



## **SERVICE RELEASE**

N3/64

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### **850 MODEL COMMANDO "STAGE TWO" ROAD RACING CONVERSION**

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*Conversion from Standard Road Specification to 'Stage Two' Road Racing Condition.*

The following components will require replacement or modification.

1. Camshaft replacement to '4S' Racing specification.
2. Piston modification to Racing condition.
3. Cylinder head Conversion to Full Flow High Compression Racing Condition.
4. New Amal Velocity Stacks for Carburettors.
5. Push Rod modification.
6. Exhaust System

The Service Release details the alterations that are necessary to convert existing components to the 'Stage Two' Road Racing condition.

Sectioned drawings are provided to guide the enthusiast in achieving the optimum port shapes, together with the drawings illustrating the necessary alterations to Push Rods and Piston Crown configurations to accommodate the increased compression ratio and valve opening.

For owners and riders wishing to fit Transistorised Electronic Ignition equipment, detailed fitting and set up instructions are provided in the Norton Villiers publication part number 065151 "Boyer Electronic Ignition" obtainable through Norton Spares outlets, or from the local Norton Distributor.

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April 1974

## 850 MODEL "STAGE TWO" ROAD RACING CONVERSION

The following table indicates the components that will require replacement or modification to achieve this stage of tune.

### TECHNICAL DATA

|   |   |   |
|---|---|---|
| Camshaft                                  | — | '4S' Racing Camshaft. Part number 064858 (fitted to standard Camshaft Pinion timing marks)                    |
| Cylinder Head                             | — | Modified to provide 10.5:1 compression ratio, and full flow porting.  |
| Piston                                    | — | Modify crown to provide increased 'valve drop'.   |
| Push Rod                                  | — | Shortened to maintain correct rocker geometry.  |
| Carburettor, Manifold and Velocity Stacks | — | Replacement of existing carburettor and air filter equipment.   |
| Valve Clearances                          | — | Inlet 0.016in. (0.4mm)<br>Exhaust 0.016in. (0.4mm)  |
| Ignition Timing                           | — | Contact Breaker 30° BTC @ 3000 RPM Fully advanced.<br>Electronic Ignition 31° BTC. @ 5000 RPM Fully advanced. |

### Modification required to Existing Components

#### 1. PISTON

Conversion of the standard 850 piston 063838 to sports condition involves deepening the valve 'cut-away' pockets in accordance with the dimensions given in Fig. 1.

The 'cut-aways' require re-machining to the amended conditions as shown to allow for the additional 'valve drop' created by the use of the new Camshaft 064858. The head diameters of both the inlet and exhaust valves should be measured—ensure head diameters do not exceed 1.490 in. (37.85mm) inlet, and 1.302 in. (33.07mm) exhaust. This will avoid any possibility of subsequent 'hook up' when using the new Camshaft in the higher engine R.P.M. range.

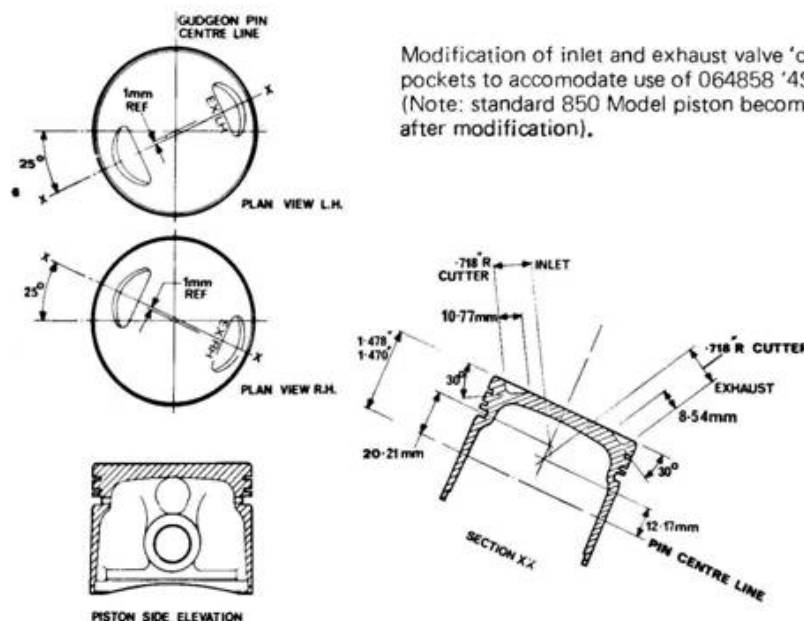


FIG. 1. PISTON CROWN MODIFICATION

## 2. CYLINDER HEAD

Modifications required to convert the standard 850 cylinder head 063830 to "Stage Two" Road Racing condition.

The diagram (Fig. 2) details the modifications that increase the compression ratio to 10·5:1 and to convert both inlet and exhaust ports to the shape to provide optimum power with flexibility.

Removal of excess material in the Inlet and Exhaust port areas should be undertaken using a rotary file, or similar equipment. Particular care must be taken not to damage valve seat inserts and valve seatings when blending the ports from within the combustion sphere area.

A high degree of polish in the inlet and exhaust ports is not essential. Consistent shape and port cross sectional area is far more important for gas flow than highly polished sidewalls.

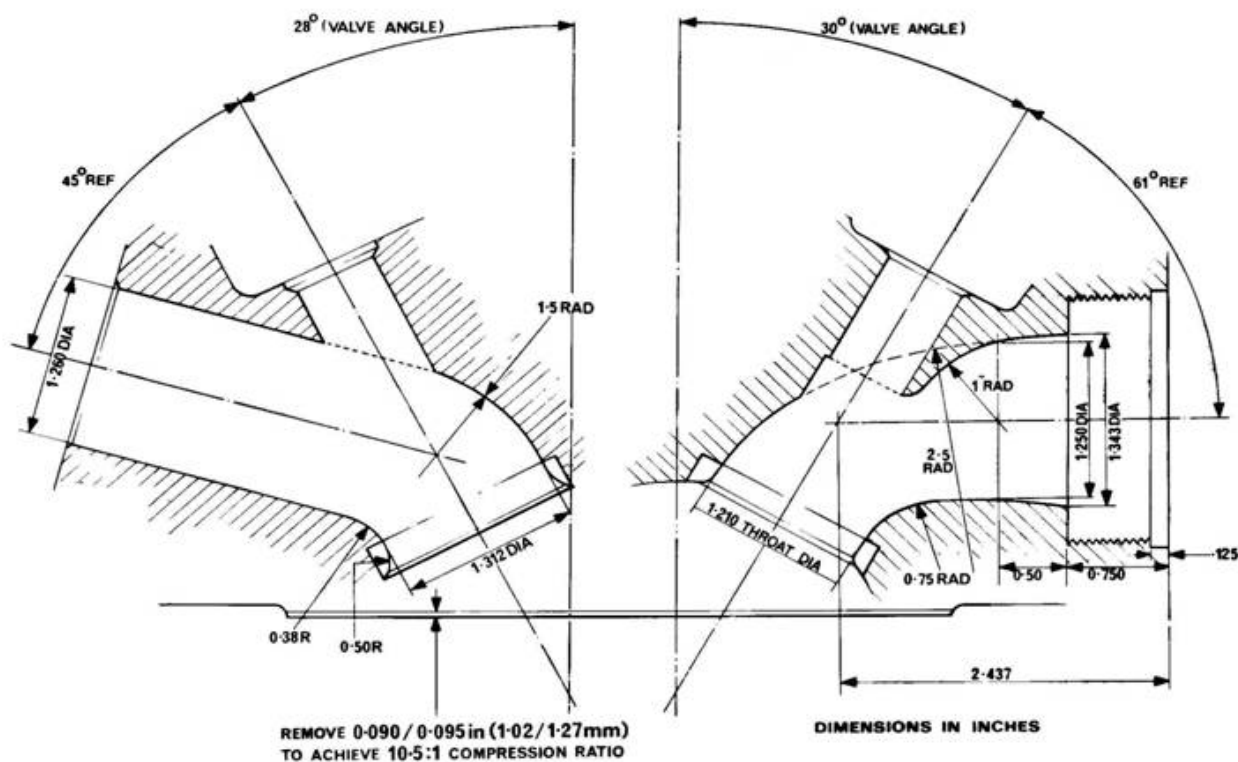


FIG. 2. CYLINDER HEAD MODIFICATION

### Compression Ratio Adjustment

The removal of material from the cylinder head gasket face should be entrusted only to specialists in this field, who have the equipment designed to maintain correct depth of cut with absolute flatness and truth during this operation.

0·090/0·095in. (2·29mm/2·41mm) should be removed to achieve a compression ratio of 10·5:1 (note: push rod lengths should be amended as described in Section 3 to maintain rocker geometry).

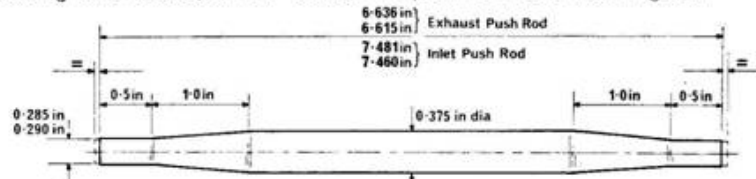
Following modifications to both the pistons and the cylinder head, it is advisable to check the actual available 'valve drop' by placing modelling clay (Plasticine) into the valve clearance 'cut-aways' and rotating the crankshaft at least two complete revolutions. Measure the thickness of the modelling clay. A minimum clearance of 0·040in./0·050in. (1·02mm/1·27mm) must be allowed when the inlet valve is closest to the piston at 3°/5° A.T.D.C.

When using the 4S Camshaft for racing it is advisable to ensure the valve springs are in first class condition and if possible to use S & W or other specialist racing valve springs. To avoid the possibility of 'valve float', increase the loading of the exhaust valve springs by fitting two heat insulation washers, NM 23392, per valve instead of one. However it is essential to check that a coil binding condition does not occur at full valve lift.

If in any doubt whatsoever, the total operation should be undertaken only by specialist machinists engaged in this type of work.

### 3. PUSH RODS

In order to maintain correct rocker geometry following removal of material from the cylinder head gasket face both end caps are removed from each of the four push rods, and equal amounts of metal removed from each end of the push rods prior to replacement of the end caps. Do not remove all the metal from one end only of the push rod as this may result in the end caps not re-seating properly, and only partially resting onto the taper run-out of the push rod itself (see Fig. 3).



### 4. CARBURETTORS

FIG. 3. PUSH ROD MODIFICATION

REMOVE EQUAL AMOUNTS FROM EACH END OF PUSH ROD.

Replace the standard 32mm Amal concentric carburettors with Amal Concentric 1036 36mm choke carburettors. If 36mm carburettors are not available 34mm carburettors may be bored out to the correct size after removal of the brass spray tube. The 36mm carburettors should be fitted with racing velocity stacks available from Amal (Racing "Air Tubes").

The total length from the open end of the velocity stack to the gasket face on the cylinder head should be 9-5" (240mm). However some difficulty may be experienced with the carburettor bodies fouling the sub frame bracing plate on the Commando frame. If this is the case, shorten the manifolds just sufficiently so that the carburettor bodies clear the frame by 3/8" (9-5mm). Fabricate manifolds so that the carburettors can be remotely rubber mounted from the engine.

As running conditions and engine specifications vary so widely in competition engines a definite ruling cannot be given regarding carburation settings, however the following settings should be a fairly accurate starting point.

- 280 Main jets
- 106 Needle jets
- 3½ Throttle valves
- Needles in centre position

Gradual taper from 36mm at carburettor and down to 32mm at cyl head end

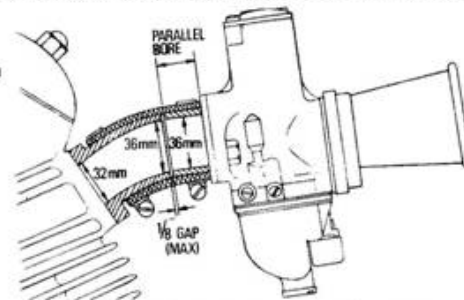


FIG. 4. CARBURETTOR MOUNTING

No. 1 manifold should measure 36mm bore at the carburettor end and then taper gradually and smoothly down to No. 2 manifold, 32mm bore at the other end. The gap between the two manifolds should not exceed 1/8" (32mm) to prevent the rubber fretting or bellowing into the ports.

On completion, it is emphasized that the engine should be run only on a minimum of 100 Octane grade fuel. Also due to the increased efficiency and immediate response of the modified engine unit, great care must be taken not to over-rev the engine in the intermediate gears. If the machine is to be ridden using standard gearing, great care should be taken not to exceed 7000 r.p.m. in top gear.

### 5. EXHAUST SYSTEM

Muffler/Silencer equipment—use the standard exhaust pipes supplied with the machine in conjunction with Roadster mufflers, part number 061978.

Megaphone equipment—use the suggested exhaust system based on the dimensions given Fig. 5 below. Fabricate from 1½ in. (38 mm) internal diameter pipe, with reverse cone megaphones to the dimensions as shown. (20 SWG. MS.).

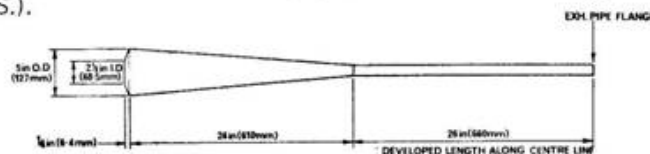


Fig. 5. EXHAUST SYSTEM

### 6. NOTE

The fitting of oversized high tensile centreless ground bolts into sized and reamed crankcase boss and rear engine mounting bolt holes is advised to ensure maintenance of maximum rigidity of assembly.