SAAB TURBOCHARGING SYSTEM

Saab
900 Turbo

DESCRIPTION

Saab uses the Garret turbocharger, with turbine and compressor impellers (wheels). See *Fig. 1*. Exhaust gases drive the turbine, which turns the compressor forwarding air under pressure to the throttle valve.

Excessive pressures are prevented by a charge pressure regulator (boost pressure control valve or wastegate). A back-up safety device, a pressure switch, prevents engine damage in case there is failure of the charge pressure regulator.

The Saab Turbo is designed to operate at low engine speeds to provide increased torque at typical vehicle driving speeds. The turbine shaft, which is delicately balanced, is mounted in a floating, sliding-contact bearing having a high oil flow. The shaft actually floats on oil during operation.

Lubrication is supplied by the engine lubrication system. The shaft is sealed against bearing housings with sealing rings installed in shaft grooves.

OPERATION

As engine operation begins, exhaust gases flow through the turbocharger's turbine impeller, causing it to rotate. Gases are expelled through the turbine to the exhaust pipe. As the turbine spins, its shaft turns the compressor impeller, compressing the intake air.

At idle speeds, the air compression has little effect upon its operation. However, as engine speed is increased (partial load), the pressurized air enters the system faster, and exhaust gases are expelled faster. The more exhaust gases passing over the turbine impeller, the faster it turns, and the more pressurized air is delivered to the engine.

At full load, the throttle valve is fully open and charge pressure increases. At 6.4-7.8 psi (.45-.55 kg/cm^2), the valve in the charge pressure regulator opens permitting exhaust gases to flow directly to the exhaust pipe, bypassing the turbine impeller.

In the event the valve sticks and does not open, charge pressure increases to 8.6-11.4 psi (.6-.8 kg/cm^2). This causes a pressure switch to break current flow to the fuel pump, thereby preventing engine damage.

The charge pressure regulator is located on the exhaust side of the engine and its valve is held closed by a spring-loaded diaphragm.

CAUTION — *Never increase the preset charge pressure regulator limit.*

TESTING

CHARGE PRESSURE REGULATOR

1) Connect a pressure gauge (83 92 813) between nipple on inlet manifold and line to pressure switch. Run hose into passenger compartment and place gauge on left hand corner of instrument panel.

2) Warm up engine, and drive vehicle in 3rd gear at an engine speed lower than 1500 RPM. Then accelerate at full throttle by pressing pedal to the floor. As engine speed approaches 3000 RPM, apply brakes while still keeping accelerator pedal pressed down.

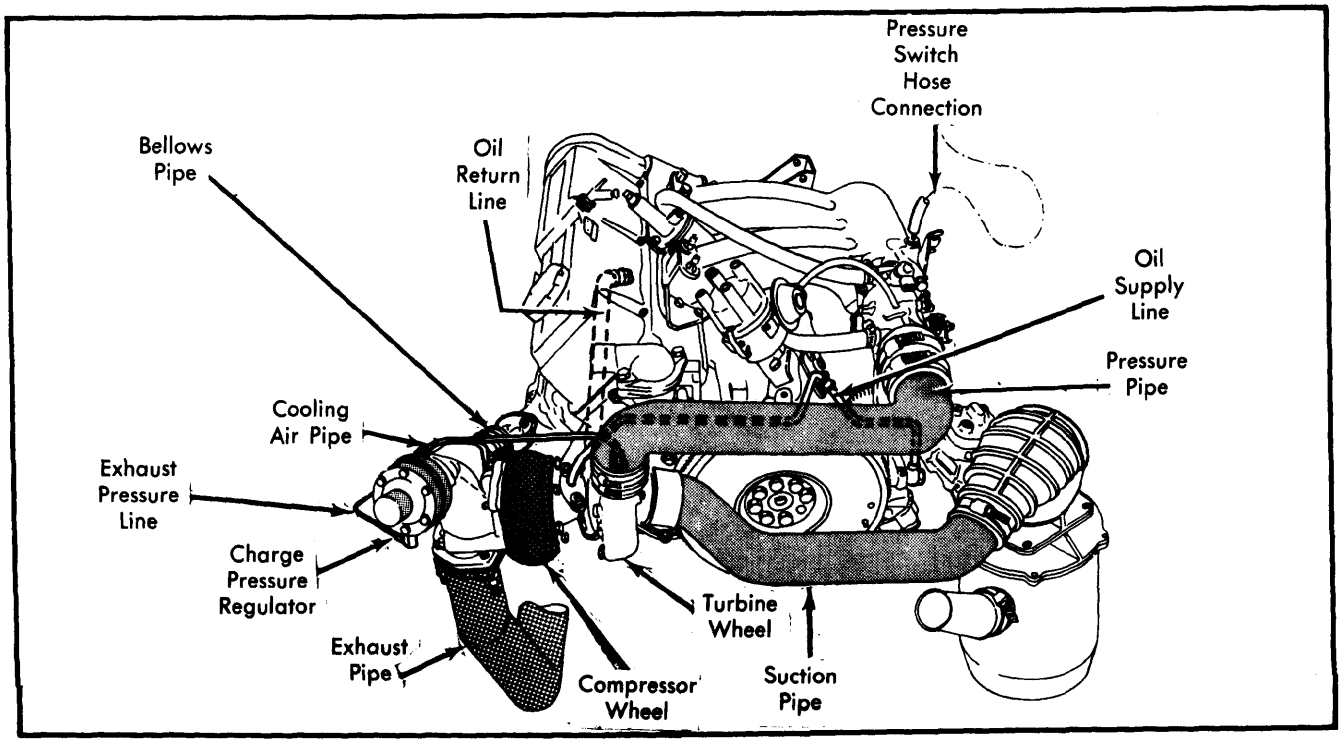

Fig. 1 Components of Saab Turbocharging System

SAAB TURBOCHARGING SYSTEM (Cont.)

3) Note maximum pressure indicated with vehicle under full load at 3000 RPM. Charge pressure should be 6.4-7.8 psi (.45-.55 kg/cm²).

4) To adjust charge pressure, disconnect exhaust line from the charge pressure regulator and remove its diaphragm housing cover. See *Fig. 2*. Loosen the lock nut, using a 10 mm spanner wrench. Grip the spring seat with adjustable pliers.

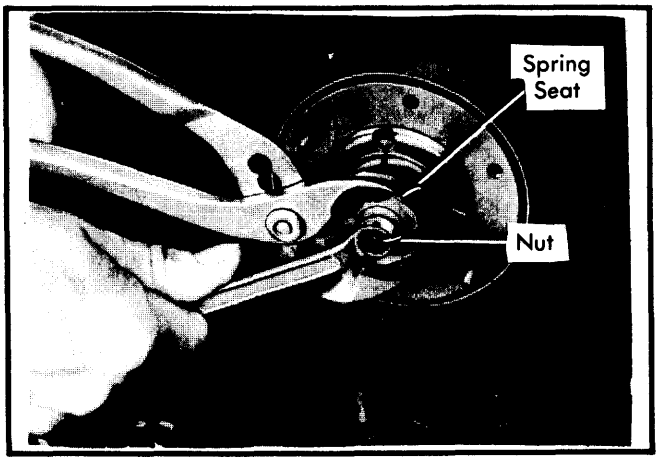

Fig. 2 Adjusting Charge Pressure Regulator

5) Adjust spring tension by rotating spring seat clockwise or counterclockwise according to table. Be sure valve does not turn. Tighten lock nut after adjustment. Replace diaphragm cover and gasket and install exhaust line. Seal the charge pressure regulator.

Charge Pressure Adjustment

Gauge Reading While Driving – Psi (kg/cm²)	Spring Seat Turns
9.57 (.67)	1 out
8.99 (.63)	¾ out
8.41 (.59)	½ out
7.83 (.55)	¼ out
7.25 (.51)	Correct setting①
6.67 (.47)	¼ in
6.09 (.43)	½ in
5.51 (.39)	¾ in
4.93 (.35)	1 in

① – If reading is 6.4-7.8 psi (.45-.55 kg/cm²), no adjustment is necessary.

PRESSURE SWITCH

1) Start the engine and run it at idle. Disconnect hose from pressure switch at inlet manifold. Connect pressure gauge and suitable pump (cooling system tester) to pressure switch hose.

2) Increase pressure with pump and check pressure at which engine cuts out. Reading should be 8.6-11.4 psi (.6-.8 kg/cm²). If not, replace pressure switch.

TURBO PRESSURE GAUGE

To check the pressure gauge on the instrument panel, use the same procedure as for the pressure switch. At maximum charge pressure, the needle should be within the wide orange range. At pressure switch actuating pressure, the needle should be in front of the limit between the orange and red zones. If not, replace gauge.

NOTE – *Late model 1980 Saabs have the pressure switch located inside the vehicle, under the instrument panel.*

REMOVAL & INSTALLATION

TURBOCHARGER

Removal – **1)** Remove charge pressure regulator and blank off exhaust pipe. Disconnect hose between compressor and throttle housing.

2) Disconnect oil supply and return lines at turbocharger. Remove bolts securing turbocharger to exhaust manifold and remove turbocharger. Plug all holes in turbocharger.

Installation – **1)** Attach turbocharger unit to exhaust manifold, using a new gasket between mating flanges. Fill lubricating inlet of turbocharger with engine oil and connect oil return line at turbocharger, using new gasket.

2) Connect the oil supply line, using new gasket and new seals. Attach the hose between the compressor and throttle housing and the hose between the air flow meter and compressor.

3) Attach the charge pressure regulator, using new gaskets and locking plates. Turn engine on starter for about 30 seconds with terminal 15 on ignition coil disconnected. This fills the turbocharger's lubrication system before engine runs.

CHARGE PRESSURE REGULATOR

Removal – **1)** Disconnect exhaust and cooling air lines from charge pressure regulator. Remove bolts from exhaust manifold flange. Save the taper seal ring and plug the exhaust pipe.

2) Remove bolts from bellows pipe and from the turbocharger. Lift off charge pressure regulator.

Installation – **1)** Attach charge pressure regulator to turbocharger, using a new gasket. Attach bellows pipe, locking bolts in place with locking plate. Remove plug from exhaust pipe and connect the pipe with taper seal ring to the charge pressure regulator housing.

2) Connect exhaust and cooling air lines. Use "Never Seize" or Molycote 1000 or equivalent on exhaust pressure line. Test drive vehicle and check charge pressure. Adjust as necessary. Seal charge pressure regulator and attach heat shield.