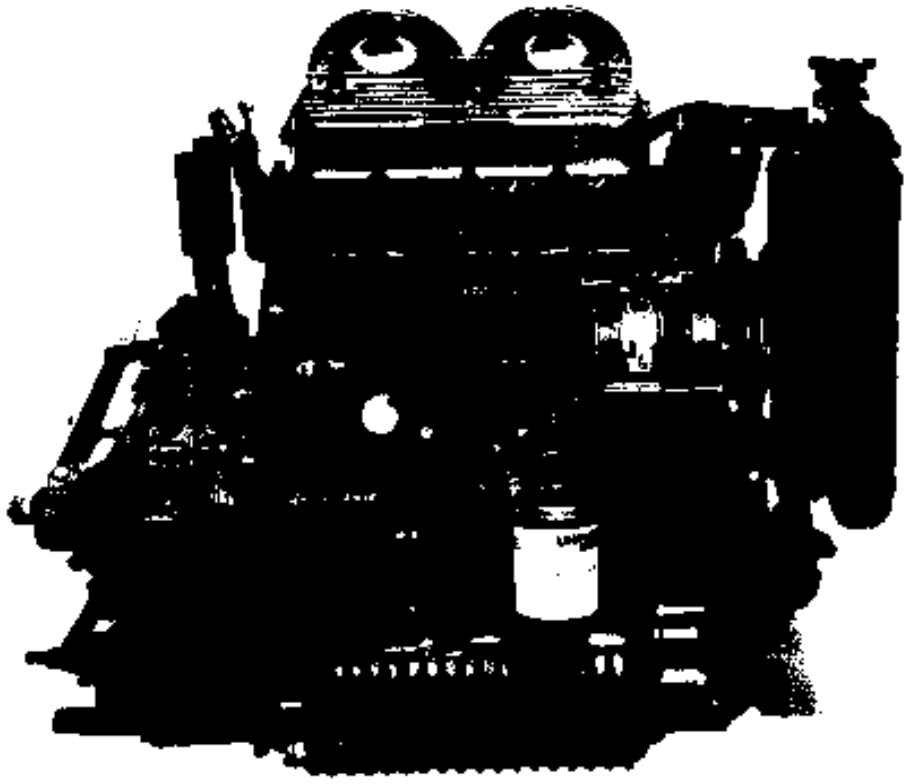
mini sport

EST Over 30 Years of Excellence 1967



Engine Assembly Manual

IMPORTANT THINGS TO CHECK.

1. The area designated for engine building must be clean and spacious, preferably away from draughts, to minimise the possibility of dust contamination.

2. Ensure all parts being used from the donor engine are adequately cleaned before attempting a rebuild.

When fitting the crankshaft, ensure it rotates freely after every step.

When fitting thrust washers to the crank, ensure the oil grooves are fitted towards the machined thrust face on the crankshaft (double check) use feeler gauges to check the end float between the crankshaft and thrust washers.

Introduce the camshaft to the block before any other process, ensure it rotates without resistance, if it does not rotate freely, apply oil generously to the cam bearings, refit camshaft and rotate with slight pressure until it is in its correct position, this process is used to "ream" the bearings to match the camshaft. Remove the camshaft, thoroughly clean the block and bearings to remove all traces of swarf.

FITTING CRANKSHAFT TO BLOCK.

1. Place block face down on clean cloth, to protect face from scratching.

2. Remove main bearing caps, taking care to remember which housing they were matched to, and in which position. Check main & big end shells are the correct size for the crankshaft being fitted.

3. Place main bearing shells into position in the housings and caps, press home firmly using the edge of the shell, not the bearing surface.

4. Generously lubricate all bearing surfaces.

5. Carefully place the crankshaft into the block, and onto the main bearing shells. Check the crankshaft for free rotation, push crank completely to one end of block to allow fitment of crankshaft thrust washers.

6. Lubricate the thrust faces on either side of crankshaft centre main journal.

7. Place one half of the thrust washer against thrust face, ensure that oil grooves are against thrust face, slide round into position in groove in block. Repeat the procedure for the other side. (If washer will not slide completely round, then rotate crankshaft slightly). This will aid the positioning of the thrust washers.

8. Check crankshaft end float with a feeler gauge between thrust washer and thrust face. (See Data Sheet for tolerance.)

9. Place thrust washers into position on centre main bearing cap with oil grooves facing out. Position main cap firmly into place over centre main journal, and tighten down with spanner until "nipped".

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GROUP A 1300 1996 British Rally Champion GROUP A 1300 1997 WRC Rally Class Winner

10. Check that the crankshaft will rotate freely, if it feels tight, or shows signs of high spots, remove cap and check bearing shell for signs of stress. Contact Mini Sport before proceeding.

11. If crankshaft rotates freely, continue to fit the other main caps in the same manner as before, ensuring they are fitted in original position, each time a main cap is fitted, check crankshaft for rotation.

12. When all caps are tightened down and crankshaft rotates freely, proceed to use torque wrench to correctly secure the main caps (See Data Sheet).

FITTING PISTONS AND CON-RODS TO BLOCK

1. Place block "face up", position block onto suitable platform to enable crankshaft to rotate. Position crankshaft so that the big end journals are horizontal, this will prevent the journal surface from being damaged when piston/con-rod assembly is fitted.

2. Examine piston to ensure piston rings are intact and correctly seated in grooves. Position open ends of ring @ 180 degrees to the adjacent ring.

3. Lubricate the piston rings and the cylinder bore carefully, fit piston ring compressor over piston, proceed to tighten around piston, taking care to tighten slowly and uniformly. If the compressor becomes tight, or makes strange sounds, or jumps tighter, then a ring may have become damaged.

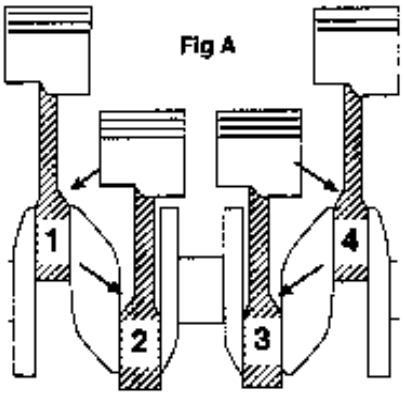
4. Check before continuing. If correct, then proceed until rings are fully compressed, remove big end cap from con rod, fit big end shell into position taking same precautions as with main bearings.

5. Proceed to fit piston/con-rod assy. into cylinder bore, ensure piston and con rod are in correct position (large shoulders face each other Fig. A), continue until compression tool is sat squarely on edge of bore. Tap gently on top edge to locate, firmly hold compression tool in position with one hand, whilst gently tapping the piston crown, until piston crown is level with block face.

6. If at any point the piston becomes tight or will not move, check that a piston ring has not been allowed to expand between compression tool and cylinder block face. If it has, then remove piston slightly, to allow correct compression of the piston rings again, then continue. Never use excessive pressure with a hammer shaft or any other heavy object.

7. Fit remaining piston assemblies into their respective bores in same manner as before. Do not push piston too far into bore, or con rod will hit the crank journals and damage will result.

Fig A



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8. When all pistons are fitted correctly, turn block over onto block face.

9. Pull con rods up to their matching crank journal and position correctly.

10. Fit big end shell bearings into con rod caps.

11. Generously lubricate journals, proceed to fit con rod caps onto con rods, taking care to fit them on their original con rods and in original position.

12. Tighten caps down in same manner as main bearings, ensuring rotation after each step.

13. Torque down all con rod caps in same manner as the main bearings.(See Data Sheet)

14 . When complete, turn block onto its side, ensure that none of the pistons protrude beyond face of block at top dead centre.

CAMSHAFT FITMENT

1. Place block on face.

2. Lubricate cam bearing surface and cam follower housings.

3 . Introduce cam followers into position, (on 1293 & 1360 engines), making sure that they slide in and out smoothly.

4. Introduce camshaft into bearings, ensure that the lobes are not allowed to damage the bearing surface.

5 . Fit "bearer plate" gasket to front face of block, and fit bearer plate .

6. Fit new camsheft thrust plate into position.

7. Fit crankshaft timing sprocket onto crankshaft.

8. Turn crankshaft until a straight edge can be placed through the centre line of the crankshaft, the timing dot on the sprocket and the centre line of the camshaft.(Fig. B)

9. Fit camshaft sprocket to enable camshaft to be rotated, to line up timing dot on cam sprocket with crank sprocket.(Fig. B)

10 . Remove cam sprocket, re-assemble complete with timing chain, ensuring timing is set as diagram (Fig. B). Fit lock tab to camshaft sprocket, fit nut and tighten to correct torque. Check camshaft and float between cam sprocket and thrust plate.

11 . Check that cam and crank sprockets are correctly aligned.

12. Place timing cover gasket in position, using a little light grease if required. Position new oil seal into timing cover, place cover in position but do not secure until front crankshaft pulley has been put into position on crankshaft. This will centralise the seal, to eliminate possible damage or misalignment which will cause an oil leak. Once cover and pulley are in position, proceed to secure the cover, taking care not to over-tighten bolts, or the gasket will be damaged .

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CAMSHAFT TIMING, USING VERNIER TIMING GEARS.

1. Place timing disc onto front of crankshaft using pulley bolt. Place DTI on block face so that the pointer is in position on No. 1 piston, rotate crankshaft in clockwise motion until the DTI needle stops moving, this is T.D.C. Position a pointer against 'O' on the timing disc.

2. Rotate crankshaft in clockwise motion until position of "camshaft full lift" is attained, see camshaft specification sheet, e.g. 110° after T.D.C.

3. Reposition DTI so that, via the push rod on no. 1 inlet lobe of the camshaft, full lift can be determined. Rotate camshaft in clockwise motion until DTI stops moving. Turn the outer ring of DTI until the needle is against '0', continue to rotate cam in same direction until needle moves again. Make a mental note of the middle of the full lift position. Turn camshaft backwards beyond full lift position, then rotate in clockwise motion until the middle position of full lift is reached. It is now possible to put the Vernier timing gear into position, making sure that the three securing Allen screws are loose. Place Vernier gear complete with timing chain into position on camshaft, taking care not to disturb the position of the camshaft. Once timing chain is secured, tighten up the three Allen screws on timing gear, secure gear to camshaft, as previously described in "Camshaft Fitment", item no. 10.

TIMING GEARS

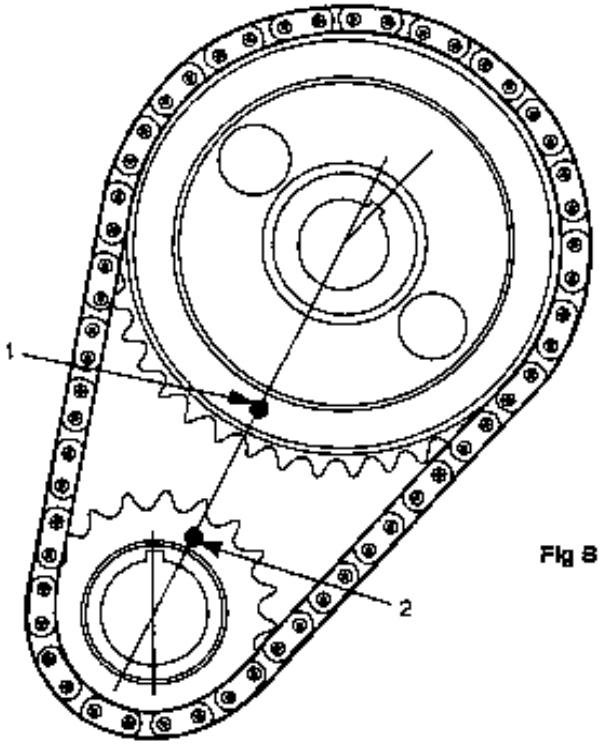

Fig 8

With the timing gears correctly assembled & the chain fitted, the two timing marks (1 & 2) are opposite & adjacent

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FITMENT OF THE CYLINDER HEAD

1. Place the block in an upright position, ensure the stud holes are free from oil or swarf.

2. Fit all head studs into position, do not use grips as they will damage the studs, creating stress points. Use either a stud extracting tool, or two lock nuts.

3. Place cylinder head gasket into position, ensuring that it is correctly positioned, i.e. stamped "top" is uppermost.

4. Tighten rocker studs into cylinder head.

5. Proceed to fit cylinder head onto block, taking care to position head carefully onto studs, or you may damage the head face.

6. Place head firmly onto gasket (making sure that by-pass hose is positioned correctly, where applicable).

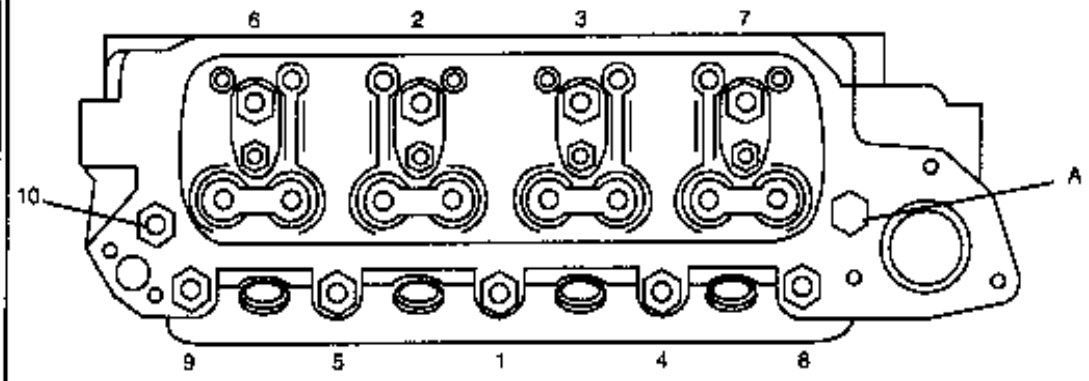
7. Place the push rods into their respective followers. Place the rocker assembly into position, make sure all push rods are seated properly on the adjusting screw ball ends. The adjusting screws must be slackened off before torquing the head down.

8. Position the locking plate over rocker pedestal with the rocker shaft locking peg in place.

9. Tighten head nuts down until they "nip", use torque wrench to tighten down in steps, i.e. 20 lb., 40 lb., 50 lb., use sequence as in (Fig. C). If a 10 stud & 1 bolt type head, the bolt (A) MUST NOT be torqued more than 25 lbs. ft.

10. Tighten up rocker pedestal retaining nuts.

Fig C



Correct order of tightening and slackening cylinder head nuts

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SETTING VALVE CLEARANCES

Rotate the crankshaft until no. 8 valve is fully open, no. 1 valve can now be adjusted. Follow the sequence on the Data Sheet for setting the remaining valve clearances.

DISTRIBUTOR FITMENT

1. Rotate the crankshaft until T.D.C. is reached on No. 1 & 4 cylinders, this can be determined by having no. 1 inlet and exhaust valves fully closed (clearance between both valves and rockers).

2. Screw a long 5/16 UNF bolt into end of distributor drive shaft, hold distributor drive in position as diagram 1, (Fig. D).

3. Insert shaft into housing, as it locates on the skew gear on the camshaft, it will rotate into position (anti clockwise) as diagram 2, (Fig. D).

4. Fit the distributor housing into position over distributor drive with new 'O' ring, and remove bolt from drive shaft.

5. The fitment of the distributor drive shaft into 'A' plus engines, is carried out in the same way, apart from the distributor housing, as this item is not fitted on this model of engine.

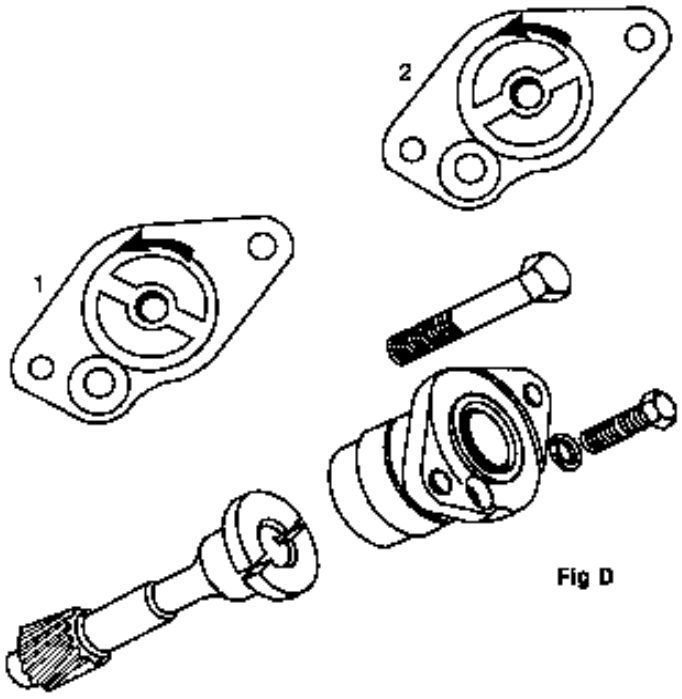

Fig D

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OIL PUMP FITMENT

Check that the oil pump turns without any high spots, if it turns freely, prime the pump with engine oil. Place gasket in position, ensure that the drive type is compatible with the camshaft. If the pump is spider drive, ensure that the drive piece is in position on the pump. Fit oil pump into the block, making sure it is positioned correctly, i.e. cut-out on boss lines up with drain hole in block.

It is now possible to fit all the ancillaries, i.e. water pump, rocker cover, distributor, alternator etc. prior to fitment onto the gearbox.

DATA SHEET

SETTING VALVE CLEARANCES

"RULE OF NINE"

1. When no. 1 valve is fully open there should be a gap on no. 8 valve. This can now be set to the correct clearance.

2.Rotate crankshaft clockwise to set all clearances, as listed below.

Valve fully open	Valve clearance to be set
(1)	(8)
(2)	(7)
(3)	(6)
(4)	(5)
(5)	(4)
(6)	(3)
(7)	(2)
(8)	(1)

TORQUE SPANNER DATA lb/ft *(Cold Settings)*	Mini 1000/1100	Mini 1293/1400	Cooper 'S' & 1430
MAIN BEARING BOLTS/NUTS	65	65	65
BIG END BEARING BOLTS/NUTS	35	35	43
CYLINDER HEAD NUTS/STUDS	50	50*	50*
CYLINDER HEAD BOLTS	N/A	25	25
CRANKSHAFT END FLOAT	.003-006"	.003-006"	.003-006"
FLYWHEEL BOLTS	115	115	115
FRONT PULLEY BOLTS	70	70	70

* CYLINDER HEAD BOLT (10STUD/1 BOLT PATTERN)

If you require any further information or assistance, please do not hesitate to contact us at the address shown below.

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THE GOLDEN RULES OF CARING FOR YOUR MINI SPORT ENGINE

WHEN THE ENGINE IS INSTALLED, THE FOLLOWING CHECKS AND ADJUSTMENTS SHOULD BE MADE:-

1 ENGINE OIL

Fill to the maximum level on the dip stick with engine oil that complies with the vehicle manufacturers specification.

2 COOLANT

Fill the cooling system using an appropriate concentration of antifreeze in the water, (Refer to vehicle manufacturers specification. Some manufacturers supply different types of anti-freeze for cast iron heads and alloy heads.)
During engine warm up period, the pressure cap must be in position at all times. In the case sealed systems, the level should be checked in the expansion tank after the unit has cooled down.

3 INITIAL RUNNING

Prior to starting the engine, disconnect the lower tension lead from the coil, ensure that this does not short to earth, and remove spark plugs. Switch on, and crank over the engine using the starter motor while watching the oil pressure warning light, this should be extinguished immediately establishing that oil pressure has been reached. If this condition is not achieved, switch off and check the oil pressure switch and associated wiring.

DO NOT RUN THE ENGINE UNTIL OIL PRESSURE HAS BEEN ESTABLISHED

When oil pressure has been established the low tension lead can be reconnected and the engine started and run.

The engine should be allowed to warm up for 15 minutes at approximately 1000 rpm and then switched off. Whilst still hot, the cylinder head nuts should be re-torqued to the vehicle manufacturers specified torque (see over), using an accurate torque wrench in the correct sequence.

The valve clearances should be re-adjusted following the re-torquing of the cylinder head. Immediately the engine is started, oil pressure must be obtained.

The correct ignition timing must be set be using a timing light. Inaccuracies can result in premature engine failure. The carburettor should be adjusted to the correct idling speed and mixture setting.

4 RUNNING IN

DURING THE FIRST 1000 MILES, THE ENGINE SHOULD NOT BE ALLOWED TO LABOUR OR EXCEED 3000 RPM, OR 50 MPH IN TOP GEAR.

5 SERVICING

On completion of running in mileage (1000 miles) the following operations should be undertaken:-

1. Check tightness of coolant hose connections.
2. Check fan belt tension.
3. Check operation of choke control.
4. Check engine idle and fast idle speeds.
5. Check coolant level.
6. Re-torque cylinder head.
7. Check valve clearances and lock nut tightness.
8. Check torque of manifold fixings.
9. Drain engine oil. Replace oil filter. Refill with new oil, every 3,000 miles. Subsequent servicing should be as prescribed by the vehicle manufacturer.

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