STREET SUPERCHARGER SYSTEM OWNER'S MANUAL

The following information and recommendations are designed to promote years of trouble-free service for your supercharger. Each Paxton supercharger system is built to precise tolerances using the finest materials available. Every system is subjected to an intensive quality audit procedure from the time we first receive raw castings to the time the precision machined components become a completed supercharger system. Air fuel ratios, ignition timing requirements and all aspects required to build fully integrated systems are tested rigorously. When applied to a stock engine, in sound working order, the installation of a complete Paxton supercharger system results in the highest street legal performance with a minimum of engine wear. If the unit is given proper care and is operated using the recommendations and instructions set forth in this guide, the unit will last the life of most vehicles. If the vehicle is modified in addition to the supercharger (i.e., heads, cam, etc.) or you have increased the impeller speed, you must follow guidelines outlined in the Paxton Racing Supercharger Owner's Manual Guide (P/N: 008576).

IMPORTANT COLD WEATHER INFORMATION

In order to achieve the low noise level of Paxton superchargers, Paxton specifies manufacturing procedures that call for minimal internal clearance. These precise tolerances however are not conducive to temperatures below 25° F. Therefore, storing the vehicle in a heated garage and/or employing the use of an engine block heater/aftermarket engine blanket is required when the vehicle is subjected to a "cold startup" in ambient temperatures below 25° F. Failure to comply with this may result in immediate supercharger failure and invalidate the supercharger warranty.

SECTION 1

EVERY PAXTON SUPERCHARGER SYSTEM IS ENGINEERED TO MEET THE FOLLOWING DESIGN OBJECTIVES:

1. To be street legal.
2. To render the highest performance within the constraints of the stock engine and its various support systems, such as the fuel and ignition systems, compression ratio and known or tested weak points.
3. To operate within the range of peak compressor efficiency by not exceeding maximum impeller speed at the engine's redline.

NOTE: Increased impeller speeds can increase boost pressure, but may do so with a penalty to supercharger efficiency. Compressors must be properly matched to each application (matching available from Paxton).

4. To maintain long term engine life (must be installed properly on an engine which is known to be in good operating condition prior to the installation of the supercharger). Understanding these design goals is important when applying the supercharger to custom applications. We strongly advise that when using the supercharger in a custom application, you make every effort to achieve the goals outlined.

SECTION 2

ENGINE STARTUP AND FUEL CONSIDERATIONS:

1. Never operate your engine at full throttle when the engine is cold. When starting the engine each day, allow plenty of time for the oil to reach full operating temperature before running above 2,500 RPM. Full supercharger operating temperature is generally achieved after the engine water temperature has been at the normal operating range for two or three minutes.

2. Always utilize the highest octane premium unleaded fuel available in your area. Paxton recommends that you always use national brands whenever possible.

3. After filling up with fuel from a source other than the one you use regularly, carefully listen for engine detonation.

4. If any detonation is audible, you may have a fuel problem. Cease utilizing heavy-throttle and drive with greater care until the fuel is consumed. If detonation is still evident, inspect for other causes such as:

a. Faulty fuel pump(s). Some vehicles are now equipped with more than one pump. Check fuel pressures when detonation is occurring.

b. Dirty injector(s), clogged fuel filter or pinched fuel line.

c. Faulty spark plug(s) or spark plug wires with too much resistance. Consult your factory vehicle service manual. Most wires should not exceed 10 ohms of resistance.

d. Improper initial timing (not set to factory specification).

e. Faulty ignition coil.

f. Cooling system not functioning properly. Check for a faulty thermostat, faulty or improper calibration of

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the thermostatic fan switch, water pump belt slippage, a plugged radiator, or bad fan clutch.

g. Dirty air cleaner.

h. If your vehicle is equipped with a boost timing retard device as part of the supercharger kit or an ignition amplifier, check to be sure that the unit and the timing retard knob (if equipped) is working.

i. Faulty or loose computer chip, if equipped.

j. Ensure that the spark plugs and spark plug gap are correct for a supercharged application.

SECTION 3

SUPERCHARGER SUPPORT SYSTEM GUIDELINES

1. Air Filters - Use the air filter system provided in your Paxton system.

2. Air Intake/Air Discharge - Must be in good condition and properly secured. If equipped with 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 Paxton.

4. Computer Chips/Programming - The use of an aftermarket computer chip is generally not recommended as they may not be calibrated for use with a supercharger and can cause detonation. Paxton offers computer chips and programs specifically developed and/or calibrated to maximize the performance of a particular Paxton supercharger system.

5. Crankcase Ventilation System - You must use the system provided in your Paxton kit to prevent excessive crank case pressures and possible engine damage.

6. Pulleys - If your supercharger drive belt comes off it may be 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. For years of trouble free operation when used for street applications, we recommend the drive ratios not be changed from the standard specification.

SECTION 4

NORMAL MAINTENANCE GUIDELINES

1. Engine Oil Fed Units Only

a. Clean the supercharger oil inlet fitting every 12,000 miles. 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 fitting. Do not overtighten fittings.

b. Follow the heavy duty/severe usage maintenance schedule in your vehicle owner's manual. Use the manufacturer's engine oil and oil filter recommendations. Do not use engine oil additives as they may contain solid particulates which can clog the supercharger feed line.

2. Self Lubricated Units Only

a. Check the supercharger fluid level using the dipstick at least every 2,500 miles.

b. Initial supercharger fluid change must be performed at 2,500 miles. The supercharger fluid must then be changed at least every 7,500 miles.

i. Drain the fluid, re-fill the unit only with 4 oz. of Paxton supplied lubricating fluid.
ii. Confirm proper oil level using the dipstick. DO NOT OVERFILL!!

c. Fluid level checking procedure:

i. Ensure that the .06" copper sealing washer is located on the dipstick base.
ii. Thread the clean dipstick into the unit until it seats.
iii. Once the dipstick has seated, remove the dipstick from the unit. Fluid should register in the crosshatched area on the dipstick.
iv. DO NOT OVERFILL!! Drain excess fluid from the unit if it is above the maximum level on the dipstick.

WARNING: Use of any fluid other than the Paxton supplied special lubricating fluid will void the warranty and may cause component failure.

3. Spark plug/ignition system guidelines. Always utilize the stock specified heat range for street legal applications. For off-road use only, use one range colder than originally specified and reduce the gap to .032" - .040". If your vehicle is equipped with an ignition amplifier such as a Crane HI-6R or MSD 6A, reducing the spark plug gap is not necessary. Never utilize platinum plugs on a vehicle not originally equipped with platinum plugs from the factory. Every 15,000 miles, check to ensure spark plug wires are within factory specified resistance. Replace whenever beyond specification or every 50,000 miles, whichever comes first. This may be contrary to factory recommended intervals, but is consistent with the use of the Paxton supercharger system on most vehicles. Paxton also offers high performance ignition wire sets for certain applications. If equipped, inspect the condition of the distributor cap and rotor every 15,000 miles. Replace as conditions warrant or every 50,000 miles, whichever comes first. Paxton recommends OEM or equivalent replacement parts.

SECTION 5

RECOMMENDED TUNING AIDS (AVAILABLE DIRECT FROM PAXTON)

1. Fuel Pressure Gauge

2. Boost Gauge

3. Ignition Amplifier/Boost Retard (standard on some kits)

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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 at idle and low engine load 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) Driver compartment adjustment for retarding ignition timing. Included with some supercharger kits to control ignition timing to prevent detonation. A boost/ vacuum referenced ignition timing control.

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. 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 islands designate maximum efficiency, the area to the left of the efficiency islands designate the temperature is too high on the surge side, and the area to the right of the efficiency islands designate 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 compressor housing.

Inducer: The air inlet portion of a centrifugal compressor.

Intercooler: A heat exchanger which reduces the temperature of the charge 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).

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 properly 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 Paxton NOVI 2000 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 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.

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