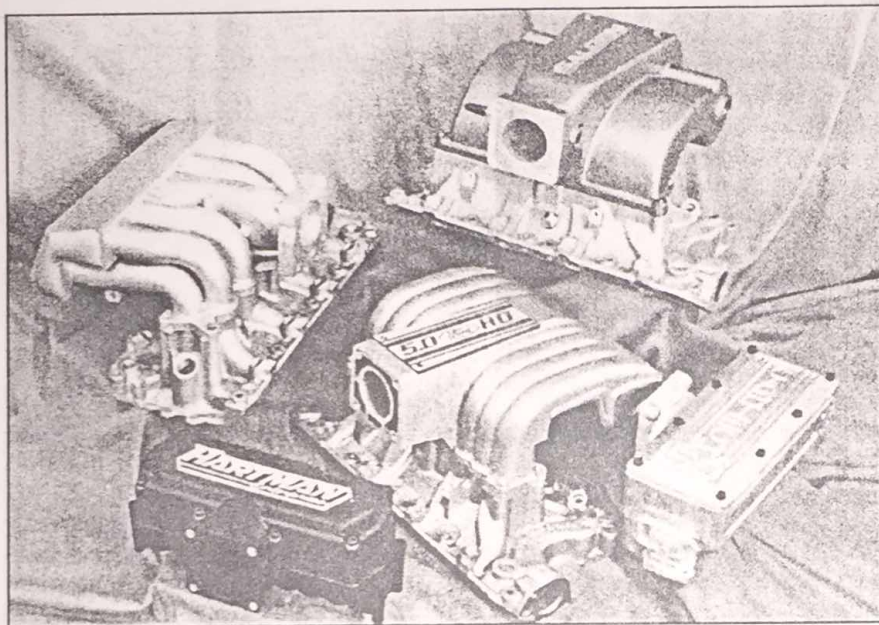


EFI INTAKE SHOOTOUT

MM&FF gets your favorite EFI intake manifolds together for the dyno jam session you've been waiting for.

BY JOHN HUNKINS

Photography by the author

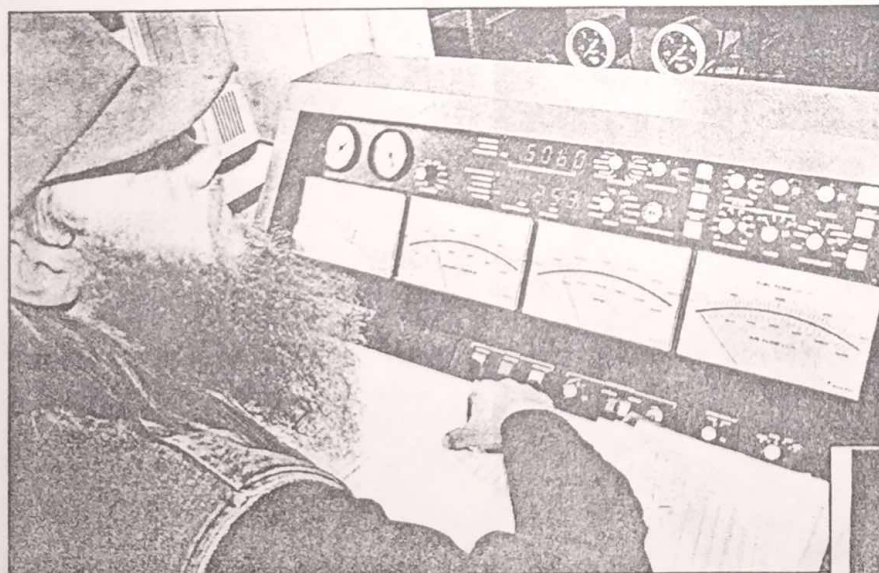


In the beginning, Ford created the fuel injected Mustang. Ford looked at it and said, "It is good, but the intake needs a companion; we shall call this companion GT-40." The 5-liter masses rejoiced at this improvement—the GT-40 was powerful, lightweight and, like Eve, attractive too.

Life was simpler for EFI tuners in 1990. If you wanted to go faster with a minimum of hassle, you just bolted on a GT-40 intake. Hard to believe it's been three years since GT-40s became available for public consumption.

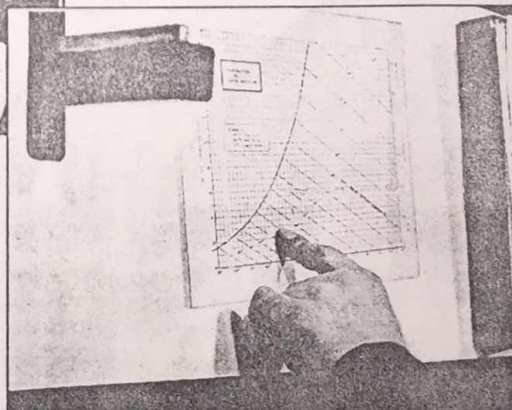
In those three years, the small-block Chevy-dominated aftermarket has awakened to smell the coffee—that new kid who moved in down the block isn't the pushover you thought. In fact, the 5-liter motor has turned out to be the biggest bully on the playground.

The aftermarket may be slow to react, but that's only because the simple laws of supply and demand take a while to kick in (especially when the Chevy-dominated aftermarket has to look up a new tree). Five-literists everywhere should take

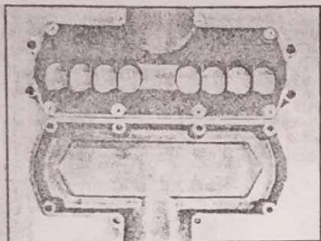


"Lawd, I'm goin' downtown, I'm jes' lookin' for some torque ..." No, it's not ZZ Top, it's R.A.P.'s Dyno Don Denne playin' some tunes on the 901T Superflow dyno.

Ensuring the accuracy and consistency of our dyno results was of paramount concern. Here, Don Denne checks the atmospheric vapor pressure on this chart after checking humidity in the dyno cell with a precision hygrometer. These data, plus barometric pressure and fuel specific gravity, are entered into the dyno's computer before each run so that no combination gets unfair advantage from the weather or fuel.

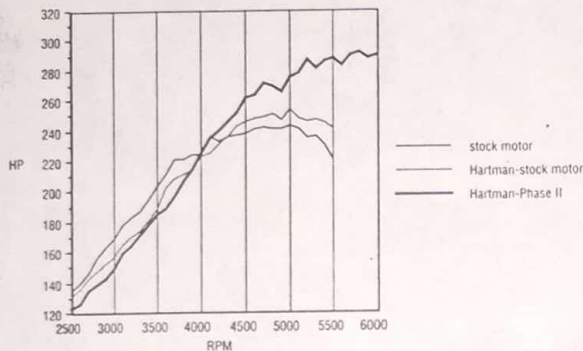


Hartman Enterprises Powerbox



High-impact thermoplastics are used extensively in the automotive and aerospace industry. Their excellent strength, light weight and thermal properties make them a natural for use in a high-performance intake manifold. Hartman Powerbox is actually a two-piece design sealed by eight hardened allen head fasteners. Actual production version has provision for EGR hookup, making it street legal.

Hartman Enterprises Powerbox



Weight (w/stock lower intake): 18 lbs.
Price: \$349

A new player in the 5-liter marketplace is the Hartman Powerbox. Designed in partnership with the Mustang fanatics over at Kaufmann Products, the Powerbox is causing quite a stir.

For starters, it is the lightest intake manifold combination in our test (weighing a good 16 lbs. less than the stock intake). This weight savings and the Powerbox's excellent heat rejection characteristics are due entirely to its composite plastic construction.

If you've ever had the misfortune of having to adjust a rocker arm with the stock intake or GT-40 intake in place, you'll appreciate the clean shot to the driver's side valve cover that the Powerbox affords. Its compact design makes working on your 5-liter a bit easier.

The Powerbox bolts to the stock lower intake and is a breeze to install (your mother could do it—without looking at the directions). This qualifies for "true" bolt-on status.

While the Powerbox was not the most powerful intake we tested, the stock lower manifold being its primary limitation, the horsepower gain in the upper range between 4000 and 5500 rpm is reasonable. On the stock motor, the Powerbox provided an average of seven more horsepower in this 1500-rpm range (see "Tach Tech," page 40).

When bolted atop a set of box stock GT-40 heads, 1.6 Crane roller rockers, 24-lb. injectors and a street-legal Crane Compucam 2040 (Phase II), the combination produced an average of 37 more hp. (Note: For both the Hartman and Cartech

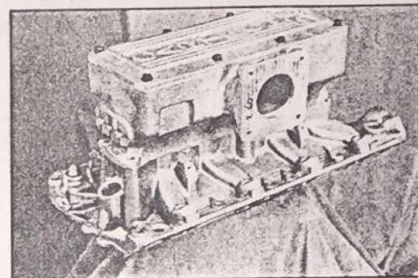
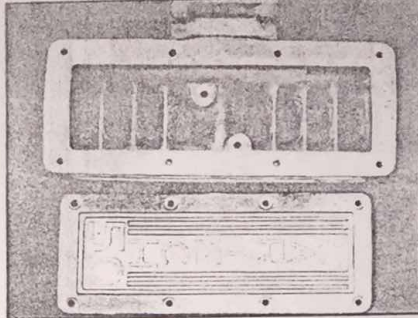
Phase II tests, we used the Extrude Hone stock lower manifold to improve breathing. According to Ron Anderson, increased breathing can also be achieved with the stock lower quite easily by hand porting, one of the services that is done on a regular basis by Ron Anderson Performance.)

Because the Hartman intake suffers from the anemic breathing of a stock lower intake, the Powerbox can make only modest gains on a normally aspirated engine. Hartman Enterprises is currently working on a new unit that incorporates the free-breathing GT-40 lower manifold. This "GT-40" Powerbox should be on the market soon.

Interestingly, when combined with the heads and cam, the Hartman just begins to take off as our dyno run ends. The short runner lengths of the Powerbox are responsible for the elevated power band. We're guessing that the Powerbox would do very well on drag cars that operate at higher rpm levels (consider using the Motorsport Extender or the Crane Interceptor to defeat the 6250 rpm rev limit in the EEC-IV computer).

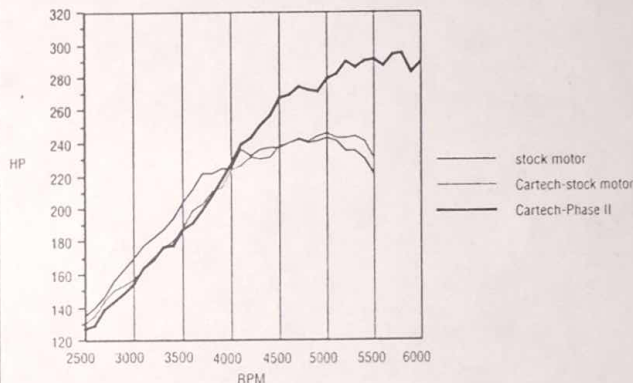
Supercharged or turbocharged motors will benefit from this design because, while the benefit of a tuned intake runner length becomes minimal, the decreased number of turns in the intake tract creates less resistance and helps to boost power output. We feel that in a forced induction application, both of the "box"-style manifolds—the Hartman and the Cartech—would have the advantage over the others in our test.

Cartech "Breadbox" Intake



Like the Hartman Powerbox, the Cartech "breadbox" is a rectangular plenum with a top sealed by eight hardened allen head fasteners. Cartech box comes in unpainted aluminum, but is usually seen with a black, anodized finish. Note gentle radiuses into intake runners. Our test unit inlet opening was ground open to 70mm. Production units are currently being cast with this larger 70mm opening.

Cartech "Breadbox" Intake



Weight (w/stock lower intake): 26 lbs.
Price: \$325

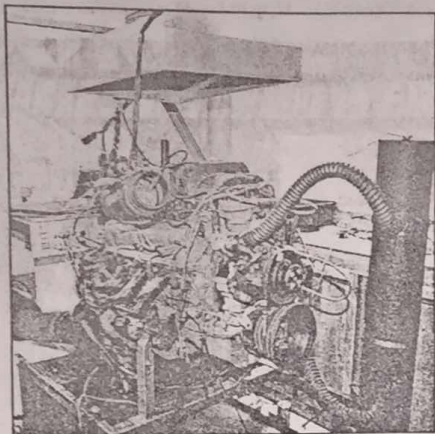
The Cartech "breadbox" intake (as it is affectionately and unofficially called by the folks at Cartech) is actually the granddaddy of all 5-liter intakes—not the GT-40 (as we indicated earlier). Cartech's Mark Harwell tells us that the "breadbox" was originally designed in 1987 for use with their engineered EFI turbo kit. As such, its design is not actually optimized for use with normally aspirated engines, but we thought it would be fun to try it out anyway, if for no other reason than to illustrate a point.

The "breadbox" was designed as just one part of a comprehensive, integrated turbo induction system. Our less-than-spectacular result illustrates what happens when induction components are poorly chosen. In normally aspirated applications, the Cartech "breadbox" makes only minor gains in the high-rpm range and sacrifices a substantial amount

of power in the mid- and low-rpm ranges.

When installed on a supercharged or turbocharged 5-liter engine, however, we have seen excellent results (see "Mind Blower," April '93; "The Houston Rocket," Dec. '90; "I Love Lucy," Jan. '93, and "Newsmakers" Aug. '92).

Between 4000 and 5500 rpm, the "breadbox" averaged only 2 hp and 1.5 lbs.-ft. of torque over the stock baseline pull, but during Phase II (Crane 2040 compucam, Crane roller rockers, GT-40 heads, 24-lb. injectors, Extrude Hone lower manifold), the Cartech performed better, adding an average of 45 hp to its power band. As with the Hartman Powerbox, the Cartech is just getting up steam as the dyno run ends. This type of plenum box seems to thrive in a high-rpm climate, giving it more of an advantage for race car applications.



Prepping an EFI motor for dyno action is no easy task. Additional provisions must be made for the computer harness, sensors, fuel injection and high-pressure electronic fuel pump. It's hard to believe that this Rube Goldberg-looking thing actually works, but it does.

credit for the aftermarket's uncharacteristic change of heart—you made the fuel injected 302 "the engine that would not go away" (applaud here).

It took giant MUSCLE MUSTANGS & FAST FORDS to assemble the five most popular EFI intake manifold combinations for your perusal. You won't find backpedaling milquetoast fluff here (wrong magazine), no sirree, Bob—we're talkin' hard-hitting, brass-tacks facts. Ron Anderson Performance in Lexington, Ill., was able and eager to handle our herculean dyno schedule by volunteering its 901T Superflow dyno along with the invaluable expertise that only comes from hundreds of years of collective experience with Ford powerplants.

Because we know that some of you are going to build up your motors in stages, we dynoed a totally stock motor (from a '92 GT with only 3000 miles on it), then we tested each intake combination twice: first, on the stock motor (but with 1½-inch equal-length shorty headers, 65mm throttle body and unfiltered C&L 73mm mass air meter). Then, for Phase II, we added a Crane Compucam 2040, roller rockers, 24 lb./hr. injectors and bone stock GT-40 cylinder heads with 1.84/1.54 valves. The rest, as they say is history.

Charts continue on page 52

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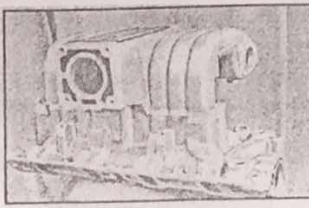
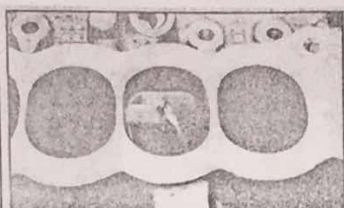
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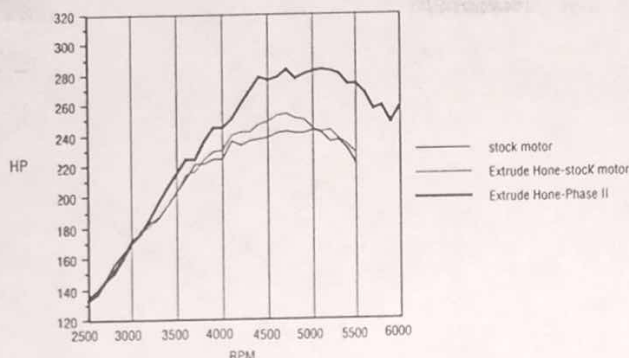
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Extrude Hone Stock Intake



Runner in stock lower intake has been enlarged and smoothed to improve flow volume and inlet velocity. Notice how casting roughness has been totally eliminated. This lower intake was also used for testing the Hartman Powerbox and the Cartech "breadbox" intakes during the Phase II portion of our dyno fling.

Extrude Hone Stock Intake



	Peak Torque	Peak Horsepower	Average hp
w/stock motor:	313.0 lbs.-ft. @ 3600 rpm	253.1 hp @ 4700 rpm	242 (4000-5500)
Phase II:	328.9 lbs.-ft. @ 3900 rpm	283.1 hp @ 4700 rpm	273 (4000-5500)

Weight: 34 lbs.

Price: \$600 (w/core exchange)

The Extrude Hone process has been around for a long time, having cut its teeth in the manufacturing world decades ago. While Extrude Hone is actually a patented process rather than an actual intake manifold design, it has an important place in our test and on your car.

The Extrude Hone process consists of forcing a formulated abrasive compound hydraulically through the passages of, in this case, an intake manifold. By doing this, excess material is selectively removed from corners and crevices. Casting flash is removed as well, and the whole tract is smoothed to improve port velocity. According to Extrude Hone's Kurt Gordon, the process of Extrude Hone is not a panacea for a poorly designed intake, but noticeable improvements can be made to practically any intake manifold.

Keep in mind that the Extrude Hone process is not limited to the stock intake manifold. Extrude Hone has had success honing all types of intakes (including the GT-40) and cylinder heads as well. In fact, Detroit regularly sends production components to Extrude Hone for reworking. Often these "breathed on" induction parts end up in internal test vehicles or on tweaked press fleet cars (one source tells us that both Ford Cobra intakes and Chevrolet LT-1 Camaro manifolds have been clandestinely diverted through the doors of the Extrude Hone facility).

For a bone stock-looking sleeper, an Extrude Hone stock intake is the ultimate slick trick. It is technically possible to put together a totally stock-looking motor consisting of an Extrude Hone intake,

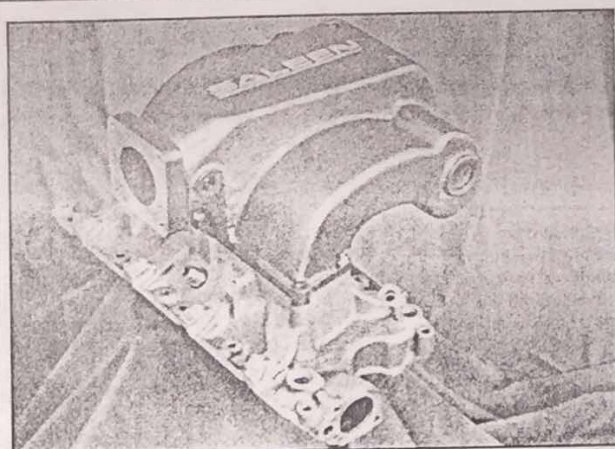
bored-out stock mass air meter, 65mm throttle body, ported and polished small-chambered stock cylinder heads, GT-40 valves (1.84/1.54) and a lumpy cam. With a set of 1 1/8-inch shorty headers and a well-hidden nitrous system, such a car could run well into the 11s. It looks stock, but it's not. (If you have a car like this, tell us about it!)

You'll notice from the graph that the Extrude Hone process doesn't sacrifice any low-end or mid-range performance to get a leg up at the high end. The gain in performance is subtle and gradual, averaging 7 hp more than stock between 4000 and 5500 rpm. In Phase II configuration, the Extrude Hone stock manifold climbed, on average, another 31 hp between 4000 and 5500 rpm. Additionally, it is the only combination in the whole group that doesn't show an upward shift in the power band when treated to the Phase II hardware; this is good for both durability and around town punch.

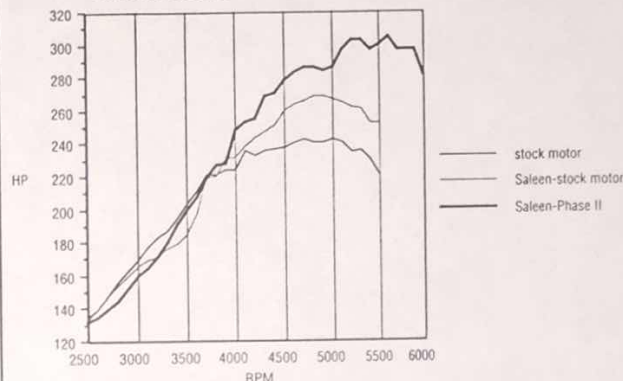
For all-around streetability and stealth (as applied to the stock manifold), the Extrude Hone process is an attractive alternative. While the Extrude Hone stock manifold is certainly no slouch, for full-tilt rock 'n' roll drag racin', we would probably consider a more radical setup. As you can see, after 5000 rpm, the Extrude Hone drops off a cliff (heck, we don't leave the line at a tick less than five grand).

We are pleased to say, however, that the Extrude Hone stock manifold holds its own just fine—low and mid-range power are its forte.

Saleen Intake



Saleen Intake



	Peak Torque	Peak Horsepower	Average hp
w/stock motor:	310.7 lbs.-ft. @ 3900 rpm	269.0 hp @ 4800 rpm	256 (4000-5500)
Phase II:	325.2 lbs.-ft. @ 4000 rpm	302.7 hp @ 5300 rpm	292 (4500-6000)

Weight: 39 lbs.

Price: \$995

Most of you are familiar with the Saleen intake manifold. It's been around for quite a while, but doesn't seem to command much respect from the drag racing crowd. Perhaps this is because Saleen is incorrectly pegged as a road racing outfit, or maybe through an unhappy accident, it was overshadowed by the introduction of the GT-40. Whatever the reason, this mooker has been sadly underrated.

Using an EFI truck lower intake as a starting point, the Saleen has the lungs of a South Pacific pearl diver. The large rectangular intake runners of the truck unit put even the GT-40 lower to shame, its only shortcoming being a slight loss of low-end power.

Rather than trying to outsmart the factory by running off on some wild theoretical tangent like a multitude of stillborn competitors, Saleen developed its plenum and intake runners along the lines of the stock unit, making improvements in critical areas and leaving alone what works.

One of the toughest obstacles for customers, according to

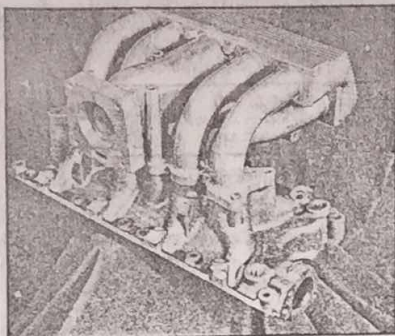
Saleen's Kevin Driskel, has been coming to terms with the cost of the unit. "We've always known our unit was best. \$1500 is a lot of money, but it's worth it." Fortunately, you lucky bunnies will be the first to find out that Saleen has substantially reduced the price of its unit—by over \$500.

You could've pushed me over with a feather when R.A.P. dyno operator Donald Denne shut the throttle down after the first Saleen dyno run. "Is that printout right, man?" I queried. "269 hp sure is a lot from some high-falutin', 'tally-ho-old-chap' road-racing setup." When the dust settled, we found that the Saleen averaged 256 hp between 4000 and 5500 rpm.

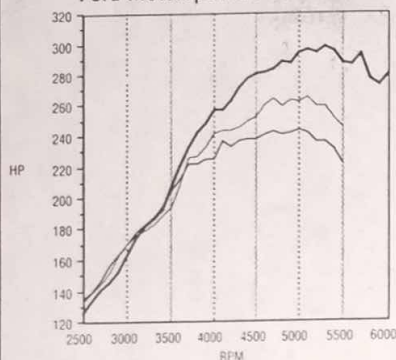
The addition of the GT-40 heads, Crane roller rockers, Compucam 2040 and 24-lb. injectors boosted output another 36 hp on average, making a grand total of 292 hp between 4500 and 6000 rpm.

Apparently, the Saleen intake is the best kept secret in the 5-liter drag racing arena—it pulled out a 6-hp advantage over the GT-40 between 4500 and 6000 rpm.

Ford Motorsport GT-40 Intake



Ford Motorsport GT-40 Intake



stock motor
GT40-stock motor
GT40-Phase II

Just go to any local drag strip on grudge night and look under the hood of five Mustangs. Chances are, four of 'em will be packing GT-40s. You'd think they were standard issue. The overwhelming majority of hopped-up Mustangs have GT-40 intakes for one reason: They work.

In a way, the GT-40 intake has become, in three short years, the benchmark that all other aftermarket manufacturers must shoot for when designing an EFI intake manifold. Historically, factory-developed aftermarket components have always had an unfair advantage because of all the resources available for development. This has become even more pronounced with the advent of sophisticated electronic engine management.

For the normally aspirated 5-liter engine, the GT-40 is one of the best deals around. Right off the bat, when placed on a stock motor, the GT-40 is worth an average of 18 additional ponies between 4000 and 5500 rpm, yet gives up very little on the bottom end. This increase may not sound like much, but considering the incredible restriction of the stock cylinder heads, it ranks right up there with tax refunds and nuclear disarmament.

With Phase II equipment, the GT-40 averaged 286 hp between 4500 and 6000 rpm—that's 51 hp over the baseline engine (which averaged 235 hp between 4000 and 5500 rpm). While these horsepower gains probably don't sound like the size of increase you're used to hearing, keep in mind that we're giving you an average over a specified

Continued on page 92

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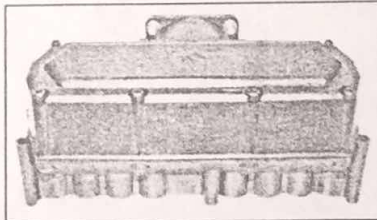
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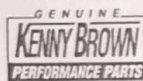
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EFI Intake Shootout (Continued from page 53)

Ford Motorsport GT-40 Intake

range. Peak horsepower numbers mean very little in a drag race, but make advertisements much more exciting (we've included them anyway for your curiosity).

	Peak Torque	Peak Horsepower	Average hp
w/stock motor:	320.2 lbs.-ft. @ 3700 rpm	264.0 hp @ 5100 rpm	253 (4000-5000)
Phase II:	337.0 lbs.-ft. @ 4000 rpm	297.1 hp @ 5300 rpm	286 (4500-6000)

Weight: 29 lbs.
Price: \$700

Stocker Or Shocker?

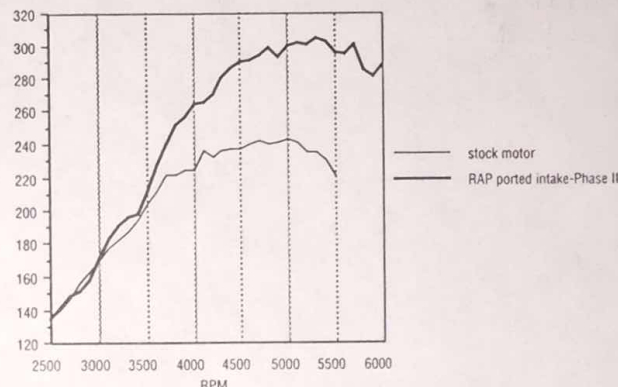
Ron Anderson is one of those tinkers who can't leave well enough alone. As a veteran NHRA champion drag racer and engine builder, Ron is always looking for ways to get a leg up on the competition—whether it's on the track, or in the marketplace.

For our dyno session, Ron cooked up a trick ported stock intake manifold and set it on top of our stock-block Phase II setup consisting of unported GT-40 heads, Crane roller rockers, 24-lb. injectors and Compucam 2040 smog-legal cam.

Like the other manifolds in our test, the R.A.P. ported manifold also had the benefit of 15/8-inch MAC equal-length shorty headers, 65mm throttle body and 73mm C&L mass air meter. The only variation in the test was that our C&L meter had a conical air filter on it instead of no air filter. (According to Ron, the filter straightens out the airflow and allows the engine to make a bit more power.)

Ron Anderson Performance first hand-ports the lower intake and port matches to the cylinder heads. The upper plenum is a little harder because it has to be cut in half and hand-ported from the inside. The halves are then welded back together and port matched to the lower intake.

Ron Anderson Performance Ported Stock Intake



Other than the visible weld on the upper plenum, the unit looks totally stock and would work great on a sleeper. With a little work (a grinding tool, body filler and some aluminum paint), the scar could just about be eliminated, giving it that mild-mannered, "seen it a thousand times" appearance.

Does it work, though? You betcha.

The hand-ported intake made an average of 294 hp between 4500 and 6000 rpm. With the air filter to straighten out the airflow into the C&L meter, the ported stocker barely edges out the Saleen intake with its huge intake runners. For more information on this service, give Ron Anderson Performance a call and just tell him we sent ya.

	Peak Torque	Peak Horsepower	Average hp
Phase II:	345.4 lb.-ft. @ 4000 rpm	304.5 hp @ 5300 rpm	294 (4500-6000)

Weight: 33 lbs.
Price: \$390 (w/core exchange)

SOURCES

Cartech Performance Systems
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C&L Performance
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