



Supercharger Installation Instructions

Toyota 22R

The Camden Supercharger System utilizes a roots type supercharger developed specifically for automotive engine applications. The present supercharger design has evolved from the first Camden Supercharger built in 1956. The experience gained from hundreds of installations in circle track race cars, sports cars, passenger cars, trucks, marine, aviation and stationary engines has been applied to periodically upgrade the design for increased reliability and improved performance. Design features of the Camden Supercharger include extruded aluminum rotors with Teflon tip seals, pressure lubrication of the rotor shaft bearings, flanged pulleys for Micro-V drive belt, one piece front extension and multi ribbed rotor housings.

General Information

A supercharged engine when operating under boost, that is, with positive manifold pressure, will experience higher combustion pressures than a normally aspirated engine. The effect is quite similar to raising the compression ratio. The major difference is that a high compression engine experiences increased loads on pistons rings, and bearings whenever the engine is operating, while a low compression ratio supercharged engine encounters higher pressures only when under boost. Most modern engines can withstand these increased pressures if proper consideration is given to fuel octane quality. As with any high compression engine, supercharged engines require the highest octane fuel available to minimize any tendency towards destructive detonation.

Camden Superchargers recommend that boost be limited to 6 PSI on an engine having a compression ratio of 8.5:1 when running on premium unleaded fuel of 92 octane. If your engine has a lower compression ratio, it is possible to increase the boost. Conversely, if your compression ratio is greater than 8.5:1, it will be necessary to reduce manifold pressure to prevent detonation.

If it is impractical to reduce the compression ratio of your engine to 8.5:1 or lower and you still want the performance gains associated with 6 PSI boost, there are some options. First of all, you could use higher octane fuel if it is available. As an alternative, octane boosting additives are available, but their cost may make them unattractive for everyday use. Boost retard systems are available, which automatically retard ignition timing as manifold pressure rises. The major objection to these devices is as you retard timing you lose power. The rationale appears to be it is better to lose a little power under boost than to destroy an engine under detonation.

Another alternative which works well on borderline knocking engines is water injection. A system which increases the volume of water introduced as boost increases is commercially available and has proven to be quite effective in controlling detonation; however, just do not run out of water when you are under full boost. Fuel mixture is extremely critical when operating under full boost as a lean mixture can lead to detonation. A boost enrichment system can be added to provide a slightly richer mixture under full throttle, max boost operation. The cooling effect of a rich mixture can prevent detonation under wide open throttle, full power conditions. If managed properly, the slight loss of power due to excessive richness will hardly be noticed.

A supercharged stock engine does not need to be "revved" as high as an un-blown engine to achieve superior performance. High engine RPM's put extra strain on reciprocating parts and should be avoided if maximum engine durability is to be achieved. The superior low and mid-range torque of a supercharged engine can be used to advantage by shifting sooner and avoiding the wear and loads caused by high RPM. This Camden Supercharger System has been designed for use on engines ranging from 90 CI to 460 CI. Compression ratios should not exceed 8.5:1 for use with a standard blower kit producing 6 PSI at wide open throttle. With the use of premium unleaded fuel, safe engine operation can be expected throughout the normal operating speed range. Horsepower and torque increases of at least 30% should be observed. The Toyota supercharger carburetor adapter will accept a Weber 2 barrel carburetor bolt pattern. As a supercharged engine can flow more total air volume than a stock engine, Camden recommends a minimum of a 350 CFM carburetor. Remember also that a carburetor that is too large can be harmful to low end response.

The Camden Supercharger kit is designed to be installed on carbureted 22R engine pickup trucks with or without low mount air conditioning and power steering. No internal engine modifications or alterations to the engine compartment sheet metal are required. The kit can also be used on passenger car applications. Passenger car applications require the purchase of an additional offset carburetor adapter.

Finally, before installing the supercharger, you should verify that your engine is in good mechanical condition. A compression test or lead-down test should be performed to check on valve and piston ring sealing. A supercharger should not be installed on an engine that is in poor condition or that has low oil pressure.

This kit is not legal except on racing vehicles which may never be used on the highway.

Tools & Equipment

Ratchet or speed handle, 3/8th drive
Torque wrench 100 ft-lb capacity
Socket set; 3/8th metric & US
Extensions; 3", 6"
8" vise grips
10" adjustable wrench
End wrenches, Metric & US
Gasket scraper
Straight blade screwdriver
Pliers
Hacksaw
3/8" Drill motor
3/8" Drill bit
7/16" Drill bit
1/8-27 NPT pipe tap
¼-18 NPT pipe tap
Loctite #242 thread locking compound
Aviation Form-A-Gasket or equivalent
Loctite 515 Gasket Eliminator
Permatex Ultra-Blue silicone RTV gasket
Engine Oil
Oil Filter

Torque Values

Blower Hold Down Bolts, 3/8-16 x 5 ½
Engine Bolts

18 ft-lbs
Factor Specs

Disassembly

Important: Before starting any mechanical work on the engine, disconnect the negative cable from the battery.

1. Drain coolant from the radiator and the cylinder block. Remove the upper radiator hose. Remove the thermostat housing and thermostat from the inlet manifold. Disconnect the lower radiator hose and any heater hoses or other hoses attached to the intake manifold.
2. Loosen and remove all the accessory drive belts from the engine. Remove all the accessories and accessory brackets which attach to the inlet manifold.
3. Remove the four nuts from the fan fluid coupling flange. Remove the fluid coupling, water pump pulley, radiator and shroud to provide easier access to the crankshaft pulley. Save the nuts and washers for later use.
4. If your engine is equipped with power steering, remove the four bolts securing the power steering pulley to the crankshaft pulley and set it aside.
5. Disconnect all linkages, fuel lines, and vacuum lines and wiring from the carburetor. Remove the carburetor from the manifold. Identify all hoses for later reassembly.
6. Remove the inlet manifold, cylinder head side cover, and EGR valve. Clean any traces of manifold gasket from the head and block surfaces. Save the attaching hardware for later use.
7. Remove the horizontal water by-pass pipe from the backside of the water pump (inlet manifold side of the engine). Clean gasket surfaces.
8. Drain the oil and remove the oil pan and oil filter.
9. Disconnect inner cable from throttle pedal. Save plastic bushing. Remove the throttle cable assembly from the vehicle.

Installation

Note: Supercharger rotors have very close operating tolerances between themselves and the rotor housing. Any foreign object introduced through the carburetor flange opening can cause serious damage to the internal components. Keep the protective tape on both the inlet and discharge ports until the last possible moment.

1. Clean the face of the crankshaft drive pulley of all grease and foreign matter. Make sure the four threaded holes are clean, **Figure 1**. Install the supercharger crank pulley and secure it with four M8x40mm bolts with 5/16 lock washers and 5/16 flat washers. Torque to factory specifications.
2. Remove the four M6 studs from the water pump pulley hub, and replace them with four M6 x 37.5 studs. Apply Loctite 242 to the threads prior to installing the studs.
3. Relocate the top front inlet manifold stud from the cylinder head, **Figure 2**.
4. Remove the oil pan and weld -8AN fitting to the oil pan, **Figure 4**.
5. Modify the water by-pass pipe by hack sawing the steel tube flush with the flange. Tap the hole with a ¼-18 NPT pipe tap, and install a ¼ NPT pipe plug. Apply sealant to the threads prior to installing the pipe plug. Install the flange on the engine using a new Toyota gasket or RTV silicone. Secure with the original hardware.
6. Remove the oil pressure sending unit from the tapped hole at the right rear of the block, under the oil filter. Install a 1/8 male street tee. It may be necessary to re-tap the hole in the block to 1/8-27 NPT for proper thread engagement. If this is required, coat the tap with grease to catch as many metal chips as possible. Clean the port thoroughly, and then remove any remaining chips with a magnet. The side port of the "T" should point towards the firewall after it has been fully tightened. Reinstall the oil pressure sending unit in the outer port of the "T" fitting and tighten securely.
7. Install the 1/8 NPT end of the 20" flexible oil pressure line into the side port of the pipe tee.
8. Remove the heater hose fitting from the stock inlet manifold, and install it in the 3/8 NPT port on the underside of the blower manifold. Install one end of the 5/8 ID heater hose on this fitting and clamp securely. Plug the top hole with a 3/8 NPT pipe plug if it is not going to be used.
9. Install a new intake manifold gasket. Install the supercharger inlet manifold using the original manifold hardware, except at the upper front of the manifold which requires two M8x80 hex bolts with 5/16 flat washers. Tighten the bolts uniformly to a final torque of 18 ft-lbs. The steel fuel lines on the fuel pump may require slight bending for proper clearance to the manifold in the manifold water tower area.
10. Install the 22RE thermostat and the thermostat housing. Apply a coating of Loctite 515 to the gasket surfaces before assembly. Secure with original M8 bolts and washers.
11. Install the water temperature gauge sending unit in the tapped hole at the rear of the thermostat housing.
12. Plug the top port of the intake manifold with a 1/8 NPT pipe plug if a vacuum/boost gauge is not installed.
13. Make sure no metal chips remain inside the crankcase. Clean the oil pan gasket surface, and reinstall the oil pan. Torque to factory specifications. Use oil pan gasket or silicone.

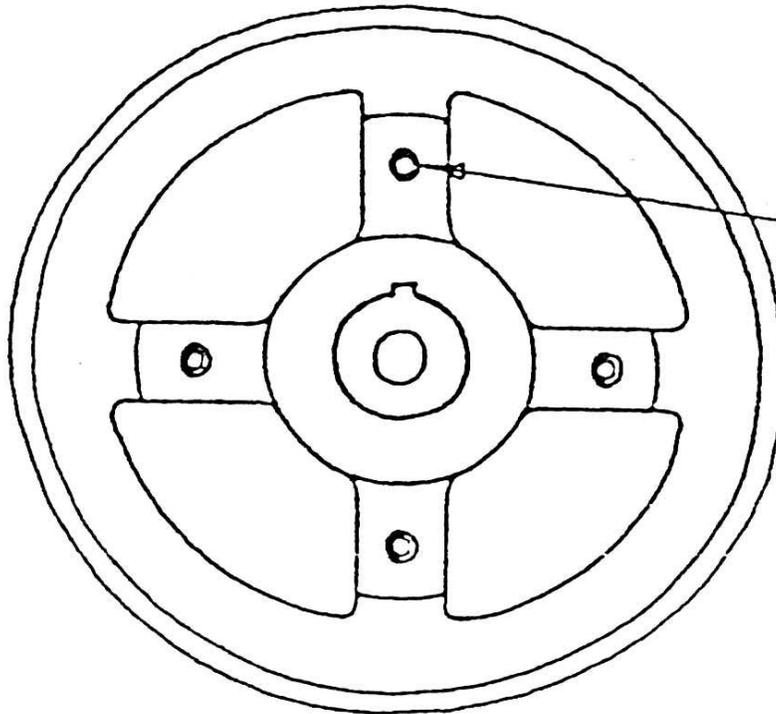
14. Reinstall the radiator, shroud, and fan. Use the fan spacer provided to position the fan forward for drive belt clearance. Use the original nuts and tighten securely.
15. Install the "O" ring in the groove around the intake port of the manifold. A light coating of Permatex #3 or other tacky gasket cement will assure the "O" ring to stay in place during assembly.
16. Remove the protective tape from the bottom port of the supercharger. Make certain the gasket surface is clean. Install four 3/8-16x5 1/2 bolts and flat washers into the counter bored holes at the front and rear of the supercharger. Apply thread sealant to the threads of the top front bolt. Carefully position the supercharger on the manifold making certain the bolts line up with the tapped holes in the manifold. Gradually tighten the supercharger mounting bolts to a final torque of 18 ft-lbs. Check for smooth turning of the supercharger pulley. Any binding may indicate the manifold surface has warped or that foreign material has become lodged between the supercharger and the manifold, *Figure 3*.
17. Install end of the 20" oil line into the "T" fitting at the block. Install the flare nut end of the oil line into the "T" fitting at the top rear of the blower.
18. Install the 1/2" oil return hose between the oil pan bung fitting and the blower oil return "T". Clamp securely using the clamps provided.
19. Reinstall the accessory brackets and accessories. Tension accessory belts according to the factory specifications.
20. Install the carburetor adapter. Apply Loctite 515 to the gasket surfaces. Secure with four 1/4-20x1.0 hex bolts with lock washers. Torque to 8 ft-lbs. Check that the blower rotates smoothly. In some cases it may be necessary to add a flat washer under the bolt to prevent interference with the rotor.
21. Fill the engine with oil to the proper level. It is recommended that an oil filter change be performed at this time. A shorter length filter may be needed for proper clearance to the supercharger.
22. Fill the radiator with coolant and check for leaks.
23. Reconnect the battery.
24. Start the engine and let it idle for a minimum of fifteen minutes. This will allow complete lubrication of the supercharger bearings prior to installing the drive belt. Check for oil, fuel and water leaks. Set the ignition timing.
25. Stop the engine and check for oil and water leaks.
26. Install the supercharger drive belt and adjust the tension with the idler pulley adjustment. Visually line up the idler pulley with the belt before tightening the clamp bolt. Make sure there is clearance between the front of the idler arm and the back of the supercharger pulley. The belt is tensioned properly when a 20 lb. force applied mid-span on the tension strand results in a 1/2 inch deflection, *Figure 5*.
27. Start the engine. The supercharger is now operational. Check the drive pulleys and belts to make sure they are running true and there is no visible wobble.

Congratulations! You have just completed a blower installation. Now go out and enjoy the increased performance, but remember you now have a lot more torque available so use caution particularly in low gear to avoid excessive wheel-spin or over-revving of you engine.



Camden Superchargers is continually upgrading their products with new capabilities or improvements. Many of these changes are made possible by our customers making recommendation which we find valuable and informative. If you wish to contact Camden for any reason, such as recommendations or just to let us know how your installation turned out, let us know.

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Clean and De-burr your pulley face. Clean out any tapped holds with a bottoming tap.

If your engine has a cast pulley, you must replace it with Toyota part #13408.

Figure 1
Crankshaft Pulley

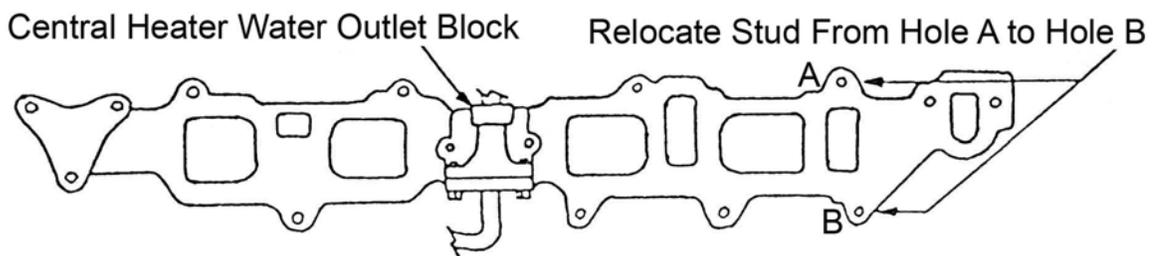


Figure 2
Relocation of Manifold Stud

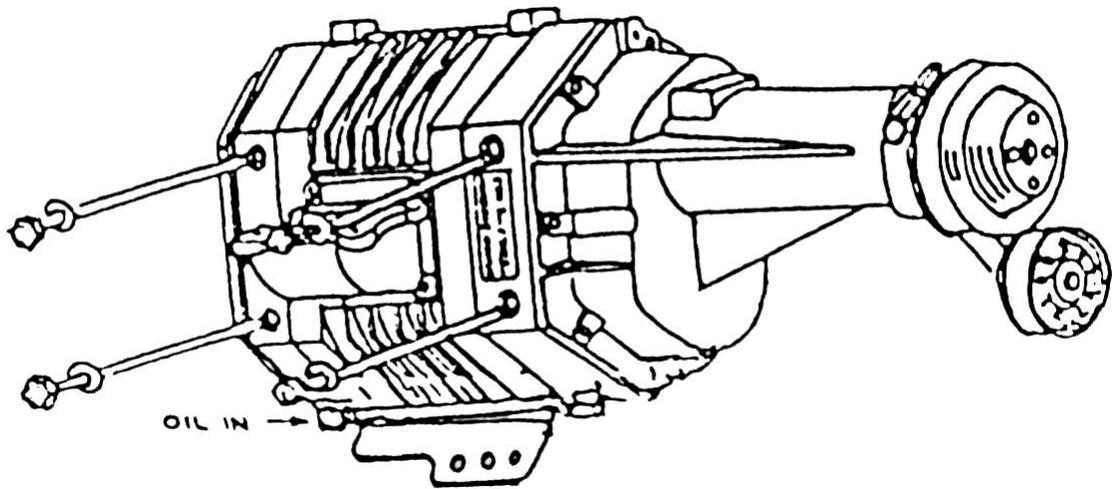


Figure 3
Supercharger Mounting Bolt Installation

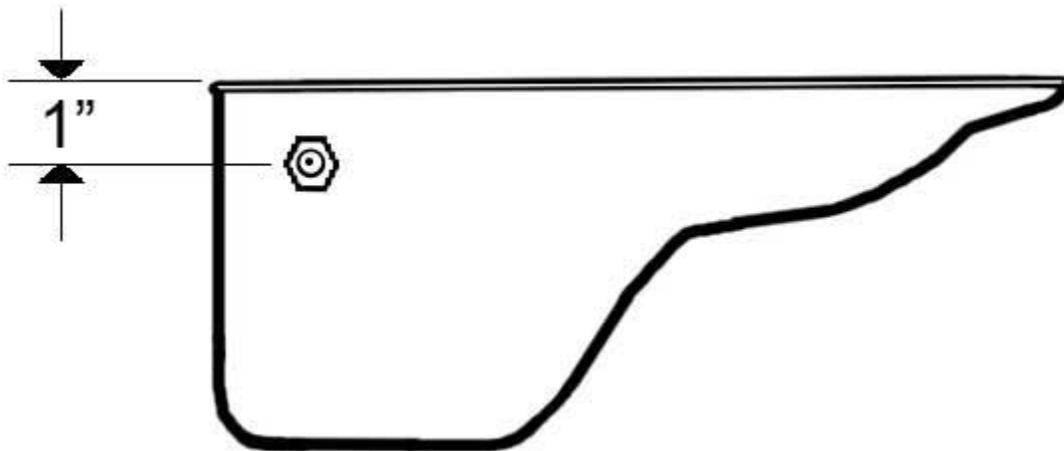


Figure 4
Supercharger Oil Return Line Installation

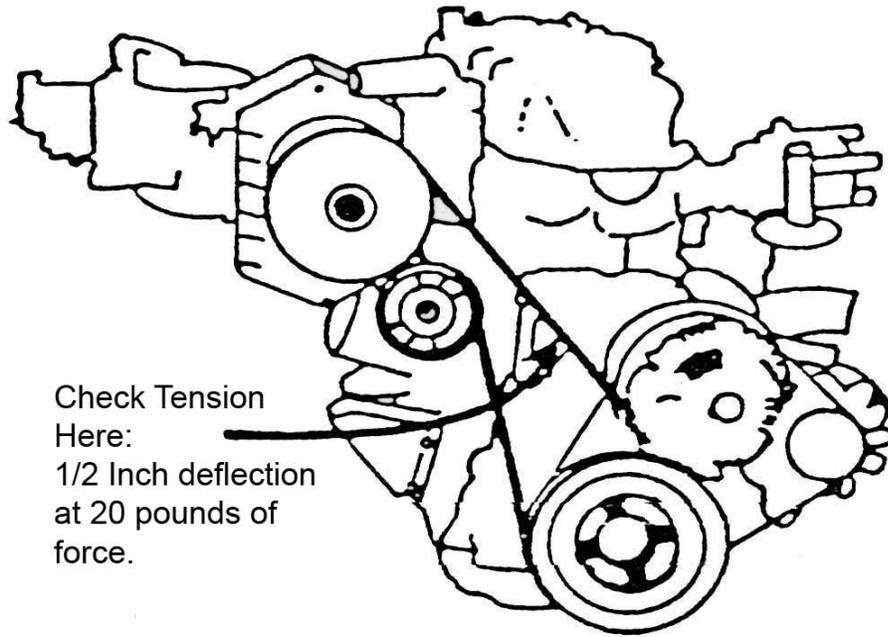


Figure 5
Supercharger Drive Belt Installation

Warranty

Nature and Duration of Warranty

Camden Superchargers, (hereinafter "Seller") warrants to the buyer that products sold under this order shall, on the date of retail purchase and for six (6) months thereafter, conform to the Specifications and Drawings referenced in the order and be free from defects in materials and workmanship. Buyer's sole remedy and seller's sole liability, under this warranty, shall be at the seller's option. Repair, replacement, or refund of the purchase price of any such product is based upon examination by seller or seller's designee, and the determination that, to seller's reasonable satisfaction, to have be nonconforming or defective. Repaired or replaced products are warranted only for the remaining unexpired portion of the original warranty.

Sole Warranty

This warranty is in lieu of all other warranties, expressed or implied, including, without limitation, any warranties of merchantability or fitness for a particular purpose. All such other warranties are hereby disclaimed and excluded by seller. In no event shall the seller be liable for any special incidental, or consequential damages with respect to seller's performance or non-performance of this order or products delivered hereunder.

Procedure

Before returning a product for warranty service, buyer should obtain shipping instructions and a Return Authorization Number (RAN) from Camden Superchargers, (253) 848-7776, 16715 Meridian E, Bldg K-A, Puyallup, WA 98375. Buyer shall pay the cost of transportation both ways for warranty services.

Warranty Limitations

The warranty, provided in Paragraph 1, shall not apply to any product that has been subject to misuse, neglect, accident, improper application, (see Warranty Limitations), or exposure to an environment beyond the limits described in the Specifications. The warranty shall not apply to any product that has been altered or repaired outside of seller's written consent. Also, the warranty shall not apply to anyone other than the buyer without seller's prior written consent.

The Camden Supercharger Warranty does not cover the following:

1. Normal wear and tear.
2. Damage resulting from improper oil or lack of oil.
3. Damage to related components, i.e. engine, drive train.
4. Costs due to down time or towing.
5. Shipping costs.
6. Removal or replacement costs.
7. Damage resulting from foreign object ingestion.
8. Damage resulting from improper installation.
9. Damage resulting from any misuse or abuse.
10. Any product used for racing or competition.
11. Any supercharger used with a crank speed to blower speed drive ratio of greater than 2.
12. Any supercharger used to produce boost levels of greater than 10 psi.
13. Supercharger damage due to backfire.