

Vintage Performance Developments /// Volvo Performance for the street and track

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Questions -Email correspondence strongly preferred. Email with questions on your particular needs as we have many other parts and services available. If we don't have it we can usually get it or make it. If you need to call, try 315 478 1229 mornings 9:00 AM - 12:00 noon eastern time. Leave a message if there is no answer as we may be in the shop and cannot get to the phone, or try cell # 315 440 6560 if necessary. There are often periods of 3 - 5 days, especially during the summer, when we are gone due to racing and other commitments. Calls and emails are replied to when we return.

Orders - Where possible email your parts order along with your zipcode and we will reply with information on parts availability and a total price with shipping. Please include information indicating the car model & year with each email.

Payments - Payments are normally made by check, money order, COD, or through Paypal (www.paypal.com) Credit card payments are currently only accepted through Paypal. Payments made by Paypal should be made to the account under our email address:
jparker3@twcny.rr.com

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Supercharger

The Supercharger Kit for Vintage Volvos

Updates to this section are underway. Check back for the revised section.

In the spring of 2000 I began testing a modern, positive displacement, belt driven supercharger on a 1968 1800. The results were truly astounding and transformed the car's performance. Zero - 60 MPH times were reduced by more than 6 seconds with a stock B18 engine. Since then there have been numerous refinements that have allowed that first prototype to evolve into a bolt on kit available to fellow vintage Volvo owners. In the process we have added a state of the art water to air intercooler as an integral part of the kit. On an otherwise stock B20 in an 1800ES, with modified head and exhaust, the system has been dynoed at over 200 HP at only 8 lbs. boost with 0 - 60 times of under 7 seconds.



Supercharger in a 140-series Volvo

fixed displacement superchargers available. But perhaps the greatest benefit of the twin-screw supercharger is its inherent ability to produce consistent, high boost pressures across a wide RPM range.

Although the high efficiency of the supercharger used allows it to function effectively without an intercooler, developments after doing the first prototype made it possible to incorporate a water to air intercooler into the system. As with the supercharger, the Laminova intercooler cores are a patented Swedish design. Using these cores allowed us to create a package that uses one structural unit for both the intake plenum and the intercooler, saving both weight and space, and increasing both horsepower and reliability at minimal additional cost. The system uses a small electric pump to circulate water through the intercooler cores and a front mounted radiator. With the intercooler, supercharger discharge air temperatures are reduced. Lower intake air temps mean a denser charge, less chance of detonation, less engine stress and more POWER!

Our aim in this process was to develop the simplest system possible that would allow vintage Volvos owners to give their cars the performance of modern vehicles, without requiring substantial modifications or changing the essential vintage character of the car. With the supercharger kit, accompanied by recommended suspension and drive line modifications, we are confident that we have achieved that goal.

Why a supercharger rather than a turbocharger? There are two basic reasons. First, simplicity - we wanted to make a reliable kit that would be available as a true bolt-on with no engine modifications. Second, driveability - we wanted to produce a system that not only had outstanding performance, but was also easy to drive, with good power throughout the RPM range. Essentially, you don't know that it is supercharged until you put your right foot down.

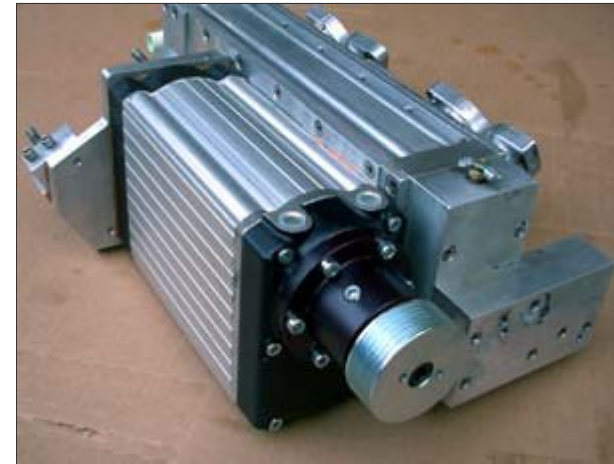
Our supercharger choice is a belt driven, positive displacement, twin-screw, Lysholm principle supercharger, built by Autorotor in Sweden. Extensive research showed that Lysholm principle superchargers provide several advantages over other designs including greater low rpm boost, higher volumetric efficiency, reduced drive power requirement, and lowered discharge temperatures. These superchargers have the highest thermal efficiency of any

Are there disadvantages to this design? One disadvantage is cost - you have to pay for high quality. Being the highest quality supercharger/intercooler combination available, the same as used in various Porsche, Mercedes, and BMW aftermarket installations and the same basic design as used in recently introduced high performance AMG Mercedes models, the choice here was to go for quality rather than the lowest possible cost. However, it is another example of getting what you pay for - the best product for your money, and that is consistent with our product philosophy and Volvo's.

The supercharger-intercooler unit bolts on in place of the stock carburetors or fuel injection manifold. A modified crank pulley replaces the stock pulley and allows the addition of the supercharger drive belt. Oil fittings and lines supplied with the kit provide lubrication to the supercharger drive gears from the engine's oil system.

Installation of the whole system requires 4-8 hours depending on skill levels. Installation on fuel injected 1800s and 140s requires a few extra steps, but does not require replacement of the fuel injection fuel pump, lines, filter, etc. If you perform the maintenance on your own vehicle you have the skill required to install this supercharger system, and do it in a day. The system comes complete with a suitably tuned sidedraft Weber 45 DCOE carb, air cleaner, modified crank pulley, belt tensioner, hardware, belts, hoses, connectors and adapters, and is ready to install. Once installed and tuned it is essentially a maintenance free system, other than the routine type of inspection needed for any automotive accessory drive belt drive.

The initial kits have been designed for all B18 and B20 engines, whether carbureted or fuel injected, but without air conditioning. A second version, available soon, with a modified belt drive system will accommodate air conditioned vehicles. Work on a system that will allow the use of an aftermarket fuel injection system is underway. Continued development and testing will produce additional modifications designed to incrementally increase all aspects of the car's performance.



Supercharger and Intercooler

Reservations should be made in advance as kits are done on a custom basis and take approximately 12 - 14 weeks from the date of order to delivery. Costs have gone up due largely to the lower value of the dollar. The current price is \$4195 for the new Mikuni carbureted version, \$3595 for the fuel injection ready version without throttle body, and \$3895 for the fuel injected version with throttle body and linkage, including recent upgrades, plus \$75 in refundable core charges. The kit comes complete with Autorotor Supercharger, Laminova 3 tube water to air intercooler, Nissens intercooler radiator, new custom modified Mikuni carb for the carbureted version, and all other parts needed to make this a bolt on kit. The fuel injected version does not include a programmable fuel injection system which is needed to replace the original D Jet system.

Currently, no further supercharger orders are being accepted for the .87 liter displacement supercharger until more are available from Autorotor/Lysholm. However there is a good supply of the slightly smaller .76 liter compressors and these can also be used in our kits.

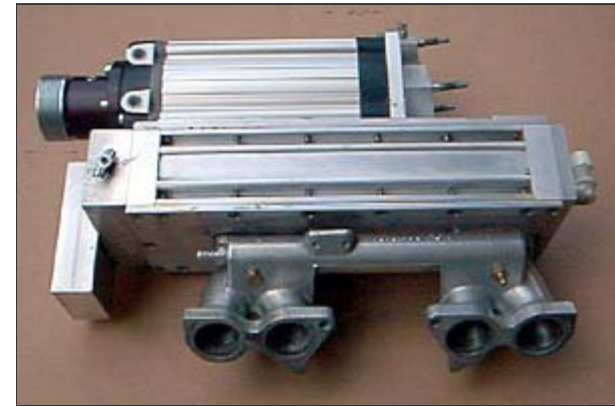
The Supercharger

Our system uses an Autorotor supercharger of unsurpassed quality, designed and built in Sweden. It is a positive displacement, twin rotor, Lyshom principle supercharger of approximately one liter displacement. The Lysholm principle provides several key advantages over all other types of superchargers: greater low rpm boost, higher volumetric efficiency, reduced drive power requirement, and lower discharge temperatures. This supercharger has the highest thermal efficiency of any fixed displacement supercharger in production in the world today. This efficiency is reflected in an intake temperature rise, before the intercooler, of less than 90 degrees F at full boost and is a key to significantly increasing engine power without over stressing the engine.

From the driver's point of view, the chief advantage of this supercharger is its inherent ability to produce consistent boost pressures across its operating range, starting at extremely low engine RPMs. There is no feeling of "coming on the cam," or "turbo lag," only prodigious low end torque that continues as the car accelerates. In tests, full boost has been achieved as low as 1500 RPM. The resulting flexibility in engine operation is clearly unmatched by any other performance system.

A supercharger is basically an air compressor. The basic features of this type of compressor are two helical, gear driven shafts, one with concave lobes, the other with convex cavities which intermesh at high speed, thereby compressing the air. It is a positive displacement pump but has no contacting parts to wear out as in the old vane type superchargers. The air is drawn in at one end of the case, compressed between the rotors and expelled from the other end of the case in a fixed ratio. These superchargers have been used in demanding industrial applications for years where extreme reliability and low maintenance were primary requirements. Only recently have advances in manufacturing techniques allowed their cost to be reduced to the level that they can be economically produced for automotive applications where they are considered to be the highest quality supercharger available.

The supercharger itself is essentially a sealed, self lubricating unit, with an industrial use rating of 22,000 hours at 15,000 RPM. That translates into more than 1 million miles at 60 MPH before a rebuild would be required. The gears which drive the twin screws do require lubrication. In order to eliminate the need for maintenance, or checking oil levels as in some other kits, our system lubricates the gears using engine oil fed by the engine's own lubrication system. All oil lines and fittings for the lubrication system are included.



With an appropriately sized supercharger in relation to engine displacement, boost levels are determined largely by the speed ratio between the supercharger and the engine. As it is a positive displacement supercharger, this is a linear ratio. A 50% increase in the RPM of the supercharger in relation to engine speed will produce a theoretical 50% increase in boost pressure, all other things being equal. See the "drive system" section for more information on changing boost levels.

The Next Generation of the Supercharger System

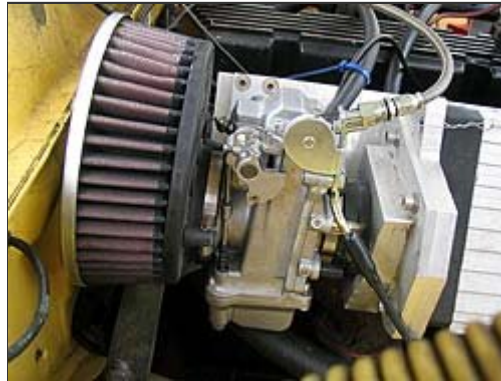
It has now been 7 years since our first supercharger system hit the road. Followed by the intercooled version a year later, it revolutionized the concept of the power that could be obtained from a B18/B20 pushrod motor and the kind of performance that you could enjoy in a vintage Volvo. Since then, changes have been more evolutionary in nature.

Development of the system continues and now allows us to produce more power per pound of boost with improved fuel economy. Improvements in cam, head and exhaust design have been essential to this process. One result has been a cam designed specifically for use with the SC system. For 200 HP or more, one of our Street Performance Heads is a necessary element. Customers using other ported heads have not been able to achieve the same power.

In the beginning, producing power was almost the only consideration. But having met our original performance goals, the goals for the system have broadened, with improvements in long term reliability and fuel mileage becoming more important than power increases. To implement these improvements, changes to the system include CNC machined aluminum crank pulleys, a spring loaded belt tensioner system for the drive belt, new anodized aluminum idler pulleys of our own design, and an intercooler radiator 40% larger than the original. But the most significant change to date is in the carburetor. We now use a modified version of the same HSR 45 Mikuni described above as an "SU replacement," and use it to get an increase of more than 50% in cruising fuel mileage. With this carb you no longer have to sacrifice fuel mileage when you opt for supercharger performance - cruising at 25 mpg is routine.

With normally aspirated B20s available with power in the 150 - 200 HP range, our basic recommendation is to reserve supercharging for those customers who want at least 180 HP. We also recommend that all supercharged cars have suspension upgrades and other modifications that are necessary to safely accommodate power levels that will completely transform your car's performance.

For those who want to use fuel injection, and it is recommended for anyone with a car that currently has FI, we offer a "fuel injection ready" version of the supercharger system. No, it does not include a fuel injection control system. And, no, you can't use it with D-Jet. But you can use it with your stock injectors, fuel rail, fuel pump, fuel lines and fuel pressure regulator. Since we now offer the fuel injected version with an adapter plate, Mustang throttle body with TPS, and throttle linkage, you can now install Megasquirt or Simple Digital Systems, etc, instead of the D-Jet ECU, sensors and wiring, and you are ready to go with a fuel injected



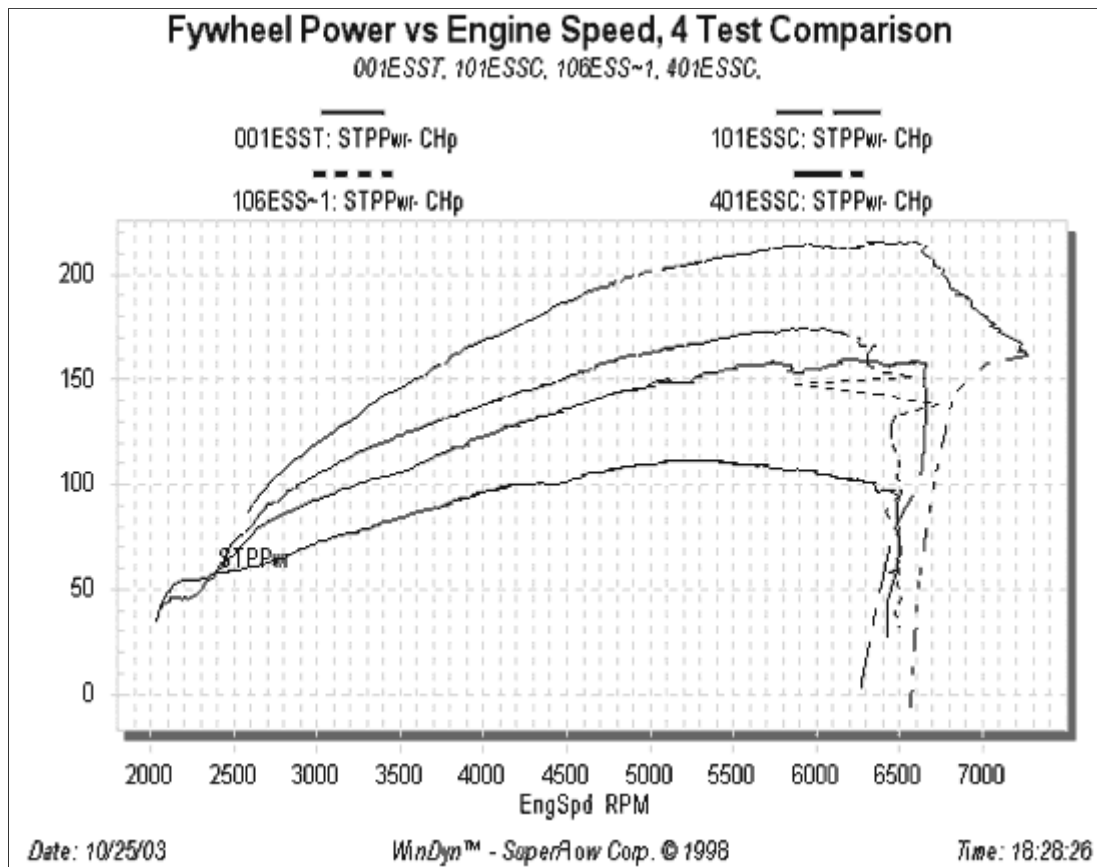
supercharger system. See Steve Berry's website www.1800philes.com and an article he wrote that appeared in the Nov. 2006 issue of Grassroots Motorsports magazine for details on using Megasquirt with our supercharger system. Steve also has an S60R, and says his supercharged 1800, even at midrange boost settings, is faster.

And for those of you who insist on ruining the traditional sports car experience of being either too hot or too cold by insisting on air conditioning, for 2006 we will have a kit that will allow the supercharger system to be used with AC.

Our original power goal with an otherwise perfectly stock engine was 150 HP. The next goal, with a modified head and exhaust system, was 200 HP at 8 lbs. boost, then 250 HP at 15 lbs. All were achieved. Then the priorities became refinement, reliability, and fuel mileage. Now, having met our goals in those areas we can turn back to power. So for 2007 our power goal will be double the original: 300 HP from a 2 liter street engine, 3 times stock HP, while still getting 25 - 30 miles per gallon. Check back for details.

The dyno chart below shows the power progression from stock engine to the most popular configuration - 10 lbs. of boost producing 216 HP at the flywheel and 221 ft. lbs. of torque.





The dyno chart compares tests of flywheel horsepower of a stock 1800ES with three different supercharged configurations. The bottom line is the stock ES. The 2nd line from the bottom represents the same car with stock engine and exhaust system with the supercharger producing a maximum of 7.7 lbs. boost. The 3rd line from the bottom is the same stock engine and exhaust with a different SC drive pulley ratio producing up to 10.5 lbs. boost. The top line is the same car with our performance head, "C" cam, 4-2-1 header, and 2-1/2 inch exhaust system with muffler and resonator at 10 lbs boost, clearly demonstrating that you do not need to increase boost to increase power. This power level in an 1800 is good for 0-60 times in the 5 second range.

Intercooler System

Compressing a gas increases its temperature. The purpose of an intercooler is to reduce the temperature of the air compressed by the supercharger. As the result of the reduction



The Intercooler

mounted radiator to the second heat exchanger - the intercooler core - mounted between the supercharger and the engine's intake manifold. Our system uses an advanced laminar flow technology heat exchanger core that allows it to be integrated into the intake manifold plenum without disrupting the air flow. There the compressed air discharged by the compressor is cooled by exchanging heat with the liquid coolant in the core. As it is inside the plenum, the intercooler core takes up no additional space and allows for the creation of an extremely compact unit mounted between the supercharger and the engine.

Brackets, hoses, an electrically powered water pump (also made in Sweden), and an aluminum expansion tank are all included in the kit and are easily installed. The pump is designed to be in operation whenever the engine is on; thus no complicated wiring is necessary.

Drive System

The supercharger is driven by a modern, multi-rib drive belt system running off of the engine's crankshaft. The crankshaft pulley has been modified to accept this belt in addition to the normal fan/alternator belt. A high quality idler pulley is part of the system. Not only does this provide for positive location of the belt, but it is also used to provide the necessary tension for the belt system. As long as it is properly tensioned, the drive system should not require any more maintenance than any other automotive drive belt system. Modifications to the basic drive system will be made to accommodate air conditioned vehicles.

One of the advantages of this type of drive system is the ease at which boost levels can be changed or adjusted. The boost level of the system is based on the speed ratio between the engine and the compressor. The compressor pulley can be replaced with larger or smaller pulleys in order to vary this ratio and therefore the boost level. This change can be

of temperature a denser charge is produced. A denser, cooler charge will produce more power than a hotter charge at the same boost level. At the same time a cooler charge reduces the chances of detonation and engine stress. The goal of the intercooler system is to keep charge air temps as close to ambient air temperatures as possible. Coupled with the high thermal efficiency of our supercharger, these temperatures may be as much as 200 deg. F. lower than in other systems.

Our intercooler is of the water to air type. Like the supercharger it is a patented design, using heat exchanger cores made by Laminova in Sweden. Unlike the typical intercooler that uses air to air cooling, it uses water (or a water/antifreeze mix) to cool the air compressed by the supercharger. The higher specific heat value of water gives this type of system a distinct advantage in its ability to absorb heat energy, and also allows for a much more compact installation.

The system essentially consists of two small heat exchanger units. One is a radiator, mounted in front of the vehicle's normal radiator. There water is cooled by outside air moving through the radiator in the same manner as in the vehicle's cooling system. An electric pump pumps the coolant from the front



Intercooler radiator, coolant pump and filler tank

accomplished in a few minutes and requires only that the supercharger pulley and the drive belt be removed and replaced by different size units. This allows the user to change the boost level to accommodate various circumstances such as the use of higher or lower octane fuel, or the need for more power for a weekend autocross or track day.

Performance Testing

Performance testing of the system began in the spring of 2000 with the prototype unit. The test car was a 1968 1800, with completely stock B18 engine and exhaust system. Preliminary tests before installation resulted in 0 - 60 times of 13.5 seconds, essentially the same as the results obtained when the car was new according to contemporary road tests. With the supercharger producing 10 lbs. boost we got consistent 0 - 60 times of 7.5 seconds. After a summer of testing, tuning and minor modifications, further testing was cut short when the parked test car was hit by a drunk driver at 5 AM one Saturday morning. The engine was pulled, opened up and examined. It showed no signs of any problems, even though we had run it with as much as 15 lbs. boost. Although we did not get to complete chassis dyno tests that had been scheduled, we felt we had enough information and test mileage to proceed with the design of a production version.



Aluminum crank pulley for the supercharger drive belt

The process of going from prototype to production resulted in several design changes, and the final product is clearly improved, both from a customer value standpoint and improved performance. The inclusion of an integrated intercooler system was the most significant of these changes, but was only one of a number of refinements.

The delays apparently typical of the introduction of any new product put us behind schedule in going from prototype to a production version of the intercooled system. Rather than test another prototype we delayed further testing until we could test with true production parts. It took until the fall of 2001 before we were ready.

As there was significant interest in adapting the supercharger to injected cars and we wanted to be able to test through a salty northeast winter, I decided to use a recently purchased unrestored 1800ES as the test car. ("I'll sell it to the first person who can pay \$750 cash and pick it up before the end of the week" was roughly the way the e-mailed offer read.) The idea was to test the system on a car that is representative of most of those out there, not a "special" with an engine built for this purpose. At times I regretted this choice, as problems not having anything to do with the supercharger system kept cropping up, and more time was spent restoring various parts of the car just to keep it running than were spent on the supercharger system itself.

Installation on the ES was very straightforward, and there was no problem at all simply hooking the Weber carb to the injected fuel system with the simple substitution of a fuel pressure regulator with a wider range than the stock regulator. As we intended to do later tests with a FI system instead of a carb, we initially left the injectors and all of their wiring in place, but later removed them as they slowed down removing and replacing the system for further modifications and testing.

The series of tests on a Superflow chassis dynamometer started with a pre-installation test of the stock 1800ES for a base line. The result of this test was a peak of 111 HP at the flywheel, 90 rear wheel HP, with stock exhaust, air filter, etc. After the supercharger installation dyno tests with the stock D cam and stock exhaust produced increases in the 40 - 50% range, with 150 HP at 6 lbs. boost and 170 HP at 10 lbs. boost being examples. During these tests it became apparent that power was being limited by the restrictions in the exhaust system as further increases in boost produced negligible increases in power.

We then changed to one of our performance heads with modified exhaust ports and larger exhaust valves, short 2.5 inch diameter exhaust, single performance muffler and C cam. The aim for this setup was to exceed 200 flywheel HP - the equivalent of what we get on the vintage race cars on the same dyno. On April 5, 2002 we tested the modified system with the same drive pulley ratio as on the last of the unmodified engine tests. We got 173 HP at the rear wheels, 208 HP at the flywheel, at only 8 lbs. boost. This was an increase of over 30 flywheel HP at 3 lbs. less boost than the test with stock components. Clearly exhaust flow in the stock setup has been a problem. After running for about a month at this boost level the boost was increased to 12 lbs. and our knock sensing timing retard system was hooked up to eliminate detonation problems typically encountered when running at high boost levels. As of the writing of this update, the car had not been dyno tested at this level of boost, but power has increased significantly over the 8 lb. boost level and is estimated to be in the 240 HP range. (If any one would like more details on the dyno tests please e-mail me so that I can send copies of individual tests.)

On the road the test car recorded a best 0 - 60 time of 11.8 seconds before supercharger installation. With the supercharger, modified head and exhaust, we were able to do it in under 7 seconds, but clutch slip with the stock clutch limited the ability to launch the car from a standing start. In order to preserve the stock components, further standing start tests were postponed until drive train modifications were made to accommodate power levels over 200 HP. The supercharged test car has been driven daily for over eight months, and has gone on several trips including a 600 mile, one day blast through portions of New England. Even though the trip included some high speed demo miles and vigorous runs through the mountains, fuel mileage on this trip averaged 18 miles per gallon, with 20 MPG being recorded for the NYS Thruway portions.

Significant conclusions from the testing of different configurations are as follows:

- Power increases of 40 - 50% can be achieved at boosts of 6 - 8 lbs. with an entirely stock engine and exhaust.
- No special ignition timing controls are needed with low compression engines at boosts in the 6 - 8 lb. range, but may be necessary for high compression engines - above 9 - 1 compression ratio, depending on level of boost, static timing, tuning, cam, and weather conditions. 4) For boosts over 8 lbs. a timing retard system is needed even with compression ratios as low as 8.5 - 1.
- The stock exhaust system is a critical element limiting the power that can be produced with approx. 170 HP being the power limit for the stock system at boost levels higher than recommended for an entirely stock engine.
- The stock driveline is adequate for power up to the 200 HP level, but both clutch and overdrive slippage are problems with power above this level.
- The most satisfying configuration includes a free flowing exhaust, modified head, and knock sensing ignition retard system to achieve over 200 HP.

The 200 + HP versions of the system have all of the power I could want on the street. Considering that most early Volvos weigh from 2300 - 2700 lbs., the power to weight ratio of these cars with the supercharger is better than many modern sports cars and sports sedans. In most cases the supercharged Volvo will also have a much broader power band, and this translates not only into ease of driving but better overall acceleration. Coupled to suspension improvements it is probably as close to having my vintage race car on the street as I am going to get, and quite a thrill to drive, especially on the back country roads sports cars were designed for. Hopefully it is a solution for all of those who have said, "I really love my old Volvo, but it just doesn't have enough power."

The results of future tests of the car with modified driveline at even higher boost levels will be posted here as the tests are completed. At this point we are only beginning to explore how much power the system will produce with further modifications.

Gauges and Monitoring

We believe strongly in the importance of monitoring engine performance. The 1800ES that is currently being used as the test bed for development of the supercharger system not only has the 1800's normal full compliment of gauges, but also a boost gauge, charge air temperature gauge, intercooler water temp gauge, exhaust gas temp gauges for each

cylinder, and a compliment of LEDs. These LEDs indicate the air/fuel ratio and show not only whether there is any detonation/pinging, but also where it is occurring, the frequency and severity. While this type of instrumentation is only necessary for testing, we do recommend that anyone who plans to "push the system" with hard driving and/or engine modifications have water and oil temperature gauges, a boost pressure gauge, and an air/fuel ratio gauge wired to an oxygen sensor in the exhaust system. Using these gauges will assure that the engine is not put under any undue stress and will greatly simplify tuning after the supercharger installation. We can help you by supplying and/or installing any of these instruments.

Upgrades

The basic supercharger system was designed as a bolt-on system that takes advantage of the rugged nature of the B18/B20 family of engines to produce significant increases in power while keeping engine stress within limits that will not jeopardize the renowned reliability of these engines. At recommended boost levels, no engine or drive-line modifications are required for power increases of as much as 50 - 60 %.

However, we recognize that it is in the nature of performance driving (and human nature) not to be satisfied with the amount of power you have, even though it is a lot more than you used to have. With this in mind, we have built into the supercharger system the ability to upgrade for more power without having to change any of the basic components. A smaller supercharger would have been easier to package, but would not have been upgradeable for higher horsepower applications. An intercooler is a highly recommended performance option on most systems but has been built into ours at no extra cost.

Ignition Systems

Computer controlled ignition systems will allow higher boost pressures to be run by retarding the ignition to prevent detonation. These systems retard the ignition either at a preprogrammed rpm, boost pressure, or when detonation (knock) is sensed. We can offer a range of these systems for those want to run higher boost pressures than the standard system.

On our test cars we use a small computer controlled system built by J&S Electronics that senses detonation on an individual cylinder basis and retards the ignition timing to that cylinder only, and then only in the amount necessary to eliminate the detonation in that cylinder. Using this system we have run boost pressures as high as 15 lbs. on a stock engine and expect to go much higher. The system also includes a boost level regulated timing retard, rev limiter, and high output ignition. The current price for this ignition system is \$495.

Engines

At some point, the stress that can be produced by high boost pressures is more than can be accommodated by production components. Fortunately, our experience with racing engines puts us in a perfect position to provide the necessary components for ultra high performance applications. Even though our stock test engines have stood up to over 200 HP, we recommend that those who intend to run hard at high boosts do it with an engine rebuilt with forged pistons and other components designed to take considerable abuse. Where appropriate these may include forged pistons, aftermarket connecting rods, etc. See our price list for details on engine options.

Driveline Components

We have been pleasantly surprised that the stock Volvo driveline components have not given us any serious problems with power levels up to 200 HP. However, we are clearly at the point of over stressing these components when we get to the 200 HP level. The problems and solutions are listed below:

- **Clutch:** At over 200 HP the stock clutch slips in the lower gears. We are currently offering a heavy duty clutch disc that will allow the stock type clutch to work at this power level. We also offer race and rally type aftermarket clutch systems.
- **Differential:** With an open differential, standing start acceleration as well as cornering under power is limited by the power going to one wheel. A limited slip differential is the obvious cure and we can supply these for most models.
- **Transmission:** The overdrive slips with sudden applications of power. A transmission swap to a true 5 speed such as a Borg Warner T5 or a Toyota transmission is the answer. Some of these transmissions have an overdrive 5th gear with a lower numerical ratio than the M41 overdrive and should provide for better fuel mileage.
- **Gearing:** Improvements in fuel mileage as well as acceleration through the gears are limited by the high rear differential gear ratios in the various Volvo models. As these ratios are not needed for low end performance with the supercharger system, a change to a lower numerical ratio is recommended. We can provide different ratio gear sets for most rearends.

Fuel Injection

Research has made it clear that the stock D Jet system will not work with forced air induction systems. However, there are several modern aftermarket, programable fuel injection systems available that can be used to replace the D Jet controller, wiring and sensors, at reasonable prices. Testing on the use of this type of FI system is planned. The supercharger system is designed so that the carb can be replaced by FI at minimal cost and use the stock fuel pump, lines and injectors of the D Jet system. It is expected that both power and fuel efficiency can be improved with a modern FI system.

Over the next year we will do a little playing and see how much performance we can really get out of the system. As we experiment, additional components we be developed and offered to fill your needs.

Suspension

Suspension improvements from VPD

2008 marked the 10th year of our work on Volvo street suspensions. Continued development and testing has produced significant advances during that period of time. Used together, our components will provide options for a perfect ride and handling system for your vintage Volvo, whether it is to be used on the street, track, or both.

If you plan to really use your older Volvo changes to the suspension are needed. Volvo was slow to make the transition to modern handling. Reviewers of Volvos 1960's era cars - Road and Track, Sports Car Graphic, Car and Driver - agreed that they were typically too high off the ground and had excessive roll in corners. These were characteristics

that were fine for rough winter roads in Sweden, but not the most appropriate for driving conditions in the US. Improving the suspension is also an important safety issue. Our suspension components are designed to bring modern handling to older Volvos and are a necessary part of any performance package. Progressive rate suspension springs are a significant advancement over other spring sets offered. Combined with appropriate lowering of the vehicle, attention to suspension bushings, shock absorbers, and sway bars where necessary, the handling of an older Volvo can truly be transformed.

Suspension Springs

- Springs are the heart of any suspension and need to be addressed for significant improvements.
- Just adding stiffer sway bars only addresses part of the problem and creates others.
- Lowering the car is an important element in improving the handling.
- Progressive rate springs offer a combination of handling and ride comfort that cannot be duplicated by single rate springs.

Most aftermarket suppliers only offer one replacement spring for the Volvo 1800/122/140, usually 20% stiffer than stock and designed for a 1 to 1 1/2 inch lower ride height than stock. Similar springs have been offered for over 30 years, and they still have the same problem they have had since the beginning. A stiffer single rate spring improves cornering ability, but the ride quality is adversely affected, sometimes to the extent of an unacceptably harsh ride. So the single rate is a compromise - not stiff enough to improve cornering as much as is desired, but still stiff enough to give a harsh ride on the street. Quoting Volvo's own R-Sport Performance Parts Catalog, "The shorter and more stiff the spring, the worse the ride becomes." Volvo recognized that the problem could be solved with progressive rate springs.

In addition to our progressive rate spring line we still offer traditional single rate street and race performance springs, including a range of springs in different heights and rates to fit individual needs. This allows you to tailor the handling to your driving style and intended use of the vehicle.

Progressive Rate Springs

- Progressive 4 spring set for 122 and 1800 (progressive fronts - matching single rate rears) \$300

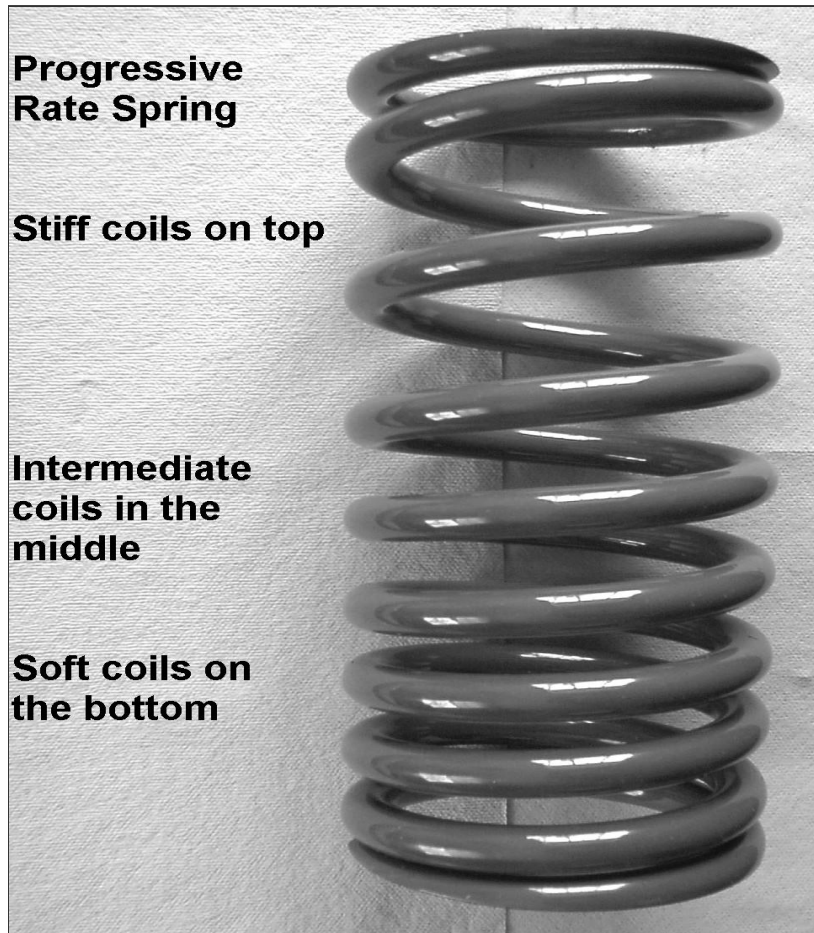
- Progressive 4 spring set for the 140 and 164 models (progressive fronts - matching single rate rears) \$320

- Progressive rate front street springs per pair \$160

Single rate springs were the only choice for vintage Volvos before we developed our progressive rate spring sets. Progressive rate springs solve the single rate spring ride quality problem. With progressive springs, to quote the Volvo R-Sport Catalog, "...the rate or stiffness of the spring progressively increases as the spring is compressed... This results in a relatively comfortable ride during normal driving but provides the necessary stiffness for large bumps and hard cornering." For this reason most of the springs offered in Volvo's R-Sport Catalog were progressive rate springs.

The following specifications illustrate how progressive springs are different. Most stock front springs for the 122/1800/140 are in a range close to 250 lbs. to 270 lbs. per inch. Most aftermarket single rate "sport springs" that are offered are in the 320 - 350 lbs. per inch range - not stiff enough for great handling, but stiff enough to hurt the ride. Our

progressive rate front street springs are generally in the range of 230 - 250 lbs. per inch for the soft coils and 450 - 500 lbs. per inch for the stiff coils, with intermediate coils in between which progress in stiffness from the soft to the stiff coil range. It is this progression, and how abrupt or gradual it is, that allows the same spring to provide both a softer ride and better handling than a single rate sport spring.



Feedback from the hundreds of customers who have tried our progressive springs has confirmed that they offer great handling with a better than stock ride. Most can't believe the difference. But don't be fooled, all progressive rate springs are not the same. Due to the success of our springs several other suppliers have offered progressive rate springs in the last few years, with very mixed results. They were progressive, but the spring rates were not even close to ours. (Ask them for specs on their spring rates.) So yes, you can now purchase progressive rate springs for a few dollars less, but what is missing is the time spent in design, development and testing in order to "get it right". Our current springs are 3rd or 4th generation evolutions of our initial designs.

Our testing has shown that progressive rate springs are not necessary in the rear and can create other problems, so our 4-spring sets consist of progressive rate fronts matched

with single rate rear springs.

We recommend installing our springs with the stock sway bar, and only going to a stiffer sway bar if additional roll control is needed. Sway bars add to the spring rate, and since their action is not progressive, stiff sway bars negate some of the advantages of progressive rate springs. Get it too stiff and the front wheels will lose road contact and tend to skip over small bumps and slide out in rough corners. Where additional cornering control is needed, we offer several choices in sway bar stiffness rather than the "one size fits all" approach of other suppliers. See the "sway bar section" below for details.

Although most "sport" spring sets will lower the ride height between 1 and 1-1/2 inches, we have developed several different progressive spring set combinations. These will accommodate different models, vehicle weights, and customer preferences as to ride heights and type of use, and include front springs of approximately stock ride height. Combined with the use of spring spacers (shims), they allow ride heights to be adjusted to individual tastes.

Our progressive rate spring sets have proved to be widely adaptable with uses ranging from street daily drivers, to weekend drives on back country roads, to autocross, trackday and even the Targa Newfoundland and Carrera Pan America Races. However, for more aggressive driving, whether on the street, in a Targa or Carrera race, or in autocross, we now have a line of stiffer progressives, specifically designed to be stiff enough to emphasize cornering control, while still having the minimum in soft coils necessary to be tolerable on the street and maintain road contact on corners that are not all racetrack smooth. These springs are for situations where improved cornering performance is more important than a soft ride.

Progressive rate springs are slightly more expensive than single rate springs, approx. \$20 more per pair, but are well worth the difference. Most of our springs are blue powder coated. Full sets for the 140 and 164 are now available (pictured above). Call, write, or e-mail for details on the appropriate spring set for your application.

Single Rate Street Springs

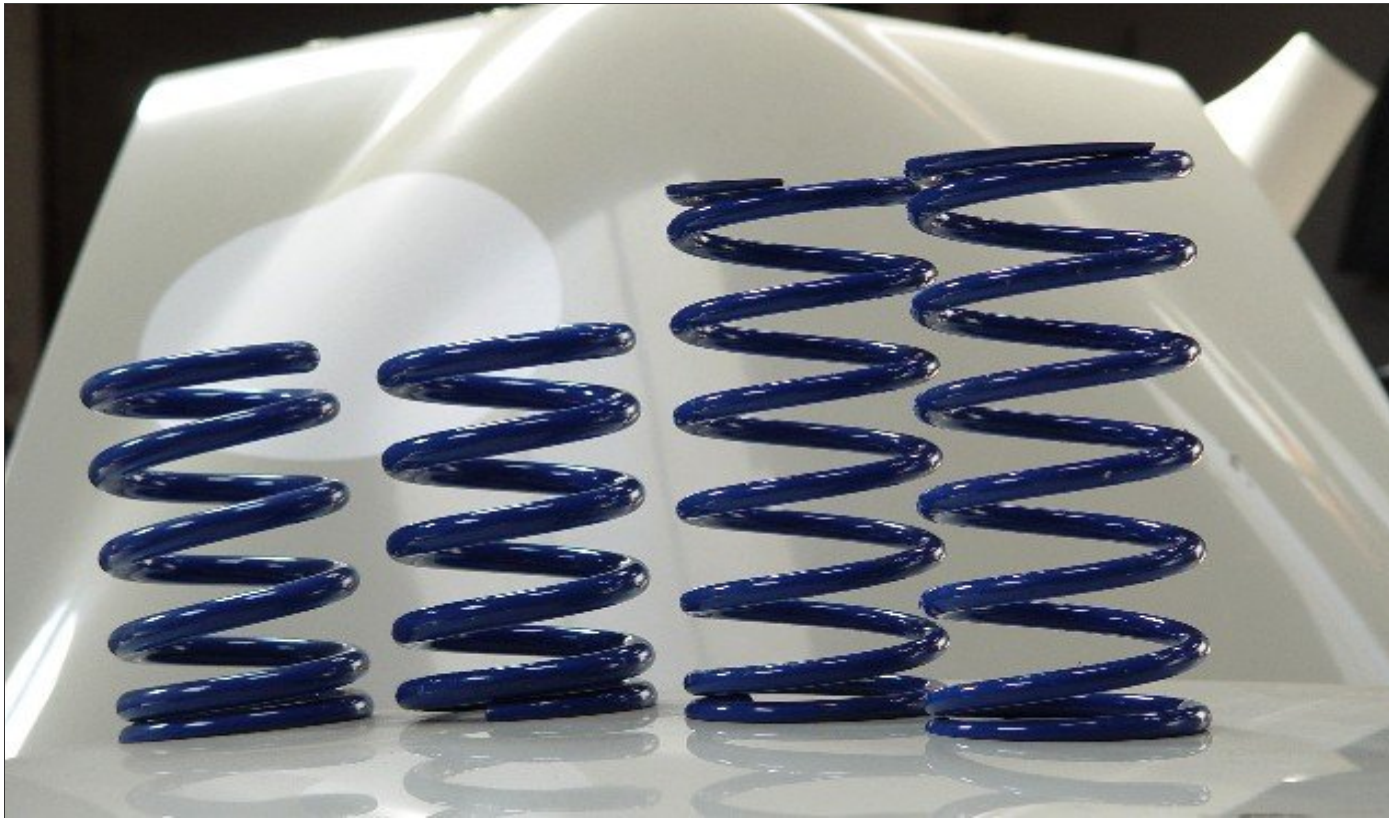
Where our progressive rate spring sets will not meet a particular need we offer single rate springs that are stiffer and shorter than stock for the front and rear. Street performance springs are usually selected to lower the car from one to two inches. (How much the car can or should be lowered is dependent on the wheel and tire combination used, the ground clearance necessary, and the need for sufficient suspension travel.) They significantly reduce body roll and give a stiffer ride. Some spring combinations may require modified mounts.

- Single rate street springs per pair 122 and 1800 \$140

- Rear spring pairs for 140, 164, and 240 models \$160

Competition and Race Springs

- Race Springs for Volvo 122 - 1800 - 140 front - \$140 per pair for single rate springs -
- New front progressive competition springs \$160 per pair
- Call or email for prices on other race spring applications



The above photo shows a set of typical Volvo 122/1800 vintage race springs.

The most important thing to note here is that the minimum front spring rate for track use is 3 times the stiffness of a stock front spring, while the rear rate is almost double stock. Race springs also produce a ride height that is usually at least an inch lower than the minimum needed for street use. This means that you really cannot use a competition track spring on the street, or a street spring on the track and expect to be competitive. Several competitors in the Targa Newfoundland and Carrera Pan America have used our progressive rate street springs and found that they offer a good compromise where good handling is required but rough roads would rule out the use of a high rate single rate spring. We now offer progressive rate competition front springs.

Some rear springs require modified spring perches or spacers. Adjustable height spring perches are also available. E-mail your individual requirements and I will try to make a recommendation as to which springs would be best for your car.



Typical race car ride height is shown above. The ground clearance is less than 4 inches.

Ride Height

How much will our springs lower your car? The answer depends on several factors.

All of our springs are tested with a load. This allows us to create matching pairs and determine which will be a little taller or shorter within a certain range. Determining the affect that new springs will have on your car's ride height is complicated by the fact that on a street car you will most likely be replacing 30 - 40 year old springs that have sagged or settled over the years, depending on the car's use, or lack of use. There were also some variations in spring rates based on model years, and some custom fitting and shimming when the cars were built. Some customers think they have original springs when they were actually replaced by a previous owner at some point. So when we say that springs are designed to lower a car 1" to 1 1/2", that's an estimate based the original stock ride height. Our experience with numerous installations is that the actual experience is often different. More important is that the springs are designed to give your car a ride height that will improve its looks and handling while still providing sufficient ground clearance for normal use. For special circumstances we can provide various types of spring spacers in order to customize the ride height.



The photo above shows the ride height with a typical progressive sport spring installation. The ride height is lower in the front than in the rear with the car unloaded, but evens out when loaded.

Spring Spacers

We offer disc type steel or aluminum spacers (shims) for the front of the 1800, 122, and 140, and the rear of the 140, in stock 1/2 and 1/4 inch sizes. Using spacers allow small adjustments in ride height to be made to suit your individual preference or to provide clearance for different tire and wheel combinations. In the front the ride height change will be double the spacer thickness. In the rear the change is the same as the thickness of the spacer. Additional spacers are available in custom sizes.

- Disc type spring spacers/shims - per pair - \$ 20
- Disc spacers available for 122, 1800, and 140 front and 140 rear

Adjustable Spring Height Adjusters

To meet advanced needs we have developed both front and rear spring height adjusters. Some simply slip in with the springs, others must be welded to the chassis. As there are a number of different types depending on the application, please e-mail for details.

Shock Absorbers

We offer several different types of performance shock absorbers for street and racing use. Whatever brand of shock you choose, it is crucial that the shocks be compatible with the rest of your suspension. In general, a shock with stiffer valving is needed with stiffer springs.

Bilsteins

Bilsteins have been the shock of choice for vintage Volvos for many years and deserve their excellent reputation. A sophisticated design allows them to provide outstanding handling performance and an exceptional ride. They seem to last forever. Not all shocks can be used on lowered cars, but this is no problem for Bilsteins. They are a good shock for use with a range of springs, including the progressive spring sets described above. However, we have found the rebound valving and gas pressure rates in their current shocks for the rear of the 1800/122 to be too stiff. Its more noticeable in the 1800 which is lighter in the rear than the 122. In order to solve this problem we recommend and offer factory revalved shocks for those models - more expensive but worth it to get it right. We stock Bilsteins for 122s and 1800s, and can order them for 544s, 140s and 164s.

- Bilsteins for most street applications - \$350 for a set of four
- Re-valved Bilsteins for the 122/1800 - The rear shocks for these models currently come from Bilstein with valving that is much too stiff for a decent ride. This has been confirmed by shock dyno data and discussions with Bilstein's US Service Dept. To solve this problem we now have them rebuilt by Bilstein to our exclusive specifications. Expensive but worth the extra cost in order to "get it right" and have the best. They will easily last the life of your car and are the key to having both excellent handling and ride qualities. - \$525 for a set of four. \$350 per pair of re-valved rears. \$175 to re-valve your rears.

Konis

Back in the 60's and 70's Koni hydraulic shocks were the standard. Several years ago Koni reintroduced these adjustable hydraulic shocks as their classic shock line. Not as

technically advanced as the Bilstein (hydraulic vs. monotube gas shock with digressive valving), the idea was to bring back the original classic Koni for vintage cars, not update it. It has one advantage - being adjustable to meet your individual needs or compensate for eventual wear. Like the Bilsteins, these shocks seem to last forever, and are an item that you keep and transfer from car to car. The set on one of my street 1800s is now on its third car and they still feel like new. Right now, Koni is not importing some of these into the US, so they are a special order item..

- Koni adjustable shocks - \$420 for a set of four on a special order basis - email for current availability

Race Shocks

- Race shocks - New shocks are being developed for 2009 - Email for details

Polyurethane Suspension Bushings

Our testing has shown that polyurethane bushings improve steering response, give a crisp feel to the handling, and reduce the feeling of wandering or floating encountered in high speed cornering with stock bushings. Polyurethane bushings are also not affected by the same causes of deterioration that affect rubber bushings. They are appropriate for both street and race applications.

Full sets are available for most Volvo models and are usually in stock for 1800s, 122s, 140s and 164s. Email for information on the availability for other models.

Pictured on the right is a set of bushings for 68 - 73 1800s and 122s.

- Complete sets for all 1800s, 122s & 140s - All bushings in our sets are poly!
- Note - Other supplier's sets are not all polyurethane, are not the same grade of polyurethane & do not include panhard & sway bar bushings
- early 1800 and 122 - \$195 (same front upper and lower - incl. panhard & sway bar bushings)



- mid 1800 and 122 - \$ 225 (later type front lower bushings - early type rear suspension - includes PB & SB bushings)
- 67 1800 and 122 - \$ 265 (includes panhard and sway bar bushings)
- 68-73 1800 and 122 \$ 255 (includes panhard and sway bar bushings)
- 67-69 140 \$ 275 (includes panhard and sway bar bushings)
- 70-74 140 \$ 355 (panhard bar bushings available separately)
- Complete and partial sets available for other models, including the 544, 200, 700, 900 - email for a detailed bushing price and availability information.

SwayBars

We offer sway bar kits, including IPD front and rear bars, as well as our own adjustable bars in several versions. Different diameters are available in the adjustable bars to be sure that one will be right for your use. Some bars are tubular for light weight and some come with separate bolt-on arms. Adjustable bars are highly recommended for competition use where being able to tune the suspension is necessary. For the discriminating street driver the ability to tune the suspension with sway bar adjustments can be just as important.

- Front / Rear IPD Kit \$315 - \$350 depending on model
- Front 1" bar, recommended for the 122/1800 for more aggressive cornering - \$165
- Custom made adjustable tubular bar kits with aluminum arms for race or street. For road race, autocross, or track day use adjustable bars are needed for suspension tuning. Call or email for details and prices.



Engines

Engine Building

Our current Volvo B18/B20 engine designs are the result of 20 years of dyno, track and road testing.

Shown below are some of our chassis dyno - rolling road - test sessions.



In the last few years the biggest change here at VPD has been the increased power available from our normally aspirated engines. When we started 140 - 160 HP was typical for a modified Volvo B20 street engine and the only way to get 200 HP was in a high compression, high rpm race engine. Then our supercharger kit made it possible to have over 200 HP on the street with a B20. This allowed us to offer a street car package for an 1800, 122, 544 or 140 that would give them performance similar to our vintage racecars. Now, after years of development, we have normally aspirated, large displacement B20 street engines with more HP and torque than the race and supercharged engines we started with. This gives you the option not only of normally aspirated street engines that look stock with 200 + HP, but also 250 - 350 HP supercharged engines, and 250 HP race engines.

As in the past, we continue to provide an engine building service to meet your street, rally and race needs based on over 20 years of experience in these areas. We can rebuild your engine to your custom specifications or supply one based on one of the engine packages outlined below. Engines are available from stock rebuilds to full-out, 8,000 RPM

race engines. Check the price list for most recent prices and options. E-mail for additional details. Engines can usually be shipped throughout the US for less than \$300 and for less than \$500 to many other countries. Recent engine orders have been from Australia, Germany, Greece, Norway and the UK.

Individual parts can be supplied to assist you in building your own engine, but we are not a parts house and prefer to supply complete systems for best results. We believe in a matched systems approach where the selection of each part in the system depends on the others, and a good match is the key to satisfying performance. This approach is reflected in all of our engines, component kits and our Street Performance Tuning Kit - systems of components designed and matched in such a way that the individual results far exceed what could be achieved through a seemingly similar combination of individual parts selected by a car owner without the benefit of extensive systematic testing.

Be sure to read " How our engines are different " at the end of the engine section.

Volvo B18 - B20 Street Engines

The main design criteria for our Street Performance Engines is to increase power without any sacrifice in the areas of driveability, reliability and fuel economy. The goal is to supply engines that meet the requirements of those who drive their Volvos on a daily basis, whether to work or on errands, but which also have enough power for modern performance on the highway, fun on a twisty country road, or a weekend autocross or track day. Our SP engines are not "racy" engines, unless you want them to be. Power bands are similar to stock engines in terms of where the power is in the RPM range. There is just a lot more of it. Good low and midrange power and torque, with immediate throttle response, are our primary goals in a street engine, not high RPM power. For street driving a broad power band and good throttle response are much more important than peak power. Power increases of as much as 40 - 50% with normally aspirated, 2 liter, B20 engines with no loss of low end power and torque are a byproduct of good design. Customers are always surprised that we can do this while at the same time improving fuel economy. With proper tuning and exhaust modifications, at least 150 HP at the crank, 120 HP at the wheels, can be expected from our typical 2 liter street performance engines. See the dyno test chart in the Street Performance Tuning Kit section below. With our stroked, large displacement B20 engines power in the 180 to 220 HP range can be expected. Most engines are now available as component kits for assembly at your location.

The Stock Rebuild

A completely rebuilt street engine, built to basically stock specifications with some upgrades, starting at \$3250* (\$2600 for the bottom end - \$650 for a rebuilt head with hardened ext. seats) Upgrades such as balancing are recommended.

The Street Performance Engine

Balanced, with our Type II performance ported head, our Street Performance cam, stock type cast pistons and reconditioned rods. This is our standard performance engine, designed to replace stock engines in all applications where more than stock power is desired, it retains the long term reliability and broad power band you are used to, but with approx. 50% more power. The previously optional upgrades of align bored mains, ARP rod bolts and ARP head studs are now standard on this engine.

- With the Type II head - \$4450*
- With the Type I head - \$4150*

The Severe Duty Street Performance Engines

A significant upgrade from the Street Performance Engine described above, this is our recommended high performance engine designed to take the higher stresses of

supercharged, turbocharged, track day, or high RPM applications - forged pistons specific to each application, ARP rod bolts and head studs, align bored, decked, balanced, custom ground Street Performance, Supercharger or Targa cam.

- With type II performance head, - \$4795*
- With Type III head - \$5245*

2130 cc Severe Duty Street Performance Engine

Basically the same as the Severe Duty engine above but with 92 mm bore for a larger displacement and more power.

- With Type II head - \$4995*.
- With Type III head - \$5450*

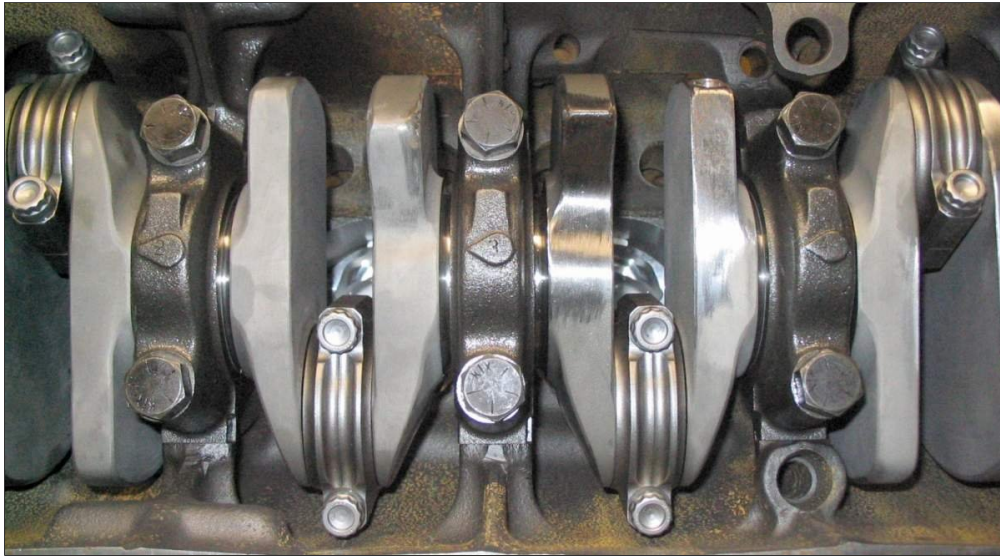
The 2.3 Liter Stroked Engine

92 mm bore x 86 mm stroke. Similar to the 2.5 in concept, but using an offset ground stock crank with forged pistons and rods. This engine will fill the gap between our 2 liter and 2.5 liter engines both in terms of price and performance with power in the 175 - 195 HP range depending on compression ratio, induction system, cam and head choices. Its one of best all around engines, perfect for a daily driver or for street/track applications including rally, targa and Carrera Panamerica events. The engine can be matched to your application with different cam and head choices. The race version listed below is similar except for the cam, head, compression ratio and designed rpm range. --

- With Type II head \$5850 *
- With Type III head - \$6300 *

The 2.5 Liter Monster B20 Street Engine - based on a custom made billet stroker crank

92mm bore x 92mm stroke. This is the answer for those who want great power with a stock look and without the complications of supercharging. All the best components - sonic tested blocks, steel billet custom made stroker cranks, H beam forged rods, forged pistons, type III head. Expensive, but well worth it for the performance. Street versions produce 200 - 240 HP with side draft carbs (Weber DCOE or Mikuni HSR) or programable FI depending on cam and compression ratio. 300 + HP supercharged. Order six months in advance to allow time for the custom crank to be produced -- Engine only - \$7350*



The heart of the 2.5 - the custom made stroker crank

All of our engines, unless otherwise specified, come with new water and oil pumps, late style neoprene front and rear seals, new pistons, rings and bearings. In engines using stock cranks and rods, these parts are magnafluxed and reconditioned. All blocks are sonic tested to ensure sufficient cylinder wall thickness. All engines are bored and honed with a deck plate. All performance engines are decked to assure the proper deck to piston height. The engine prices listed above do not include intake or exhaust manifolds, carbs, fuel injection systems, superchargers, flywheels, clutches or distributors. These items can be added to any engine order at additional cost. Rocker assemblies are checked and reconditioned. Engines are pre-oiled then drained prior to shipping. Valve lash is set cold. Engine prices, unless otherwise specified, are for engines of stock displacement with overbores of .050" or less.. Add \$125 to any engine price to add a baffled oil pan.

Be sure to read the details at the end of the " Engine " section on how are engines are different from those made by anyone else.

*** Engine prices are based on a core exchange. Where an equivalent, useable core engine is not provided a core charge of \$350 is normally added.**

*** Engine prices are based on our most up to date information on parts costs at the time prices are posted. If our cost for parts not in stock increases significantly, even after the order date, these increases may have to be passed on to the customer.**

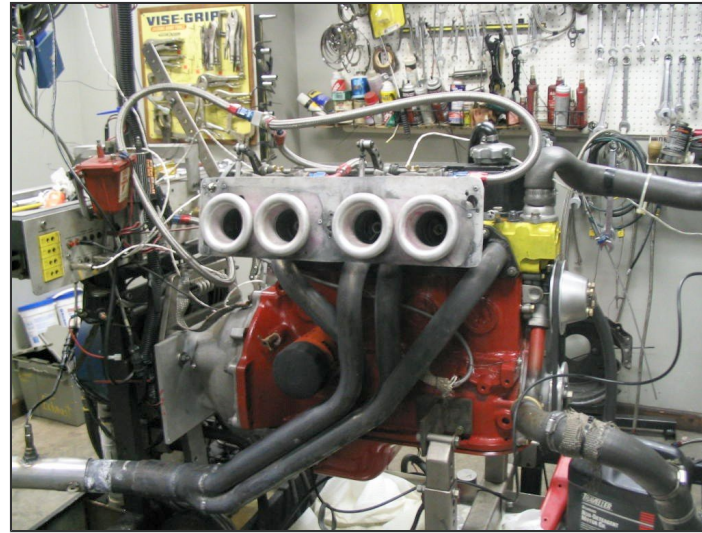
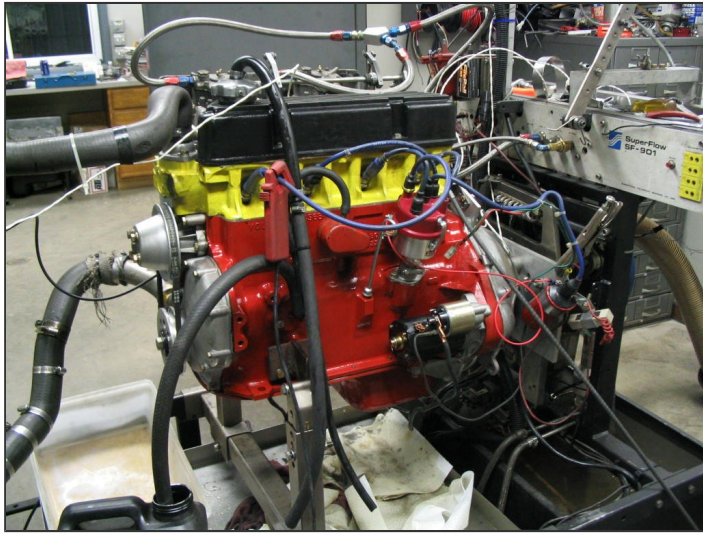
Stroker Kits

Stroker component kits for local assembly

- The 2.5 liter engine components are available as a special order kit consisting of balanced stroker crank, forged H - beam rods, rod bearings, and forged pistons - \$3650
 - The 2.3 liter component kit - forged pistons, Crower rods, rod bearings, offset ground crank - \$2350
 - The 2.3 liter component kit as above, but supplied without the offset ground crank - \$1700
 - These components are special order items requiring from 10 - 20 weeks for delivery.
-

Race Engines

Our standard Volvo B18/20 vintage race engines produce 200 + HP at 2 liters, with a broad power band and are normally run on the track between 4,000 and 8,000 RPM. The design is one that we have developed based on 20 years of vintage racing and dyno testing experience, and is basically an evolution of the engine that I have used in my own vintage racecar since 1992. Since it's designed for vintage racing, reliability and flexibility are key objectives in its design, but it is a race engine designed for track use only. Customers have been using and winning with these engines in vintage racing and in SCCA's Historic Series for many years. (After 10 years my 1800 still holds an SCCA Historic Series track record at Watkins Glen.) We have also built engines for other types of racing and rallying which are now in use in US and several other countries.



One our race engines during dyno testing.

Due to customer demand we are now producing larger displacement engines, in various bores and strokes, including a top of the line, 2.5 liter, bored and stroked maximum performance race engine. With these engines power in the 250 HP range is the norm. All of our race engines use components custom made to our specifications. Piston sizes, pin heights, pin size, rod lengths, and rod journal diameters are changed to maximize performance. Choices in specifications, parts brand, or parts price increases may affect the prices listed below. All race engine prices include a baffled oil pan. Dyno test results available on request.

- B20, 2 liter vintage race engines with ported race head, custom race cam, forged pistons, Carillo or Crower rods, balanced and blueprinted, approx. \$6250*
- B20, 2130 cc race engine, stock stroke x 92 mm bore, \$6450*
- B20, 2.3 liter race engine, 92 mm bore x 86 mm stroke with offset ground crank - \$6750*
- 2.5 liter B20 monster engine, 92mm bore - 92mm stroke with billet steel stroker crank, all the best components, the most powerful B20 Volvo race engine you can buy. Designed for higher rpm than the street version listed above, this pure race version uses lighter, longer rods, lighter pistons, and has a head and cam designed to facilitate high rpm - high compression use. - \$7800*
- ITB short block - blueprinted cam, align bored, balanced, rods resized and reconditioned with ARP rod bolts, custom deck height, bored and honed with a deck plate, with baffled oil pan - \$2800*

*Additional core charges or exchange requirements may apply to all engine rebuilds. The typical B20 core charge for engine and head is \$350. For engines to be shipped there may be additional packing and handling charges for preparing the engine for shipping

Volvo Announces Performance Kit

ROCKLEIGH, N.J., May 30 — A factory-engineered, high-performance tuning kit that boosts engine horsepower nearly 50 per cent was announced by Volvo today.

Designed primarily for competition, but suitable for street use, the kit raises engine output from the standard 95hp to 135 and drops 0-60 mph acceleration times for Volvo sedans from more than 13 secs. to less than 10.

Basic components contributing to this performance increase are a modified cylinder head, high-performance camshaft, lightened fly-

All Pittsburgh Team

LE MANS, France, May 20 — For the first time, an all-Pittsburgh, Pa. entry will be competing for top honors in the famous 24-hr. Grand Prix of Endurance at Le Mans, France. The team will field a new Ford GT40 owned by Wm. S. McKelvy and Richard Holquist of Pittsburgh. The drivers will be Holquist and Dr. M. R. J. Wyllie. Chief Mechanic is Jim Baily.

wheel and modified exhaust manifold.

According to Volvo's Vice President James C. La Marre, components in the kit are identical to those used in the factory competition engines which powered Volvo to the 1965 World Rally Championship.

Approved for both sedan and sports car racing in the United States, the kit is designed to bolt on to all sedans, station wagons and sports coupes equipped with Volvo's B-18 Series (five main bearing) engine.

"After successfully testing this kit in the world's toughest international rallies for nearly a year," Mr. La Marre said, "we are confident that our engine can reliably withstand the extra stress of 50% more horsepower.

"To highlight this confidence, Volvo is covering these kits with the full factory warranty."

Available in limited quantity at a suggested retail price of \$299, the tuning kits can be ordered now through all authorized Volvo dealers.

In 1966 Volvo offered a tuning kit for B18 engines designed to increase HP by close to 50% based on the same engine components they used to win the 1965 World Rally Championship. Now we have a tuning kit similar in general concept, but using components of modern design engineered for street rather than race performance

Our Street Performance Engine Tuning Kit will increase power in a properly built B20 to the 150 - 170 HP (at the crank) range while remaining perfectly tractable for normal street driving. In part throttle operation it feels like a stock engine, only smoother. Larger displacement engines will benefit from additional increases in power based on the percentage of displacement increase. For those building their own engines, or seeking to add performance modifications to an engine that is still in basically good shape, this is the perfect package. The components are the same as those used in the engines we build in our shop but in a bolt on package that will take all of the guess work out of performance upgrades for the do-it-yourself enthusiast. The kit consists of our Type II Street Performance head, head gasket, custom ground SP cam, aluminum timing gear,

performance lifters and pushrods, and ceramic coated exhaust header. Recommended for use with suitably tuned Mikuni, SU or Weber carbs, or programable fuel injection (SDS, Megasquirt, etc.) replacing the stock D Jet control unit. SP kits for supercharged engines have a different cam and lower compression head. Free flowing exhaust required.

Basic tuning kit with above stated components - \$2350. Add an aluminum flywheel, new OEM type clutch pressure plate, performance clutch disc, and performance exhaust with mandrel bent tubing and high capacity mufflers to make a complete system.

How Our Engines Are Different

Our engines are designed and built based on over 20 years of experience. building and modifying these engines. For most of that time we have been doing dyno, street and track testing to validate the results. This process has produced design changes that are unique to our engines. On many engines crank throws, rod lengths, component weights and bearing sizes are different from stock and these improvements have evolved over the last 20 years.

You can have engines rebuilt for less money, but you can't have engines built for less that are built with the same care, attention to detail and experience that we use in building them. We spend more time cleaning and preparing our blocks both before and after machining than a lot of shops spend doing an entire rebuild. Although some components and specifications may differ, the same basic steps and care go into building our street engines as go into our race engines. When you spend less on an engine its cheaper because less time was spent on it due to the steps that were left out - including design and testing time. If our engines are more expensive its because of the extra time, additional care, and a long list of additional steps that go into building them. Its also why our engines produce more power on the dyno and on the road, are more economical, and are more reliable.

Ten of our standard steps that you don't usually see in engine rebuilds done by others include:

- 1) all blocks go through a several step cleaning process both before and after machining
- 2) all block soft plugs and oil gallery plugs are removed and replaced
- 3) blocks are sonic tested for sufficient wall thickness;
- 4) the cylinders are honed with a deck plate;
- 5) the mains are align honed ,
- 6) blocks are decked for proper deck to piston height and piston to cylinder head clearance;
- 7) stock rods are magnafluxed, checked for straightness, resized, bead blasted, reconditioned, and usually supplied with high performance rod bolts, new pin end bushings, and balanced;
- 8) cranks are checked for proper indexing and straightness, magnafluxed to check for cracks, the journals are polished and/or ground, and finally the crank is balanced;
- 9) oil pans are completely cleaned and repainted;
- 10) Engines are pre-oiled and then drained prior to shipping.

- 11) Rocker arms and shafts are checked and reconditioned.
- 12) Valve lash is set cold, then reset hot after the head bolts are re-torqued on engines we install.

The list could go on..

Some design differences:

- 1) 20 years of building and racing these engines has allowed us to do a lot destructive testing, some of it unintentional, but every failure has had its benefits as they have given us an opportunity to learn what works, what needs to be changed and what does not. In the beginning we went through a couple of engines a season, but my last race engine lasted 12 years until I blew it up in a 4 hour enduro running against modern racecars.
- 2) "If it ain't broke don't fix it." " KISS - Keep it simple, stupid." Two of the most important design philosophies that we follow. Especially important when dealing with old engines where it is really easy change too much based on what is now available.
- 3) With similar cars on both the street and the track, we have been able to go through an evolution of trying design elements on the track and then adapting them to street applications. Take our current line of street heads for example. They are a direct evolution of a small port race head design that I introduced in 1998 on my racecar. It did not result in the most peak horsepower, but had a broader power band and better throttle response, elements that made it easier to drive hard - good enough to win the Volvo Grand Prix that year against Volvos from all over the US and Canada, and set a track record at Watkins Glen for the SCCA Historic Series that still stands.
- 4) We have not felt restrained to do it a certain way just because Volvo did it that way. It would just not make sense not to take advantage of modern materials and techniques in building our engines. If Volvo had known of a better way to do it 40 years ago, then they would have done it. With modern materials we can run smaller bearings which have less resistance, longer rods and lighter pistons for more power and efficiency.
- 5) With years of design changes behind us, some of our engines have about as much VPD design in them as they do Volvo - our bore, our stroke, our rod length, our bearing sizes, our piston pin diameter and height, our lifters, our pushrods, our cam designs, our head port shapes, our valves, our crank pulleys, our flywheels, our clutches, etc.

Some test differences:

I have a strong belief in the importance of scientific testing, and a background that allows me to know how it should be conducted. We test everything we make. When doing head porting, even though I have ported well over 100 Volvo heads, I still flow test the head before, during and after porting - and even though it " looks right " I frequently have to go back and touch up a port to make sure it is right.

When replacing or modifying an engine in a customer's car, whether its a race car or street car, we go to the extra trouble of dynoing it before we make any changes. This gives us a baseline and allows us to document exactly what was accomplished.

At this point we have records that go back for more than 20 years - flow tests, dyno tests, track times - that allow us to make comparisons when we make changes. A lot of these tests were done on the same machines and tracks that we run on now so that we can still make direct comparisons. There are even certain lightly traveled public roads, with

convenient markers, where we have been doing testing for many years. Any opportunity to test is used, rather than just going by the seat of our pants.

We have also learned the hard way, that just getting a better test number on a machine does not mean that you will get the same performance on the road. One of my head experiments that produced the really nice flow numbers was a real bust in terms of the power that it produced in the real world. So engine testing progresses from the bench, to the dyno (and sometimes both engine and chassis dynos) and then to the road and or track.

Heads & Porting

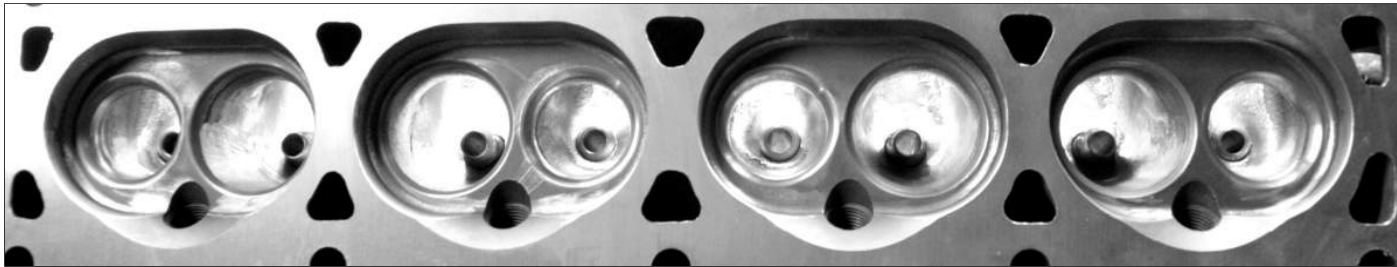
Head Porting - Flow testing

One of the last items most people think about in an engine upgrade is really the most important - the cylinder head. Companies focus on selling camshafts, carburetors, exhaust systems, etc.- easy stuff to sell and all designed to improve air and fuel flow into and out of the engine. But in the air flow equation, the limiting factor is still the smallest or most restrictive part. No matter what is bolted on to it, if that most restrictive part is in the cylinder head, than that is what is going to limit the total amount of air that can flow into and out of the engine and the amount of power that engine can make.



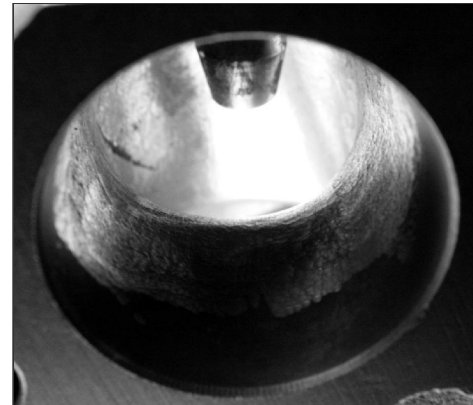
Once we accept the concept that we have to improve the capacity of the intake and exhaust ports to flow more air and fuel through the cylinder head in order to make more power, then head modifications have to be considered the key to enhancing engine performance and a prerequisite for all further modifications. Efforts to increase power without following this principle usually do not end well. Fortunately, the areas of greatest potential for increased power and efficiency are also in the head.

Modifications to the ports, as well as the combustion chambers, valves and valve seats, address the most serious performance restriction in the Volvo B18/B20 engines - head flow limitations based on the stock port designs. Without improvements in head flow, changing cams and increasing displacement will not produce satisfactory results. Our engines produce very significant improvements in power and torque (as much as double the stock outputs), not only in terms of peak numbers but throughout the normal operating range, because of radical improvements in flow produced by modifications to the ports, valves and combustion chamber shape. These modifications make it unnecessary to resort to long duration cams, which typically produce increases in top end power while losing it at the low end. When our heads are matched with our cams and exhaust systems, the result is a perfect combination of power, driveability and even fuel economy - improved performance without any drawbacks.



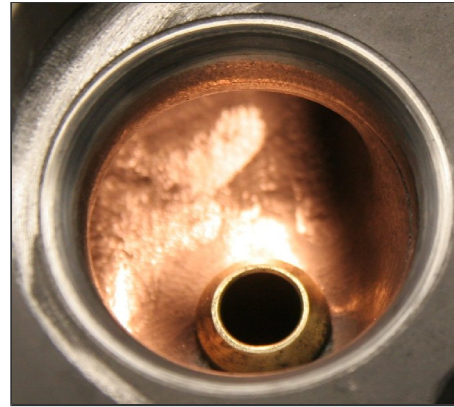
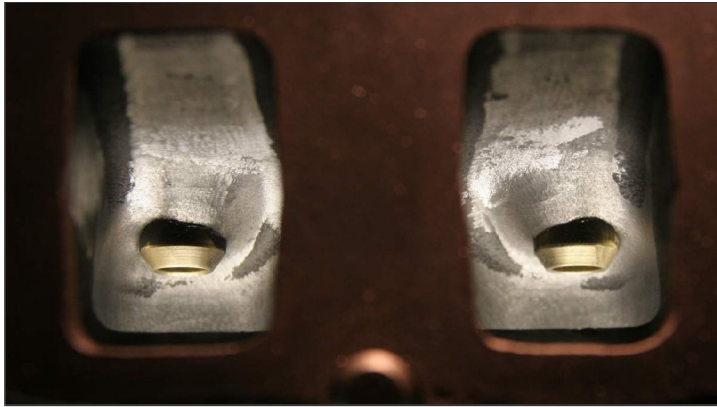
On a custom basis, various degrees of head work are offered from street performance to full race applications. Extensive work on the flow bench, followed by dyno, street and race testing, allows us to be sure of the results that will be obtained. These are not educated guesses based on what works on other engines or what someone else did, but are well-tested configurations on our engines. The port design and degree of port enlargement is tailored to the specific application. We do not put heads with large race type ports on street engines. Even our race heads are normally designed to produce maximum rates of acceleration rather than maximum peak power numbers.

All of our head work is backed up by flow bench testing, both before, during and at the end of the porting process. Over 20 years of experience porting, testing, racing and building Volvo engines for all types of uses with these heads gives us the experience to "do it right". The more heads we do, the more we learn. Our heads are constantly improving - recent comparison tests have confirmed that today's street heads are better in many aspects than the race heads we did several years ago - and those heads were still winning races last year.



Only a comparatively small portion of the time that it takes to produce one of our performance heads is spent doing actual head porting, though that time is crucial to a successful result. The rest of it, after the head is cleaned, checked and prepped, goes into installing hardened exhaust seats; enlarging the valve spring pockets to accommodate larger springs; milling the combustion chambers to unshroud the valves; cutting the angles on the valves; cutting seats in the head; removing and installing valve guides; reaming the guides to the proper size for each valve stem; removing the soft plugs, removing checking and

desired combustion chamber size for the desired compression ratio; checking and installing the valves, springs, seals, retainers and locks; and a few other things that I have left out.



Custom port work is done on an hourly basis. Depending on the work specified \$400 - \$800 would be the typical cost range for custom porting a B20 street head where valve, guide and extensive seat work is not required. Call or Email for details.

Free flow testing - we've had a standing offer to flow test one intake and one exhaust port of any B18/B20 head, without charge, other than return shipping. We make this offer in order to give the customer a starting point or baseline for decisions on whether further work is needed. Results are compared to those from stock and ported heads.

See the end of this section for a more detailed description of our head porting efforts.

Street Performance Heads

Head flow, particularly exhaust port flow, is the main factor limiting power in the B20 engine. Our street performance head was designed to solve this problem. It will meet most street performance requirements including use with our supercharger system. The design includes modified combustion chambers to improve combustion efficiency and unshroud the valves, hardened seats, bronze guides, high flow stainless steel valves including an oversize 36mm exhaust valve, three angle valve job, and dual valve springs. The head is milled to achieve the desired compression ratio.

Our street performance head is usually based on the B20F casting, or the similar late B20 carb head, in order to take advantage of differences in these casting that allow the best exhaust port shape to be produced. The chief restriction on these heads is in the exhaust port, so that is where improvements are emphasized, typically improving exhaust flow by over 30%. The superior intake port, needing little work for most street applications, and larger intake valve of the fuel injected heads, allows modification time to be

concentrated in the exhaust and combustion chamber where it is most cost effective.

The SP head will work with a variety of carbureted and fuel injected induction systems, but requires tuning of these systems to support significant increases in fuel/air flow. Although designed to work best with our cams and exhaust systems, significant increases are possible with other components. Using the SP head on a properly rebuilt 2-liter B20 engine with our street performance cam and exhaust, a very broad power band with 120 HP at the wheels and 150 HP at the crank can be expected. Power and torque increases start at very low engine speeds and continue throughout the useable RPM range. Detailed dynamometer results are available on request.

Type I

Includes more extensive intake porting than past versions, new high flow valves with larger 36 mm exhaust valves, 3 angle valve job, hardened exhaust seats, dual valve springs, bronze guides, milled to specified compression ratio. Similar to our traditional Street Performance Head (now called the type II head) but at a lower cost due to its stock combustion chamber and less extensive porting - \$995 (Core charge \$150)

Type II

Our standard Street Performance Head, a significant step up from the Type I. Includes new high flow valves with larger 36 mm exhaust valves, 3 angle valve job, hardened exhaust seats, dual valve springs, bronze guides, milled to specified compression ratio. Adds more extensive porting and modified combustion chambers to un-shroud the valves and support higher flow rates as compared to the Type I - \$1300 (Core charge \$150)

Type III

A step up from the Type II head due to its larger ports and more extensive porting - similar to our race head but with slightly smaller ports, valves and valve springs. Designed for high performance street use, track day, rally, Targa and Carrera Panamerica race cars. Recommended for larger displacement performance engines, especially our 2.3 and 2.5 liter stroked engines. \$1750 (Core charge \$150)

On our supercharger system the use of the Type II head with an appropriate exhaust system has produced increases of over 50 HP compared with stock heads and exhaust systems at similar boost levels. On normally aspirated engines this head is the basis for our street performance engines producing from 150 - 180 HP at 2 liters. The Type III head is recommended for larger engines or where 180 - 230 HP or more is the goal.

All prices and performance information is based on heads built up from B20 F cores. Prices and performance of heads based on B18, B20B and B20E cores will vary.

Race Heads

Race heads are a significant step up from the street performance head. Similar work is involved, but almost 3 times the number of porting hours are put in, with most of the additional time going into the intake ports. The heads are milled to increase the compression ratio to your specification, usually over 13 - 1. Valves are high performance stainless steel, normally 44mm intake and 38mm exhaust. Valve springs are 1.44 diameter dual springs with an additional dampener. Lightweight titanium keepers are included. These heads will typically support over 200 HP from a 2-liter B20 engine.

The typical vintage race head includes most of the features of the street performance heads plus larger ports, 1.4 inch triple valve springs good for 8,000 rpm, titanium retainers, 38 mm exhaust valves, milled to 13 - 1 CR. More than double the porting time goes into this head as compared to our Type II SP head. It's designed to work with our race cams and headers to produce reliable road race engines dynoed with our bottom ends and exhaust systems at 200 HP for a 2 liter engine and up to 250 HP for larger displacements. \$2195 (\$150 core charge). Special versions of this head are available for various applications. Call or email for additional details.

Economy Heads

For those with a head that has basically good components - good valves and guides - we now offer an economy head rebuild that includes basic porting. Hardened seats are installed. The valves and seats are given 3 angle valve jobs. Critical areas of the exhaust port are ported for a 10% (early & E heads) - 25% (F heads) improvement in exhaust flow.

Economy performance head with your stock valve springs \$535

Economy performance head with new retainers and 1.25" dual valve springs \$695

Engine Parts

Engine Parts

In addition to our engines and heads we supply many basic engine components to be used in your own build. Unless stated otherwise, all parts listed below are for Volvo B18/B20 engines.

Pistons

Custom built forged pistons for NA and forced induction applications from street to race. Pistons for a .050 B20 overbore are normally in stock. Other sizes available on custom order in 4 weeks. \$660 incl. pins rings and design time. Stock B20 type cast pistons are also available.

Valves and Guides

All of our Volvo B18/B20 engines, whether for street, supercharger, or race, use very high quality, severe duty, high flow,



stainless steel valves. For street engines these are normally 44mm intakes and 36mm exhaust. For the typical race engine the exhaust valve size is increased to 38mm. The shape of these valves gives a significant flow improvement. Stock type replacement valves are also available, but why use them.

For B18 engines we have guides that allow B18 heads that come with 11/32 stem valves to be converted to the same valves as used in the B20 with 5/16 stem.

- SS high flow street and race valves, 5/16" stem, necked down for improved flow. Available sized - 42, 44, 46, & 48 mm intakes - 36 & 38 mm exhausts, \$26 each
- Bronze valve guides, Volvo B20 (\$56) - per set of 8
- Bronze valve guides used to convert B18's to 5/16 stem valves (\$64) - per set of 8
- Valve seals, B20 (\$18 per set of 8)
- Valve locks B20 (\$18 per set of 8)

Email for additional prices for your specific application.



Our B20 exhaust valve compared to a stock valve.

Valvesprings and Retainers



For Volvo B18/B20 street, rally and race engines we offer a selection of dual and single valve springs matched to your performance needs in various diameters, heights and rates. This includes valve, spring and retainer combinations designed for the use of taller, larger diameter springs (up to 1.44 diameter for race applications) which allow the use of higher spring pressures, accommodate higher valve lifts, and reduce spring fade and valve float under high performance and racing conditions. Order based upon exact requirements. E-mail for recommendations. See the price list for pricing details.

Street Performance - Volvo B18/B20

Our street performance and supercharged engines use dual valve springs 1.25 in diameter. These require the enlargement of the spring pockets on a stock head. These springs are highly recommended for any engine with a non stock cam. Matching steel and aluminum retainers are available.

- Dual 1.25" valve springs for street use - \$90 - per set of 8
- Dual 1.25" valve springs for street, high performance, and rally use - \$ 100 per set of 8
- Retainers for dual 1.25" valve springs -- steel - \$ 55 - per set of 8
- Retainers for dual 1.25" valve springs -- aluminum \$ 75 - per set of 8

Race - Volvo B18/B20

Due to more radical cam designs and higher rpm used, our race engines are usually set up with 1.44 diameter dual springs with damper, chosen for long life in high RPM applications. In order to use these springs the stock spring pockets in the head have to be enlarged. An aluminum valve cover with reliefs milled for the springs is also required. Titanium spring retainers are used with these springs.

- Dual 1.44" valve springs for race use \$105 - per set of 8
- Titanium dual spring retainers - \$135 - per set of 8

Pushrods & Lifters

Problems with the stock Volvo B18/B20 pushrod and lifter combination caused us to change these components in our race engines many years ago. Since making the changes we have not had any problems, so we use these new components in all of our engines.

Pushrods

The stock pushrods flex, especially in high performance applications using cams with higher than stock valve lift rates, reducing lift and contributing to valve train vibration and instability. To solve this problem we offer high quality performance pushrods to fit various lifter and rocker arms combinations. Available in various lengths, 5/16 is the standard diameter as in the photo below.



Stock B20 Pushrod above - our standard Performance Pushrod below.

Lifters

Based on years of experience in race and street engines, including some premature wear issues, we do not use stock Volvo type lifters. Instead we use competition style, US made solid lifters in all of our engines, street or race. Our performance pushrods are required with these lifters. Used with our cams, valve springs, spring retainers and valves, the result is a well tested, reliable combination.

New lifters have to be used when installing a new camshafts.

Performance Lifters (\$60) and matched length pushrods (\$85) for standard rocker arms - \$145 per set

Rocker Arms

Improved Stock-type Rockers

Stock Volvo rockers are specified as having a lift ratio of 1.52 to 1, but give an actual ratio of between 1.43 and 1.47 to 1. This results in less valve lift than expected and less than what is specified for the cam you are using. To cure this problem, we have stock rockers modified to provide a true 1.5 to 1 and higher ratios. Note that the use of any of the above rockers may require the use of non-stock pushrods.

- Stock Type Rockers - Instead of working on rollers the time will be spent improving results with the stock rockers. They are actually lighter than aluminum roller rockers, and have proven to be stronger and more reliable. The problem with the stock rockers is that the actual ratios vary widely from rocker to rocker, are usually much less than the 1.52 ratio specified, and thus produce unequal valve lift in each cylinder. To solve this problem we now test each rocker we use in our engines and can provide matched sets.
- High Ratio Stock Rockers - Matched sets of stock rockers selected and modified to provide equal and higher than stock lift ratios. \$ 275 per set on exchange or add \$75 core charge.

High Lift Ratio Roller Rocker Arms

After an evaluation the decision has been made that we will not be offering roller rocker kits for 2009 and instead will concentrate on improving results with stock rockers which have proven to be more reliable than the rollers. No sense making a change unless you know you will get a better result - "keep it simple" !! Below is the description of the previously offered kit. We hope to have an improved version available in 2010.

- Increases valve lift and effective duration.
- Increases horsepower and torque.
- Allows higher RPM operation.
- Reduces valve train wear and increases the life of valve guides and seats.
- Reduces heat by reducing friction.
- Change back to the original in minutes.

Most modern pushrod racing and performance engines use roller rocker arms due to their many advantages. In England they have been used on vintage racing and rally cars for many years. We have made these available in the U.S. for use on Volvo pushrod engines.



These high ratio (1.6 - 1) alloy roller rocker arms for Volvo B18 and B20 engines are available individually or as a kit. The kit is complete and ready to install. It includes 8 roller rockers, modified shaft stanchions, pushrods, shims, and miscellaneous parts. The only modification necessary to the engine before bolting it on is a slight enlargement of the pushrod holes in the head. This modification must be done with the head off the block. A cast alloy valve cover must be used in order to provide sufficient rocker clearance.

The basic 1.6 ratio kit is priced at \$495. Request the separate information sheet for more information. Check the price list for the most current price and availability information. These kits are only available on a periodic basis.

Rocker Shaft Stabilization

Flexing of the stock rocker shaft causes harmful harmonic vibrations and can reduce valve lift significantly under operating conditions. Modifications tested in our racing

program have provided solutions and are offered on a custom basis. E-mail for further details.

Camshafts

The camshaft determines the engine's characteristics more than any component other than the head. For the engine to perform correctly the cam has to be matched to the other parts of the engine. Changes in displacement, compression ratio, valve size, exhaust configuration, the induction system, the flow characteristics of the head, and how the car is going to be used have to be considered in determining optimum camshaft specifications. Our cams are custom ground to match these specifications based on modern camshaft design concepts.

You can save money by purchasing an older cam design that is less expensive because it has been made in large numbers and is sold as a "one size fits all" performance solution, but it will not give the same results. Most of these older design performance cams have long durations in order to increase high end power, necessary to make up for poor head flow, and the result is a loss of low and midrange power. The most common of these are made by ISKY and have not changed since the early 70's. Incredibly, one of our competitors still advertises their street performance cam (made by ISKY) using a 1974 review by Road and Track magazine. Does anyone really believe that there have not been significant advances in cam design in the last 35 years? Really? Have they not done any comparative cam testing and development for these engines in the last 35 years? Really? They also offer a street torque cam (also made by ISKY) for customers who want low end power, thereby acknowledging that they don't have one cam that offers increases in power across the full, street use rpm range.

So before we got into the street cam business for B18/B20 engines the choice in the US market was one cam if you wanted an increase in high rpm power or another cam if you wanted an increase in low end power. Clearly there was a better way, and we have it - cams developed using modern cam design technology, designed by current cam design experts, with continuous evolutionary development based on current street, track and dyno testing. Computer designed lobe shapes with lifts and duration that are different for the exhaust and intake are just some of the features of our cams that are different from the earlier cam designs.

We prefer not to quote cam specs and instead recommend cams by application, as the normally published specs are often misleading. The cam that we normally use in our street performance engines has 264 deg of intake duration and 268 deg of exhaust at .020 lift, with .285" lift at the cam and 110 deg lobe centers. But this tells you nothing about the most important design element of the cam - the shape of the lobes. More important than the duration at .020 or .050 lift, is the duration at .100, .200, etc. Our cams, especially the street cams, are designed to have as little overall duration as possible in order to assure that power and torque increases are produced throughout the RPM range with no loss of low and midrange power. With lobe shapes that open the valves more quickly than other cams with similar low lift durations, they have more duration at mid to higher valve openings, and produce more power. As the optimum requirements for the intake and exhaust are different, our cams typically have durations and lobe shapes designed to meet the separate requirements of the intake and exhaust. Cheaper cams use one profile for both. The result is that our cams produce power increases over a broader RPM range without sacrificing low and midrange power and torque.

We normally stock several versions of our Street Performance (SP) Cam, the Targo Cam, the Supercharger Cam for high boost supercharger applications, and our vintage race

cam. Other cam grinds are available on a custom basis to match your engine requirements. With modern computer-controlled production technology it is a comparatively simple process to optimize the cam design to match the specs of the engine it is to be used in. Cams made in small volume, based on modern cam design concepts and tailored to the specifics of a particular engine are more expensive but well worth the price. It takes about a month for a custom cam, ground on a new core.

Our cams are Custom Ground, Computer Designed and Matched to your Engine Specs

Lobe shapes based on the most modern computer design criteria

Street Performance

Designed to improve power throughout the RPM range. Mild mannered at low speeds while supporting up to 50% increases in power - \$250

Street Performance - Stroker

A modification of the basic Street Performance cam, but designed to meet the needs of our larger bore, stroked engines - \$250

Targa

Developed for use in events like the Targa Newfoundland and Carrera Pan America where an engine must meet the requirements of both normal street driving and high speed race sections. It's designed to provide more high end power than our Street Performance cam, and to be more appropriate for our large displacement engines in sporting applications. It is our standard rally cam and is also recommended for racecars that are driven to the track, track day cars, etc. - \$250

Supercharger Cam

Designed specifically for use in our supercharged engines. Testing has shown 50 more HP than the stock C cam originally used at similar boost. \$250

The Vintage Race Cam

The heart of our 2 liter vintage race engines. Nitrided. \$350

Race cams

Computer designed as needed. Nitrided for hardness and durability. \$350

Other grinds

Including stock C and D grinds, available from \$100 and up.

Accessories

Camshaft retainer plates - \$20. Spacer rings - \$ 15. Keys - \$5

Timing Gears

If your Volvo B18/B20 engine has a fiber-type cam timing gear it must be replaced when doing a cam change. Pulling the fiber cam gear weakens them and leads to premature failures when reinstalled. Based on years of race and street use we recommend replacement with an aluminum cam gear - much stronger than the fiber gears, lighter and quieter than the steel gears. Cam and crank gears must be replaced in matched sets and are only sold as sets. Aluminum and steel cam gears can normally be re-used - \$150

Pulleys

Aluminum Crank Pulleys

We now offer a selection of aluminum crank pulleys for both supercharged and normally aspirated applications. These are CNC machined from 6061 T6 aluminum. These include 3 sizes of SC crank pulleys - \$150, single groove 5.20" and 4.80" O.D. pulleys - \$105, and twin groove pulleys - \$140. All are designed to slightly under-drive the alternator and waterpump for power savings. They can be modified for use with crank triggered ignitions.

Pictured are 4 sizes of aluminum crank pulley for the supercharger system, plus 2 underdrive waterpump/alternator pulleys.

New - Crankshaft Vibration Dampener

One of our newest Volvo B18/B20 products, still undergoing final testing, is a crankshaft vibration dampener that is integral with our aluminum crank pulleys. Call or email for details and pricing.



ARP Bolts

ARP head stud kit

Comes with nuts and hardened washers, highly recommended for all engines as the original head bolts are showing fatigue and often do not give an accurate torque reading. Switching to these studs is the cure for most head gasket problems. Considered mandatory for street performance and race use. — \$100 per set

Rod bolts

Custom made by ARP. Needed to prevent rod failure in high RPM street or basic race use. Will not fit engines with 8 bolt cranks. - \$105 per set

Gaskets and Seals

Head Gaskets - High Performance and Racing

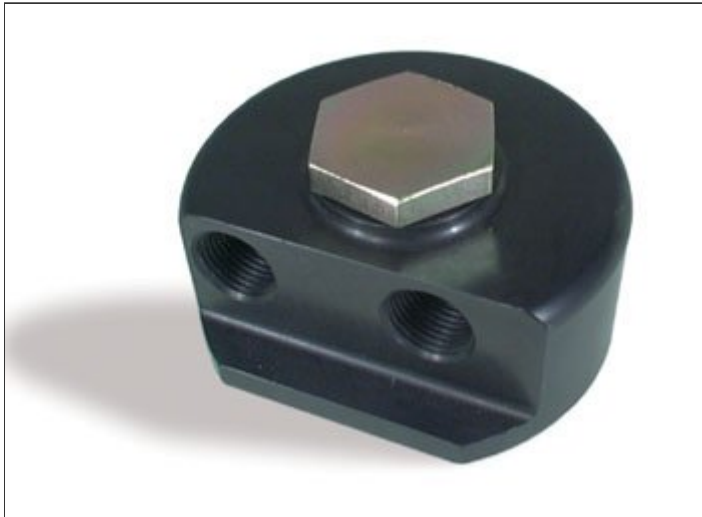


- Comet head gaskets in stock and custom bore and thickness sizes for Volvo B18/B20 high performance and racing applications . Used in all of our large bore B20 engines. Most stock sizes - \$110 - Slightly higher for custom sizes. Gaskets for other Volvo and non Volvo engines also available on a special order basis.
- Volvo B20 - 92 mm x .036" - \$110
- Volvo B20 - 92mm x .045 - \$110
- Volvo B20 - 92 mm x .060 - \$137.50
- Elring gaskets - The standard Volvo gasket - used in all of our engines - including race engines - when a special size is not needed. Common sizes usually in stock.

Front and Rear Seal Housings with modern Seals

Convert your B18/B20 from leaky felt seals to modern silicone rubber seals. Machined front timing cover with seal - \$45 plus refundable \$45 core charge. Machined rear seal housing with seal - \$40 plus refundable \$30 core charge.

Oil Cooler Adapter



For those of you who have had problems getting the oil lines to clear the header or just want a better quality adapter than those previously offered, I now have a solution which has eliminated all problems. It is a high quality billet aluminum adapter with the threaded holes for the oil line fittings on the side, not coming straight out from the block. In addition, the adapter can be rotated 360 degrees and tightened in any position. This is a great unit compared to the cheap, cast metal units previously available and has eliminated the oil line clearance problems on my race car and street cars using headers and remotely mounted oil coolers. Comparatively expensive at \$85, but well worth the price. Problems with the old type units cost me a race weekend and a set of engine bearings in '98, plus countless extra hours during every engine change. I will never use that type again.

Machined billet aluminum, not the cheap cast ones. These can be rotated to any angle to facilitate hose to header clearance. - \$85

Baffled Racing Oil Pans

To provide for continuous oil flow during racing conditions it is necessary to modify the oil pan to prevent the oil from being forced away for the oil pump pickup by G forces during cornering. We have tested out a simple system of baffles, without moving parts, which has given excellent results over twelve years of racing use. A requirement to ensure a continuous oil supply on the race track or in hard cornering.

On your core or exchange \$125 Core charge \$75 With oil temp fitting \$100

Rods

We use several different rods in our Volvo B18/B20 engines. Most of our Street Performance engines use stock rods that have been reconditioned and upgraded with ARP rod bolts. For race or rally engines that will be run at over 7,000 RPM we use various brands of aftermarket forged rods depending on the application. When using custom made rods we take advantage of the opportunity to have them made to the most advantageous dimensions - longer, lighter and with smaller journals than stock. The result are more efficient engines with lighter components.

The custom rods used in our component kits are usually in stock. Call or email for specifics and prices.

Carburetion

Intake Manifolds

Manifolds for sidedraft - DCOE type carbs

Available For B18, B20, B21, B23, B230 engines. These are copies of the original, no longer available, R- Sport manifold . They should not be confused with the cheap, shorty manifolds usually offered in Weber kits that have flow restrictions due to their short length and comparatively tight bends. In a recent dyno test we gained 12 HP by switching from the commonly sold "shorties" to our longer manifolds.

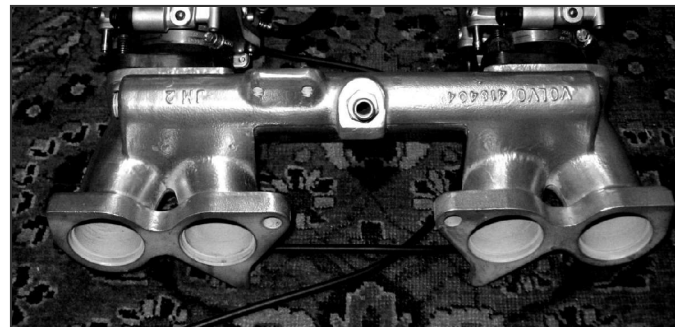
Recommended for all installations with Weber DCOE type carbs. Mandatory for racing, rallying and large displacement engines \$325.



SU intake manifolds

These are the original aluminum intakes used on the early dual SU carburetors. A significant improvement in performance applications over the later cast iron combination intake and exhaust manifolds.

Silver ceramic coated aluminum - \$110 Uncoated - \$55



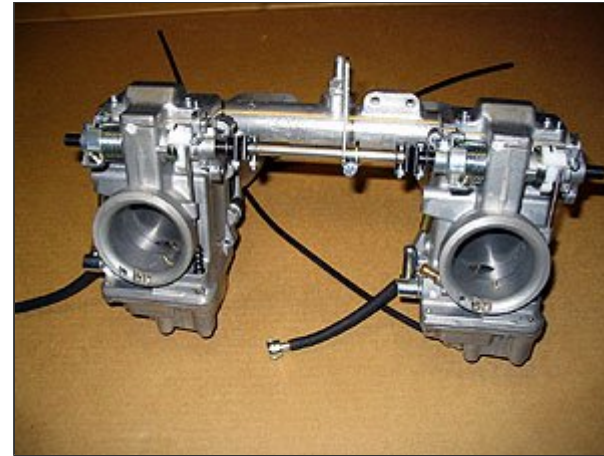
Mikuni Carbs



MGB and Sunbeam Alphine Mikuni installations are shown in the photos above.

The Mikuni HSR 45 is an advanced carb, originally designed to replace SU carbs on motorcycles, that we have adapted both as an SU replacement on normally aspirated engines and, in modified form, for use in our supercharger system. It has the flexibility to provide both improved power and fuel economy. Our Mikuni carb kit is designed to be an easy to bolt-on replacement for SU carbs, right on the stock SU manifold. The kit includes two carbs, two carb to manifold adapters, a throttle shaft, linkage to adapt to the

SU linkage, and two K & N air filters. Improved for 2007 with a smaller needle and seat to eliminate the need in most applications for a fuel pressure regulator. Check the price list for further updates.



Originally designed as an SU replacement performance carb for Harley Davidson motorcycles, it is a larger version of flat slide carbs used on smaller motorcycles. The size, essentially the same as the 1 3/4 inch bore or an HS6 SU, and incorporation of an accelerator pump jet makes it perfect for automotive applications. Carburetor development for automobiles stagnated more than 30 years ago when automotive manufacturers turned to fuel injection to meet emissions and fuel economy requirements, while at the same time, the evolution of carburetor design for motorcycles, snowmobiles and jet skis continued at a rapid pace. Fortunately, automotive enthusiasts can now benefit from those years of continued development. Essentially the Mikuni flat slide is the most advanced product of those years of evolutionary development which began with the traditional SU carb of the 1950s.

These carbs are reliable and easy to tune and maintain. Parts are less expensive and fewer in number than in most automotive style carburetors. Compared to SU carbs, they are easier to tune because specific

jets meter fuel for various throttle openings. Compared to a sidedraft weber, tuning is much simpler, cheaper and more direct since there are no emulsion tubes, replaceable venturies or the need to guess as to what the result of a change will be. It is hard to describe how much of a pleasure tuning these carbs can be, as compared to SUs or Webers. You really have to experience it to fully comprehend the difference.

For additional details on these carbs, a complete tuning and parts manual is available online from Mikuni. Go to www.mikuni.com/fs-manuals.html and click on "HSR tuning manual."

Our new installation Instructions are in the "Articles" section.



The Dual Mikuni Kit

With either HSR 42mm or 45mm carbs with extended throttle shafts for dual mounting, including linkage & manifold adapters - \$795.

Manifold adapters for various different car models are available. With K & N black top air filters -\$875. With chrome top filters - \$890. Kit now includes one pair of larger main jets.

Extra jets - \$5.50 a pair - recommended .

Our new chrome filters have the same provision for a breather hose as the black tops. Add \$110 for silver ceramic coated aluminum SU intake manifold - \$55 for the manifold used, uncoated. Extra main jets \$5.50 per pair - 2 pairs of larger mains recommended. Accelerator pump jets \$8 per pair. Re-profiled jet needles \$15 per pair.

New Quad Mikuni Kit The Ultimate Carb Kit

A unique and totally cool setup! 4 HSR Mikuni carbs on a Weber DCOE type manifold for large displacement and high HP racing and street 4 cyl. engines. Carbs and adapters only - \$1550. Carbs, intake & linkage adapters, B20/21/23/230 intake manifold & air filters - \$1995 Email for kit prices for non - Volvo applications

MGB and TR4 Dual Mikuni Installations



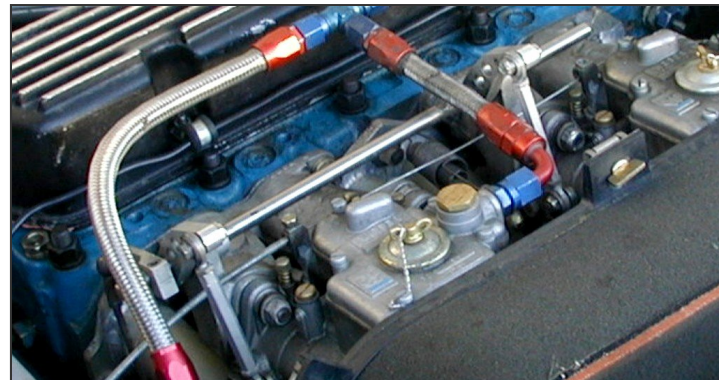
Dual side draft DCOE Weber carbs, used (when available) and new, 40, 42, and 45mm, set up for specific applications and matched to manifolds, porting, cam, etc. Linkage kits also available. We are not a traditional "dealer" of these carbs, but recognize the need to provide specific carbs to go with our performance modifications.



Although these are still the standard for vintage racing, the Mikunis in this section are usually a better choice for street use. Production of these carbs has been intermittent in the last few years but they are now available again, including the newer type 152 - 45 DCOE , and the classic and hard to find classic Type 9 - 45 DCOE . Check the price list for current pricing.

Linkage

Throttle Linkage Lever Arms - Top quality, custom made, machined aluminum throttle linkage arms for Weber sidedraft and other similar carbs - \$ 33 each. Email or call for prices and availability of other linkage components including custom made, braided stainless steel throttle cables.



Air Horns

Full radius aluminum air horns - in several lengths for Weber DCOE and similar type carbs - \$54 each.



The air horns shipped with Weber carbs are basically for decoration only. In dyno testing on Volvos we usually get better power with them removed. The full radius horns really work to improve flow and are available in several lengths to help with tuning. On our Volvo engines we usually find that the shorter horns work best.



Mikuni air horns with screen type filters - perfect for race applications or other occasional use - \$120 a pair.



Mikuni air horns with screen filters on Jim Grey's TR4 vintage racer



Filters



ITG Foam Air filters - Imported from England for sidedraft carbs - email for details and pricing.

Available in various sizes, the rounded shape allows them to fit where square filters will not.

Mandatory for use with Weber sidedraft carbs and the longer manifolds on the Volvo 1800.

Accessories

Mikuni HSR jets - main jets - \$5.50 per pair. Accelerator pump jets \$8 per pair. Re-profiled jet needles \$15 per pair.

Soft mounts and spacers for SU and other carbs in performance applications - email for details.

Weber DCOE Jets and Accessories Main jets \$6. Air correction jets \$6. Idle jets \$7. Email for prices on other jets and accessories.

Used Weber Sidedraft carbs We usually have used Weber DCOE carbs in stock. Email for availability and pricing.

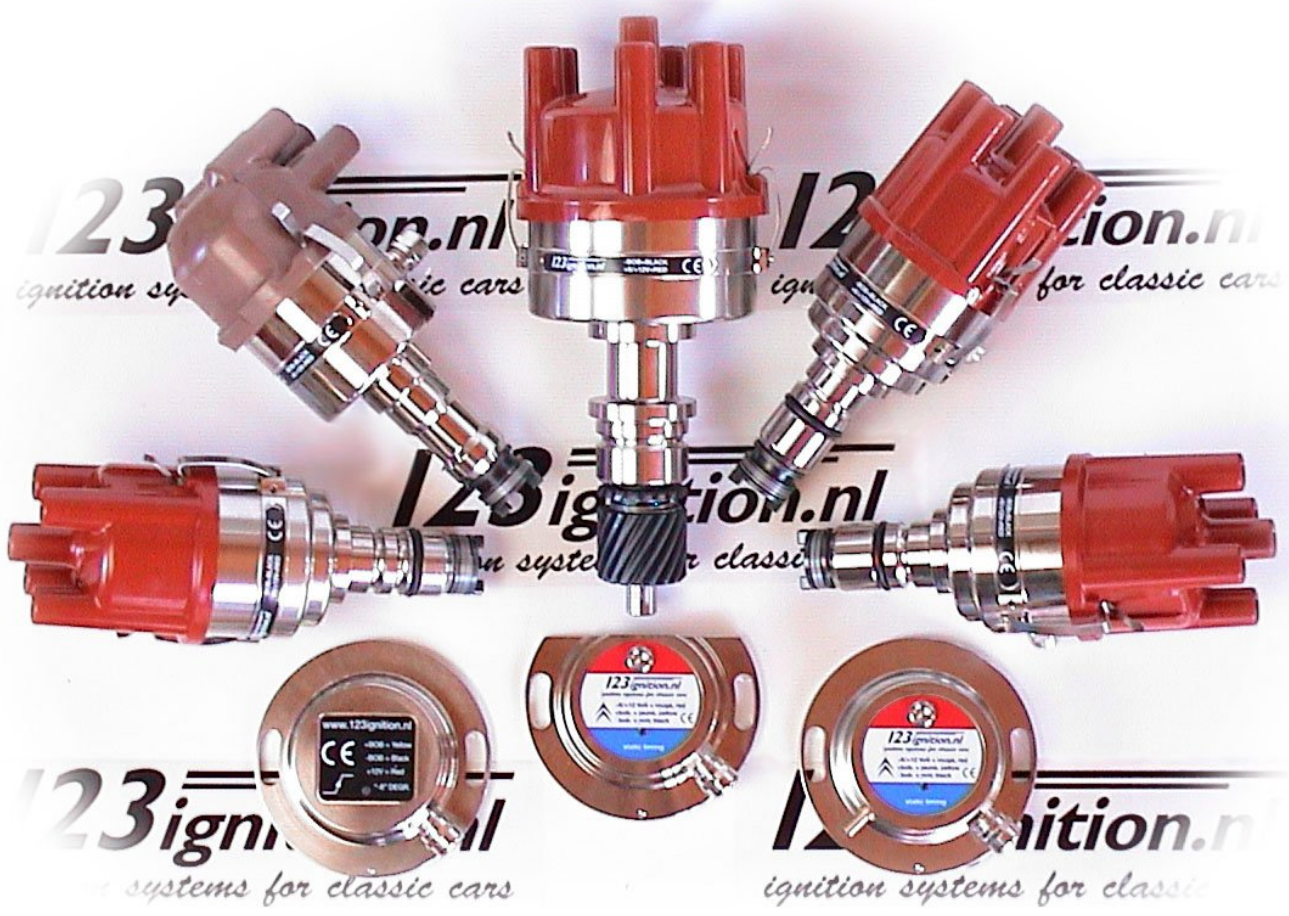
Ignition

Spark Options

We only offer two ignition components. Both are high quality parts, designed to fill a specific need, and built on a limit basis by small companies. Both work on vintage Volvos as well as on a wide range of other vintage cars

123 Distributors

The newest addition to our line of products are the unique 123 Distributors from Albertronics in the Netherlands. Available for Volvo B16, B18, and B20 engines, as well as MG, Mercedes, Minis, Jags, Porsche, Triumph, VW, etc. In these new distributors the mechanical parts of traditional distributors that are subject to wear (points, advance mechanisms, etc.) have been replaced by electronic components that provide the right advance and optimal dwell angle throughout the rev range to provide peak spark energy and improved performance. They have an excellent reputation for reliability, are a drop in replacement with 2 wire hookup, and have both selectable centrifugal advance curves and vacuum advance. A great upgrade for any vintage car and a much better option than electronic ignition kits that still leave you with an old distributor with unknown amounts of wear. A complete range of 123 ignition distributor's is available for Aston Martin, Austin-Healey, Austin, Citroen, Fiat, Jaguar, Land Rover, Mercedes, MG, Mini, Morris, Peugeot, Porsche, Rover, Triumph, Volvo and VW as well as other Lucas and Bosch distributor equipped cars. \$399.95 for the standard Volvo B18/B20 version. \$414.95 for the unit designed to be used with Volvo DJet fuel injection. Prices for other vintage cars are similar. Email for the details for your make and model. Discounts for group purchases are available.

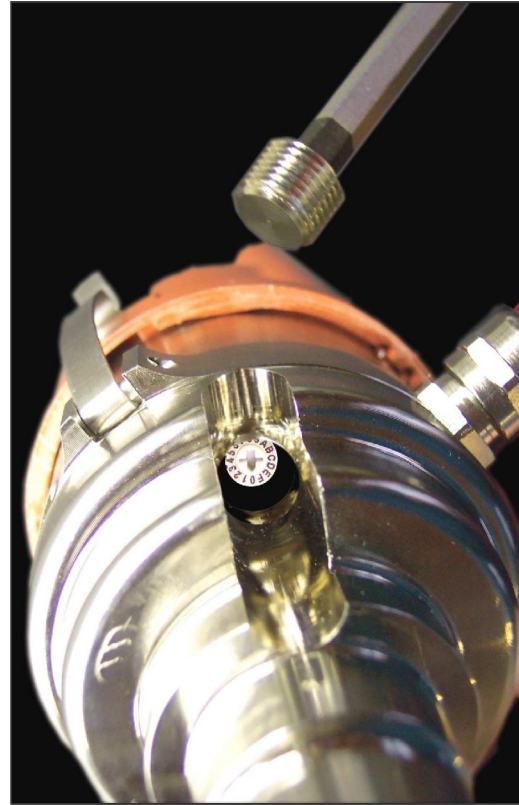


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SafeGuard Ignition Control

Knock Sensing Ignition Control Systems

These are perfect for either high compression or forced induction applications. The adjustable ignition retard system based both on knock and boost will allow an engine to run a higher compression ratio and/or higher boost pressure than is possible without the system. On our supercharged engines this system has allowed 50% increases in boost. They also include an adjustable rev limiter. Highly recommended for high CR or turbo/supercharger applications.



Includes adjustable RPM limiter.

With MAP sensor for both boost and knock based adjustable timing retards - \$495

With knock retard only, for normally aspirated applications - \$450

With A "dual monitor" senses and displays information on both air/fuel ratio and detonation. A very useful addition to the knock sensing ignition system that facilitates tuning.
\$179

Exhaust

Headers

For the B18/B20 we now essentially have two headers - a 4-1 race header that is made to order, and a new 4-2-1 "tri-Y" header custom made to our specifications right here in northern New York. It is similar in general concept to the header we used to import from Europe, but with several improvements and better quality control. It was designed to provide clearance for a variety of intake manifolds, alternator clearance, and upper A arm clearance on 122s & 1800s set up with less than stock camber. It is less expensive than a 4 into 1 of comparative quality, and allows more room for plumbing. The tri-Y design normally produces more torque and has a wider power band in most applications, but may yield less peak horsepower at high RPM than a properly designed 4-1 header. The 4-2-1 is recommended for most applications from street, to autocross, to rallying, and even road racing applications where a broader power band is more important than high RPM peak power.



Street Performance 4-2-1 headers - New and improved design made in the USA for 544s, 122s, 1800s, and 140s. Designed to increase power and torque over a wide RPM range. Will work with a variety of intakes but may not fit on cars with generators. \$325 Normally stocked with silver ceramic coating & O2 sensor mount - \$ 465

4 - 2 - 1 headers for 240s, 740s and 940s, imported from Sweden on special order.

Custom Built Race headers 4 - 1 - \$450 - \$485 depending on tube size

Ceramic Coating of any of the headers, black or silver - \$140

Exhaust Systems

Mandrel bent, stainless steel tube systems.

Selected performance exhaust system components are now ready for 122 sedans and 1800s in stainless steel. For most applications they consist of a muffler, resonator and mandrel bent tubing. Locations of components are essentially the same as stock. Although designed to attach to our exhaust headers they can be adapted to other headers and stock exhaust manifolds. Some components are available in 2", 2.25", as well as 2.5". Components are available separately so that you can use them to make custom systems with your choice of mufflers. Complete sets of stainless steel 2.5 inch mandrel bent exhaust tubes for most models without mufflers - \$250. Over the axle stainless tube section as a separate piece - \$175. Email for more details.

Driveline

Clutch

High Performance Clutches

Testing has shown that the stock clutches cannot cope with power levels approaching or exceeding 200 HP, especially with drivers who like to show off their power with rapid starts and wheel spin. To solve this problem we are now stocking a line of upgraded clutch products including several different types of performance clutch discs and upgraded pressure plates.

The application of these parts is not limited to those cars equipped with turbos or superchargers. Within a range of products there are clutch discs and covers that are perfect for normally aspirated as well as turbo cars, including 240s and 740s. Disc choices include carbon fiber, kevlar, solid hub and button type discs. Clutch covers include those with ranging from stock to 100% additional holding power. Package deals are available with our aluminum flywheels for a true performance clutch and flywheel setup.

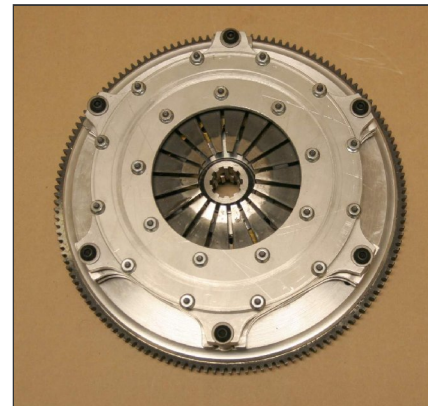
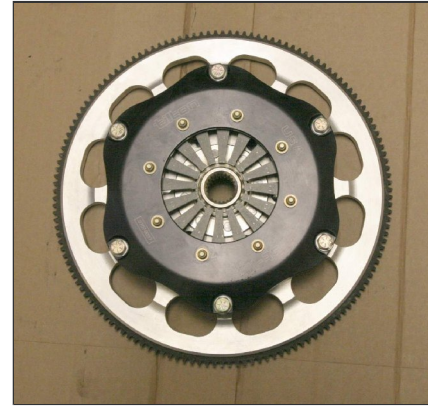
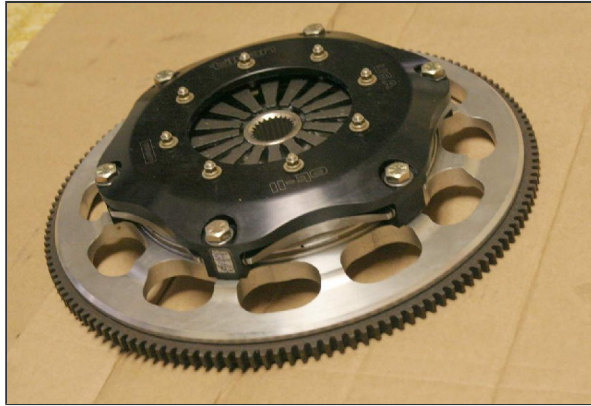


Applicable to Volvo M40/41, M45/46, and T5 and T9 transmissions, 8.5 " diameter unless otherwise stated, others by custom order

- Light weight OEM type pressure plate \$90 - This is a Sachs 240 style pressure plate. Recommended as an upgrade for use on earlier cars as it is lighter and stronger than the earlier style clutches used on the 544/122/1800/140.
- Dual spring pressure plate - \$275 - This is our older style PP made for us by Clutchnet. Good holding power but not recommended for cable clutch cars.
- 2 New and improved designs for 2007 include the following two clutch pressure plates.
- Modified pressure plate and heavy duty clutch disc. Designed for street applications in the 200 - 250 HP range where a stock feel clutch is desired. This is a new product designed and tested in 2006 and is superior to those available previously - \$400 with heavy duty organic disc. \$455 with kevlar disc recommended where semi race use is expected.
- New dual disc street clutch designed for higher HP including street/race applications. Uses the stock 8.5 inch clutch bolt pattern. This clutch can do it all - handle high torque loads (350 ft.lbs +) and abuse, but with a street clutch feel & normal clutch pedal pressure. The weight of 13 lbs with discs is less than a stock single disc clutch with disc. Price depends on the disc type and input shaft splines - \$850 - \$960 including discs.
- Street performance clutch discs - several types available from \$140 - \$195
- Severe duty organic discs- \$140
- High performance kevlar discs - \$195 availalbe with solid or sprung hubs

- Race type performance clutch discs - email for details
- Tilton race clutches

Dual disc clutches - 7.25" race - top, 8.5" street - bottom



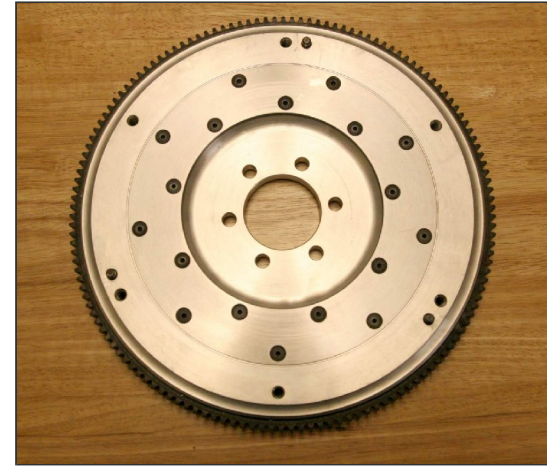
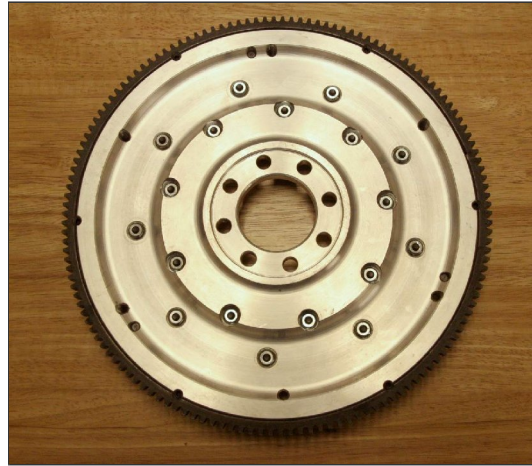
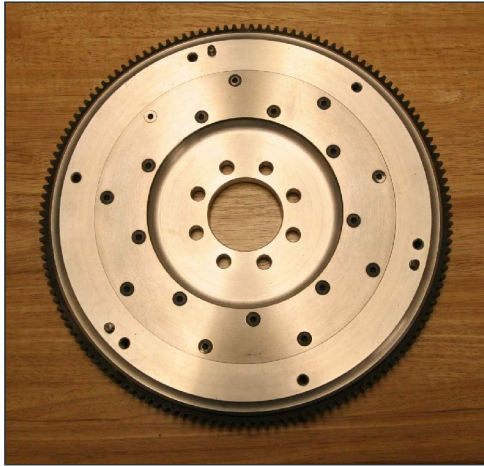
Aluminum Flywheels

Lightening the rotating mass is critical for high performance. The most significant weight reduction available is in the flywheel. This is a performance improvement that will help everytime the engine accelerates. Our aluminum flywheels are normally for RWD Volvos, but others can be provided on request. Street AL flywheels are usually less than half of the stock weight. Race AL flywheels less than 1/3 stock weight.

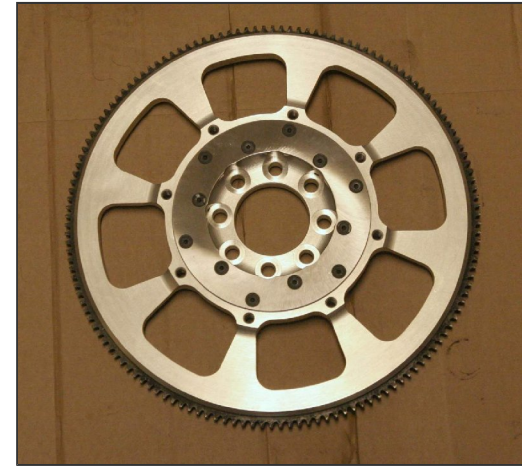
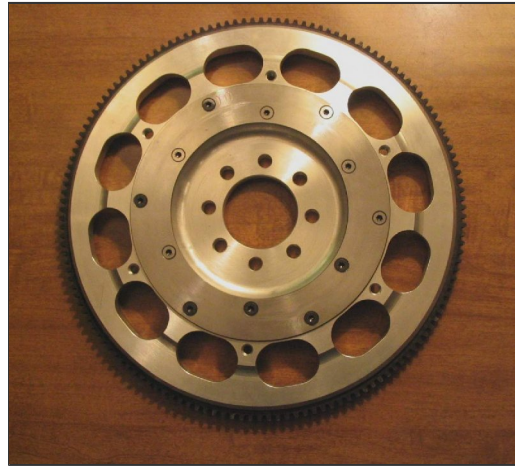
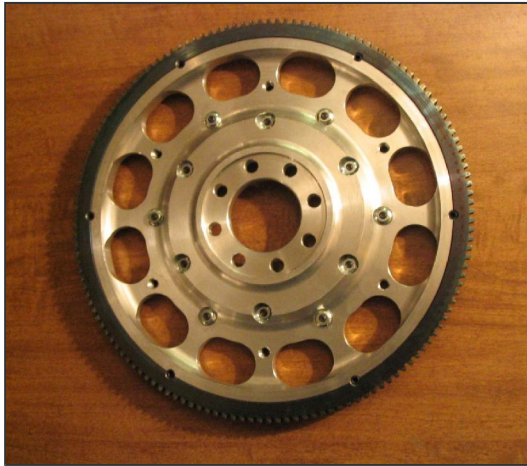
- Street - 8.5 inches - 9 lbs. (stock flywheels are 22 lbs. or more!) Can be used on all rear drive Volvos - Specify 6 bolt (' 73 and earlier) or 8 bolt (' 74 and later) crank - \$450
- Race Flywheel for 7.25" Tilton clutch - 6 lbs. \$560* 5" and 8.5 " versions also available.

For precision balancing add \$60. The flywheel should be balanced with the clutch pressure plate to be used. Aluminum flywheels often require a longer release bearing and/or clutch fork pivot modification. Email for details.

Six and eight bolt street aluminum flywheels for 8.5" clutch - 9 lbs.



Race flywheels for 7.25" and 5" clutches.



Rear End Gear Sets

Increase your rearend ratio for race or rally. Decrease the ratio for highway cruising. 3.73, 3.90, 4.1, 4.56, & 4.88 ratios available for the Dana 30 - \$220

Limited Slip Differentials

For Dana 30 rear ends - 27 spline - all disc brake 1800s, 140s, 240s, etc. we recommend the Truetrac® Limited Slip. The Truetrac® is Tractech's limited slip differential . This is an all gear driven differential that automatically provides smooth torque transfer for traction on demand. The Truetrac® provides durable and dependable performance with no loss in power and no clutch plates to wear out. - \$540 (due to manufacturer's price increase)

The original equipment disc type Dana "Powr-Lok" is not currently available.

Rearend Conversions

The most common conversions address the safety problems associated with the rear drum brake cars. Unfortunately, breaking of the rear axles on drum brake cars has been a continuous problem in Volvo performance applications since



the '50s. As the power and handling of these cars have improved, the stresses on this comparatively weak component has increased the rate of breakage. In vintage racing, most cars raced for more than a season with the original axles have suffered breakage and serious consequences. Options involve either the replacement of the rear end with a Volvo disc brake housing, or modifying the original housing to use Ford axles and drum brakes as was done on my race car more than ten years ago. (It still beats the disc brake rear cars.) Please e-mail for details.

Transmission

Conversions

The Borg Warner (now Tremec) T5 transmission is a comparatively lightweight (70 lbs.), 5-speed transmission that has been manufactured for the past 20 years for various OEM applications and is found in Fords, Chevies, and various other cars and trucks. The transmission is of a modular design and can thus be found with various input shafts, tail shaft housings, shifter positions, etc. It is comparatively simple to modify and repair and parts are readily available at quite reasonable prices. It went through a process of upgrades over the first years of its manufacture, increasing its HP and torque ratings from 200 ft. lbs. to over 300 ft. lbs. The uprated versions are commonly known as "World Class" T5s. (In applications where a higher torque rating is required Tremec 3550 TKO transmissions are available.) Fifth gear is an overdrive fifth, comparable in ratio in some models to the gearing in Volvo's overdrives, in others it has higher or lower overdrive ratios.

We are now stocking adapter plates, CNC machined from 6061 T6 aluminum, that allow a T5 transmission -- usually from a '92 and earlier 5-liter Mustang -- to be mated to either an M40/41 or M45/46 bell housing and their associated engines. Using this adapter plate and a recommended transmission, the shifter will be in the stock location in an 1800E/ES, a 140 with rearward shifter location, and the 240. On the 740 the shifter will be over 1 inch farther forward than stock.

The aforesaid cars all have transmission tunnels wide enough to easily accommodate the T5. The T5 needs a wider transmission tunnel than is normally found in the 544 and early 1800s and 122s -- 9 inches wide vs. 14 inches for later cars. Some of the older cars may have been made or modified to accept an automatic transmission and thus have the wider tunnel. In cars with the narrower tunnel modifications can be made to accommodate the T5 and the best way to do this may be the installation of a wider tunnel from a later car or the use of a narrower transmission. If in doubt, first measure the width of the tunnel.

We are currently not marketing this trans swap as a complete kit. Most of the additional parts needed are readily available. The pilot bearing, throwout bearing, clutch fork, slider yoke, and clutch disc, are stock items, either Ford or Volvo. The Volvo clutch fork has to be modified to fit the Ford throwout bearing and we now can provide this modification. In the future we will have transmission mount adapters for some models.

We also have performance clutches, discs and pressure plates for these applications which will allow the clutch to handle much higher power outputs than the stock clutch can take.

Parts needed for a T5 swap:

- T5 transmission -- Recommended is the T5 from an '88 - '93 5-liter V8 Mustang. In selecting a transmission particular attention must be paid to the input shaft length, as this length determines whether a particular transmission will work with our adapter plate and Volvo bell housing. Transmissions are identified by their tag number, not any of the numbers stamped on the housings. With the tag number you can determine the transmission's OEM application as well as gearing and input shaft specifications.

Details on the Ford version of these transmissions can be found at the FordMuscle magazine website:

www.fordmuscle.com/archives/2000/09/t5swap/index2.shtml or go to the "T5 transwap" article, then either to the "manual - trans manual article" and/or the T5 identification chart.

Transmissions typically range in cost from \$1200 - \$1300 for a new Ford T5, to \$600 - \$900 for a rebuilt transmission, to \$200 - \$500 for a used trans. In the used market, the T5 from the '88 - '93 Mustang usually sells at a premium as it is one of the most desirable for various transmission swaps due to its input shaft length, power handling capacity, and gear ratios.

- Adaptor plate -- We have adapter plates in stock. \$160 for the plate for use with the M40/41 bell housing used with the B18/B20 engines. For swaps into 240s, 740s, etc., an adapter plate and machining of the M45/46 bell housing is necessary -- \$250 including the machine work done on your bell housing or as a core exchange.
- Ford throwout bearing -- The Ford throwout bearing is used with the Volvo clutch fork. The fork has to be modified to fit the Ford bearing and to move the bearing closer to the clutch pressure plate. For cars with cable operated clutches the pins in the fork have to be ground to shorten them to fit the larger diameter of the Ford throwout bearing and machined offset spacers, that we provide, are inserted over the pins. Details on the modifications needed for other types of clutch forks can be provided.
- Ford pilot bearing -- For the T5 from the V8 Mustang the Ford pilot bearing is used and fits the Volvo crank without modification. For the T5 from the 2.3 liter Mustang the stock Volvo pilot bearing can be used.
- Slider yoke -- This fits onto the tailshaft of the transmission and becomes part of the first universal joint of the driveshaft. Approx. cost - \$30 - \$40.
- Driveshaft -- Although the stock driveshaft can be modified to take the slider yoke, in most applications a one piece drive shaft is recommended. Approximate cost of a 2-1/2 inch one piece shaft done by a drive line shop is \$200. Care must be taken to check that there will be sufficient clearance at full suspension travel up and down.
- Transmission mount -- An adapter has to be fabricated to adapt the T5 to the stock transmission mount. On some models this is as simple as adding a steel angle to the stock mount. It is crucial that the mount be designed to maintain proper transmission height.

correct splines for the Ford T5 input shaft. These are available as a stock Ford part or in various aftermarket performance versions. We normally stock performance versions of this disc, the most popular being the carbon/organic that provides significant additional holding power and long life in performance applications while retaining a stock feel. Some Volvo turbos have a 9 inch clutch. We can provide 9 inch performance discs to match this clutch and flywheel on a custom basis. See our website price list for clutch disc prices.

- Clutch pressure plate -- The Volvo pressure plate can be used with an appropriate disc and other parts described above. For high performance applications with power over the 200 HP level we recommend a modified pressure plate. This is normally in stock.

- Flywheel -- Most of the RWD Volvos have a flywheel designed for use with the 8.5 clutch. Some cars have a 9 inch clutch with heavier flywheel. For performance applications we recommend replacing the flywheel with the lighter 8.5 inch clutch version. We can also provide lightweight aluminum flywheels for both 6 and 8 bolt cranks. These weigh approx. half the weight of the stock 8.5 inch clutch flywheels and are much safer than attempting to machine weight off the stock flywheel.

- Shifter -- The T5 often comes without a shifter or shifter handle. Shifters and shifter handles in different configurations are readily available from aftermarket suppliers such as Hurst, B&M, etc.

- Speedometer drive adapter -- Adapters will have to be worked out on an individual basis until we can include adapters in complete trans swap kits. On models with an electronic sender no modification is usually necessary.

We also offer the parts necessary for customers to do their own transmission swaps. CNC machined aluminum adapter plates to attach the BW T5 to Volvo M40/41 and M45/46 bell housings, along with other parts needed in the transmission swap, are usually in stock. Some parts such as a modified driveshaft and transmission mount are usually provided by the customer. The M45/46 swap requires machining of the bell housing in addition to the adapter plate. We now have a good stock of these bell housings that have already been machined. Instructions and lists of the other parts needed for the T5 transmission swap are available. See the T5 Transmission Swap section of the website, under products, for details. Adaptors for other transmissions, including the Ford T9 (Merkur, XR4Ti, Sierra), which will fit the narrower trans tunnel on the earlier cars, are also available. See the clutch and flywheel sections above for components that will work with these transmission swaps.

- T5 adapter plates for B18/B20 - \$175

- T5 adapter plates for 240/740 with modified bell housings - \$250 Core charge \$100 if we provide the bell housing. Modified bell housings in stock. No transmission modification required. Send us your bell housing to save on the \$100 bell housing core charge.

- Modifications to cable type clutch forks for use with Ford release bearings - \$20 Inserts - \$20 Core charge - \$50

- Modifications to hydraulic type clutch forks for use with Ford release bearings - \$40 Core charge - \$50

- Ford release bearings - Steel high performance type - not plastic - \$50

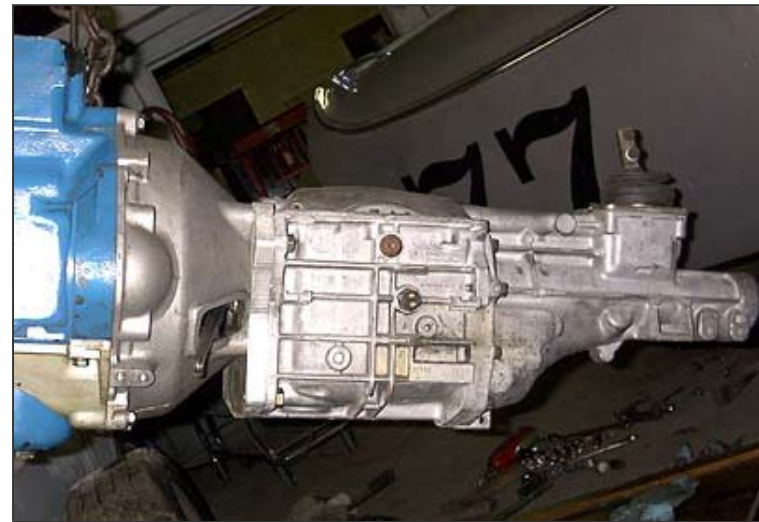
- Special pilot bearings for use with the T5 from the 5.0 L Mustang \$25
 - T5 Slider Yoke - \$60
 - T 9 adapter plates for B18/B20 - \$175
-

T5Z Close Ratio Transmission

These transmissions are based on the Ford Motorsports T5Z aftermarket trans from Tremec, custom built to our specifications. The heavy duty T5Z has a cluster gear reinforcing plate and stronger fifth gear to meet the needs of customers whose street or track use requires a T5 with higher HP capacity and a close ratio fifth gear that can be used for acceleration rather than just highway economy cruising. The combination of both a 2.95 first and .80 overdrive 5th gear, a combination not normally available, make this a close ratio trans. Also available with .73 or .90 fifth gears. We now also offer an economy version which leaves out the reinforcing plate and uses a stock type .73 5th gear, saving \$300 in the initial cost and giving better highway fuel economy in most applications.

HD T5Z with cluster gear reinforcing plate and stronger than stock .80 5th gear. With stock shifter \$1995. With billet Pro 5 quick shift shifter \$2165.

Economy version T5Z with 2.95 1st and .73 5th. With stock shifter - \$1695. With Pro 5 shifter - \$1895.



Either trans can be supplied with the Slick Shift shifter that allows the shifter position to be moved back several inches - ideal for the 700 and 900 series Volvos - . Email for details.

T9 Ford Sierra

The perfect replacement 5 speed transmission for those pre - 1970 cars with narrow trans tunnels. Customers have complained that they can't find used versions of this transmission in the US, so we have arranged to provide rebuilt units imported from the UK - \$1200 Email for details on special introductory offers.

Cars

Custom Racecar Development

P1800 Vintage Racecar For Sale

Sold for the asking price, but we can build you one like it!

One of our recently built 1800 vintage racecars is for sale. The car has only 3 races since a complete rebuild in 2002. Its setup and equipment are typical of our vintage racecars. Nick did a beautiful job on the body as shown in the photo below. The engine is our 2 liter vintage race engine with dual Weber 45 DCOE carbs, forged pistons, BHP cam, Crower rods, baffled oil pan, ported race head, 13 to 1 compression ratio, dynoed at over 200 HP. The suspension includes Carrera adjustable shocks, race springs and adjustable front sway bar. The car has 4 wheel discs brakes, Tilton brake cylinders with adjustable bias, aluminum flywheel, Tilton 7-1/4 inch clutch, fire system, etc. This is a good value at the \$15,000 asking price as the car is ready to race. A trailer and extra set of tires and wheels is also available for a complete race package.

More Photos



1963 P 1800 for Sale

One of our customers has asked us to sell his P1800 that is currently in our storage garage. He lives outside of the US and has decided that the cost of transporting the car is more than he wants to spend. The car is in decent running condition, although it has not been on the road in several years. It has a new interior and comparatively new paint though there are areas that need some additional work. The body is basically solid with no obvious rust problems. Not a show car, but could be a fun daily driver in its present condition, while needing some body and paint work in the future to bring out the car's potential. Photos will be added shortly. Email me at jparker3@twcny.rr.com for details. \$5200.

Universal Products

123 Distributors for all makes

Under construction. See the ignition section above.

Mikuni Carbs for all makes

Under construction. See the Carb section above.

>> Questions - Order Process - Payments

Questions -Email correspondence strongly preferred. Email with questions on your particular needs as we have many other parts and services available. If we don't have it we can usually get it or make it. If you need to call, try 315 478 1229 mornings 9:00 AM - 12:00 noon eastern time. Leave a message if there is no answer as we may be in the shop and cannot get to the phone, or try cell # 315 440 6560 if necessary. There are often periods of 3 - 5 days, especially during the summer, when we are gone due to racing and other commitments. Calls and emails are replied to when we return.

Orders - Where possible email your parts order along with your zipcode and we will reply with information on parts availability and a total price with shipping. Please include information indicating the car model & year with each email.

Payments - Payments are normally made by check, money order, COD, or through Paypal (www.paypal.com) Credit card payments are currently only accepted through Paypal. Payments made by Paypal should be made to the account under our email address: jparker3@twcny.rr.com
