ENGINEERING, INC.

RACE SUPERCHARGER SYSTEM OWNER'S MANUAL

The following information and recommendations are designed to promote a long, trouble-free service life for your supercharger. Each Vortech supercharger system is built to precise tolerances using the finest materials available.

SECTION 1
ENGINE STARTUP AND FUEL CONSIDERATIONS

1. Never operate your engine at full throttle when the engine is cold. When starting the engine each day, always allow time for the oil to reach full operating temperature before running above 2,500 RPM. Full supercharger operating temperature is generally achieved only after the engine water temperature has been at the normal indicated operating range for two or three minutes.
2. Always use the highest octane fuel available.
3. Always listen for audible detonation.

SECTION 2
GENERAL SUPERCHARGER SUPPORT SYSTEM RECOMMENDATIONS

1. Air Filters - Always use an air filter on the supercharger inlet to prevent the supercharger from ingesting foreign objects.
2. Air Intake/Air Discharge - Must be in good condition and properly secured. If equipped with a flex hose, this must be free of damage/leaks.
3. Belt Tension - Excessive belt tension can lead to supercharger or crankshaft bearing failure. Do not use a non-slipping or cog-type belt on a supercharger designed to be driven with a serpentine drive belt (non heavy duty). Replacement belts for your application are available from Vortech.
4. Crankcase Ventilation System - You must use the free flowing, baffled system provided to prevent excessive crankcase pressures and possible engine damage.
5. Pulleys - If the supercharger drive belt comes off during operation, it is most likely due to misalignment of the supercharger pulleys caused by installation problems or movement of the mounting plate. Misalignment can also be caused by overtightening (and failing) of the belt, which can negatively affect the supercharger and crankshaft bearings.

SECTION 3
NORMAL MAINTENANCE RECOMMENDATIONS

1. Clean the supercharger oil inlet fitting at every oil change. When the vehicle is cold, remove the oil inlet fitting at the supercharger and clean it thoroughly utilizing high pressure air to blow the orifice clean before reinstallation. Do not attempt to remove the screen/filter inside of the oil feed fitting. This oil inlet fitting is designed with a very small orifice, which provides a mist of oil directly onto the gears. Never use Teflon tape or other sealants on any oil feed line fittings. Do not overtighten fittings.
2. Use manufacturer's/engine builder's engine oil and oil filter recommendations. Do not use engine oil additives as they may contain solid particulates such as moly or Teflon which can clog the supercharger feed line.
3. Spark Plug/Ignition System Guidelines - Vortech recommends the use of spark plugs that are at least one to two heat ranges cooler than what is stock utilizing a plug gap of .030" - .040". The use of premium high performance "spiral core" ignition wires are required for optimum performance as well as dielectric grease on the inside of the wire boots. Ignition amplifiers such as Crane HI-6/7 or MSD 6/7AL are also required for boost levels over 10 psi.

SECTION 4
RECOMMENDED TUNING AIDS (AVAILABLE DIRECT FROM VORTECH)

1. Fuel Pressure Gauge
2. Boost Gauge
3. Ignition Amplifier/Boost Retard

SECTION 5
SUPERCHARGER CARE GENERAL RECOMMENDATIONS

1. Check and select your impeller speed per guidelines outlined in Section 7 of this manual.
2. Select the correct compressor performance for the job. Vortech offers compressor matching services to help you select the proper supercharger for your application. Contact the Vortech Sales Department for details.
3. Use the proper compressor bypass valve on all high rpm or racing systems.

SECTION 6
CUSTOM SUPERCHARGER MOUNTING INFORMATION

1. The supercharger must be mounted within 50° of vertical. That is 50° to the left or right with the lowest of the three oil return provisions selected for the drain. This is to provide proper return oil drainback

 25FEB00 V 2.0 DRAFT P/N: 008515

and help control oil drainage. Additionally, the input shaft must be parallel to the crankshaft. The compressor housing may be loosened and rotated virtually 360° for optimum outlet alignment.

2. The supercharger mounting holes are 3/8-16 x 7/8" deep. The tensioner plate holes are metric: M12-1.75 x 3/4" deep. It is imperative that the tensioner plate pivot bolt in the center of the gearcase cover not be allowed to bottom out.
3. Mounting brackets should be rigid, utilizing five of the six supercharger mounting holes. Construction should not allow the bracket to resonate in a critical range (this may depend on engine configuration), nor should the bracket offer any significant flex. Mounting plates should be at least .250" in thickness. For racing applications, we recommend a minimum thickness of .312".
4. An oil feed and drain must be provided. Filtered oil from the engine must not be contaminated by Teflon tape or other sealant that might plug the oil feed fitting in the supercharger. Vortech offers a supercharger oil filter kit for most installations.
5. Return oil to the oil pan using 1/2" I.D. hose (or larger) or -8 AN fitting (or larger) routed gradually downward with no dips, allowing the oil to enter the oil pan above the oil level. This is a gravity drain system. On applications such as endurance and/or road racing engines or for high speed sustained supercharger operation applications such as a freestanding engine, the use of two supercharger oil drains are required to evacuate the engine oil from the supercharger. An alternate method would be to use one drain hose off the supercharger and a vent hose attached to one of the other drain fittings off the bottom of the supercharger. Drain restrictions, kinks or returning the oil below the oil level in the pan may cause a severe windage problem that consumes significant power and generates heat. Supercharger seal failures may also result.
6. The oil feed fitting **must** remain in the original position on the supercharger gearcase as when it was shipped from Vortech. The oil entering the supercharger gearcase **must** flow in the same direction that the gears are rotating.

SECTION 7
SUPERCHARGER UNIT OPERATING PARAMETERS AND CONSIDERATIONS

1. SUPERCHARGER PRESSURE LEVELS
Engines will respond differently to a supercharger. Smaller displacement engines with less of a CFM demand will result in more pressure than a larger displacement engine, when the same two superchargers are driven at the same impeller speed. The higher pressure level in the smaller displacement engine is a direct result of more restriction. Engines with "large port area" heads and high lift/overlap camshafts may also exhibit lower boost levels. To make up for the pressure loss, the supercharger will need to be spun faster. Never spin a supercharger beyond its absolute maximum impeller speed. Supercharger reliability and adiabatic efficiency should be your highest priorities when selecting a supercharger. Vortech Engineering, Inc. superchargers excel in both of these categories, if correctly sized and ratioed for your particular application. Contact us directly, if you need assistance in sizing a supercharger for your application. We offer custom matching services at no charge.

2. IMPELLER SPEED
Maximum impeller speeds are not the same for all units. No unit will run at its maximum speed continuously without optimum conditions and additional coolers, filters, etc. Refer to the SUPERCHARGER SPECIFICATIONS & PERFORMANCE APPLICATION GUIDE section in this manual to find the maximum speed for your unit.

3. CALCULATING SUPERCHARGER IMPELLER SPEED:

$$\frac{\text{Crank pulley diameter* x 3.45** x engine rpm @ shift}}{\text{Supercharger pulley diameter*}} = \text{Impeller speed}$$

Example of Serpentine Pulley:

$$\frac{\text{7.0” x 3.45 x 6,000}}{\text{3.33”}} = \text{43,514 Impeller speed}$$

Example of Cog Pulley:

$$\frac{\text{73 cog pulley teeth x 3.45 x 7,500}}{\text{34 cog pulley teeth}} = \text{55,555 Impeller speed}$$

* When measuring pulley diameters, measure at the top of the ribs where the serpentine belt rides. For cog pulleys substitute the number of teeth for the diameter.

** 3.45 denotes the internal step-up ratio inside of the supercharger.
Substitute 3.60 for all V-2 superchargers.

SPECIAL NOTE: Premature supercharger failure can occur if the maximum impeller speed is exceed-ed. It has been observed and noted that some indi-viduals overspin their Vortech supercharger to make more boost during motorsport competitions. This action is not recommended and should be avoided.

4. AFTERCOOLING
It is important to realize that the higher the boost pressure, the hotter the air discharge temperature will be (simple physics). To overcome this phenomenon, Vortech has developed several air-to-water aftercooler systems that add significant overall engine horsepower by effectively cooling the discharge air. Due to their careful design, Vortech's aftercoolers experience minimal pressure loss through the core and duct assemblies. This minimal pressure loss is not attainable using conventional "intercoolers" that are improperly sized to an application. This means

Questions? Please contact: Vortech Engineering, Inc. • 1650 Pacific Ave., Channel Islands, CA 93033-9901
Phone: (805) 247-0226 • Fax: (805) 247-0669 • Website:vortechsuperchargers.com • Hours: M-F 8AM - 4:30PM (PST)

more overall horsepower and slower supercharger speeds to attain a significant horsepower increase.

5. BELTS AND PULLEYS
   a. Serpentine Drive Belts-The faster you spin a supercharger, the greater the tendency for belt slippage to occur. Most vehicles respond differently as to when the slippage will occur. 6 rib systems are more prone to slipping because they have less surface area for the belt to grip. An inherent design characteristic of serpentine belts is a certain amount of belt slippage. This mainly occurs on deceleration, but may also occur on acceleration if the belt is too loose or if the belt being utilized is not of sufficient width to transmit the horsepower being generated. Excessive belt tension can lead to supercharger or crankshaft bearing failure. For high boost/impeller speed levels, use the widest serpentine belt/pulley combination available.
   b. Cog Pulley Drive Belts-The only Vortech super charger designations that may be driven with a cogged (non-slipping) type drive belt have special internal modifications. There still exists the very real possibility of supercharger damage when using this type of drive, but this special configuration is more tolerant. The configured units show a "RACE H", "RACE M", "MARINE H" or "MARINE M" designation below the EO# box on the supercharger identification name plate. Non-slipping cog-type belts require less tension than serpentine belts due to their design. Excessive belt tension can lead to supercharger or crankshaft bearing failure. Do not overtighten the belt. If in question, please call Vortech to confirm your supercharger specifications for drive purposes.
   c. Miscellaneous Pulley Guidelines-The propensity for grooved belts to move over one or more grooves, or come off completely, is always due to an alignment problem. Either statically (the pulleys are misaligned due to an installation or tolerance problem) or dynamically (the loading or unloading of the system caused mainly by flex or movement of the mounting plate) may cause misalignment. Misalignment can also be caused by overtightening (and failing) of the belt, which can negatively affect the supercharger and crankshaft bearings. Some non-Vortech pulleys do not provide the precision fit and balance which are essential for performance and durability and are therefore not recommended. Never force or hammer on the pulley or supercharger input shaft. The pulley should barely slip over the shaft when it is 75-80°F. Always use a small amount of oil or grease on the shaft. The key to keyway fit is also critical, as is balance. The key provided by Vortech is the proper length and weight for a Vortech aluminum pulley. The use of steel pulleys is not recommended due to their extra weight and possible associated corrosion problems.

6. BYPASS VALVES - If the supercharger installation is used for racing or if the pulley has been changed, there exists the possibility of compressor surge (and its associated heat buildup) or overspeeding of the unit, either of which can lead to failure. Overspeeding the supercharger can lead to bearing failure or impeller rubbing. If no compressor bypass valve is used in conjunction with increased impeller speeds, compressor surge can exist, particularly during deceleration or during transmission shifts. This can lead to heating and subsequent expansion of the impeller, which can cause the impeller to rub the housing. Needless zinging (free revving) of the engine can destroy the supercharger if the pulley ratios are high, especially if no bypass valve is installed. Any Vortech supercharger that is producing more than 6 psi needs a compressor bypass valve to prevent compressor surge and possible failure of the supercharger. The standard bypass valve (P/N 8D001-001), that Vortech provides in most of its V-1 S-Trim, SC-Trim, T-Trim and V-9 G-Trim street supercharger systems will be sufficient to impeller speeds not exceeding 41,000 rpm and boost levels not to exceed 10 psi. If either of these operating parameters is exceeded, then a Vortech Maxflow Mondo Bypass Valve (part number 8D103-001) or Maxflow Race Bypass Valve (part number 8D204-001) must be used to prevent compressor surge. The above listed operating parameters should also be used when running a V-1 A, B, S, SC-Trim, V-5 D-Trim, G-Trim, F-Trim or V-9 G-Trim, F-Trim on your application. Most V-1 R-Trim, V-1 T-Trim, V-3 and V-7 superchargers require the above mentioned racing or Mondo bypass valve when used with high boost or racing applications. All V-4 superchargers require the use of two Mondo bypass valves mounted in parallel. When using an adjustable bypass valve, it is very important that it opens and closes at the proper times. The valve should begin opening between 3-4 inches of vacuum and be completely open between 6-8 inches of vacuum.

SECTION 8
SYSTEM OPERATING PARAMETERS AND CONSIDERATIONS

1. SUPERCHARGER MOUNTING HARDWARE
Supercharger mounting brackets must be rigid to minimize flex or vibration under racing conditions. Vortech addressed this subject in the development of its race bracket packages like the V-3/V-4 race bracket/pulley package (P/N 4FP218-010) and the crank/strut support module (P/N 4FP110-010). Other manufacturer's products may flex and cause severe vibrations under certain extreme conditions. Vortech does not recommend mounting a strut rod from the supercharger to any part of the body or shock tower due to excessive vehicle body flexing (including solid motor mounts or motor plates) evident during racing conditions.

The above mentioned parts are strictly Ford specific.

APPROVED MOUNTING PLATE SUPPORT METHODS ARE AS FOLLOWS:

- An adjustable strut rod between the crankshaft and the supercharger pulley.
- A static strut rod between the supercharger mounting plate and the engine (header, flange, etc.).

2. DRIVE BELTS - Vortech recommends the use of the widest cog belt that is practical and one that is Kevlar reinforced, to be used to help prevent belt breakage. The belt must not be overtightened. A cog belt by design is a non-slipping belt. It only needs to be snugged up. It is recommended that the belt be properly tightened only after the engine has warmed up. This is due to thermal expansion of related components. When the vehicle is running, the belt may look as if it is loose and requires more tension. Do not buy into this misconception. The belt will not come off provided that the supercharger bracketry is sufficiently rigid. If you overtighten the belt, you may cause crankshaft and/or supercharger bearing failure which will also cause a premature drive belt failure. Do not overtighten the belt!

3. DRIVE PULLEYS - When utilizing other manufacturer's supercharger and crankshaft pulleys, it is imperative that the pulleys be matched correctly. The profile of the teeth on the crankshaft pulley, supercharger pulley and the drive belt must match each other (i.e. HTD, Polychain, etc.). The overall pulley runout must not exceed .010". It is critical that the pilot on the harmonic balancer fit snugly into the inside of the crankshaft pulley. Runout must also be checked once the crankshaft pulley is installed onto the harmonic balancer. This can easily be done by turning the engine by hand and utilizing a magnetic base with a dial indicator. The pulleys also need to be properly balanced. If the pulleys suffer from excessive run-out and/or from an out of balance condition, severe vibrations will occur and may cause an engine and/or supercharger failure. All Vortech pulleys are rigorously inspected in our Quality Control Department and will provide "vibration-free" operation when properly installed. It is always better to start with a larger supercharger pulley and lower shift points to help with dialing in the engine and the suspension. Later, you can put on smaller supercharger pulleys and raise your shift points as your problems are resolved. Only the crankshaft and idler pulley should have flanges on them. The supercharger pulley should not have flanges. Pulley flanges cause excessive load on the input shaft bearings by pulling the input shaft in and out during acceleration and deceleration. This may cause premature failure. The supercharger drive assembly (Ford specific) component (P/N 4FP116-011) of the V-3/V-4 Race Bracket Pulley Package addresses this issue with excellent results.

4. AIR FILTRATION - Always use some sort of air filtration device on the supercharger air inlet to prevent debris from being ingested into the supercharger. If the supercharger impeller is damaged by debris, the impeller will become out of balance. If you continue to use the supercharger with the impeller out of balance, it may fail. The air filter should be checked every maintenance schedule (cleaned and/or replaced, as needed). In addition, there is a Vortech factory-applied black index mark between the impeller and the impeller shaft/nut. If the impeller has moved in relation to the impeller shaft/nut, this line will be broken. If this occurs, it is very likely that the impeller has touched the compressor housing. The supercharger should immediately be returned to Vortech for inspection.

5. ICING DOWN - It is very important to observe the following guidelines regarding "icing down" the engine and supercharger between runs. Wait 20 minutes after a run before placing ice on the supercharger. Always remove the ice 30 minutes before the run. It is preferable to use a large electric fan instead of ice. "Icing down" the supercharger, especially outside of these guidelines, can decrease the impeller to housing clearance due to a differential in thermal expansion and allow contact that may lead to total failure of the unit. The supercharger was designed to operate with a minimum impeller clearance. The use of ice was not a design consideration and is not recommended.

6. ENGINE TUNING/FREE REVVING
   When tuning the engine in the pits or garage area using the transmission brake to load the engine, it is recommended not to rev the engine beyond 6000 rpm. When the engine is decelerated, you must slowly decrease the engine rpm's over a period of three to four seconds. Rapid engine/supercharger deceleration may cause engine and/or supercharger failures. Any free revving of the engine without a load on it can cause premature supercharger failure. Do not free-rev the engine with the supercharger belt in place while attempting to dial in fuel pressure, "clean out" the engine on the starting line, etc. We recommend the use of a hand vacuum/pressure pump (available at most auto parts stores) for checking fuel pressures, bypass valves, etc. If you are unable to locate a source for the pump, call Vortech and we will provide you with a source.

7. BURNOUT BOX
   Extreme care must be exercised in the burnout box. If your vehicle is traction limited (because you have

Questions? Please contact: Vortech Engineering, Inc. • 1650 Pacific Ave., Channel Islands, CA 93033-9901
Phone: (805) 247-0226 • Fax: (805) 247-0669 • Website: vortechsuperchargers.com • Hours: M-F 8AM - 4:30PM (PST)

too much horsepower for your suspension), you may experience a supercharger failure. Traction loss can cause the engine and supercharger to be rapidly accelerated and decelerated as well as overspun, resulting in a premature failure of one or both. Listed below are some precautions that must be observed:

- The engine rpm should not and does not need to exceed 4500 rpm in the burnout box (use rev limiter).
- The burnout should only be done in one gear. Do not start in first gear and shift into second. Start in second gear and hold a steady rpm.
- You need to slowly accelerate and decelerate the engine during the burnout. Do not stab the throttle and let off quick. Rapid acceleration followed by rapid deceleration may cause a supercharger failure.
- Do not "modulate" the throttle up and down while heating the tires.

8. THROTTLE BODY LOCATION
   On road racing applications or high speed endurance racing, mounting the throttle body before the air inlet of the supercharger has distinct benefits. When the throttle body is closed it "chokes off" the airflow to the supercharger, thus virtually eliminating the need for air bypass valves. This mounting location also provides cooler discharge temperatures and lower horsepower consumption during part throttle conditions, when the engine is at a high rpm.

The previously listed precautions have been obser-ved and utilized by numerous racing teams with great success. This information has been tested in the most severe racing conditions with excellent results. Vortech superchargers performance and durability have been proven in the field at numerous events throughout the country and around the world.

GLOSSARY

Aftercooler: A heat exchanger which reduces the temperature of the compressed charge before it enters the combustion chamber.

Air By-Pass Valve: Device designed to eliminate compressor surge. It functions by allowing air to be dumped (or routed back to the supercharger inlet on MAF engines) from the discharge side of the supercharger. It employs pressure sensor lines that operate an internal diaphragm connected to a valve. This is an essential performance improving device that also improves durability.

Air Fuel Ratio: The amount of air compared to the amount of fuel in the air fuel ratio mixture, almost always expressed in terms of mass (see stoichiometric). Ideal air fuel ratio is 14.7:1 (see fuel rich/lean).

Ambient Temperature: The current temperature of the surrounding outside air.

Atmospheric Pressure: Normal pressure in the surrounding atmosphere, generated by the weight of the air above us pressing down. At sea level, in average weather conditions, atmospheric pressure is approximately 100 kPa (about 14.5 psi) above vacuum or zero absolute pressure.

Barometric Pressure: Another term for atmospheric pressure. Expressed in inches of Mercury (in.Hg.). How high atmospheric pressure (relative to zero absolute pressure) forces Mercury up a glass tube. 14.5 psi= 29.92 in.Hg.

Blower: Term often applied to all types of superchargers.

Boost: Condition of over pressure (above atmospheric in the intake manifold) caused by intake air being forced in by a supercharger.

BTM: (Boost Timing Master) Drivers compartment adjustment for retarding ignition timing. Included with some supercharger kits to retard ignition timing to prevent detonation. A boost/vacuum referenced ignition timing retard.

Choke Line: Area on compressor map where the compressor can no longer efficiently deliver the amount of airflow the engine needs. It is the point where boost pressure falls off on a compressor map, even though air flow continues to increase. Can be caused by reaching the capacity of the impeller, the capacity of the compressor housing passageway, or the inlet. For example, if a Vortech V-5 D-Trim is used on a 700 hp big block engine, the supercharger would operate on the choke side of the compressor map. Proper compressor matching to the application eliminates this problem.

Compression Ratio: The ratio of maximum engine cylinder volume (when the piston is at the bottom of its stroke) to minimum engine cylinder volume (with the piston at TDC). Thus, the theoretical amount that the air to fuel mixture is compressed in the cylinder.

Compressor Housing: The housing which makes up the enclosure portion of the compressor. Also referred to as the volute, scroll or snail.

Compressor Maps: Graphic summaries of supercharger performance data (with respect to pressure and flow) generated using test equipment and procedures.

Density: The ratio of the mass of something to the volume it occupies. Air has less density when it is warm, and less density at higher altitudes.

Detonation: (Knock) Sudden increase in cylinder pressure caused by pre-ignition of some of the air-fuel mixture as the flame front moves from the spark-plug ignition point. Pressure waves in the combustion chamber crash into the piston or cylinder walls. This results in the sounds known as knock or ping. Strongly influenced by fuel octane rating, ignition timing, and compression ratio as well as boost level. May be caused by hot carbon deposits on the piston or cylinder head.

EFI: (Electronic Fuel Injection) A computer controlled fuel system that distributes fuel through an injector located in each intake port of the engine. The fuel injectors are usually fired using individual circuitry.

Efficiency Islands: The percentage values that designate the efficiency expressed in an island representation on a compressor map. The area inside the island designates maximum efficiency, the area to the left of the efficiency island designates the temperature is too high on the surge side, and the area to the right of the efficiency island designates that drive horsepower is high on the choke side.

Fuel Rich/Lean: An evaluation of air to fuel ratio based on an air-fuel value known as stoichiometric or 14.7:1. In most fuel injection systems rich/lean is determined by voltage signal from the oxygen sensor. An excess of oxygen lean is a voltage of less than .4 volts. A rich condition is indicated by a voltage of greater than .6 volts.

FMU: (Fuel Management Unit) A vacuum/boost referenced fuel pressure regulator. Used to increase the pressure by regulating fuel flow returning to the tank from the stock fuel pressure regulator.

Impeller: The finned or bladed rotating wheel housed inside the volute.

Inducer: The air inlet portion of a centrifugal compressor.

Intercooler: A heat exchanger which reduces the temperature of the air between stages of compressors or superchargers.

MAF: (Mass Air Flow Sensor) An electric hot wire used to measure the mass or weight of intake air.

MAP: (Manifold Absolute Pressure [or its signal circuit]) Manifold pressure measured on the absolute pressure scale, an indication of engine load. At sea level, with the engine off,
MAP=100 kPa (14.7 PSIG)

Naturally Aspirated: An engine without a supercharger.

PCV: (Positive Crankcase Ventilation) Engine crankcase fumes ducted back to the intake manifold to reduce air pollution.

Pressure Boost: The difference in pressure between barometric and intake manifold absolute pressure on a supercharged engine (read as gauge pressure).

Pressure Absolute: The sum of gauge pressure and atmospheric pressure. One standard atmosphere = 29.92 in. of mercury (Hg) = 14.696 lb/in (PSI).

Questions? Please contact: Vortech Engineering, Inc. • 1650 Pacific Ave., Channel Islands, CA 93033-9901
Phone: (805) 247-0226 • Fax: (805) 247-0669 • Website: vortechsuperchargers.com • Hours: M-F 8AM - 4:30PM (PST)

Pressure Ratio: Manifold absolute pressure divided by standard barometric pressure. Pressure Ratio = gauge pressure + atmospheric pressure divided by the absolute pressure. The vertical scale on a compressor map and it indicates the pressure rise across the compressor. It is scaled this way instead of psi because the inlet conditions are unknown.

Pressure Regulator: A spring loaded relief valve that returns excess fuel to the tank to maintain system pressure.

PSI: (Pound Per Square Inch) PSI can be a measure of air or fluid pressure.

SAE J1723: The only way to evaluate the efficiency of a centrifugal supercharger. It outlines the procedures for testing and then presenting results in accurate and usable compressor maps. See www.sae.org/Prodserv/stds/J1723_199508.htm.

Speed Lines: On a compressor map, pressure at any given speed is relatively the same until the inlet chokes and the pressure falls off. Usually, when the pressure falls off, the efficiency also falls off.

Stoichiometric: The correct chemical mixture of air and fuel to yield complete combustion.

Supercharge: Increase the density of charge by compressing it before it enters the combustion chamber.

Surge: Compressor surge is a condition that occurs when there is insufficient air flow to support a specific pressure on the compressor outlet side. It often occurs during vehicle deceleration when the throttle is closed, but the compressor is still at high speed. It can occur at high RPM and small throttle opening conditions if the compressor has been refit to run faster and it can be a chronic problem if the incorrect supercharger has been selected. It can cause catastrophic supercharger failure. It heats the discharge air, reduces engine response and, if prolonged, can heat soak the supercharger. Mass air flow sensors do not function well during compressor surge.

Surge Line: The lowest flow for any speed. It is audibly identified by a coughing or banging noise and physically by a very high temperature. A volume of air rushes out the inlet, only to be sucked back in when the compressor recovers. The temperature increases every time this occurs. For example, if a Vortech V-4 XX-Trim supercharger is installed on a 2.0 liter engine, the supercharger would operate in surge or the left side of the compressor map. Proper compressor matching to the application eliminates this problem.

TPS: (Throttle Position Sensor) Sensor that provides the control module with a variable voltage that represents the position of the throttle. The TPS is a sealed unit and cannot be repaired. The TPS is usually located in the throttle housing.

Valve Overlap: The number of crankshaft degrees expressing the time when both the intake and exhaust valves are open.

Volute: A scroll or snail shape housing used to contain the impeller and diffuser. Located at the rear of the supercharger unit where the air enters the supercharger. Sometimes referred to as a scroll or compressor housing.

Vortex: Free flowing inward spiral such as seen at the drain of a bathtub.

VORTECH SUPERCHARGER SPECIFICATION CHART

SUPERCHARGER	TYPE	ROTATION	FINISH	AIR INLET OPENING (HOSE DIA.)	AIR INLET OPENING (INDUCER DIA.)	AIR DISCHARGE (HOSE DIA.)	AIR DISCHARGE (HOSE DIA.)	IMPELLER SPEED (EFFICIENT MAX)	IMPELLER SPEED (ABSOLUTE MAX)	PERFORMANCE @ ABSOLUTE SPEED	PERFORMANCE @ ABSOLUTE SPEED (MAX PSIG*)	PERFORMANCE @ ABSOLUTE SPEED (MAX FLOW CFM*)	ADIABATIC EFFICIENCY (HP RANGE**)
V-1 A-Trim	STD	Clockwise	Satin	3.50”	2.50”	2.75”	2.38”	40,000	45,000	10	720	480	66%
V-1 R-Trim	HD	Clockwise or Counterclockwise	Satin or Polished	3.75”	3.29”	2.75”	2.38”	55,000	58,000	24	1,100	750	74%
V-1 SC-Trim	STD/HD	Clockwise or Counterclockwise	Satin or Polished	3.50”	3.10”	2.75”	2.38”	50,000	53,000	20	1,000	680	75%
V-1 S-Trim	STD/HD	Clockwise or Counterclockwise	Satin or Polished	3.50”	3.10”	2.75”	2.38”	45,000	50,000	20	1,000	680	72%
V-1 T-Trim	HD	Clockwise or Counterclockwise	Satin or Polished	3.75”	3.29”	2.75”	2.38”	52,000	55,000	26	1,200	825	73%
V-2 SQ SC-Trim	STD/HD	Clockwise or Counterclockwise	Satin or Polished	3.50”	3.10”	2.75”	2.38”	50,000	53,000	20	1,000	680	75%
V-2 SQ S-Trim	STD/HD	Clockwise or Counterclockwise	Satin or Polished	3.50”	3.10”	2.75”	2.38”	45,000	50,000	20	1,000	680	72%
V-4 J-Trim	HD	Clockwise	Satin or Polished	5.00”	3.50”	3.50”	3.06”	50,000	58,000	28	1,600	1,100	74%
V-4 X-Trim	HD	Clockwise	Satin or Polished	5.00”	3.90”	3.50”	3.06”	55,000	58,000	29	1,700	1,300	79%
V-4 XX-Trim	HD	Clockwise	Satin	5.00”	3.90”	3.50”	3.06”	58,000	64,000	29	1,850	1,400+	78%
V-5 G-Trim	STD/HD	Clockwise or Counterclockwise	Satin or Polished	3.50”	3.125”	2.50”	2.06”	62,000	65,000	25	800	575	73%
V-7 YS-Trim	HD	Clockwise	Satin or Polished	4.0”	3.64”	3.0	2.64”	60,000	65,000	29	1,500	1,000	74%
V-9 F-Trim	STD	Clockwise or Counterclockwise	Satin or Polished	3.50”	2.874”	2.50”	2.10”	60,000	65,000	20	800	575	72%
V-9 G-Trim	STD	Clockwise or Counterclockwise	Satin or Polished	3.625”	3.125”	2.50”	2.10”	60,000	65,000	20	800	575	72%

SPECIAL NOTES:

* Pressure and flow performance data acquired in the Vortech Engineering, Inc. test cell to SAE J1723 standards. To see details on SAE J1723 test procedures, go to www.sae.org/prodserv/stds/J1723_199508.htm. Superchargers are not rated for flow or pressure at efficiencies below 60%.

** Horsepower data resulted from engine dyno tests and/or extrapolated from compressor map data. Due to our rating system, horsepower figures are a relative guide and not an absolute maximum. Superchargers exceeding 6 PSIG require a Vortech standard bypass valve or a Vortech Maxflow racing bypass valve. Superchargers exceeding 10 PSIG require a Vortech Maxflow Mondo or Maxflow racing bypass valve. Cog belt drive systems are recommended for all heavy duty superchargers.

Questions? Please contact: Vortech Engineering, Inc. • 1650 Pacific Ave., Channel Islands, CA 93033-9901
Phone: (805) 247-0226 • Fax: (805) 247-0669 • Website: vortechsuperchargers.com • Hours: M-F 8AM - 4:30PM (PST)

25FEB00 V 2.0 DRAFT

P/N: 008515