Sanden 508, since the available location made things very tight with the right motor mount, compressor and #1 cylinder header pipe. Likewise, the included Lincoln Mk 8 compressor was just too tight. In any case, the Sanden 507 seems to work better with available R-134a freon. But since the 507 was never available with a serpentine belt drive, pulleys were scavenged off a junkyard Sanden 508 assembly and swapped.

All original head & block holes were used to mount the components, except for one which I drilled into a cast boss the factory used as a machine-tool location pad. And a second idler belt pulley was found to be necessary due to the serpentine belt routing without the OEM power steering pump and with the relocated alt. After mounting everything up, I fabricated a small heat shield between the #1 header pipe and the backside of the alternator, as insurance.



Above- testing pulley alignment in mock-up jig



Above- finished alternator and A/C brackets

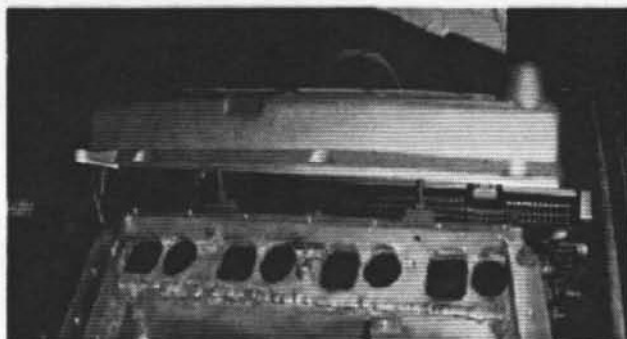
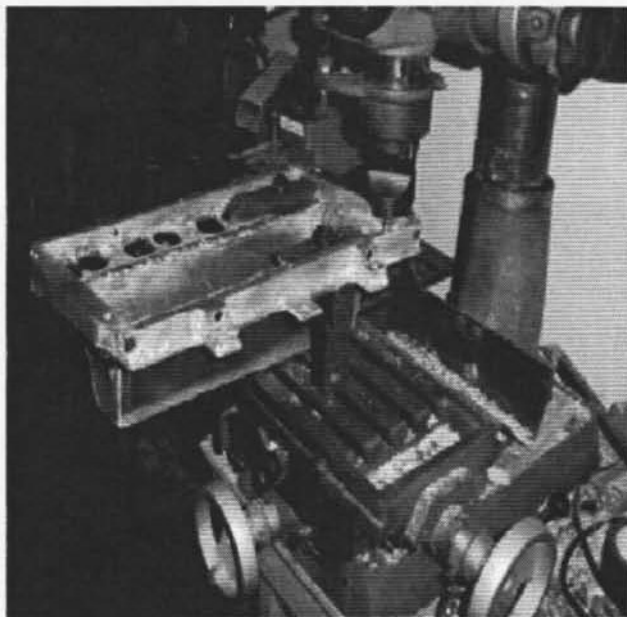
With the alternator and A/C compressor mounted, I started in on the blower and intake. I soon discovered that if the engine was positioned in the stock location as dictated by the engine and ZF mounts, the blower pulley hit the rear window glass in the Pantera. I had two choices- to reverse the blower and drive it with a jackshaft from the back ala the old Wilkinson dual Magnechargers, or move the whole powertrain back for clearance.

Reversing the blower seemed to offer more challenges while simply shifting the powertrain backwards was straightforward. So I started in with a unique intake manifold design, since there was nothing on the market that coincided with our combination of engine, blower and chassis. Vendors who do a similar swap use a modified '97 Cobra intake with a different brand of supercharger.

I decided to keep the secondary runner selector control, which also mount the injectors. After a number of false starts, I decided on a custom intake that took air from the blower, forced it down to the bottom of the plenum, then back up the sides. There wasn't enough room to try multi-length runners. It's welded up from 6061 aluminum plate and mounts the blower upside-down like Saleen does on his SOHC kits.

Even though I spent a lot of time securely clamping the aluminum pieces together before welding, most of the intake had to be finish-milled due to heat distortion. If I had it to do over, I would use more large pieces to cut down on the amount of welding, since the assembly will have to be milled anyway.

I knew that this blower would need a smaller pulley than it came with, so eventually, I found a 2.8" dia pulley on E-Bay that fit the M-90 and would deliver about 6 psi. When the pulley arrived, it had a Ford part number! I sized the serpentine belt by cutting & glueing the old one until it fit, then measured what was left & found the right size at my local parts store.

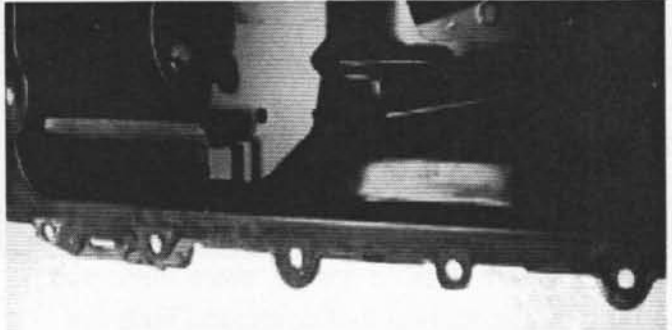
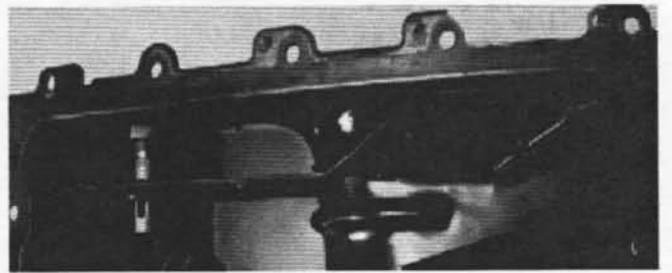


Top- clamping parts to heavy steel prior to welding

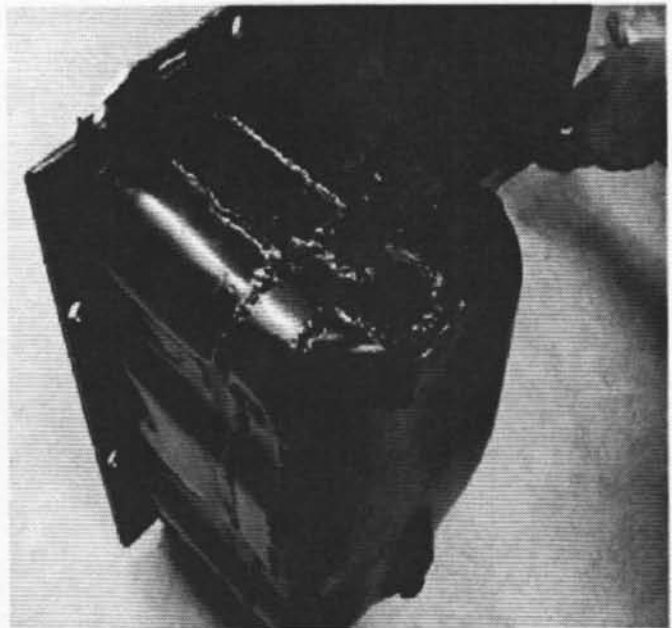
Middle- Welded but still needs milling to be flat

Lower manifold bolted down. Note reinforcement bar to help retain blower while under boost. The square inches of area inside the manifold means that at 6 psi boost, there's about 1000 lbs of force trying to separate the parts.

The next challenge was an increased volume oil pan that would fit the Pantera chassis. The stock 4.6 pan is a well baffled assembly but has a volume-increasing lump sticking out the back of the pan, so this 'tumor' was cut off and the resulting hole welded shut.



I also cut the bottom of the main sump off and welded in a 1-1/2" deep extension to increase its volume. The result is a nicely baffled assembly holding 8 quarts that fits the Pantera chassis.



And since the bottom of the sump was lowered, the length of the stock pickup was also increased the same amount so the pickup and pan bottom stayed in the same relationship.



The engine fit is really tight everywhere. In order to clear the inner fender panels, the heads need to be modified. The rear of the heads look odd but fortunately have lots of extra metal since a single casting is designed to be used on either the left or right side of the block. Thus the heads have all the needed metal to bolt up to the timing chain cover on both ends. So all of this can be cut away on the back. Without such trimming, lots more modification to the Pantera's inner fenders would be necessary for the engine to fit.

In addition, there is a small section on the left head containing an oil passage that is unused and can be removed. To plug the resulting hole, I added a pipe plug further up in the head. All this trimming is highly technical(!)- a Sawzall was used!

I wasn't sure what to use for a starter. With the ZF transaxle, the starter needed to bolt up to the normal small-block bellhousing, but also needed to fit against the 4.6's oil pan rail, and this is somewhat wider than on the 351-C block. In addition, the 4.6 starter location is higher up than the Cleveland's position. After some careful measurements and research, I found a gear-drive mini-starter for a 302 Ford *automatic* (from Summit Racing) had the right depth of starter gear engagement when using a manual flywheel with 164 teeth.

Older Ford engines had different ring gear locations for both manual and automatic transmissions. And big blocks were even more different. A stock starter was too large in diameter and too long to fit unless way- more of the block was cut away. Even so I had to trim a section of the block and cut away one of the stock 4.6 bellhousing tabs (not used with the ZF).

Yet another area needing modification was the oil pressure sender boss, a protrusion mounted below the filter, which ends up hitting the Pantera's shift linkage. I cut the protrusion off flush and plugged it with a pipe plug. The sender gets relocated to the back of the right cylinder head which conveniently has an oil passage (see at right). Note how the sender wire was integrated into the engine wiring harness.

To be continued....



Starter fit to block is tight. Note small notch cut in frame for clearance, too



Area behind flywheel cut away to mount starter.

