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## Chapter 6, Notes Page



### Additional Tuning Instructions for SAAB V-4

These instructions are intended for competition tuning of the V-4 engine according to the Group 2 regulations. The instructions can be partly used also for a slight power increase. The following modifications are to be done:

#### 1. Engine Block

The surface facing towards the cylinder head is to be milled 2.5 mm. To get a perfect tightening under the intake manifold, this surface of the block is also to be milled (see note 1). The block can be bored to 91 mm. The cylinder volume is then increased to 1531 cm<sup>3</sup>. With the block milled to 2.5 mm, the compression ratio is 11.0:1. After the machining, the cylinder heads must be countersunk to make room for the pistons.

#### 2. Cylinder Heads

The cylinder heads are to be countersunk as much as the block is milled, i.e., for compression of 11.0:1, 2.5 mm. The cut recesses for the pistons are located from the holes for the guide bushings on the exhaust side of the cylinder heads (see page 3). To get a perfect tightening, the intake manifold is to be milled (see point 19). From note 2 you can see how much to mill and countersink the cylinder heads to achieve various degrees of compression. At very small increases, i.e., milling under 1.0 mm, the cylinder heads can be milled directly and milling of the block is then not necessary. Adjustment milling of the intake manifold is also unnecessary. The intake ports of the cylinder heads are filed and the port form inside the valve seat should be as shown in enclosure 4. The form of the exhaust port is shown in enclosure 2. The volume of the combustion chambers of the cylinder is to be measured as follows: Place the cylinder heads with the combustion chamber upwards. The plane level is controlled with the water level. Spark plugs and valves must be mounted. Fluid body e.g., thin oil or methylated spirit is filled from a measuring glass with a known value, e.g. 50 cm<sup>3</sup>. When the combustion chamber is filled you can determine the volume of the combustion chamber by measuring the fluid that is left in the glass. When this volume is known, the compression ratio can be determined with the aid of note 2, where the thickness of the gasket is considered. Retighten the cylinder heads twice with an interval of 500 km (300 miles).



Tightening torque 65 ft/lb. Before mounting the cylinder heads, the head bolts must be shortened as much as the cylinder head or block has been milled, to make sure that the heads bolts do not bottom out.

### 3. Carburetor

At this time we recommend a carburetor made by Solex 38PDSI-2. The distance between the holes in the carburetor flange must be adjusted so that the carburetor fits to the studs of the intake manifold. The carburetor is equipped as follows:

Choke tube	30
Main jet	185-190
Air correction jet	80
Pilot jet	65
Acceleration pump jet	50
Needle valve	2

The travel of the accelerator pump should be checked for proper adjustment. In the wintertime it may be necessary to use the inner hole on the swivel rod. The carburetor can also be equipped with a 40 mm butterfly, i.e., the butterfly housing is bored to 40 (-0 +0.05). A new butterfly must also be made or purchased. With this butterfly the choke tube can be taken away. The inlet part of the carburetor barrel should be rounded (R=.315in.). After this modification, the main jet should be increased to 195-200.

### 4. Air filter

The air filter is to be modified according to enclosure 9.

### 5. Fuel pump

No modifications.

### 6. Oil pump

The spring on the oil pump, for the reduction valve is changed to a stronger spring. This spring can be purchased from SAAB Competition Dept., Trollhattan. With this modification the oil pressure is increased about 1 kg/cm<sup>2</sup>.

### 7. Oil cooler

For competition driving an oil cooler must be used. An oil cooler can be purchased from SAAB Competition Dept., Trollhattan. (With an oil cooler, it requires another 2 quarts of oil.) Always use a SAAB or Ford original oil cooler.

### 8. Water pump

No modifications. Check, however, that all ducts in the pump are open. Change all wire clamps to screw



- clamps. Change all water hoses between the pump and block to high pressure 2 ply hoses. Check the brazing on the water distributor pipe.
9. Thermostat
- The adjustment for the opening temperature of the thermostat is to be screwed downward 4 to 5 turns. Bore 3 to 5 holes in the sealing plate, in the center of the thermostat.
10. Crankshaft
- No modifications. The outer bearings should be changed to bearing 436390 (red) and 436391 (blue).
11. Flywheel
- The flywheel is lightened as shown in page 4 and enclosure 5. The weight reduction is about 2 kg. (5 lbs.). After the machining the flywheel must be balanced. At every removal and replacement of the flywheel the bolts must be changed.
12. Clutch, disc
- Only stock clutch components are to be used.
13. Piston, connecting rod
- Pistons and connecting rods have been weighed before the mounting and do not have to be machined. At every removal the bearing cap bolts or the connecting rod bolt must be changed.
14. Camshaft with drive
- Camshafts suitable for rallies can be purchased from SAAB Competition Dept., Trollhattan. Check the tooth clearance between the crankshaft and the gear (max. 0.1 mm) A metal gear for the balance shaft is available under Spare Part #635376.
15. Valve lifter
- The valve lifters are modified according to page 6. No modifications push rod to the push rod.
16. Rocker arm
- The width of the rocker arm is ground from 1-1.5 mm. The height of the arm must not be decreased.
17. Valve springs
- Stronger valve springs can be purchased from SAAB Competition Dept., Trollhattan.
18. Valves
- The valves are adjusted and polished according to page 4. The rubber covers on the valve rods must not be removed. Valve clearance: Inlet 0.5, exhaust 0.6 cold engine.
19. Intake Manifold
- The ducts of the intake manifold must be matched to the ducts of the cylinder heads. Use bluing to determine where the machining is to be done. The intake under the carburetor is to be filed or milled to fit the carburetor (38). The duct walls are to be polished as carefully as possible. If the cylinder head surface of the engine block is milled more than



1.5 mm, it may be necessary to mill the tightening surface of the intake manifold against the valve housing to get a perfect fit. This surface is to be milled 1.5 mm if the block is milled 2.5 mm.

20. Distributor

Remove the vacuum advance unit from the distributor. The breaker plate must then be welded or brazed to the bottom plate, which is screwed into the distributor housing. The centrifugal ignition advance must not be changed. The rotor is to be changed to one without resistance. The spark plug connectors are to be changed to ones without resistance. The ignition timing should be 9° static. Ignition coil Bosch TK 12 ALO with a resistor is recommended.

21. Spark plugs

Suitable spark plugs are Bosch W 280 T13S and Champion L644 or other makes with the corresponding heat range.

22. Crankcase ventilation

The air cleaner for engines in cars before Chassis No. 434173 should be modified. Engines with a closed crankcase ventilation are to be modified as follows: Connecting pipe 425680 is mounted in the block for connection of hose 800239. Use either a modified filter 800171 or make a connecting pipe and braze or weld this pipe to the lower edge of the filter inside the filter cartridge. With this system the oil filler cap on the right valve cover must be changed to 425941. The other hose connections in the valve cover must be tightened. Remove the expansion valve under the carburetor. If a connecting pipe to the bottom of the filter is made, a flame guard must be placed either in the hose or in the pipe. This flame guard is to be made out of steel wool with a net on both sides so that the steel wool can not be sucked into the engine. See also page 8.

23. Exhaust System

The exhaust pipes, made of 44 mm (ID) steel pipe, extended from the cylinder heads past the gear box and through two holes on each side of the gear box. The pipes come together to one pipe, 1.3 meters from the opening, with the same diameter (44). The exhaust system is finished with a rear muffler, modified to accommodate the larger exhaust pipe. You can, of course, draw the exhaust pipes through the ordinary holes. The above mentioned measures, however, are still valid.

24. Miscellaneous

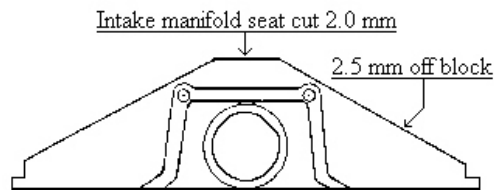
Regarding fuel, 100 octane gasoline is to be used. With a rally camshaft and rally valve springs, revolutions up to 6600 rpm can be used. At 6700-6800 rpm the valves will float. This must be avoided



as much as possible as the power will decrease and the stress on the valve system will increase.

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NOTE 1



The surface facing towards the cylinder head should be milled 2.5 mm. The seat for the intake manifold must also be milled 2.0 mm, to insure a proper seat.

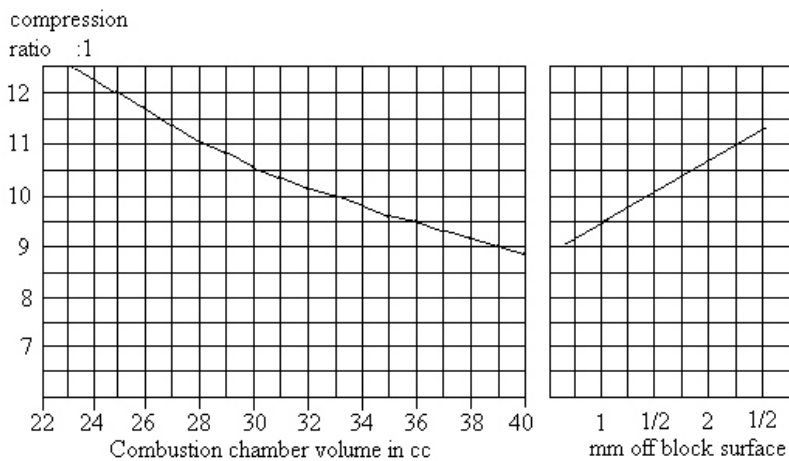
This will raise the compression to approximately 11.0:1. Boring the block to 91 mm, one mm oversize, will increase the displacement to 1531 cc. NOTE: The cylinder head must be countersunk, in conjunction with the above, to accommodate the upward travel of the piston (see page 3).

See page two for information on other compression ratios, if desired.

The head bolts must be shortened the same amount as taken from the block to avoid bottoming.

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NOTE 2



This graph shows the relationship between combustion chamber volume and the compression ratio.

Line A shows the change in compression when cylinder volume is reduced by milling the head.



Line B indicates the change in compression produced by milling the block, a maximum of 2.5 millimeters, and counterboring the head to allow for piston clearance. Note that the area of the chamber increases in this instance.