

## Sunbeam Alpine Engine re-assembly recommendations

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**NOTE: We are not professional mechanics and claim no expertise but have owned Alpines for many years. These notes and the accompanying video are simply the record of what we did when we rebuilt this Alpine engine, there may be other and better ways of doing this, this is our way.**

Do the job 'in your head' several times over before you start work, make a copy of the pages from a workshop manual or rebuild article that you want to follow that can get dirty in the garage and be thrown away afterwards, make a list of exactly what you are going to do, or use this one. Ensure that you have all torque settings to hand and an accurate torque wrench. Ideally use a professional engine stand (ours cost just £47 brand new and is worth much more than that) as it lets you spin the engine over easily and makes working like this so much easier and cleaner. Get all the tools you expect to use together, including any 'special' tools such as the crank nut spanner that we had to make to tighten the starter dog. Check that every part needed is to hand, cleaned, bagged (and is the correct size/oversize or undersize for the new engine). As you work smear all moving parts with a very thin coat of LM grease then lubricate with running in oil as fitting. There will be different and possibly better ways of rebuilding an Alpine engine but this is how we did it.

Start by fitting pistons to con rods (warm as necessary with hot air gun to move gudgeon pin), check piston numbering and orientation. When the word 'front' is towards you the lubrication hole on the con rod will be on the left. In the engine the hole is pointing towards the camshaft side of the engine. Add circlips to gudgeon pins, make sure they are seated properly in the grooves and everything is moving freely and easily.

### **With block the right way up**

Check piston ring gaps in each bore and file each ring to size as necessary. Keep piston rings separate once gapped and place immediately onto their respective pistons. On these pistons the oil control rings are in four parts. Two thin silver rings sit at the top and bottom. To assemble insert first thin oil ring into the groove, then the small black oil ring, then the larger mesh oil ring then fit the second thin silver ring. The top two piston rings look identical and are unmarked on these pistons so once gapped it is important to keep them in their grooves. Gap the top rings to 0.025", the second rings to 0.015". Fit the Big End shells to the Big Ends, keep rear of shells dry, lubricate white metal bearing face. Bag each con rod assembly together to keep clean.

### **With block upside down**

Insert Camshaft into block (lubricate) and fit securing plate with two bolts. Fit main shells into block lubricate white metal faces, leave rear of shells dry. Check all the oil ways line up with oil holes in bearing shells. Lay Crankshaft in block, (lubricate). Start with the middle bearing. Add the two thrust washers (the two grooves and the white metal bearing surface face the crankshaft thrust faces - lubricate). Thrust bearing come in multiple oversize's, both of these on this engine are the maximum size of + 0.025".

Note: Never depress the clutch when starting an Alpine as you will cause undue wear to these thrust washers. Depress the clutch only once the engine is running.

Tighten middle shell bearing cap but not to full torque yet. Use sealant at each end cap corner before pushing fully home. Keep machined faces clean. Ensure that the front bearing cap is vertically true to give a flat surface for sealing behind the timing chest before you tighten it fully.

Check everything spins freely after tightening each main bearing cap. Then torque up in stages up to 55ft/lbs on each bolt ensuring everything spins after each tightening.

### **With block the right way up, then turned over as each con rod attached.**

Fit ring compressor over Piston One, compress piston rings and fit piston assembly into block from above, gently tapping down with a piece of soft wood. Once inserted in bore, spin engine over. Connect con rod up to crank. Ensure that as the big ends are fitted the bearing caps and the con rod go together so that the 'tang' of each shell are both at the same side.

Note. At some time previously the engine in this video has either been incorrectly assembled or incorrectly marked as Number 1 assembly has '1' stamped on opposite sides of con rod and big end cap when these are correctly assembled.

Ensure lots of lubrication and recheck orientation of big end caps as you fit each one. Tighten con rod nuts on big ends and use loctite. Torque each nut up to 24ft/lbs Check that everything turns freely after each con rod connected, ensure oil hole in con rod points towards camshaft side of engine.

### **With block upside down**

Fit back plate that holds engine mounts. Use a fresh gasket and gasket sealer on both sides. Examine one-way valve in chain oiler, ensure it is springing correctly and that the sealing ball is present inside it and fit to front face of block.

Highlight the timing gear marks. Fit woodruff keys to camshaft and crankshaft and gently fit both timing pulleys. Turn crankshaft so the pistons in cylinders one and four are at TDC then turn camshaft until the two marks on the timing pulleys line up.

Remove timing pulleys and fit timing chain over pulleys without moving their relative positions, then refit both over their woodruff keys.

**WARNING NOTE:** With the marks aligned on the two timing wheels this is actually No 4 at TDC. You must now turn the crank one complete revolution (360°) forwards THEN insert the oil pump and align the distributor drive groove to 45° as shown.

**This step is NOT shown on the video but you MUST do it.**

We did not have a problem as it doesn't really matter too much with a 1600 engine (12 tooth oil pump) and we were able to just switch the HT leads by 180° but with a 1725 (11 tooth oil pump) you will end up with the timing being 16° out if you don't do this. This will misalign the distributor and cause you unnecessary problems.

### **With block on side**

Having followed the advice in the warning note, fit the oil pump and check timing is correct as per manual - 45° across face (painting half of distributor location slot helps with lining this up).

Note: The marks on the Timing Gears visible in our video at this point will be in a different position to yours provided that you have rotated the crankshaft as required.

### **With block upside down**

Once all is timed correctly tighten camshaft bolt, securing flat edge washer and lock washer. Once tight, tap over lock washer edge to secure. Fit timing chain tensioner spindle, timing chain tensioner plus washer and split pin. Lubricate everything.

Place oil thrower ring on crankshaft over woodruff key and grease face. Put new gasket on timing chest and secure all round with instant gasket sealant on both sides. Put the centre timing chest bolt and copper washer in position. Put one thickness of electrical tape around crankshaft pulley, then oil the tape. Push crankshaft pulley through timing chest hole and turn it until it spins with the electrical tape pinched between the pulley and the timing chest all the way around. Mark the end of the crankshaft to show where the woodruff key position is. Push crankshaft pulley onto crankshaft and push timing chain tensioner into timing the chest as you do so. Loosely centralise timing chest hole around pulley. Gently tighten central timing chest bolt and all the other bolts around the timing chest. Ensure you can still move the chest to adjust it and centralize the pulley.

Once happy that the crankshaft pulley is spinning freely with the electrical tape in place *without binding* tighten each timing chest bolt until it is secure. Remove crankshaft pulley and take off the electrical tape. The shaft and hole should look perfectly centred now. Refit crankshaft pulley again, this time without tape. It should spin without rubbing.

Lock crankshaft by inserting a block of hard wood between the crankshaft web and the inside of the block. Tighten the starter dog over the crankshaft pulley. We were advised to torque this to 180ft/lbs by an experienced Alpine race driver. This is very tight! (Some Alpines have a different type of started dog and a lock washer arrangement that doesn't require such extreme tightening.

Smear each corner of the front and rear main bearing carriers with instant gasket sealant, smear both sides of the two pieces of sump gasket with sealant and fit to the sump. Insert the cork seals into the recesses in the bearing caps front and rear and ensure they are seated correctly. Do not put any sealant on the cork seals. Fit sump. Starting in the middle on each side attach

the sump bolts. Work uniformly until all sump bolts are fitted and sump is securely on with instant gasket squeezing out of the join. Clean any excess away.

Our car has a small magnet glued to the sump plug with liquid steel to collect any ferrous metal swarf before it passes through the oil pump. It also has another magnet, a 'Filter Mag' fitted around the oil filter intended to catch more particles of swarf that make it to/through the filter. Every ferrous particle that you catch here has been kept out of the oil pump which must be a good thing.

### **With block the right way up**

Fit new head gasket, fit cylinder head to block tightening the bolts and studs in sequence in stages until you get to 45ft/lbs. Put spark plugs loosely in head and cover inlet and exhaust openings to reduce risk of dirt getting in. Insert new cam followers in tappet chest (lubricate everything)

Refit rocker feed pipe at bottom, fit new cork gasket for tappet chest cover and fit cover dry. Do not over tighten and pull gasket flat as the cork gaskets work best when they can 'bounce' a bit. Refit pushrods (in their correct positions as numbered when removed) then refit rocker assemblies with tappets loose (Nuts on rocker pedestals are torqued to 11 ft/lbs). Connect rocker oil feed pipe at top.

Set tappet gaps inlet 012" exhaust 014". This should be re-done once hot but cold setting will get the car started. Fit flex plate (this is an Automatic Alpine) to crankshaft. The torque setting is 40 ft/lbs. Fit oil filter housing and distributor mount. Tape up and seal any openings into engine

Fit Water pump, using new gasket and sealant. Fit thermostat housing with new gasket and sealant and fit bypass hose. Put engine in car, secure engine to bell housing with the mounting

bolts and connect flex plate to torque converter (40 ft/lbs). Fill engine with Running-in oil, connect up all cooling pipes, mix distilled water and anti-freeze together and fill system. Fit peripherals such as starter motor, alternator, exhaust and carburettor etc. The manifolds on this car are fitted to the cylinder head by 3/8 and 5/16 UNC Allen headed bolts of either 1" or 1 1/4" lengths depending on the manifold flange thickness. This is an idea developed by people who race Alpines and makes fitting and removal much easier.

### **After 300 Miles**

Run car for 300 miles varying the load on the engine, accelerating gently and keeping top speed below 40mph, then drop out the running in oil, clean sump plug magnet. Remove rockers and **when completely cold** re-torque cylinder head bolts. Before torquing bolts down release tension one flat then re-torque to 45ft/lbs. This removes any stiction caused by corrosion etc and ensures that the torque wrench reading is correct.

Replace oil filter, fill with standard engine oil. Reset the tappet gaps when engine is fully hot (Checking engine compression now gives a sign of how well it is running in). Run for 200 miles varying load on the engine, accelerating a little harder and keeping top speed below 50mph. Run for a further 500 miles gradually increasing the load on the engine and top speed until car is fully run-in.

### **After 1,000 miles**

After car has covered at least 1,000 miles from engine re-build and once fully run-in. Drop oil out of engine, clean sump magnet, re-fill engine with 'Flushing oil', (run for 10 minutes at tick over only). Drop out Flushing oil. Replace oil filter, clean

sump plug magnet – it will pick up more swarf during flush.

Remove rockers and **when completely cold** re-torque cylinder head bolts for the final time (release tension one flat then re-torque to 45ft/lbs). Fill with standard engine oil. Reset the tappet gaps when engine is fully hot.

**With just routine servicing the car should now run for 1,000s of miles.**

We did this rebuild and running-in 'our way' having read numerous manuals, articles and reports on how to do it first and listening to advice from numerous people who have done it before. We chose the options that seemed to make sense and although the job can be done differently, this way has worked well for us. The car is fast, smooth and economical.

Good luck with your own engine re-build. Take sensible safety measures at all times and work slowly and methodically and you be successful.

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