MINI COOPER 'S'
970, 1070 & 1275 cc
1275 GT

These engines are tuned to a fairly high degree in standard form, but further power can be obtained at the expense of some tractability at lower speeds. Full information on dismantling and assembly is contained in Workshop Manual Part No. AKD 4935, including some special tools which may be required.

Copies of up-to-date F.I.A. Homologation Forms are available ONLY from the R.A.C. Competitions Department, 31 Belgrave Square, London SW 1., who will also be able to answer any queries concerning eligibility of modified cars.

Cylinder Head & Block

Remove all frazes from the combustion chamber and ports, but leave the locating sleeves in place when matching the manifold ports. Raise the compression ratio by machining the head face. Removing 0.012" (.305m/m) reduces the capacity by approximately 1cc.

A special polished cylinder head complete with large inlet valves is available Part No. C-AHT 221. This has inlet valve 1.479" (37.6m/m) exhaust valve 1.1515" (29.243m/m) and combustion chamber capacity 16.4cc. When fitted to the 999cc unit (970 bored +0.040") the compression ratio will be 12.8:1 with flat top pistons. On the 1275 unit with dished pistons it will be 11.4:1. On a 1293cc unit (1275cc bored +0.020") to obtain a compression ratio of 12.5:1 using dished pistons it is necessary to machine the cylinder block face to within 0.010" (.254m/m) of the piston crowns at T.D.C. Use head gasket C-AHT 188 in all cases and ensure that there are no burrs at the base of the latest head studs, identified by a dimple or letter T. Special head washer C-AHT 288 (contains 10) are available to prevent any possibility of the head lifting with a high compression ratio.

Bore & Pistons

Blocks can be bored a maximum of +.040" (1.016m/m) but DO NOT RECHAMFER TOP EDGE of bore as gasket burning could result. Use forged flat top piston set C-AJJ 3382, available only +.020" or +.040". A combustion chamber volume of 21.4cc will give 11:1 C.R. on 1071cc or 12:1 on 1275. With the latest Sprint camshafts, it may be better to go to 13:1 C.R. with Super Premium fuel.

Dished top pistons may give slightly more power on 1293cc engines and forged competition piston sets C-AJJ 3377 are available +.020" or +.040". With a polished head of 16.4cc these pistons will give 11.4:1 C.R.

When ordering pistons, the required oversize should be indicated by suffix 23 or 43, since all pistons are now Grade 3.

Valve Springs

Standard valve springs will avoid undue load on the valve gear, but stronger ones are available to increase valve crash speed to approximately 8,400 r.p.m. when the full race or sprint camshafts are used. Lightening the valve gear will raise the valve crash speed.

Valve spring inner	C-AEA 652	8 off
Valve spring outer	C-AEA 524	8 off
Collar - locating	C-AEA 654	8 off

The locating collar is essential to stop the springs becoming coil bound.

PLUSPARTS AND PLUSPACS

Description	Part No.	Qty/Car
IGNITION/SPARKING PLUGS		
High Tension Kit	C-AJJ 4010	1
Plug connector - rubber - angled	C-AHT 265	4
Plug connector - rubber - straight	C-AHT 661	4
Champion N64Y	C-37H 4208	4
H.T. Lead 6ft.	C-AHT 226	1
Master Cut Out Switch	C-AHT 332	1/2
OIL COOLER & PICK-UP		
Oil Cooler Kit	C-AJJ 3384	1
Adaptor for Automatic versions	C-AHT 220	1
Oil Pump Pick-up Pipe	C-AHT 54	1
Oil Cooler Cover	C-AHT 181	1
PISTONS (1300 only)		
Piston Assembly - flat top +.040"	C-AEG 043043	4
Piston Assembly - forged - dished +.020"/+.040"	C-AJJ 3377	1
Piston Assembly - forged - flat top +.020"/+.040"	C-AJJ 3382	1
POLISHED CYLINDER HEADS		
Head Assy. 1300 (16.4 cc)	C-AHT 221	1
Head Assy. 1300 (19 cc)	C-AHT 222	1
Head Assy. 1100/1300 (19 cc)	C-AHT 134	1
Head Assy. 1100/1300 (19 cc)	C-AHT 463	1
Head Assy. 1100 (23 cc)	C-AHT 90	1
Head Assy. 1100 (25.5 cc)	C-AHT 141	1
Gasket - Cylinder Head 1100	C-AEA 647	1
Gasket - Cylinder Head 1300	C-AHT 188	1
SUNDRIES		
Tachometer (Scuttle Mounting)	C-37H 2889	1
SUSPENSION		
Rear Bump Stop Kit	C-AJJ 3386	1
VALVE GEAR		
Valve Spring - Inner - 165 lb	C-AEA 768	8
Valve Spring - Outer	C-AEA 524	8
Valve Spring - Inner - 180 lb	C-AEA 652	8
Locating Collar	C-AEA 654	8
Inlet Valve (37.6% 1.464") 1300	C-AHT 55	4
Inlet Valve (35.6% 1.401") 1300	C-AEG 544	4
Inlet Valve (33.2% 1.307") 1300	C-AEG 569	4
Kit - Duplex Timing Chain 1100	C-AJJ 3325	1
Lightened Camshaft Sprocket 1300	C-AEG 578	1
Lightened Tappet	C-AEG 579	8
Valve Rocker Spacer	C-AEG 392	3
Hidural Valve Guide Set	C-AJJ 4037	1
ENGINE PLUSPACS		
Pluspac 'A' 1100 Manual Gearbox	C-AJJ 3342	1
Pluspac 'B' 1100 Manual Gearbox	C-AJJ 4004	1
Pluspac 'A' 1100 Automatic Gearbox	C-AJJ 3348	1
Pluspac 'A' 1300 Manual & Automatic Gearbox	C-AJJ 3344	1

Leyland ST

Data

Model 1100 & 1300 Range **Sheet** Fa - 1 **Issue** 4

PLUSPARTS AND PLUSPACS

Description	Part No.	Qty/Car
BODYWORK		
Bonnet Securing Strap Set	C-AJJ 3381	1
Petrol Tank Shield	C-AHT 176	1
Headlamp Cowl Kit	C-AJJ 3385	1
BRAKES		
Disc Pad Set DS11 (Mk.I Brakes)	C-AHT 16	1
Disc Pad Set DS11 (Mk.II Brakes)	C-AHT 224	1
CAMSHAFTS		
Rally Camshaft 24°, 64°, 59°, 29° lift .252" (1100)	C-AEA 731	1
Race Camshaft 50°, 76°, 75°, 45° lift .315" (1100)	C-AEA 648	1
Road Camshaft 16°, 56°, 51°, 21° lift .250" (1300)	C-AEG 567	1
Rally Camshaft 24°, 64°, 59°, 29° lift .252" (1300)	C-AEA 800	1
Race Camshaft 50°, 70°, 75°, 45° lift .315" (1300)	C-AEG 529	1
Sprint Camshaft 60°, 80°, 75°, 45° lift .315" (1300)	C-AEG 597	1
Valve Rocker Screw - lengthened	C-AEA 692	8
CARBURETTERS		
Twin 38m/m (1½") SU HS4	C-AUD 709	1
Installation Kit 38m/m (1½") SU HS4	C-AJJ 4040	1
Flare Pipes for 1½" carburetters - alloy	C-AHT 247	2
1¾" Twin SU HS6	C-AUD 641	1
Kit, Installation for 1¾" SU H6 Carbs	C-AJJ 4001	1
Flare pipe for 1¾" carburetters	C-AHT 392	1
Cable, Accelerator	C-AHT 85	1
EXHAUST		
Competition Manifold 1100	C-AHT 250	1
Pluspac 'A' system 1100/1300	C-AHT 92	1
Competition Manifold 1300	C-AJJ 4003	1
FINAL DRIVE GEARS		
Final Drive Gear 3.938:1	C-22G 340	1
Pinion " " 3.938:1	C-22G 69	1
Final " " 4.267:1	C-22G 370	1
Final " " 4.35 :1	C-22G 443	1
FLYWHEEL		
Lightened Steel Flywheel	C-AEG 421	1
Ultra Light Steel Flywheel	C-AEG 619	1
GEARBOX		
Limited Slip Differential Kit	C-AJJ 3387	1
3.44:1 Gear Final Drive 62 teeth)	C-BTA 1250	1
3.65:1 Gear Final Drive 62 teeth)	C-BTA 1247	1
3.76:1 Gear Final Drive 64 teeth) Use	C-BTA 1248	1
3.93:1 Gear Final Drive 63 teeth) with	C-BTA 1252	1
4.13:1 Gear Final Drive 62 teeth) C-AJJ 3387	C-BTA 1246	1
4.26:1 Gear Final Drive 64 teeth)	C-BTA 1251	1
4.35:1 Gear Final Drive 65 teeth)	C-BTA 1249	1
Close Ratio Gear Kit (straight cut) 3 Synchromesh	C-AJJ 3371	1
Close Ratio Gear Kit (straight cut) all Synchromesh	C-AJJ 4014	1
Close Ratio Gear Kit (Helical cut) all Synchromesh	C-AJJ 4032	1

Oil Cooler and Cover

An oil cooler is recommended for fast roadwork, particularly in warm weather and when towing a caravan or trailer. A complete kit of parts is available Part No. C-AJJ 3384 which will fit all versions of the range. Cars with automatic gearboxes will also require connecting Pipe C-AHT 220.

Fit winter motoring, when a quicker warm-up of the oil is required, Oil Cooler Cover C-AHT 181 should be fitted, but remember to remove it for competition use, or when the warmer weather returns.

Brakes

A special puller as detailed in the Workshop Manual will be necessary when examining the rear brakes, but pad wear on the front can easily be checked. Brake Servo unit may be fitted to these cars using Unipart Kits.

On all cars with Mk.I brakes (fixed caliper type) harder pads with DS11 material are available Part No. C-AHT 16. If these are fitted, there may be a tendency for the rear wheels to lock when lightly loaded. The existing brake pressure limiting valve should be changed to Part No. 31G 911 (375 lbs/sq.in) or if this reduction is not sufficient, Part No. 21A 1774 (315 lbs/sq.in) should be tried.

Harder Pads are available for Mk.II brakes (swinging caliper type) in DS11 material, Part No. C-AHT 224.

Oil Pick-up Pipe

In order to reduce the possibility of loss of oil pressure due to surge when cornering fast and continuously, a modified Oil Pick-up Pipe C-AHT 54 is available. This will fit transverse manual 'A' series gearboxes and is ideal for use in competition driving tests, rallies, autocrosses, etc.

Suspension

To support the extra weight on the rear of the car when towing or carrying heavy loads, Bump Stop Pac C-AJJ 3386 should be fitted which is a direct replacement to the standard rubber fitted.

Carburetters

For a further stage of tune on 1100 & 1300 engines fitted with Pluspac A, twin 1¼" SU carburetter may be installed. This modification requires the standard carburetter parts that are fitted to the MG & 1300 GT models.

Cars fitted with twin 32m/m (1¼") SU carburetters may be tuned further by fitting Pluspac B C-AJJ 4004, this Pac contains 38m/m carburetters, inlet and exhaust manifolds plus the required fitting parts and detailed fitting instructions.

As an alternative, twin 38m/m (1½") HS4 carburetter C-AUD 709 can be used with installation kit C-AJJ 4040. Use flare pipes C-AHT 247 to reduce turbulance at carburetter intakes.

Exhaust Manifold & System

Exhaust system C-AHT 92 as supplied in Pluspac A can be fitted to standard cars having a single carburetter.

When fitting the competition exhaust manifold C-AJJ 4003 to cars with twin carburetters it will be necessary to fit an adaptor pipe to join the manifold to the exhaust system.

For maximum power on a race-tuned 1293cc engine twin 1¾" SU carburetter C-AUD 416 with installation kit C-AJJ 4001 can be used with flare pipes C-AHH 7209. Alternatively a twin choke Weber carburetter can be fitted. Kit C-AJJ 3360 contains the special inlet manifold and all necessary pipes, brackets and controls to fit 45 DCOE Weber carburetter C-AHT 143.

Accelerator Cable

An improved accelerator cable C-AHT 85 has been developed for smooth operation under arduous rally conditions. It will fit both 1100 and 1300 models with SU or Weber carburetter.

TUNING INFORMATION

M.G.B.

Tuning Booklet C-AKD 4034 is available, which covers engines with 3 Main Bearings indentified by engine number prefix 18G or 18GA and 5 Main Bearing engines, indentified by the prefix 18GB onwards. It contains sections to enable the best performance to be obtained from the MGB, whether it be in standard form or tuned to full competition specification.

Tuning is dealt with in seven stages, plus such additional requirements as close ratio gears, competition brakes, suspension modifications etc. A section is also included which gives all the standard data relative to this car, together with a list of Part Numbers for all the special parts, to enable the correct part to be ordered.

It should be used in conjunction with the Workshop Manual AKD 3259 which gives all necessary information for correct maintenance and repair.

M.G.A.

Tuning Booklet C-AKD 819 is available which covers the 1500cc and 1600cc engines. It does not cover the 1622cc or twin cam units. Before carrying out any tuning ensure both the engine and chassis are in good mechanical order. Workshop Manual AKD 600 is still available which provides full details of the car for its correct maintenance and repair.

COMPETITION HOMOLOGATION

Most competitive events are run under rules agreed by the F.I.A. which limit modifications for certain groups or categories. As soon as improvements are incorporated into production or become available as special parts, the necessary steps are taken to have these parts approved for competition and included on the homologation forms.

However, whilst every care is taken, we can accept no responsibility for ensuring that any specifications or modifications comply with the F.I.A. Regulations or homologation forms. Copies of all Forms of Recognition are available from the R.A.C. Motor Sport Division, 31 Belgrave Square, London SW1X 8QH, who will also be able to advise on any queries concerning eligibility of modified cars.

Valve Gear

Strengthened rocker shaft AEG 399 can be fitted on competition engines. To fit this shaft three new drilled pedestals 12G 1926 and a new tapped pedestal 12G 1927 will be required. Ensure that one of pedestal 12G 1926 lines up with both the oil drilling in the cylinder head and the rocker shaft. Valve rocker 12G 1221 can be fitted and being improved material can be lightened by grinding the valve pad so that each rocker fits its individual valve.

Alternatively the standard pressed steel rocker can be strengthened by welding around the edge.

To reduce friction the coil spring rocker spacers should be replaced by replaced by solid spacers C-AEG 392 (3 off) and spring washers AEG 168 (6 off). The spacing washers should be used either side of the rocker, but can be moved to ensure it is located directly above the valve stem.

Fan Belt

Where regulations permit running without a dynamo, use the standard water pump pulley 2A 601 and short fan belt C-AEA 539. A spare fan belt can be slipped around the timing case and water pump for a quick changeover during a competition.

Weber Carburetter Manifold

For maximum power a special manifold is available to take a 45 D.C.O.E. Weber carburetter. Kit C-AJJ 3360 includes this manifold and all control rods, levers, springs, fuel pipes etc., necessary for mounting the carburetter.

Weber carburetter C-AEH 785 has settings for the MGB and it is suggested that the basic specification is changed to 38mm choke, 185/190 Main Jets, 210 air correction and .60 Pump Jets although final settings will depend on the degree of tuning completed.

SUMPGUARD

A very substantial sumpguard as used by the works team is available as a complete kit Part No. C-AJJ 3320 including all necessary mounting plates and rubbers. This guard which will reduce the ground clearance weighs 35lb (16 kg) and should not be confused with other guards of less robust construction.

BONNET STRAPS

Leather securing straps are available as a set, Part No. C-AJJ 3381, to ensure that the bonnet cannot fly open during competitive events.

DASH PANELS

Aluminium dash panels with a black crackle finish are available for the Mk.I bodies. These are drilled to take 3" (76 %) tachometer on the driver's side, the remainder being left blank to enable the owner to position switches and other instruments as required. Part No. C-AJJ 3330 RH drive, or C-AJJ 3331 LH drive.

Similar pairs of dash panels are available in glassfibre, they have a grained finish and are without any holes, so that they will suit Home or Export cars.

APPLICATION

Mini Mk.I All Models	C-AJJ 3330 RHD C-AJJ 3331 LHD
Mini Mk.II 850, 998 Cooper 'S' Mk.II & Mk.III	C-AJJ 4095
Mini Mk.II 1972 Model 850, 998	C-AJJ 4095A
Clubman 998, 1275 GT Auxiliary Panel (Navigators)	C-AJJ 4096
As above, but RH fitting for LHD Cars	C-AJJ 4096A

Aircraft type instrument 'P' light as used on Leyland ST prepared rally cars are supplied under Part No. C-AHT 396.

PERSPEX WINDOWS

Perspex Window Sets C-AJJ 3363 are available for Mk.I or Mk.II bodies. The perspex back-light C-AHT 148 fits direct to the Mk.II aperture including the Clubman and GT bodies, but a paper template is supplied to convert this to suit the Mk.I aperture. The template should be placed on the OUTSIDE of the perspex and the surplus trimmed off. The perspex Quarter light fits direct into cars without the Deluxe hinged quarter light using rubber surround 14A 6825 RH and 14A 6826 LH. These parts will NOT fit the latest bodies with wind up windows.

LIGHTWEIGHT PANELS

Glassfibre panels for the Mini Clubman and 1275 GT bodies are available to special order, bare and unpainted.

Door RH	C-AHT 336	Door LH	C-AHT 337
Boot Lid	C-AHT 338	Bonnet	C-AHT 339

MINI REAR ANTI-ROLL BAR

C-AJJ 4009

Contents

Description	Part No.	Qty.
Anti Roll Bar	C-AHT 256	1 off
Link Plate	C-AHT 257	2 off
Link	C-AHT 258	2 off
Distance Piece	C-AHT 259	2 off
Tight Nut 7/16" UNF	LNZ 107	2 off
Flat Washer 5/16"	PWZ 105	2 off
Bolts 7/16" x 1½" UNF	HBZ 0712	2 off
Spring Washer 7/16"	LWZ 207	2 off
Lock Nut 7/16" UNF	FNZ 207	2 off
Bolt 5/16" xx1¼" UNF	HBZ 0510	4 off
Nut 5/16" UNF	FNZ 105	4 off
Spring Washer 5/16"	LWZ 205	4 off
Bracket R/H Outer	C-AHT 260	1 off
Bracket R/H Inner	C-AHT 261	1 off
Bracket L/H Outer	C-AHT 262	1 off
Bracket L/H Inner	C-AHT 263	1 off
Bush Rubber	21A 666	2 off
Stop Ends	AHH 6564	4 off
Bolt ¼" x ⅝" UNF	HZS 0405	4 off
Bolt ¼" x ¾"	HZS 0406	4 off
Nut ¼" UNF	FNZ 104	8 off
Spring Washer	LNZ 204	8 off
No 10 x ⅜"	PNZ 0307	4 off
Nut No. 10	FNZ 103	4 off
Spring Washer 3/16"	LWZ 203	4 off

Fitting

Remove rear wheels and brake drums. Unscrew top and rear bolts holding back plate. Fit bracket C-AHT 257 with longer bolts supplied and fit 5/16" plain washer between bracket and radious arm (top bolt only).

Fit link to bracket ensuring countersunk side of spacer faces ball joint. Remove retaining bolt from petrol tank straps and move tank towards centre of car. Unscrew rear subframe bolts and ease down subframe. Place a block between body and subframe to allow for drilling.

Drill a hole ¼" (6·5㎜) dia. 2" (50㎜) in from the centre of the displacer pipe hole in the subframe, 1⅝" (41㎜) up from the lowest edge of the subframe rear cross-member. Offer up the correct bracket and secure to subframe before drilling through the remaining hole. The roll bar is hung to the rear of the brackets, and the top holes in the brackets run diagonally upwards and outwards.

Assemble brackets onto roll bar and bolt to subframe. Connect up bottom link, remove packing block, replace subframe bolts and petrol tanks. Ensure that no parts of the linkage can foul the car, particularly on full bump.

Issued by : BRITISH LEYLAND SPECIAL TUNING DEPARTMENT, ABINGDON-ON-THAMES, BERKS..

SPEEDWELL

HIGH-LIFT ROCKERS

FITTING INSTRUCTIONS

IMPORTANT NOTE

The Speedwell Rocker Gear gives its improved performance by increasing valve lift. Every engine has certain mechanical limitations to its valve lift and it is vital to check that fitting the Speedwell rockers does not give excessive lift otherwise the engine may be severely damaged.

The fitting procedure embodies a check to determine whether the lift is excessive. This MUST be carried out, even if a kit of parts has been supplied by Speedwell and the following table has been used as a guide to clearances, spring type etc. No claim concerning damaged engine parts will be considered if incorrect assembly could have been detected by this means.

In B.M.C. A and Mini series engines the exhaust valve heads overhand the block (see Fig.1). For this reason it is sometimes necessary to cut clearance slots in the block to permit the valve to lift. This is quite a simple operation requiring no special knowledge or skills, carried out with a special cutter-set obtainable from Speedwell.

The following table serves as a guide to which type of valve spring to use and whether clearance slots are likely to be required in the block:-

(a) SPEEDWELL ALLOY HEADS
See instructions supplied with head.

(b) B.M.C. A & MINI SERIES IRON HEADS
NOT machined to raise compression ratio.

With the following camshaft and rocker gear combinations use:-
Speedwell single valve springs, no shrouds, no washers under springs.
It should not be necessary to clearance-cut the block.

Camshafts fitted as standard to:-
Austin A.35, A.40 Mark I & II (950 c.c.)
Morris Minor 1000 (950 c.c.)
Austin Mini
Morris Mini Minor
Sprite Mark I

} In conjunction with Speedwell High-Lift Rockers.

With the following camshaft and rocker-gear combinations use:-
Speedwell double valve springs, Speedwell special spring caps, no shrouds or washers under the springs. It should not be necessary to clearance-cut the block.

Camshafts fitted as standard to:-
Sprite Mark II
Cooper Mini

High-Lift Rocker Camshafts
Austin Healey Sports Cm.
Speedwell Cams CS2, CS4, CS5.

} In conjunction with Speedwell High-Lift Rocker Gear.

(c) B.M.C. A & MINI SERIES IRON HEADS MACHINED TO RAISE COMPRESSION RATIO

Use valve springs given in (b) above.

If not more than .050 inch has been removed, it should not be necessary to clearance-cut the block using the following camshaft and rocker combinations.

Camshafts fitted as standard to:-

Austin A.35, A.40 Mark I and II (950 c.c.)
Morris Minor 1000 (950 c.c.)
Austin Mini
Morris Mini Minor
Sprite Mark I

) In conjunction with Speedwell High-Lift Rockers

With all other cams it will be necessary to clearance-cut the block.

If more than .050 inch has been removed, it will always be necessary to clearance-cut the block. Speedwell modified Iron Heads come into this category.

FITTING PROCEDURE

1. Drain the water and remove rocker cover.
2. Set the engine to top dead centre on cylinders 1 & 4 with cylinder 1 firing i.e. both valves closed on cylinder 1, both valves slightly open on cylinder 4.
3. Loosen off cylinder head nuts and rocker shaft bracket fixing nuts in correct sequence as shown in the B.M.C. Manual.
4. Remove the eight rocker shaft bracket nuts and remove the complete rocker gear assembly.
5. Remove the shaft locating grub-screw from the front mounting bracket and the split pins from each end of the shaft. Retain the thrust washers and springs in their order for re-assembly. Dismantle and clean shaft. If badly worn, obtain a new shaft from any B.M.C. parts supplier, Part No. 2A16.
6. Trial Assembly. Fit the new mounting brackets and rockers 1 and 2 only to the shaft. Screw the tappet adjusters right up into the rockers so as to give the largest possible clearances. Fit the shaft in position on the engine with the two rockers over cylinder 1. Tighten up the head and rocker support bracket nuts. Without turning the engine adjust the tappet clearance on the two rockers to that normal for the camshaft in use (usually .012 inch). If it is not possible to obtain sufficient clearance it will be necessary to insert shims under the rocker support brackets (Speedwell Part No.VA.97). This is usual practice when the cylinder head has been machined to raise the compression ratio.
7. Clearance Check. CAREFULLY rotate the engine, watching valve 1 (exhaust) lift. Watch for:-
   (a) Any undue resistance to turning indicating valve hitting block or valve cap hitting guide.
   (b) Valve spring compressing solid.

   If neither of these things happen, continue turning engine until valve 1 reaches full lift. Using a heavy screwdriver or similar, bear down on the valve cap. When the force of the valve spring is overcome the cap and valve should move down slightly before either:-
   (i) The valve head meets the block.
   (ii) The valve spring cap meets the valve guide.
   (iii) The valve spring compresses solid.

A minimum of about 1/32 inch of such clearance is advisable.

Continuing to turn the engine, repeat the check on valve 2 (inlet). If the clearances are in order, continue fitting. If clearances cannot be obtained see section 13 and take the appropriate action before proceeding with section 8.

8. Loosen off cylinder head and rocker bracket nuts. Remove shaft and brackets. Assemble complete rocker gear as shown in diagram with a shim each side of the mounting brackets. Offer up the assembly to the cylinder head. If any rocker face is not exactly central over a valve stem, try an extra shim as shown in the diagram. When the correct number and position of shims has been ascertained re-assemble the rocker gear with the extra shims in place.

9. Check that all pushrods are perfectly straight by rolling them on a flat surface. Any doubtful ones should be replaced - B.M.C. Part No. 2A14, obtainable from any parts supplier. When removing pushrods take care not to lift the cam followers out of position. Followers may be reached by removing the two pushrod covers on engine block.

10. Replace pushrods and fit rocker assembly to engine making sure that the rocker bracket with the oil drilling is in the correct position to correspond with the oilway in the cylinder head. Use the new locking plate supplied on this bracket. Tighten head nuts in correct sequence to 40 lbs.ft. and the rocker bracket nuts to 25 lbs.ft. torque.

11. Set tappet clearances as usual for the camshaft in use (usually .012 inch). Rotate engine by hand, checking operation of all rockers. Oil each of the pushrod cups and replace rocker cover.

12. Re-fill coiling system.

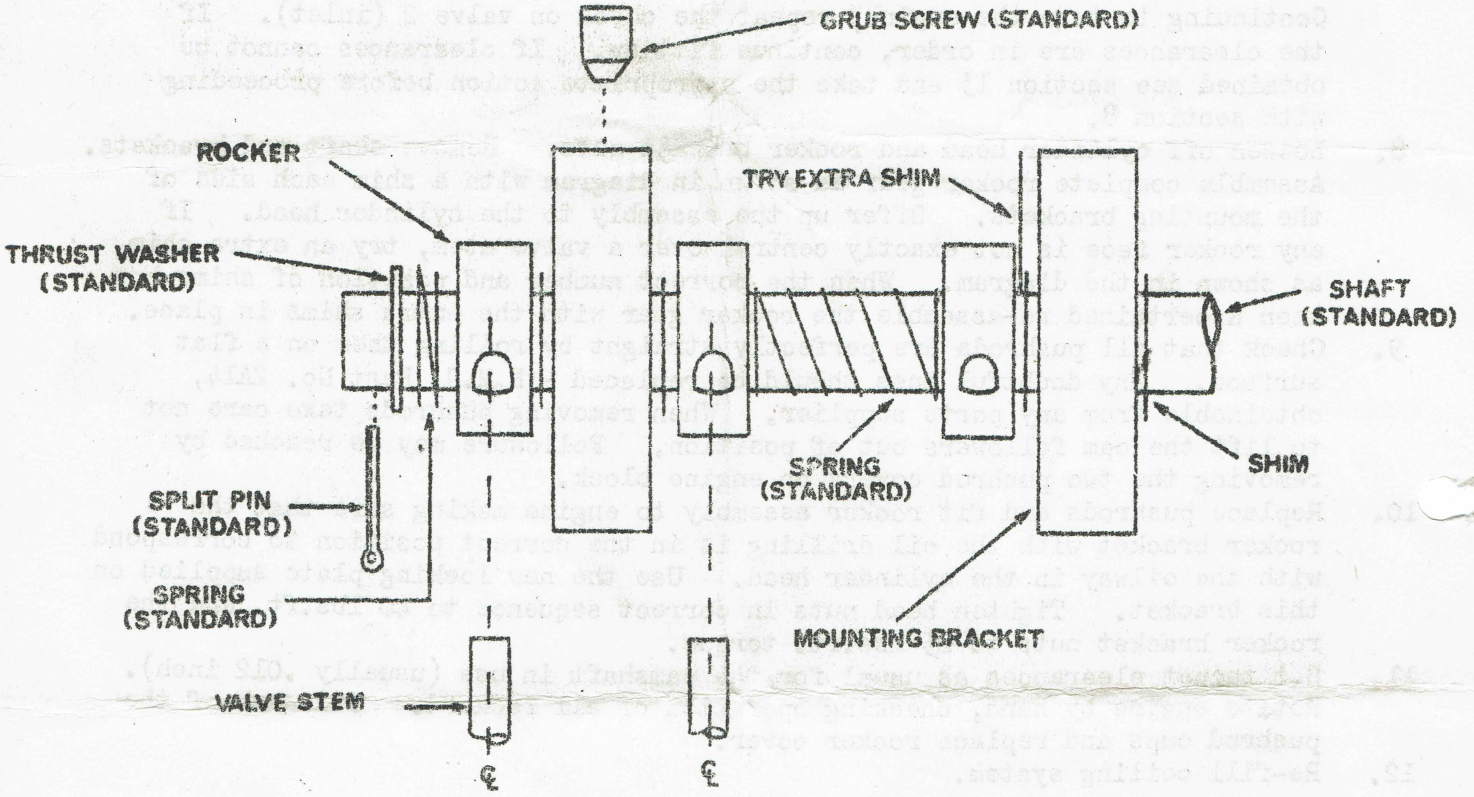
13. If clearance cannot be obtained when performing check 7.
   (a) If the valve spring compresses solid. Fit Speedwell double valve springs and special caps. These will permit a lift of up to 0.410 inch.
   (b) If the valve cap contacts the valve guide, fit Speedwell special caps. These will permit a lift of up to 0.440 inch.
   (c) If the exhaust valve head contacts the block, clearance slots must be out. This is quite a simple operation, requiring no special knowledge or skill, carried out with a cutter set obtainable from Speedwell. Full instructions are supplied with the cutter set.

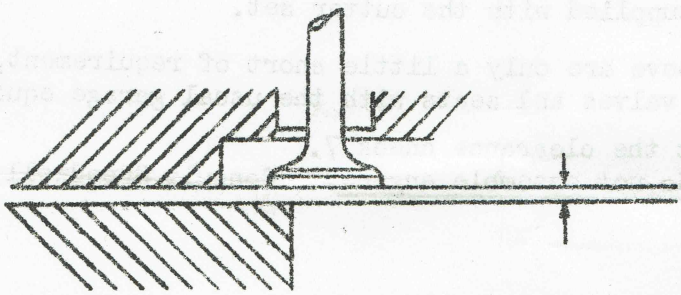
If the clearances at a, b or c above are only a little short of requirement, they may be increased by refacing the valves and seats with the usual garage equipment.

After any of these changes repeat the clearance check 7.
If clearance cannot be obtained do not assemble engine. Consult Speedwell Technical Department.

SPEEDWELL PERFORMANCE CONVERSIONS LTD.,
Speedwell Centre, Cornwall Avenue,
London, N.3.

Phone: FIN 7866
Grams: "SPEEDERCON"





EXHAUST VALVE AT FULL LIFT

Fig.1

C-AJJ 4014

CLOSE RATIO STRAIGHT CUT GEAR SET

for MINI COOPER 'S' and similar gearboxes WITH 4 SPEED SYNCHROMESH ONLY

NOT SUITABLE for gearboxes with 3 SPEED SYNCHROMESH

Contents

1st Motion Shaft	C-22A 1732	1 off
1st Speed Gear	C-22A 1735	1 off
2nd Speed Gear	C-22A 1734	1 off
3rd Speed Gear	C-22A 1733	1 off
Laygear	C-22A 1737	1 off
Rev Idler	C-22A 1738	1 off

Instructions

This kit should be used in conjunction with Gasket Set 8G 2571 and Lockwasher Set 18G 8085, unless the individual parts are more easily obtained separately.

Check the endfloat of laygear and if more than .006" (.15m/m) the thrust washer must be changed to reduce clearance to NOT LESS THAN .002" (.05m/m). Check the circlip interference fit on first motion shaft to see if the large one supplied in the kit is required.

The shimming on the 3rd motion shaft ball race retainer must also be checked as described in the Workshop Manual Part No. AKD 4935 which gives a chart of shim sizes. Replace all worn parts while gearbox is dismantled. The special oil pick-up pipe C-AHT 54 may also be fitted at the same time.

When assembling gearbox, reverse the dismantling procedure but note the following points. Fit the 1st Motion Shaft from inside gearbox WITHOUT its ball race. Engage 2nd Gear before fitting assembled mainshaft from inside gearbox WITHOUT its ball race. Close the first motion shaft and mainshaft together, ensuring the spigot bearing is in position, and lower the assembly onto the selectors. Fit ball races to both shafts.

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SPIN-RESISTANT DIFFERENTIAL

C-AJJ 3387

Contents

Diff. Assembly	C-BTA 1106	1 off
Drive Shaft	C-BTA 1242	2 off
Circlip	CCN 122	2 off
Washers	C-BTA 1243	2 off
Bolts for Gear	BTA 370	6 off

This Powr-Lok differential assembly will not fit the standard range of final drive wheels, which cannot be machined by conventional means.

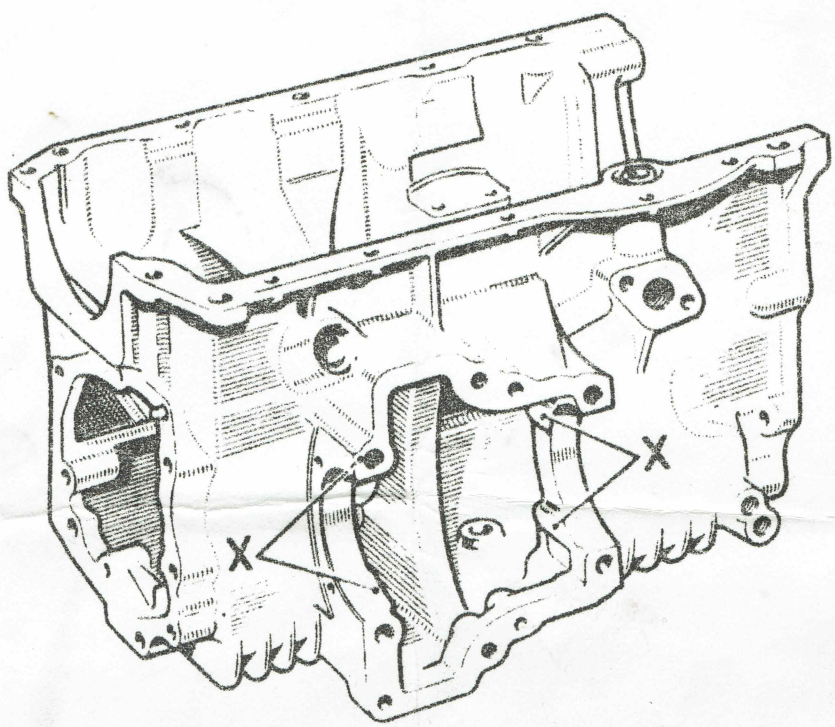
New Final Drive Wheels as shown below are designed to fit this differential

Ratio	Teeth	Part No.	Pinion
3.44	62	C-BTA 1250	22A 413
3.65	62	C-BTA 1247	22A 399
3.76	64	C-BTA 1248	22A 399
3.93	63	C-BTA 1252	C-22G 69
4.13	62	C-BTA 1246	22G 99
4.26	64	C-BTA 1251	22G 99
4.35	65	C-BTA 1249	22G 99

Cars fitted with rubber drive couplings must be converted to needle-roller drive couplings, as shown on Tuning Data Sheet A-10 Issue 2.

Fitting

Before refitting the differential it will be necessary to file or grind away excess material at the edge of the differential bearing housing as shown at X. At least 1/16" (1.5 %) clearance must be given, because the shims must be fitted on the OPPOSITE side of the differential that shown in the Workshop Manual. Bias the assembly AWAY from the flywheel side, and refit the diff. housing with its joint washers. Fit the LEFT hand cover with its joint washer, and evenly tighten the bolts. With new bearing 13H 264, the preload should be .004" (.1 %), so the correct gap before the side cover gasket is fitted should be .011" (.28 %). The joint compresses to .007 (.18 %). Finally, check the clearance inside the gearbox between the main shaft bearing and crown wheel face which should be about .030" (.75 %).



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SPECIAL TUNING

FOR THE

MINI-COOPER 'S'

970, 1071 & 1275c.c.

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C-AKD 5096

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DESCRIPTIVE INDEX

Description	Part No.	Qty./Car	Sheet No.
BODYWORK			
Bonnet securing strap set, leather	C-AJJ 3381	1	A-11
Rubber toggle strap set (3)	C-AJJ 4016 *	1	
Narrow wing set for 3½" or 4½" wheels	C-AJJ 3316A	1	A-10
Wide wing set for 5½" wheels	C-AJJ 3353	1	A-10
Pivotting single lamp bracket	C-AJJ 3318	1 or 2	A-9
Competition 4 lamp mounting bar complete	C-AJJ 3329	1	A-9
Seat, competition lightweight bucket type	C-AHT 201	1 or 2	A-9
Alloy Door set	C-AJJ 3379	1	A-11
Alloy Bonnet and Boot set	C-AJJ 3380	1	A-11
Dash Panel pair - Right Hand drive (Mk.I only)	C-AJJ 3330	1	A-11
Dash Panel pair - Left Hand drive (Mk.I only)	C-AJJ 3331	1	A-11
Dash Panel pair - Mk.II cars only	C-AJJ 3373	1	A-11
Perspex window set	C-AJJ 3363	1	A-11
BRAKES			
DS11 brake pad set - Cooper 'S' only	C- 8G 8996	1	A-8
VG 95 rear brake shoes - Cooper 'S' only	C- 8G 8997	2	A-8
VG 95 linings and rivets - Cooper 'S' only	C- 8G 8998	1	A-8
Dual brake master cylinder kit	C-AJJ 3388	1	A-8
CAMSHAFTS			
Full race	C-AEA 648	1	A-2
Sprint	C-AEG 597 * 418.	1	A-2
Super Sprint	C-AEG 595 * 448.	1	A-2
CARBURETTERS, etc.			
1½" Twin S.U. - R.H.D. (CP4 needles)	C-AUD 178	1	A-2
Installation kit for 1½" Carbs. - R.H.D.	C-AJJ 3301	1	A-2
1½" Twin S.U. - L.H.D. (CP4 needles)	C-AUD 176	1	A-2
Installation kit for 1½" Carbs. - L.H.D.	C-AJJ 3302	1	A-2
1½" Twin S.U. fixed jet type (BG needles)	C-AUD 165	1	A-4
Flared intake pipes for 1½" carbs. (Alloy)	C-AHT 247 *	2	A-2
S.U. Float chamber adaptor	C-AHT 180 *	2	A-2
Fuel pump, dual type kit complete	C-AJJ 4015 *	1	A-9
Weber 45 D.C.O.E. carburetter	C-AHT 143	1	A-4
Installation kit for Weber carb.(incl. Manifold)	C-AJJ 3360	1	A-4
Manifold for twin H6 or HS4 S.U. carbs.	C-AEG 489	1	A-2
Twin HS4 carburetter pair	C-AUD 224	1	
Twin H6 carburetter pair	C-AUD 416 *	1	A-2
Installation kit for H6 carbs.	C-AJJ 4001 *	1	A-2
Flared intake pipes for 1¾" carbs.	C-AHH 7209	2	A-2
Cable - accelerator	C-AHT 85	1	A-4
CLUTCH, FLYWHEEL & PRIMARY GEAR			
Competition diaphragm spring assembly (orange)	C-AEG 481	1	A-4
Clutch driven plate	C-22G 247	1	A-4
Clutch pressure plate - lightened	C-AHT 230	1	A-4
Flywheel, lightened steel	C-AEG 421	1	A-4
Flywheel, ultra light	C-AEG 619 *	1	A-4
Locking plate, for crankshaft pulley	C-AHT 146	1	A-4
Primary gear, competition bushed	C-AJJ 3370	1	A-5

* New or corrected Part No.

continued on Sheet Aa - 2

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DESCRIPTIVE INDEX (continued)

Description	Part No.	Qty./Car	Sheet No.
PISTON			
High comp. 4 ring flat top +.040" Grade 3	C-AEG 043043	4	A-1
High comp. 4 ring flat top +.020" (Set of 4)	8G 243223	1	A-1
Forged lightweight pistons (Set of 4)	C-AJJ 3377	1	A-1
SPARKING PLUGS			
Champion N64Y	C-37H 4208	4	A-2
Champion N57R	C-27H 5982	4	A-2
Champion N62R	C-37H 2149	4	A-2
Champion N60Y	C-37H 2148	4	A-2
Plug cover, waterproof competition type	C-AHT 265 *	4	A-2
H.T. cable	C-AHT 266 *	1	A-2
SUMPGUARD			
Scottish Rally type sumpguard, complete kit	C-AJJ 3320	1	A-11
SUSPENSION			
Hard setting hydrolastic units, red	C-21A 1819	2	A-6
Progressive rear bump stop kit	C-AJJ 3313 - 11/68	1	A-7
Rear anti-roll bar kit complete	C-AJJ 3317	1	A-7
Rear anti-roll bar kit complete	C-AJJ 4009	1	A-7
Steering rack - improved type R.H.D.	21A 1961	1	A-9
Steering rack - improved type L.H.D.	21A 1962	1	A-9
Tie rods - adjustable	21A 1092	2	A-8
Negative camber set	C-AJJ 3364	1	A-8
Shockabsorber kit - for hydrolastic cars	C-AJJ 3362	1	A-6
VALVE GEAR & HEAD			
Heavy 180 lb. valve spring (outer	C-AEA 524	8	A-1
(inner	C-AEA 652	8	A-1
(locating collar	C-AEA 654	8	A-1
Strengthened rocker shaft	AEG 399	1	A-5
Valve rocker screws, lengthened	C-AEA 692	8	A-2
Valve rocker spacer	C-AEG 392	3	A-5
Lightened tappet	C-AEG 579	8	A-5
Lightened steel camshaft sprocket	C-AEG 578	1	A-5
Cylinder head complete with valves	C-AHT 221 *	1	A-1
Head gasket, competition	C-AHT 188 *	1	A-1
WHEELS			
Magnesium Alloy 4½" (Cooper 'S' only)	C-21A 1968	5	A-10
Alloy wheel installation kit (for C-21A 1968)	C-AJJ 3327	1	A-10
Magnesium alloy 5½" (Cooper 'S' only)	C-21A 2132	5	A-10
Wheel nut set (for 21A 2132)	C-AJJ 3361	1	A-10

* New Part

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These engines are tuned to a fairly high degree in standard form, but further power can be obtained at the expense of some tractability at lower speeds. Full information on dismantling and assembly is contained in Workshop Manual Part No.. AKD 4935, including some special tools which may be required.

Copies of up-to-date F.I.A. Homologation Forms are available ONLY from the R.A.C. Competitions Department, 31 Belgrave Square, London S.W.1., who will also be able to answer any queries concerning eligibility of modified cars.

Cylinder Head & Block

Remove all frazes from the combustion chamber and ports, but leave the locating sleeves in place when matching the manifold ports. Raise the compression ratio by machining the head face. Removing 0.012" (.305 m/m) reduces the capacity by approximately 1cc.

A special polished cylinder head complete with large inlet valves is available Part No. C-AHT 221. This has inlet valve 1.479" (37.6 m/m) exhaust valve 1.1515 (29.243 m/m) and combustion chamber capacity 16.4cc. When fitted to the 999cc unit (970 bored +0.040") the compression ratio will be 12.8:1 with flat top pistons. On the 1275 unit with dished pistons it will be 11.4:1. On a 1293cc unit (1275cc bored +0.020") to obtain a compression ratio of 12.5:1 using dished pistons it is necessary to machine the cylinder block face to within 0.010" (.254 m/m) of the piston crowns at T.D.C. Use head gasket C-AHT 188 in all cases and ensure that there are no burrs at the base of the latest head studs, identified by a dimple or letter T. Special head washer C-AHT 288 (10 off) are now on test to prevent any possibility of the head lifting with a high compression ratio.

Bore & Pistons

Blocks can be bored a maximum of +.040" (1.016 m/m) but DO NOT RECHAMFER TOP EDGE of bore as gasket burning could result. Use forged flat top piston set C-AJJ 3382, available only +.020" or +.040". A combustion chamber volume of 21.4cc will give 11:1 C.R. on 1071cc or 12:1 on 1275. With the latest Sprint camshafts, it may be better to go to 13:1 C.R. with Super Premium fuel.

Dished top pistons may give slightly more power on 1293cc engines and forged competition piston sets C-AJJ 3377 are available +.020" or +.040". With a polished head of 16.4cc these pistons will give 11.4:1 C.R.

When ordering pistons, the required oversize should be indicated by suffix 23 or 43, since all pistons are now Grade 3.

Valve Springs

Standard valve springs will avoid undue load on the valve gear, but stronger ones are available to increase valve crash speed to approximately 8,400 r.p.m. when the full race or sprint camshafts are used. Lightening the valve gear will raise the valve crash speed.

Valve spring inner	C-AEA	652	8 off
Valve spring outer	C-AEA	524	8 off
Collar - locating	C-AEA	654	8 off

The locating collar is essential to stop the springs becoming coil bound.

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Camshaft

For rallying the latest standard camshaft AEG 510 gives the best low speed pick up, but camshaft C-AEA 648 gives more top-end power losing tractability in the lower range, but is suitable for long distance events. For short races use camshaft C-AEG 597 or for absolute maximum power at sprint meetings use C-AEG 595 (See Sheet Z-2 for details). The oil pump MUST be changed to Part No. 12G 1128 or 12G 1924 when using these camshafts, which has spider drive flanges.

All competition camshafts may require longer tappet adjusting screws C-AEA 692 unless the head or block have been machined to take dished top pistons.

Carburetters

On right hand drive cars, fit 1½" carburetter pair C-AUD 178 using installation kit C-AJJ 3301, or for left hand drive cars use carburetters C-AUD 176 and kit C-AJJ 3302. These carburetters are fitted with blue springs and CP4 needles, but should be reset as follows, before rechecking after track testing. The standard distributor is normally quite satisfactory. Use flare pipes C-AHT 247 (aluminium) to reduce turbulence at carburetter intake, and float extensions C-AHT 180 to raise the fuel level ½" to prevent surge on corners.

970cc	Static Ign.	12°	B.T.D.C.	CP4	Needle,	Part No.	AUD 1118
1071cc	" "	7°	B.T.D.C.	MME	"	" "	AUD 1265
1275cc (cam C-AEA 648)	" "	2°	B.T.D.C.	BG	"	" "	AUD 1067
1275cc (cam AEG 510)	" "	2°	B.T.D.C.	7	"	" "	AUD 1006

Further power may be obtained by fitting HS6 carburetters C-AUD 416, together with installation kit C-AJJ 4001. These 1¾" carburetters should be used with large valve head C-AHT 221 and one of the full-race or sprint camshafts. Flare pipes C-AHH 7209 are available to fit these large carburetters.

Sparking Plugs, Coil & H.T. Connections

Champion N64Y (C-37H 4208) are suitable for rally work or fast road use, but N60Y (C-37H 2148) is even harder for severe conditions. For racing use N62R (C-37H 2149) or N57R (C-27H 5982) which is harder (a cooler running plug).

In order to ensure a really positive connection to the plugs, rubber connectors C-AHT 265 are now available which seal very tightly onto the plugs. A 6ft. length of special H.T. cable is available to Part No. C-AHT 266 for use with these connectors and screw-in coils.

Current HA12 coils are fitted with push-on spade terminals, and push-in H.T. connection which are not positive enough for severe rally use. HA12 coil C-AHT 269 is now available with screw-on terminals and H.T. connection. Water-proof H.T. kit C-AJJ 4010 contains 4 connectors, a length of H.T. cable, competition coil C-AHT 269 and a coil cover 8G 727.

Exhaust Manifolds and System

Fit the homologated competition exhaust manifold C-AEG 365 for 1275cc or C-AEG 432 for 970 and 1071cc engines. The standard exhaust system is quite satisfactory for power, but a special system for rally use Part No. C-ARA 334 is available, which is shielded and has an upswept tailpipe.

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ALTERNATIVE GEARBOX RATIOS

Alternative gearbox ratios are available for units with 3 speed synchromesh gearboxes OR 4 speed versions, but different parts are required.

3SPEED SYNCHROMESH	Std. Ratio (helical)	Close Ratio (helical) ⊕	Std. Ratio (spur) ⊕	Close Ratio (spur)
1st & Rev. ratios	3.200	2.568	3.077	2.573
2nd gear ratio	1.916	1.780	1.875	1.722
3rd gear ratio	1.357	1.242	1.307	1.255
1st Motion Shaft	See	C-22A 985	C-22G 427	C-AJJ 3371
2nd Speed Gear	Parts	C-22A 986 *	C-22G 428	(Complete
3rd Speed Gear	List	C-22A 987	C-22G 429	Kit)
Laygear	AKD 3509	C-22G 210 *	C-22G 335	
1st Motion Shaft	20 teeth	23 teeth	20 teeth	22 teeth
2nd Speed Gear	28 teeth	29 teeth	27 teeth	28 teeth
3rd Speed Gear	24 teeth	25 teeth	23 teeth	24 teeth
Laygear teeth	26,23,19,13	24,21,17,13	25,22,18,13	23,20,17,13

Spur cut C.R. Gear Kit C-AJJ 3371 contains stronger layshaft 22A 1371 for competition use. Ensure all other parts not in kit are in good condition.

These gears must be fitted in sets, and can be used in all Mini Cooper 'S' gearboxes, Mini Cooper 998cc gearboxes, 848cc Mini Gearboxes after Engine Number 815140, and 1100s fitted with 'B' type gears only (See Mechanical Parts List). They are NOT suitable for cars with all synchromesh gearboxes.

On all earlier Minis and 997cc Mini Coopers fit later transmission assembly to accept the close ratio gears. For further information refer to the parts list.

NOTE When assembling spur-cut gears, reverse the dismantling procedure but fit the 1st Motion Shaft from inside gearbox WITHOUT its ball race. Engage 2nd Gear before fitting assembled mainshaft from inside gearbox WITHOUT its ball race. Close the first motion shaft and mainshaft together, ensuring the spigot bearing is in position, and lower the assembly onto the selectors. Fit ball races to both shafts.

4 SPEED SYNCHROMESH GEARBOXES

The Cooper 'S' with 4 speed synchromesh is already fitted with close ratio helical gears, but Minis with the standard ratio gearbox can be converted to helical close ratio gears by using Helical C.R. Gear Kit C-AJJ 4032.

A spur-cut Close Ratio Gear Kit C-AJJ 4014 will be available shortly, containing the necessary straight cut close ratio gears for this latest gearbox. Complete transmission assemblies can be interchanged so ensure the correct parts are ordered for the appropriate gearbox.

RATIOS	Std. Helical	C.R. Helical	C.R. Spur
Reverse	3.54:1	3.35:1	2.69:1
1st	3.52:1	3.3 :1	2.543:1
2nd	2.22:1	2.07:1	1.73:1
3rd	1.43:1	1.35:1	1.257:1
1st Motion Shaft	17 teeth	18 teeth	19 teeth

* These parts are no longer available from the factory.

⊕ Existing stocks cannot be replaced when exhausted.

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Flywheel and Clutch

After Engine No. 9F/SA/Y42730 an improved crankshaft AEG 479 was fitted, and this may be used on earlier 1275cc engines for competition use.

It is dangerous to lighten the standard cast iron flywheel but the lighter steel flywheel C-AEG 421 (10.5 lbs. - 4.8 kg.) is safe at high revolutions, and an ultra light version C-AEG 619 is being prepared. The lightened clutch pressure plate C-AHT 230 may also be fitted at the same time. Use the competition diaphragm clutch spring assembly C-AEG 381 together with a bonded clutch driven plate C-22G 247. The whole crankshaft, flywheel, clutch and damper assembly should be fully balanced separately and as a unit.

A balanced assembly complete is available to special order C-AJJ 4018.

Oil Pick-up Pipe

In order to reduce the chance of loss of oil pressure due to surge, a modified Oil Pick-up C-AHT 54 is available. This is suitable for all Mini, Cooper, 1100, 1300 and Mini Cooper 'S' manual gearboxes and is ideal for use in competition driving tests, rallies, autocrosses and for racing.

Fixed Jet Carburetters

For racing where cold starting can be done by hand, carburetters with fixed jets are available Part No. C-AUD 165 for a pair. These are fitted with BG needles and should be used with installation kit C-AJJ 3301 for R.H.D. cars or C-AJJ 3302 for L.H.D. cars. Fit the recommended needles shown on Sheet A-2.

Weber Carburetter

A twin choke 45 D.C.O.E. carburetter Part No. C-AHT 143 is available with the best jet settings for a race-tuned 1293 car. Any variations may require slightly different jets.

This carburetter should be fitted to a new manifold included in a complete installation kit C-AJJ 3360, which also contains accelerator cable C-AHT 85.

Accelerator Cable

An improved accelerator cable C-AHT 85 has now been developed for smooth operation under arduous rally conditions. It will fit all the Mini, Cooper and Cooper 'S' range with S.U. or Weber carburetters.

Oil Cooler

For racing and prolonged high speed driving it is essential to use the large capacity 13 row oil cooler ARO 9809 with heavy duty pipes C-AHT 3 and C-AHT 4. This cooler is now standard, but may be fitted to other cars using Oil Cooler Kit C-AJJ 3309 containing full instructions. A larger 16 row cooler C-ARO 9875 is available for racing when the grille can be modified to provide adequate clearance.

Crankshaft Pulley Locking

When fitting the crankshaft pulley, care should be taken that the keyway is a good fit to the key. After fully tightening the large securing bolt a special locking plate C-AHT 146 should be fitted by means of the damper screws to lock this bolt. This is not suitable for Pulley 88G 305, but is designed for separate pulley and damper AEG 454 and 12A 367.

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Model MINI COOPER 'S' **Sheet** A - 5 **Issue** 8

Rocker Shaft Assembly

A strengthened rocker shaft AEG 399 is now fitted in production, but earlier engines may be identified by the locating screw in the end pedestal. To fit the latest shaft, a new drilled pedestal 12G 1807 and a new tapped pedestal 12G 1806 will be required, together with two of the original plain pedestals AEG 166. Ensure that pedestal 12G 1807 lines up with both the oil drilling in the cylinder head and in the rocker shaft.

To reduce friction, the coil spring rocker spacers can be replaced by solid distance tubes Part No. C-AEG 392 (3 off) and washers AEG 168 (6 off). The washers should normally be either side of the end pedestals, but may be moved to ensure each rocker is immediately above the valve stem. It may be necessary to machine the side of some pedestals to get the rocker central, but the correct order of assembly must then be maintained. The latest standard valve rockers 12G 1221 can be further lightened by careful grinding at the sides only so that the strength is not reduced.

Check that the push-rods are straight and true, after which a small amount of material can be removed from around the top cup.

Lightened Tappets and Sprocket

Specially machined tappets C-AEG 579 are now available which are a little lighter than the standard version, thus reducing the loading on the camshaft and raising valve bounce r.p.m.

A lightened steel camshaft sprocket C-AEG 578 is also available. Note that this is NOT suitable for any 'B' series engines as the timing would then be incorrect. This also applies to the standard steel sprocket AEA 696.

Primary Gears

Primary gear set C-AJJ 3370 is now available with a steel-backed bush to prevent breakage during competition use, and should be assembled with just a smear of engine oil. The latest bushes are line bored in position, so are NOT available separately.

Dynamo and Alternator

To avoid damage to the dynamo at high speed, it is advisable to fit larger dynamo pulley C-AEA 535 together with longer fan belt C-AEA 756. The coil should be remounted upright on the wing panel at the rear of the engine to reduce the load on the dynamo brackets. Where regulations permit running without a dynamo, use standard water pump pulley 2A 601 and short fan belt Part No. C-AEA 539.

A spare fan belt of the correct type can be clipped around the water pump and timing cover for a quick changeover if one breaks during competition.

Alternator Fitting

An alternator kit is not available, but a list of all necessary parts is supplied with special cast alternator mounting bracket C-AHT 32. This is designed to take Lucas 11AC Alternator 13H 2131 in place of the existing dynamo using pulley C-AEA 535 and fan belt 13H 923. This will then cope with extra lights, heated screens, etc. for rallying, or can be used for continual stop-start motoring where the dynamo output may not be adequate.

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SUSPENSION MODIFICATIONS

Cone Rubber Type

For cars running at the normal trim height competition adjustable shock absorbers are available for front, Part No. C-AHT 282 and rear C-AHT 283.

If the car is to be lowered, a maximum of 0·312" (7.9%) may be removed from both the front and the rear struts, but modified shock absorbers C-AHT 284 front and C-AHT 285 rear must be fitted, to ensure that the shock absorber and mounting brackets are not strained. It is essential to move the brake pipe away from the top of the rear suspension arm, to prevent this being damaged by contact with the rear bump stops.

Hydrolastic Type Suspension

There have been changes in production on cars with Hydrolastic suspension, and it is advisable to use the latest standard Cooper 'S' suspension for normal rally use. The Mechanical Parts Lists show the changepoints at which the latest Helper Spring 21A 1806 and Rear Strut 21A 9¾" (24.76 cm) long were fitted. Early cars MUST have these fitted at the same time as Front Displacer 21A 2012 and Rear Displacer 21A 2014 are fitted. Competition unit C-21A 1819 will raise the front end to compensate for extra weight when used with the latest struts,etc.

Alternative Hydrolastic Units

	EARLY CARS		LATE CARS	
	Marking	Part No.	Marking Bands	Part No.
Normal - front	NIL	21A 1477	1 orange or green	21A 1804 or 2008
- rear	NIL	21A 1703	1 orange or green	21A 1804 or 2008
Stiff - F. & R.	1 yellow band	C-21A 1705 ⊕	2 orange bands	21A 1811
Hard - front	1 red band	C-21A 1819	1 blue or silver	21A 1872 or 2012
- rear	2 red bands	C-21A 1821 ⊕	2 blue or silver	21A 1874 or 2014

After fitting new displacer units take great care that they are located properly and ensure that the ball sockets do not become displaced at the start of pressurising. Tale the pressure up to 400 lb./sq.in. (28.1 kg.cm^2) and wait at least 20 minutes for vehicle to settle, before reducing to the correct running pressure of 263 lb./sq.in. (18·41 kg./cm^2) for early cars or 282 lb./sq.in. (19.74 kg./cm^2) for cars with the latest struts, etc.

Front Bump Stop Kits

For serious rally use, Front Bump Stop kits C-AJJ 4007 are now avaiilable to provide progressive stiffening of the front suspension. For most events the fitting of both front and rear kits will avoid the need to change the hydrolastic units to Silver or Red. Only the Cooper 'S' is fitted with these hard units as standard.

Shock Absorbers for Hydrolastic

Hydrolastic units incorporate internal dampers, but for certain types of rally use, shock absorbers can be fitted to the front using the parts in Shock Absorber Kit C-AJJ 3362.

⊕ Parts no longer available; use later parts with new rear strut and helper springs.

* See Mechanical Parts List for changepoints. (See also Sheets A-7 & A-8)

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Model MINI RANGE (Hydrolastic Only) **Sheet** A - 7 **Issue** 7

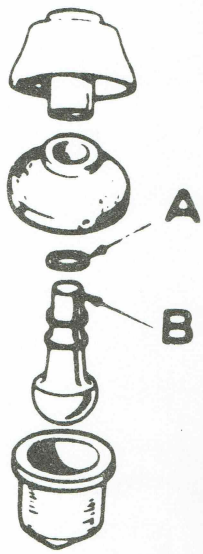
Rear Bump Buffers (Hydrolastic cars only)

Fitting Rear Bump Buffer Kit, Part No. C-AJJ 3313 will control the nose-up attitude on fierce acceleration, and will improve the handling of the car when the rear is heavily laden. Check radius arm bearings for excessive wear.

Raising Ride Height

Front units C-21A 1819 (1 red band) incorporate a .180" spacer to give the greatest ride height and are as hard as later units (See A-6). If the front loading is especially heavy, packing washers can be used PROVIDING THE DRIVE SHAFTS REMAIN HORIZONTAL.

Excessive packing of the displacer struts can be dangerous and under no circumstances should a washer thicker than 0.150" (3.81 m/m) be fitted. Spacers shown 'A' are available as follows:



0.050" (1.27 m/m) thick - Part No. 21A 356
0.080" (2.03 m/m) thick - Part No. 21A 463
0.100" (2.54 m/m) thick - Part No. AJH 5322
0.150" (3.81 m/m) thick - Part No. 21A 1845

Cars should not normally be run with pressure exceeding 300 lb./sq.in. (21 kg./cm^2) but to compensate for extra weight on the front i.e. sump guard and extra lamps, it is satisfactory to fit stronger rear helper springs 21A 1806 to early cars. As well as affecting the handling, damage will result if the car is driven whilst making continual contact with the rebound stops.

Ensure the Hydrolastic pump pressure gauge is occasionally checked against a steam gauge or similar accurate equipment.

Lowering Ride Height

For circuit racing on relatively smooth tracks, the suspension may be lowered by machining accurately 0.2" (5.1 m/m) from the front displacer pistons, and 0.3" (7.6 m/m) from the rear displacer strut. Before refitting these parts, it is ESSENTIAL to see that the ball sockets 'B' still seat properly, if necessary by filing or drilling to clear any ridges. Do not use the standard rear bump buffers, but if the parts in kit Part No. C-AJJ 3313 are considered to provide too much resistance, bump stops 21A 1728 R.H. and 21A 1729 L.H. may be used with special securing screws and washers. It is essential to pack the rebound stops to compensate for the lowering of the car to ensure suspension movement is controlled. Fit rear anti-roll bar and the Silver and Double Silver displacers to late cars, together with rear struts 21A 1805 and helper springs 21A 1806. * Excessive lowering and negative camber can damage drive shafts.

After allowing the new displacer units to settle as explained on Sheet A-6, the pressure can be lowered until the car is just clear of the bump stops. Note that the car will settle lower when the fluid is cold, and DO NOT use pressures less than 220 lb./sq.in. (15.5 kg./cm^2). It does not matter if the pressures are uneven from side to side.

Rear Anti Roll Bar

To increase roll stiffness and oversteer, fit anti-roll bar kit C-AJJ 3317 or C-AJJ 4009 which has rubber bushes to prevent damage during rough rallies.

* See also Sheets A-6 & A-8 and Mechanical Parts List AKD 3509 for Changepoints.

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Adjustable Tie Rods

The castor angle of the front wheels can be varied by fitting Tie Rod Adjuster 21A 1092. The existing tie rod should be cut off 13·687" (347·7 m/m) from the centre of the bolt holes in the fork, and then threaded 1¾" (44·5 m/m) using ½" UNF die.

This should only be carried out when reliable equipment is available to check the steering geometry, and when adequate knowledge is available as to the results. The correct castor angle is 3°, but this should not be varied by more than + or - 2°. An adjustment in length of 0·10" (2·5 m/m) corresponds to 1° variation. Shorten tie rod to increase castor angle, and lengthen to decrease. Carefully retrack front wheels afterwards.

Negative Camber

The camber angle on production cars can vary from 1° positive to 3° positive, but longer bottom Suspension Arms are available as a pair Part No. C-AJJ 3364 to alter the car to a nominal 1½° negative camber. When fitting these special bottom arms it is ESSENTIAL to secure a plate ⅛" (3·2 m/m) thick 1" x 1·½" (25 m/m x 38 m/m) UNDERNEATH the REBOUND platform of the TOP suspension arms. Fix these by drilling and tapping two small holes in each arm to take countersunk screws through the plates. The screws should then be peened over to prevent them coming out.

Brakes

On the Cooper 'S' only, fit competition DS11 brake pad set C-8G 8996 (1 off) together with the harder VG 95 rear brake shoes C-8G 8997 (2 off). Alternatively, the existing shoes may be relined using VG 95 brake lining set C-8G 8998 (1 off). Check that all brake pipes are in good condition and cannot chafe. Check the hoses are not twisted or starting to perish. For rally use, a light coil spring can be fitted over the hoses to protect them from stones, and the disc shield should be partially cut away to provide maximum ventilation.

For serious competition work, and on all group V & VI cars, Dual Braking Systems must be installed. This ensures that if a brake fluid leakage occurs, the front or rear brakes will still function separately and satisfactorily. Dual Braking Kit C-AJJ 3388 contains a master cylinder together with the necessary pipe and instructions for installation.

Only Lockheed Series II Disc Brake Fluid should be used in these cars for bleeding or topping-up.

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Model MINI RANGE **Sheet** A - 9 **Issue** 7

Lightweight Seat

A lightweight Bucket Seat C-AHT 201 is now available, complete with frame weighing only 17½ lb. (8 kg.). This is fully adjustable and will fit on both driver's and passenger's side of the car.

Fog and Spot Lamp Mounting

Additional driving lamps can be mounted in front of the grille without restricting the accessability of the distributor, fan belt and oil filter by using easily detachable brackets.

When fitting four extra lamps, use Competition Mounting Bar C-AJJ 3329, which swings forward after releasing two of the three fixing bolts. On Clubman and 1275 GT bodies, use lamp bar C-AHT 312.

One or two extra lamps can be separately mounted using Pivotting Lamp Bracket C-AJJ 3318, for one lamp which hinges forward to give access.

Fuel Pump

When regulations permit, fit a fuel pump with dual electrical components, which can replace the existing pump, or be moved inside the car and re-piped. Use dual pump kit C-AJJ 4015, but ensure that all connections are in perfect condition and that the pipes cannot chafe anywhere. See Mechanical Parts List for details of the twin fuel tank if this is not already fitted.

Steering Rack

For really arduous rally conditions, fit rack 21A 1961 R.H.D. or 21A 1962 L.H.D., which were fitted to all Cooper 'S' cars from Car No. 992021 R.H.D. and 995102 L.H.D. on Mk.I cars. Mk.II has a different rack incorporating the same improvements.

British Leyland Emblems

British Leyland Special Tuning self-adhesive emblems are now available in pairs under Part No. C-AKD 5125. They are in a vinyl material and are practically indestructible once fitted to any solid flat surface.

Lapel Badge

British Leyland Special Tuning lapel badge with an enamelled design ¾" wide, as above is now available with a pin fixing.

Oil Cooler and Cover

An oil cooler is essential for competition or very fast road use (see Sheet Z-3), but for normal use in the winter it is beneficial to keep the oil from becoming overcooled. Cover C-AHT 181 is designed to fit any size of factory oil cooler and can easily be fitted or detached.

Extra Radiator

For particularly hot conditions highly tuned engines may require an additional radiator, which can be fitted in front of the dynamo. Kit C-AJJ 4011 contains a specially designed radiator, parts and instructions for fitting.

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Model MINI COOPER 'S'/1275GT **Sheet** Aa-1 **Issue** 10

DESCRIPTIVE INDEX

Description	Part No	Qty/Car	Sheet No
BODYWORK			
Bonnet securing strap set, leather	C-AJJ 3381	1	A-11
Rubber toggle strap set	C-AJJ 4016	1	A-11
Narrow wing set for 3½" or 4½" wheels	C-AJJ 3316A	1	A-12
Narrow wing set for 3½" or 4½" wheels (1275GT)	C-AJJ 4019	1	A-12
Wide wing set for 5½" wheels	C-AJJ 3353	1	A-12
Wide wing set for 5½" wheels (for 1275 GT)	C-AJJ 4020	1	A-12
Pivotting single lamp bracket	C-AJJ 3318	1 or 2	A- 9
Competition lamp mounting bar complete	C-AJJ 3329	1	A- 9
Competition lamp mounting bar complete	*C-AHT 312	1	A- 9
Seat, competition lightweight bucket type	C-AHT 201	1 or 2	A- 9
Seat, Rallying Deluxe Mexico type	*C-AHT 201A	1	A- 9
Dash Panel pair - Right hand drive (Mk.I only)	C-AJJ 3330	1	A-11
Dash Panel pair - Left hand drive (Mk.I only)	C-AJJ 3331	1	A-11
Dash Panel pair - Mk.II cars only	C-AJJ 3373	1	A-11
Perspex back light	*C-AHT 148	1	A-11
Perspex window set	C-AJJ 3363	1	A-11
Fibre Glass Door RH	*C-AHT 336	1	A-11
Fibre Glass Door LH	*C-AHT 337	1	A-11
Fibre Glass Boot	*C-AHT 338	1	A-11
Fibre Glass Bonnet	*C-AHT 339	1	A-11
Aluminium doors	*C-AJJ 3379	1	A-11
Aluminium bonnet & boot	*C-AJJ 3380	1	A-11
Instrument "P" light	*C-AHT 396		A-11
BRAKES			
DS11 brake pad set	C- 8G 8996	1	A- 8
VG 95 rear brake shoes	C- 8G 8997	2	A- 8
VG 95 linings and rivets	C- 8G 8998	1	A- 8
Dual brake master cylinder kit	C-AJJ 3388	1	A- 8
Handbrake protector plate	C-AHT 212	1	A- 8
Handbrake protector plate	C-AHT 213	1	A- 8
CAMSHAFTS			
Full race	C-AEA 648	1	A-14
Sprint	C-AEG 597	1	A-14
Super Sprint	C-AEG 595	1	A-14
Road tune	*C-AEG 567	1	A-14/16
Full race	*C-AEG 529	1	A-14
Full race (8 port head - Carburetters)	*C-AEG 599	1	A-14
Full race (Fuel injection)	*C-AEG 419	1	A-14
CLUTCH FLYWHEEL PRIMARY GEAR & CRANKSHAFT			
Competition diaphragm spring assy. (orange)	C-AEG 481	1	A- 4
Clutch driven plate - race	C-22G 247	1	A- 4
Clutch driven plate - Road/rally	C-AHT 349	1	A- 4
Clutch pressure plate - lightened	C-AHT 230	1	A- 4
Flywheel, lightened steel	C-AEG 421	1	A- 4
Flywheel, ultra light	C-AEG 619	1	A- 4
Locking plate, for crankshaft pulley	C-AHT 146	1	A- 5
Primary gear, competition bushed	C-AJJ 3370	1	A- 5
Balanced rotating assy	*C-AJJ 4018	1	A- 4
Main Bearing nut set	*C-AJJ 4013	1	

* New or corrected Part Numbers

continued on Sheet Aa-2

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Model MINI COOPER 'S'/1275 GT **Sheet** Aa - 2 **Issue** 9

DESCRIPTIVE INDEX (Continued)

Description	Part No	Qty/Car	Sheet No
CARBURETTERS etc.			
Installation kit - Twin Weber	*C-AJJ 4053	1	A- 2
Inlet manifold - Twin Webers	*C-AHT 382	1	A- 2
Twin 1¼" SU kit	*C-AJJ 4043	1	A- 16
1½" Twin SU - RHD (CP4 needles)	C-AUD 178	1	A- 2/16
Installation kit for 1½" Carbs - RHD	C-AJJ 3301	1	A- 2/16
1½" Twin SU - LHD (CP4 needles)	C-AUD 176	1	A- 2/16
Installation kit for 1½" Carbs - LHD	C-AJJ 3302	1	A- 2/16
1½" Twin SU fixed jet type (BG needles)	C-AUD 165	1	A- 2
Flared intake pipes for 1½" carbs (Alloy)	C-AHT 247	2	A- 2
SU Float chamber adaptor	C-AHT 180	2	A- 2
Fuel pump, dual type kit complete	C-AJJ 4015	1	A- 9
Weber 45 DCOE carburetter	C-AHT 143	1	A- 2
Installation kit for Weber carb (inc. Manifold)	C-AJJ 3360	1	A- 2
Manifold for twin H6 or HS4 SU carbs	C-AEG 489	1	A- 2
Twin HS4 carburetter pair	C-AUD 224	1	
Twin H6 carburetter pair	C-AUD 416	1	A- 2
Installation kit for H6 carbs	C-AJJ 4001	1	A- 2
Flared intake pipes for 1¾" carbs	C-AHH 7209	2	A- 2
Cable - accelerator	C-AHT 85	1	A- 8
DYNAMO, PULLEY AND FAN			
Pulley for reduced speed	C-AEA 535	1	A- 5
Fan Belt to suit pulley C-AEA 535	C-AEA 756	1	A- 5
Fan belt short	C-AEA 539	1	A- 5
Competition fan blade	C- 2A 997	2	Z- 3
Alternator mounting bracket	C-AHT 32	1	A- 5
EXHAUST			
Competition manifold (970cc and 1071cc)	C-AEG 432	1	A- 4
Competition manifold (1275cc)	C-AEG 365	1	A- 4/16
Competition exhaust system for rallying	C-ARA 334	1	A- 2/4
Competition side exhaust system for racing	C-AHT 290	1	A- 2/4
Competition large bore manifold for racing	C-AHT 289	1	A- 4
Competition manifold (8 port head)	*C-AHT 343	1	A- 4
Gasket (for C-AHT 343)	*C-AHT 380	1	A- 4/13
GEARBOX PARTS			
Powr-Lok differential kit	C-AJJ 3387	1	A-10
Oil pump pick-up pipe, competition	C-AHT 54	1	A- 9
Close ratio straight cut gear sets			
3 speed synchromesh gearboxes only	C-AJJ 3371	1	A- 3
4 speed synchromesh gearboxes only	C-AJJ 4014	1	A- 3
Final Drive gears - conventional diff			
3.938 wheel	C-22G 340	1	A-10
4.267 wheel	C-22G 370	1	A-10
4.35 wheel	C-22G 443	1	A-10
Final Drive gears - for Powr-Lok diff			
3.444 wheel	C-BTA 1250	1	A-10
3.647 wheel	C-BTA 1247	1	A-10
3.765 wheel	C-BTA 1248	1	A-10
3.938 wheel	C-BTA 1252	1	A-10
4.133 wheel	C-BTA 1246	1	A-10
4.267 wheel	C-BTA 1251	1	A-10
4.35 wheel	C-BTA 1249	1	A-10
Pinion 3.938 ratio (See sheet A-10 for others)	C-22G 69	1	A-10
Close ratio Helical cut (4 speed synchromesh)	*C-AJJ 4032	1	A- 3

* New or corrected Part Number

continued on sheet Aa-3

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Model MINI COOPER 'S'/1275 GT **Sheet** Aa - 3 **Issue** 8

DESCRIPTIVE INDEX (Continued)

Description	Part No.	Qty/Car	Sheet No
LITERATURE & INSIGNIA			
Tuning Booklet - Mini Cooper 'S'	C-AKD 5096		
Binder for Special Tuning Data Sheets	C-AKD 5061		
Divider set for Binder	C-AKD 5093		
Tuning Data Sheet set (All current models)	C-AJJ 3333		
British Leyland Special Tuning Emblems (1 pair)	C-AKD 5125		A- 9
British Leyland Special Tuning Lapel Badge	C-AHT 200		A- 9
British Leyland Special Tuning Woven Badge	*C-AHT 333		A- 9
British Leyland Special Tuning Tie	*C-AHT 402		A- 9
OIL COOLER & RADIATOR			
Competition oil cooler kit (13 row cooler)	C-AJJ 3309	1	A- 4
Oil Cooler kit (13 row cooler)	*C-AJJ 4030	1	A- 4
Oil pipe, short, heavy duty	C-AHT 3	1	A- 4
Oil pipe, long, heavy duty	C-AHT 4	1	A- 4
Oil cooler cover	C-AHT 181	1	A- 9
Oil cooler, extra large 16 row	C-ARO 9875	1	A- 4
Auxiliary radiator kit	C-AJJ 4011	1	A- 9
PISTON			
High comp. 4 ring flat top +.040" Grade 3	C-AEG 043043	4	A- 1
High comp. 4 ring flat top +.020" (Set of 4)	8G 243223	1	A- 1
Forged lightweight pistons (Set of 4)	C-AJJ 3377	1	A- 1
Piston Flat top forged (Set of 4)	*C-AJJ 3382	1	A- 1
IGNITION			
Sparking Plug - Champion N64Y	C-37H 4208	4	A-15
Sparking Plug - Champion N57R	C-27H 5982	4	A-15
Sparking Plug - Champion N62R	C-37H 2149	4	A-15
Sparking Plug - Champion N60Y	C-37H 2148	4	A-15
Sparking Plug - Champion G63	*C-AHT 412	4	A-15
Sparking Plug - Champion G59R	*C-AHT 435	4	A-15
Sparking Plug - Champion G56	*C-AHT 413	4	A-15
Plug cover, waterproof competition type	C-AHT 265	4	A-15
H.T. cable	C-AHT 266	1	A-15
Coil HA12	*C-AHT 269	1	A-15
Waterproof H.T. kit	*C-AJJ 4010	1	A-15
Master Switch	*C-AHT 332	1	A-15
SUMPGUARD			
Scottish Rally type sumpguard, complete kit	C-AJJ 3320	1	A-11
SUSPENSION			
Hard setting hydrolastic units, red	C-21A 1819	2	A- 6
Progressive rear bump stop kit	C-AJJ 3313	1	A- 7
Rear anti-roll bar kit complete	C-AJJ 4009	1	A- 7
Steering rack - improved type R.H.D.	21A 1961	1	A- 9
Steering rack - improved type L.H.D.	21A 1962	1	A- 9
Tie rods - adjustable	21A 1092	2	A- 8
Negative camber set	C-AJJ 3364	1	A- 8
Shockabsorber kit - for hydrolastic cars	C-AJJ 3362	1	A- 6
Front bump stop kit	C-AJJ 4007	1	A- 6

* New or corrected Part Numbers

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Model MINI COOPER 'S'/1275GT **Sheet** Aa - 4 **Issue** 1

DESCRIPTIVE INDEX (continued)

Description	Part No.	Qty/Car	Sheet No
VALVE GEAR & HEAD			
Heavy 180 lb. valve spring (outer	C-AEA 524	8	A - 1
(inner	C-AEA 652	8	A - 1
(locating collar	C-AEA 654	8	A - 1
Strengthened rocker shaft	AEG 399	1	A - 5
Valve rocker screws, lengthened	C-AEA 692	8	A - 2
Valve rocker spacer	C-AEG 392	3	A - 5
Lightened tappet	C-AEG 579	8	A - 5
Lightened steel camshaft sprocket	C-AEG 578	1	A - 5
Cylinder head complete with valves	C-AHT 221	1	A - 1/2
Head gasket, competition	C-AHT 188	1	A - 1/16
Head washer set - discs	*C-AHT 288	1	A - 1
Cylinder Head complete	*C-AHT 134	1	A -16
Cylinder head complete	*C-AHT 222	1	A -16
8 Port Cylinder head complete (Cast iron)	*C-AEG 612	1	A -13
8 Port cylinder head complete (Aluminium)	*C-AHT 346	1	A -13
Inlet valve	*C-AHT 410	4	A -13
Exhaust valve	*C-AHT 411	4	A -13
Valve Spring Inner 70 lb.	*C-AHT 366	8	A -13
Valve Spring Outer 130 lb.	*C-AHT 367	8	A -13
Hidural Valve Guides	*C-AJJ 4037	1	A -14
Valve - Inlet	C-AHT 376	4	A -13
Valve - Exhaust	C-AHT 377	4	A -13
Seat - Valve Spring	C-AHT 378	8	A -13
End Pedestal	C-AHT 381	2	A -13
Guides - Hidural Exhaust	C-AHT 365	4	A -13
Guides - Hidural Inlet	C-AHT 364	4	A -13
WHEELS			
Magnesium Alloy 4½"	C-21A 1968	5	A -12
Alloy wheel installation kit (for C-21A 1968)	C-AJJ 3327	1	A -12
Magnesium alloy 5½"	C-21A 2132	5	A -12
Wheel nut set (for 21A 2132)	C-AJJ 3361	1	A -12

* New or corrected Part Numbers

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Model MINI COOPER 'S'/ 1275 GT. **Sheet** A - 1 **Issue** 10

These engines are tuned to a fairly high degree in standard form, but further power can be obtained at the expense of some tractability at lower speeds. Full information on dismantling and assembly is contained in Workshop Manual Part No. AKD 4935, including some special tools which may be required.

Copies of up-to-date F.I.A. Homologation Forms are available ONLY from the R.A.C. Competitions Department, 31 Belgrave Square, London S.W.1., who will also be able to answer any queries concerning eligibility of modified cars.

Cylinder Head & Block

Remove all frazes from the combustion chamber and ports, but leave the locating sleeves in place when matching the manifold ports. Raise the compression ratio by machining the head face. Removing 0.012" (.305 m/m) reduces the capacity by approximately 1cc.

A special polished cylinder head compete with large inlet valves is available Part No. C-AHT 221. This has inlet valve 1.479" (37.6 m/m) exhaust valve 1.1515 (29.243 m/m) and combustion chamber capacity 16.4cc. When fitted to the 999cc unit (970 bored +0.040") the compression ratio will be 12.8:1 with flat top pistons. On the 1275 unit with dished pistons it will be 11.4:1. On a 1293cc unit (1275cc bored +0.020") to obtain a compression ratio of 12.5:1 using dished pistons it is necessary to machine the cylinder block face to within 0.010" (.254 m/m) of the piston crowns at T.D.C. Use head gasket C-AHT 188 in all cases and ensure that there are no burrs at the base of the latest head studs, identified by a dimple or letter T. Special head washer C-AHT 288 (contains 10) are available to prevent any possibility of the head lifting with a high compression ratio.

Bore & Pistons

Blocks can be bored a maximum of +.040" (1.016 m/m) but DO NOT RECHAMFER TOP EDGE of bore as gasket burning could result. Use forged flat top piston set C-AJJ 3382, available only +.020" or + .040". A combustion chamber volume of 21.4cc will give 11:1 C.R. on 1071cc or 12:1 on 1275. With the latest Sprint camshafts, it may be better to go to 13:1 C.R. with Super Premium fuel.

Dished top pistons may give slightly more power on 1293cc engines and forged competition piston sets C-AJJ 3377 are available +.020" or +.040". With a polished head of 16.4cc these pistons will give 11.4:1 C.R.

When ordering pistons, the required oversize should be indicated by suffix 23 or 43, since all pistons are now Grade 3.

Valve Springs

Standard valve springs will avoid undue load on the valve gear, but stronger ones are available to increase valve crash speed to approximately 8,400 r.p.m. when the full race or sprint camshafts are used. Lightening the valve gear will raise the valve crash speed.

Valve spring inner	C-AEA	652	8 off
Valve spring outer	C-AEA	524	8 off
Collar - locating	C-AEA	654	8 off

The locating collar is essential to stop the springs becoming coil bound.

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Model MINI COOPER 'S'/1275 GT **Sheet** A - 2 **Issue** 11

Carburetters

On right hand drive cars, fit 1½" carburetter pair C-AUD 178 using installation kit C-AJJ 3301, or for left hand drive cars use carburetters C-AUD 176 and kit C-AJJ 3302. These carburetters are fitted with blue springs and CP4 needles, but should be reset as follows, before rechecking after track testing. The standard Cooper 'S' inlet manifold should be used on the 1275 GT. Use flare pipes C-AHT 248 (aluminium) to reduce turbulence at carburetter intake, and float extensions C-AHT 180 to raise the fuel level ½" to prevent surge on corners.

Use the standard Cooper 'S'distributor set to the following static timing.

970 cc	Static Ign.	12° B.T.D.C.	CP4 Needle	Part No.	AUD 1118
1071cc	"	"	7° B.T.D.C.	MME "	"	AUD 1265
1275cc (cam C-AEA 648)	"	"	T.D.C.	BG "	"	AUD 1067
1275cc (cam AEG 510)	"	"	2° B.T.D.C.	7 "	"	AUD 1006

Further power may be obtained by fitting HS6 carburetters C-AUD 416, together with installation kit C-AJJ 4001. These 1¾" carburetters should be used with large valve head C-AHT 221 and one of the full-race or sprint camshafts. Flare pipes C-AHH 7209 are available to fit these large carburetters.

With the rally exhaust system C-ARA 334 use KW needles AUD 1247 or with the race side exhaust C-AHT 290 use RR needles AUD 1494 on the 1293 unit.

Fixed Jet Carburetters

For racing where cold starting can be done by hand, carburetters with fixed jets are available Part No. C-AUD 165 for a pair. These are fitted with BG needles and should be used with installation kit C-AJJ 3301 for R.H.D. cars or C-AJJ 3302 for L.H.D. cars. Fit the recommended needles shown above.

Weber Carburetter (5 port Cylinder Head)

A twin choke 45 D.C.O.E. carburetter Part No. C-AHT 143 is available with the best jet settings for a race-tuned 1293 car. Any variations may require slightly different jets.

This carburetter should be fitted to a new manifold included in a complete installation kit C-AJJ 3360, which also contains accelerator cable C-AHT 85.

Inlet Manifold (for use with 8 Port Cylinder Head C-AEG 612)

A prefabricated inlet manifold to take twin Weber carburetters is available under part number C-AHT 382. This should be fitted using jointing compound and a gasket manufactured from 0.010" (.254 m/m) cardboard. The manifold is drilled and tapped for a servo adaptor.

Carburetters (for use with 8 Port Cylinder Head C-AEG 612)

Twin 45 D.C.O.E. Weber carburetter C-AHT 143 should be fitted after changing to the following settings:

Choke Tubes	38 m/m	Emulsion Tube	F 16
Main Jet	2.00m/m	Slow Running	60F8
Air Connection	1.70m/m	Pump Jet	0.45m/m
Needle Valve	2.00m/m	Pump inlet & discharge valve	2.54m/m hole

The carburetter should already be fitted with Auxiliary Venture 3.5 m/m and the Float Level is 5 m/m.

The necessary parts required for fitting the carburetters are contained in kit C-AJJ 4053.

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Model MINI RANGE **Sheet** A - 3 **Issue** 10

ALTERNATIVE GEARBOX RATIOS

Alternative gearbox ratios are available for units with 3 speed synchromesh gearboxes OR 4 speed versions, but different parts are required.

3 SPEED SYNCHROMESH	Std. Ratio (helical)	Close Ratio (helical) ⊕	Std. Ratio (spur) ⊕	Close Ratio (spur)
1st & Rev. ratios	3.200	2.568	3.077	2.573
2nd gear ratio	1.916	1.780	1.875	1.722
3rd gear ratio	1.357	1.242	1.307	1.255
1st Motion Shaft	See	C-22A 985	C-22G 427	C-AJJ 3371
2nd Speed Gear	Parts	C-22A 986 *	C-22G 428 *	(complete-
3rd Speed Gear	List	C-22A 987	C-22G 429 *	kit)
Laygear	AKD 3509	C-22G 210 *	C-22G 335 *	
1st Motion Shaft	20 teeth	23 teeth	20 teeth	22 teeth
2nd Speed Gear	28 teeth	29 teeth	27 teeth	28 teeth
3rd Speed Gear	24 teeth	25 teeth	23 teeth	24 teeth
Laygear teeth	26,23,19,13	24,21,17,13	25,22,18,13	23,20,17,13

Spur cut C.R. Gear Kit C-AJJ 3371 contains stronger layshaft 22A 1371 for competition use. Ensure all other parts not in kit are in good condition.

These gears must be fitted in sets, and can be used in all Mini Cooper 'S' gearboxes, Mini Cooper 998cc gearboxes, 848cc Mini Gearboxes after Engine Number 815140, and 1100s fitted with 'B' type gears only (See Mechanical Parts List). They are NOT suitable for cars with all synchromesh gearboxes.

On all earlier Minis and 997cc Mini Coopers fit later transmission assembly to accept the close ratio gears. For further information refer to the parts list.

NOTE: When assembling spur-cut gears, reverse the dismantling procedure but fit the 1st Motion Shaft from inside gearbox WITHOUT its ball race. Engage 2nd Gear before fitting assembled mainshaft from inside gearbox WITHOUT its ball race. Close the first motion shaft and mainshaft together, ensuring the spigot bearing is in position, and lower the assembly onto the selectors. Fit ball races to both shafts.

4 SPEED SYNCHROMESH GEARBOXES

The Cooper 'S' with 4 speed synchromesh is already fitted with close ratio helical gears, but Minis and 1275 GT with the standard ratio gearbox can be converted to helical close ratio gears by using Helical C.R. Gear Kit C-AJJ 4032.

A spur-cut Close Ratio Gear Kit C-AJJ 4014 is available containing the necessary straight cut close ratio gears for this latest gearbox. Complete transmission assemblies can be interchanged so ensure the correct parts are ordered for the appropriate gearbox.

RATIOS	Std.Helical	C.R. Helical	C.R. Spur
Reverse	3.54:1	3.35:1	2.69:1
1st	3.52:1	3.3 :1	2.543:1
2nd	2.22:1	2.07:1	1.73:1
3rd	1.43:1	1.35:1	1.257:1
1st Motion Shaft	17 teeth	18 teeth	19 teeth

* These parts are no longer available from the factory.

⊕ Existing stocks cannot be replaced when exhausted.

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Model MINI COOPER 'S'/1275 GT **Sheet** A - 4 **Issue** 11

Flywheel and Clutch

It is dangerous to lighten the standard cast iron flywheel but the lighter steel flywheel C-AEG 421 (10.5 lbs - 4.8 kg.) is safe at high revolutions. An ultra light version C-AEG 619 (9 lbs 6 ozs - 4.2 kg.) is also available. The lightened clutch pressure plate C-AHT 230 may also be fitted at the same time. Use the competition diaphragm clutch spring assembly C-AEG 481, together with bonded clutch driven plate C-22G 247 for racing or C-AHT 349 for rallying or road use with a tuned unit. The whole crankshaft, flywheel, clutch and damper assembly should be fully balanced separately and as a unit.

A Cooper 'S' balanced assembly complete with crankshaft, flywheel, clutch and pressure plate assembly is available to special order, Part No. C-AJJ 4018.

Primary Gears

Primary gear set C-AJJ 3370 is now available with a steel-backed bush to prevent breakage during competition use, and should be assembled with just a smear of engine oil. The latest bushes are line bored in position, so are NOT available separately.

Steering Rack

For really arduous rally conditions, fit rack 21A 1961 R.H.D., or 21A 1962 L.H.D., which were fitted to all Cooper 'S' cars from Car No. 992021 R.H.D., and 995102 L.H.D., on Mk.I cars. Mk.II has a different rack incorporating the same improvements.

Oil Cooler

For racing, rallying and prolonged high speed driving it is essential to use the large capacity 13 row oil cooler ARO 9809 with heavy duty pipes C-AHT 3 and C-AHT 4. This cooler is now standard, but may be fitted to other Mini range cars using Oil Cooler Kit C-AJJ 3309 containing full instructions. On the 1275 GT fit kit C-AJJ 4030. A larger 16 row cooler C-ARO 9875 is available for racing when the grille can be modified to provide adequate clearance.

Exhaust Manifold & System

Fit the homologated competition manifold C-AEG 365 for the 1275 cc or C-AEG 432 for the 970 and 1071 cc engines using 5 port cylinder heads. On 8 port 1275 cc engines use manifold C-AHT 343 which should be fitted using special gasket C-AHT 380.

For road use the standard Cooper 'S' exhaust system is quite satisfactory for power but on the 1275 GT a new front pipe $1\frac{3}{4}$" inside dia. should be used from the manifold to the front end of the first silencer.

A special system for rally use C-ARA 334 is available, which is shielded and has an upswept tailpipe.

For racing a straight through side exhaust system C-AHT 290 should be used with manifolds C-AHT 289 or C-AHT 343.

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Model MINI COOPER 'S'/1275 GT **Sheet** A - 5 **Issue** 1C

Rocker Shaft Assembly

A strengthened rocker shaft AEG 399 is now fitted in production, but earlier engines may be identified by the locating screw in the end pedestal. To fit the latest shaft, three new drilled pedestals 12G 1926 and a new tapped pedestal 12G 1927 will be required. Ensure that one of pedestals 12G 1927 lines up with both the oil drilling in the cylinder head and in the rocker shaft.

To reduce friction, the coil spring rocker spacers can be replaced by solid distance tubes Part No. C-AEG 392 (3 off) and washers AEG 168 (6 off). The washers should normally be either side of the end pedestals, but may be moved to ensure each rocker is immediately above the valve stem. It may be necessary to machine the side of some pedestals to get the rocker central, but the correct order of assembly must then be maintained. The latest standard valve rockers 12G 1221 can be further lightened by careful grinding at the sides only so that the strength is not reduced.

Check that the push-rods are straight and true, after which a small amount of material can be removed from around the top cup.

Lightened Tappets and Sprockets

Specially machined tappets C-AEG 579 are available which are a little lighter than the standard version, thus reducing the loading on the camshaft and raising valve bounce r.p.m.

A lightened steel camshaft sprocket C-AEG 578 is also available. Note that this is NOT suitable for any 'B' series engines as the timing would then be incorrect. This also applies to the standard steel sprocket AEA 696.

Crankshaft Pulley Locking

When fitting the crankshaft pulley, care should be taken that the keyway is a good fit to the key. After fully tightening the large securing bolt a special locking plate C-AHT 146 should be fitted by means of the damper screws to lock this bolt. This is not suitable for Pulley 88G 305, but is designed for separate pulley and damper AEG 454 and 12A 367.

Dynamo and Alternator

To avoid damage to the dynamo at high speed, it is advisable to fit larger dynamo pulley C-AEA 535 together with longer fan belt C-AEA 756. The Coil should by remounted upright on the wing panel at the rear of the engine to reduce the load on the dynamo brackets. Where regulations permit running without a dynamo, use standard water pump pulley 2A 601 and short fan belt Part No. C-AEA 539.

A spare fan belt of the correct type can be clipped around the water pump and timing cover for a quick changeover if one breaks during competition.

Alternator Fitting

An alternator kit is not available, but a list of all necessary parts is supplied with special cast alternator mounting bracket C-AHT 32. This is designed to take Lucas 11AC Alternator 13H 2131 in place of the existing dynamo using pulley C-AEA 535 and fan belt 13H 923. This will then cope with extra lights, heated screens, etc. for rallying, or can be used for continual stop-start motoring where the dynamo output may not be adequate.

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Model MINI RANGE **Sheet** A - 6 **Issue** 8

SUSPENSION MODIFICATIONS

Cone Rubber Type

For cars running at the normal trim height competition adjustable shock absorbers are available for front, Part No. C-AHT 282 and rear C-AHT 283.

If the car is to be lowered, a maximum of 0·312" (7·9m/m) may be removed from both the front and the rear struts, but modified shock absorbers C-AHT 284 front and C-AHT 285 rear must be fitted, to ensure that the shock absorber and mounting brackets are not strained. It is essential to move the brake pipe away from the top of the rear suspension arm, to prevent this being damaged by contact with the rear bump stops.

Hydrolastic Type Suspension

There have been changes in production on cars with Hydrolastic suspension, and it is advisable to use the latest standard Cooper 'S' suspension for normal rally use. The Parts Lists show when the latest Helper Spring 21A 1806 and Rear Strut 21A 1805 (9¾" 24·76 cm long) were fitted. Early cars MUST have these fitted at the same time as Front Displacer 21A 2012 and Rear Displacer 21A 2014 are fitted. Competition unit C-21A 1819 will raise the front end to compensate for extra weight when used with the latest struts, etc.

Alternative Hydrolastic Units

	EARLY CARS		LATE CARS	
	Marking	Part No.	Marking Bands	Part No.
Normal - front	NIL	21A 1477	1 orange or green	21A 1804 or 2008
- rear	NIL	21A 1703	1 orange or green	21A 1804 or 2008
Stiff - F. & R.	1 yellow band	C-21A 1705 ⊕	2 orange bands	21A 1811
Hard - front	1 red band	C-21A 1819	1 blue or silver	21A 1872 or 2012
- rear	2 red bands	C-21A 1821 ⊕	2 blue or silver	21A 1874 or 2014

After fitting new displacer units take great care that they are located properly and ensure that the ball sockets do not become displaced at the start of pressurising. Take the pressure up to 400 lb./sq.in. (28·1 kg.cm^2) and wait at least 20 minutes for vehicle to settle, before reducing to the correct running pressure of 263 lb./sq.in. (18.41 kg.cm^2) for early cars or 282 lb./sq.in. (19·74 kg./cm^2) for cars with the latest struts, etc.

Front Bump Stop Kits

For serious rally use, Front Bump Stop Kits C-AJJ 4007 are now available to provide progressive stiffening of the front suspension. For most events the fitting of both front and rear kits will avoid the need to change the hydrolastic units to Silver or Red. Only the Cooper 'S' is fitted with these hard units as standard.

Shock Absorbers for Hydrolastic

Hydrolastic units incorporate internal dampers, but for certain types of rally use, shock absorbers can be fitted to the front using the parts in Shock Absorber Kit C-AJJ 3362.

⊕ Parts no longer available; use later parts with new rear strut and helper springs.

* See Mechanical Parts List for changepoints. (See also Sheets A-7 & A-8).

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Model MINI RANGE (Hydrolastic Only) **Sheet** A - 7 **Issue** 7

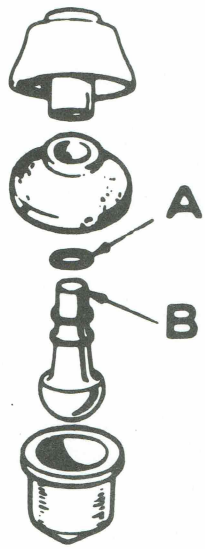
Rear Bump Buffers (Hydrolastic cars only)

Fitting Rear Bump Buffer Kit, Part No. C-AJJ 3313 will control the nose-up attitude on fierce acceleration, and will improve the handling of the car when the rear is heavily laden. Check radius arm bearings for excessive wear.

Raising Ride Height

Front units C-21A 1819 (1 red band) incorporate a .180" spacer to give the greatest ride height and are as hard as later units (See A-6). If the front loading is especially heavy, packing washers can be used PROVIDING THE DRIVE SHAFTS REMAIN HORIZONTAL.

Excessive packing of the displacer struts can be dangerous and under no circumstances should a washer thicker than 0.150" (3.81 m/m) be fitted. Spacers shown 'A' are available as follows:



0.050" (1.27 m/m) thick - Part No. 21A 356
0.080" (2.03 m/m) thick - Part No. 21A 463
0.100" (2.54 m/m) thick - Part No. AJH 5322
0.150" (3.81 m/m) thick - Part No. 21A 1845

Cars should not normally be run with pressure exceeding 300 lb./sq.in. (21 kg./cm^2) but to compensate for extra weight on the front i.e. sump guard and extra lamps, it is satisfactory to fit stronger rear helper springs 21A 1806 to early cars. As well as affecting the handling, damage will result if the car is driven whilst making continual contact with the rebound stops.

Ensure the Hydrolastic pump pressure gauge is occasionally checked against a steam gauge or similar accurate equipment.

Lowering Ride Height

For circuit racing on relatively smooth tracks, the suspension may be lowered by machining accurately 0.2" (5.1 m/m) from the front displacer pistons, and 0.3" (7.6 m/m) from the rear displacer strut. Before refitting these parts, it is ESSENTIAL to see that the ball sockets 'B' still seat properly, if necessary by filing or drilling to clear any ridges. Do not use the standard rear bump buffers, but if the parts in kit Part No. C-AJJ 3313 are considered to provide too much resistance, bump stops 21A 1728 R.H. and 21A 1729 L.H. may be used with special securing screws and washers. It is essential to pack the rebound stops to compensate for the lowering of the car to ensure suspension movement is controlled. Fit rear anti-roll bar and the Silver and Double Silver displacers to late cars, together with rear struts 21A 1805 and helper springs 21A 1806. * Excessive lowering and negative camber can damage drive shafts.

After allowing the new displacer units to settle as explained on Sheet A-6, the pressure can be lowered until the car is just clear of the bump stops. Note that the car will settle lower when the fluid is cold, and DO NOT use pressures less than 220 lb./sq.in. (15.5 kg./cm^2). It does not matter if the pressures are uneven from side to side.

Rear Anti Roll Bar

To increase roll stiffness and oversteer, fit anti-roll bar kit C-AJJ 4009 which has rubber bushes to prevent damage during rough rallies.

* See also Sheets A-6 & A-8 and Mechanical Parts List AKD 3509 for Changepoints.

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Model MINI COOPER 'S'/1275 GT **Sheet** A - 8 **Issue** 8

Adjustable Tie Rods

The castor angle of the front wheels can be varied by fitting Tie Rod Adjuster 21A 1092. The existing tie rod should be cut off 13.687" (347.7 m/m) from the centre of the bolt holes in the fork, and then threaded $1\frac{3}{4}$" (44.5 m/m) using $\frac{1}{2}$" UNF die.

This should only be carried out when reliable equipment is available to check the steering geometry, and when adequate knowledge is available as to the results. The correct castor angle is 3°, but this should not be varied by more than + or - 2°. An adjustment in length of 0.10" (2.5 m/m) corresponds to 1° variation. Shorten tie rod to increase castor angle, and lengthen to decrease. Carefully retrack front wheels afterwards.

Negative Camber

The camber angle on production cars can vary from 1° positive to 3° positive, but longer bottom Suspension Arms are available as a pair Part No. C-AJJ 3364 to alter the car to a nominal $1\frac{1}{2}^{\circ}$ negative camber. When fitting these special bottom arms it is ESSENTIAL to secure a plate $\frac{1}{8}$" (3.2 m/m) thick 1" x 1.$\frac{1}{2}$" (25 m/m x 38 m/m) UNDERNEATH the REBOUND platform of the TOP suspension arms. Fix these by drilling and tapping two small holes in each arm to take countersunk screws through the plates. The screws should then be peened over to prevent them coming out.

Brakes

Fit competition DS11 brake pad set C-8G 8996 (1 off) together with the harder VG 95 rear brake shoes C-8G 8997 (2 off). Alternatively, the existing shoes may be relined using VG 95 brake lining set C-8G 8998 (1 off). Check that all brake pipes are in good condition and cannot chafe. Check the hoses are not twisted or starting to perish. For rally use, a light coil spring can be fitted over the hoses to protect them from stones. The disc shield should be partially cut away to provide maximum ventilation, and handbrake protector plates C-AHT 212 RH, C-AHT 213 LH, should be fitted to the rear back plates.

For serious competition work, and on all group V & VI cars, Dual Braking Systems must be installed. This ensures that if a brake fluid leakage occurs, the front or rear brakes will still function separately and satisfactorily. Dual Braking Kit C-AJJ 3388 contains a master cylinder together with the necessary pipe and instructions for installation.

Only Lockheed Series II Disc Brake Fluid should be used in these cars for bleeding or topping-up.

Accelerator Cable

An improved accelerator cable C-AHT 85 has now been developed for smooth operation under arduous rally conditions. It will fit all the Mini, Cooper Clubman and Cooper 'S' range with S.U. or Weber carburetters.

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Model MINI RANGE **Sheet** A - 9 **Issue** 9

Lightweight Seats

Two types of lightweight bucket seats are available. For Racing C-AHT 201 should be used and for Rallying a deluxe Mexico type C-AHT 201A is most suited.

Both seats are supplied complete with frame which is fully adjustable and will fit on both driver's and passenger's side of the car. The total weight is approximately 17½ lbs (8 kg).

Fog and Spot Lamp Mounting

Additional driving lamps can be mounted in front of the grille without restricting the accessability of the distributor, fan belt and oil filter by using special brackets, C-AJJ 3329 for the Mini or C-AHT 312 for the Clubman type body. However, current Road Traffic regulations must be studied by the owner before fitting more than two lamps to these brackets.

One or two extra lamps can be separately mounted using Pivotting Lamp Bracket C-AJJ 3318 for each lamp, which hinges forward to give access.

Fuel Pump

When regulations permit, fit a fuel pump with dual electrical components, which can replace the existing pump, or be moved inside the car and re-piped. Use dual pump kit C-AJJ 4015, but ensure that all connections are in perfect condition and that the pipes cannot chafe anywhere. See Mechanical Parts List for details of the twin fuel tank if this is not already fitted.

Oil Pick-up Pipe

In order to reduce the chance of loss of oil pressure due to surge, a modified Oil Pick-up C-AHT 54 is available. This is suitable for all Mini, Clubman, Cooper, 1100, 1300 and Mini Cooper 'S' manual gearboxes and is ideal for use in competition driving tests, rallies, autocrosses and for racing.

Oil Cooler Cover

An oil cooler is essential for competition or very fast road use (see Sheet Z-3), but for normal use in the winter it is beneficial to keep the oil from becoming overcooled. Cover C-AHT 181 is designed to fit any size of factory oil cooler and can easily be fitted or detached.

Extra Radiator

For particularly hot conditions highly tuned engines may require an additional radiator which can be fitted in front of the dynamo. Kit C-AJJ 4011 contains a specially designed radiator, parts and instructions for fitting.

British Leyland Insignia

British Leyland Special Tuning self-adhesive emblems are available in pairs under Part No. C-AKD 5125. They are in a vinyl material and are practically indestructible once fitted to any solid flat surface.

A woven badge C-AHT 333 of the same design is also available for sewing to overalls, anoraks etc.

A pin fixing enamelled lapel badge C-AHT 200 and cuff links C-AHT 395 have the same design ¾" wide.

The British Leyland Special Tuning tie C-AHT 402 is available in blue with a woven ¾" wide design as above.

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Model All MINI range **Sheet** A - 10 **Issue** 4

Powr-Lok Differential

The original type of positive locking limited slip differential C-AJJ 3303 and C-AJJ 3326 are no longer available for these cars. A new Powr-Lok Differential Kit is available to Part No. C-AJJ 3387 which will be supplied in lieu of the earlier types.

C-AJJ 3387 will only fit cars with needle roller drive shafts, and flange couplings. Earlier cars with rubber drive shaft couplings can be replaced by needle roller drive shafts using the following standard parts:

End cover	22G 419	2
Seal - for end cover	22G 423	2
Collet - for driving flange	22G 424	4
Seal - rubber, for flange	22A 1202	2
Washer - plain	22A 1201	2
Washer - spring	LWZ 510	2
Setscrew - for driving flange	22A 1104	2
Nut - for bolt	LNZ 205	8
Driveshaft Assembly R.H. * Cooper 'S' only	21A 1857	1
Driveshaft Assembly L.H. * Cooper 'S' only	21A 1858	1
Driveshaft Assembly R.H. * Mini & Cooper only	21A 1852	1
Driveshaft Assembly L.H. * Mini & Cooper only	21A 1854	1

* See Mechanical Parts Lists for Breakdown of these Driveshaft Assemblies if required.

If a conventional differential is required after converting to needle-roller couplings, differential gears 22A 1151 (2 off) and driving flange 22A 1152 (2 off) will be required.

ALTERNATIVE FINAL DRIVE GEARS

Ratio	3.444	3.647	3.765	3.938	4.133	4.267	4.35
(Teeth)	(18/62)	(17/62)	(17/64)	(16/63)	(15/62)	(15/64)	(15/65)
Wheel	22A 411	22G 940	22A 401	C-22G 340	22G 101	C-22G 370	C-22G 443
Pinion	22A 413	22A 399	22A 399	C-22G 69	22G 99	22G 99	22G 99
Mod'ed Wheel	C-BTA 1250	C-BTA 1247	C-BTA 1248	C-BTA 1252	C-BTA 1246	C-BTA 1251	C-BTA 1249

N.B. Cars fitted with Powr-Lok Differential C-AJJ 3387 require the modified final drive wheel, but use the same pinion as before.

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Model MINI RANGE **Sheet** A - 11 **Issue** 8

SUMPGUARD

A very substantial sumpguard as used by the works is available as a complete kit Part No. C-AJJ 3320 including all necessary mounting plates and rubbers. This guard weighs 35lb (16 kg) and should not be confused with other guards of less robust construction, but it will reduce the ground clearance.

BONNET STRAPS

Leather securing straps are available as a set, Part No. C-AJJ 3381, to ensure that the bonnet cannot fly open during competitive events.

A rubber toggle set C-AJJ 4016 is also available having a speedier action.

DASH PANELS

Aluminium dash panels with a black crackle finish are available for the MK.I bodies. These are drilled to take 3" (76 m/m) tachometer on the driver's side, the remainder being left blank to enable the owner to position switches and other instruments as required. Part No. C-AJJ 3330 RH drive, or C-AJJ 3331 LH drive.

Similar pairs of dash panels are available in glass fibre, they have a grained finish and are without any holes, so that they will suit Home or Export cars.

APPLICATION

Mini MK.I All Models	C-AJJ 3330 RHD C-AJJ 3331 LHD
Mini MK.II 850, 998 Cooper 'S' MK.II & MK.III	C-AJJ 4095
Mini MK.II 1972 Model 850, 998	C-AJJ 4095A
Clubman 998, 1275 GT Auxiliary Panel (Navigators)	C-AJJ 4096

Aircraft type instrument 'P' light as used on Special Tuning prepared rally cars are supplied under Part No. C-AHT 396.

PERSPEX WINDOWS

Perspex Window Sets C-AJJ 3363 are now available for MK.I or MK.II bodies. The perspex back-light C-AHT 148 fits direct to the MK.II aperture including the Clubman and GT bodies, but a paper template is supplied to convert this to suit the MK.I aperture. The template should be placed on the OUTSIDE of the perspex and the surplus trimmed off. The perspex Quarter light fits direct into cars without the Deluxe hinged quarter light using rubber surround 14A 6825 RH and 14A 6826 LH. These parts will NOT fit the latest bodies with wind up windows.

LIGHTWEIGHT PANELS

Aluminium panels for the MK.I are available to ensure minimum weight for club competition use. The panels can be specially ordered by description.

Glass fibre panels for the Mini Clubman and 1275 GT bodies are available to special order, bare and unpainted.

Door RH	C-AHT 336	LH	C-AHT 337
Boot lid	C-AHT 338	Bonnet	C-AHT 339

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Model COOPER 'S' & 1275 GT ONLY **Sheet** A - 12 **Issue** 2

WHEELS

Magnesium alloy wheels are recommended for race and rally use, since these are considerably lighter and stronger than pressed steel wheels.

The 4½" x 10" wheels C-21A 1968 (5 off) are used for rallying and road use with installation kit C-AJJ 3327, which contains 18 wheel nuts and various balance weights.

For racing only, the wider 5½" x 10" wheel C-21A 2132 is used with installation kit C-AJJ 3361. These wheels come outside the bearing centres so they are not approved for normal use. Although heavy duty taper roller bearings are used in the hubs, a close check should be kept for signs of excessive wheel bearing wear. Owners should note that since so many tyres are now available, the satisfactory fitting of these is their responsibility. Racing tyres should not be used on the road, since they are so easily deflected by white lines etc.

Although 12" diameter wheels have been tried, their advantage for certain very special events is so minimal, and specialist tyres so difficult to obtain, that they are no longer readily available from the factory.

Under no circumstances should the recommended wheel nut torque, 43 lb.ft. (5.94 kg/m) be exceeded.

NO OTHER NON-STANDARD WHEELS WHATSOEVER ARE APPROVED.

WING EXTENSIONS

Regulations for road vehicles in most countries require that the bodywork should cover the wheels above a line passing through the hub. Nearly all competition rules and regulations also stipulate this.

For 4½" wheels, use either C-AJJ 3316A on the original Cooper 'S' bodies, or C-AJJ 4019 on the 1275 GT body.

For 5½" wheels, use either C-AJJ 3353 on the Cooper 'S' or C-AJJ 4020 on the 1275 GT body.

Wing extensions C-AJJ 3316A, C-AJJ 3353, C-AJJ 4019 and C-AJJ 4020 are homologated.

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SPECIAL TUNING DATA

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Model COOPER 'S'/1275 GT **Sheet** A - 13 **Issue** 1

8 Port Cylinder Head (Cast Iron)

A special polished cast iron 8 port cross flow cylinder head suitable for fuel injection or twin Weber carburetters is available under part number C-AEG 612. The combustion chamber capacity is approximately 14cc and is supplied assembled complete with valve springs Outer C-AHT 367, Inner C-AHT 366, Inlet valve C-AHT 410 1.475" (37.8㎜) and Exhaust valve C-AHT 411 1.185" (30㎜).

8 Port Cylinder Head (Aluminium)

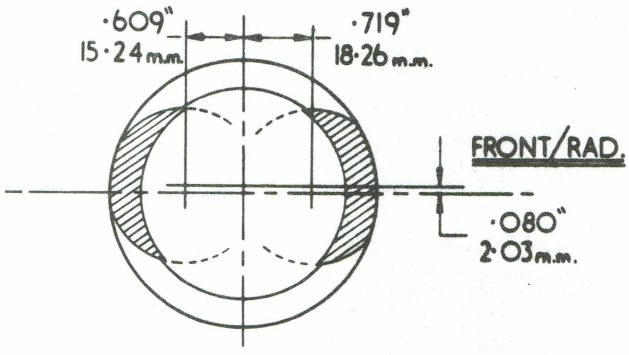
The British Leyland 8 port aluminium full race cylinder head C-AHT 346 is supplied under Part No. C-AJJ 4064 complete with additional rocker pedestals, valves, 200 lb. valve spring , cap, cotters, studs, inlet and exhaust gaskets, but is not assemblied. It is fitted with inlet valves 1.4" (35.6㎜) dia. C-AHT 376 and exhaust valves 1.215" (30.8㎜) dia. C-AHT 377.

Before final fitting of the inlet and exhaust valves they should be ground into the head to obtain a combustion chamber capacity of 13cc. 10㎜ sparking plugs are required and details are given in the instructions contained in C-AJJ 4064.

Fitting Procedure 8 Port Head

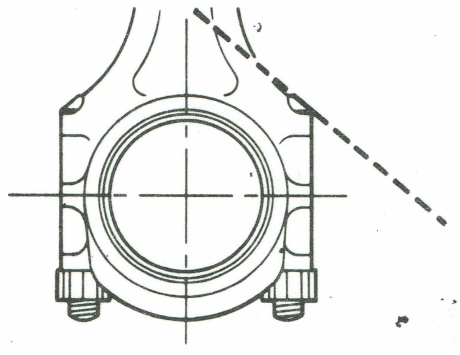
Modifications are needed to the Cooper 'S' bonnet when using twin Weber carburetters on heads C-AHT 346 or C-AEG 612. This is not allowed under existing Group II regulations, so it will usually be necessary to use the 1275 GT body.

For maximum power the compression ratio should be 12.5:1 on the 1293 unit. Using dished pistons C-AJJ 337723 it is necessary to machine the cylinder block face so that the piston is flush with the block face at T.D.C. To allow the valves full travel it will be necessary to undercut the piston crown 0.050" (1.270㎜) deep, 1.625" (41.275㎜) diameter as per Fig. 1. The cutter should have a 1/16" (1.6㎜) radius on the outer cutting corner.



PISTON TOP

Fig. 1



CONNECTING ROD

Fig. 2

If facilities do not exist for machining pistonsthe block face can be machined to within 0.025" (0.635㎜) of the piston crown at T.D.C. Use head gasket C-AHT 188 in all cases and ensure there are no burrs at the base of the latest head studs, identified by a dimple or letter 'T'.

Owing to the 8 port head having a non standard valve sequence, number 2 and 4 connecting rods may foul the camshaft. To overcome this the top edge of the conrod big end and the head of the bolt should be chamfered as per Fig. 2.

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SPECIAL TUNING DATA

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Model 1275GT/COOPER 'S' **Sheet** A - 14 **Issue** 1

Camshaft

For road and mild rally tuning, on the 1275 GT, camshaft C-AEG 567 gives the best low speed pick-up. On the Cooper 'S' use the latest standard camshaft AEG 510.

Camshaft C-AEA 648 on the Cooper 'S' or C-AEG 529 on the 1275 GT gives more top end power, losing tractability in the lower range, but is suitable for Rallycross, Rallying and long distance Racing.

For short races use C-AEG 597 or for absolute maximum power at sprint meetings use C-AEG 595. When using these camshafts on the Cooper 'S' the oil pump must be changed to 12G 1128 or 12G 1924 which have spider drive flanges.

Two additional **bolts** HBN 0412 have to be fitted to the rear of the cylinder block which has to be drilled 13/64" (5.15 m/m) and tapped $\frac{1}{4}$" UNF (6.35 m/m). A new gasket 12G 730 and lockwashers 12G 2097 and 12G 2098 should be used.

See tuning sheet Z -2 for camshaft timing details.

The 8 port cylinder head valve sequence differs from the conventional cylinder head, therefore the camshafts listed on sheet Z - 2 are not suitable.

Two special camshafts are available C-AEG 599 for use with carburetters and C-AHT 419 for fuel injection which has an extended nose piece for driving the Lucas fuel injection metering unit.

Details of the camshafts are as follows :

	Part No.	
	C-AEG 599	C-AHT 419
Inlet opens B.T.D.C.	60°	60°
Inlet closes A.B.D.C,	80°	80°
Exhaust opens B.B.D.C.	85°	95°
Exhaust closes A.T.D.C.	55°	65°
Inlet period	320°	320°
Exhaust period	320°	340°
Cam lift	.315"	.315"
Valve lift	.394"	.394"
Running clearance	.015"	.015"
	. 38m/m	. 38m/m

For checking timing set rocker clearance to .021" (.53 m/m). Both camshaft use the flange oil pump drive.

Valve Guides

Hidural valve guides are fitted to cylinder heads C-AHT 612, C-AHT 221 and C-AHT 222. Replacement guides are available in sets under part number C-AJJ 4037

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Model MINI COOPER 'S'/1275GT **Sheet** A - 15 **Issue** 1

Sparking Plugs, Coil & H.T. Connections

Champion N64Y (C-37H 4208) are suitable for rally work or fast road use. For racing use N60Y (C-37H 2148), N62R (C-37H 2149) or N57R (C-27H 5982) which is harder (a cooler running plug).

In order to ensure a really positive connection to the plugs, rubber connectors C-AHT 265 are now available which seal very tightly onto the plugs. A 6 ft length of special H.T. cable is available to Part No. C-AHT 266 for use with these connectors and screw-in coils.

Current HA12 coils are fitted with push-on spade terminals, and push-in H.T. connection which are not positive enough for severe rally use. HA12 coil C-AHT 269 is now available with screw-on terminals and H.T. connection. Water-proof H.T. kit C-AJJ 4010 contains 4 connectors, a length of H.T. cable, competition coil C-AHT 269 and a coil cover 8G 727.

On the 8 port head 10mm sparking plugs are used. It is good practice to warm up a highly tuned race engine with hotter plugs to assist in bringing the engine up to its proper operating temperature as rapidly as possible. This will also stop oil fouling of the race plugs. The warm up plugs must be removed before practice otherwise this could destroy an expensive unit.

The following chart gives 10mm plug recommendations.

Heat Range	Part No.	Type	Application
Hot	C-AHT 412	Champion G.63	Warm up only
	C-AHT 435	" G.59R	8 port head carburetter
Cold	C-AHT 413	" G.56R	Fuel Injection

The plug reach and cylinder head boss depth may vary. It is therefore recommended that the plugs are installed and checked for fit before the head is fitted. A plug that does not extend the full threaded length of the plug boss can cause hot spots and decrease the compression ratio. A plug that extends beyond the length of the plug boss can also cause hot spots and possibly interfere with the pistons and spoil the gas flow of the combustion chamber. In some cases a change to another plug reach may rectify the problem or shims can be used to ensure a correct depth fit.

All 10mm sparking plugs mentioned are .700" (19.05 mm) reach.

Master Switch

The fitting of a master switch in the main battery head is compulsory in some forms of motor sport. A suitable switch is available under part number C-AHT 332 and as a safety feature should be fitted on all competition cars.

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Model 1275 GT only **Sheet** A - 16 **Issue** 2

For a mild stage of tune a Stage I polished cylinder head C-AHT 134 can be fitted which increases the compression ratio to 9.5:1 approximately.

Tuning can be varied to suit individual requirements but the following stages of tune are recommended.

STAGE II (9.5:1 CR)

Performance 'S' Kit C-AJJ 4082

Contents:

Polished cylinder head
Additional 1½" carburetter
Free flow exhaust manifold
Head gasket
Special distributor
Sparking plugs N64Y
Air cleaners
Plus sundry fitting parts

Performance Times

M.P.H.	STD 1275 GT	STD COOPER 'S'	1275 GT 'S' KIT
	Secs	Secs	Secs
0 - 30	4.3	3.5	3.3
0 - 40	6.4	6.0	4.8
0 - 50	9.8	8.2	7.2
0 - 60	14.2	11.2	10.0
0 - 70	20.8	15.4	14.0
0 - 80	34.3	23.4	20.7
0 - 90	-	34.7	32.7

Figures by permission of "Motor" (Road Test Dec. '71)

STAGE III (10.6:1 CR)

Performance 'S' Kit	C-AJJ 4082
Camshaft	C-AEG 643
Crankshaft (tuftrided)	12G 1817
Pistons +.020"	C-AJJ 3377

At the expense of engine flexibility further power can be obtained by following the detailed tuning in this booklet.

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C-AJJ 3371

CLOSE RATIO COMPETITION GEAR SET

for MINI COOPER 'S' and similar gearboxes WITH 3 SPEED SYNCHROMESH ONLY

NOT SUITABLE for gearboxes with 4 SPEED SYNCHROMESH

Contents

1st Motion Shaft	C-22G 1048	1 off
2nd Speed Gear	C-22G 1049	1 off
3rd Speed Gear	C-22G 1050	1 off
Laygear	C-22G 1047	1 off
Layshaft	22A 1371	1 off
Bearing for Layshaft	88G 396	2 off
Circlip for Layshaft	22G 278	2 off
Circlip Mainshaft Race (Large)	2A 3711	1 off
Baulk Rings	22G 220	3 off
Circlip for 1st Motion Shaft Race	CCN 110	1 off
Oil Seal-Flywheel Housing	13H 2934	1 off
Lockwasher - Flywheel Housing	2A 3519	1 off
" " "	2A 3520	1 off
" " "	2A 3521	1 off
Flywheel Lockplate	22A 1155	1 off

Instructions

This kit should be used in conjunction with Gasket Set 8G 2411 and Lockwasher Set 18G 8085, unless the individual parts are more easily obtained separately.

It is essential that the correst 1st Speed Gear is used when converting transmission assemblies, 22A 1021 is the latest part superceding 22A 863 and 22G 359. ONLY THESE ARE SUITABLE.

Check the endfloat of laygear and if more than .006" (.15 %) the thrust washer must be changed to reduce clearance to NOT LESS THAN .002" (.05 %). Check the circlip interference fit on first motion shaft to see if the large one supplied in the kit is required.

The shimming on the 3rd motion shaft ball race retainer must also be checked as described in the Workshop Manual Part No. AKD 4935 which gives a chart of shim sizes.

When assembling gearbox, reverse the dismantling procedure but note the following points. Fit the 1st Motion Shaft from inside gearbox WITHOUT its ball race. Engage 2nd Gear before fitting assembled mainshaft from inside gearbox WITHOUT its ball race. Close the first motion shaft and mainshaft together, ensuring the spigot bearing is in position, and lower the assembly onto the selectors. Fit ball races to both shafts.

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