1982 Turbocharging Systems

VOLVO GLT

GLT

DESCRIPTION

The Volvo Turbocharged engine is basically a B21 engine equipped with an exhaust driven turbo-compressor. The turbocharger is mounted on the passenger side of the engine.

Components include the turbine, compressor wheel, rotor shaft, bearings, housing and wastegate. In addition, a pressure regulator, pressure switch, overload protection switch and a turbo warning light on the instrument panel are connected into the system.

Engine modifications made to the B21 engine to accept the turbocharger are as follows: Pistons have increased clearance in the bore to withstand the high temperatures generated by the turbocharger. Compression ratio has been lowered to offset some of the increased charge provided by the compressor.

Exhaust valves are stellite coated and sodium cooled to resist high temperatures. An engine oil cooler located at the side of the radiator has an integral thermostat. Heat shields are provided for some components to deflect heat from the turbocharger. The air/fuel control unit on engines equipped with the Continuous Injection System is the same as the 6-cylinder engine model, with 2 of the fuel outlets plugged.

These plugged outlets must not be connected to fuel lines. The fuel pump has increased capacity as does the cold start injector. The injectors have a larger opening for more fuel injection as required.

OPERATION

The turbine wheel is driven by exhaust gasses. A shaft connects the turbine wheel with the compressor wheel. As exhaust gas flow increases with engine speed, the turbine speed increases and consequently compressor discharge increases.

Turbo compressor wheels rotate at a very high speed, requiring the shaft assembly to be carefully balanced. The shaft is supported by bearings using pressurized oil for lubrication. The shaft seals are a piston ring type.

The turbocharger is connected to the standard engine oiling system. Oil supply and pressure must be sufficient to prevent shaft bearing failure. The turbo compressor is designed to provide a relatively high discharge pressure at middle range RPM. In order to prevent excessive pressure at high speeds, several controlling and regulating devices are required.

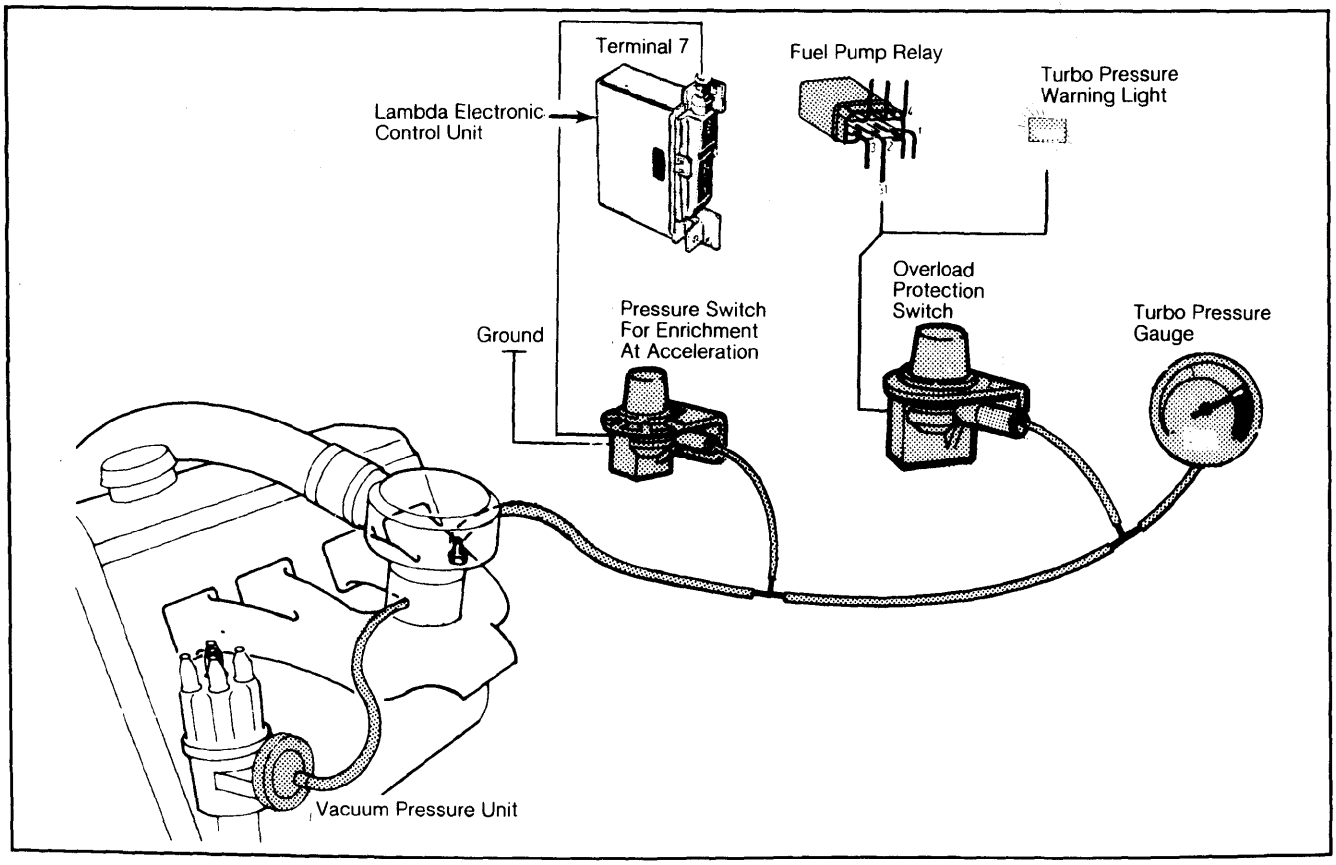
Pressure Sensor Regulator & Wastegate Actuator

This device monitors discharge pressure from compressor. When pressure reaches 6 psi (.42 kg/cm^2), regulator begins to open wastegate. As pressure increases, the regulator gradually increases wastegate opening. A control rod stroke of approximately 3/8" (10 mm) is achieved just before maximum pressure switch cuts out fuel pump relay.

Enrichment Pressure Switch

A pressure switch, located on the firewall, receives compressor pressure from a fitting on intake manifold. It will close when pressure reaches 2.9 psi (.20

Fig. 1: Control Devices for Volvo Turbocharging System



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VOLVO GLT (Cont.)

kg/cm²). When it closes, it grounds terminal 7 of the Lambda sond electronic control unit. This will cause Lambda system to operate on a special fixed cycle of 58.5°, allowing for fuel enrichment upon acceleration.

Overload Protection Switch

Excessive compressor pressures may damage engine by inducing an overload, and are normally prevented by pressure sensor and wastegate actuator. In case of failure of that system, a second overload protection switch is activated.

The switch receives pressure input from the intake manifold. When pressure reaches 10 psi (.70 kg/cm²) the pressure switch will open a ground circuit for fuel pump relay, momentarily stopping fuel pump flow, resulting in a reduced compressor pressure.

Pressure Control of Spark Timing

The distributor centrifugal advance mechanism provides a spark timing which is too advanced when turbocharger is operating at high load. To counteract this, the pressure control unit at distributor has double function. Under normal operating conditions it can advance the spark by a maximum 15°. At high pressures it retards the spark timing by a maximum 8°, when compressor pressure reaches 5 psi (.35 kg/cm²).

TESTING

COMPONENT CHECK

1) Ensure that exhaust pipe-to-turbocharger nuts are properly tightened and that no leaks exist between pipe and turbocharger. Nuts should be tightened to 16-18 ft. lbs. (22-25 N.m).

2) Ensure that seal on control rod from pressure regulator to wastegate actuator is intact. Seal is either a compressed sleeve nut, or a wire and lead seal.

TIMING RETARD

1) Connect a standard radiator pump and pressure gauge to distributor air pressure unit. Plug hose removed from distributor.

2) Using a dwell meter with a scale extending to 70°, set on 4-cylinder setting and connect it to the Lambda sond service pickup of the electronic control unit.

3) Start engine and idle. Note ignition timing. Pump pressure tester up to 5.1 psi (.35 kg/cm²). Ignition timing should retard 6-10°. If not, check distributor and replace distributor pressure unit, if required.

FULL LOAD ENRICHMENT SYSTEM

1) Connect standard radiator air pressure pump and gauge in-line between intake manifold and pressure switch on firewall. Connect dwell meter to Lambda sond service pick-up on electronic control unit.

2) With engine running, pump up air pressure until dwell meter display reads a steady 56.0°-61.0°. Air pressure reading at this point should be 2.9 psi (.20 kg/cm²). If reading is not to specification, replace pressure switch and re-check system.

OVERLOAD PROTECTION SWITCH

With pressure tester, gauge and dwell meter hooked up as in above test, pump tester up until engine stalls. Air pressure reading should be 10 psi (.70 kg/cm²). At same time, air pressure indicator on instrument panel should move to red zone and red "Turbo" warning light on instrument cluster should light. If not, replace overload protection switch.

Fig. 2: Lambda System Connection Point For Dwell Meter