

MINI & MINI COOPER
848, 997 & 998 cc



SPECIAL TUNING DATA

Issued by: BRITISH LEYLAND SPECIAL TUNING DEPARTMENT
 ABINGDON-ON-THAMES • BERKSHIRE • ENGLAND

Model 848cc & 998cc MINI
 997cc & 998cc MINI COOPER

Sheet Da - 1 Issue 7

DESCRIPTIVE INDEX

<u>Description</u>	<u>Part No</u>	<u>Qty/Car</u>	<u>Sheet No</u>
<u>BRITISH LEYLAND STAGE I TUNING KITS, (for single carburetter cars only)</u>			
Tuning Kit, 850cc Manual gearbox only	C-AJJ 3343	1	D-1
Tuning Kit, 998cc Automatic gearbox only	C-AJJ 3345	1	D-1
Tuning Kit, 998cc Manual gearbox only	C-AJJ 3346	1	D-1
Tuning Kit, 850cc Automatic gearbox only	C-AJJ 3347	1	D-1
<u>ENGINE</u>			
Performance Kit (848 & 998cc Manual)	C-AJJ 3393	1	D-1/3
Twin 1½" S.U. Carburetter Kit	C-AJJ 4043	1	D-1
Twin 1½" HS.4 Carburetter Kit	C-AUD 224	1	D-1
Twin 1½" HS.4 Installation Kit	C-AJJ 4040	1	D-1
Head gasket - competition	C-AEA 647	1	D-1 ✓
Head gasket - for full race heads	C-AHT 188	1	D-1/6
Fan 2 blade type	C- 2A 997	2	Z-3
Alternator mounting bracket	C-AHT 32	1	
Crankshaft - Tuftrided (848cc Mini only)	C-AEG 515	1	D-3
Crankshaft - Tuftrided (998cc only)	C-AEA 601	1	D-3
Oil pump pick-up pipe, competition	C-AHT 54	1	D-2
Crankshaft pulley locking plate	C-AHT 146	1	D-3
Duplex timing chain kit	C-AJJ 3325	1	D-3
Lightened tappet	C-AEG 579	8	D-3
Camshaft - full race	C-AEA 648	1	D-4
Flywheel - lightened steel	C-AEG 421	1	D-3
Flywheel - ultra light	C-AEG 619	1	
Clutch pressure plate - lightened	C-AHT 230	1	D-3
Valve spring - outer	C-AEA 524	8	D-4
<u>CYLINDER HEAD</u>			
Cylinder head complete, polished & assembled	C-AHT 87	1	D-4
" (See	C-AHT 90	1	D-4
" Sheet D-4	C-AHT 134	1	D-1/4
" for	C-AHT 141	1	D-4
" full	C-AHT 221	1	D-4
" details)	C-AHT 222	1	D-4
"	C-AHT 463	1	D-1/4
<u>EXHAUST</u>			
Competition manifold (large bore)	C-AEG 432	1	D-6
Rally protected exhaust system	C-ARA 334	1	
<u>FINAL DRIVE</u>			
3.938:1 ratio (Wheel	C-22G 340	1	A-10
(Pinion	C-22G 69	1	A-10
4.267:1 ratio Wheel	C-22G 370	1	A-10
4.35:1 ratio Wheel	C-22G 443	1	A-10
(see Sheet A-10 for other standard ratios)			
Powr-Lok differential	C-AJJ 3387	1	A-10
(see Sheet A-10 for final drive wheels to suit)			

See appropriate Tuning Data Sheet before ordering.

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SPECIAL TUNING DATA

Issued by: BRITISH LEYLAND SPECIAL TUNING DEPARTMENT
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Model MINI RANGE

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DESCRIPTIVE INDEX (Continued)

<u>Description</u>	<u>Part No.</u>	<u>Qty/Car</u>	<u>Sheet No.</u>
<u>BODYWORK</u>			
Bonnet Strap Set	C-AJJ 3381	1	A-11
Rubber Toggle Set	C-AJJ 4016	1	A-11
Pivotting single lamp bracket	C-AJJ 3318	1 or 2	A- 9
Competition lamp mounting bar	C-AJJ 3329	1	A- 9
Seat Lightweight Bucket type	*C-AHT 201	1 or 2	A- 9
Seat Rallying De-Luxe Mexico type	*C-AHT 201A	1 or 2	A- 9
Perspex window Set	C-AJJ 3363	1	A-11
Dash Panel pair RHD cars (Mk.I only)	C-AJJ 3330	1	A-11
Dash Panel pair LHD cars (Mk.I only)	C-AJJ 3331	1	A-11
Dash Panel set (Mk.II bodies only)	C-AJJ 3373	1	A-11
Instrument 'P' light	*C-AHT 396	1	A-11
Narrow Wing set (Mini)	C-AJJ 3316	1	D- 2
Narrow Wing set (Clubman & GT)	C-AJJ 4019	1	D- 2
Wide Wing set (Mini)	C-AJJ 3353	1	D- 2
Wide Wing set (Clubman & GT)	C-AJJ 4020	1	D- 2
Sumpguard - Scottish Rally type complete	C-AJJ 3320	1	A-11
Headlamp Cowl Kit	*C-AJJ 3385	1	A- 9
<u>BRAKES</u>			
DE11 Brake Pad set (998cc COOPER ONLY)	C-AHT 223	1	D- 5
Competition Lined shoes (1 $\frac{1}{4}$ " front & rear)	C- 8G 8997	4	D- 5
Competition Lined shoes (1 $\frac{1}{2}$ " front only)	C-AHT 315	2	D- 5
Competition Lining set (1 $\frac{1}{4}$ " wide)	C- 8G 8998	1	D- 5
Competition Lining set (1 $\frac{1}{2}$ " wide)	C-AHT 316	1	D- 5
<u>GEARBOX</u>			
Close ratio straight-cut gear set			
3 speed synchro gearbox	C-AJJ 3371	1	A- 3
4 speed synchro gearbox	C-AJJ 4014	1	A- 3
Close ratio helical cut gear conversion			
4 speed synchro gearbox	C-AJJ 4032	1	A- 3
<u>LITERATURE</u>			
Tuning Booklet - Mini Range 848, 997 & 998cc	C-AKD 5099		
Binder for Special Tuning 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 Lapel Badge	C-AHT 200		A- 9
British Leyland Special Tuning Emblems (1 pr)	C-AKD 5125		A- 9
British Leyland Special Tuning Woven Badge	C-AHT 333		A- 9
<u>OIL COOLER</u>			
Oil Cooler Kit, comp etc (Mini)	C-AJJ 3309	1	Z- 3
Oil Cooler Kit, (Clubman & GT)	C-AJJ 4030	1	
Cover for oil cooler in winter	C-AHT 181	1	

* NEW PART NUMBER OR INFORMATION

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Model MINI RANGE

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DESCRIPTIVE INDEX (Continued)

<u>Description</u>	<u>Part No.</u>	<u>Qty/Car</u>	<u>Sheet No</u>
<u>SUSPENSION</u>			
Hard setting hydrolastic units - red	C-21A 1819	2	A- 6
Progressive rear bump stop kit	C-AJJ 3313	1	A- 7
Front bump stop kit	C-AJJ 4007	1	A- 6
Rear anti-roll bar kit complete	C-AJJ 4009	1	A- 7
Shock absorber kit - front, hydrolastic cars	C-AJJ 3362	1	A- 6
Shock absorber - front adjustable lowered	C-AHT 284 *	2	A- 6
Shock absorber - rear adjustable lowered	C-AHT 285 *	2	A- 6
Shock absorber - front adjustable normal	C-AHT 282 *	2	A- 6
Shock absorber - rear adjustable normal	C-AHT 283 *	2	A- 6
Negative camber kit	C-AJJ 3364	1	D- 5
Tie rods - adjustable	21A 1092	2	D- 5
<u>WHEELS</u>			
Steel 4½" wheel (NOT for Cooper 'S' or Clubman GT)	C-AHT 182	5	D- 2

* New part number or information.

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SPECIAL TUNING DATA

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Model 848cc, 998cc MINI & MINI CLUBMAN

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Issue 9

BRITISH LEYLAND STAGE I POLISHED HEAD KITS

For a mild stage of tune to enhance the performance of the Mini range Stage I kits are available for fitting without affecting the Owner Service Statement. They are NOT suitable for the twin carburetted cars.

C-AJJ 3343	850cc Manual Gearbox	C-AJJ 3345	998cc Automatic Gearbox
C-AJJ 3347	850cc Automatic Gearbox	C-AJJ 3346	998cc Manual Gearbox

For the Countryman or Traveller version, add suffix A to the part number.

Each kit contains a polished cylinder head, completely assembled with valves and springs, matching inlet/exhaust manifold, modified carburetter items, sparking plugs, studs, identifying label and all necessary joints and fitting instructions. The 998cc versions are also supplied with a new silencer assembly.

BRITISH LEYLAND STAGE I TWIN CARBURETTER KITS

For 998cc units with MANUAL gearboxes, a Twin Carburetter Kit C-AJJ 4043 is now available which does NOT affect the New Car Owner Service Statement. It contains the necessary carburetters, manifolds, air cleaners, fitting instructions etc., to permit easy assembly. If the compression ratio is raised, a new distributor Part No. C-27H 7766 will be required and the New Car Owner Service Statement will be affected from this stage onwards.

Any queries concerning Owner Service Statement matters should be referred to British Leyland (Austin-Morris) Ltd., Service Division, Cowley, Oxford.

Further power can be obtained at the expense of some flexibility. Although tuning can be varied to suit individual requirements, the following stage tuning is recommended, but is excluded under the terms of the New Car Owner Service Statement.

850cc MINI

<u>Stage II</u> (9.25:1)	
Polished cylinder head and inlet manifold, single 1½" S.U. carb.	C-AJJ 3393
<u>Stage III</u> (9.25:1)	
As Stage II plus.	
Camshaft	AEG 510
Carburetter needle No. 5	AUD 1004

998cc MINI & CLUBMAN

<u>Stage II</u> (9.3:1)	
Polished cylinder head and inlet manifold, single 1½" S.U. carb.	C-AJJ 3393
<u>Stage III</u> (9.7:1)	
Polished cylinder head	C-AHT 134
(It is necessary to undercut cylinder block, see D - 4)	
Twin 1½" S.U. carburetters	C-AUD 224
Installation kit	C-AJJ 4040
Camshaft (SU fuel pump required with all non-standard camshafts)	AEG 510
Head gasket	C-AHT 188
<u>Stage IV</u> (9.7:1)	
Polished large valve head	C-AHT 463
(It is necessary to undercut cylinder block, see D - 4)	
Twin 1½" S.U. carburetters	C-AUD 224
Installation kit	C-AJJ 4040
Head gasket	C-AHT 188
Crankshaft (tuftrided)	C-AEG 601
Camshaft	C-AEA 731
(S.U. fuel pump required with all non-standard camshafts)	

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Model 848cc & 998cc MINI (Single Carb.)
997cc & 998cc MINI COOPER

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Information on carrying out normal work on these cars is contained in Workshop Manual Part No. AKD 4935. Parts lists are also available to special order showing exploded views of all the parts, and important changepoints.

Mechanical Parts List	- Cooper & Cooper 'S'	- AKD 3509
Body Parts List	- Cooper & Cooper 'S'	- AKD 3510
Parts List	- Mini & Mini Clubman range	- AKD 5146

Alternative Gearbox Gears

Full details of close-ratio helical cut gears and also stronger, but more noisy, straight cut standard and close-ratio gears are shown on Tuning Sheet A-3 for fitting to certain 'A' Series Transverse gearboxes.

Alternative Final Drive Gears

Ratios of 3.44, 3.647, 3.764, 3.938, 4.133, 4.267, and 4.35 are normally available for fitting to any 'A' Series Transverse Manual Gearbox. Powr-Lok differential C-AJJ 3387 can also be fitted to any cars with Hardy-Spicer needle roller drive shafts. See Tuning Sheet A-10 for full details.

Oil Pick-up Pipe

A modified oil pick-up C-AHT 54 is now available, designed to reduce the possibility of lost oil pressure due to surge. This will fit all manual gearboxes fitted to transverse 'A' type engines, and is ideal for use in competition driving tests, rallies, autocross, and for racing. When fitting, ensure it is clear of the casing and gears, as vibration can cause failure.

Wheels and Spacers

4½" wide wheels, suitable for the Mini and Mini Clubman are now available to Part No. C-AHT 182. These will also fit the 998cc Mini Cooper prior to the following car number changepoints: Austin RH Steering C-A2S7-981485, LH Steering C-A2S7-987414, Morris RH Steering K-A2S4-979618, LH Steering K-A2S4-986469. Later cars must be fitted with earlier rear brake drum 21A 22 to bring wheels within bearing centres. When wider wheels are fitted it will be legally necessary to extend the bodywork to cover them, using Narrow Wing Extension Kit C-AJJ 3316A for early bodies, or C-AJJ 4019 for the Clubman range. If even wider wheels are used for competition use, Wide Wing Extensions C-AJJ 3353 or C-AJJ 4020 for Clubman & GT will be required.

N.B. Wider wheels put a greater load onto the wheel bearings and these should be checked regularly for signs of excessive clearance. NO OTHER NON-STANDARD WHEELS WHATSOEVER ARE APPROVED.

Mini Cooper 'S' standard or wide rim wheels MUST NOT be fitted to the Mini or normal Mini Cooper front or rear hub assemblies. The fitting of spacers more than ⅛" (3.2%) thick is not approved for any reason. Do not exceed wheel nut torque of 42 lb.ft. (5.8kg.%) with any wheels.

Auxiliary Fuel Tank

Full details of all parts necessary to fit fuel tank 21A 2183 to the RH side of the car are shown in the Mini Cooper Mechanical Parts List. Kit Part No. 18G 8083 contains all the necessary parts and fitting instructions, with the exception of connecting pipe 21A 1338 which must be ordered separately.

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Model 848cc & 998cc MINI (Single Carb.)
997cc & 998cc MINI COOPER

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Issue 3

Performance Kit (Manual Gearbox cars only)

If more power is required than is offered by the Stage I Tuning Kit shown on Sheet D-1, a complete Performance Kit C-AJJ 3393 is now available containing a fully polished and assembled cylinder head, but with a larger manifold to take a 1½" SU carburetter. Both the carburetter and suitable air cleaner are also contained in the kit, together with full fitting instructions.

Strengthened Crankshafts (848cc & 998cc)

For competition or severe use, a stronger crankshaft in 'Tuftrided' material is available under Part No. C-AEG 515 for the 848cc version or C-AEG 601 for the 998cc engines. These will take the Cooper 'S' lightened flywheel C-AEG 421 or ultra-light version C-AEG 619, standard Cooper 'S' diaphragm clutch, and lightened clutch pressure plate C-AHT 230. The competition Cooper 'S' clutch is not necessary and would overload the crankshaft thrust washers.

Crankshaft Damper

The Cooper 'S' crankshaft pulley and damper AEG 454 and 12A 367 will fit the strengthened crankshafts C-AEG 515 and C-AEG 601. If these parts are used, it is also possible to lock the retaining bolt 12A 283 by means of the latest competition locking plate C-AHT 146, but not if combined pulley and damper 88G 305 is used. It may be necessary to fit the Cooper 'S' front mounting bracket to clear the damper.

Duplex Timing Chain

When using competition camshafts (See Data Sheet Z-2) timing gear wear can be reduced by fitting Duplex Chain Kit C-AJJ 3325. This contains the necessary chain and sprockets, together with fitting instructions.

Lightened Tappets

Specially machined Tappets C-AEG 579 in improved material are now available, which are lighter and more wear-resistant than the standard parts. These should be fitted in sets to reduce the loading on the camshaft and raise valve bounce speed.

Accelerator Cable

An improved accelerator cable C-AHT 85 has now been developed to ensure smooth operation under arduous rally conditions. It will fit cars with either SU or Weber carburetters.

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Model 848cc & 998cc MINI

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POLISHED CYLINDER HEADS

Part No.	Combustion Chamber Capacity	Valve Head Diameter		Compression Ratio		Valve Springs	
		Inlet	Exhaust	850 Mini	998 Mini	Inner	Outer
C-AHT 87	20.5/22cc	1.098" 27.89%	1.005" 25.53%	9.25	9.3	-	AEA 311
C-AHT 90	23/24cc	1.151" 29.23%	1.005" 25.53%	8.6	8.6	AEA 401	AEA 311
C-AHT 134	18/19.5cc	1.307" 33.2%	1.156" 29.4%	10.0	9.7	12G 1137	12G 1136
C-AHT 141	25/26cc	1.215" 30.81%	1.005" 25.53%	8.2	8.2	AEA 401	AEA 311
C-AHT 221	16.4cc	1.479" 37.6%	1.156" 29.4%	11.0	10.4	C-AEA 652	C-AEA 524
C-AHT 222	16.4cc	1.401" 35.6%	1.156" 29.4%	11.0	10.4	C-AEA 652	C-AEA 524
C-AHT 463	19cc	1.401" 35.6%	1.156" 29.4%	10.0	9.7	AEA 768	AEA 767

With these cylinder heads it may be necessary to undercut the cylinder block to allow the valves full travel. The machining should be done from the valve guide centre and the valve head should have a minimum lift and diametric clearance of 1/16" (1.59%).

Use cylinder head gasket C-AEA 647 except with heads C-AHT 134, C-AHT 221, C-AHT 463, C-AHT 222 when gasket C-AHT 188 should be used.

For competition use, fit Hidural valve guides C-AJJ 4037. Heads C-AHT 221, C-AHT 222 and C-AHT 463 have Hidural guides fitted.

VALVE SPRINGS

If the valve crash speed is to be extended, bearing in mind the condition and whether strengthened parts have been fitted to the unit, use outer spring C-AEA 524 with cylinder heads C-AHT 87, C-AHT 90 and C-AHT 141.

On cylinder heads C-AHT 134 and C-AHT 463 use inner spring C-AEA 652, outer spring C-AEA 524 and new bottom locating collar C-AEA 654 in place of the existing standard part.

CAMSHAFT

Full camshaft details are given on Sheet Z-2. With advance stages of tune it is advisable to line bore the cylinder block and fit camshaft bearing liners available in kit 8G 2392

For full race tuning fit camshaft C-AEA 648, which will require longer tappet adjusting screws C-AEA 692. These will only fit forged valve rocker 12G 1221 and locknut FNN 605, which should be used complete with a strengthened rocker shaft AEG 399.

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Model MINI, MINI COOPER & CLUBMAN

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Issue 3

Suspension Modifications

The information detailed in Tuning Sheets A-6 and A-7 can also be applied to the Mini and Mini Clubman in most cases.

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%) from the centre of the bolt holes in the fork, and then threaded 1 $\frac{3}{4}$ " (44.5%) 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%) 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 $\frac{1}{2}$ ° negative camber. When fitting these special bottom arms it is ESSENTIAL to secure a plate $\frac{1}{8}$ " (3.2%) thick 1" x 1 $\cdot\frac{1}{2}$ " (25% x 38%) UNDERNEATH the REBOUND platform on 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

Competition brake lining and disc pad materials are available as follows:
848cc (Original dry cone suspension)

Single leading shoe	1 $\frac{1}{4}$ " F & R)	Lined shoes C-8G	8997	4 off
Later 2 leading shoe	1 $\frac{1}{4}$ " F & R)			

Later Mini & Mini Clubman (Hydrostatic or latest dry cone suspension)

2 leading shoe	1 $\frac{1}{2}$ " front only	Lined shoes C-AHT	315	2 off
	1 $\frac{1}{4}$ " rear only	Lined shoes C-8G	8997	2 off

Cooper 998cc Mk.I/II

Disc/Drum Brakes	front only	Disc pads C-AHT	223	1 off
	1 $\frac{1}{4}$ " rear only	Lined shoes C-8G	8997	2 off

N.B. Replacement linings are available:

	1 $\frac{1}{2}$ " wide	Lining set C-AHT	316	1 off
or	1 $\frac{1}{4}$ " wide	Lining set C-8G	8998	1 off

Harder linings require more pedal effort which can be achieved by

- Brake Servo Kit 18G 8171 and supplementary kit 18G 8173 (Mini or Cooper) or
- Fitting larger bore wheel cylinder to earlier models (standard on ALL Mk.II models). i.e.

Cylinder assembly	R.H. front	37H 2015	2 off
	L.H. front	37H 2016	2 off
Cylinder assembly	Rear	17H 8152	2 off
Limiting valve	-	21A 2031	1 off

N.B. The fitting of a brake servo kit will NOT increase the efficiency of the brakes, but will only reduce the pedal effort required.



SPECIAL TUNING DATA

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Model 998cc POWER UNIT (11:1 Full Race)

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Issue 5

The following is a suggested specification for a full race power unit for under 1000cc class events. Power output should be 85/90 B.H.P. at 7,300 RPM.

<u>Description</u>	<u>Part No.</u>	<u>Qty</u>
Pistons	C-AJJ 4039	1 set
Connecting Rods	C-AJJ 4035	1 set
Large Valve Cylinder head 16.4cc	C-AHT 222	
Camshaft, Full Race	C-AEA 648	
Crankshaft, Competition	C-AEG 601	
Carburettors (twin 1½" SU)	C-AUD 224	1 Pr
Installation Kit	C-AJJ 4040	
Exhaust Manifold	C-AEG 432	
Cam Followers (lightened)	C-AEG 579	8 off
Flywheel, Ultra-light	C-AEG 619	
Clutch Assembly	GCC 103	
Clutch Driven Plate	C-22G 247	
Clutch Pressure Plate (lightened)	C-AHT 230	
Duplex Timing Chain Kit	C-AJJ 3325	
Crankshaft Locking Plate	C-AHT 146	
Oil Pump Pick-up Pipe	C-AHT 54	
Accelerator Cable	C-AHT 85	
Cylinder Head Gasket	C-AHT 188	
Sparking Plugs N60Y	C-37H 2148	4 off
Fan Blade	C- 2A 997	2 off
Gears (Straight cut) (4 speed synchro)	C-AJJ 4014	
Thermostat Blanking Sleeve	C-AJJ 4012	
Water Pump	12G 1771	
Bottom Water Hose	12A 1550	
Dynamo Pulley	C-AEA 535	
Distributor	C-27H 7766	
Limited Slip Differential	C-AJJ 3387	
Final Drive Gear (See Sheet A-10)	(To choice)	

The special pistons C-AJJ 4039 require a special set of rods C-AJJ 4035 with interference fit gudgeon pins. Fitting these is quite involved, but instructions are supplied with the pistons.

It will be necessary to undercut the cylinder block .150" (3.8%) deep, 1.26" (32%) diameter to allow the exhaust valve full travel. The machining should be done from the valve guide centre, to give a minimum lift and diametric clearance of 1/16" (1.59%). A modified block can be ordered specially machined from Abingdon. The centre main bearing cap should be supported with a 7/16" (11.1125%) thick steel plate and longer studs.

Set static ignition timing to approximately 2° B.T.D.C. and fit B.G. carburetter needles AUD 1067 in place of the A.M. needles fitted to the carburettors. Both these settings may be varied for individual engines, but the distributor vacuum unit is not connected.

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