

Adding a Turbo

Contributed by Administrator
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It seems almost inevitably, folks see all the fun the Turbo owners are having, and want in on the action. Unfortunately, there simply isn't much of market for tuner parts for non-turbo Saabs. On the upside, adding a turbo to your naturally aspirated Saab really isn't all that expensive or all that hard.

Here is what you're going to need to know:

- Exhaust side: Turbocharged cars have a different exhaust manifold, exhaust downpipe, and larger-diameter exhaust system with a single muffler. This is all bolt-up, with no modifications required. Additionally, they have a plug in the block for the turbo oil supply and return, and '88 and later 900s and '87 and later 9000s have supplies and returns for water-cooling.
- Engine Internals: Non-turbos have a higher compression ratio and different intake camshaft profile (the exhaust cams are the same). The connecting rods and crankshaft should be the same, but piston quality may be different. Early turbo cars (b-motors only, I believe) have sodium-filled exhaust valves to help them resist heat, but all h-motor cars (turbo and non-turbo) have such exhaust valves.
- Turbocharged cars use a simple vacuum controlled ignition system, and use the APC system to control knock by adjusting charge pressure. Non-turbo cars use an EZK (electronic) ignition system, and use it to control knock by adjusting timing.
- Turbocharged cars have an air exchange oil cooler to keep engine oil temperatures down. The oil cooler is fed via the oil filter housing; the turbo-style housing can be bolted up to the block on non-turbos.
- Turbos have the APC system, which is powered from the main fuse block and has components in the cabin and the engine compartment.
- Turbo cars have a fair amount of circuitry to deal with turbo charging pressure. For example, the APC system is tied into the braking system to reduce charge pressure when the brakes are applied, and it's tied into the cruise control system to limit the turbo to base boost while the cruise is engaged. Additionally, turbos have an overboost switch to cut power to the fuel pump should boost exceed a preset limit (16 psi or so).
- Turbo cars are fitted with a number of check valves to prevent air pressure from getting to places it shouldn't be. There is a check valve on the valve cover breather to prevent the turbo from pressurizing the valve cover, and there is one in the brake master cylinder to prevent the same which may not be present on non-turbo cars.
- 16v turbos have an intercooler and bypass valve - these can be easily installed in a non-turbo car. Installing the bypass valve may require swapping intake manifolds, as the main valve cover breather on non-turbos connects to the throttle body where the bypass valve should, and there may not be a connection on the intake manifold to locate it where it normally is on turbos.
- Turbos have different fuel requirements. On 8v cars this may require using a fuel distributor from a turbocharged car. On 16v cars, this will require changing injectors. The fuel pumps are the same between turbos and non-turbos. 16v non-turbos have a higher rated fuel pressure regulator, which can (and arguably should) be used when converting. The air mass meter and main fuel injection ECU is the same between cars.

Sound complex? It is. Doing a complete conversion is a major undertaking, and as I said above, may simply be not worth it. Here are two approaches I've considered:

- Swap a complete turbocharged engine into the non-turbo car. The cruise control and braking circuitry aren't exactly required, but I would strongly recommend installing the overboost protection just in case. APC could be wired in externally - the Volvo APC site gives excellent insight as to how this would be done. Another possibility would be to use an aftermarket boost controller, such as the ones made by HKS or Apexi.
- Build a "high compression LPT" engine. The idea here is to install all the turbo parts, but keep the stock, high-compression engine and run low boost - 4 to 6 psi should be safe, 8psi would be a little extreme but should be okay. Use the turbo fuel system with the non-turbo fuel pressure regulator, turbo cam profiles, turbo exhaust system, install the turbo oil cooler, but keep the non-turbo ignition system. All the vacuum system differences would have to be

accounted for, but due to low boost none of the electronics would have to be installed - just set the mechanical wastegate for one or two psi lower than the actual boost you decide to run (to account for any boost creep). Due to the low boost pressures, an intercooler would likely not be required, but I would recommend running one anyway. As a safety precaution, it might be advisable to use higher-flow injectors for extra cooling - look to the aftermarket or grab some from a Saab 2.3l engine. This is the route I plan to take with my 900S project - I'll let everyone know how long it takes me to grenade my engine... :)