

'CHARGIN' THUNDER



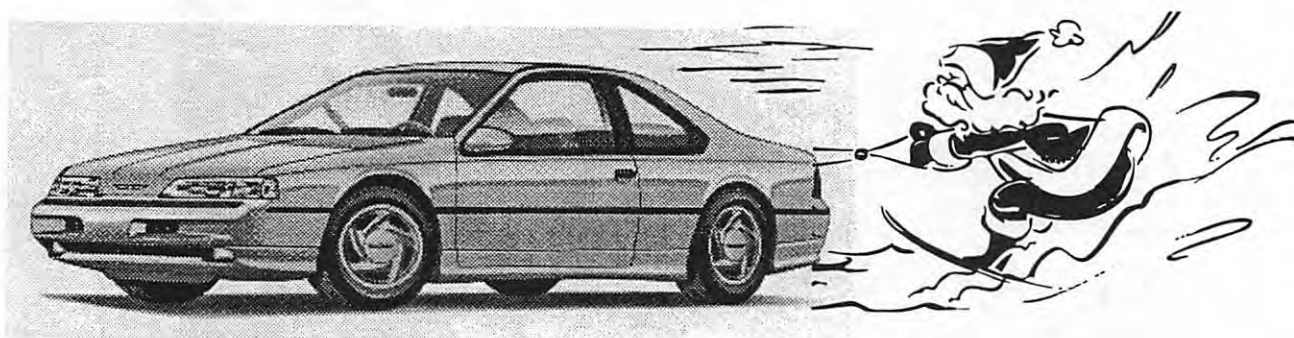
VOLUME I

Bill Hull, *President & Editor*

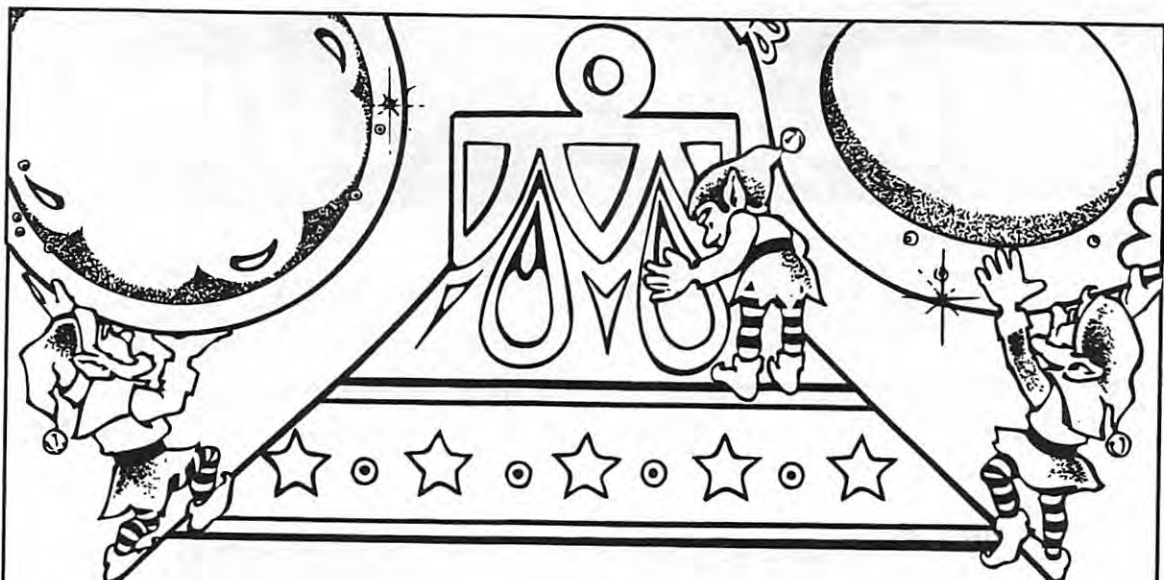
DECEMBER 1996

THE OFFICIAL NEWSLETTER
OF
THE SUPER COUPE CLUB OF AMERICA

*Dedicated to the Preservation and Performance
of the Thunderbird Super Coupe
1989 - 1995*



Seasons Greetings



*Elvis shows his groupies
his SC collection*



FROM THE BIRD'S NEST... By Bill Hull

Hello, Super Coupers! Well, it's that time again. Time for another exciting issue of Chargin' Thunder, the only newsletter/magazine dedicated solely and entirely to the Thunderbird Super Coupe. As this December issue goes to print, our ranks have swelled to over 330, with a new member finding the "Promised Land" at the rate of one a day (as has been the case for the last 9 months!). Ford Motorsport SVO alone refers an average of 5 SC owners per week to the SCCoA, most of who join with us; undoubtedly the most knowledgeable, enthusiastic, friendly, and "debonair" group of car owners the world has ever seen!

The featured subject in this issue of Chargin' Thunder is exhaust systems and headers. Now that headers are actually available and being delivered, and improved True-Dual exhaust systems are in stock, I feel it is safe to whet your appetite for the single most important "Go-Goody" for the SC - exhaust improvements!

Before going any further, I want to discuss a somewhat unpleasant subject - this being a "We" Club, I feel it concerns all of us, not only those Club Members who have been directly affected. Referring back to Chargin' Thunder, June issue, where I mentioned a problem with some Club members saying they wanted certain parts (primarily headers), then when it came time to pay for same, changed their mind. I have been "stood up" on headers numerous times, to the point where I cannot consider a set sold until I have received payment in advance, whether by check, money order, or Master Card/Visa. The headers are shipped to me COD, so I must be financially covered before they arrive by UPS. Otherwise, I would be divorced by now, and sleeping in the back of my pick-up truck, surrounded by several sets of Super Coupe headers and down-pipes. Not only do these headers not taste very good (although they sure are pretty!), they would not keep me very warm this time of year either!

Having said the above, as many of you know, Watson has been extremely slow delivering headers. After making a set for me last June (before Carlisle), and promising me continued production, they did not actually restart production and delivery until mid-November. Based on what Watson was telling me, I started taking pre-paid orders for headers back in July, expecting a two to three week delivery schedule. As it turns out, several of you Club members have had to wait three to four MONTHS for your headers, and some of you needing cats still have not received your headers and down-tubes! To be fair to Watson Engineering - they could be charging \$1000 for just their headers alone, still \$500 cheaper than JBA, the only other source for these headers in the world, to my knowledge. They are producing these headers for the Super Coupe Club at a fair price,

but they can't forsake their main source of income - prototype and special R&D work for the likes of Rousch Racing and Ford Motor Company - just to make a few sets of headers for the Super Coupe Club. They are basically "working us in" as they find time. In essence, they are doing us a favor, in spite of the delays. The alternative is no headers, or headers so expensive no one could afford them (JBA).

Similiar delays have also occured in production of the True-Dual exhaust systems. I am finally having the exhaust systems manufactured locally, but only after being promised by two different shops who said they would do them for us, but never could "find the time" to actually begin production. This caused a big delay (2 months) in delivering the exhaust systems. I could have had Tracking Products deliver dual systems within two weeks, but at a cost of \$550. By eliminating the middle-man (Tracking Products) I was trying to save you Club members \$150, having priced these systems in the last newsletter at \$395, plus shipping, of course. As it turns out, Tracking Products was not marking these systems up as much as I thought, as I could not find anyone who would make these systems for \$395, (after first being told by two shops that they would). Last Friday, Dec.6, I found out why. Needing a pattern for the 89 - 91 Super Coupe dual exhaust system, and using my car for a mock-up model, two expert mechanics with a \$12,000 pipe bending machine, and with my help, spent SIX hours making ONE prototype dual system! Material alone, (five 8-ft sticks of pipe per system), costs \$150 dollars (stainless, is an additional \$250 per set, not including the increased difficulty of bending same)! Sunday, again using my car for a mock-up, and using a 92-95 gas tank which I had purchased (different exhaust routing than previous years), the three of us spent FIVE hours making a prototype exhaust system for 92-95 SC's. The R&D costs alone (which, I hope, I can recoup after several additional sets are sold) was \$800 for the two prototype systems, PLUS the the actual production costs of these two systems. It doesn't take a fourth grade education to figure out that I am selling these first eight exhaust systems for LESS than I am paying for them! - not good business practice! In addition, Watson raised their price to me on the headers and downtubes since last June (increased production cost, they said). Having already been paid in advance, I cannot and will not pass these increased costs on to you members who have already pre-paid- - this also is not good business. In a nutshell, I'm taking a beating worse than the one I took on the Club apparel!

To top it all off, I ordered 20 specially made (direct from the factory) double-wall, 300 lb test cardboard cartons in which to ship the dual systems and headers, plus bubble-wrap and styrofoam "peanuts" for packing material - cost to me, \$500. Tracking Products just threw the pipes into a big box (no packing) and shipped them off, rattling all the way across the country in the back of UPS trucks! Further, shipping one-way from Jet-Hot to me (for which I have been charging \$15, turns out to be instead, \$32, including a nice crush-proof Jet-Hot Inc. carton. Remember,

much of this is new to me, never having done these things before, so I had a steep learning curve! Believe me, I have been forced to learn quick! Otherwise, I might yet end up sleeping in the back of my pick-up!

My reason for relating the above story to you Club Members is not because I am seeking your sympathy. As I said in the June newsletter concerning the Club apparel, nobody forced me to do the afore-mentioned things - so I cannot place the blame on anyone else but myself. My dream and heart-felt desire is to hear and read about thousands of Thunderbird Super Coupes all across this great land of ours, running 13 second ET's at drag strips, running well at auto-cross, road course and oval track events (like Car Guys, etc.) and even open road rally/races like they have in Nevada. I would like the whole world to come to appreciate the Super Coupe for the outstanding automobile it truly is! I really LOVE the Thunderbird Super Coupe!

Anyway, for those of you who have had to wait an excruciating length of time for your orders to be filled, I sincerely apologize. I truly believe I have tried to do the best I am capable of, but as I have heard it said before, "The road to Hell is paved with good intentions". Sometimes doing one's best is just not good enough. I have been mislead and jerked around by others - this in turn has caused me to appear to have done the same to some of you. Those of you who have felt compelled to call me wondering where your parts are, I understand completely. Those of you who have NOT called every week asking about your orders must have the patience of Job, and I appreciate your understanding. I do want to make one thing very clear, however. These delivery delays are in no way a sinister plot to defraud anybody, nor has anyone's money ever been in danger of being misspent or lost. I have a separate bank account for the Super Coupe Club, apart from my personal and paint business accounts,, and the money you members have sent me has always been there.

The bright side of all of this is that I think we are "over the hump"! The headers (especially Jet-Hot Coated) are fantastic! - very well designed and made. The dual systems are far superior to the Tracking Products systems, both in material (heavier guage, all aluminized pipe, not just aluminum coated), and design (we improved on the Tracking Products system). This improved system is more "adjustable" to allow for production variations between automobiles, as well as for the slight differences in connection to stock vs Watson down-tubes. I personally have one of these systems on my car now, and although I had a good 2½ inch system on my car already, this system, with the addition of the 2½ inch down-tubes from Watson, makes noticeably more power, AND IS QUIETER!

Another part which has been temporarily delayed (I should say temporarily out of stock, due to great demand) is the modified supercharger adapter tops. An initial run of 16 units, with a 3/4 inch raise, have already been delivered. They, as

advertised, fit under stock hoods using the stock upper inter-cooler tube (with a minor alteration to the alternater bracket-to I/C tube flange). Reports from SC Club members who have installed their modified SC tops have all been very positive, to say the least!...ranging from Stan Barbers' "YIPPEE" to others saying "Awesome part, dude"!, "Peachy-keen"!, and even "Hunky-dorey to the Max"! Anyway, after waiting for a month for delivery of twenty new SC tops from Eaton (by way of Magnuson Products), at this time the machine shop is expediting work on these units. Magnuson is sending me 10 more units this week, for a total of 30. Only 2 of the 16 members who have already received their modified tops have chosen to return their stock units for the \$60 core refund - why should they when new ones cost \$275 from Ford!? I would no doubt keep mine too! Those of you waiting for this power-enhancer should receive your tops in time for Christmas.

As some of you already know, the price on the SC tops has had to be increased. I had the machine shop do additional work (both extra welding and extra CNC milling) than we first agreed upon - therefore, they had to charge me more than I first expected. After I receive them back from the machine shop, the work I must do is also greater than I imagined (partly because of the increased CNC milling). Because Eaton has a plentiful supply of new SC tops, and few members want to return their old tops for a core anyway, the new price does not include a core charge.

I bought a large air compressor, four die-grinders (a regular size straight, a 90-degree, a 120-degree, and a real life-saver - a large straight die-grinder with a six-inch extention for reaching into the throat of these SC tops. This big, long die-grinder is a two-hander, but it really does the job! In addition, I purchased four carbide cutters for working with aluminum, four carbide cutters for steel or cast-iron, 400 sanding rolls of assorted courseness, (it takes 10 rolls per top at 50 cents per) and various other periferal items to make the job go smoothly. But it is still a JOB! After spending approximately one hour per top smoothing out the rough spots with the die-grinder, the throats are greatly enlarged over stock, and smooth as if they had been Extrude-Honed! Next, I wash each top in a five gallon bucket of kerosene to remove all bits of aluminum and cutting oil. Then, I wash each top in a strong detergent solution to remove the kerosene. After lightly sanding each top, I bath them again, this time in acetone, to remove any impurities which could interfere with the adhesion of the new paint job. After priming each top with high-heat engine primer, I bake them in my oven (while my wife is at work, of course - are you kidding me!) for 30 minutes at 200 degrees. After they cool off, I touch up any minor nicks and scratches which may have occured during machining with spot putty. Another coat of primer, another 30 minutes in the oven - then I'm ready for my finish coat of gray (also engine enamel). 30 more minutes in the oven, then finally I apply two good coats of high-heat clear-coat. One more trip to the oven - then they are ready for my

quality control check. After lovingly massaging these beautiful works of art, I kiss each and every one good-by. Finally, they are carefully packaged in bubble-wrap and placed in their own special boxes for shipping to their lucky new owners.

"WE WILL SELL NO WINE BEFORE IT'S TIME"! These modified SC tops are dynamite! Every Super Coupe in America needs one and should have one. I am more convinced than ever these modified tops are so effective, that when combined with the equally effective headers and duals and a K&N air filter, these parts alone, when bolted on a STOCK Super Coupe are worth at least 75 horse-power! When other bolt-ons such as larger throttle-bodies, mass-air meters etc. are added, with all these parts now complimenting each other (because backpressure is no longer a factor), 100 horsepower will be the satisfying result! Because of this, and because I have learned alot from you Club members I have revised my "How Fast Can You Afford To Go" section from June's newsletter. It follows:

Assuming excellent traction, increased gear ratio (especially on 89-93 AOD'S without the wide-ratio gear-set), good weather conditions, synthetic fluids, and a 180 lb driver with razor-sharp reflexes, the following results can be expected in the quarter-mile.

Stock Super Coupe 210-230HP, 4500RPM shifts 15.4-15.9 ET @ 88-90 MPH (average) ("Hello officer? Nice day, isn't it". 130 MPH!?? You must be mistaken, officer, this is a nice family car, with a built-in rev-limiter. It can't even GO more than 110 MPH"!

STAGE 1 - 290 - 310 HP, 5000 RPM shifts, 14.5 ET @ 96 MPN ("Hello, little Mustang..How would you like to try your big brother on for size"?

1. Headers and dual exhausts (2½inch)
2. Modified SC adapter top
3. K&N air filter
4. 155 lph fuel pump
5. Magnecor plug wires
6. Inter-cooler fan
7. Stock injectors
- 8 180 degree thermostat (in summer)
9. 93 Octane fuel (minimun)

STAGE 2 - 350 HP 5000 RPM shifts, 13.5 ET @ 102 MPH ("Hello, Mr. Z-28 ...How would you like to run a Fix-or-Repair Daily?..Heh,Heh...Just for fun, of course!

1. Magnuson S-Model blower, or S-model modifications
2. High-capacity inter-cooler
3. 36 lb/hr injectors for 89-93 SC's
4. Under-drive pulleys

5. C&L 73MM Mass-Air meter
6. BBK 65 or 70MM throttle body
7. Octane booster

STAGE 3 - 375 HP, 5500 RPM shifts, 13.0 ET @ 106 MPH ("Hey buddy! Isn't that one of those Buick Grand Nationals I've heard so much about? Say, How would you like to.....")

1. Crane cam #208/294-13, (or equivalent), with related valve train components- valve springs, roller-rockers, retainers, etc. (power-band - 1500-5500 RPM)
2. Head work - 1.60 exhaust valves, minor porting, combustion chamber modifications to relieve valve shrouding, etc.
3. 190 lb/hr fuel pump
4. Balance and blue-print
5. 2500 RPM stall-converter for AOD's
6. H.D. AOD parts incl. aux trans cooler
7. Extrude-Honed inlet-plenum, I/C tubes, & I/C tube to intake manifold adapter.

STAGE 4 - 400 HP - 6000 RPM shifts - 12.5 ET @ 110 MPH ("Hello?...Bonneville Salt Flats?...I'd like to make an appointment for my 'Bird....")

1. Crane cam #HR 220/311-114 (or equivalent) Power band 2000-6000 RPM
2. 38 lb/hr Lucas injectors, w/boost-controlled FMU.
3. 2½ inch dual exhaust system (or equivalent - see Charles Warners article "Unplugged and Flying").
4. Thermal coating on pistons, heads, valves, etc (for durability and increased power.

STAGE 5 - 450 HP - ("Hello?... Mission Control?...Houston, I think we've got ourselves a problem!"....)

Notice: injectors larger than 36 lb/hr are not required until exceeding 375 HP... A Boost-controlled FMU is not recommended until the 400 HP level. Why? Neal Frisbee, who obviously has done his homework (as well as extensive fuel-flow and head-flow work) tells me the Super Coupe already has a factory "boost-controlled FMU". The stock fuel-rail pressure automatically increases one PSI for every one PSI increase in boost, from 40-43 PSI to 52-56PSI! I confirmed this with Lee Bender at C&L Products. Lee told me, because of this designed-in feature on the Super Coupe, the stock 30 lb/hr fuel injectors are sufficient for 325-350 HP, the 36 lb/hr fuel injectors are good for 400 HP - PROVIDING THE FUEL PUMP IS ADEQUATE FOR THE JOB! The reason - increasing the fuel rail pressure makes the injectors "work harder", increasing fuel delivery under boost, essentially making stock injectors "think" they are larger than they really are.

Neal Frisbee has run 13 flats with nitrous-assist and stock 30 lb/hr injectors!! However, he has compensated for his additional fuel delivery needs (because of the nitrous, etc) by increasing his fuel-rail pressure to 80 PSI! (and by using a 230 ltr/hr, Mondo fuel pump!) There is a limit to how much fuel-rail pressure one can use, however. When fuel injectors are forced to work at 100% duty cycle, they are prone to failure (or burn-out). Fuel rail pressures exceeding 80 PSI on stock SC's can cause fuel rail leaks, pressure regulator failure, or injector O-ring blow-out!

Another built-in feature of the Super Coupe CPU (EEC-4 and EEC-5), is the ability to automatically retard ignition timing 10 degrees when the knock-sensor reports detonation, or when under boost conditions. These two features (boost controlled FMU and automatic timing retard) that Ford wisely built into the Super Coupe engine management system, backs up the opinion held by many (including myself) that the SC does not need an after-market computer chip-module. These chip-module manufacturers make two consistent claims- their chips are designed to increase fuel delivery and increase ignition timing - all at the proper time, of course! Well, the Super Coupe ALREADY increases fuel delivery at the proper time (under boost) and supercharged engines as a rule don't want or need additional ignition timing - it can cause catastrophic DETONATION quicker than you can say "three-thousand dollars, please!" If Ford Motor Co. thought the Super Coupe needed additional ignition timing, they would have provided it (with-in their safe parameters). Who would YOU rather trust? The manufacturers of our fine SC's, or Chief Engineer Jamie Turvey, of Superchips, Inc? OH RATS! That reminds me! I forgot to include Superchip modules under Stage 1, above. Go ahead and just add an additional 50-100 HP to the above HP figures (and don't forget the accompanying MASSIVE increase in torque!).

By the way, referring back to the Sept. issue of Chargin' Thunder...after re-examining the SUPERCHIPS, INC. sales brochure, so masterfully researched and written by MY HERO Chief Engineer Jamie Turvey, I discovered some additional GREAT NEWS! In addition to smoking computer-enhanced pot, ol' Jamie must be dropping some acid! If his Superchip module (with pulley combo) really did increase torque on these cars by 35% (105 lb/ft) at 3000 RPM, guess how much the HORSEPOWER would increase at 3000 RPM. Well, using our familiar and by this time (no doubt) memorized formula - $HP = RPM \times Torque \text{ divided by } 5252$ (as discussed in June issue of Chargin' Thunder) we find that the Superchip, Inc. module combo will increase our HP at 3000 RPM by an astounding 60 HP! WOW! WOW! and DOUBLE WOW! The only problem is, previous to this claim and on the SAME PAGE, Chief Engineer Jamie Turvey claims only a meager 35 HP increase. Make up your mind, Jamie, which magic number should we use???

My wife, after reading my less-than-flattering appraisal of Chief Engineer Jamie Turvey's Superchips, Inc. sales brochure said:
"What if HE sees this article, HE may want to sue you for

slander". My response was "Let HIM try - I will counter-sue on be-half of every Super Coupe owner in America". My grounds for for such a suit? FALSE ADVERTISING AND FRAUD! of course! In addition, I would sue HIM for trying to spread a contagious disease with which he most obviously is afflicted - "OPTI-RECTI-LITE-US" Don't try to find this disease listed in any medical encyclopedia, folks, but its' symptoms are unmistakable and easily recognized. "OPTI-RECTI-LITE-US" is when certain people shield their head from ultra-violet radiation (by placing it where the "sun don't shine"), which invariably gives such people a rather "cloudy" out-look on life.

Back to Lee Bender of C&L Products again. Lee assures me that all Super Coupes, regardless of model year 89-95, use the same C&L Mass Air meter sampling tube - AS LONG AS THEY HAVE STOCK SIZE INJECTORS. Remember, the C&L as well as most other after-market mass-air meters, retain and use the stock factory sensor (hot-wires), which send their signal to the factory processor which in turn "tell" the stock injectors "what to do" based on engine air-flow requirements. Each model year SC has a specific electronic engine control processing unit, or "computer" (EEC-4 or EEC-5). These "computers" know which size injectors each car has so no custom sampling tube is needed for the C&L unit UNLESS ONE CHANGES INJECTOR SIZES. When 89 - 93 SC owners change from 30lb/hr to 35-36lb/hr injectors, then you need to change the sampling tube to correctly calibrate your C&L to your engine processing unit. The great thing about the C&L unit is - thats ALL you have to do. New samping tubes are only \$35 apiece - I also keep in stock the needed sampling tubes. Stock mass-air meters, besides being restrictive, offer no such adaptibility.

Further, Lee has flow-benched the stock 89-90 50MM mass-air meter, as well as the stock 91-95 73MM, against his 73MM Max Flow after-market piece. Results:

89-90	450 CFM
91-95	500 CFM
C&L	700 CFM

The 91-95 stock meter, even though it is 73MM in diameter, has a middle divider which severly limits it's ability to flow large amounts of air. Cutting out the divider helps, but it still lacks the adjustibility of the C&L meter.

The C&L mass-air meter won the SEMA (Specialty Equipment Manufactures Associaton) award for "Best Engineered New Product" when it came on the market a few years ago. Vortech Engineering, bought the rights to produce this piece from C&L - thus the new name Vortech Max-Flo. I'm sure Vortech shopped around before they decided on the C&L meter - don't forget Vortech is a big-time manufacturer of centrifugal super-chargers for many types of vehicles - I'm sure they picked the best on the market on which to stake their name and reputation. The same basic C&L-Vortech mass-air meter that fits the Super Coupe also fits the Mustang 5.0L, the Taurus SHO, and Ford Explorers and Ranger pick-ups.

Lee Bender has also told me to caution those of you who have

fashioned a Ram-Air intake system. He agrees with me that "Ram-Air" is a mis-nomer. There is no way to "Ram" any more air into these motors than they need. The Blower takes care of all that. I prefer to call such systems "Fresh Air" or "Cool Air" intake systems. Anyway, Lee tells me that some of these "Ram Air" systems CAN pressurize the factory AIR BOX, causing the mass-air meter to become confused and send false signals to the computer.

While I am on this subject, I will pass on this information. I recently purchased a 7" and a 9" K&N cone filter. After comparing them to the stock size panel filter and measuring their effective flow areas, I came up with these figures:

K&N Panel filter - 76.56 sq/in
K&N 7" Cone filter - 87.95 sq/in
K&N 9" Cone filter - 151.89 sq/in

The 9" cone filter has TWICE the filtration surface area of the stock K&N panel filter. This does not mean it will FLOW twice the amount of air, just that it has the CAPACITY to do so - provided the engine needs it. However, for any given flow rate, I would expect the PRESSURE DROP to be much less, therefore offering even less restriction to air-flow than even the stock size K&N. I am presently working on a "Fresh-Air Induction System" for the SC, using the 9" K&N and three inch plastic ducting, which will eliminate the factory air box and silencer, and attach directly to the mass-air meter. It should be very effective and hopefully cheaper than the K&N Filter-Charger kit which is basically a 5" or 7" cone filter, a plastic "flow-directer", and a mounting bracket. Not worth \$149.00!

One more "hot tip" before I go on to another section. My word processor is running out of memory (and so am I!). In light of the fact that many of you Club members are soon going to be "pushing the envelop" with your SC's, and considering the relatively poor quality of today's fuel (at least octane-wise), it might be prudent to stop and ponder a moment on available "Octane Boosters". Since Tetra-Ethel Lead has been long gone as a fuel additive, and un-leaded is now the only legal high-way fuel, finding high-performance fuel for high compression or super-charged street cars has become increasingly difficult and expensive. Un-leaded racing fuel- 100 octane (Research rating) is between \$3-\$4 dollars per gallon at drag strips. Leaded racing fuel can damage oxygen sensors and catalytic converters, even if used for short periods in diluted amounts. Octane boosters can be a real life-saver and are safer and much more convenient to carry on board an automobile than cans of racing fuel (especially on trips).

All Octane Boosters are not created equal, however! The Ethel Corporation, of Tetra-Ethel-Lead fame, a company whose headquarters is right here in Richmond, Va. spent millions of research dollars to formulate a replacement fuel additive which would raise octane levels of highway gas without the environmental hazards and the catalytic converter/oxygen sensor

damaging effects of lead. After investing these many millions of dollars, they did indeed, come up with an EPA approved additive which economically and effectively raised the octane level of unleaded gas. It is called, are you all ready for this?? .. "Methylcyclopentadienyl Manganese Tricarbonyl" (or MMT, for short). Whew! That's even hard to type, much less pronounce! Anyway, The Ethel Corporation, expecting to market this great product to all the major oil companies, got a real shock! Several environmental groups, already blaming Ethel Corp. for everything from birth defects to the mythical hole in the ozone layer, raised such a hew and cry that none of the oil companies would touch MMT with the proverbial 10-foot pole! Ethel Corp's only market for MMT is as an octane booster sold only in small bottles at your auto parts store. I have found two brands which contain MMT - 104 Octane Boost & Super Octane Boost, and Bardahl's "Knock-Out". Most other off-the-shelf so-called octane boosters contain nothing more than methanol, or unspecified "petroleum distillates" which could technically be nothing more than kerosene, but which is usually naptha, tolulene, etc, some of which are already contained in fuel as detergents and stabilizers. Anyway, just to prove to all of you that I hold nothing back and keep no "secrets" that might give me an unfair advantage should we "break the rules and bylaws" at a Club meet, I do use MMT regularly on the street. At the drag strip I mix racing gas 50/50 with 93 octane Amoco - the only gas that finds its way into my precious Super Coupe's little tummy! For you youngsters out there, Amoco produced 100 Octane (Research) unleaded fuel over 30 years ago (we used to call it "white gas" because it was, and still is, crystal-clear). It was good gas back in the sixties too - my 11 to 1 compression Z-28 ran as good on Amoco 100 octane as it did on Sunoco 260 102 octane! As Mr. Ripley would say, "Believe It Or Not".

Well, I have to sign off on this section, as my word processor really is almost out of memory; and I would hate for all these "words of wisdom" to be erased (or failed to be recorded for posterity) because of a computer glitch!

I am not finished, though, by a long shot. ARE WE HAVING FUN YET?

Please turn page and continue on this exciting journey!

Your editor.

FROM THE BIRD'S NEST ...CONTINUED...

Well, I have returned after re-charging my word processor - I now have a full memory-bank once again!

Kenny Brown called several weeks ago to ask my opinion on his soon-to-be produced Supercharged V-8 Thunderbird! I told him I thought it was a tremendous idea, and believe it will be a great automobile - and therefore in great demand! I mentioned to him the results of our Club's "Confidential Survey", where 90% of you respondents confirmed that you would be interested in an SVT-type High-Performance T-Bird if Ford or someone else would bring one to market at an affordable price. Kenny and I have talked several other times - his first prototype "Blown Bird" is featured in January "Super Ford" magazine. In March, "Motor Trend" will feature a similiar article. See enclosed brochure!

As further proof that I hold back no information or secrets from you Club members, I have enclosed brochures on a product line of friction reducers manufactured by Entech, Corp. Their featured product "Energy Release" is like nothing else I have ever tried. It was introduced to me by a life-long friend (an engineer by profession) who was the first to "turn me on" to the benefits of Mobile One synthetic oil twelve years ago. I have been using Energy Release in my crankcase for over two years - it is fantastic! I cannot say just how much it is worth in terms of added performance - I just know it works! I have also started using it in my supercharger (1 oz), as well as my power steering. I havn't tried it in my transmission yet because I am getting ready to re-build my AOD (using Art Carr heavy-duty parts, incl, 2500RPM 10" Super-Torque converter, one-piece billet in-put shaft, extra clutch packs, and an SVO wide-ratio gear set- all the goodies!). I use Energy Release in my wife's Jeep, my pick-up (incl. manual trans. and transfer case), my lawn mower, my air-compressor, and any where else heat and friction cause added wear. Energy Release is only available thru dealers, it is not available thru any retail outlets.

I recently became an Entech distributor after testing every available oil fortifier, friction reducer, and engine treatment I could put my hands on, including STP, Lucas, Dura-Lube, Slick 50, Hi-Tach, SFR, Pro-long, Turbo-Tech, as well as every synthetic motor oil readily available on the market (Mobile One, Amsoil, Red-Line, Valvoline, Castrol Syn-Tec, Pennzoil, Royal Purple, Scheiffer Moly and Quaker State). Entech did not just out-perform them all - it absolutely BLEW THEM ALL AWAY!

I tested these products on two different machines: a "Brake Machine", where a "bearing race" mounted on a high-speed spinning shaft (connected to an electric motor) and coated with each different product can be forced against a metal "test bullet". A Torque wrench and an amp meter are attached to this test

machine which allows a very scientific measurement of the metal-to-metal friction reduction ability of each individual product. Energy Release absolutely excelled!

An even more severe test was the Fallax Pin and Block test machine. This is a somewhat widely used industrial test standard. Every other product, including my beloved Mobil One, allowed the pin to heat-weld to the test block (from metal-to-metal friction) within five seconds with only a 101b torque load. I ran Energy Release for 45 seconds with an 801b torque load - and it never did heat-weld - my test drill started smoking - so I had to quit the test to keep from destroying my test drill!

Listen - I am the WORLD'S greatest skeptic when it comes to automotive "Miracle Products". Referring back to the first issue of Chargin' Thunder, and the article on synthetic oils, I have seen many so-called "Technological Break-Thru's" come and go. I am one of the most difficult people I know to convince that a new product is actually superior to existing standards of performance. I will not put just any product in my Super Coupe. If I had not seen Energy Release perform with my "own eyes", I would not have "ever" believed it is really as good as it is. Because I am hard to convince, I know many of you are too. Therefore, I am not asking any of you to believe me. I don't even expect any of you to believe what you read in these Entech Corp. brochures. But I will guarantee you all one thing. Those of you who come to SCCoA Club meets next year, will see this amazing product demonstrated before YOUR very eyes, and then you all will also become believers! Yes! IT'S THAT GOOD! I have already sent some free samples to several Club members who do machine work, as well as to several engine builders I know. I am so confident of Energy Release's superiority, I told these people to test E.R. against anything else they had in their shops, and to get back to me with their un-biased results. I will let the Club know when the results get back to me. Entech Corp. claims Rousch Racing as an enthusiastic user of their products. (Proprietary information)

Bill Evanoff reported something very interesting to me awhile back. He told me the 3.8L Super Coupe engine had the HIGHEST incidence of warranty repairs of ANY other Ford engine. He said many of the problems were relatively minor, but no doubt this is one of the reasons Ford dropped the car - maybe one of the major reasons people did not buy them in large numbers in the first place. The 3.8 SC engine had a much higher warranty cost than even the more intricate and "high-tech" DOHC SHO engine, the SOHC & DOHC 4.6L, and the newer Duratec line-up of DOHC engines. I expect many of the warranty claims were head-gasket related problems, especially with the earlier year SC's. The SC engine had a warranty claim record of 44 per 1000 automobiles, the SHO only 26.9, the 4.6L, 17.3, and the Duratec only 9.2 per 1000. Bill also reported to me that, after talking to some of the design engineers who worked on the 3.8 SC engine, they told him ALL of the major engine fasteners (main bolts, rod bolts, head bolts, etc) were MARGINAL at horsepower out-puts over 250!

HURRAY FOR A.R.P.!! This supports my stated case for exhaust improvements for DEPENDABILITY as well as for PERFORMANCE!

GEARS VS ACTUAL REAR-WHEEL TORQUE (AND HORSEPOWER):

Bill Schlabach, Mem# 5, from Canton, MI sent me an article on gears and the relationship they have to acceleration, fuel economy, etc. It is included in this newsletter and is titled "How Low Can You Go".

If reference to this article, I have said since day one that increased gearing, especially for AOD equipped SC's, is the "biggest bang for the buck" for "over-all performance improvement". Improving the exhaust system is the "biggest bang for the buck" so far as increasing "engine horsepower". I have made the statement, when discussing increased gear ratios, that doing so lets your car put more real power TO THE GROUND. (It is basic Physics - the principle of Leverage). There is a side-bar to the above mentioned article, that really brings this point out. The relationship between engine power and REAL rear-wheel power (minus drive-line losses, where again 5-speed cars have a 25HP advantage) is clearly defined in this side-bar called "Calculating Gear Ratio". Once you know your OVER-ALL ratio in first gear (trans.x rear end) you can multiply this number times your estimated engine torque, and arrive at your cars TOTAL TORQUE OUTPUT at the rear wheels (again, minus drive-train losses). I have taken the time to calculate the total torque output for the most common SC gear combinations: WHAT AN EYE-OPENER! No wonder you 5-speed guys get wheel-hop! You are overwhelming your poor SC with torque! Using 300 ft/lbs for a constant input, at say 2500 RPM, a decent launch RPM, check out these figures:

5-speed

1st gear ratio	rear gear ratio	over-all ratio	total-torque
3.75	2.73	10.23	3070 ft/lbs
"	3.08	11.55	3557 " "
"	3.27	12.26	3678 " "
"	3.55	13.31	3993 " "

AOD's

2.40	3.27	7.84	2352 ft/lbs
"	3.55	8.52	2556 " "
"	3.73	8.95	2685 " "
"	4.10	9.84	2952 " "

4R70W (AOD-E-W) or AOD w/wide ratio gear-set

2.84	3.27	9.28	2784 Ft/lbs
"	3.55	10.08	3204 " "
"	3.73	10.59	3177 " "
"	4.10	11.64	3492 " "

Us AOD drivers will NEVER touch you 5-speed guys for real rear-wheel horsepower - ain't no way! SORRY ABOUT THE WHEEL-HOP, GUYS! Heh, Heh! I mean, us poor HANDICAPPED AOD drivers need some kind of break just to TRY to keep up with you 5-speed TORQUE-MONSTERS!

Some of you Club members have offered your help to the SCCoA. Many of you already have done much to cause this Club to grow faster than I ever imagined! One thing all of you can do which would result in further rapid growth (it really helped the SHO Taurus Registry grow - to over 5000 claimed members in just 5 years). Contact your individual states' DMV or DOT office and ask them if they will agree to compile Thunderbird Super Coupe ownership lists from their computer files of registered drivers. Bill Evanoff has already done this with the state of Ohio. They told him they do this procedure frequently for car clubs. The easiest (and probably only way) to obtain this information is by checking the 8th digit in the VIN. On the Super Coupe this digit is actually a letter, the letter "R" (early production vehicles may be "C"). States that agree to do this usually charge a reasonable fee for doing so. Those of you that obtain this information can then notify me (please include DMV phone number) and then I will take it from there. This saves me from having to call all 48 states to try to obtain this information all by myself, leaving me more time to work on our next newsletter!

This completes FROM THE BIRD'S NEST - turn the page for more exciting news! Your editor...

BIRDS OF A FEATHER - (Letters to the Editor)

Robert J. Degrilla
8768 Torey Pines Terrace
Orlando, Fl. 32819-3839
Tel: 407-876-0369

November 10, 1996

Dear Bill,

My sincere congratulations on the great job you've done with the SC Club and especially the magazine (its gone beyond a newsletter).

I have a suggestion and a comment:

SUGGESTION - Why not start a "Bird Coop" section for members with cars wanted/for sale and parts wanted/for sale?

COMMENT - I seriously took to heart Bill Evanoff's story on the chip installation. I have a Superchip in my 93 SC with 26,000 miles. I immediately took the chip off (for about 200 miles) and noticed a DECLINE in performance. While I did not do any technical comparisons before and after, I did re-install the chip. I did note how much easier it is to do a '93 chip installation vs. a '90 installation - 5 minutes versus 30 minutes (no glove box removal and reinstallation).

Also, I still have not received my Kenne Bell ram-air kit for my SC - ordered 6-96 - "production quality problems" - ready soon I'm told. Keep the faith!

Best regards,

Bob

Bob - appreciate your comments and suggestion! I hope more members will take the time to do the same! Beginning with this newsletter we have a new section called "Bird Coop"! Thanks again! Ed.

Erik Stratmeyer
1232 Pioneer Lane
Shakopee, MN 55379
Tel: 612-496-0712
Bill,

Please send me a set of the A.R.P. head studs. Enclosed are some snap shots of my baby. My car is a 90 SC, 5-speed, black with black leather, every option. It even has the woefully malfunctioning Ford alarm system. At least it doesn't slow the car down. Are there any forged pistons out there that are close to the 3.8's bore size? I know 94-95 rods are better than their earlier counter-parts, but some Crower Sportsman rods have to be better. My objective is to build a strong foundation that will support later mods. This comes down to: crankshaft, rods, and pistons.

One more question: can conventional lifters (hydraulic or mechanical) be used in this motor and with your camshafts? Rollers are fine but regular lifters reduce valvetrain weight. Thank you, Bill, for giving the Super Coupe a leg to stand on. I've spent 3 years combing through Super-Ford magazines trying to come up with something better than just a Borla Exhaust system!

Keep on smokin''em!

Erik Stratmeyer

P.S. Think 2 H.P. per cubic inch! 13's are nice but I'd rather run 12's!

P.S.S. If anyone out there is running an S.V.O. extender or other computer interface call me.

Ed.- Erik, thanks for your letter! In response to your questions: Forged-True makes a nice forged piston for the 2.3L Turbo engine, part# 2720P, which will work with 89-93 SC 3.8's. I know this because the engine I bought from Lance Broderick three years ago had them fitted to the stock rods etc. The SVO catalog lists the stock 74-96 2.3L bore size as 3.780. The stock 3.8L bore size is 3.810. The 2.3L pistons I have are .040 over (1MM) which would make them 3.820, meaning the block in which these pistons came out of must only have an overbore of approximately .015, (instead of the .040 I originally believed) giving the needed .005 sidewall clearance. Neal Frisbee says the Buick GN piston design will also work in the SC. He has Venolia forged pistons (\$650-set) in his SC based on this design. Both of these designs (2.3L and GN) when forged, are much lighter than the stock cast hypereutectic pistons on the SC. They will not work with the 94-95 rods, however, unless modified to work with the free-floating wrist-pins. Using 94-95 wrist-pins (with 89-93 design pistons) will not work because of slightly different

dimensions (O.D. and taper), and lack of a C-clip groove in the piston.

The '94 SC rods are much better than in previous year SC's - bronze-bushed for the free-floating wrist-pin, no oil squirter hole (a definite weak-point, even recognized by Ford), better grade metal (according to SVO), and somewhat beefier around the shoulder area. Surprisingly, weight is increased by only 20-30 grams. The 94 SC rod is strikingly similar to the 351W truck/marine rod, long considered to be a stout piece (used in the SVO 351W crate motors), and is only .043 shorter - 5.9135 vs 5.956 for the 351W rod. At least one SC owner (not a Club member) Frank Joseph, tel:813-372-8871, tells me he has, or is going to use, the 351W rod and custom pistons with a .043 shorter compression distance (piston pin to top of piston) to make up for the longer 351W rod length.

I have also heard of SC owners having their rod journals turned so they can use the 6.0 inch Chevy Sportsman rods you mentioned. I personally don't think this is worth the expense (unless the rod journals need turning anyway). Besides, I don't WANT any Bow-tie parts in MY SC! But still, it does remain an option.

Along this same line, in previous phone conversations, you and others have raised the question of stroker cranks for the SC. The 4.2L V-6 that Ford is using for the base engine in the F-150 Pick-up is basically a stroked 3.8L. I don't think the crankshaft in the 4.2L is forged as in the 3.8L SC, however. The 4.2L rod is slighter longer at 6.091. In my opinion, it is not worth the considerable expense to off-set grind the crank just to pick up 30 cubic inches by way of a .35 increase in stroke. I would personally prefer to retain the stock stroke (which is comparatively long to begin with), build a bullet-proof bottom end, and put my money into other more cost-effective mods (headers and exhaust, modified SC top, etc.) which would allow the safe use of more boost or even nitrous assist.

Conventional lifters will not work in stock 3.8L engines due to their shorter length (vs. roller-lifters). You are right about the increased weight of roller-lifters vs conventional - however, there are other places in the valve-train where weight savings can be realized (under-cut valves, titanium retainers, roller-rockers, etc.) while still retaining the benefits of self-adjusting hydraulic roller-lifters - less friction (therefore less heat and wear), better durability, and the ability to take advantage of fatter cam profiles without valve bounce or float. Using stronger (increased rate) valve springs will compensate for the increased weight of the stock roller-lifters, and although stiffer valve springs generally mean accelerated lobe and lifter wear, the decreased friction offered by the roller more than off-sets this added stress. Another reason conventional lifters will not work with stock 3.8L cams is because the way the lobes are cut. Conventional cam lobes are ground with a slight side-to-side taper which, when contacting the convex shape of

conventional lifters, causes them to constantly rotate, thus increasing their longevity. Roller cams don't need, therefore don't have, this taper on the lobes.

2 HP per cubic would be great, but I personally doubt the Super Coupe could achieve this level (460HP) while still remaining streetable and reliable. Besides, 350HP is sufficient to run in the 12's with a properly prepped SC (gears, traction, etc.). I intend to be there come spring (in the 12's, that is). Neal Frisbee STOLE! (OK, OK, TOOK!, fair and square) my self-proclaimed title "Fastest Super Coupe in America" in Columbus, Ohio, over Labor Day '96. He has only borrowed it however, and I intend to get it back (with-out the laughing-gas). It would be very un-presidential not to try, don't you agree!

Anyway, new SC Club member Darrel Heard, #321, of Portland, OR, tel:503-618-9115, who is familiar with the Ford SC which ran 202 mph at Bonneville, tells me THAT Rousch-prepped monster (see pictures of same in this issue of Chargin'Thunder, courtesy of Bill Evanoff) produced 450HP. I doubt it was street-able. We will never know as Bill says that Ford Motor Company routinely destroys special project cars such as this. (Probably afraid a car like this could fall into the hands of a maniac such as myself and become a LETHAL-WEAPON!)..Further, Darrell Heard says his modified (but very street-able) SC turned 160 MPH at Bonneville. Darrell also tells me about a guy named Monty, from Salt Lake City, Utah, who has run 180MPH at Bonneville in his YELLOW modified SC, and who still drives it on the street. This story has been confirmed to me by a man at HPC (High Performance Coatings) in Oklahoma City, OK, who also personally knows this Monty fellow (a man after my own heart!). I would LOVE to pick HIS brain!

While on the subject of Bonneville and top speed of Super Coupes, I have received (on good authority) a very interesting report: Several years ago, Ford Motor Company randomly picked five 5-speed SC's and five AOD equipped SC's off the assembly line and took these 10 stock SC's down to Texas. There, on a five mile closed test track, they ran these cars wide-open for ten thousand miles, full-boost and all, stopping only to re-fuel and change drivers. Reportedly, they suffered no mechanical failures (not even head-gaskets!), save for a couple of burnt out over-drive bands on the AOD cars. The 5-speed cars started out topping 140 MPH, the AOD's quit at 135MPH. After several thousand miles, when well broke-in, the 5-speed cars were pushing 150 MPH, the Aod's, 140 MPH. HEY! Clubbers! Not bad for a stock car, huh!!

Tuesday, December 3, 1996

Bill Hull
President
Super Coupe Club of America
2239 Banbury Street
Charlottesville, VA 22901

Dear Bill,

Good talking to you on the telephone a few weeks ago. I agree with you on the Super Chips article. Simply "tricking" the EEC-IV to run rich is not the proper way to make horsepower. A rich mixture does not equate with more horsepower. The stoichiometric ratio for complete combustion of gasoline is approximately 17lbs of air per lb of fuel, depending on the oxygen content of the air and the hydrocarbon content of the fuel. In reality, most cars run an air/fuel ratio of around 15:1 in order to prevent detonation and assure fuel ignition. There is an old racers slogan that says "Lean is mean, but fat is where its at". Spark ignition engines make the most horsepower at their leanest operating condition (closest to 17:1). Unfortunately this often leads to catastrophic engine damage. For example: in drag racing, the engine is tuned for peak power when it burns through the piston just when the car trips the lights at the end of the 1/4 mile. Clearly, simply running rich does not produce more horsepower. Increased airflow, more correctly Oxygen, mixed with the proper amount of fuel produces additional horsepower. If a person has modified their engine so that they have increased the air flow to the point that the fuel injection system is not able to supply enough fuel, perhaps they should consider a programmable sub-injector. This would provide additional fuel only when the airflow requires it. This type of system is very popular on many of the imported turbo cars. Simply having the system run rich all the time is not a real solution. The EEC-IV system on our cars is fairly sophisticated, but like anything, it was designed to operate within a certain set of parameters. If the car owner has changed some components of the engine, the EEC may, or may not, be able to adapt to those changes. Basically, every component of the engine is part of a system. As such, changes to one component may require additional changes to other components in order to get the best performance from the system. Remember the days of carburetors, when you had to change jetting when you added headers? The feedback systems on our cars is worlds ahead of that. But we must remember that even the most modern car was built within a set of design constraints. And certain modifications may require significant changes to other parts of the system. Enough said. Keep up the good work.

Sincerely,



It was August of 1995, my '81 Z-28 was just recently stolen and I desperately needed some reliable transportation. I liked General Motors and planned on buying another one. Due to my income at the time, I could afford up to \$9,000 on loan (no fire and theft on the Camaro). I looked at many mid-size automobiles from each of the GM divisions from '88 to '92 and was disgusted. The dealers and private owners wanted to much money for the amount of car they were trying to unload. Many of the cars had major design flaws(i.e. rear disc brake calipers) and the others had a look and feel I did not desire. I love rear-wheel-drive automobiles and think their more than just transportation.

My cousin is also a car enthusiast, particularly Fords, and kept telling me about the early Super Coupes; supercharged V-6 with 300lbs of torque and 210 horses. Then there was my brother who owns a '94 T-Bird with the 4.6 Liter engine. It's a nice car but I didn't like the style of the nose of the car (the earlier versions, '89-'93, in my opinion, are better looking and were also in my price range). They both got excited when they talked about the Super Coupes. I had heard very little about these cars and wanted to know why they were getting so excited.

One day, while driving around with my girlfriend, I stopped in at used car lot that had a '89 Cougar XR7 with the supercharged setup and a 5 speed. I happened to know the guy working there, who frequented the parts store I used to work at. I asked him to take a spin and he let me and my girlfriend go alone. This was my chance to experience what all the excitement was about.

The car had 118,000 miles on it and was still in good shape. We took off down the rode and the ride was smooth and comfortable but I wanted more. So I hit the first on-ramp available and reached cruising speeds gradually, not wanting to alarm my girlfriend. I could hear the supercharger whine quietly as I accelerated. The car ran smooth at 70mph and felt like we doing 50mph. So far, I was impressed. I was feeling anxious an just wanted to toe the pedal to the floor to see what it could do. I exited the freeway and proceeded to get back on in the opposite direction. At this point, I could no longer hold back and advised my girlfriend to hold on. I put the pedal to the floor in second gear on the on ramp and watched the vacuum/boost gage swing as I was forced back into the seat. My blood quickened. The tach redlined as I shifted into third. At this point we were going 80mph and the tach was reading just around 4000rpms with two more gears to spare. I had to let off due to traffic but at that point it did not matter. It was too late. A decision had been made. I was going to buy a Super Coupe.

Although the Cougar is not a bad looking car, I preferred the style of the Thunderbird. I purchased a white '90 SC with the 5-speed two weeks later. It was not my favorite color but I needed a car and this was the best deal I could find at the time. I bought it with 73k miles for \$7,500. I did not think I could get so much for so little.

I have had the car for over a year now and I am still in love with it. I took it to the drags this summer and did a 16.2 ET @ 86mph with 93k stock miles on it. Chirping 2nd and 3rd gear is such a thrill. Now I want more and I am ready to spend some money to get it. Call me addicted, but at least I'm enjoying the ride.

I have been reading up on these cars, not that there is a hell of a lot written about them, and hope this club can help me get some more ideas on what I can do. I am hoping to get in the mid to lower 14's next summer. All help would be appreciated.

Jim Perry
Warren, RI

Jim Perry
510 Child Street, Unit 307B
Warren, RI 02885

e-mail: jep@ids.net
or jep@cherry-semi.com

October 26, 1996

Bill Hull, President and Editor
Super Coupe Club Of America
2239 Banbury Street
Charlottesville, VA 22901

Dear Bill,

Thanks for sending the newsletters. Quite impressive and ultra-informative. I have been reading them constantly and have learned a great deal about what modifications I will plan for, and in what order to do them. My '90 SC is black/black with leather, moonroof, JBL stereo upgrade, AOD and power everywhere. I LOVE it! The only modifications I have done are lowering 1.5", gas shocks, 245/50/16 Goodyears on chromed stock rims (the 255s rubbed up front), Kenwood receiver, CD changer in the trunk and tinted glass. The car has been very reliable over the six plus years, actual mileage is just over 214,000 miles. I just love to drive the Bird. They truly do fly. Over that span I have replaced the AOD twice. The OEM lasted 90,000 miles, the replacement 120,000 miles. Some suspension work and the "brain" for the ABS at 45,000 miles. The Goodyears last 60,000+ and I get 22 mpg. Leaks some oil but overall a very nice ride. Plus it has been paid off for some time.

Now that the sled has over 200,000 miles I plan an extensive rebuild with the help of SCCOA. After doing some research I felt like Ford's ugly step child. Mustangs everywhere. T-Birds in NASCAR, but nobody modifies Birds? Enter SCCOA...pretty cool. Perfect timing. I would like more information on the dual exhaust system with headers, the 3.73 vs 4.10 gears and AOD upgrades for now. I plan on an early Christmas present for moi. For early '97 I am budgeting a total engine rebuild, porting, blue-printing and balancing. Include a mild cam and upgrade the supercharger with the required intake mods. Any other suppliers for intercoolers other than Sparco? Next summer a new paint job.

Any SCCOA events planned for the West Coast? Hope you keep up the excellent newsletter/magazine because I love this car and I LOVE YOU MAN!! (for starting the club).

A Devout SC Fan,



Scott Preston
Northridge, CA

Dear Scott - All of your questions should be answered in this issue of Chargin' Thunder. At this time, there are no SCCoA events scheduled for the West Coast. We do have quite a few members in CA, AZ, OR, and WA states, however, and I think it would be great if someone out there would take the lead and plan some SCCoA activities; even organize a West Coast Chapter of the SCCoA. I would love to attend such events myself, especially if someone would send me round-trip plane tickets! Ed.

Stan Barber
618 N. Inyo St.
Ridgecrest, CA 93555
Nov. 24, 1996

Dear Bill,

I installed the new improved SC outlet hat on my 94 AODE equipped Super Coupe, and all I can say is "YIPPEE!" The power increase is very noticeable, even at the low end. My wife drove the Super Coupe (without me in it), and upon returning said: "WOW....the car is more responsive, and I didn't even punch it!". Thanks for producing a great bolt on part!

Sincerely

Stan Barber

Stan Barber

P.S.

I have the following recommendations about installation of this new product. I completely removed the Intercooler so I could reposition it correctly during reassembly. Also, it was necessary for me to hack-saw and remove the alternator bracket mount on the upper I/C tube. This was the only way I could get the upper I/C flanges to mate correctly. As far as painting the new outlet hat, I used NAPA's "universal gray engine enamel" part # MS 7883. I then sprayed on some clear coat. I think it's a close enough match to the stock color.

Dear Stan - Thanks for your comments and suggestions regarding the SC adapter tops. Other members have reported similar performance gains after installing the modified SC tops. None have mentioned having to remove their intercoolers however, or even having to loosen the bottom IC connecting nuts. Could be minor differences between cars due to production tolerances. Thanks for the tip on the paint color - I tried about 10 different grays - I picked the one I thought was the best match. I will use the NAPA color from now on! Be sure to stay in touch!
Ed.

10/4/96

MR. BILL HULL
SUPER COUPE CLUB OF AMERICA
2239 BANBURY STREET
CHARLOTTESVILLE, VA 22901

DEAR BILL,

I RECENTLY RECEIVED A PACKAGE FROM THE SCCA CONTAINING MY MEMBERSHIP PACKAGE, FIRST TWO (2) NEWSLETTERS AND RED ALL-SPORT POLO SHIRT WITH SCCA LOGO. ALL I CAN SAY IS "FANTASTIC". SINCE PURCHASING MY BRIGHT RED '90 SC IN APRIL OF '92, I'VE MADE MANY CALLS AND INQUIRIES AS TO WHAT WAS AVAILABLE FOR MY CAR. THE RESPONSE WAS USUALLY THE SAME: "IF ONLY YOU BOUGHT A 5.0 MUSTANG OR AN SHO !" IT WAS A TERRIFIC STROKE OF LUCK THAT I STUMBLED ONTO YOUR CLUB AT THE PFCA SWAP MEET IN COLUMBUS, OHIO.

INCLUDED WITH THIS LETTER ARE PICTURES OF MY BRIGHT RED '90 SC. OTHER THAN THE STANDARD SC FEATURES, MY CAR INCLUDED: DUAL 6-WAY POWER SEATS, JBL AUDIO, ELECTRIC ANTENNA AND BASE COAT/CLEAR COAT PAINT.

MODIFICATIONS I'VE MADE TO DATE ARE AS FOLLOWS:

2 3/4" RAISED COWL INDUCTION HOOD, FROM LEGENDARY CARS, WITH 1971 MACH 1 HOOD LATCHES (YES THEY REALLY WORK).

REAR DECK SPOILER, ALSO FROM LEGENDARY CARS.

35'TH ANNIVERSARY WHEELS STRIPPED AND PAINTED BRIGHT RED WITH 255/50/16 TIRES. 1996 T-BIRD DOOR HANDLES.

35'TH ANNIVERSARY HOOD EMBLEM & FENDER BADGES, 1996 SALEEN "SUPERCHARGED" SCRIPT ON HOOD AND COBRA "SVT" EMBLEM ON TRUNK.

K & N AIR FILTER WITH SILENCER REMOVED.

C & L/VORTECH 73MM MASS AIR METER.

"SUPERCHIPS" COMPUTER CHIP FROM C & L PERFORMANCE.

MARCH SUPERCHARGER PULLEY FROM C & L PERFORMANCE.

STAINLESS BORLA EXHAUST FROM C & L PERFORMANCE.

AUTO SPECIALTIES ACCESSARY UNDER DRIVE PULLEY SET.

FUTURE MODIFICATIONS TO BE MADE ARE:

EIBACH 1 1/2" LOWERING SPRINGS.

AUBURN LOCKING UNIT WITH 3.73 MOTORSPORT GEAR.

I JOINED YOUR CLUB FOR A FEW REASONS. FIRST AND FOREMOST, THESE CARS ARE AN ABSOLUTE BLAST TO DRIVE AND IT'S GREAT TO FIND A CLUB CENTERED AROUND THIS. SECOND, I'M LOOKING FORWARD TO GAINING VALUABLE INFORMATION ABOUT THESE CARS. THIRD, BUT NOT LAST, IF ANYTHING I'VE DONE TO MY CAR HELPS SOMEONE ELSE THEN IT'S A TRIP WORTH THE TAKING.

BILL, BEING INVOLVED IN SOME LOCAL CLUBS, I REALIZE THIS IS QUITE AN UNDERTAKING YOU'VE STARTED. KEEP UP THE GREAT WORK BECAUSE.. "THIS BIRD WAS MEANT TO FLY".

SINCERLY,

JOHN M THULL II
1075 STEWART ROAD NORTH
MANSFIELD, OHIO 44905

Supercoupe Club of America
2239 Banbury Street
Charlottesville, V.A.

Attn: Bill Hull

September 30, 1996

Dear Bill,

I am sending this letter in reference to the Supercoupe Club of America. I own a 1993 Supercoupe 5-speed, Sunrise Red with white leather interior. It has an aftermarket stereo and aftermarket wheels along with a sophisticated alarm system. I try to take good care of my car. And try to do my best to let people know exactly what a Supercoupe is by taking them for a ride, he he. Currently it has 34,000 miles but I'm using it to commute to school so we'll see what happens.

I have been looking around for the past three years for aftermarket add-ons. I have been for the most part unsuccessful and not to happy about this. I purchased a K&N filtercharger and a pulley for the supercharger (did not want the full set because I need all the power from my alternator as possible for my audio system). Recently I have installed a Hypertech power chip and have mixed feelings about it. I bought the chip last year and just got around to putting it in. For the first few days I was not able to put the air conditioning on it would die out, for the most part. That went away as the computer learned the new chip. It solved one problem which I am happy about, it goes right into first. Before it would hesitate, I was told that there is a safety on the gear box and thats what it was. Now I have absolutely no problem going into first. In the beginning I felt the engine ran smoother. I have since changed my mind. In the morning with a cold start,

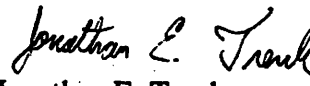
after the engine is on I hear a ticking sound for about a minute. I don't know what that is. The engine runs rougher now even when the engine is warm. When warm it feels almost like there is a slight knock. When I shut the engine off, this is even rougher than before. I'm very displeased about this. I was also told by a *JET* performance sales rep. that my computer learns the changes in the computer and sets them back to factory settings, is this true? I would appreciate anything you know or heard about the Hypertech chip. One mechanic told me that my plugs and wires are bad but there's only 34,000 miles on it, and you know what's involved in a routine spark plug change on these cars \$\$\$\$\$\$. It feels to have added power though, but at what expense.

I stopped by a car audio store this past week and was approached by a man who had asked a few questions about my car. He went on to tell me about your club, briefly. He wrote down your address so I sent you this letter. He told me about a number of after market parts which he found available through your club and I would like to join so I may receive this information. One product he told me about was a *true* dual exhaust. He told me that the pulley without the exhaust is useless because of the backpressure and that I will ruin my supercharger, is this the case?

Well anyway I am very anxious to learn more about your club. And extremely into my car so I will be thrilled to help out in any way possible. I would greatly appreciate it if you could answer the few questions I had asked you if you know anything about them. Please send me the necessary membership forms so that I may join as soon as possible.

By the way, does the club have an internet address or an e-mail account? Thank you for your time and I will be waiting anxiously for your response.

Very truly yours,



Jonathan E. Trenk
762 Inwood Road
Union, N.J. 07083-6625

P.S. I have enclosed a picture of my car for you to drool over :-). Just kidding. Did I spell your last name correctly, the guy's hand writing was sloppy? :-)

enc.

Dear Jonathan - In response to your question about factory processers re-learning or adapting to after-market computer chip modules, thus negating any performance gains - this topic is still the subject of a raging debate- see Bill Evanoff's article on Chips & Dips, in Sept. issue of Chargin' Thunder.

Concerning your wires and plugs - changing either is really not that difficult - even though Ford dealers charge from 4-6 hours labor for same. Anyone who owns a Super Coupe and has never done their own maintenance needs to put their SC up on a lift, ramps, or set of jackstands. The intimidation factor drops considerably when the SC is viewed from UNDERNEATH the car. From this viewpoint, one can actually see the ENGINE, as well as associated components (plugs, wires, headers, etc.)

Factory wires are basically junk, in my opinion. Only 34,000 miles from a set of stock wires is not uncommon, especially on a car which is 3 - 4 years old. My first set "lunched out" at about 20,000 miles, and the car was only one year old! I was replacing the factory wires about once a year at a price of \$65, when I learned about Jacobs making a custom replacment set for the SC, and for the same price. The Jacobs plug-wire set has a metallic core, instead of graphite impregnated fiberglass strands (which tend to burn-out) as in the factory wires. Also, the Jacobs wires have a metallic spiral winding plus additional shielding to eliminate both EMI and RFI. The Magnecors, which come in 8MM (like Jacobs), 8.5MM, and even 10MM (special order

only) are even superior to Jacobs. They are race quality wires, and the reason they are not advertised like Jacobs is because they sell all they can produce to NHRA, IHRA, and NASCAR race teams, etc. The Magnecors are bright red, too, which really makes them stand out on the Super Coupe.

One must remember, the 3.8L supercharged engine must be thought of as (among other things) a high-compression engine. For every 3 pounds increase in boost, the effective compression ratio goes up approximately 1 point (when compared to a normally-aspirated engine). If running 12 pounds of boost, essentially this is comparable to raising the compression ratio from 8.2 to 12.2! If using other power producers - improved exhaust, over-drive pulleys, S-model blowers, and modified SC adapter tops, etc, which allow (force?) increased quantities of air into the combustion chambers, even higher cylinder pressures will result. Higher cylinder pressures result in more power as long as detonation is not present.

Engines with very high cylinder pressures require a very hot spark to ensure ignition of the fuel-air charge. A weak spark cannot over-come high cylinder pressure, and can actually be extinguished before igniting the fuel-air mixture. This, of course, leads to mis-fires and greatly reduced performance, (even severe engine damage if not corrected). Fortunately, The Super Coupe's six-coil-pack delivers abundant spark energy, up to 100,000 volts according to my local Ford service manager (twice what earlier electronic ignitions could deliver, and probably enough to kill a man unlucky enough to get "bit" while playing with a plug wire, especially if standing in water!).

While on the subject of plugs and wires - many Club members have asked me about Split-Fire "V" or "twin-electrode" spark plugs and Split-Fire "twin-core" wires. According to my SC owners manual, Ford tried "split-electrode" platinum plugs on some (or all) 89 models. After one year, they went back to conventional single electrode platinum plugs. Evidently, Ford was not very impressed with split-electrode plugs! In my opinion, both "twin-electrode" plugs and especially "twin-core" wires are a bunch of "owl-hocky"! If the SC coil-pack delivers 100,000 volts of spark-energy to the spark plugs, for instance, then this much spark-energy will be available to ignite the fuel-air mixture. There may be some advantage to the split-electrode design because of the greater number of air-molecules which could be in close contact to the initial spark, or sparks, with the dual electrodes, but the same advantage would be true if one gapped his single-electrode plugs a little wider (which I do, .056). However, if one gaps his plugs too wide, the spark, which now has to jump farther to reach the ground electrode, may be extinguished before it makes the longer journey. In any event, Split-Fire twin-electrode plugs definitely do not deliver twice the spark energy of a single-electrode plug, nor do Split-Fire twin-core plugs wires deliver twice the spark energy of single-core wires, they just "split it", so to speak - thus their name,

I suppose. I personally believe their advertising is misleading. Hummmm...I wonder if Chief-Engineer Jamie Turvey, of SuperChips, Inc. fame, also writes advertising for Split-Fire??

Anyway, for the last four years I have been using Bosch platinum spark plugs, stock factory replacement, gapped on the high side of recommended gap settings of .052-.056. I have never had a plug related problem with the Bosch platinums, use them in my Ford pick-up and my wife's Jeep Wrangler, and best of all, and the main reason I started using them in the first place - I can purchase them at Advance Auto for only \$1.79 each, any day of the week!

To answer your question on over-drive pulleys vs stock exhaust - I wouldn't use the term useless - I prefer the word "DANGEROUS"! Consult Chargin' Thunder Volume 1, March, June, September, and December editions. Ed.

October 15, 1996

Dear Bill Hull,

I enjoyed meeting you and all the other club members at Carlisle in June (I started this letter months ago). It's nice to finally meet others with the same car as myself. My bird is a 1989 SC 5 speed, red with all factory options and 140K miles. The engine was replaced (blower and all) at ~120K due to an unfortunate incident involving a flash flood. The air intake became submerged (I didn't think the water was THAT deep), and the engine sucked in water, cracking the block and heads. The replacement engine was from a wrecked SC with ~20K. The original engine was still running strong at 120K, so with the new one only having about 40K, I expect to keep it for quite some time.

I have made the following modifications:

- K&N air filter
- Hypertech Power Module
- March Performance Pulley (supercharger) (didn't increase max boost of ~11 psi)
- Dynomax Cat-back exhaust system (didn't have any effect on max boost of ~11 psi)

Other modifications I am considering are:

- Revised supercharger outlet (providing it fits under the stock hood)
- Rear end gear change (from the stock 2.73 to a 3.27) I doubt I would go to a 3.55 since I do a considerable amount of highway driving.
- Larger MAF and Throttle Body assemblies (Would this be effective with the above mods that I have already made?)

As far as the Hypertech power module, it made a noticeable difference at part and WOT, and didn't affect drivability, MPG or anything else that I know of. I have had it installed for about a year now, and have not noticed any side effects. I always use 93 octane (or better) gasoline, and have not experienced any detonation.

Enclosed is a check for \$285 for a revised supercharger outlet. I would like to get this piece providing: the new piece fits under the stock hood and it uses the stock intercooler tube (w/o modification). When removing this piece, should I loosen the large intercooler collar nut first, then the 4 bolts securing outlet to the supercharger, or the reverse?

I love the newsletter, and look forward to many more.

Sincerely,



Robert Beaton
14617 Monmouth Drive
Burtonsville, MD 20866
(301) 890-8430
rbeaton@scientechnology.com

P.S. I really hope that Ford does build the SVT Thunderbird. I've had two Mustangs before my Thunderbird, and won't go back. I test drove a new GT, with the modular V8. It was a nice car, but is too small for me. One of the reasons I got my bird was the fact that it would hold 4 people and their stuff comfortably, and still wanted performance. The Thunderbird SC fits my needs perfectly. I checked out the SHO, but wasn't (and still not) ready for 4 doors.

Dear Robert - thanks for your letter. Complete instructions are included with every modified SC adapter top. Ed.

LISA KISER
P.O. Box 28002

(770)419-0006
Atlanta, Georgia 30328

11/1/96

Mr. Bill Hull, Pres.
Super Coupe Club of America
2239 Banbury Street
Charlottesville, VA 22901

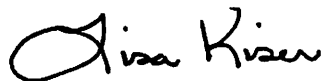
Dear Mr. Hull:

It was a pleasure speaking with you earlier this week regarding the Super Coupe Club and I greatly appreciated your taking the time to contact me personally. I will look forward to meeting you at some point personally, perhaps on your planned trip to the south next year.

I just wanted to drop you a quick note of thanks for the phone call and to forward you the additional \$15.00 fee that I owe you for my membership in the club. It has admittedly been some time since I was first told of your club and I suppose that the dues were \$25 or I would have, of course, forwarded the correct amount at that time. I did understand that you said I could wait on this until after I received the first 3 issues that have already been printed of the newsletter/magazine, however, I did already see the first copy and I know that it was packed with information.

Again, thank you for the personal call & introduction and please let me know if there is anything I can do to help with the club from Atlanta. Drive safely!

Sincerely,



Lisa Kiser
(770)432-2294 ext.

Dear Lisa - Thank you for your letter. I do plan on attending some Ford event in the spring of '97, probably in the Atlanta area, and hope to see many SC Club members there! I really think it is neat when woman take interest in automobiles, especially Super Coupes - hey! I'm a '90's type of guy!

AND NOW..DRUM ROLL, PLEASE..... THIS ISSUES' FEATURE ARTICLE!

HEADERS AND DUALS...AN EXHAUSTING SUBJECT..

By Bill Hull

From the earliest days of my fascination with hot-rodding to the present, I have always been impressed with the horsepower gains available when improving stock exhaust systems. Admittedly, as a teen-ager I "opened up" my exhaust systems as much for the increased noise level as I did for the improved performance. In later years I came to realize I could "have my cake and eat it too" - louder did not necessarily mean better - but it was possible to have a much better flowing exhaust without greatly increased noise levels. For the past three years I have always advised Super Coupe owners to "start at the back" - reducing exhaust back pressure in these cars is critical - not just for performance but for RELIABILITY! I always knew the SC had a very restrictive factory exhaust but did not realize just how much so until Charles Warner, SCCoA member #241, ran some pressure tests on his own Super Coupe. The numbers are truly shocking, although not really surprising. Charles is an Engineer and Director of New Product Development for FLIR SYSTEMS, INC. (Forward-Looking Infrared Radar) in Portland, Oregon. More importantly to us Club members, Charles is a Super Coupe lover with an inquisitive mind and the initiative to follow it up. Be sure to read his excellent article "Un-Plugged and Flying!" which follows this piece by your editor.

Two of the first products I tried to obtain for you Club members was a good dual-exhaust system and headers, knowing they would be absolutely essential in order to make any substantial horsepower gains. I have gone back thru my many car magazines and books and found several articles on exhaust systems which I feel can explain this subject more thoroughly than I.

EXHAUST SYSTEM & HEADERS from HOW TO BUILD HORSEPOWER Volume 1 by David Vizard (S-A Design Books)

"Your understanding of how the internal combustion engine produces horsepower will always improve with a greater comprehension of the dynamics of motion. This is never more true than in the exhaust system. Although most of the "moving parts" in this system do not require lubrication or periodic adjustment, they nevertheless experience VIOLENT DYNAMIC MOTION. In a world sealed from view by thin steel exist a place where gasses at temperatures EXCEEDING 2000 DEGREES (F) and pressure waves moving at the SPEED OF SOUND interplay with the outside world to either help the engine purge the cylinder of spent gasses or work against this same process.

If the exhaust system was simply a collection of tubing that routed exhaust flow to the rear of the vehicle, the job of optimizing system performance would be relatively easy. But the exhaust system is expected to perform at least one additional critical function: It must minimize noise. This non-performance related requirement necessitates a muffler system, and mufflers greatly complicate the task of maximizing horsepower. Mufflers act like a cork. They introduce a restriction to flow, increase backpressure in the exhaust system, and partially as a result of this, help isolate noise pulses from the outside world.

Over the years, I've heard many strange claims from so-called experts. One I've heard more than once asserts that a performance engine- or any conventional four-cycle engine for that matter-needs some exhaust backpressure to optimize efficiency. This pronouncement was almost certainly made by someone who had never used a dyno or carefully evaluated how exhaust system flow affects performance. I have found that reducing exhaust backpressure always improves power and fuel economy, providing, of course, the air/fuel ratio and ignition timing are carefully optimized both before and after exhaust system backpressure is decreased.

In a simple sense, a high-performance engine can be defined as one that produces more exhaust volume than a stock engine of the same displacement. Since horsepower is derived from burning fuel, the more fuel the engine efficiently burns the more horsepower (and exhaust) it will produce. Therefore each engine modification that improves horsepower will - with no complementary changes made to the exhaust system - increase exhaust backpressure. In fact, A 40% INCREASE IN POWER (from 210 HP to 300 HP in a Super Coupe - ed.) will typically DOUBLE BACKPRESSURE, and if you manage to DOUBLE engine horsepower, exhaust backpressure will increase by a FACTOR OF FOUR! As I've mentioned, any backpressure is undesirable, but we have to be practical about these things. Since it is not possible to achieve zero restriction, we must establish a realistic goal. A stock exhaust system can develop pressures as high as 9psi (even higher on some factory vehicles). With a better choice of mufflers, catalytic converters, and tailpipes, however, this same engine would develop maximum backpressure of only 2.2psi. If measurements indicate a backpressure of more than 5psi during full-throttle operation at any point in the rpm range, the exhaust system needs work.

CATALYTIC CONVERTERS - To reduce hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides (NOx) vehicle emissions, most late model cars use a catalytic converter in the exhaust system. This device looks similar to a muffler but uses platinum, palladium, and rhodium (referred to as noble metals) to accomplish a remarkable task. They chemically combine with

pollutants, change the nature of those gasses, and then as part of this same chemical reaction, redeposit all of the noble metals, but in the process change the chemistry of the other reacting gasses: CO, HC, and NO_x are transformed into CO₂ (carbon dioxide), H₂O (water), and N₂ (nitrogen gas). In fact, the catalytic converter is so effective in removing pollutants, that most of the pollution control devices on modern cars do nothing more than "fine tune" the combustion process to optimize the function of the catalytic converter. As remarkable as the catalytic converter may be, it does not do its job without cost. In most cases a converter is more restrictive than a muffler. Catalytic converters only work properly when they are hot; real hot! At about 400 to 500 degrees (F) the converter reaches its light-off temperature, at which it is 50% effective in converting pollution gasses to less noxious forms. Full operating temperatures range anywhere from 900 to 1600 degrees (F). These temperatures, nearly as hot as those in the combustion chambers, make steel glow dull red. It is essential that you consider these temperatures when working with catalytic converters. First of all, the converters will only reach high working temperatures if they are located very near the exhaust ports. Exhaust temperatures can drop considerably three or four feet downstream from the headers/manifolds, and the converter may not reach the light-off point. Second, high converter temperatures require adequate heat shielding to prevent under-chassis or floorboard fires, which can occur when the vehicle is parked after extended periods of use, when catalytic converters remain hot long after the engine is shut down. (Good reasons for Jet-Hot coating, ed.)

MUFFLERS - After the catalytic converter, the next major obstacle to flow is the muffler. A well designed muffler will reduce engine noise without generating excessive backpressure and choking the engine to death. Unfortunately, not all mufflers are well designed. In fact, some mufflers are so good at generating backpressure that they can rob 30 or 40 horsepower from a factory high-performance engine. But there are excellent performance mufflers also, and by selecting the right design you can easily bolt-on substantial power gains.

Mufflers fall into three major categories: restrictors, absorbers, and reflectors. Silencing most factory mufflers is accomplished by generating restriction, usually by forcing exhaust gasses through small-diameter passages. Unfortunately, this technique also generates the greatest backpressure and wastes the most power. Performance mufflers, on the other hand, often rely on absorption, where the sound entering the housing is converted to heat as it interacts with a packing material -like fiberglass- through a frictional process. This method generates less backpressure, but is a somewhat less effective silencer. Mufflers also use internal baffles to reflect sound waves back toward the inlet. The best performance mufflers often combine

reflection and absorption techniques to improve silencing while maintaining large internal passages to keep restriction at a minimum. An excellent example of this technology can be found in the Walker Dynamax Super Turbo muffler. It uses glass-pack absorption and flow reversal "acoustic mirrors" to reflect sound back to its source.

CROSSOVER PIPES - Extensive dynamometer and high-way testing have demonstrated that a simple crossover pipe - interconnecting the two sides of a dual-exhaust system just after the collectors and ahead of the mufflers - can increase engine power. The crossover pipe transfers exhaust shock waves from one side of the system to the other, usually helping to silence the over-all exhaust system. The crossover pipe also allows each side of the engine to partially share the combined muffler flow capacity. Although, even the most effective crossover will not double system flow, improvements of 25% are common.

HEADERS - Headers allow the engine to "exhale" more easily by reducing pumping losses that occur when the piston moves up on the exhaust stroke, but this is only the most obvious potential advantage that tube headers can provide. If the exhaust cycle only occurred once, building headers would be a simple job of minimizing restrictions. But even at 2000rpm, a V6 engine produces nearly 50 exhaust pulses per second per bank of cylinders. These pressure pulses interact with exhaust gas motion to brew up a complex dynamic "soup" that affect the optimum header tubing size, length, and overall design. Stock exhaust manifolds are not efficient at higher flow volumes and engine speeds because of their basic design. Nearly all manifolds have short runners that join into a common chamber fashioned with little thought to flow. As exhaust enters a manifold it faces two major obstacles: 1. restrictive passages; as a plain, simple orifice, manifolds flow poorly; and 2. pulses from each cylinder "interfere" and further increase restriction, since the individual pipe lengths for each port are often far too short.

Tube headers address both of these major flow obstacles. By extending the length of each pipe with smooth tubing and effectively isolating the individual exhaust ports, a tube-type exhaust header improves flow and virtually eliminates cylinder-to-cylinder interference. When headers are combined with an efficient exhaust system, even more power can be gained through cylinder scavenging. It may seem remarkable that a device made of metal tubing, consisting of no moving parts, could pull fresh air-fuel mixture past the open intake valve, over an almost stationary piston, and help purge the combustion chamber of exhaust gasses; generating essentially "free" horsepower.

As pressure pulses move through each exhaust tube, they carry

energy that acts in two ways to generate a scavenging effect and improve horsepower. First, the moving mass of gasses has the property of inertia. Inertia is the tendency of moving objects to resist any change in their motion. The high pressure blasts of gas that leave the exhaust ports tend to keep moving through the primary tubes, and the inertia of these gasses, if sufficiently strong, will draw additional air-fuel mixture through the open intake and exhaust valves during overlap. There is also a second way that headers help purge exhaust gasses from the cylinder: A shock wave of low pressure, generated when the high-pressure exhaust pulse leaves the system, can help draw additional air-fuel into the cylinder during overlap. This reverse wave of low pressure travels back up the tube toward the exhaust valve also at the speed of sound (which varies with temperature, but is generally considered to be about 1200 to 1300 ft/sec. Adjusting the length of the primary header tubes to optimize reverse-wave scavenging is called resonant tuning. Dyno tests that I have performed over the years inevitably show that most engines are insensitive to the shape of the passages that exhaust gasses enter once they leave the port. Furthermore, as long as the overall header design promotes flow, there is little measurable sensitivity to dents in the pipes, variations in pipe lengths, and variations in pipe diameters, but they are sensitive to the number of bends and their radius. Tight bends substantially increase restriction and dampen scavenging, and this almost always results in lost power.

KEEPING THE HEAT IN - Headers help scavenge the cylinder of exhaust gasses and assist the induction system in drawing in a fresh air-fuel charge. The energy for these tasks is derived from the energy contained within the exhaust flow itself. The more energy that can be kept inside the tubing until it is discharged at the collector or into the exhaust system, the more efficiently the header system will function. One form of this energy is heat, and heat is directly related to exhaust volume and velocity within the pipe. As heat dissipates from the exhaust system, exhaust velocity diminishes and in some cases this can reduce scavenging. Heat escaping from the headers can affect power in another-perhaps even more important-way; it is released into the engine compartment where it can heat the induction system and incoming air. Dyno studies indicate that every 10 degrees increase in induction temperature will reduce power by 1%. Considering that header tubing runs as hot as 2000 degrees (F) or higher, there is the possibility for substantial power loss. (Another good reason for Jet-Hot coating, ed).

SUMMARY - an obvious question at this point may be what performance and ECONOMY gains can be expected if the complete exhaust system is redesigned with an emphasis toward minimizing backpressure and increasing exhaust scavenging? Benefits will vary, but the following example will illustrate what's possible.

On one of my 350 cid V-8-engine tests (comparable to the 3.8l SC engine, ed.), initially equipped with a factory single-exhaust system, baseline, stock horsepower was measured at 152, with an exhaust system backpressure measuring an ENORMOUS 16.5psi. Next the stock catalytic converter was eliminated and the stock factory muffler was replaced with a Dynamax Super Turbo. the horsepower jumped up to 210, and the exhaust system backpressure dropped to 3.5psi. Finally a dual-exhaust system was installed that was carefully fabricated to minimize backpressure. This package, equipped with dual Super-Turbos but STILL using the stock exhaust manifolds, produced a very respectable peak-horsepower improvement of 47% over the stock factory system. Horsepower was measured at 224, with system backpressure barely registering on the gauge at well under one psi. Later, installation of a set of well designed tube headers increased peak-horsepower to over 250, with system backpressure still under one psi.

From "The Complete Guide to Bolt-On STREET POWER", By Jay Storer, S-A Design Books- Chapter 1, Exhaust Systems.

The further you dig into the world of high performance, the more you will realize that most modifications involve compromise of some sort. You generally can't get the maximum improvement in power without some sacrifice in another direction. But the exhaust system is one area where this doesn't quite hold true, which is a major reason why we are discussing the exhaust system first. NO OTHER AREA OF MODIFICATION WILL YIELD AS MUCH HORSEPOWER-PER-DOLLAR AS REDUCING EXHAUST RESTRICTION, AND IT'S THE ONLY PERFORMANCE AVENUE THAT DOESN'T HAVE SOME DRAWBACK. The usual sacrifices in the quest for power are driveability and fuel economy-not traditional characteristics of a strong hot rod-but improvements in the engine's exhalation have no effect on the former yet may substantially improve the latter!

From STREET SUPERCHARGING By Pat Ganahl - S-A Design Books -

HEADERS AND EXHAUST - Supercharged engines do not like backpressure. It's very simple. If you are pumping a greater quantity of air into the engine on the intake side, you've got a greater quantity that has to get out the exhaust side, and you don't want the plumbing backing up. A SUPERCHARGED ENGINE PICKS UP SIGNIFICANT POWER WHEN IT IS UNCORKED!

For the street, the object is to keep the exhaust system as unrestrictive as possible. A set of headers would be a good choice, especially on higher-boost motors (over 8psi). In the case of a supercharged engine, though, typical header "tuning"

theory does not apply. In other words, the length, diameter, and collector style of the headers is of little consequence. The rule of thumb for blown motors is to use big tubing, since exhaust gas temperature is higher in a blown engine and it will expand more, and to keep the primaries short.

For the rest of the exhaust system on your blown streeter, use as large-diameter tubing as practical (2 or preferable 2½ inch diameter), keep the number of bends and overall length to a minimum, and use low-restriction "turbo" type mufflers. If possible, use mufflers with the same diameter tubing as the exhaust system. Remember that an exhaust system is just like any other fluid-flow system-the smallest restriction at any one point affects flow through the whole system.

There's really nothing else to say about getting the exhaust out of a blown engine. Just remember that the capacity of the exhaust system-or the amount of exhaust the engine will have to expel-will be proportional to the amount of air the blower is pumping in..except that the exhaust is much hotter, and therefore takes up considerably more volume.

THE COOLING SYSTEM - One essential component of the total vehicle power package often overlooked by performance engine builders is the cooling system. Any high performance engine will require increased cooling capacity, since roughly 30% of the engine's power is absorbed by the cooling system. Remember that the power (energy) made in the motor is first converted to heat before it is converted to work. The more power your engine makes, the more heat it produces, and the more heat must be dispelled by the radiator. A supercharged engine not only makes more power, but it also inherently creates more heat because 1. the blower heats the intake charge a certain amount and 2. a certain portion of the engine's power is used up in driving the blower.

This concludes this section on Headers and Duals- truly an exhausting subject. Hope you Club members have found this interesting and informative. Ed.

ADDENDUM

HEADERS AND DUALS...AN EXHAUSTING SUBJECT..

By Bill Hull

After reading and re-reading the previous article on exhaust systems and their function, I decided to expand on several of the points brought up by David Vizard, Jay Storer, and Pat Ganahl (in other words, to put in my "two cents worth"). I do not want to beat this subject to death, but I sincerely believe an improved exhaust system is THE key for increased performance on the Super Coupe. At the risk of over-simplifying for those of you who already understand the dynamics of motion and the physics of fluid flow as it applies to exhaust systems, I want to illustrate in a way that has helped me to come to understand these things (at least to some degree).

On any engine system, we must look at the over-all picture, starting in front of the air-cleaner all the way back to the tip of the tail-pipe. Many people have called and asked, "How much horsepower will I get if I install a larger throttle-body, mass-air meter, duals, etc". I usually respond by saying, "If your engine is capable of, or is trying to move, more air, then all of these pieces can certainly show substantial gains in horsepower. If however, one adds only a 70MM throttle-body, for instance, to an other-wise stock engine, this piece by itself would probably show no gain in performance".

Allow me to digress a bit, and relate a story we shall call "Gullible's Travels":

As my hero Newt Gingrich is so fond of saying (Boy! I bet I'll catch it for mentioning his name!), "Let me suggest to you" that instead of molecules of air trying to move through the labyrinth which makes up the 3.8L Super Coupe engine system, imagine instead, there are millions of tiny people rushing thru a tunnel trying to get into a football stadium. Between the parking lot (air-box) and their reserved seats on the fifty yard line (tail-pipe tip), all of these millions of micro-lilliputians must pass thru a series of gates, turn-stiles, twists and turns, and not least of all, a giant wind-mill/meat-grinder combo (blower), and a high-pressure firey furnace (combustion chamber) not seen since the days of Shadrach, Meshach, and Abednego, of Bible fame. (I know, you all are starting to think I'm touched in the head by now. Well, I am diabetic and half-senile, so I do have an excuse! Please, bear with me on this)..

Remember, these millions of people are in a great hurry, moving at the speed of sound or even faster (super-sonic?), trying to get to their seats before the kick-off. After they pass thru a

giant strainer to remove riff-raff (the air-cleaner), they try to compress to squeeze thru their first narrowed passage (mass-air meter). Most go thru the main passage, but some try to sneak through a much smaller hole (the sampling tube). After they join up again, they go whizzing through another restricted passage with a big flapper (throttle-body). Sometimes, this flapper is open, so many rush thru quite easily. Other times, this flapper is closed so a few must find their way past this road block by taking the long way around (idle-bypass). Then, the fun really begins! A few lucky people find a short cut (engine-air-bypass), but when the pace really picks up (under boost), all must begin a rapid journey which even Disney World can't match for excitement! Suddenly, everyone is sucked into this giant wind-mill/meat grinder (blower), squeezed together unmercifully, and spewed out into another little torture chamber (supercharger-adapter top) where they must all wait their turn before they can leave (unless, or course, the wise owner of this particular ball park has purchased a raised and enlarged SC top from the SCCoA)! These poor, dazed, little people continue on their journey at great speed, only to encounter a row of quite small passages where many friends become separated, although everyone seems to cool off a bit (intercooler). It's a good thing too!, as they are about to be sprayed with gasoline and sucked into a series of giant firey furnaces!! Although, these poor miniature football fans are being forced into this horrible place, only a portion can enter at a time. Rapidly opening and closing turn-stiles (valves) limit their entry and exit. (Upon reaching their assigned seats, all agree that this was a most trying time).. After being squeezed together to the point of unconsciousness, someone sets off a stick of dynamite (spark plug) in this giant collapsing torture chamber and they are blown out of the exit turn-stile. Now, instead of being sucked into a new passage, they feel themselves being pushed at the speed of sound down a very hot, dark tunnel and through an even hotter honey-comb shaped oven (catalytic converter), unless, of course, the owner of this particular stadium runs an illegal enterprise, having purchased a set of off-road high-flow headers and down-pipes without cats from the SCCoA! Anyway, just before they finally reach the freedom of their 50 yard line seats, they are forced to negotiate their way thru a mouse-maze-like contraption (muffler), when finally, to their great relief, IT'S OVER! They are HOME-FREE! EUREKA!

Although frazzled and worn, the majority of these dedicated football fans make it to their seats in time for the kick-off. A few unlucky ones are casualties to a band of high-way-men called "THE DETONATORS", but only those unlucky enough to enter ballparks owned by unenlightened "Steinbrenners", who refuse to read "CHARG'N THUNDER". All survivors agree they are bound to go to heaven when they die, because, after what they just went thru to get to their seats, they have already been to (as Hank Williams, Jr. would put it) "Hell, or New York City, it's about the same to me"!

Upon arriving back home after the ball game, and after several hours of reflecting back on their horrendous experience at the football stadium most of these unfortunate fans agree - they will immediately sell their season football tickets, move to Florida, and take up golf, where they can make ~~make~~ up their OWN rules as they go along (and CHEAT too - if their buddies ain't watching)!

WOW! back to the real world! I am starting to feel faint, Club members. I think I will go lie down for awhile, and return to this exhausting subject later.

LATER: after enjoying the therapeutic benefits of a Power Nap!

Every function of any internal combustion engine is dictated and controlled by the laws of Physics. There is really no "Black Magic" involved. After removing all hysteria, uncontrolled bias, and egomania, ("My daddy's car is faster than your daddy's car", or later in life, "My '51 Studebaker can out-run your '49 Henry J") etc., one comes to realize that all engines are basically air pumps and they all have to move more air in order to produce more power.

Referring back to the article on exhaust systems by David Vizard, where he states "a 40% increase in power will typically double backpressure", consider this: the stock Ford 3.8L V-6 is rated at 145HP. The supercharged 3.8L Super Coupe V-6 (with essentially the same stock exhaust manifolds) is rated at 210-230HP, an increase of from roughly 45-60%. I do not know what the backpressure is on a stock 3.8 T-Bird, but according to this formula, it would be roughly one-half of the SC's. To put it another way, the backpressure on the Super Coupe is probably more than double that of the stock 3.8L, because of the 50% increase in power with the supercharger!

With excessively high backpressure to begin with, is it any wonder then, when adding power producers like overdrive pulleys, S-Model blowers, even modified SC adapter tops, that Super Coupes are reknown for blowing head gaskets, etc? As Val Kilmer (Doc Holiday) so succinctly states in the movie "Tombstone" after reporting to Wyatt Earp on his shoot-out with another gun-fighter - "The pressure was greater than he could bear"! So, many a Super Coupe has ended up in automotive "Boot Hill" for the same reason. Simply put - the exhaust system affects the entire engine system even though it is at the end of the line (Tail-End Charley, so to speak). Don't forget, even in human beings, constipation can cause dizziness and head-aches!

As a counter-point however, it is possible to go too large on the exhaust system with a stock Super Coupe. I wouldn't have thought there is room under the floor pan for this to be the case until hearing from Keith King, member #245. Keith removed the entire stock exhaust system (header back) on his basically stock 95 SC and replaced it with 2½ inch pipe all the way to the end. He reports his quarter-mile ET dropped 6-tenths and top speed fell

off 4 to 5 MPH. In his case, I believe he lost the benefits of exhaust scavenging (the ability of the exhaust gasses to stay together and help pull itself along). With a highly modified engine (350 HP), 2½ inch pipes would be ideal - not so, evidently, on a basically stock engine.

Along this same line, Gary Cook of Watson Engineering told me that when they tried 3 inch collectors and open pipes on the Bonneville Super Coupe, it LOST power. He claims they are building the exact size headers for the SC Club they ~~ended~~ up using on Ford's Bonneville SC, which produced 450 HP according to one source. Therefore, I believe the headers we are FINALLY getting, along with the 2½ inch True-Dual exhaust system is ideal for us Club members, and probably sufficient for up to 350HP.

As I am truly exhausted from all this typing, I believe I will leave it at that. As always, I welcome any and all comments from you Club members on this and any other subject.

Your humble editor...

Un-plugged and Flying!

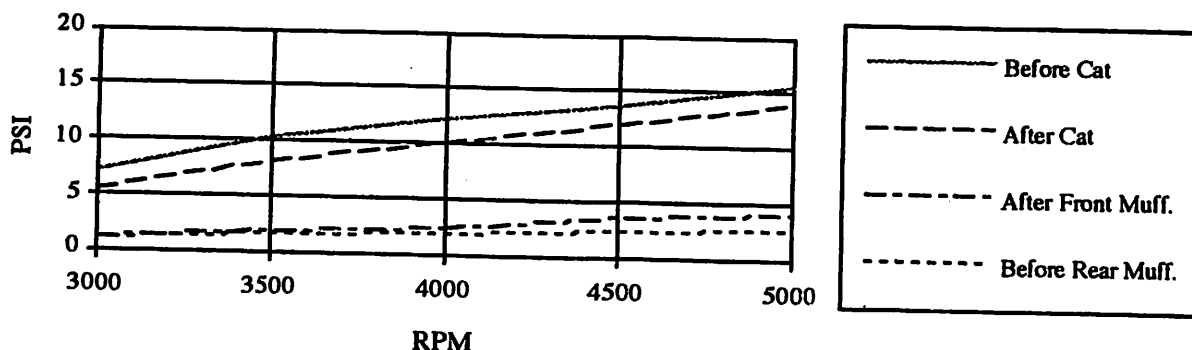
by Charles Warner

Having gone the way of overdrive pulleys, cracked heads and blown head gaskets the assertion by Bill that the stock SC exhaust system causes cracked heads and blown head gaskets caught my attention. Tending not to believe everything I hear I decided to do the research required to understand the problem and let physics provide the facts. So, armed with a great deal of motivation (my cracked head episode set me back two grand) I set out to determine if the SC's exhaust system is really as bad as Bill claims.

The test platform was my modified 91 SC which sports ported and chambered heads, high lift cam, overdrive pulley, ported stock exhaust manifolds, large fuel injectors and a few other goodies. I figure the car is a good test platform to determine if a better exhaust system is useful for Super Coupes on their way to making big time horsepower.

I started out by tapping into the stock exhaust system at several points and measured the back pressure at wide-open-throttle (WOT) over a RPM range from 3000 RPM to 5000 RPM. The results are a real eye opener, see the plot below. I had a hard time believing what I saw, 15.5 PSI back pressure at 5000 RPM's!! The pressure readings were so off-the-wall I doubled checked the readings with another gage, same results.

SC Stock Exhaust Back Pressure @ WOT



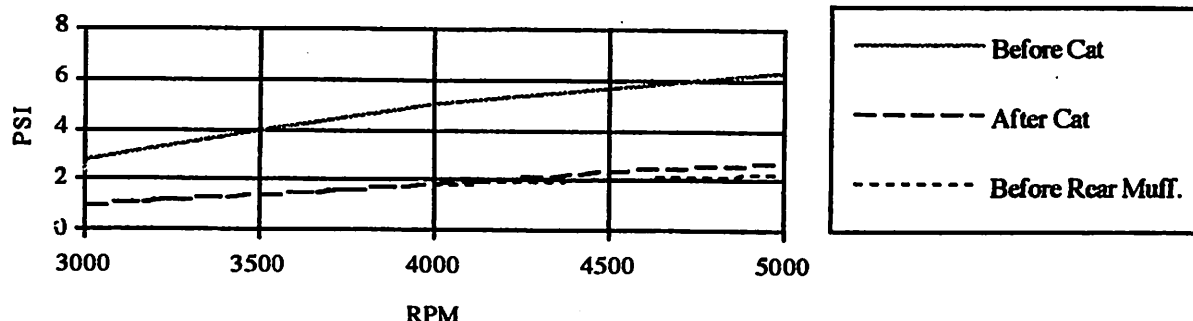
Some problems caused by this high back pressure situation include:

- 1.) During the overlap period (the time when the piston is at or near top-dead-center and both the intake and exhaust valves are open) there is more pressure at the exhaust valve then at the intake valve. Which way will air move? Humm, exhaust gases are flowing into the intake manifold! Race engines with long tube headers create a vacuum at the exhaust valve during this period to purge the combustion chamber of exhaust gases. Exhaust pressures so high that exhaust gas wants to flow into the intake manifold is obscured.
- 2.) After the exhaust stroke the combustion chamber is still charged with hot exhaust gases at 15 PSI. Assuming exhaust gas temperatures are 1500 degrees and accounting for the cylinder to combustion chamber volume ratio the intake air temperature is raised by over 150 degrees! The tendency of a fuel/air mixture to detonate has been studied for decades, the primary factors are: 1.) Pressure (compression ratio), 2.) Temperature of the mixture, 3.) Time (the duration the gas mixture is held at the first two conditions) and 4.) Fuel chemistry (octane rating). There are other factors such as combustion chamber shape, flame pattern, etc. however, temperature is one of the significant factor. In fact, some of the Buick Grand National racers run 160 degree thermostats to reduce engine temperatures 30 degrees in an attempt to reduce detonation while running high boost pressures.
- 3.) When the piston is moving up on the exhaust stroke it is doing work (pumping air) against high pressure. To move enough air to produce 350 HP (about 600 CFM) at 15 PSI requires around 30 horsepower. I can think of better uses for this energy, like turning wheels.

I'm convinced it was designed that way to make the Super Coupe just a tab bit slower then Ford's dear little pony car.

Considering the above I set out to build the lowest back pressure exhaust system possible. I calculated that two 2 1/2 exhaust pipes would have about 1/2 PSI back pressure, but upon inspection of the SC under carriage I could see it was next to impossible to route two 2 1/2 inch pipe through the channel provided for the exhaust pipe. After pondering the situation I soon realized that one 3 1/2 inch pipe has the same cross sectional area as two 2 1/2 inch pipes and would fit the routing channel nicely. It would also have the same back pressure. Well, several weekends and several hundred dollars later I had built a 3 1/2 inch system from mandrel bends that fit like a glove and even used that original mounting brackets. The design is the same as the original except the pipe sizes were increased. The 2 inch pipes were replace with 2 1/2 inch and the 2 1/2 inch pipe and front muffler were replace with 3 1/2 inch. The system was aluminized and fitted with pressure measurement fitting at the same points as the stock system. The same series of pressure measurements were ran on this system, the graph below tells the story.

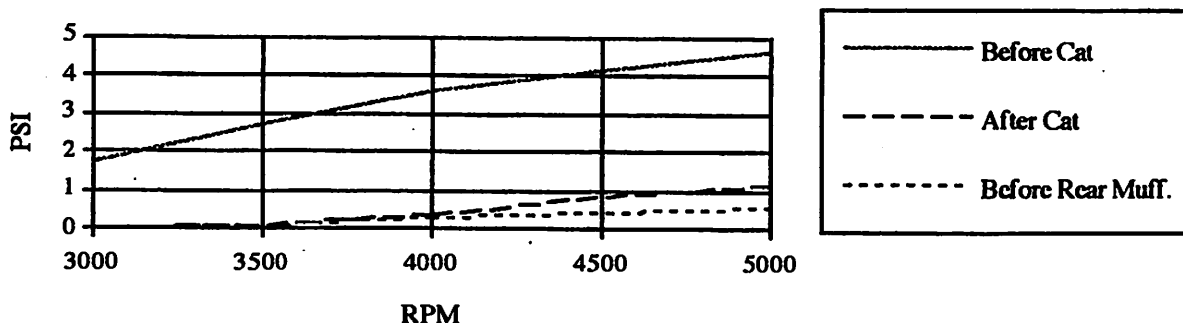
Back Pressure with 3.5 inch Exhaust & Turbo Mufflers @ WOT



The back pressure at the manifold (Before Cat) was reduced from 15.5 PSI to 6.3 PSI, a big improvement. Notice there is only .6 PSI drop between the rear muffler (Before Rear Muff.) and the catalytic converter (After Cat). Things are getting better, but the system still has 6.3 PSI back pressure.

The next two areas to improve are catalytic converters and mufflers. The mufflers I chose were inexpensive or I should say cheap Thrush California Boss Turbo Mufflers with 2 1/2 inch inlet and exit, about \$20.00 each. These mufflers didn't improve the back pressure at all, they had the same pressure drop as the original rear mufflers, about 2 1/4 PSI. They were so loud that I could hardly hear the stereo over the roar. One good side effect was they were so loud I couldn't hear my wife saying, 'slow down!, slow down!, slow down!', , , , just kidding. I shopped around a bit but couldn't convince myself the mufflers I looked at were both low back pressure and low noise, so I decided to design and build my own. I know I'm getting a little eccentric here, just ask my wife, but give me a break this is my Super Coupe I'm working on. The experimental mufflers I designed are nearly as quiet as the stock system and have a pressure drop of only .6 PSI. So I proved, if only to myself, it is possible to have both low noise and low back pressure at the same time. It would be interesting if someone made a side-by-side comparison of available mufflers to determine which ones really work on blower birds. In any case the back pressure is continuing to drop as can be see in the chart and the power levels are going up a bunch.

Back Pressure w/ 3.5 inch Exhaust & Experimental Mufflers @ WOT



My SC with the original exhaust system accelerated from 20 MPH to 55 MPH in 4.17 seconds. With the 3 1/2 inch exhaust system this time was reduced to 3.80 seconds, an improvement you can really feel. I made several 0 to 60 MPH attempts but wheel spin hampered performance, the 245/50 tires don't even come close to holding the power this motor is capable of producing. The best 0 to 60 time was 5.7 seconds, part throttle through most of first gear then nailing it after 40 MPH. On the exhaust side I still have high flow cats and headers to install. I am sure both will improve performance since the CAT back pressure is 3.5 PSI (I think this can be reduced to 1/2 PSI) and the exhaust manifold's ability to move air with its small 1 3/4 inch diameter is poor. It is interesting to note that the blower (even with an overdrive pulley) could only build 12 PSI boost after the heads were ported and now with the high flow exhaust the manifold pressure has dropped to 10 PSI. I think it is time for a modified blower cap, perhaps a S blower, larger throttle body, high flow intercooler and a pay raise. All kidding aside, the SC responds very well to an improved exhaust system and makes other modifications possible. Just think how high the back pressure must be if you have a S Blower, larger throttle body, etc. and a stock exhaust system.

Realizing that I was on to something good I contacted Bill and with a great deal of excitement, told him what I was doing, he agreed it was exciting stuff. I also contacted a company who can manufacture exhaust systems (less experimental mufflers) on a computer controlled mandrel bending machine using my system as a pattern for a cost below what it caused me to buy mandrel bends and cut and weld them together to form a system. The down side is the computer requires programming and this tooling cost must be spread across many systems to make it economical to manufacture. So guys, give Bill or myself a call if you are interested in owning a super high flow system I described above. If there is lots of interest I will go ahead and spend the money to have the machine programmed to manufacture these systems and provide them to the club. If not and you still want to soup up your bird buy the dual system from SCCA or build your own. Whatever you do start with the exhaust and add an overdrive pulley and other stuff after you reduced the back pressure. I think you will save yourself some repair bills in the process. And Bill, thanks for setting me straight, the members of the club owe you a lot.

Lets get this flock flying and in the mean time Merry Christmas and a Happy New Year to all you SC lover out there!!

Charlie Warner
(503) 357-5444

BEAK TO BEAK . . . Questions and Answers..

By Bill Hull

Dear Mr. Hull

I am a Tibetan monk and live alone at the top of the mountain (well, I do have a goat for companionship). I've heard of the Super Coupe Club (actually I saw it in a VISION). While surfing the NET with my battery-powered lap-top, I again found your Club mentioned on the "Thunderbird Nest". I have been trying to "reach" you through meditation, ESP, and seance - all to no avail! Therefore, I must break down and write to you as you obviously have negative Karma!

My question to you is: If you are so smart, then why aren't you rich?

Signed: His-Holiness,
Ambrose P. Ahs-sol

Answer:

Dear Mr. Ahs-sol: I do believe I could FEEL you calling - my nose itched all last week! Anyway, to answer your question - BEFORE I was born I was given a choice - to be born either rich or good-looking. Top that with all of your magic! Being very immature for my age at the time, I chose to be born good-looking! Now that I am forced to sleep in the back of my pick-up truck (with no lap-top, and no goat for companionship), if I had to make the same choice again, I would no doubt choose to be born rich, because being so good-looking all my life has gotten me nowhere! I would, however, have named myself, SUE, so like Johnny Cash says, I would have had to grow up strong and mean!

Dear Mr. President, Super Coupe Club of America

After reading your wonderful newsletter, Chargin' Thunder, Sept. issue, I believe I have a solution to the problem plaguing all EFI automobiles: namely, not enough time to inject fuel into the cylinders between piston strokes - so enlightenly explained by Chief Engineer, Jamie Turvey, of Superchips, Inc. fame.

I have developed a special lead alloy piston, which because of its great mass, will restrict engines to 1500 RPM, thus allowing the injectors sufficient time to "do their thing". An additional benefit to using this lead-alloy piston is: as the piston "gives itself up" under combustion heat and pressure, the exhaust valves will become coated with lead, much like in the days of leaded

gasoline, thus eliminating the need for hardened valve seats.

I have discussed this idea with Chief Engineer Jamie Turvey. He wants my permission to seek a U.S. Patent on this break-thru technology. (He says he has connections because of his world-wide reputation).

My question to you, Sir, is: What do you think of this technology, and if and when this product is brought to market, would you be willing to list it in the parts sheet of your fine newsletter, Chargin' Thunder? Your response is anxiously awaited! Thank you!

Signed: Perciville Q. Fudpucker, P.H.D. (piled higher & deeper)

Answer:

Dear Perciville: Because I was unfortunate enough to be born good-looking instead of smart, I'm afraid all of this new technology is WAY over my head. We do, however, have several Engineers who are members of the SC Club. I will be sure to pass this information on to them, and let them "make the call". As for listing this new product in the Club newsletter, that will have to be ruled on by the Club "Rules and Bylaws" Committee, the Chairman of which is - "The Honorable Dick Adams" Member - The American Honky-Tonk Bar Association.

Dear Mr. Hull

I really enjoy the quarterly newsletter Chargin' Thunder. As soon as it arrives at our mail-box, I immediately quit what I am doing (slopping the Hogs, can wait, right!) and make my sister read it to me - cover to cover! I do wish it had more pictures - but HEY! I'm not complainin'. I have learned so much in the last 9 months, my own mother doesn't hardly recognize me anymore. I can now "hold my own" with all my buddies down at Bill & Hillary's pool-hall when automotive subjects come up.

My question is: What does the "S" in "S" Model supercharger stand for? Thanks for your help, and keep up the great job on "Chargin' Thunder".

Signed: Bubba T. Ledbedder
(Member - Jeff Foxworthy's "Redneck Hall-of-Fame")

Answer:

Dear Bubba: The "S" in "S" model supercharger stands for "STEALTHY" as in "Stealth Aircraft". The reason for this is

because when looking at the "S" model blower from under the hood of a Super Coupe, your Bow-Tie buddies don't have a clue that they are about to "have their doors blown off! Another reason the "S" stands for "Stealthy" is because, like Stealth Aircraft, an "S" model blower does not show up on enemy radar screens.

Last, but not least, the "S" model was thus named because according to Mrs. Maureen Magnuson, Jerry Magnuson's lovely wife, He (Jerry) is so good at sneaking out the back door of the shop to go body-surfing (and leaving Bob McGinnis with all the work), everyone involved believed it only fitting for the "S" to stand for "Stealthy"

This concludes our initial "Beak to Beak" section. Be sure to send in your questions and benefit from more enlightening answers in the NEST newsletter!

The "BIRD COUPE" . . BUY - SELL - TRADE.

Roy McCullough, of Hicksville, NY Mem.# 141 has two (2) 90 model SC's, 1 5-speed, 1 AOD..for parts cars, in addition to his daily driven 90 SC. Give Roy a call if you need parts and can't locate them at a conventional wrecking yard. Tel: 516-933-8508

Steve Pritchard, of Indianapolis, IN, Mem #163 has: 1 new (still packaged) '95 model Eaton supercharger \$950; an overdrive pulley (unknown brand), \$30, and a set of 35th aniv. wheels, no rust, \$350. Tel: 317-787-8556

Jeff Royer, of Boyertown, PA, is looking for a SC to buy. Tel: 610-367-0831

Mark Finchim wants to sell his Red 90 5-speed SC, incl. CD, blk cloth, moon-roof. 54,000 miles. \$9500 Tel: 540-987-9023

Wanted: Drivers-side door for late-model Camaro Z-28. Lost during drag race with T-bird Super Coupe on back road near "Whitewater", ARK.. Can be reached by calling White House, Wash. DC. ask for "Chelsea"

140 mph speedometers are available from Dave Weaver at 5-Star Ford. Tel; 602-946-3900, or 1-800-866-1520

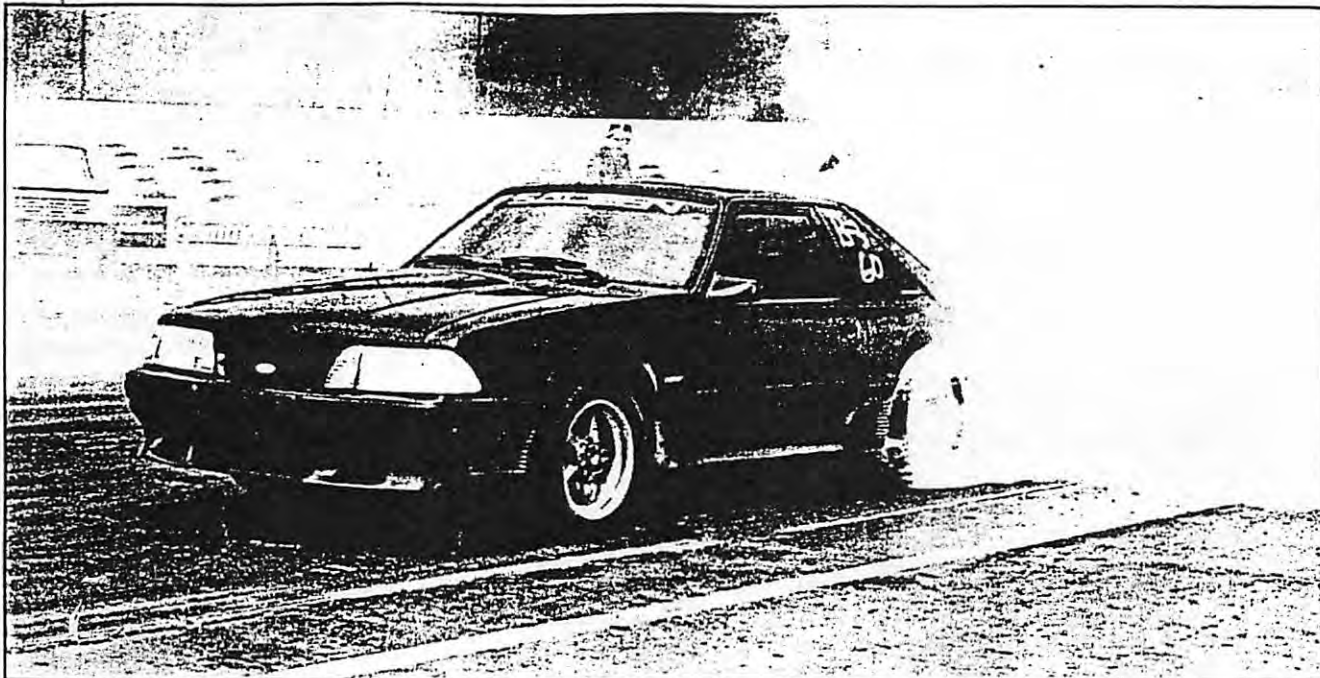
"Ford High Performance" magazine deserves your consideration as a T-bird enthusiast. Bob McClurg's magazine features a large dose of T-Bird articles. 6 issues per year \$15.95 PO Box 68003, Anaheim, CA. 92817-0833. Cynthia MacFarlane (subscription mng.) Tel: 714-572-2255 (courtesy - TIX Oct 96)

Tom Wilson (Super Ford Editor and MN12 Booster) is now the "Technical Correspondence" Editor at Road & Track. Write him a question on SC's. (courtesy TIX Oct 96)

For Sale: Driver's-side door for late-model Camaro Z-28. Found on back road near "Whitewater". ARK. Slightly used. Call, BR-549, (Junior Sample's Auto Sales)

Wanted: Scrap lead - used wheel weights, fishing-line sinkers, obsolete bomb-shelter doors, etc. Top dollar! Seller must pay shipping. Call Perciville Q. Fudpecker, PHD at 1-900-GET-A-THRILL

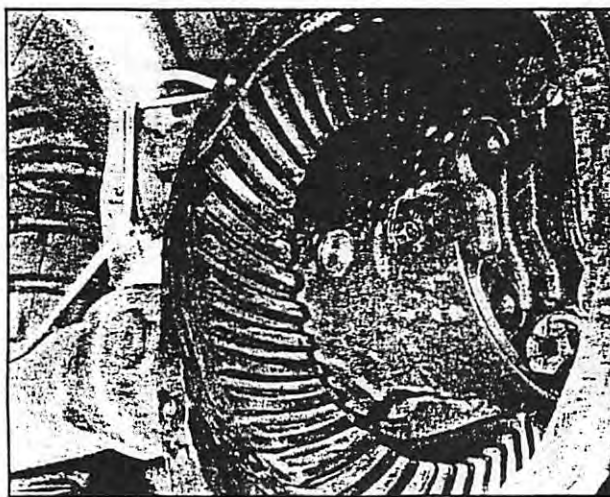
Wanted: A "REAL JOB" - Because of a slow down in production due to sharply reduced sales, I am now seeking gainful employment. Qualifications: Educational background - 2 years full-time at Margie's Pre-school; 20 years at the Graduate School of "Hard Knocks"; Employment History - 10 years R&D at America's foremost manufacturer of after-market computer-chip modules; Can be reached by calling: "False Advertising" Dept, Superchips, Inc., ask for "Jamie"



How Low Can You Go?

We answer that question and many more, as we examine the effects of rear end gearing on driveability, acceleration, fuel economy and dragstrip performance.

BY NEIL VAN OPPRE
Photos by Steve Collison



Because changing the ring and pinion gear is not an easy task, you'll want to ask others who have made gear swaps about their experiences with gas mileage, engine noise at cruise speed and improvement in acceleration. If at all possible, try to drive cars with similar engine modifications but different ratios. You'll have to be the judge of how much noise you can handle, and how much economy you can afford to give up.

Rear end gearing is often addressed on these pages, but a recent desperate information request from reader Michael Ulsch of Jacksonville, Fla., prompted us to devote a complete story to this subject.

Regardless of vehicle or engine type, choosing rear end gears properly is a matter of analyzing your needs and calculating which ratio will deliver the desired results. This concept, the "total combination theory," should be a natural thought process for anyone who

is a regular reader. After all, you've heard it expounded here countless times before. And because this story relates to previous articles we have compiled a list of recommended reading (see page 84) regarding such topics as induction and camshafts, which will help to explain the relationships between those systems and rear end gearing.

Street vs. race

Obviously, in a full-time drag race application there is only one concern:

Calculating Gear Ratio

Use the following equation to find which gear ratio will give the desired RPM for highway or dragstrip use:

$$\text{Finish Line RPM} = \frac{\text{Gear Ratio} \times 336 (\text{constant}) \times \text{MPH}}{\text{Tire Diameter}}$$

Example: $4633 = \frac{3.55 \times 336 \times 101}{26}$ $3.55 \times 336 \times 92 \div 26.7 = 4110$
 $3.55 \times 336 \times 90 \div 26.7 = 4021$

To find cruise RPM in Overdrive, multiply rear end ratio by overdrive ratio:

Example: $3.55 \times .68 = 2.41$ $2.41 \times 1712 = 4110$
 $1712 = 2.41 \times 336 \times 55$ $3.55 = 2187$
26

To find overall first gear ratio (gear reduction), multiply rear end ratio by transmission first gear ratio:

Example: $3.55 \times 3.35 = 11.89$

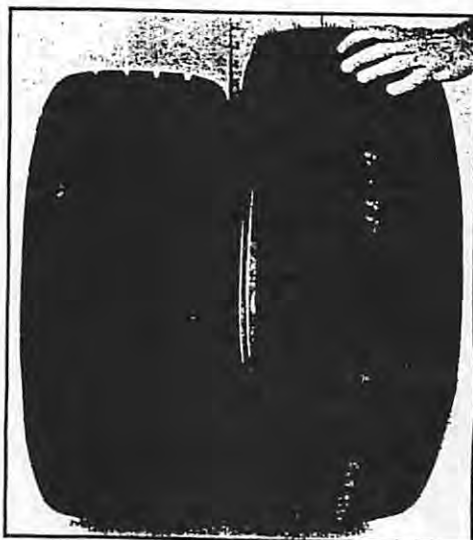
To find total torque output, multiply peak engine torque by overall first gear ratio (use to determine driveline capacity):

Example: $300 \text{ lbs.-ft.} \times 11.89 = 3567 \text{ lbs.-ft.}$

Available 8.8 gear ratios and corresponding RPM increase:

Gear Ratio:	2.73	3.08	3.27	3.55	3.73	4.10	4.30	4.56	5.13
% RPM Rise:	-12.6	6.4	8.3	5.1	10.0	4.9	5.9	12.5	

Information courtesy of Char-Trends (314/7390-6367)



Tire height affects true final drive ratio in a major way. A shorter tire will give you a numerically higher ratio (more leverage off the line), just like a change in gear ratio. A taller tire, like the Mickey Thompson Sportsman Pro on the right, will tame down the rear end quite a bit. (Even though the Sportsman Pro is listed as a 26-inch-tall tire, it easily measures between 27 and 28 inches. *Hint:* Because manufacturers measure their tire size differently, you'll want to compare them side-by-side. Some manufacturer literature will list the rollout—or circumference—in inches. This can be helpful in making size comparisons when a side-by-side examination is not practical.)

getting to the end of the strip as quickly as possible. However, in a multipurpose car you need to balance dragstrip performance with the ability to drive the car comfortably in a variety of other ways. While the use of overdrive transmissions in modern performance cars makes it possible to enjoy a high level of performance without sacrificing drivability, there are still compromises to be made.

The key is to find a gear that maximizes the complete power band of

the engine. Reaching the finish line 1000 rpm below the camshaft's peak power range is not the route to low ETs. On the street, though, it gets more complicated. Even if you spend considerable time at the dragstrip, you probably drive your car to the track. Just how much gear you can tolerate at highway speed is a matter of personal preference. If you have a street car without overdrive, it won't take long for steep gears to get on your nerves. In that case, even a ratio in the low-to-mid

Recommended MM&F Reading

10 Best Buys in Bolt-ons, Aug. '91
 Induction Instruction, Dec. '91
 Bumpstick Basics, Feb. '92
 Mean Mr. Mustang Update, July '92

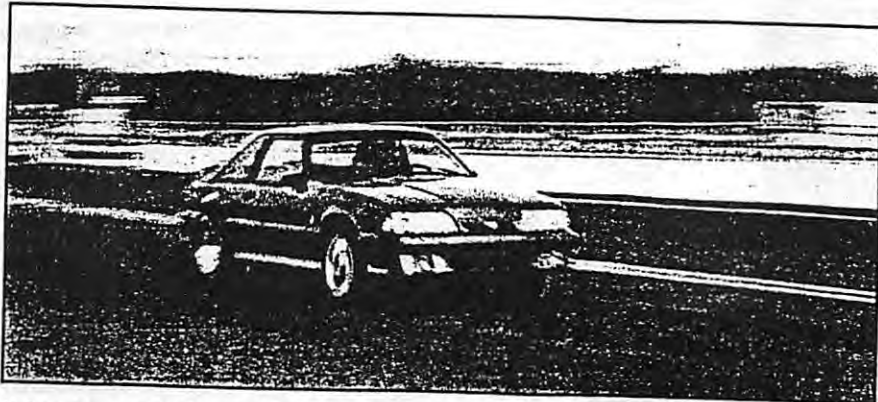
three series can get obnoxious.

Any available overdrive transmission can make 4.10s livable on the street, but again you need to strike a balance between personal preference and actual need. The 4.10 ratio is definitely a bit severe for a 5-liter car with a stock cam, but install an aftermarket cam with a power band that stretches to 5500-6000 rpm and they become necessary. For all the reasons stated, it's very hard to declare a particular ratio as "perfect" without knowing everything about the way a car is driven and who is doing the driving. But, after logging many road miles in a variety of Mustangs, I think 3.73 gears offer the best balance between maximum acceleration, smooth part-throttle driving and good economy in a stock-cammed 5-liter. For more on the pros and cons of steep gearing for the street, see the sidebar "Exploding Myths: Fast 5-Liters And Fuel Consumption."

Numbers, numbers, numbers

In his letter, Michael Ulsch asked us to give detailed information regarding rpm ranges, top speeds, track times and gas mileage (city and highway) of the individual 8.8 ratios available for the 5-liter. Sufficient space is not available to consider every combination, so we have included a sidebar with the equation to compute gear ratio and a chart (courteously supplied by Char-Trends of Maryland Hts., Mo.) showing the rpm increase between each available ratio. Employing a pocket calculator, you can use this information to experiment with your current combination and predict changes based on your particular driving needs.

In the "10 Best Buys In Bolt-Ons," (Aug. '91), I took a strong stand on the issue of when it was most cost effective to change gears in the average



If dragstrip performance is your main concern, a numerically higher gear will give the greatest leverage out of the hole for most Mustangs. Highly powered blower or turbo cars (which typically have fatter torque curves than normally aspirated cars) may actually perform better with lower ratios (3.27 or 3.55) to take advantage of a broader power band. Everything else being equal, fuel economy seems to be fairly uniform for ratios 3.27 through 4.10, so cruise noise level will be the only major factor other than acceleration.

Exploding Myths: Fast 5-Liters And Fuel Consumption

I am constantly amazed by people who make blanket statements about the relative merits of a particular gear ratio without any regard for the specific application or actual knowledge of the real-world consequences of their recommendation. Case in point. I've heard from many sources that you can't use a 3.73 or 4.10 gear in your street car without sacrificing considerable fuel economy over the often-used 3.55 gear. That's not true.

After using 3.55 gears from September 1987 to October '89, I have used 4.10 gears exclusively in my stock-motored, daily driven '87 LX (with three different transmissions, including one automatic). This car, rapidly approaching the 100,000-mile mark, still gets the same gas mileage with the 4.10 gears as it did with the 3.55s. I average 20 mpg in combination driving (without conscious regard for economy) and on more than one occasion have knocked down as much as 24 mpg during extended highway cruising. I have already stated that 4.10s are a bit extreme with the stock roller cam, and I admit they raise cruise rpm to a more "noticeable" level, but one of the reasons I use such a steep gear is because I sometimes tow a trailer and find clutch life is much improved with the added gearing.

An important thing to remember about fuel economy is that shift points on acceleration have as much (if not more) to do with gas mileage as actual cruising speed. You use much more fuel accelerating the car to the desired cruise speed than you do maintaining that speed. No gear ratio is economical if you leave every light with the tires blazing, throwing shifts in excess of 3000 rpm.

Want good gas mileage with big gears? Try shifting at 2000-2200 rpm (the same numbers we recommend for any other ratio). The irony here is that the same low gear ratio that will accelerate your car more quickly on the dragstrip will also accelerate it more quickly on the street—with less fuel-burning load on the engine.—N.V.O.

street 5-liter, and which ones to use. When starting with a 3.08 gear, I recommended not upgrading immediately. I also suggested that a change of only one ratio number was nearly inconsequential, considering the time, effort, expense and resulting performance increase. By referring to the chart you can see that there is only a 6.4 percent rpm increase between the 3.08 gear and the 3.27, while the jump from 2.73s to 3.08s is nearly double that at 12.6 percent. You can translate this into

actual cruise and trap rpm for your particular car by using the gear ratio equation.

As an example, consider a car outfitted with a 3.08 gear and 26-inch-tall tires that normally travels the quarter-mile at 98 mph. Finish line rpm for this car would be only 3900 rpm in fourth gear. The 3.27 gear would only raise that figure to approximately 4150 rpm. Ideally, you would like to reach the speed traps at a minimum of 4600 rpm in fourth gear (4600-5000 is the

How Gear Ratios Affect Top Speed

MPH in high gear (1:1) on 225/60R15 tires (25.63 in. diameter) @ 6000 rpm

2.73:1=167.58	3.73:1=122.65
3.08:1=148.53	4.10:1=111.58
3.27:1=139.90	4.30:1=106.39
3.55:1=128.87	4.56:1=100.32

Formula For Figuring Top Speed

MPH = Tire Diameter in Inches x Engine RPM x .002975 divided by Total Gear Ratio (i.e., 4.10).

optimum range with the stock roller cam). If your car is making sufficient horsepower to run 98 mph at only 3900 rpm (and all 5-liters do), then a switch to a 3.55 or 3.73 gear would allow the car to accelerate much quicker and use the entire available power band. With adequate traction the result should be a dramatic improvement in ET and mph.

The example above helps illustrate several other points. Although I don't recommend drag racing with a 2.73 gear, you can see why it is necessary to go through the lights in third gear ($2.73 \times 1.29 = 3.52$ or in '90-up production T-5, $2.73 \times 1.33 = 3.63$). Unless you have an obsession with gas mileage, I feel the 3.08 is the minimum gear ratio for adequate performance. The 3.08 will give you an overall first gear ratio of 3.35:1 compared to 9.1 for the 2.73s. A 10:1 ratio is considered the minimum for good acceleration and will actually help fuel economy (see sidebar).

Also, don't get too caught up with the actual gear ratio numbers or the sometimes minor differences between them. Every ratio has an application and, although you might not think of a 3.27 gear as a high-performance ratio, there are supercharged applications using EEC-IV electronics where cars run in excess of 130 mph at less than 6000 rpm. In these cases, a "small" gear is necessary. Naturally aspirated cars have to rely on more gear because they have less torque to accelerate the car.

There are also times when a change to the engine combination can require a minor change in gearing, but most of you will make only one gear change. That's why it's important to consider every aspect of how you drive your car, and what compromises you are willing to make.

automotive

531 Spectrum

Please keep in mind no other fastener source has the line depth of ARP—and you can't use what's not available. We have the correct part for virtually every popular application plus many of those that are simply not available from other sources.

Contrary to the notion offered by companies with lesser capabilities—ARP fasteners are very affordable. Our *High Performance Series*, for example, is specifically designed to be competitive with all other lines. Even those of lesser quality. But, when you make ARP your choice you are choosing products that deliver the added value of higher quality—for approximately the same dollars. Plus the best warranty in the business. 100% satisfaction guaranteed.

True, some of the fasteners in the ARP *Pro Series* and *NASCAR Series* carry a higher value. Although these may appear to be expensive, it is important to realize these applications are so highly specialized, there is generally nothing else that compares in either quality or availability. And while you may never have a need for an Ilmor Formula 1 or Mercedes Indy rod bolt—daily, we have customers who do?

The advantage of our capability may not be instantly obvious. ARP is definitely not a manufacturer beating their chest about how great they are. There are significant economic and quality efficiencies controlling the entire process. It is these efficiencies that make it possible for us to provide products that are higher quality than anything else available—anything you've ever seen in threaded fasteners. Yet at comparable, affordable pricing.

Perhaps the most understated advantage of our "Total Manufacturing Concept", is knowing that every part was produced at an ARP plant in Southern California—not an obscure village somewhere in a nation whose name you can't pronounce. It's great insurance. In recent years the fastener business has been scandalized by unscrupulous companies that repackaged substandard, foreign made bolts and sell them as premium American made, products. You can't be too careful about the source and quality of fasteners that are used in expensive racing engines and chassis.

Because we are primarily an aerospace fastener manufacturer, one of only twelve world wide—government licensed to manufacture MS21250 fatigue rated fasteners and is QPL (*Qualified Products Listing*) approved, some might think we are over qualified to

produce fasteners for automotive use. But, in truth it simply means we know more about the production of high quality fasteners than any other in the automotive field. As a manufacturer of fasteners, used mainly in professional racing—our customer list reads like the "Who's Who in International Racing". In literally every form of racing. It is no accident that professional engine builders, racing teams and drivers insist on ARP. Nowhere will you find a more complete selection of, American made, professional quality threaded fasteners. Fasteners designed and produced specifically for racing applications.

Through our continued research and development, even other aerospace manufacturers look to us for special production processes.

By solving the fastener needs of others we are creating products for you. Daily we ship fasteners that are a direct product of the technology that evolves when we produce special application products. Remember we are the only manufacturer actually willing and able to do custom and development work...it's because of this manufacturing capability that ARP daily produces leading edge fasteners for Drag racing, Indy, NASCAR and Formula 1.

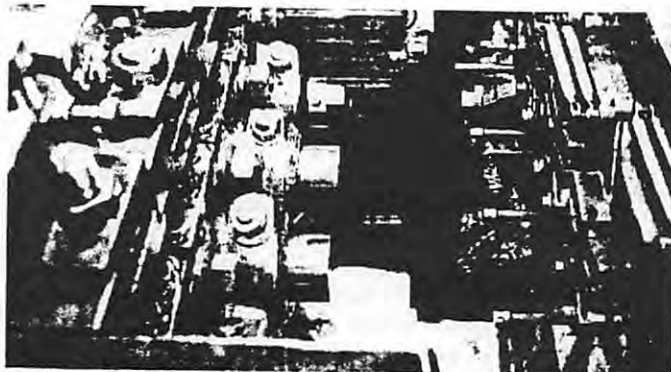
Put your confidence in the best alloys and superior processing too.

Quality begins with only the finest grades of alloys. For example, many alloy materials are generally available in several levels of quality. The 8740 alloy is available in 4 grades:

- 1) SDF (guaranteed seamless and defect free), CHQ, aircraft quality**
- 2) CHQ (cold head quality), aircraft quality**
- 3) Aircraft**
- 4) Commercial**

We specify only SDF & CHQ aircraft quality 8740. It may be 3 times the cost of commercial quality 8740, more expensive than the materials used by our competitors, **but at ARP—random failures are unacceptable.** 8740 has been a standard in the aerospace industry for many years because it can be safely heat treated to 180,000 - 200,000 psi. We achieve the highest performance quality through manufacturing processes not generally available everywhere. Some fastener manufacturers consider 4340 an adequate substitute.

We do not and neither should you.

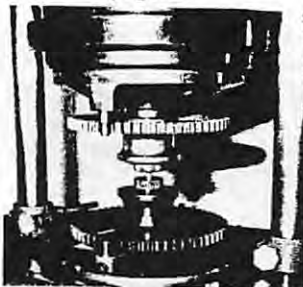


The ARP "COLD-HEADING" facility is the only of its kind totally dedicated to the production of fasteners for racing and high performance use. Large spools feed premium wire into these machines where tons of pressure cold-form the heads on all ARP bolts, studs and nuts.

Making tough fasteners, rated up to 290,000 psi. ..without killing ductility, is easy. When you know how!

The commercial fastener industry, without sufficient exposure to aerospace technology, is generally unaware of the materials or processes required to produce high strength/high ductility fasteners of this caliber. The use of carbon steels has been their standard for years. The problem is easy to understand. Carbon steels are not very clean materials structurally. When cold form headers came of age, there became a need for cleaner materials. Alloys that would prevent splitting during the forging process. The materials of choice for commercial bolts and socket screws are 4037 and 4140, which can be safely heat treated to 160,000 to 180,000 psi. Anything above this leads to embrittlement or a loss of ductility. Commercial bolt companies would have you believe that as the tensile strength exceeds 200,000 psi, the fastener becomes too brittle.

Those of us in the aerospace industry know better—and for years have used alloys capable of 320,000 psi—while retaining excellent ductility properties. Some of the applications for these materials include space exploration and landing gears. At ARP we use a wide variety of materials for threaded fasteners. These materials are characterized by their strength—which range from moderate to ultra high-super alloys. Reciprocating loads, like connecting rods are the most significant applications for this broad range of materials. The most cost effective design is the one in which the bolt strength is great enough to handle the anticipated load, plus a safety margin, for the occasional-inadvertent overloads. Using a material which provides more strength than required is generally not cost effective, simply because as strength increases so does material cost. In many cases that increase can be significant. Typically we work with 7 alloys. In the quench and temper group we use: **8740** chrome moly, **ARP2000** and **L19**. We are continually developing new materials and manufacturing processes like the following super alloys: **INCONEL 718**, **MP-35 & MP-159**, **Custom Age 625** and **Aremet 100**. Complete specifications for these alloys can be found on page 25.



Rod bolts challenge the limits of fatigue more than any other fastener. We routinely use resonant frequency machines to test bolt fatigue by varying the tensile load between a minimum and maximum load at frequencies between 6,000 and 9,000 cycles per minute.

A complete, inhouse, laboratory facility is used for evaluating these materials as well as the performance of the threaded fasteners. Tensile and fatigue strength are the primary characteristics studied in our effort to develop the best possible products. Actual breaking strengths are determined in order to clearly define fastener capability—

as opposed to demonstrating that some arbitrary specifications are satisfied. Such specifications only establish *minimum* performance strength values. Not *actual* strength value. Accurate knowledge of actual

strength value, permits efficient and cost effective fastener design.

Material and tensile strength selection is only a part of the over-all picture when manufacturing racing quality fasteners. All of our products are designed specifically for their intended applications.

The occurrence of fastener fatigue is principally due to cyclic loading and off-loading of the fastener—referred to as Reciprocating loads. While fatigue resistance can be partially attained by material selection and tensile strength, equally important is specific fastener design.

Undercutting for example, increases flexibility. Full engagement of threads reduces stress concentrations at the root radius of the last thread. Shot-peening sets up a compressive stress on the surface that helps prevent cracking. Perhaps the most critical process is thread rolling after heat treatment. This one procedure is the most significant because it alone can increase the fatigue life of a bolt by more than 1000% over a fastener threaded prior to heat treatment. Plus—careful attention to the root radius is important and when processed, as done at ARP, in accordance with MIL-S-8879, which contains the detailed requirements for controlled root radius ie; J-form threads (UNJ Symbol), material strength is added to the threaded areas and stress risers and notch sensitivity are reduced. The following paragraph is from this specification and is simply for your information.

"6.1 INTENDED USE. Threads covered by this specification are recommended for high temperature use and for applications requiring very high fatigue life stress levels commensurate with the physical size and weight of the product. Applications are found in aircraft engine and airframe, missile, space vehicle, and similar design areas where size and weight are critical."

ARP produces a variety of designs for very specific reasons.

Undercutting: Reducing the shank diameter of fasteners eliminates head gasket sealing problems. Short fasteners are very stiff and the amount of bolt stretch available is about the same as the amount of compression in the gasket. Should the gasket lose some of its compression due to set, it can quickly eliminate the pre-load (*torque*) in the fastener—unloading the gasket. The result is naturally a blown head gasket. So it's easy to see the why the care required to properly design an undercut fastener, to provide the precise stretch, is absolutely critical.

Step-down studs: Cylinder head studs that are 7/16-14 on the block end with a 3/8" shank and 3/8-24 nut thread. We do this specifically for cylinder heads that have been *rolled over* or severely angle milled. This feature is a great benefit to the engine builder because enlarging or changing the direction of the original bolt hole can open a water jacket or a port. Another benefit of using step down studs is the ability to place cylinder heads with small diameter bolt holes on cylinder blocks with larger diameter bolt holes—without modifications.

12-point nuts: Reduced wrench diameter bolt heads give added clearance on racing set-ups that utilize repositioned valves and large diameter valve springs—eliminating the need to disassemble valve train components to facilitate retorquing.

Rocker arm studs: are subjected to severe bending loads. This cyclic bending is the main cause of fatigue. Therefore, a material with good ductility at higher tensile strength is indicated. To ensure proper valve train geometry concentricity is maintained to a tolerance of .0050 maximum T.I.R., from end to end, we offer rocker studs in two tensile strength ranges: 170,000psi for high performance applications and 190,000psi for maximum and extreme applications where minimum deflection at extended high RPM's is required. Plus we offer the broadest range of complete kits for specific engines and valve train components available. 31 separate applications listed in this catalog alone. Many of our rocker studs feature a special step flange to facilitate the use of push-rod guides without changing rocker arm geometry.

Main cap fasteners: are essentially subjected only to constant tension loads and essentially require the same load properties as cylinder head fasteners. If forces were great enough to cause separation, the fastener would be subjected to cyclic fatigue loading as previously described.

Leadloy is commonly found in automotive aftermarket accessory fasteners. It contains a high percentage of lead... and we won't use it.

We build quality into everything we make at ARP. The same attention to detail is used in our entire line of fasteners, including for example, valve cover, oil pan and carburetor studs. Leadloy, is a material commonly found in products offered by other automotive suppliers. This material contains a high percentage of lead and cannot be heat treated—because it machines easily, it produces very cheap products. Some of the problems associated with using Leadloy is thread galling (nuts locking on the studs), inferior clamping capabilities (resulting in leakage), improper alignment (an adjustment is usually made by hammering the studs around until the part goes on) and breakage. Usually the result of galling or inferior tensile strength.

We manufacture our accessory fasteners with the same care and attention used to make our head and main studs. Our alloy materials are heat treated to 170,000 psi (15% stronger than grade 8). They are centerless ground and thread rolled after heat treatment for perfect concentricity (alignment), resulting in the finest accessory studs available.

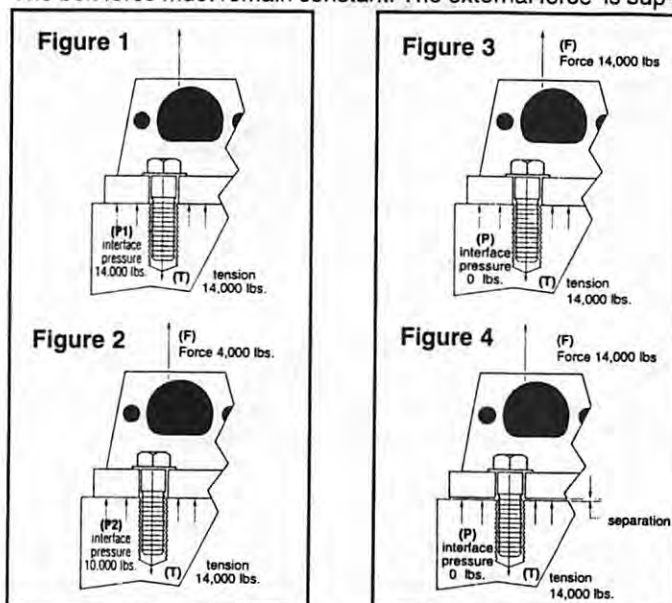
"The best method of fastener retention is to stretch the fastener an engineered amount, which we can control...a fastener used properly works like a spring."

The maximum work a fastener can do is when it is torqued correctly and stretched a precise amount. We can control this stretch by using an accurate torque wrench and with good thread lube. On the other hand, if a fastener is over torqued and becomes stretched too much—you have exceeded the yield strength and it's ruined. If the fastener is longer than manufactured—even if it is only .001", the fastener is in a partially failed condition. Therefore all our fasteners are designed to stretch a given amount and must be somewhat elastic."

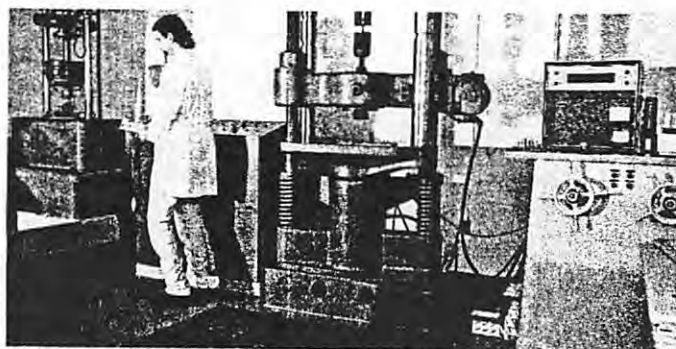
Heat, primarily in aluminum is another problem area. Because the thermal expansion rate of aluminum is far greater than that of steel it is possible to stretch a fastener beyond yield as the aluminum expands under heat. An effective way of counteracting thermal stress is in choosing a material with greater heat resistance and by producing a more flexible bolt.

Cylinder head fasteners are generally subjected to *constant tension loads only*. Contrary to the belief of some commercial fastener companies there are no fatigue loads present. The main focus here is the exertion of enough compressive force to prevent the cylinder head from lifting under maximum load. Consider a cylinder head and block joined together by a fastener. Because the cross-section is much smaller the fastener, even if made of hardened steel, will be much more flexible than the cylinder head and block. Think of the fastener as a spring connecting the head and block. When the joint is pre-loaded, such as by means of a torque on the bolt, a tension force (T) is generated in the bolt. This causes an initial stretch in the bolt. This also produces an interface pressure (P1) between the

cylinder head (A) and the block (B). Without external load, the force due to (P1) just equals the force (T) generated in the bolt. Consider what happens when an external force (F) is applied. Due to the rigidity of the cylinder head and block, there is no change in the distance between point (A) and (B). Therefore, the force can change only if there is additional stretch in the bolt. The bolt force must remain constant. The external force is sup-



ported by a reduction of the interface pressure (P1) which becomes (P2) (where the value of (P2) is less than (P1). That is, the force due to (P2) plus the external force (F) add up to be equal to the tension force (T), which remains constant as (F) increases and (P) decreases. When the external force (F) gets large enough to exceed the tension force (T), the interface pressure (P) finally reaches zero. At that point, the cylinder head (A) and the block (B) begin to separate and fluctuating loads are then imposed on the fastener, which could lead to fatigue failure. However, gasket failure due to loss of pre-load would occur before fastener failure.



The Amsler resonant frequency fatigue tester and an Tinius-Olsen 60,000 lb, computer controlled tensile machine are in continual operation verifying the integrity of our standard line of threaded fasteners, in addition to new designs and alloys performance.



Believe it or not, the "metallography" lab sees constant activity. Literally every thread rolling machine set-up is microscopically verified before and during every production run to assure proper thread roll depth. Heat treatment and alloy microstructures are also polished then etched to check grain structure and to assure that there is no carburization or decarb on the fastener surface.

HIGH PERFORMANCE SERIES • CONNECTING ROD BOLT KITS

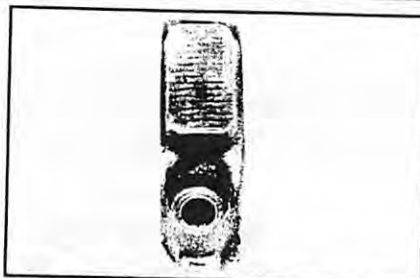
Unquestionably the most critical fastened joint in an automotive engine is where the connecting rod halves mate. Connecting rod bolts support the primary tension loads caused by engine operation in each revolution or cycle of the crankshaft. When the crankshaft rotates, the big end of the rod (OEM & Aftermarket) becomes oval-shaped and the rod bolts flex. As the crankshaft continues to rotate, the rod becomes round again. With alternating tension loads and cyclic bending of the bolts, it is important to install fasteners that are able to exert a clamping force greater than the load imposed upon the joint (tension). A bolt that delivers the longest life in cyclic bending (fatigue) is essential. Each ARP connecting rod bolt is designed and manufactured specifically for its intended application—using the best materials, processes, designs and engineering. Even surpassing the most stringent aerospace specifications.

Put protection into your engine.....Install ARP rod bolts in your connecting rods!

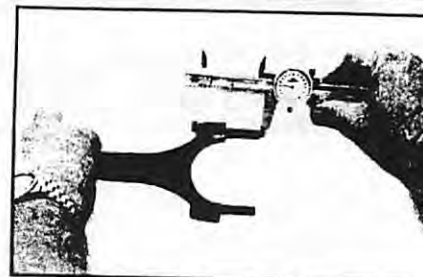


How To: Install OEM-style Rod Bolts

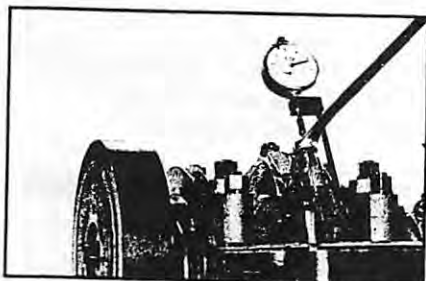
Improved reliability and optimum strength are the main attributes of ARP's replacement rod bolts. These are the finest fasteners available today, and are recommended for all high performance applications.



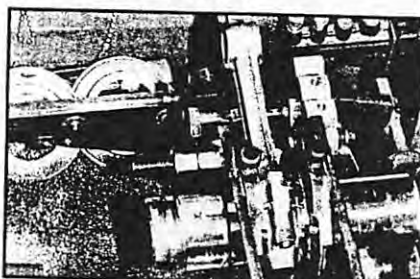
1. Inspect rods to ensure there is adequate chamfer to clear radius under heads, then install bolts after inspecting for damaged hardware.



2. Reinstall the rod cap, then measure bolt length using a rod bolt stretch gauge, or micrometer (free standing length).



3. Lubricate rod nuts and washers with ARP Moly lube, torque nuts to achieve recommended bolt stretch. A rod bolt stretch chart is located on page 13.



4. With proper pre-load applied, have rods resized. This procedure is recommended any time rod bolts are replaced.



5. Reinstall rod and piston assemblies in engine using the prescribed bolt stretch method or by following recommended torque values.

Whether measured by stretch or by torque, the proper preload in a connecting rod bolt is essential for trouble-free performance. If a bolt is installed without sufficient pre-load (or pre-stretch), every revolution of the crankshaft will cause a separation between the connecting rod and rod cap. Called "OLVALATION", this imposes additional stretch in the bolt, which then disappears when the load is removed on each revolution, or cycle. This cycle stretching and relaxing can cause the bolt to fail due to fatigue, just like a paper clip that is bent back and forth by hand. To prevent this condition, the bolt's preload must be greater than the load caused by engine operation.

A properly installed bolt remains stretched by its preload and isn't exercised by the cyclic loads imposed on the connecting rod. A quality bolt will stay stretched this way for years without failing. The important thing is to prevent the bolt from failing due to fatigue by tightening it to a load greater than the demand of the engine. Protect your bolts - tighten them as recommended.

In other types of bolted joints, this careful attention to tightening is not as important. For example, flywheel bolts need only be tightened enough to prevent them from working loose. Flywheel loads are carried either by shear pins or by side loads in the bolts; they don't cause cyclic tension loads in the bolts. Connecting rod bolts, on the other hand, support the primary tension loads caused by engine operation and must be protected from cyclic stretching. That's why proper tightening of connecting rod bolts is so important. The accompanying charts list recommended stretch and torque values for ARP's full line of connecting rod bolts.

Friction is an extremely challenging problem because it is so variable and difficult to control. The best way to avoid the pitfalls of friction is by using the stretch method. This way preload is controlled and independent of friction. Each time the bolt is torqued and loosened, the friction factor gets smaller. Eventually the friction levels out and becomes constant for all following repetitions. Therefore, when installing a new bolt where the stretch method can not be used, the bolt should be tightened and loosened several times before final torque. The number of cycles depends on the lubricant. For ARP recommended lubes 5 loosening and tightening cycles is enough.

MAIN STUD KITS

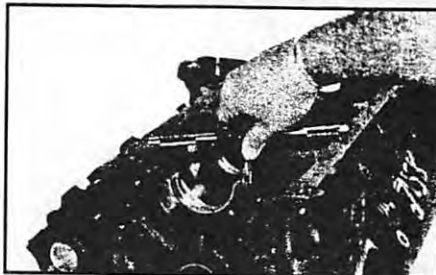
By installing an ARP main stud kit, you can eliminate main cap walk and fretting, and protect the threads in your cylinder block. Manufactured in our own factory using the best materials, processes, designs and engineering, every ARP main stud kit meets or exceeds the most stringent aerospace specifications.

All kits are complete with hardened parallel-ground washers and aerospace quality nuts. Some applications have provisions for mounting windage trays and have specially designed standoff studs with serrated lock nuts to position the windage tray and lock it securely in place. *All studs are 190,000 psi tensile strength.*

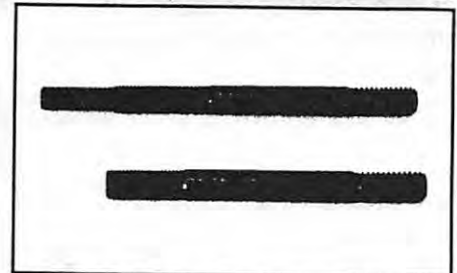


How To: Main Stud Installation

The installation of an ARP main stud kit assures you of improved main cap retention while equalizing block stresses and enhancing reliability. Main studs are highly recommended for any extreme duty environment.



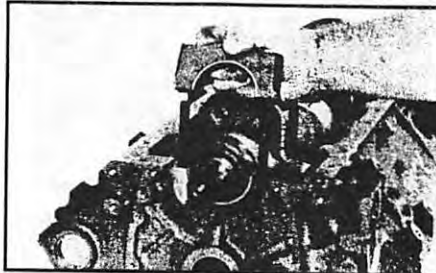
1. Clean and re-tap all bolt threads in block to ensure proper thread engagement and accurate torque readings.



2. Clean and inspect all hardware prior to installation, looking for obvious defects or shipping damage.



3. Screw studs into block, hand tight ONLY. For permanent installation, apply ARP thread sealer sparingly to threads.



4. Install main caps, checking for binding and misalignment. Lubricate threads, nuts and washers with oil or ARP moly assembly lubricant before installation.



5. Using the general fastener torque chart found on page 12, torque to proper values in three increments. NOTE: Proper pre-load must be achieved prior to ARP thread sealer setting up, if used.

HEAD STUD KITS

No gimmicks! Just the best you can buy, at any price Manufactured in our own factory using the best materials, processes, designs and engineering. Every ARP stud kit meets or exceeds the most stringent aerospace specifications. Kits come complete with appropriate number of studs, hardened & parallel ground washers, and aerospace quality nuts.

Rated 190,000 psi tensile strength.

Optional features:

12-Point nuts - With a reduced wrenching diameter, these nuts allow use of larger diameter valve springs which eliminates the need for valve train removal to facilitate cylinder head retorquing.

Undercut studs - It is preferable to make a stud or bolt as flexible as possible. If a stud or bolt is very stiff and does not stretch much, the amount of set in the gasket will reduce the effectiveness of that stretch. This becomes very critical as the length of the bolts and studs becomes shorter. Very short fasteners are

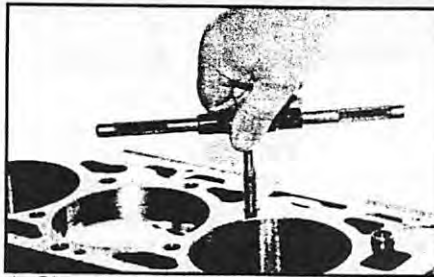
also very stiff, and the amount of stretch present is about the same as the amount of compression in the gasket. If the gasket loses some of its compression due to set, it can eliminate the preload in the fastener and unload the gasket. The result is a blown head gasket. Undercutting the fastener provides the extra stretch critical to retain proper gasket seal.



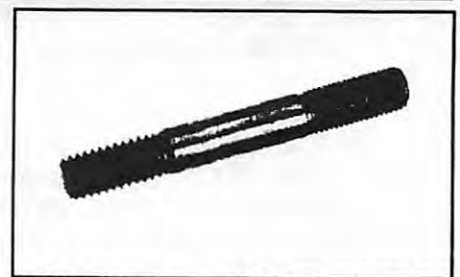
How To: Head Stud Installation

Improved sealing, accurate torque readings, and block thread protection are but a few reasons to install an ARP head stud kit. Recommended for high-compression and extreme duty application.

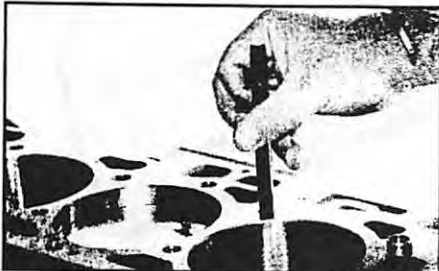
SPECIAL NOTE: Where the stretch method cannot be used, the bolts must be installed by torque and several factors should be taken into account. Please refer to "Friction Facts" on page 14



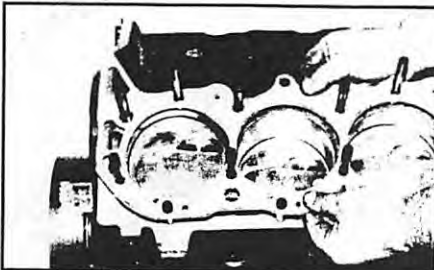
1. Clean and re-tap all bolt threads in block to ensure proper thread engagement and accurate torque readings.



2. All hardware should be cleaned and inspected for possible shipping damage prior to installation.



3. Since most studs extend into the water jacket, coat threads with ARP thread sealer and screw in hand tight ONLY. NOTE: If permanent mounting is preferred, Loctite may be used.



4. Install gasket and head, then lubricate washers and nuts with oil or ARP moly assembly lubricant prior to their installation.



5. Following the engine manufacturer's torque pattern, torque each stud nut in three increments to recommended values found in the general fastener chart on page 12.

Stretch Gauge



We highly recommend using a stretch gauge when installing rod bolts. It is the most accurate way to determine the correct preload in the rod bolt. Our stretch gauges come with a dial indicator and extra heavy springs for consistent repetition.

Stretch Gauge.....100-9941

Friction Facts

If the stretch method cannot be used in a particular installation, so that the fasteners must be installed by torque alone, there are certain factors that should be taken into account. ARP research has disclosed the following rules:

1. The friction factor changes from one application to that of the next. That is, the friction is at it's highest value when the fastener is first tightened. Each additional time the fastener is torqued and loosened this value gets smaller. Eventually the friction levels out and becomes constant for all following repetitions. Therefore, new fasteners should be tightened and loosened through several cycles before applying final torque. The number of times depends on the lubricant. For all ARP recommended lubes 5 cycles is enough before final torquing.

2. The lubricant used is the main factor in determining friction, and therefore, the torque for a particular installation. Motor oil is a commonly used lubricant because of it's ready availability. If less friction is desired in order to install the fasteners with less torque, special low friction lubricants are available. With special lubes, the required torque can be reduced as much as 20 to 30 percent. It is important to keep in mind that the reverse is also true. If the torque value has been specified for a particular fastener on the basis of low friction lube, installing the fastener with motor oil will result in insufficient preload; the torque has to be increased to compensate for the extra friction caused by the motor oil.

3. Surface finish is also important. For example, black oxide behaves differently than a polished fastener. It is therefore important to observe the torque recommendations supplied with each fastener.

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ARP THREAD LUBRICANTS AND SEALERS

It's difficult to determine the required amount of torque necessary to provide the correct preload and clamp force of a given fastener. For example - when tightened, dry unplated fasteners use up about 85% of the applied torque simply by overcoming the friction between the male and female threads. To insure that all ARP fasteners produce the optimum level of service, the installed residual stress is calculated and verified experimentally using a superior quality lubricant. The friction coefficients of lubricants vary dramatically, making it difficult to consistently produce the exact amount of stress within the fastener to clamp the components together. We recommend the use of our **ASSEMBLY LUBRICANT** or **THREAD SEALER** in order to precisely duplicate the recommended tightening specifications provided with all ARP fasteners.

Assembly Lubricant (0.5 fl. Oz).....100-9901

Assembly Lubricant (1.69 fl. Oz).....100-9903

- Premium grade Moly base w/rust & corrosion inhibitors
- Effective lubrication range: -30°F to 750°F
- Load range: 500,000 PSI
- Other applications: Primary assembly lube for engine components, press fitting, gear trains & gen'l machinery.

Thread Sealer (1.69 fl.Oz).....100-9904

- Teflon based w/rust & corrosion inhibitors
- Effective range: -30° to 550°F
- Sealant range: 10,000 PSI (pressure)
- Application: delivers a flexible leak-proof seal in aluminum, steel, stainless steel and plastic against coolants, water, gasoline, natural gas and LPG.



The most respected name in racing fasteners

TORQUE RECOMMENDATIONS

HEAD STUDS - Initially install head studs into block, **HAND TIGHT ONLY**, according to ARP recommendations. After placing head gasket and head over studs and onto block, proceed to torque stud hold-down nuts in the proper sequence recommended by Ford:

Step 137 ft/lbs

Step 245 " "

Step 352 " "

Step 459 " "

Step 5Loosen all nuts 2 or 3 turns

Supercharged models only

Step 648 to 55 ft/lbs

Step 7Rotate an additional 90 to 110-degrees. This "torque-to-yield" method recommended by Ford may cause inconsistent torque readings. ARP recommends the following **FINAL** torque readings:

Final torque when using oil...90 Ft/lbs

Final torque when using ARP Moly ...75 Ft/lbs

MAIN STUDS: After screwing main studs into block **HAND TIGHT ONLY** according to ARP recommendations: torque to 65-81 ft/lbs in three increments.

ROD BOLTS: Ford recommends 31-36 Ft/lbs with stock rod bolts. ARP recommends 50 ft/lbs torque w/ARP lube when using their high-strength bolts; when using the **STRETCH** method (.0060"-.0067").

ROCKER ARM STUDS or BOLTS: Tighten in two steps: 1...5-11 ft/lbs, 2...18-26 ft/lbs.

IN SUMMARY.....

Looking back over the past nine months, I can hardly believe everything that has happened to me personally, as well as all that has taken place concerning the SCCoA (actually, they are one and the same). Beginning early last March, 1996, when people who had received their April issue of "Super Ford" magazine (before I had recieved mine) started calling wanting to join the Super Coupe Club which, according to "Super Ford", already existed, and was seeking new members, my life has been one big roller-coaster ride! As most of you already know, at that time, there WAS NO SUPER COUPE CLUB, it was just an idea I had entertained from time to time. Believing I had neither the time, energy level, or qualifications for such an undertaking (I was right!), I never pursued this "idea" any further. When Rod Short from "Super Ford" called wanting to do a photo-shoot of my SC for a future article in his magazine, I said to my wife, "Well, I guess we WILL have a Super Coupe Club! I should have heeded the warning she gave me when she rolled her eyes and said "What do YOU know about starting or running a car club!" Typically, (never being one to back down from a challenge) I said "I don't know diddley-squat!, but we'll just learn as we go along". I have always heard it said, if you throw an infant into a pool of water, it will not drown, but will begin swimming on its own, the instinct of self-preservation taking over. This is somewhat the way I felt - it was either sink or swim! Well, I'm still swimming, although sometimes UPSTREAM (like a spawning salmon), and so far I haven't drowned! (although I have swallowed alot of water!).

I'm sure it is hard for you Club members to realize the amount of time it takes to "run" a Club like the SCCoA. Tons of paper-work, daily trips to the Post Office and UPS, and always phone calls to make. There are hardly enough hours in the day! From the first phone call back in early March to the present, we have not had one "normal" evening together, un-interrupted, where we can just "kick back" and relax. Seldom does so much as a supper-time go by without a phone call. We have learned to adapt (at least I have) but we need to make some changes out of sheer necessity, if for no other reason. (Or else I may voluntarily begin living in the back of my pick-up - no lap-top, no goat - and no phone!). From this day forth, I must ask Club members to limit calls to specific inquiries, and not to call just to past the time of day, or because your wife has gone shopping and boredom has set in. I hesitate to just let the answering machine pick up, because in addition to having three children and three grandchildren who frequently call, I know if I have to return a Club related call, it will be my dime, and my phone bill has not been less than \$350 per month since last March. From now on, if I return a call it will have to be collect. If Club members want to refuse the collect call, and call me back, that is between your conscience and "MA" Bell. Again, I want you all to feel free to call, just remember there are 330-plus other members who may be trying to get thru also, and there is just one of "me".

All I'm asking is, "have a reason to call".

I also strongly suggest that all SC owners purchase a \$12 Haynes or Chilton shop-manual, or better yet, a complete set of Ford shop-manuals from Helms, listed in the back of your owners manual. I have confessed in previous newsletters that I don't consider myself a very good mechanic, much less an automotive engineer. I have had members call me to ask how many quarts of fluid their AOD holds, how to drain their torque-converter, even how to drain the fluid from their radiator-trans cooler! (and this particular individual wasn't even going to do the work himself - his mechanic was going to do it for him!) This scenario has happened many times, even with non-Club members, often late at night. My wife gets up at 4 A.M., and I get up as soon as coffee is ready! I try to get to bed by 10 P.M. E.S.T., but it is often later than this. I sincerely would like to help everyone who has a problem but just do not have the time to be everyone's personal mechanic, phone-pal, or father-confessor.

When this Club was new (actually it still is!) someone who had previously been part of another car club told me "You are going to have to make up your mind if you want to be an editor of your Club magazine, or just sell parts and be a technical advisor for same". I asked him why? He said "Because you will not have time to do both, trust me!" Obviously, I did not heed his advice, because in addition to the above, I am having new parts manufactured for the SCCoA, and even spending a great deal of time actually working on said parts myself!(SC adapter tops).

On SCCOA member told me "You are the PERFECT man for the job" (President and Editor). Also, "The SCCoA can become a second full-time job if you let it" Well, the SCCoA became a second full-time job immediately (with-out me letting it), like the tail wagging the dog, and I am definitely not the PERFECT man for the job - HECK! - I'm not PERFECT, period! (But I am good-looking!) The PERFECT man (or woman) for the job would be a retired automotive engineer/master mechanic, independently wealthy, unmarried, patient, charismatic, and on good terms with Chief Engineer, Jamie Turvey, of Superchips, Inc. (good-looking would be optional).

Anyway, earlier I mentioned my life has been like a roller-coaster ride. When I have been able to convince manufacturers to produce custom specialty parts for the SC, and especially when they actually become available, (like headers, SC tops, and ARP parts, etc.) I am elated. When there are inordinate delays in delivery, (like headers, SC tops, ARP parts, etc.) I get real down on myself, and feel like I have failed, not just myself, but you Club members, as well. Many days I feel like the "Lone Ranger", who, when realizing that he and Tonto are surrounded by Indians, turns to Tonto and says, "Looks like we're in BIG TROUBLE Tonto!" Tonto replies, "What do you mean, WE?, Kemo-Sabe"?!

Remember, besides being 51 years old (yes, you youngsters out there, it DOES make a difference!), and managing my own paint business, a full-time job in itself, I was diagnosed as being severely diabetic last February. I had suspected such was the case years ago, but being stubborn as I am, I neglected to seek professional help until I really had no choice. My eye-sight had deteriorated, my energy-level was on "E", and generally I just felt like HECK! My doctor, upon completing a thorough examination of my dilapidated self, and discovering my blood-sugar level was THREE TIMES that of a normal person, declared me to be a "walking time-bomb"! He told me in addition to being severely diabetic, I had high blood-pressure, elevated cholesterol, was 50 pounds over-weight, and basically "had one foot in the grave, and the other foot on a banana peel!" I am now under-going regular treatment for the diabetes, and am getting better, but I am still not where I want, or need to be, especially energy-wise.

Anyway, enough of my belly-aching. Referring back to my being 50 pounds over-weight. Have you all ever noticed how when making mention of an overweight woman, it is politically correct to use the term "Full-Figured"? Heck! They even have their own special section in clothing stores, as well as their own special clothing catalogs! When men are over-weight, such as myself, we are just referred to as "Obese" or "Pigs". This, my friends, is flagrant Sex-Discrimination! I don't know what all this has to do with Super Coupes, (except I know mine would be much faster if I only weighed 150 lbs, instead of 230 lbs!)

Anyway, back to the subject at hand. In spite of all of the above negativism, I am very pleased, HECK! I'm PROUD of what this Club has accomplished in just 9 months. Just flip back thru this newsletter, for instance. It appears this issue of Chargin' Thunder is going to total 75-80 pages, with no adds (it may have to be stapled in TWO sections!) Like some of you have already described it, this one really is a BOOK! The three previous issues were all 50+ pages; they would have been larger except I just didn't have the time. I HAVE had time to work on this issue (ten solid days, including two week-ends- no football or basketball!). My wife told me this morning "All I ever hear around here is Super Coupe this, or Super Coupe that! We don't even have a LIFE anymore". Well, maybe she just got up on the wrong side of the bed! She'll get over it!?

If you all will think back to where YOU were Super Coupe-wise a year ago, even 9 months ago. Very few parts were available: even less information about these fine cars. About the only technical information available was from the people who wanted to sell you a pulley or a chip, and as we have learned, (some the hard way) this information is often long on promises, short on substance! Remember back to the March issue of Chargin' Thunder, when I stated my two reasons for starting this Club 1. To give the Super Coupe the respect it deserves, and 2. To give me a chance to share my love for this car with others of like mind and to

exchange ideas and technical knowledge with same? I think this Club has come along way towards accomplishing these goals! We're not done by a long shot, but we have made great strides in the right direction, don't you all agree? And like John Paul Jones said centuries ago, "I have NOT YET begun to fight"! There is so much more I want to do! (Starting with re-claiming my title "Fastest SC in America"!) HECK! I don't even have time to work on my own car anymore! But it is going to happen! Next spring, with my current 70,000 mile engine, stock short-block, - 12.8's @ 106 MPH, minimum! You can go ahead and put it in the bank! How about it Neal? You might a well go ahead and start boxing up MY title! I want it back! Actually, I would be just as pleased if one or more of you other members ran 12.0 flat @ 110 MPH, having benefited from information and parts made available thru the SCCoA! I really mean it! I even told Neal Frisbee so on the phone the other evening. I told him that we BOTH may be "pulling hind-teat" come next spring! Some of you members have more money than either Neal or myself, and as stated at the top of the parts price list, "Speed Cost Money. How Fast Can You Afford To Go"? You don't really even have to know that much, so long as you find a good engine builder who does, tell him what you want, and of course, have the "duckies" required to get it done.

The Bible cautions us against pride and bragging. Proverbs 27, verse 2 says "Let another man praise you, and not your own mouth". I believe this is good advice, and try to follow it. One of my heroes, Pete Rose, the all-time producer of base-hits in professional baseball, once said "It ain't braggin' if you can back it up"! At the risk of going against Proverbs' admonition, I must say again: I really am proud of this Club, and with your members help, expect it to get bigger and better, just like this newsletter/magazine/book. What do you think, fellow Club members? Let me hear from you! Keep those cards and letter coming!

Everyone really should join T.I.X. Paul Cornell's latest newsletter is forty-some pages long, plus his cover letter. Paul has many sources, being on the West Coast, that I do not have access to. Many of his subscribers are SC owners, and the more information available on these cars, the better.

Remember, this completes my obligation so far as our four quarterly newsletters is concerned. Annual membership stays at \$40 for 1997, and is due anytime between now and the next newsletter in March. (Unless you all would rather have a bi-monthly newsletter - 6 annually - and be willing to pay \$10 per, or \$60 annually). Several people have told me "You are telling to much, and putting TOO MUCH in the newsletters; you are going to run out of things to say - then what are you going to do for a newsletter"? Obviously, these individuals don't know how full of hot-air I am! I can think of many, many subjects I would like to write about. As a matter of fact, as a preview of next March's

newsletter, I intend to discuss: Intercoolers (air-to-air & air-to-liquid), their function, effect on in-let temperature and air-flow, how to increase their effectness (fans,etc). Charles Warner intends to do some air-flow and temperature studies for us on stock vs Spearco intercoolers; also stock vs modified SC tops. Also in March: Extrude-Hone vs stock inlet plenums, I/C tubes, etc.; head flow improvements incl/combustion chamber modifications. The new split-port heads for the 3.8L and 4.2L with 6 (six!) intake ports PER head. Exhaust temperature measurements; suspension and brake mods; T-56 six-speed or Tremec/Mazda 5-speed swaps, Thermal coatings for internal engine components, and much, much, more! (Including the usual heavy dose of my sick humor!)

Let me hear from you! Remember, in spite of all I've said, THIS IS STILL A WE CLUB, NOT A ME CLUB! I am just a fat, old, half-senile, diabetic, WALKING TIME BOMB! You all ARE the Club!

Remember also, Our First Annual SCCoA Convention as part of THE ALL-FORD NATIONALS, Carlisle, PA, June 7,8,&9,1997. Don't just meet me there, BEAT ME THERE!

By the way, MERRY CHRISTMAS AND A HAPPY NEW YEAR, EVERYONE! KEEP THE FAITH, AND KEEP ON CHARGIN'!!

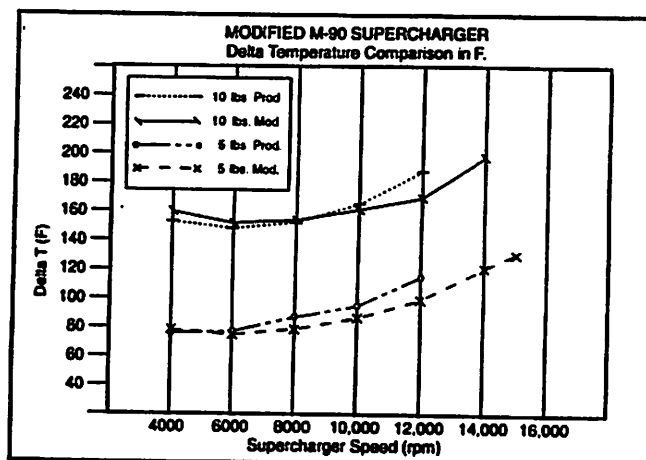
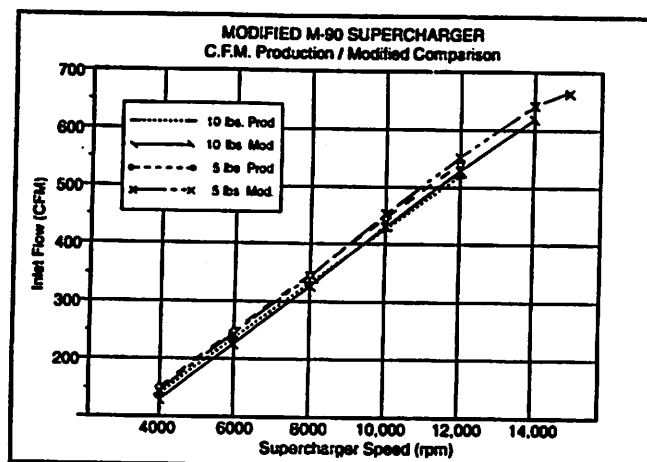
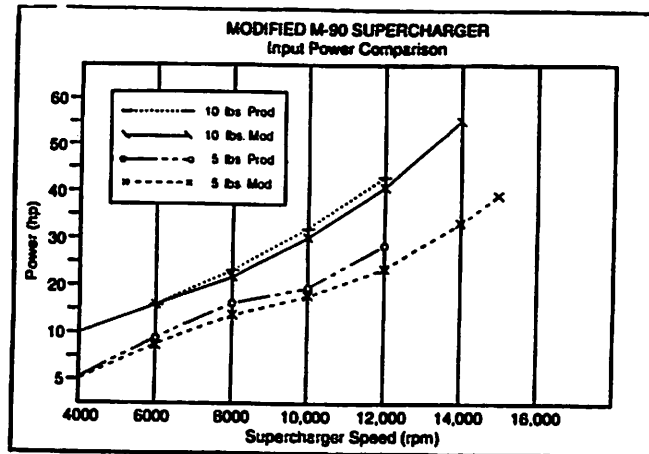
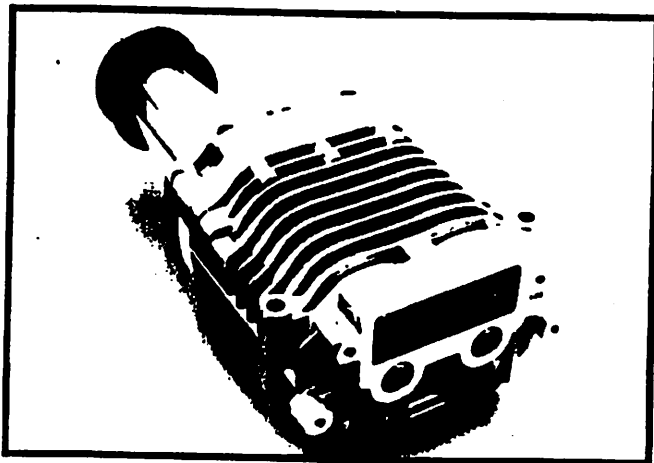
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"S" modifications may be made to all Eaton Superchargers on the outlet side. Intake modifications are selected as to "type" on all others. Call for pricing on this super improvement.

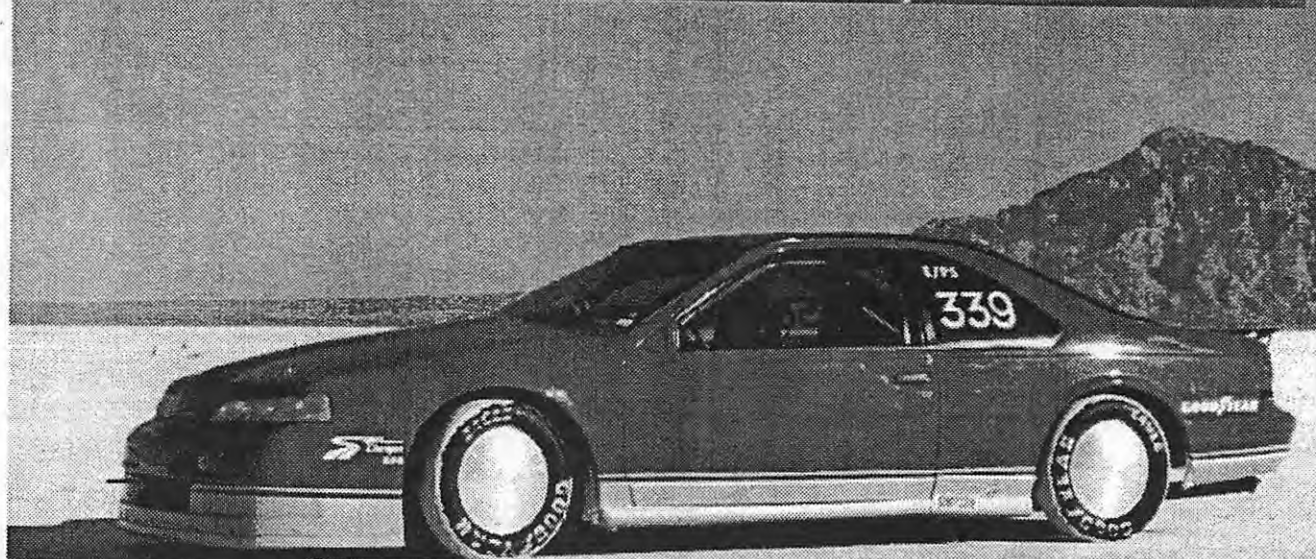
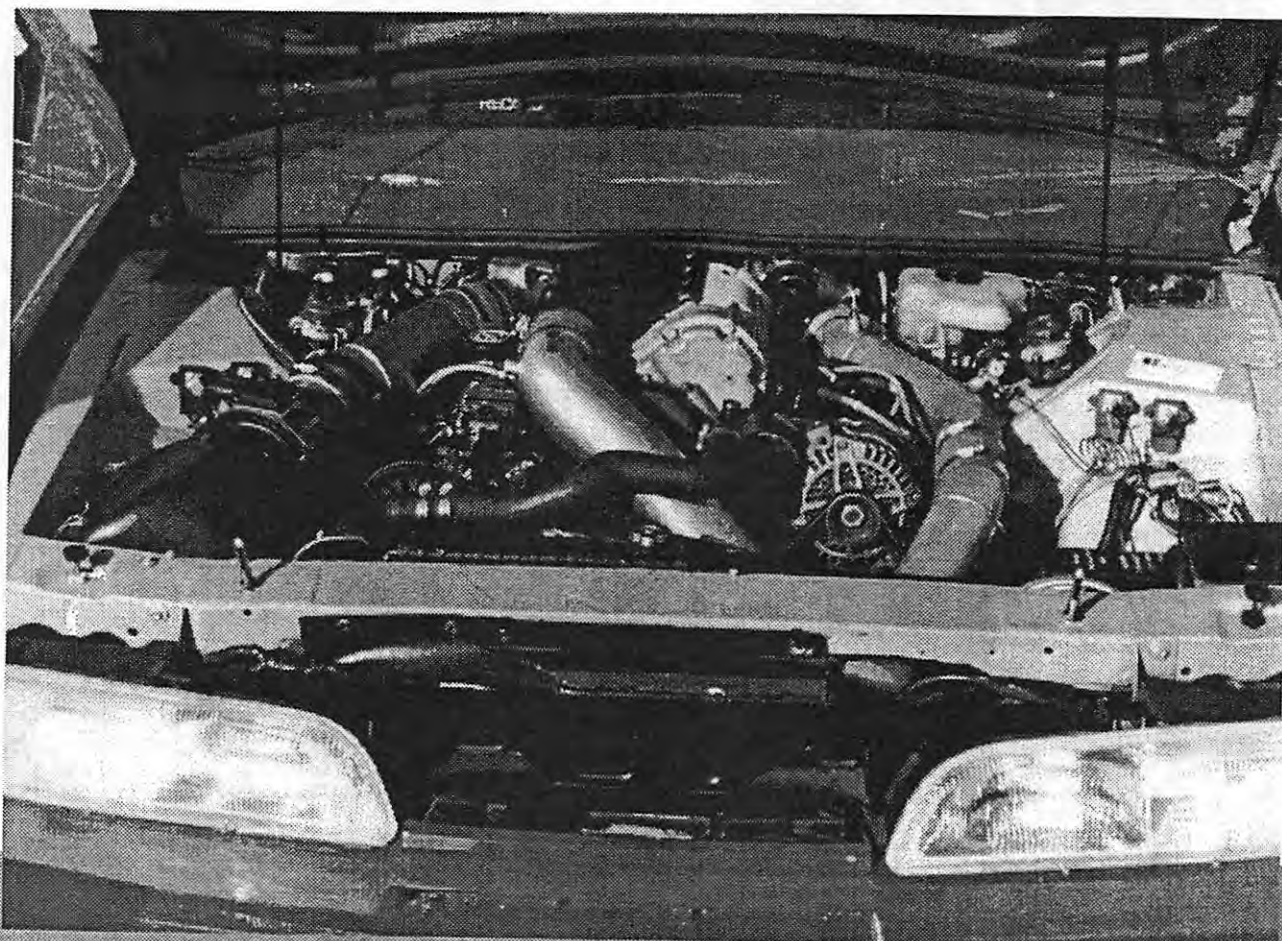


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