Technical Information
Bulletin No. 13

PREPARATION AND ASSEMBLY OF 5TA, T.100A, T100S/S, 3TA & T90. 350cc and 500cc "C" Range Models ENGINES FOR MAXIMUM PERFORMANCE

WORKSHOP TOOLS

It will be assumed that the following items are in the owner's possession and that he has both experience and necessary workshop facilities.

Piston ring clips.
Engine timing dics.
Set of feeler gauges.
Crankshaft and camwheel extractor Z.89.
Additional parts for Z.89 tool, Z.144 and Z.145 (Engine No. H.29733 onwards).
Clutch centre extractor DA.50/1
"C" Range Workshop Manual.
Contact breaker cam extractor D.484 (Engine No. H.29733 onwards).
Contact breaker oil seal Pilot D.486 (Engine No. H.29733 onwards).
T.D.C. Tool D.571/2 (Engine No. H.35987 onwards).

INTRODUCTION

All models have a common stroke of 65.5 mm. The early T21 model had straight sided crankshaft webs, but after the introduction of the 5TA model all crankshafts became common. The 350 c.c. models have a bore of 58.25 mm. with steel connecting rods and $\frac{3}{16}$" dia. gudgeon pin. 500 c.c. models have a bore of 69 mm. with alloy connecting rods and $\frac{11}{16}$" dia. gudgeon pin.

The insert big end bearings are common to both the 350 c.c. and 500 c.c. models and have a bearing surface of white metal. The plain right main bearing bush material is VP3 copper lead. No alternative materials are available for either application.

Various conditions of standard, wide and close ratio gears have been fitted but for competition work it is essential to fit the current condition of the appropriate gears as shown in this bulletin.

A number of special high performance components are available for the above Triumph machines which may be fitted to increase the power output. This Bulletin tabulates and co-relates all the necessary technical information that is available so that the owner who wishes to increase the performance of his machine may do so, starting from the point experience has shown to be best. These alterations are not necessarily for machines which are to be retained for road use.

If the owner follows the sequence outlined he will achieve the optimum for the particular chosen condition, after which the maximum will be gained by his own experience and endeavour.

Model **Engine Number**

T21 from **H101.** Original 350 c.c. model introduced in 1957 with rear enclosure panels and 17 inch dia. wheels. This model used a crankshaft having straight-sided crankshaft webs. The later crankshaft having "pear"-shaped webs cannot be fitted without changing the crankcase also. This crankshaft can, however, be fitted to later crankcases, using spacing washer E.4006.

3TA from **H.5485.** 3TA model introduced and a corresponding **5TA** 500 c.c. model 5TA added to the range. Both models used a common crankcase and crankshaft. The steel connecting rods were retained for the 3TA, but the 5TA used rods of RR.56 Hiduminium alloy.

T100A **H.11512.** A Sporting version of the 5TA model was introduced for the 1960 season using the A.C. Magneto (E.T.) ignition system and battery lighting. This system was used up to engine H.22439 when a changeover was made to full coil ignition as used for other models in the range. Some owners converted earlier T100A models to the later system and full details are given in Service Bulletin 219. For machines still using the original equipment, full details of the method used for setting the ignition timing, including rotor positions, are given in Technical Information Bulletin No. 10. Both these publications are available from the Service Department upon request, providing the engine number and ignition are quoted. This model was also fitted with high performance camshafts E.4038 inlet and E.4023 exhaust, nacelle, rear enclosure panels and 17" dia. wheels. A larger clutch using 5 bonded and 6 plain plates and a primary chain tensioner slipper were fitted, but 5TA and 3TA models did not incorporate this until later. Unless the machined boss (at 5 o'clock go the crank drive shaft, near the stator) is incorporated, a chain tensioner cannot be fitted. Even so a new outer cover (Part No. E.4122) is required.

T100A from **H.18412.** From this engine number a 1 inch choke monobloc carburetter was used (376/273). The exhaust camshaft was changed to the E.4039 type and a needle roller bearing layshaft fitted to the gearbox with a single needle roller bearing incorporated in the left hand end of the gearbox casing.

5TA from **H.18512.** Used the larger T100A and T100S/S clutch in place of the original clutch which used 4 bonded and 5 plain plates, but retained the sintered bronze layshaft bushes.

T100A from **H.22439.** The electrical system was changed from the A.C. magneto type with battery lighting to a full coil ignition set as used by other models in the range. The high performance camshafts E.4038 inlet and E.4039 exhaust were fitted.

T100S/S from **H.25252.** Alternative sporting model introduced 1961. Basically the same as the T100A but with the following differences. 10" dia. front and 18" rear wheels, abbreviated rear panels, detachable headlamp and two into one exhaust system. The E.4023 exhaust camshaft was fitted to bring the engine power lower down the r.p.m. range. The T100A clutch and needle roller bearing were also fitted.

T90 from **H.29733.** Sporting version of the 3TA model intro-**T100S/S** duced 1963. New three spring clutch having 6 bonded and 6 plain plates, two into one exhaust system, detachable headlamp and abbreviated rear panels and 18" dia. wheels were fitted in common with the T100S/S model. Twin contact breaker driven from the R/H end of the exhaust camshaft and twin ignition coils were used in place of the distributor and single coil originally fitted on T90 & T100S/S models.

T90 from **H.32465.** A switch panel was fitted to the left-hand **T100S/S** side of the machine in place of the "sports" panels previously fitted, incorporating the lighting and ignition switches. Re-designed front forks with "outside" springs fitted to all models.

3TA from **H.32465.** The full rear enclosure panels were deleted **5TA** and "sports" type panels fitted in their place, but the nacelle headlamp was retained still with the lighting and ignition switches incorporated. Twin contact breakers and twin ignition coils fitted.

3TA
5TA from **H.35987.** A bolt-on frame strut was incorporated for **T90** additional support of the fuel tank which was sup-**T100S/S** ported on rubber mountings. The large front mudguard previously fitted to 3TA and 5TA models was replaced by a sports type mudguard with additional front stays.

3TA
5TA from **H.40528.** All coil ignition models used 12 volt **T90** lighting and ignition system. A six pint engine oil **T100S/S** tank with positive rear chain lubrication was also fitted. All models employed a left-hand switch panel in place of the "sports" rear panels. The switch gear incorporating a barrel-type ignition lock was fitted to the switch panel with a "tell-tale" warning lamp incorporated in the headlamp shell. The previous detachable fuel tank steady bar became an integral part of the frame and a redesigned fuel tank incorporating new Triumph motifs was employed. A 'kill' button was fitted to the right handlebar.

from	H.49833
3TA	Discontinued
5TA	
T100T T100R	Daytona Sports models introduced. These models have twin carburetters, an entirely new cylinder head to suit with modified combustion chamber shape, valve angles, inlet stud spacings and new inlet manifolds. T100T/T100R have 8" Front brake. Cam followers E4040 are fitted as standard. T90, T100T and T100R have 1¼ in. dia. exhaust pipes. T90 fitted with alloy connecting rods similar to T100 except for small end bush diameters. All models incorporate bolted up swinging arm with side support plates on the rear frame. Entirely new heavier duty front frame fitted with revised petrol tank mountings. The lighting switch is now sited in the headlamp shell.

BRIEF TECHNICAL DATA

Model	Capacity	C. Ratio	I.O.	I.C. @ 0.020 in. lift	E.O.	E.C.	Carburetter Choke Size	Valve Inlet	Head Size. Exhaust	Inlet. Port
T21	348 c.c.	7.5 : 1	26½	69½	61½	35½	(1 1/32" up to H.2329 (375/23) (29/32" from H.3330 (375/32)	1 5/16"	1 1/16"	1"
3TA	348 c.c.	7.5 : 1	26½	69½	61½	35½	29/32" (375/62)	1 5/16"	1 1/16"	7/8"
T90	348 c.c.	9 : 1	34	55	48	27	1 1/32" (376/300)	1.429" 1.435"	1.200" 1.195"	1"
5TA (from H.	490 c.c. 40528)	7 : 1	26½ 34	69½ 55	61½ 48	35½ 27	7/8" (375/35) 7/8" (375/35)	1.439" 1.435"	1 5/16"	1"
T100A	490 c.c.	9 : 1	27	48	48	27	7/8" (375/35)	1.439" 1.435"	1 5/16"	1"
TR5A	490 c.c.	9 : 1	34	55	55	34	1" (376/273)	1.439" 1.435"	1 5/16"	1"
T100S/S	490 c.c.	9 : 1	34	55	48	27	1" (376/273)	1.439"	1 5/16"	1"
T100T T100R	490 c.c.	9.7 : 1	40	52	61	31	1 1/16" (376/324/325)	1 17/32"	1 5/16"	1 1/16"

For all dismantling and assembly procedure follow the instructions as detailed in the Workshop Manual. The procedure detailed hereafter is in respect of non-standard high performance equipment only.

SECTION 1 ENGINE

Strip out completely and examine for wear, fatigue, misuse and any signs of damage. Remember that if you intend to increase the performance of the machine, all components will be subject to higher loads and the trouble and patience to achieve this condition will be wasted if a suspect item is refitted and subsequently gives trouble. Fit new gaskets and washers throughout.

(a) Crankcase

Rebuild with new con. rod and flywheel bolts and nuts. Clean out the sludge tube if the machine has completed a considerable mileage. When using any of these engines for high performance work, the current crankshaft right plain main bearing housing lockplate should be fitted. Where it is not already incorporated, a suitable groove should be made in the main bearing housing to accept the backplate, or the current housing Part No. E.4322 should be fitted. The face of the crankcase should also be relieved to allow the small lockplate (Part No. E.4139) to be fitted. This should be retained by a self tap screw (Part No. E.4140). The crankcase must be drilled with an 1/8"(.125") drill to a depth of 3/8" in the appropriate position. Prior to replacing the bush, apply "Loctite" sealant to both the bush and the housing after making sure no lubricant remains on the surfaces. This prevents any possibility of subsequent lateral movement under arduous heat conditions. If a new timing side main bearing bush is to be fitted, it is necessary to line ream it using service tool number Z.128. The cost of this tool for the average owner with limited usage is uneconomical, and we suggest that your local Triumph dealer will be capable of carrying out this work for a small charge. Bushes of 0.010", 0.020" and 0.030" undersizes are available for use with reground crankshaft assemblies. Fit the high performance camshafts only in conjunctions with E.4040 tappets (cam followers). Align and bolt up the crankcase halves taking care that the breather and spring is properly located in the inlet cam shaft and drive side crank case half. Fit the piston rings using "tapered face" top and second compression rings and standard oil control rings. T100A, T100S/S and T90 machines are already fitted with 9.0-1 compression ratio pistons, but the other models will require these to be fitted. Refit the cylinder block, preferably using piston ring clips to avoid damage to the piston and/or rings. Heavy duty piston rings (D/24) supplied under part No. CP. 160 are available for high performance work. These can only be used in conjunction with E.4021 9:1 500 c.c. pistons.

CAMSHAFTS AND EXHAUST SYSTEMS

FOR RACING PURPOSES

Inlet camshaft E.4038 (distributor) } in conjunction
E.5163 twin C.B. arrangement } with E.4040
Exhaust camshaft E.4039 (distributor) } tappets
E.5044 twin C.B. arrangement }

I.O. 34° I.C. 55° E.O. 55° E.C. 34°

FOR HIGH PERFORMANCE ROAD WORK

Alternative exhaust camshafts and settings for road use with silencers: (3TA and 5TA only).

Distributor models E.4023 Exhaust opens 48° } in conjunction
Exhaust closes 27° } with E.3753
Twin C.B. models E.4786 Exhaust opens 48° } tappets
Exhaust closes 27° }

For racing purposes use:

1¼ inch dia. twin downswept exhaust system (Part No. E.3992 L/H and E.3994 R/H) with megaphones (16" long and 4" exit dia.). T21 models must use exhaust pipes Part No. E.3864 L/H and E.3865 R/H. For short twisting circuits and scrambles type events use: 1½" dia. twin downswept exhaust system (Part No. E.3992 L/H and E.3994 R/H) with straight-through extensions (Part No. E.4042 L/H and E.4043 R/H).

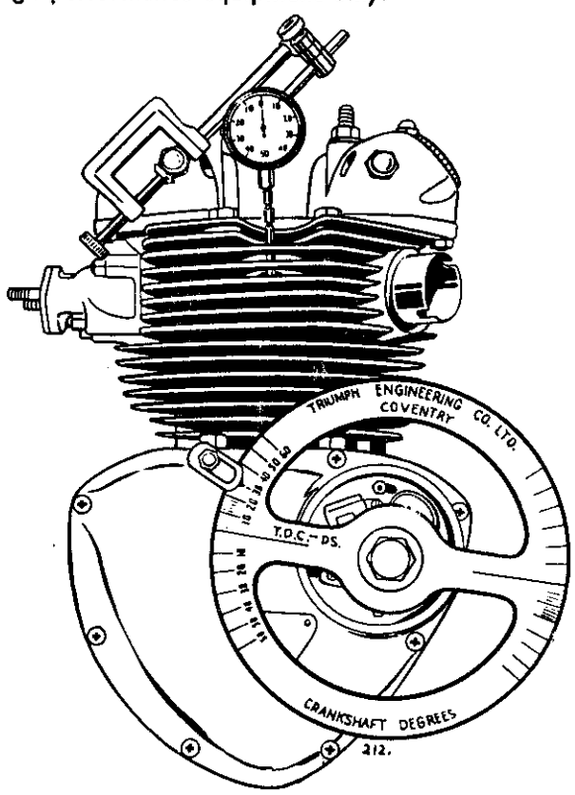


FIG. A. DIAL TEST INDICATOR AND DEGREE TIMING DISC ARRANGEMENT

For road racing use straight-through silencer equipment with the above camshafts with 1½" dia. twin downswept exhaust system (Part No. E.3992 L/H and E.3994 R/H) with straight-through sports silencers (Part No. E.4157 L/H and E.4158 R/H).

Models T90, T100T and T100R have 1¼" dia. exhaust pipes as original equipment (Part Numbers E5325 L/H and E5327). These should be retained and fitted in conjunction with silencers E4157 and E4158. No exhaust pipe extensions are manufactured to suit these exhaust pipes but suitable ones can be made up to 8½ ins. length if required.

If silencers or megaphones are used it is essential that they are adequately sway-braced between the silencer or megaphone nose clips and the bottom of the frame down tube.

Where machines were fitted with the two in to one system as standard equipment, this should be removed and twin downswept exhaust pipes Part Nos. E.3992 L/H and E.3994 R/H, fitted in place of the original equipment.

(b) Cylinder Head

The engine performance is far more dependent on the port shape and size than finish. The port section should be almost constant, free from sharp corners, bumps or waviness and the finish should be good. It has been found that a mirror finish is not necessary. Final port finishing after the shape has satisfactorily been achieved, should be carried out with great care.

larger diameter valves can only be fitted to cylinder heads used on engines from engine number H.29733 as these versions incorporate larger diameter valve seat inserts, and allow for larger diameter valve seats and increased throating.
Bronze valve guides are available for all models, under Part Number E.6301. Should larger valves be fitted for special purposes the valve cutaways in the piston crowns should be increased to prevent contact with the valves at high r.p.m. Any sharp corners should be blended away to prevent "hot spots". Also the auxiliary spheres in the cylinder head may need blending. Grind the valves in and fit a new set of valve springs, available under Part Number CP.177.
From Engine Number H.32465 the push rod cover tube design was changed to improve the oil tightness at this point. This affects the cover tubes, sealing washers and tappet guide blocks. The later arrangement can be fitted to earlier models, provided the cylinder block flange is machined to provide clearance for the new tappet guide blocks and push rod tube bottom cup arrangements. (See Fig. B).
Fit the cylinder head and push rod cover tubes, checking that the copper cylinder head gasket has no sharp edges around the bore to cause pre-ignition.

(c) Cylinder Head—Twin Carburetter T100T/T100R

This cylinder head as produced will give the optimum performance and will require only final port finishing as above. No ttempt should be made to vary valve sizes. To convert and existing single carburetter model (500 c.c. only) to this condition will be extremely costly and our experience indicates that the maximum performance will be available only where all the parts listed below are fitted at one and the same time.

Qty.	*Part No.*	*Description*
2	E6884	Piston Assy. 9.75 c.r.
1	E6966	Cylinder Head
2	E6853	Inlet Valves
2	E6854	Exhaust Valves
4	E6855	Bottom Cups
1	E7136	Left Manifold
1	E7137	Right Manifold
2	E6772	Manifold Washer
4	S582	Studs
4	13105/00/2	Nuts
4	29505/07/2	Socket Head Screws
1	376/324	L.H. Carburetter
1	376/325	R.H. Carburetter
2	E6916	Balance Pipe Adaptor
1	E6958	Balance Pipe
2	E5473	Clip
1	F7564	Pipe, Carb. to Carb.
2	F5690	Banjo
2	E6848	Clips
1	E5044	Exhaust Camshaft
4	E4040	Cam Follower
1	E5325	Exhaust Pipe
1	E5327	Exhaust Pipe

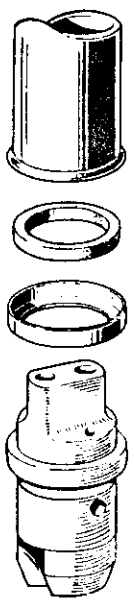


FIG. B. MODIFIED PUSH ROD COVER OIL SEAL ARRANGEMENT

From Engine Number H.29733 all models incorporated a thinner cylinder head gasket (.024" thick). The cylinder head overall depth was amended correspondingly. Heads and gaskets must not be interchanged as this affects:

(a) compression ratio

(b) push rod cover tube sealing effectiveness

It is no good increasing the size of the inlet ports (i.e. cross sectional area) unless bigger inlet valves are fitted, and it is of no use increasing both unless a high compression ratio is used. Conversely, it is of no use increasing the engine compression ratio unless attention is paid to the engine breathing — i.e. valves and ports.
Optimum sizes of each are already chosen for the standard model concerned, and any single departure must be considered as a combination of all three factors.

(c) Valve Timing

The valve timing marks should be set to the timing marks shown in the Workshop Manual. It is essential to use the triple keyway camwheels to enable accurate valve timing to be achieved, and these should be assembled with the proper tool, otherwise damage to the camshaft or camwheel will occur.

First and foremost, a degree timing disc must be bolted to the driveshaft and T.D.C., accurately established, using a D.T.I. (dial test indicator) on the crown of the piston. Fix a pointer at 360° with pistons at the top of their travel. Adjust accurately until the indicated piston travels either side of T.D.C. gives an equal number of degrees either side of the 360°.

Once this has been achieved fit the crankshaft timing pinion and intermediate wheel. If a D.T.I. is not available T.D.C. can be established using a depth gauge on the piston crown, rotating the engine as shown, as before so that the pistons travel down the stroke either side of T.D.C. to the mark chosen on the timing stick at about one inch of piston travel from T.D.C. Adjust the timing disc to read equally either side of 360° with the stick down to this mark.

Similarly, where reference is made later to 0.020" lift with zero valve adjustment, and no D.T.I. used, then set the adjustment at 0.025" with the other valve on the same camshaft fully open and the 0.020" point referred to is when a 0.005" feeler is just "nipped". This alternative drill applies right through the procedure.

Note.—From H.35987 T.D.C. can be established by removing the blanking plug situated in the crankcase just behind the cylinder block and inserting service tools number D.571 and D.572 which locates the flywheel assembly at T.D.C.

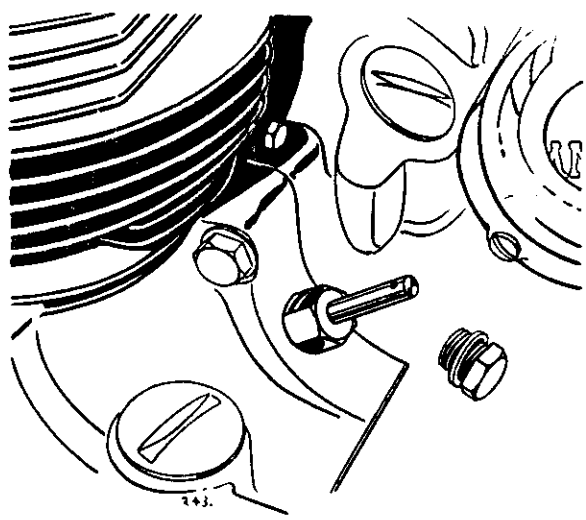


FIG. C. T.D.C. LOCATION TOOL D571/2 IN POSITION (FROM ENGINE No. H35987)

The normal camwheel markings are quite accurate enough for normal use, but for the greatest possible accuracy use the procedure detailed below.

METHOD 1

Initial valve timing (note alternative figures or the exhaust camshaft recommended for use with the silencers), fit the exhaust rockerbox with one pushrod and adjust the valve adjuster to 0.020" (0.50 mm.) clearance on the cam base circle. Set the engine rotating forward, that is, in its normal correct direction of rotation, to 34° A.T.D. Rotate the camshaft in the opposite direction until all play in the push rod and rocker gear is taken up, fit the exhaust camwheel lining up the nearest keyway to give a mesh without disturbing the setting of the cam. Mark the keyway in the camwheel for if the wheel has to be removed to equalize between the cylinders later, and no mark is made, the previous careful work can be lost.
Remove the exhaust rocker box and push rod and fit the inlet in a similar manner, using the previous cylinderas reference when fitting the push rod. Again rotate the engine forward to 35° B.T.D. and set the valve adjuster to 0.020" (0.50 mm.). Rotate the camshaft in the same direction assemble the camwheel to the shaft as above. Mark the keyway chosen on the camwheel. This method of initial assembly ensures that the exhaust closing-inlet opening over lap is correct and this is the condition to aim for it either cam open period proves to be short and the theoretical figures cannot be achieved.

METHOD 2

Alternatively, if the fitter is more adept, the camwheels can be assembled with the shafts as shown in Fig. D during crankcase assembly, and the engine subsequently fully built. Again the keyway selected (this time to the appropriate marks on the wheels) should be marked to make handling easier if and when final vernier adjustment of the timing is made. This method probably required more time to obtain final accuracy than the step by step method described earlier. This valve adjusters should now be set at zero, with only a sliding fit between the rockers and valve tips. Fit the dial test indicator firmly to the cylinder head. It is most essential that the D.T.I. is rigid and secure, otherwise erroneous results will be achieved. If a D.T.I. is not available, set the adjusters at 0.025" on the base of the cam (i.e. other valve fully open), as referred to earlier, and carry out the same drill using a 0.005" feeler gauge, the point of "nip" being equivalent to 0.020" lift zero clearance. First check the inlet by rotating the engine "forward" and log the point on the degree disc, not when the valve commences to open, but at 0.020" lift. This ensures that the followers are off the cam base

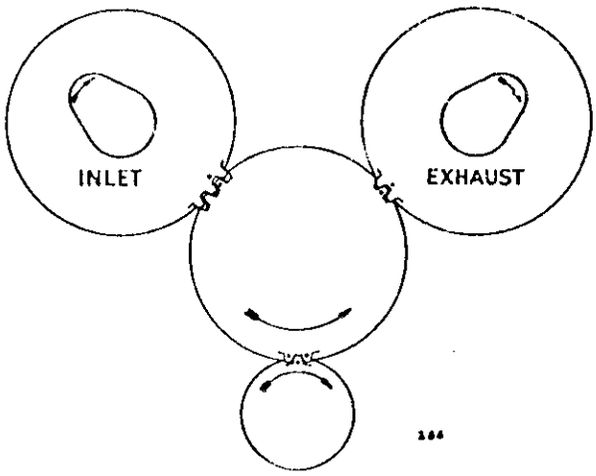


FIG. D1. STANDARD VALVE TIMING MARKS (ALL MODELS AND CAMSHAFTS EXCEPTING T100T/T100R)

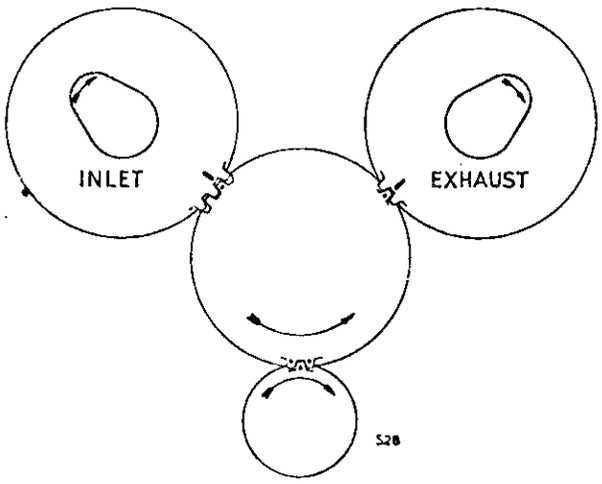


FIG. D2. VALVE TIMING MARKS (T100T/T100R ONLY)

circle and all slack in the rocker gear has been taken up. Still rotating "forward" check the point where 0.020" is reached on closing. It is usually found that the lift of the cam is greater than the range of the D.T.I. and therefore it is advisable to rotate the engine "backwards" until the inlet opens and rises well past the 0.020" mark and then reversing the direction, rotate the engine normally "forward" and log the point where 0.020" is reached as the valve closes. Then check the other cylinder on the same camshaft.

ADJUSTING THE CAM TIMING AND BALANCING BETWEEN THE CYLINDERS

The object is now to balance the inlet opening (i.e. between the cylinders), i.e. choose a nominal to suit both and adjust the camshaft using the cam wheel keyway to ensure this position occurs at 34° B.T.C. engine rotating "forward". To "adjust" the cam, the camwheel has to be removed and the wheel replaced in such a way that when re-meshed the cam is either advanced or retarded as required. The teeth of the camwheel are pitched at 7° apart (i.e. 15° engine) and the three keyways are equi-spaced, therefore giving 5° engine steps back or forward. When the camwheel is removed and in your hand, rotate the engine the amount it is necessary to adjust the timing (making sure the cam does not move once the wheel is removed), and carefully offer up the camwheel and re-mesh in a position where cam keyway and teeth line up and mesh correctly.

Remember, if the engine is rotated forward in this operation the cam will be retarded relative to the engine, and vice-versa. Once this has been done, check both cylinders and log the figures, and if successful, remove the previous keyway marks and etch or permanently record the final position, for if at a future date the intermediate wheel is removed, the marks as standard on the wheel will not give any guide to refitting. It is important that the camshaft is "at rest" when the camwheel is removed. Do not attempt to remove with the valve open and the spring compressed, otherwise the previous settings will be lost if the cam spins to rest.

Repeat the above on the exhaust camshaft, aiming at the mean exhaust closing at 34° A.T.C. (note alternative figures when using camshaft suitable for silencers).

When this has been achieved, again permanently mark the camwheels, fit the nuts and continue the assembly of the engine. This procedure and settings apply to all models. The limits on the cam are ± 2½° so that if you achieve your settings within these limits your adjustments are as correct as possible.

ELECTRICAL EQUIPMENT

Lucas RM.15 or RM.13/15 alternators were fitted to all models up to H.25252. RM. 19 alternators were fitted thereafter.

IGNITION TIMING

There are two types of ignition system in current use:

(1) Coil ignition
(2) A.C. Magneto (Energy Transfer — E.T.) ignition.

Machines up to Engine Number H.29733 have a distributor driven by skew gears from the inlet camshaft and later models have twin contact breakers driven from the end of the exhaust camshaft. The T100A and earlier TR5AR, was an A.C. magneto machine (E.T.) with battery charging and lighting equipment, whereas all other A.C. magneto machines have no battery and run with direct lighting or even with lighting equipment removed.

For maximum performance the ignition should be set at full advance. On distributor models this can be achieved by manually advancing the auto advance cam against the mechanism spring whilst setting the distributor or C.B. back plate. When this has been achieved the static setting on the degree plate should be checked for future reference. CHECK BOTH CYLINDERS.

On twin contact breaker machines maximum performance and reliability will only be available where the ignition timing on both cylinders is set using a stroboscope as detailed in the workshop manual.

The following table is of piston movement and crank angle for the three conditions of exhaust and usage and illustrates the recommended rotor positions on A.C. models.

Type of Use	Exhaust System	Ignition Timing fully advanced	Rotor Position
		350 c.c. and 500 c.c.	
Road	Silencers	37°	"S"
Sports	Straight through	39°	"M"
Racing	Megaphones	42°	"R"

On A.C. machines it is essential for maximum spark energy at full advance, at full engine speed r.p.m. that the rotor is in absolutely correct relationship to the stator pole piece. Later rotors are marked on the appropriate peg hole as above, but to check, the correct procedure is detailed below.

(It will be noted that *all* A.C. magneto machines incorporate an engine drive sprocket with a rotor location peg — whereas coil ignition models locate the rotor on the drive shaft with a key).

To check the rotor location, set the engine at full advance. Position the rotor on the drive shaft with the rotor magnets $\frac{1}{16}$" ahead of the stator pole piece, and tap the rotor onto the peg on the drive sprocket. Drill the peg locating hole in the rotor in this position. This ensures a good healthy spark at full engine advance.

Further information is available on timing distributor equipped T100A, T100S/C, TR5, and TR5A/C machines from the Service Department by requesting Service Bulletin 229.

Owners retaining the distributor type E.T. ignition system should remove the condenser if fitted, and substitute the larger external condenser (Lucas part 54413286) under the coil fixing bolt and connected to the black and white lead. If a fault is suspected in the ignition system Technical Information Bulletin No. 10 available from the Service Department provides information on fault tracing.

CONVERTING FROM DISTRIBUTOR TO TWIN CONTACT BREAKERS

The following parts will be required by owners who wish to convert distributor equipped models to the current exhaust camshaft driven contact breakers.

COIL IGNITION MODELS

Qty.	*Part No.*	*Item*
1	E.5044	Exhaust camshaft
1	E.4630	Timing cover
1	E.4571	C:B cover plate
1	E.5049	Joint washer (for cover plate)
2	F.4715	Screws ($1\frac{3}{8}$" U.H.)
2	GS.229	Serrated washers
1	47605	Contact breaker assembly (4CA)
1	E.5451	Bolt (for C:B Assy.)
1	S25-43	Washer (for E.5451 bolt)
1	E.4568	C:B oil seal
2	E.4747	Pillar Bolts
2	E.6559	Washers (for E.4747 bolts)
1	45152	Ignition coil (MA6 (additional))
1	E.4563	Camshaft nut

A.C. MAGNETO (E.T.) MODELS

Use all above parts except where alternatives are shown below:

Qty.	*Part No.*	*Item*
1	31071	Cut-out Button
1	47602	Contact breaker assembly (4CA)
1	54215824	Rotor (RM19 E.T.) for drill drive peg hole as described).
1	47188	Stator (R.19 E.T.)
2	45149	Ignition coils (3 E.T.)
2	54415B2	Condenser
1	E.4142	Dowel (for rotor)
4	F.6112	Coil Brackets
2	F.6122	Bolt ($1\frac{1}{16}$" U.H.)
2	F.4366	Distance piece
2	F.6125	Retainer
2	F.6136	Retainer
2	S.25-43	Plain washer
4	W.932	Bolt (1" U.H.)
7	E.1612	Serrated washer
6	F.879	Nut

It will of course be necessary to blank off the original distributor drive hole. It is suggested that a small plate approximately $\frac{1}{16}$" thick could be cut to shape to cover the bore hole and the machine faced area where the distributor was seated previously. The crankcase and plate should then be carefully drilled to accept two self tap screws. Prior to entering the screws, a suitable gasket should be made to prevent oil leakage and the thread of the screws should be coated with Loctite.
The original access hole for the contact breaker wires in the timing cover should then be blanked off to prevent oil entering the C:B housing. The housing should then be drilled at the 12 o'clock position as near as practicable to the chromium plated cover without breaking through the edge of the housing with the drill. A suitable rubber grommet should then be fitted and the C:B wires passed through at this stage. As an additional precaution against the ingress of water, a proprietary sealing compound can be used on the grommet and C:B wires at the point of entry.

SECTION 2 TRANSMISSION

DUPLEX PRIMARY DRIVE

The primary drive is by Duplex chain in an oil bath chaincase. Oil capacity is $\frac{1}{2}$ pint (300 c.c.) of S.A.E. 20 grade oil, although some riders prefer to remove the outer cover and substitute a guard to allow a cooling air stream to pass over the chain and sprockets. This is entirely a matter of preference. If the latter course is adopted the chain tensioner, where fitted, must be removed and an independent primary oiler should be installed. All models have a 26 tooth engine sprocket and a 58 tooth clutch sprocket integral with clutch housing. If the chain fitted to your machine is not of the endless type, the split links should be removed and the chain riveted. The primary chain size is $\frac{3}{8}$" x $\frac{1}{4}$" Duplex (78 links).

CLUTCH

First read the information in Section C of the Workshop Manual. If the four spring clutch is used, the extra strong clutch springs Part No. T.1560 should be fitted.
The four spring clutch (prior Engine Number H.29733) can be modified to incorporate an additional clutch plate (i.e. greater torque carrying capacity) if the flange on the back of the shock absorber is machined off. In this case the order of reassembling the clutch plates should be reversed, i.e. the bonded plates next to the clutch wheel followed by a plain steel plate, etc., and finishing with a plain steel plate next to the spring loaded pressure plate. Whether or not this modification is carried out the shock absorber should be removed and the four countersunk backplate screws (three after Engine Number H.29733) soldered in position.

GEARBOX

Again the specification of gears is purely a matter of choice and requirements for the type of going, but generally speaking the following types of gear clusters are best suited to the individual use:

CLOSE RATIO — Road racing and high speed work.
STANDARD RATIO — Normal road touring, scrambling, etc.
WIDE RATIO — Trials riding.

It is unnecessary to reiterate that unless the owner is absolutely satisfied with the case, bushes, bearing shaft and gears, etc. it is wasted effort and time to refit them for high powered use. The gear clusters required should be ordered through your local dealer, quoting the part numbers of the gears listed and the model for which they are required. Under no circumstances should these various gear forms be mixed. It is best to remember that the ideal is to choose the point where the rider expects to reach his maximum speed in top gear and to achieve his maximum r.p.m. at this point. Safe maximum r.p.m. can be taken as 7,600 r.p.m. for all models.

Generally speaking, the power curves fall away above these r.p.m. and revs. in excess of these have often been achieved and maintained successfully without any resultant distress, and the decision to exceed them must be the responsibility of the rider, who alone can "feel" the potentialities of his motor under the conditions in which he is riding.

Gearbox sprockets of 17-20 teeth are available. The rear chain size is $\frac{3}{8}$" x $\frac{1}{4}$". Rear wheel sprockets having 43 teeth or 46 teeth are available in both standard and quickly detachable types. Variations in overall gearing with the alternative gearbox and rear wheel sprockets fitted are shown at the end of the bulletin. For any high performance work it is essential to convert the gearbox to a needle roller layshaft bearing condition and gear clusters incorporating the latest tooth form, which experience has shown to be best. The part numbers of the gears are listed in close, wide and standard ratios.

CLOSE

Item	Part No.	No. of Teeth	Reduction
Mainshaft high ...	T.1821	20T	1st 1.99
Mainshaft cluster ...	T.1971	16/22T	2nd 1.35
Mainshaft second ...	T.1832	20T	3rd 1.12
Layshaft cluster ...	T.1972	17/23T	4th Direct
Layshaft third ...	T.1942	21T	
Layshaft low ...	T.1950	27T	

WIDE

Item	Part No.	No. of Teeth	Reduction
Mainshaft high ...	T.1684	23T	1st 3.18
Mainshaft cluster ...	T.1959	15/24T	2nd 1.97
Mainshaft second ...	T.1837	20T	3rd 1.37
Layshaft cluster ...	T.1960	14/24T	4th Direct
Layshaft third ...	T.1839	20T	
Layshaft low... ...	T.1961	29T	

STANDARD

Item	Part No.	No. of Teeth	Reduction
Mainshaft high ...	T.1947	22T	1st 2.48
Mainshaft cluster ...	T.1948	16/24T	2nd 1.61
Mainshaft second ...	T.1922	21T	3rd 1.22
Layshaft cluster ...	T.1949	15/23T	4th Direct
Layshaft third ...	T.1839	20T	
Layshaft low... ...	T.1950	27T	

NOTES

T90 and T100S/S machines from Engine Number H.32465 already have the latest gear clusters and needle roller bearings fitted. 3TA and 5TA machines from Engine Number H.32465 have the latest gear clusters fitted but will require the needle roller bearings and kickstarter spindle fitting to convert them to the suggested condition, with the appropriate layshaft assembly.
T100S/C (Export) machines from H.32465 are fitted with the latest wide ratio gear clusters and needle roller bearings.

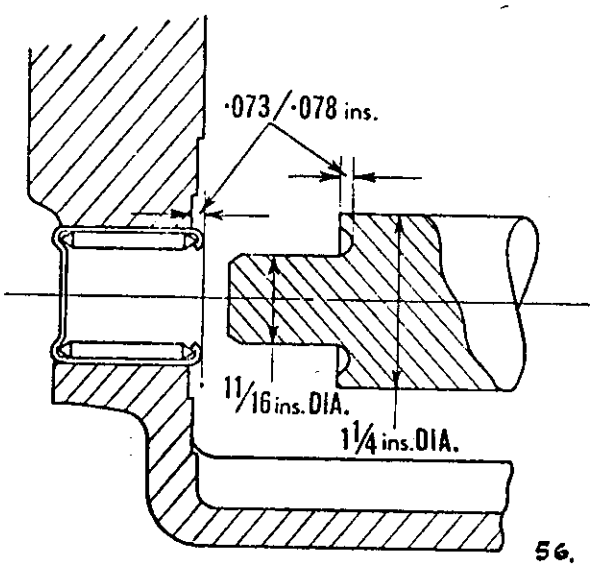


FIG. E. NEEDLE ROLLER BEARING DRIFT

SECTION 3 CONVERTING EARLIER MACHINES TO A NEEDLE ROLLER BEARING LAYSHAFT CONDITION

To convert an earlier machine fitted with sintered bronze lay shaft bushes to the needle roller bearing layshaft condition, use the gears listed and also the following parts:

1 — T.1827 Kickstarter spindle
1 — T.1897 Needle roller bearing (for fitting into the Kickstart spindle)
1 — T.1606 Needle roller bearing (for the drive side of the layshaft)
1 — T.1607 Thrust washer (plain face next to T.1606 needle roller)

When converting to different ratio gear clusters, check that the sliding gears clear the cutaway on the sides of the selector forks. Earlier selector forks can be modified by grinding if necessary. Under no circumstances must the various gear forms be mixed. The original layshaft bearing bush should be removed by inserting a suitable tap and carefully drawing the bush out after heating the case to approximately 100°C. It will be observed that the gearbox shell has been machine faced around the area in which the bush was originally fitted. When the needle roller bearing is fitted (with casing hot) it should remain .073" — .078" proud of the machined facing. Early crankcases were not machined to accept the layshaft bearing thrust washer. A flange cut from the original T.1367 layshaft bush can be used in place of the T.1607 thrust washer if necessary.

A double diameter drift should be turned to enable the needle roller bearing to be driven into the gearbox shell without damage. Suitable dimensions are shown in Fig. E.
The outer portion of the bore into which the bearing fits should be sealed with a suitable proprietary sealant to prevent any possible seepage of lubricant.

SECTION 4 FRAME

(a) Forks
It has been found that for scrambling a stiffer front fork action is desirable. Heavier grades of oil may be used in both the current and earlier forks, but the recommended quantity should not be exceeded. Internal fork damper kits are available for 1964 models onwards.

(b) Rear Suspension
The standard rear hydraulic dampers are specified with 130 lb. rate springs. These should be substituted by 90 lb. rate springs (Part Number 9054/69 yellow/white) for road racing conditions. Both the forks and the rear suspension must, of course, be finalised to give a balanced condition best suited to the rider.

SECTION 5 AUXILIARY EQUIPMENT

(a) Carburetter
The basic settings for the more widely used set of conditions are appended at the end of the booklet. Once again it is not necessary to reiterate that these are basic settings and jets and slide, etc., have to be tried to suit the particular machines and type of running that is to be encountered and are a matter of test and experience. We have no experience of fitting twin carburetters of any make or type to 350 c.c. machines and are therefore, unable to offer any advice on the settings and results that can be expected. It is desirable to fit an air cleaner for scrambling.

(b) Tachometer
Models up to Engine Number H.29732 (Distributor condition) can use the tachometer kit available under Part Number CP.182. In the case of the machines originally fitted and continuing to use a nacelle, it will be necessary to make a suitable bracket for mounting the tachometer.
Models from Engine Number H.29733 (Twin C:B Condition) should use the parts listed in the appropriate Replacement Parts List, the tachometer being driven from the left hand end of the exhaust camshaft. (3TA, 5TA from H.32465).
From Engine Number H.40528 a right angle drive gearbox was used to drive the tachometer cable. Machines between Engine Number H.29733 and H.40527 can fit this in place of the drive previously used, but it is also necessary to change the cable and tachometer head.

(c) Handlebars
Only standard handlebars as shown in the Spare Parts List are available from Triumph spares sources.

(d) Wheels and Brakes
Wheels should be carefully balanced for high speed work. Balance weights are available under Part Number W.1197 (¼ oz.) and W.1198 (1 oz.). Mention should be made of the absolute care and attention that must be paid to the wheel, tyre and brake maintenance so that they are always in the best possible condition. Earlier machines can be fitted with fully floating brake shoes for increasing the braking power, Part Number W.1406 LEADING BRAKE SHOES and W.1407 TRAILING BRAKE SHOES, both c/w LININGS. Variations from standard production brake linings can only be obtained from the brake lining manufacturers or their rperesentatives.

SECTION 6 GENERAL

(a) Polish
As with the inlet ports where the care taken in producing a good shape and blending is more important than highly polished finish, so it is with the general assembly. Polished flywheels, con. rods, crankcase internals are not as important as a high degree of care in assembly and installation, and are a waste of time unless every item on the machine is in first class condition and properly fitted.

(b) Blending of Radii
On rotating and other parts liable to high stresses, the removal of sharp corners forming "Stress Raisers" is important and can prolong the life of an engine by increasing its inherent fatigue resistance, but also (like the art of lightening) can easily be carried to excess with the resultant lack of section and consequent loss of strength. Generally speaking light application with a polishing bob or fine grade carborundum stone on suspect sharp edges and corners is sufficient to reduce them to within safe limits.

CARBURETTER SETTINGS
(95 Octane Petrol)

USING HIGH PERFORMANCE CAMSHAFTS, E.4040 TAPPETS AND 9.0-1 C : R PISTONS (9.75 T100T/T100R) AND SILENCERS

Note.—These settings are intended as a guide only. No fixed settings can be given to satisfy every machine under given conditions and the rider must finalise his own settings to suit himself.

	350 c.c.	500 c.c.	500 c.c., T100T/T100R Twin Carburetters
Carburetter	Monobloc 376/300	Monobloc 376/273	Monobloc (2) 376/324 376/325
Choke	1¼ inc.	1 in.	1⅛ ins.
Main jet	180	190	200
Pilot ...	20	25	25
Needle jet ...	.106	.106	.106
Needle pos.	Middle groove	Middle groove	Middle groove
Needle type	"C"	"C"	"C"
Throttle valve	376/3½	376/3½	376/3½

ENGINE REVOLUTIONS PER MINUTE CHART

GEAR RATIOS	4.25	4.5	4.8	5.0	5.15	5.25	5.4	5.5	5.65	5.75	6.0	6.25	6.5
M.P.H. 50	2798	2962	3160	3292	3390	3456	3555	3621	3720	3785	3950	4115	4279
60	3357	3555	3792	3951	4068	4148	4266	4345	4464	4543	4740	4938	5135
70	3913	4143	4419	4603	4742	4834	4972	5064	5202	5294	5524	5754	5984
80	4477	4740	5056	5267	5425	5530	5688	5793	5951	6057	6320	6583	6847
90	5036	5332	5688	5952	6103	6221	6399	6518	6695	6814	7110	7406	7703
100	5596	5925	6320	6583	6781	6912	7110	7242	7439	7571	7900	8229	8558
110	6155	6517	6952	7242	7459	7604	7821	7966	8183	8328	8690	9052	9414
120	6715	7110	7594	7900	8137	8295	8532	8690	8927	9085	9480	9875	10270
130	7275	7702	8216	8558	8815	8986	9243	9414	9671	9842	10270	10698	11126
140	7834	8295	8848	9217	9493	9677	9954	10138	10415	10599	11060	11521	11982

This chart is based on a 350 x 19 Racing Rear Tyre giving 790 wheel revolutions per mile.

350 x 18 = 803 revolutions per mile.
350 x 19 = 780 revolutions per mile.
400 x 18 = 785 revolutions per mile.
400 x 18 Sports = 777 revolutions per mile.

We are not able to supply parts or quotations from these Works and these must be obtained through your local Triumph distributor or stockist.

OVERALL GEAR RATIOS

GEARBOX SPROCKET	REAR WHEEL SPROCKET	
	43 Teeth	46 Teeth
17 Teeth	5.64	6.04
18 Teeth	5.33	5.71
19 Teeth	5.50	5.40
20 Teeth	4.80	5.13

TRIUMPH ENGINEERING CO. LTD., Meriden Works, ALLESLEY, COVENTRY

Reprinted for J. R. Technical Publications Ltd., by Regeena Printing Ltd., Nottingham, England

Technical Information
Bulletin No. 14

PREPARATION AND ASSEMBLY OF

TRIUMPH

UNIT CONSTRUCTION 6T, TR6 & T120 ENGINES FOR MAXIMUM PERFORMANCE

A number of special high performance components are available for the above Triumph machines which may be fitted to increase the power output. This Bulletin tabulates and corelates all the necessary technical information that is available, so that the owner who wishes to increase the performance of his machine may do so, starting from a point experience has shown to be the best. These alterations are not suitable for machines which are to be retained for normal road use.

If he follows the sequence outlined he will achieve the optimum for the particular chosen condition, after which the maximum will be gained by his own experience and endeavours.

WORKSHOP TOOLS

It will be assumed that the following items are in the owner's possession and that he has both the experience and necessary workshop facilities:—

WORKSHOP MANUAL
PISTON RING CLIPS
DIAL TEST INDICATOR
ENGINE TIMING DISC & POINTER
SET OF FEELER GAUGES
CONTACT BREAKER EXTRACTOR D484
CAMWHEEL EXTRACTOR & REPLACER TOOLS Z89, Z144, Z145
CLUTCH EXTRACTOR DA50/1
CRANKSHAFT PINION EXTRACTOR Z121
C:B OIL SEAL PILOT D486

SECTION 1. ENGINE

Strip out completely and examine for wear, fatigue, misuse and any signs of damage. Remember that if you intend increasing the performance of the machine, all the components will be subjected to higher loads and the trouble and patience required to achieve this condition will be wasted if a suspect item is refitted and subsequently gives trouble. Fit new gaskets and washers throughout.

(a) Crankcase

Rebuild with new con rod and flywheel bolts and nuts and clean out the sludge tube.
Fit the E5162 inlet camshaft and E5047 exhaust camshaft in conjunction with E3059R tappets (cam followers). For machines from engine number DU24875 use exhaust tappets part number E6490. For machines to be used on the road or in Clubmans type events with full silencer equipment, it is essential to use the alternative exhaust camshaft part number E4855. This camshaft is fitted as standard equipment to TR6 & T120 models. The exhaust cam timing figures would then be—exhaust valve opens B.B.C. 48° and closes 27° A.T.C., measured with 0·020" tappet clearance or with the alternative method suggested. Align and bolt up the crankcase halves, taking care that the rotary breather and spring is properly located in the inlet camshaft and drive side crankcase half. Fit the piston rings using tapered face top and second compression rings and standard oil control rings. The original 8·5-1 compression ratio pistons (7·5-1 for 6T) may be retained or the alternative pistons giving a compression ratio of 9·0-1 (Part No. CP206) or 11·0-1 (Part No. CP202) can be fitted. Locate the pushrods and pushrod tubes ready for fitting the cylinder head after this has been prepared. It should be unnecessary to repeat that the engine should have been assembled after all the components have been individually cleaned and oiled, and oil liberally used during the assembly process. The 11·0-1 pistons are not suitable for use in a machine to be retained for road use.

(b) Cylinder Head

Use the high performance cylinder head c/w guides part number E5727 and carburetter adaptors Part No. E5351 and E5352 and two insulating blocks Part No. E4918 to enable 1⅛" choke carburetters to be used with advantage.
The engine performance is far more dependent on the port shape and size, rather than finish. The port section should be almost constant, free from sharp corners, bumps or waviness and the finish should be good. It has been found that a mirror finish is not absolutely necessary. Final port finishing, after the shape has been satisfactorily achieved, should be done with the carburetter adaptors in place and the ports blended in as a whole.

The optimum size of valves are fitted as standard equipment, but exhaust valves of Nimonic material are available, part number E4604. The ports do not need any alteration other than blending out. Grind in the valves and fit a new set of interference racing valve springs Part No. CP102, and bottom cups Part No. E1544. The inlet guides may be shortened (with a resultant shortening of life in consequence) and streamlined to reduce port obstruction to a minimum. This is not necessary on the exhaust valve guides, for unless the section is adequate to carry away the heat a temperature build up can occur and the stem and guide will suffer. When fitting the cylinder head make sure that the inner edges of the bores in the copper gasket are rounded and that no sharp corners are existing to introduce pre-ignition.

(c) Valve Timing

Triple keyway timing gears are already fitted as standard equipment to enable accurate timing to be achieved, and these should be assembled with the proper tool, otherwise damage to the camshaft, camwheel or crankcase bush will occur.

First and foremost, a degree timing disc must be bolted to the driveshaft and T.D.C. accurately established, using a D.T.I. dial test indicator through the plug hole on the crown of the piston.

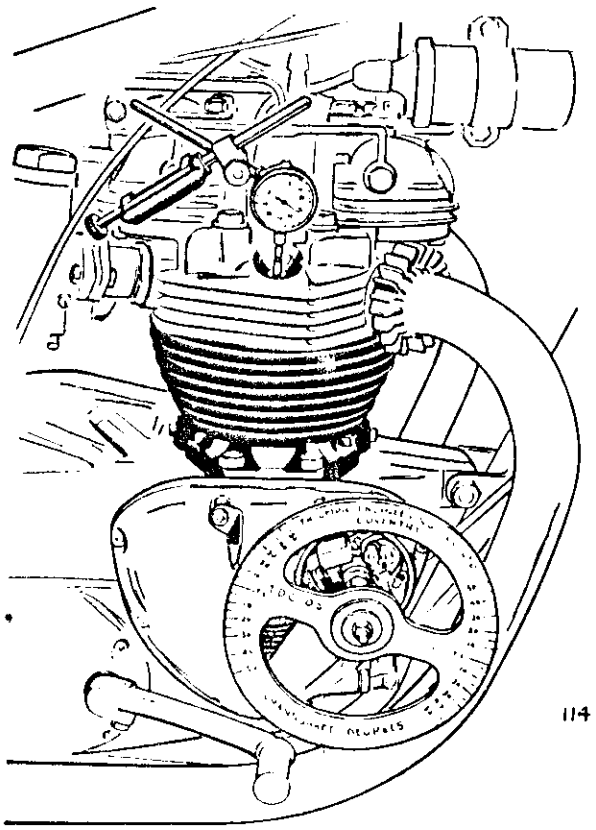
NOTE. From engine number DU13375, provision was made for establishing T.D.C. quickly and easily by inserting T.D.C. tool D571/2 in a hole provided behind the cylinder block for this purpose after removing a blanking plug. The engine should be slowly rotated until the plunger of the tool locates in a keyway provided in the flywheel. The engine will then be at true top dead centre.

Fix a pointer at 360° with the pistons at the top of their travel and adjust accurately until the indicated piston travel either side of T.D.C. gives an equal number of degrees either side of 360°.

Once this has been achieved, fit the crankshaft timing pinion and intermediate wheel. If a D.T.I. is not available, T.D.C. can be established using a marked rod through the plug hole on to the piston crown, rotating the engine as before so that the pistons travel down the stroke either side of T.D.C. to a mark chosen on the rod at about 1" of piston travel from T.D.C. Adjust the timing disc to read equally either side of 360° with the rod down to this mark.

Similarly, where reference is made later to 0·020" lift with zero valve adjustment, and no D.T.I. is used, then set the adjustment at 0·025" with the other valve on the same cam fully open, and the 0·020" point referred to is when a 0·005" feeler is just "nipped". This alternative drill applies right through the procedure.

FIG. A



Timing Disc D605/8 and D.T.I arrangement for timing the ignition

METHOD 1 Initial Valve Timing

Fit the exhaust rocker box with one push rod and adjust the valve adjuster to 0·020" (0·50 mm.) clearance on the cam base circle.

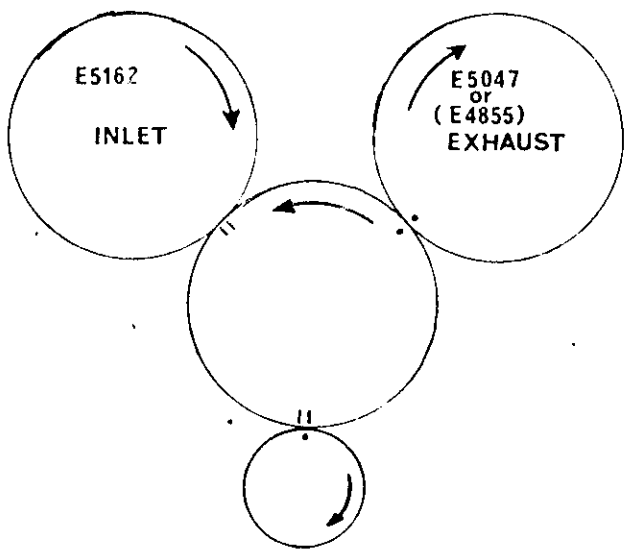
Set the engine rotating forward, that is, in its normal correct direction of rotation, to 35 A.T.C. Rotate the camshaft in the opposite direction until all the play in the push rod and rocker gear is taken up; fit the exhaust camwheel, lining up the nearest keyway to give a mesh without disturbing the setting of the cam. Mark the keyway used on the camwheel, for if the wheel has to be removed to equalise between the cylinders later, and no mark is made, the previous careful work can be lost.

Remove the exhaust rocker box and push rod and fit the inlet in a similar manner, using the previous cylinder as reference when fitting the push rod.

Again rotate the engine forward to 35 B.T.C. and set the valve adjuster to 0·020" (0·50 mm.). Rotating the camshaft in the same direction, assemble the camwheel to the shaft as before. Mark the keyway chosen on the camwheel.

This method of initial assembly ensures that the exhaust closing—inlet opening overlap is correct and this is the condition to aim for if either cam open period proves to be short and the theoretical figures cannot be achieved.

FIG. B



Valve Timing marks (all models)

METHOD 2

Alternatively, if the fitter is more adept, the camwheels can be assembled initially with the shafts as shown in the accompanying drawing during crank case assembly, and the engine subsequently fully built including the final assembly of the push rods, cover tubes and rocker boxes. Again the keyways selected (this time to the appropriate marks on the wheels) should be marked to make handling easier if and when final vernier adjustment of the timing is made. This method probably requires more time to obtain final accuracy than the step by step method described earlier.

The valve adjusters should now be set at zero, with only a sliding fit between the rockers and the valve tips. Fit a dial test indicator firmly to the cylinder head. It is most essential that the D.T.I. is rigid and secure, otherwise erroneous results will be achieved. If a D.T.I. is not available, set the adjusters at 0·025" on the base of the cam (*i.e.*, the other valve on the cam fully open) as referred to earlier, and carry out the same drill using a 5 thou. feeler gauge, the point of "nip" being the equivalent of 0·020" lift zero clearance.

First check the inlet by rotating the engine "forward" and log the point on the degree disc not where the valve commences to open, but at 0·020" (0·50 mm.) lift. This ensures that the followers are off the base circle and all slack in the rocker gear has been taken up. Still rotating "forward", check the point where 0·020" is reached on closing. It is usually found that the lift of the cam is greater than the range of the D.T.I., and therefore it is advisable to rotate the engine "backwards" until the inlet opens and rises well past the 0·020" mark and then reversing the direction, rotate the engine normally "forward" and log the point where 0·020" is reached as the valve closes.

Then check the other cylinder on the same camshaft.

ADJUSTING THE CAM TIMING AND BALANCING BETWEEN CYLINDERS

The object now is to balance the inlet opening (I.O.) between the cylinders, *i.e.*, choose a nominal to suit both and adjust the camshaft using the camwheel keyways to ensure this position occurs at 35° B.T.C. engine rotating "forwards".

To "adjust" the cam, the camwheel has to be removed and the wheel replaced in such a way that when re-meshed the cam is either advanced or retarded as required. The teeth of the camwheel are pitched at 7½° apart (*i.e.*, 15° engine) and the three keyways are equi-spaced, therefore giving 5° engine steps back or forward. When the camwheel is removed and in your hand, rotate the engine the amount it is necessary to "adjust" the timing (making sure the cam does not move once the wheel is removed) and carefully offer up the camwheel and re-mesh in a position where cam keyway and teeth line up and mesh correctly.

Remember, if the engine is rotated forward in this operation the cam will be retarded relative to the engine, and vice versa.

Once this has been done, check both cylinders and log the figures, and if successful, remove the previous keyway marks and etch or permanently record the final position, for if at a future date the intermediate wheel is removed, the marks as standard on the wheels will not give any guide to refitting.

It is important that the camshaft is "at rest" when the camwheel is removed. Do not attempt to remove with the valve open and the spring compressed, otherwise the previous settings will be lost if the cam spins to rest.

Repeat the above on the exhaust camshaft, aiming at the mean exhaust closing at 35° A.T.C.

When this has been achieved, again permanently mark the camwheels, fit the nuts and continue the assembly of the engine.

The limits on the cams are $\pm 2\frac{1}{2}°$, so that if you achieve your settings within these limits your adjustments are as correct as possible.

When the timing cover has been cleaned, refit, using the oil seal pilot tool D486 to avoid damaging the contact breaker oil seal.

(d) Ignition Timing

The ignition should be set in the fully retarded (static) position to the following settings. Check BOTH Cylinders.

From engine No. DU101—DU5824. 11° B.T.C. crank position or 0·036" B.T.C. piston position. (Giving 39° B.T.C. fully advanced).

From engine No. DU5825. 15° B.T.C. crank position or 0·068" B.T.C. piston position. (39° B.T.C. fully advanced).

The full timing procedure is given in Section B31 in the workshop manual.

The engine unit may now be fully built with the exception of the primary drive, which should receive attention as below.

SECTION 2. PRIMARY DRIVE

The primary transmission is of the duplex chain type with a chain tensioner. The engine sprocket and clutch sprocket have 29 teeth and 58 teeth respectively. The clutch is of the three spring twelve plate type with integral shock absorber. Bonded clutch plates available under part number T1885 are particularly suitable for high performance work. Some riders prefer to remove the primary chain cover, and allow a cooling stream of air over the clutch etc. This is entirely a matter of preference, but in this case the chain tensioner should be removed and an independent oil supply arranged. An endless "racing specification" chain should be used.

SECTION 3. GEARBOX

Again the specification of gears and ratios is purely a matter of choice and the type of event to which they are to be subjected, but generally speaking the following types of gear clusters are best suited to the indicated use:—
Close Ratio—Road racing and high speed work.
Standard Ratio—Normal touring, scrambling, etc.
Wide Ratio—Trials riding.
Again it is unnecessary to reiterate that unless the owner is absolutely satisfied with the crankcases, bushes, bearings, shafts and gears etc., it is wasted effort to refit them for high performance work. When selecting suitable gear ratios it is best to remember that the ideal is to choose the point where the rider expects to reach his maximum speed in top gear and to achieve his maximum r.p.m. at this point.
Safe maximum r.p.m. can be taken as 6,700 r.p.m.
Generally speaking, the power curves fall away above these r.p.m., and revs. in excess of these have often been achieved and maintained successfully without any resultant distress, and decisions to exceed them must be the responsibility of the rider, who alone can "feel" the potentialities of his motor under the conditions in which he is riding.

SECTION 4. FRAME

(a) Forks

It has been found that for scrambling a stiffer front action is desirable, and it is usual to fit sidecar springs and/or heavier grade oil. The quantity should not be increased.
Internal front fork damper kits are available by ordering through your local Triumph dealer. Both the forks and rear suspension must, of course, be finalised to give a balanced condition best suited to the rider.

(b) Exhaust Equipment

If silencers or megaphones are used it is most essential that they are adequately sway braced between the silencer or megaphone nose clips and the bottom of the frame down tube.
The standard silencer Part No. E4949 used throughout the 650 cc. range of machines is quite suitable for high performance use.
The type of event to which the machine is to be subjected controls the type of exhaust system, but it can be roughly summarised as under:—

High performance road work—"straight - through" absorption type silencers.

Road racing (a) Circuits with good, long straight sections and high speeds—megaphones.
(b) Short twisting circuits—straight through with extensions.
(c) Scrambles and cross country work where flexibility is required—straight throughs with extensions.

Using the recommended camshafts, the maximum performances are obtained as under:—

Straight throughs with extensions	1¾" outside diameter of exhaust pipe
Straight through absorption silencers	1½" outside diameter of exhaust pipe
Megaphones	1 5/16" diameter or 1½" diameter for almost comparable results.

This applies to all models.

SECTION 5. EQUIPMENT

(a) Carburetters

Most racing conditions will demand a twin carburetter specification for ultimate performance, and basic settings for the more widely used set of conditions are appended at the end of the booklet. Once again it is not necessary to reiterate that these are basic settings and jet and slides, etc., have to be tried to suit the particular machines and type of running that is to be encountered and are a matter of test and experience.
Air cleaners are desirable for scrambling.

(b) Tacho equipment

A tachometer can be fitted to all models, but in the case of machines using a nacelle, it will be necessary to make up a bracket for mounting the tachometer. A list of all the parts required is shown in the replacement parts manual for the machine concerned. From engine number DU24875, a new type of right angle drive tachometer gearbox was fitted. This can be fitted to earlier machines if required, but it will also be necessary to change the tachometer head and drive cable.

(c) Handlebars

Only the standard type of handlebars are available from Triumph spares sources.

(d) Wheels

Wheels should be balanced for high speed work, and the balance weights are provided under Part Nos. W1197 (½ oz.) and W1198 (1 oz.). Mention should be made of the absolute care and attention that must be paid to wheel, tyre and brake maintenance so that they are always in the best possible condition.

(e) Brakes

Great care must obviously be taken over the preparation of the brakes, as these will be called upon to perform duties far in excess of that required for normal road touring. The standard fully floating brake shoes should be retained, if in good condition, and fitted with racing linings with the proper relining equipment available in most motorcycle workshops. We are not able to supply or advise the most suitable linings for any given event. Do not forget to chamfer the leading edges of the lining to avoid brake "grab". Check the brake drum for ovality and the brake anchor plate for fatigue cracks.

GENERAL

(a) Polish

As with the inlet ports where the care taken in producing a good shape and blending is more important than a highly polished finish, so it is with the general assembly. Polished flywheels, cams, rods, crankcase internals are not as important as a high degree of care in assembly and installation, and are a waste of time unless every item on the machine is in first class condition and properly fitted.

(b) Blending of Radii

On rotating and other parts liable to high stresses, the removal of sharp corners forming "stress raisers" is important and can prolong the life of an engine by increasing its inherent fatigue resistance, but, also (like the art of "lightening") can easily be carried to excess with resultant lack of section and consequent loss of strength. Generally speaking, light application with a polishing bob or fine grade carborundum stone on suspect sharp edges and corners is sufficient to reduce them to within safe limits.

GEAR RATIOS USING A 46 TOOTH REAR WHEEL SPROCKET

GEARS	STANDARD RATIO				CLOSE RATIO				WIDE RATIO			
GEARBOX SPROCKET	TOP	3rd	2nd	1st	TOP	3rd	2nd	1st	TOP	3rd	2nd	1st
17	5·41	6·44	9·15	13·40	5·41	5·89	7·02	9·15	5·41	7·73	11·9	19·6
18	5·11	6·08	8·64	12·51	5·11	5·57	6·64	8·64	5·11	7·30	11·2	14·8
19	4·84	5·76	8·17	11·80	4·84	5·27	6·28	8·17	4·84	6·92	10·7	14·0
20	4·60	5·47	7·77	11·43	4·60	5·02	5·97	7·77	4·60	6·57	10·1	13·3
G/BOX REDUCTION	1:1	1·19:1	1·69:1	2·44:1	1:1	1·09:1	1·30:1	1·69:1	1:1	1·43:1	2·2:1	2·9:1

ENGINE REVOLUTIONS PER MINUTE CHART

GEAR RATIOS	4·25	4·5	4·8	5·0	5·15	5·25	5·4	5·5	5·65	5·75	6·0	6·25	6·5
m.p.h. 50	2798	2962	3160	3292	3390	3456	3555	3621	3720	3785	3950	4115	4279
60	3357	3555	3792	3951	4068	4148	4266	4345	4464	4543	4740	4938	5135
70	3913	4143	4419	4603	4742	4834	4972	5064	5202	5294	5524	5754	5984
80	4477	4740	5056	5267	5425	5530	5688	5793	5951	6057	6320	6583	6847
90	5036	5332	5688	5925	6103	6221	6399	6518	6695	6814	7110	7406	7703
100	5596	5925	6320	6583	6781	6912	7110	7242	7439	7571	7900	8229	8558
110	6155	6517	6952	7242	7459	7604	7821	7966	8183	8328	8690	9052	9414
120	6715	7110	7584	7900	8137	8295	8532	8690	8927	9085	9480	9875	10270
130	7275	7702	8216	8558	8815	8986	9243	9414	9671	9842	10270	10698	11126
140	7834	8295	8848	9217	9943	9677	9954	10138	10415	10599	11060	11521	11982

This chart is based on a 350×19 Racing Rear Tyre giving 790 wheel revolutions per mile. 350×18=803 revolutions per mile.
350×19=780 revolutions per mile. 400×18=789 revolutions per mile. 400×18 Sports=777 revolutions per mile.

BASIC CARBURETTER SETTINGS (ALL MODELS)

Using high performance camshafts and E3059R tappets.

I.O. 35° B.T.C.
I.C. 56° A.B.C.
E.O. 56° B.B.C.
E.C. 35° A.T.C.
} All ±2½° at 0·020" lift, zero valve adjustment.

Exhaust conditions.
A. 1½" Straight through. 37" pipe length.
B. 1½" Straight through. 37" pipe length (best).
C. 1½" Megaphones. 31½" pipe length.

ALL MODELS	MINIMUM OCTANE RATING=95 OCTANE								
11·1:1 or 9·0:1 C:R.	AMAL 389 MONOBLOC			AMAL 389 MONOBLOC			AMAL 376 MONOBLOC		
EXHAUST CONDITION	A	B	C	A	B	C	A	B	C
CHOKE	1 3/16"	1 3/16"	1 3/16"	1⅛"	1⅛"	1⅛"	1 1/16"	1 1/16"	1 1/16"
MAIN JET	340	350	350	330	340	340	210	220	220
NEEDLE JET	·106	·106	·106	·1065	·1065	·1065	·1065	·1065	·1065
PILOT JET	25	25	25	25	25	25	25	25	25
SLIDE	389/3½	389/3½	389/3½	389/3	389/3	389/3½	376/3½	376/3½	376/3½
NEEDLE TYPE	D	D	D	D	D	D	C	C	C

These settings are intended as a guide only. No fixed settings can be given to satisfy every machine under any given conditions and the rider must finalise his own settings to suit himself.
We are not able to supply direct from these works and any parts or quotations required must be obtained through your local Triumph dealer or distributor.
NOTE. This bulletin is the only one available dealing with the tuning of this range of unit construction machines.

Reprinted for J. R. Technical Publications Ltd., by Regeena Printing Ltd., Nottingham, England

REF. 947/65

Technical Information
Bulletin No. 4

PREPARATION AND ASSEMBLY OF

TRIUMPH TIGER CUB

ENGINES

FOR MAXIMUM PERFORMANCE

A series of alternative components have now been made available for the Tiger Cub to provide a 'Conversion' condition, giving a 40% increase in overall B.H.P. output with a corresponding increase in road performance for those wishing to participate in sporting activities with their machines.

The conversion is regarded here as being applicable to a 1958 T20C (Competition version) but obviously the basic engine tuning applies to all the T20 range. A table giving recommended overall ratios with different available tyre and wheel conditions is appended at the end of the bulletin.
A detailed parts list of the above items is also appended which is based on a T20C Competition Cub basic specification, and any variation from this on a machine on which work is to commence must be taken into account when compiling the necessary spares requirements.

It will be assumed that a Tiger Cub Instruction Manual and a Tiger Cub Replacement Parts List is to hand before work commences on the machine, and any detailed work described therein will not be repeated here.

The components are available as follows :

For the Engine
Piston 9:1 CR complete with high duty piston rings.
Camshaft.
Cylinder head with large inlet port and inlet valve.
Stronger valve springs.
Carburetter adaptor.

For the Gearbox
Mainshaft high gear assembly.
Layshaft high gear 27/18T combination.

For the Primary Drive (for machines fitted with the $\frac{3}{8}$" pitch single or duplex chains)
Engine drive sprocket and spacer.
Clutch assembly complete. (See Section 2).
Primary chain $\frac{1}{2}$" pitch.

Rear Drive
Gearbox sprocket 19T.
Rear wheel sprocket 54T (for the range of rear wheel and gearbox drive sprockets available, see Table 2).

Exhaust System
Downswept exhaust pipe.
Exhaust pipe extension.

Carburetter assembly
Amal Type 376 $\frac{1}{16}$" choke.
Remote float bowl, rubber mounted, with associated fuel lines.

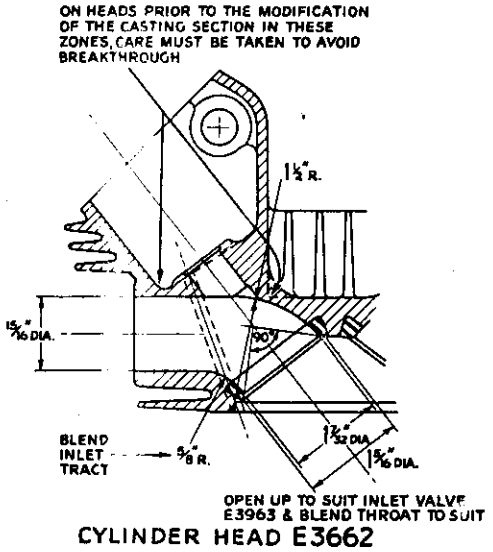
SECTION 1 ENGINE

Strip out completely as described in the Instruction Manual and examine for wear, fatigue, damage, or failure. Do not refit any components which are suspect, or all the work carried out on the machine will be wasted if later a failure is suffered as a result. Rebuild with new gaskets and washers throughout.

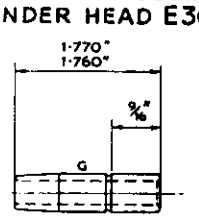
(a) Crankcase
If the machine is prior to engine No. 24090 strip out the flywheel assembly and fit the present specified big end liner which is of high duty material (VP3).
The flywheel timing side journal and bush should be examined for wear and the latest material (VP3) liner, Part No. E3655, fitted (standard equipment from engine No. 26276).
Rebuild the engine components into the crankcase as described in the Instruction Manual, ensuring that the primary inner cover is a good interference fit (.0027") in the crankcase. Fit the new camshaft to the "dots" as described for the standard camshaft, when the "High Performance" timing will be automatically achieved. Fit the new piston and rings, and a new barrel if there is the slightest signs of a "step" in the location of the top compression ring in the old cylinder barrel. In any case it is advisable to lightly scuff the surface of any used barrel before fitting new pistons and rings, to ensure suitable running in conditions are achieved.
Assemble the engine, oiling all the components separately and using oil liberally during the assembly process.

(b) Cylinder Head
The cylinder head has been modified to the condition shown in the drawing below, but care must be taken to ensure that a break through does not occur in the zones indicated, on engines prior to the time when the head casting was built up in these areas. Before refitting the valves, the carburetter adaptor should be bolted up and the inlet port blended to give an almost constant section, free from sharp corners, bumps and waviness. A mirror finish is not essential, but the maximum smoothness is desirable. It will be found that the seat for the larger valve is adequate without resorting to blending in the auxiliary sphere in a new head, but if the head has been serviced at some time and had the seats recut, it will be found necessary to reblend the larger inlet port condition into the combustion sphere to remove any sharp changes of section.

Shorten the valve guides by 5/64" at the top end in the rocker cavity, to a dimension of $\frac{3}{16}$" from the top of the circlip groove as shown in the diagram to allow for the greater cam lift.
Fit the new inlet and original standard exhaust valve if it is satisfactory, together with the new valve springs and special bottom cups. Reassemble the head as described in the Manual. Note that the tappet clearance is 0.002" inlet, 0.004" exhaust, with "High Performance" camshaft.



CYLINDER HEAD E3662

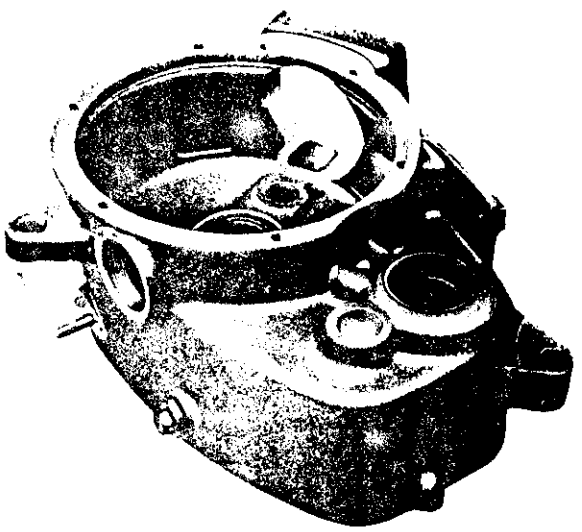


VALVE GUIDE E3208

TIMING (illustrated on right)
When the camshaft has been assembled into the camwheel using the specified key, the inlet/exhaust camshaft timing is automatically achieved, and assembly of this component into the engine as described in the assembly procedure in the Manual will provide the correct inlet/exhaust valve timing.
To achieve maximum power and flexibility, a maximum spark advance figure of 40° B.T.C. must be established. If the engine is prior to engine No. 22117 it is recommended that a distributor of the present standard type (range 24° engine) Lucas Part No. 40529A is fitted, and timing the engine at 16° ($\frac{1}{16}$") B.T.C. with the engine stationary, will automatically give the correct advance figure at peak power R.P.M.
Alternatively, the engine may be run with a degree disc bolted securely on to the engine drive shaft, with a pointer attached to the crankcase set to read 360° at T.D.C., and a stroboscope light triggered from the spark plug used to set the distributor at 40° B.T.C. from above 4,000 r.p.m.
Experience has shown that it is permissable to lock up the distributor advance mechanisms altogether and time the engine at 40° B.T.C. on fixed ignition.
It is also advisable to fit twin contact breaker springs to eliminate the possibility of flutter at high R.P.M.
For a wiring diagram suitable for running without lighting equipment refer to the diagram in the Tiger Cub Instruction Manual No. 5.

SECTION 2 PRIMARY DRIVE

If the engine is built to the conditions described in this bulletin it will be found that an overall drive ratio suitable for the power output cannot be achieved using either the $\frac{3}{8}$" pitch single or duplex chain conditions.
An 18/36 tooth combination is necessary, using the $\frac{1}{2}$" pitch primary chain as shown in the Parts List at the end of the Bulletin, giving a ratio of 2 : 1 primary drive in lieu of 2.53 : 1 with the 19/48 combination with the $\frac{3}{8}$" pitch chain condition.
These sprocket ratios are fixed due to the fixed centres of the engine driveshaft and gearbox mainshaft. It will be found necessary to change only the driveshaft sprocket and spacer, clutch housing and sprocket, drive plates and chain to convert machines subsequent to engine No. 35847, but the complete clutch assembly will be required on machines prior to engine No. 11621

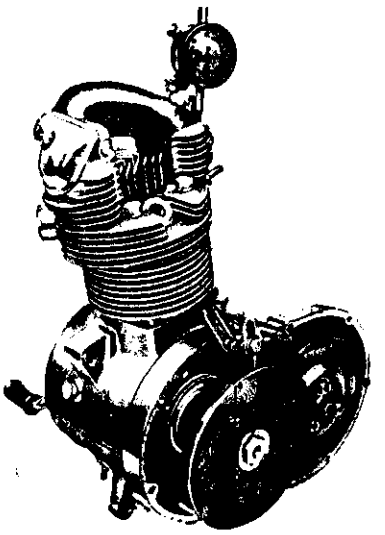


SECTION 3 GEARBOX

For High Performance competition work, a close ratio gearbox conversion is provided giving the following gearbox ratios.

Top	1.0 : 1
Third	1.2 : 1
Second	1.875 : 1
Bottom	2.72 : 1

The components necessary for this conversion are the mainshaft high gear and layshaft high gear giving an 18/27 tooth combination. The parts are listed separately at the end of the bulletin and are assembled with the rest of the original standard gears from the box to form the new assembly.
It may be necessary at this stage to fit the 19 tooth gearbox drive sprocket, if the wheel size chosen necessitates this to achieve the required ratio, in which case it is essential to provide chain running clearance at the crankcase at the zone to the rear of the flywheels.
This is incorporated in the crankcase casting with effect from engine No. 42865, but will have to be machined, with great care, avoiding break through on all earlier crankcases. It is worth investigating therefore, if the ratio cannot otherwise be achieved using other tyre, wheel and sprocket ratios instead, to avoid this eventuality.
Note also that with effect from engine No. 35847 a "gitts" type oil seal was introduced at the gearbox drive sprocket, and in consequence the new sprocket fitted must be machined to suit, otherwise damage will occur to the seal. Subsequent to this engine number fit T1513 range of sprockets.



SECTION 4 REAR DRIVE AND WHEEL SIZES.

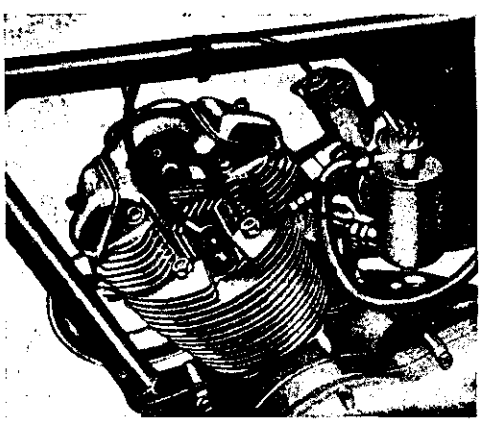
Having decided the wheel sizes to be used, the ratios given at the end of the bulletin should be studied to determine the sprockets required. For the basic machine considered here, a 1958 T20 Competition Cub, with 3.50" × 18" rear tyre equipment, at present fitted with a 16T gearbox drive sprocket, 46T rear wheel sprocket and $\frac{3}{8}$" duplex primary, an overall ratio change from 7.26 (std.) to 5.74 is required.
This ratio cannot be achieved using 18" rear tyre and the $\frac{3}{8}$" duplex chain. Therefore the 18/36, $\frac{1}{2}$" pitch chain is necessary.
The ratio can now be achieved using :

$$\frac{36}{18} \times \frac{54}{19} = 5.68$$

or alternatively

$$\frac{36}{18} \times \frac{48}{17} = 5.65$$

Therefore if the crankcase is prior to engine No. 42865, use the 5.65 ratio, giving a 17T gearbox drive sprocket, as clearance for a 19T is not provided. Further reference to the chart for other ratios will enable a choice to be made.
Remember the overall ratio required alters with the tyre size chosen, and this is known as the "equivalent ratio" to keep the engine revolutions turned, to distance travelled ratio constant.



Carburetter Float Bowl and Feed Pipe Layout using the later 'Kit' components

SECTION 5 CARBURETTER AND ASSOCIATED FEED

A $1\frac{1}{16}$" Choke type Amal 376 carburetter is used, fitted with a .106 needle jet and needle middle notch, 376/3 slide and 140 main jet, single feed banjo and remote float bowl, rubber mounted from a bracket attached to the frame as shown. A parts list is available and assembly should be as shown in the accompanying photograph.

SECTION 6 FRAME

1. There is at present available a 10" straight through extension suitable for fitting to the standard downswept T20 Cub exhaust pipe, E.3257 $1\frac{1}{16}$" diameter, and this gives maximum power coupled with maximum flexibility.
2. **Rear Chainguard**

For most of the sprocket ratios available it will be necessary to remove the chainguard to provide chain running clearance.

SECTION 7 OVERALL DRIVE RATIOS

From experience it will be found most useful to remember that the optimum engine r.p.m./road speed relationship is 90 m.p.h. at 6,800 r.p.m. Final choice of ratios is a matter of experience, and will depend on the type of circuit or event, and the weight and size of the rider.

TABLE 1

ENGINE REVOLUTIONS PER MINUTE

Gear Ratios	4.32	4.59	4.77	4.95	5.14	5.32	5.4	5.58	5.76	5.95	6.12	6.3	6.53	6.75	7.0	7.2	7.47	7.55	8.0
	4.84	5.1	5.3	5.5	5.7	5.9	6.0	6.2	6.4	6.6	6.8	7.0	7.25	7.5	7.75	8.0	8.3	8.6	8.9
	4.8	5.05	5.25	5.45	5.65	5.85	5.95	6.15	6.34	6.53	6.73	6.93	7.18	7.43	7.67	7.92	8.22	8.5	8.82
M.P.H. 20	1296	1363	1416	1471	1515	1576	1603	1660	1712	1767	1820	1872	1940	2008	2074	2140	2220	2300	2380
25	1620	1703	1770	1838	1906	1970	2003	2075	2140	2208	2275	2340	2425	2510	2592	2675	2775	2875	2975
30	1944	2044	2124	2206	2287	2364	2404	2490	2568	2650	2730	2808	2910	3012	3111	3210	3330	3450	3570
35	2268	2385	2478	2574	2668	2758	2805	2905	2996	3092	3186	3276	3395	3514	3629	3745	3885	4025	4165
40	2592	2726	2832	2942	3050	3152	3206	3320	3424	3534	3640	3744	3880	4016	4148	4280	4440	4600	4760
45	2916	3066	3186	3309	3431	3546	3606	3735	3852	3975	4095	4212	4365	4518	4666	4815	4995	5175	5355
50	3240	3407	3540	3677	3812	3940	4007	4150	4280	4417	4550	4680	4850	5020	5185	5350	5550	5750	5950
55	3564	3748	3894	4045	4193	4334	4408	4565	4708	4859	5006	5148	5335	5522	5703	5885	6105	6325	6545
60	3888	4089	4248	4413	4575	4728	4809	4980	5136	5301	5460	5616	5820	6024	6222	6420	6660	6900	7140
65	4212	4429	4602	4780	4955	5122	5209	5395	5564	5742	5916	6084	6305	6526	6740	6955	7215	7475	7735
70	4536	4770	4956	5148	5337	5516	5610	5810	5992	6184	6373	6552	6790	7028	7259	7490	7770	8050	
75	4860	5111	5310	5516	5716	5910	6011	6225	6420	6626	6826	7020	7275	7530	7777	8025			
80	5184	5452	5664	5884	6100	6304	6412	6640	6848	7068	7280	7488	7660	8032					
85	5508	5792	6018	6251	6481	6698	6812	7055	7276	7509	7735	7956	8245						
90	5832	6132	6372	6618	6862	7092	7212	7470	7704	7951	8190								
95	6156	6473	6726	6986	7243	7486	7613	7885	8132										
100	6480	6815	7080	7355	7625	7880	8015												

3.25" × 16" Rear Tyre
3.50" × 18" Rear Tyre
3.00" × 19" Rear Tyre

TABLE 2

Overall Gear Ratio using 18/36 Combination ½" Pitch Primary.

Gearbox Sprockets	Rear Wheel Sprockets 46	48	50	52	54	56	58	Recommended Ratios
13 Teeth	7.07	7.38	7.7	8	8.3	8.6	8.91	
14 Teeth	6.58	6.85	7.15	7.44	7.42	8.0	8.3	3.25" × 16" 18/46 5.1
15 Teeth	6.13	6.4	6.66	6.94	7.20	7.47	7.74	3.50" × 18" 16/46 5.7
16 Teeth	5.75	6.0	6.25	6.5	6.75	7.0	7.25	3.00" × 19" 17/48 5.6
17 Teeth	5.42	5.65	5.88	6.12	6.35	6.58	6.82	
18 Teeth	5.12	5.33	5.56	5.78	6.0	6.22	6.45	(i.e. all have the same equivalent ratio giving 6,800 r.p.m. at 90 m.p.h.)
19 Teeth	4.84	5.06	5.26	5.47	5.68	5.90	6.12	

For intermediate Gear Ratios, Multiply by the factor as shown.

Standard Ratio Gears		Close Ratio	
Top	1 : 1	Top	1 : 1
Third	1.3 : 1	Third	1.2 : 1
Second	2.0 : 1	Second	1.875 : 1
Bottom	3.0 : 1	Bottom	2.72 : 1

Equivalent ratio is the ratio that would be required to give the same r.p.m./m.p.h. relationship, using a different size rear tyre, **not** the ratio obtained when simply fitting a different size wheel.

$$\text{Overall ratio} = \frac{\text{clutch sprocket teeth no.} \times \text{Rear wheel sprocket teeth no.}}{\text{Engine drive sprocket teeth no.} \times \text{Gearbox drive sprocket no.}}$$

$$\text{Equivalent Ratio} = \frac{\text{Overall ratio} \times \text{R.P.M. of tyre used when calculating overall ratio}}{\text{New tyre size revs per mile}}$$

TABLE 3

Tyre equipment available and revs/mile chart.

Tyre Size	Universal	Racing
3.50" × 19"	822	829
3.00" × 19"	811	815
3.25" × 18"	820	829
3.50" × 18"	803	823
3.25" × 16"	892	—

TABLE 4

The following gearbox drive sprocket and rear wheel sprockets are available.

Gearbox Drive Sprocket		Rear Wheel Sprocket	
Prior to Engine No. 35847 (Utilising Felt Washer)	For use with neo-prene oil seal after Engine No. 35847		
13 Teeth T1488	13 Teeth T1555/13	46 Teeth W1320	
14 " T1489	14 " /14	48 " W984/48	(note special small headed bolts W. 1322 are reqd. for this sprocket.)
15 " T1339	15 " /15	50 " W1074	
16 " T1369	16 " T1513/16	52 " W1075	
17 " T1081	17 " /17	54 " W1076	
18 " T1204	18 " /18	56 " W1077	
	19 " T1568	58 " W1078	

HOW TO USE THE TABLES

After considering the type of course or event in which the Cub is to be used, refer to chart 1 giving engine R.P.M. against road speed.

Remember the optimum to aim for, for open flat road racing circuits is the ratio giving 90 m.p.h. at 6,800 r.p.m.

This will have to be "adjusted" to suit the particular event, rider, conditions, etc.

From the ratio chosen using Chart 1, relative to the particular tyre and wheel size being used, refer to Table 2 for the final drive sprocket combination to give that ratio.

Table 1 is calculated using Universal tyre equipment. When using racing tyres, to obtain the overall ratio more accurately, refer to Table 3.

Multiply the ratio obtained with the Universal tyre by :—

$$\frac{\text{Universal tyre revs/mile.}}{\text{Revs per mile of new tyre.}}$$

Then refer to Table 2 for suitable sprockets, using this new ratio obtained.

To obtain the accurate Engine R.P.M. with the new racing tyre. Multiply the R.P.M. given on the Chart for the original Universal Tyre by :—

$$\frac{\text{Revs per mile of new racing tyre}}{\text{Original Universal tyre revs/mile}}$$

This will give the actual engine R.P.M. at the road speed indicated on the chart, using alternative tyre equipment.

HIGH PERFORMANCE
CONVERSION COMPONENTS AVAILABLE FOR THE
TRIUMPH Tiger Cub

(T20C COMPETITION)

The undermentioned parts list details the necessary items required to convert the T20 to the 'High Performance' condition, and relates to the basic T20C (Competition) Cub only.

New Items	Description	No. Off	Replaces	No. Off	Remarks
ENGINE					
CP172	Piston Assembly. 9 : 1 complete with rings, gudgeon pin, circlips, etc.	1	CP141	1	
					Theoretical Valve Timing Tappets set to zero adjustment I.O. 59° E.O. 85° I.C. 81° E.C. 55°
E3959	Compression Ring, Top	1	E656	1	
E3960	Compression Ring, 2nd	1	E3048	1	
E3961	Oil Control Ring	1	E3387	1	
E3962	Camshafc	1	E3183	1	
E4050	Cylinder Head	1	E3662 } E3957 }	1	NOTE : E3662 Cylinder Head fitted to machines after T.20 45086 can be converted by the owner as the casting was then modified to allow a greater inlet port bore.
E3208	Valve Guides	2	E3208	2	NOTE : The latest condition of these guides are shortened $\frac{1}{64}$" to $\frac{1}{16}$" from the top of the circlip groove to the top face to allow greater rocker movement with the E3962 camshaft. Now standard on all Cubs from Engine No. 45312.
E3963	Inlet Valve	1	E3146	1	
E3965	Valve Spring, Inner	2	E3214	2	
E3966	Valve Spring, Outer	2	E3215	2	
E3964	Cup, Bottom	2	E3213	2	
E3986	Adaptor, Carb. to Head	1	E3954	1	
E4051	Joint Washer	1	E3250	1	
W103	Nut, Carb. adaptor Stud	2	F874	1	
GEARBOX					
T1568	Sprocket Gearbox 19T	1	T1513/16	1	If this sprocket is required to obtain the chosen ratio, note that from Eng. No. 42865 sufficient clearance has been provided on the standard crankcase, otherwise the clearance will have been provided.
T1565	Mainshaft High Gear Assy. (27T)	1	T1514	1	
T1594	Layshaft High Gear Assy. (18T)	1	T1091	1	
PRIMARY DRIVE	The following components may not be required if the chosen ratio can be obtained using the existing 19/48 $\frac{1}{2}$" Duplex chain already on the machine (see tables in this Bulletin giving $\frac{1}{2}$" pitch 18/36 combination, and a similar table for the $\frac{3}{8}$" Duplex chain at the end of this components list).				
E3581	Sprocket Engine 18T	1	E3912	1	(To suit $\frac{1}{2}$" pitch Primary chain).
W954	Distance Piece Sprocket	1	E3913	1	
T1341	Clutch Complete ... ... Consisting of :—	1	T1493	1	(To suit $\frac{1}{2}$" pitch Primary chain).
T1343	Clutch Housing and Sprocket (36T) complete ...	1	T1509	1	
T1294	Driving Plates ... ... (All other components common to both T1341 and T1493 clutches)	3	T1503	3	
D338	Chain Primary $\frac{1}{2}$" pitch 48 links	1	D382	1	
CARBURETTER					
376/217	Amal type 376, $1\frac{1}{4}$" choke ("chopped off" float chamber, and complete with single base feed banjo). *Note:* The Part No. 376/217 excludes the Remote Float Chamber as under : Float chamber (remote) 14/620 complete with single top feed banjo and special top nut 14/369 and E3989 mounting rod (2BA)	1	ZENITH 17 MX	1	
E4052	Bolt Carb. to adaptor	2	Addit.		
S25—3	Washer, bolt, carb. to adaptor	2	Addit.		
F4547	Float chamber bracket Assy.	1	Addit.		To be welded to frame top tube $6\frac{1}{4}$" forward of centre line of seat tube on drive side.
E3987	"METALASTIC" mounting	1	Addit.		
E4054	Bolt, metalastic mounting	2	Addit.		
E4053	Washer, metalastic mounting	2	Addit.		
T1017	Nut, metalastic mounting	2	Addit.		
H745	Nut, Float chamber mounting rod	3	Addit.		
F4541	Petrol pipe assy., carb. to float bowl		Addit.		
F4553	Petrol Pipe Assy., tank to float bowl	1	F4470	1	
D420	Throttle Cable	1	D406	1	
ADDITIONAL ITEMS IF REQUIRED					
E3257	Exhaust Pipe (downswept)	1	E3883	1	
E3967	Extension (Scraight through) Exhaust Pipe ...	1	E3840	1	
R49 (or equiv.)	Spark Plug	1	HN F80 or N7	1	
	For sprocket sizes and Part Nos. see this Bulletin, Table 4.				
D341	Chain, Rear, $\frac{1}{2}$" pitch 116 links	1	D277	1	
E4048	Plug, gearbox, gear indicator boss	1	E3280	1	To be fitted to seal gearbox when indicator cable is removed

Table 2 (continued)

Overall Gear ratio using 19/48 Teeth combination $\frac{1}{2}$" Pitch Primary Rear Wheel Sprockets							
Gearbox Sprockets	46	48	50	52	54	56	58
13 Teeth	8·94	9·32	9·7	10·0	10·5	10·9	11·3
14 Teeth	8·3	8·65	9·0	9·4	9·75	10·0	10·5
15 Teeth	7·75	8·07	8·4	8·75	9·1	9·45	9·8
16 Teeth	7·25	7·57	7·9	8·2	8·54	8·85	9·18
17 Teeth	6·84	7·14	7·43	7·72	8·03	8·32	8·65
18 Teeth	6·45	6·74	7·0	7·3	7·58	7·87	8·16
19 Teeth	6·12	6·38	6·55	6·9	7·18	7·45	7·73

Reprinted for J. R. Technical Publications Ltd., by Regeena Printing Ltd , Nottingham, England

TRIUMPH ENGINEERING CO. LTD., Meriden Works, ALLESLEY, COVENTRY

Ref. 485/59