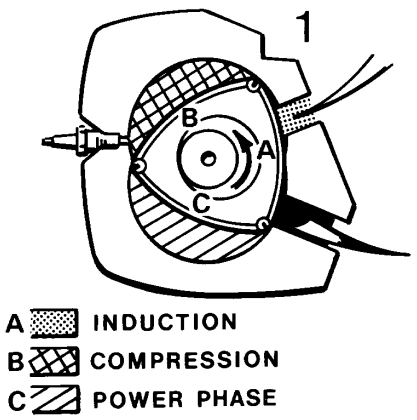
SECTION B

ENGINE

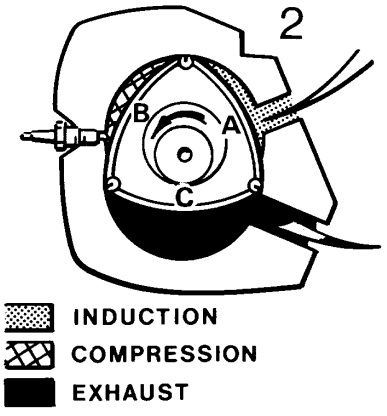
INTRODUCTION

THE ROTARY ENGINE

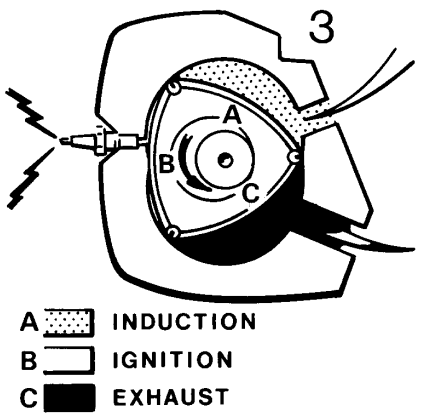
The Rotary Engine utilises the rotating combustion chamber principle originally conceived by Felix Wankel in the mid 1950's and has been the subject of constant progressive development since that time. The first rotary engine powered motor car ran as long ago as 1960, and the first production car was produced soon afterwards in 1964. Norton have been actively involved in this development since 1969 and have now become established as one of the leading authorities on the rotary engine.



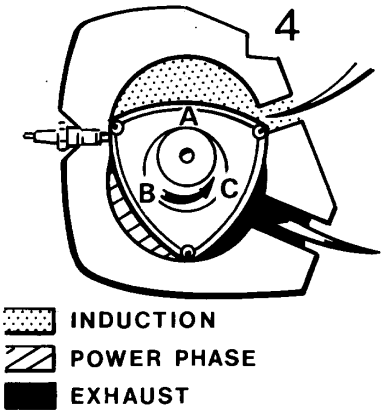
Induction of fuel/air mixture commences when the rotor achieves position A.



With continued rotation, the fuel/air mixture is compressed at positionB.



When the rotor attains position B, the compressed fuel/air mixture is ignited.



The gas expands providing the power, until exhaust occurs on reaching position C.

Fig. B1. Operating sequence of the Wankel Engine illustrating the four phases of the combustion principle completed within one single rotation of the rotor.

PRINCIPAL OF OPERATION

The Wankel rotary combustion engine works according to the Otto-cycle principle, with four distincly separate individual phases – induction, compression, expansion (the actual working phase) and exhaust. From Fig. B1 "Operating Sequence of the Wankel Engine" it will be seen that a change from maximum chamber volume can only take place when the rotor has travelled through 90°, that is whilst a rotor flank moves from 1, through 2 and 3, the contained volume increases gradually. and induction occurs. During succeeding 90° movements, the compression, expansion and exhaust phases take place in strict sequence. In addition, one complete thermodynamic cycle will currently be taking place in each of the three chambers, whilst the rotor turns through 360°.

The drive shaft makes three complete revolutions for each turn of the rotor, which determines that every thermodynamic phase extends over 270° of shaft rotation. The relative movement is controlled by an internal ring gear incorporated within the rotor, meshing with a stationary pinion fixed to the outer end cover.

THE NORTON ROTARY ENGINE

The Norton rotary engine comprises only three basic moving parts; an eccentric shaft and twin rotors mounted by means of needle roller bearings and displaced at 180° to each other on the shaft. The three corners and side flanks of each rotor incorporate spring loaded gas seals within the trochoid shaped combustion chamber housings thereby ensuring the efficiency of induction, compression, expansion and exhaust phases of the operating cycle.

The eccentric rotor shaft is forged in EN36 steel and is supported at either end by substantial roller main bearings located in each stationary gear housing mounted within the aluminium end plates. Air cooling passages are drilled axially through the shaft below the rotor needle roller bearing journal surfaces, and the rotors themselves are cast with internal integral cooling fins in axial passages at each of the three corners of the triangular rotor.

Filtered cold air is drawn into the aluminium alloy centre plate of the engine where lubricating oil from the metering pump is injected prior to the air stream being divided to pass through holes in either side of the centre plate. The induction air is then drawn through the rotor and shaft cooling passages to openings in the left and right end plates respectively, and thence up through the hollow forward engine mounts into the frame plenum chamber (See Fig. A2 – "Engine Lubrication System"). In passing through the centre of the engine, the air not only cools the internal surfaces, but distibutes the oil mist to all the moving parts of the engine before passing into the working chambers of the engine and being burnt.

Fuel/air mixture is provided by two S.U. H.I.F. 4 constant depression carburettors, drawing air from the frame plenum chamber. The throttle butterflies are fitted directly in the combustion housing inlet port entries, providing the necessary degree of fuel/air mixture control. Machines with twin rotor idle facility specify an additional auxiliary flywheel, auto advance ignition and incorporate in both inlet ports an auxiliary fuel-air mixture feed pipe direct from each carburettor by-passing the throttle butterfly, thereby providing adjustable idle control on both combustion chambers.

On single-rotor idling models (manufactured prior to engine number 3110) the left inlet port does not feature this adjustable auxiliary fuel-air mixture feed, but is alternatively arranged to be fed by means of a throttle operated, solenoid controlled valve allowing unfuelled air direct from the frame plenum chamber when the throttle is in the closed position. This action termed 'single rotor idling' causes the left rotor to cease giving power, provides an additional frictional load for the right rotor to carry, and therefore allows the provision of a stable idle quality without requiring additional flywheel inertia and the electronic ignition retard facility.

Drive is taken from the right end of the eccentric shaft by an hydraulically-damped enclosed duplex primary chain, transmitting the power through an all metal multi-plate clutch to a five speed constant mesh gearbox. The left end of the eccentric shaft carries the engine flywheel and generator. A capacitor discharge electronic ignition unit is triggered by an inductive pick-up mounted adjacent to the periphery of the flywheel.

SECTION B1

ENGINE REMOVAL

NOTE:

Mating surfaces on the engine, gearbox and primary drive casings and mating surfaces within the engine unit do not, unless otherwise stated, use gaskets. All jointing surfaces on this engine unit are machined to close tolerances and care must be taken when stripping and re-assembling to avoid damage.

CAUTION:

AS COMPONENTS ARE REMOVED, ALL EXPOSED AIR PASSAGES IN THE ROTOR HOUSINGS MUST BE SEALED WITH MASKING TAPE AS ENTRY OF FOREIGN BODIES, SWARF ETC MAY RESULT IN EXTENSIVE DAMAGE TO THE ENGINE.

REMOVING THE ENGINE UNIT

Where a fairing is fitted, remove both bottom panels to allow access to the power unit. Where fitted, remove the lower fairing mounting frames. Lift the seat and remove the side covers by releasing the 'Dzus' fastener at the top forward corner of the panel. Lift upwards to remove, Remove the fuel tank as described in Section E2. Disconnect the positive and negative battery leads and remove the battery (Section H1). Drain the gearbox lubricant by removing the magnetic drain plug situated in the base of the gearbox casting. When the lubricant has drained, clean the drain plug and drain plug aperture. Replace drain plug using 'Loctite 648'. (Section A7). Drain primary chaincase lubricant by removing the socket headed bolt in the primary chaincase cover (Section A8).

Remove the exhaust system as described in Section E10.

Remove the left and right carburetters as described in Section B6 and place upright in a secure position away from any potential source of ignition or contamination.

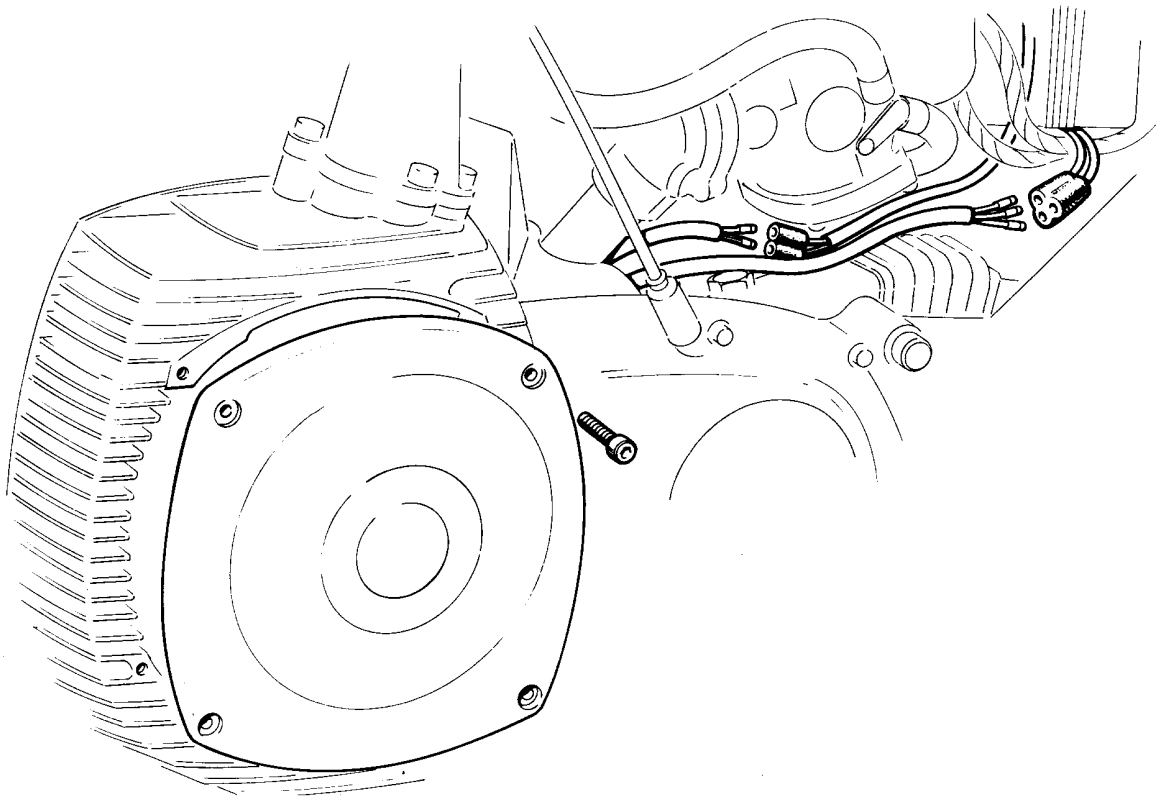


Fig. B2. Disconnecting voltage regulator, ignition wires and generator cover

Remove the clutch adjustment access cover, the clutch lift plate and primary chaincase cover as described in Section C1 "Removing the Primary Chaincase Cover", with the addition that, if the engine is to be removed from the frame, it is now advisable to remove the two front, and one rear socket headed bolts securing the right footrest mounting plate to the machine, and tie back to clear the primary chaincase being careful to avoid damaging any hydraulic pipes.

Moving to the left side of the machine, disconnect the two ignition trigger unit leads (slate grey and slate grey/black) and the three generator leads at the in-line connector (there is no need to remember which way round the generator leads are connected or to refer to the wiring diagram as these leads can be re-connected in any order). Release four socket headed bolts securing the generator cover to the left engine end plate and remove the cover gently pulling through the generator leads.

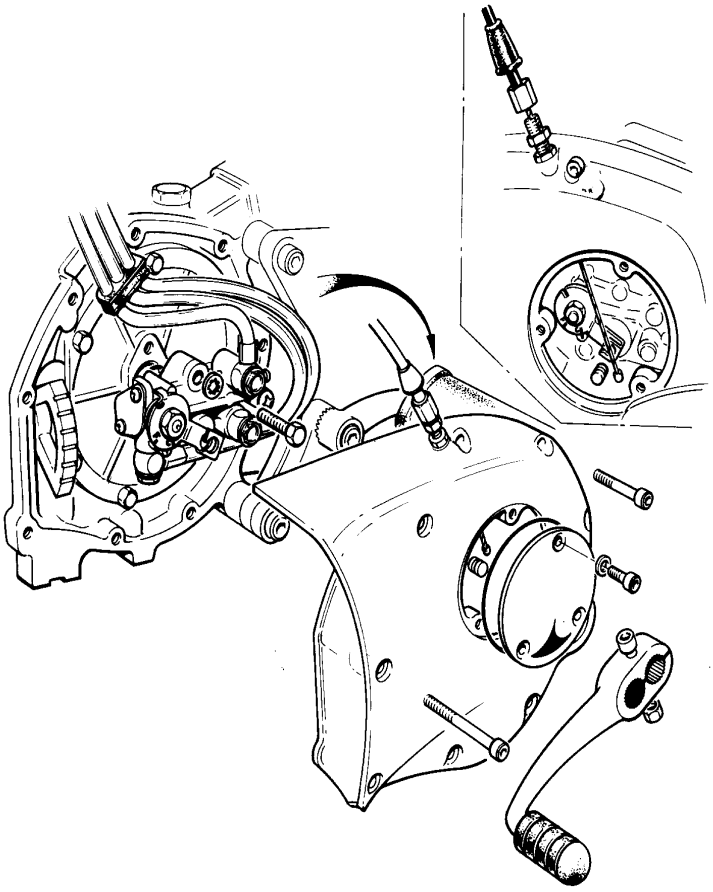


Fig. B3. Removing the gearchange cover and oil metering unit

Slacken the socket headed bolt securing the left riders footrest and rotate through 180 deg to clear the gearchange cover. Remove the access cover to the oil metering unit by removing three socket headed bolts. Disconnect the operating cable by pushing the lever arm upwards and releasing the cable being sure to retain the nylon trunnion. Release nine bolts securing the gearchange cover in place and gently tap free. Before removing the supply pipe from the engine oil tank to the oil metering unit, obtain a 2" to 3" piece of pipe similar to the supply pipe and block one end (or alternatively, one of the gearbox cover bolts inserted into the piece of pipe will do). This is used to block the oil feed at the oil tank adaptor to prevent excess spillage of lubricant. Remove two bolts securing the oil metering unit to the gearbox end cover and remove the oil metering unit. Tie to the engine to avoid damage whilst the engine is being removed.

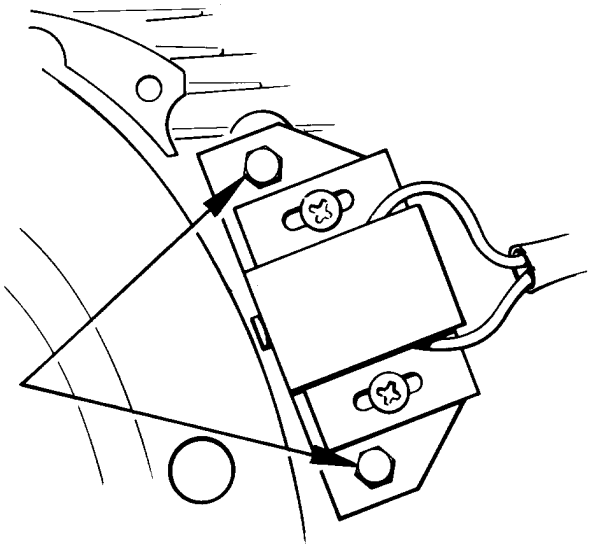


Fig. B4. Ignition pick-up trigger unit (Release two screws)

Disconnect the two in-line connectors from the ignition trigger unit leads and the leads on the single rotor idling valve - where fitted.

Remove the ignition trigger unit and micro-switch by releasing two bolts (fig B4 - arrowed) which will release both the ignition trigger unit fibre mounting pad, and the micro-switch mounting plate. To remove the micro-switch it will be necessary to open the throttle wide in order to clear the throttle stop lever, Disconnect the throttle cable (Fig B5) by holding open the throttle levers with a screw-driver or similar tool, lift the outer cable from the cast bracket on the idling valve body (A) and hookthe cable clear of the operating lever (B). Refer to Section G3 for full details of complete throttle cable removal and replace-ment. To remove the idling valve, release three socket headed bolts securing the elbow to the frame and remove one socket headed bolt securing the idling valve to the left rotor housing. Note that the right inlet pipe and associated drain pipes, and the throttle plate (twin rotor idle models) need not be removed at this stage (Fig B6).

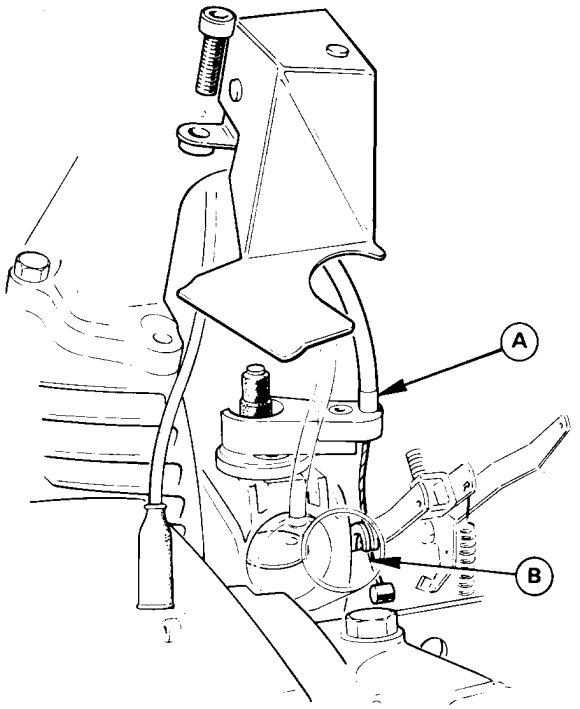


Fig. B5. Disconnect the throttle butterfly cable on Twin rotor idle models. (See Fig B41 for the single rotor idle model arrangement).

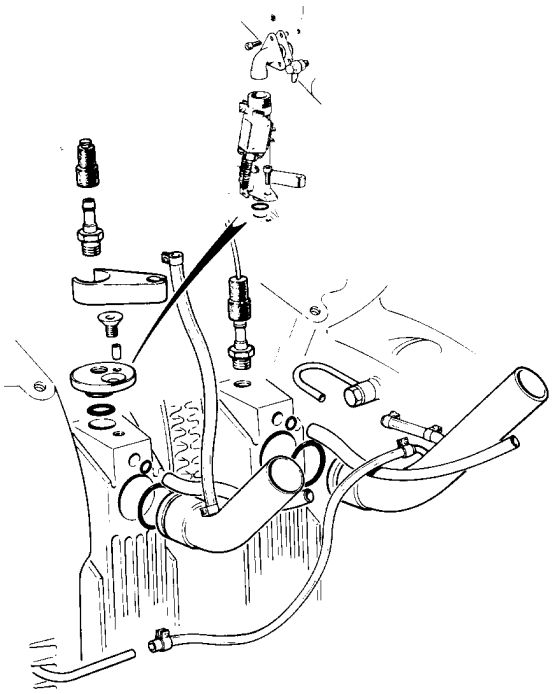


Fig. B6. Illustrating the location of the throttle plate and cable abutment arrangement on twin rotor idle models, the inlet, idle and drain pipes, and (inset) the air by-pass valve on single rotor idle models.

Remove the air box front panel/coil assembly and disconnect the coil leads - Section E3 and remove the two air box support screws.

Disconnect and remove the left horn and the left air transfer port by releasing three screws at the left engine plate and four screws at the frame end of the transfer port. BLOCK ALL ACCESS PORTS TO THE ENGINE AND FRAME WITH MASKING TAPE TO PREVENT DAMAGE BY THE INGRESS OF FOREIGN BODIES.

Before continuing further dismantling, fit two strong elastic bands around the primary chain tensioner slippers (Fig B8) to secure them in the correct position for re-assembly and remove the tensioner by releasing three bolts securing the tensioner to the right engine end plate/inner chaincase. Remove tensioner back plate. Release the trapped oil within the tensioner body by applying a thin bladed screwdriver to the ball release valve as shown in Fig B8.

Fit the clutch spring compressor tool Part No 69-0614. Tension, and remove the clutch pressure plate by releasing the large circlip located in the lip of the clutch drum. Remove six or more clutch plates and fit the clutch hub locking tool Part No 50-0140 into the clutch drum.

In order to assist in the release of the flywheel, clutch and sprocket securing nuts, first remove the three socket head screws retaining the auxiliary flywheel on twinrotor idle models. Extract the auxiliary flywheel by means of the M8 threaded holes in the flywheel. Fit the flywheel restrainer bar Part No 50-0231 to the flywheel (Fig B7).

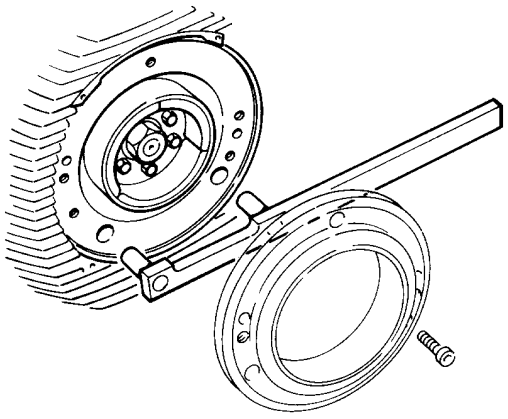


Fig. B7. Using the flywheel restrainer bar

Remove the clutch hub nut and then the engine sprocket securing nut, washer and balance weight. If the flywheel is to be removed from the engine unit it is advisable to slacken the securing nut at this stage. Fit extractor tool Part No 50-0408 to the engine sprocket (Fig B9) using the two M8 x 1.25 x 60 bolts supplied. Draw the sprocket along the shaft until the primary chain just starts to tighten. Remove the extractor from the engine sprocket and fit it to the clutch hub using the M8 x 1.25 x 40 bolts provided and draw the clutch hub/drum/ starter gear unit along the gearbox mainshaft until free movement is felt.

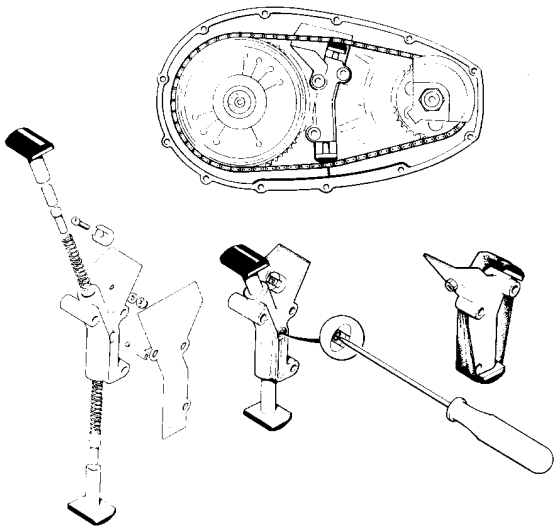


Fig B8 Removing the chain tensioners–illustrating
a) exploded view of the tensioner assembly
b) releasing the oil pressure
c) use of restraining rubber bands

Remove the extractor. It should now be possible to remove the clutch hub assembly and engine drive sprocket simultaneously with the primary chain in position around the clutch hub and engine sprocket. Unless work is to be carried out on the clutch hub/starter gear assembly, do not remove the primary chain but leave it in place to assist re-assembly.

Note: It is important to refit the primary chain the same way round as previously fitted.

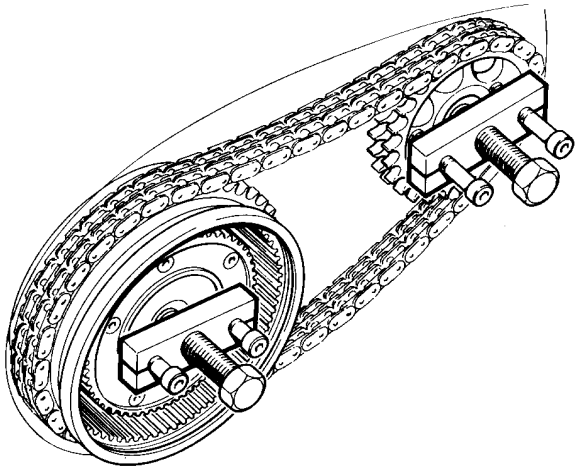


Fig. B9. Removing clutch and engine sprockets using the extractor tool

CAUTION:
DO NOT BE TEMPTED TO STRIKE THE ROTOR SHAFT ENDS TO REMOVE A STUBBORN ENGINE SPROCKET, COUNTERBALANCE WEIGHT OR FLYWHEEL. SUCH ACTION WILL INEVITABLY RESULT IN INTERNAL DAMAGE.

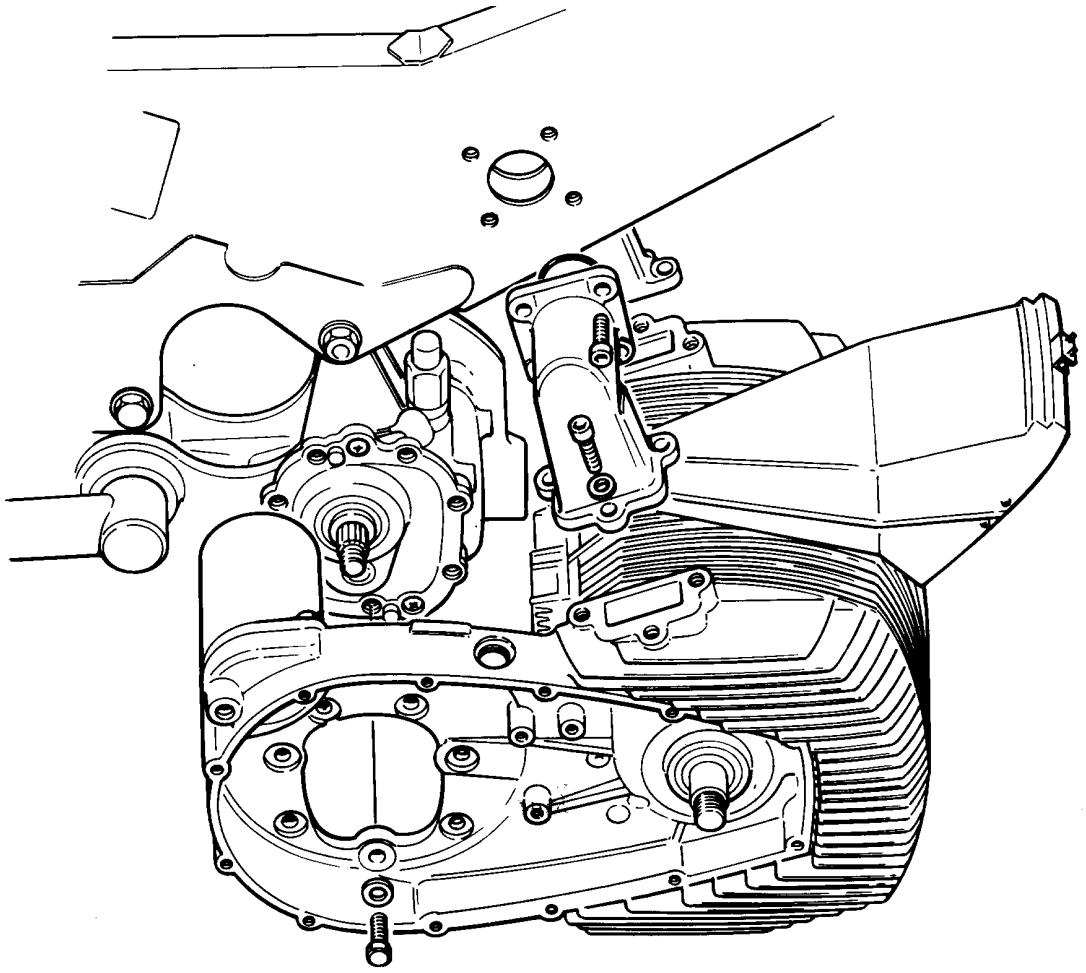


Fig. B10. Removing the engine from the frame

Disconnect the thermocouple lead from the white multi-pin plug at the instrument binnacle. Free the cable and secure to the engine to enable the engine to be removed
Disconnect the right horn and remove. Remove the right transfer port by releasing three socket headed bolts at the right engine plate and four socket headed bolts at the frame.

Disconnect the starter motor to starter solenoid lead at the solenoid and tuck the engine to battery earth lead in towards the power unit to avoid snagging when removing the engine from the frame. Remove all but two of the engine right end plate/primary drive inner cover to gearbox mounting bolts. Support the power unit under the rotor housings, release the remaining two bolts, and being careful to avoid damaging the locating dowels remove the power unit turning slightly to the right to clear the starter motor and gearbox.

Place a support under the engine and obtain assistance to remove the power unit (Fig.B10). Whilst it is possible for the individual to lift the engine unassisted, it is necessary to turn it to the right whilst removing from the frame. We therefore advise against attempting to remove the engine without assistance.

SECTION B2

DISMANTLING THE ENGINE UNIT

Before commencing the dismantling of the power unit, ensure a clean area is prepared to place the internal engine components in strict order of dis-assembly. As the majority of these parts will be capable of further service, it is absolutely essential that the order and sequence of dis-assembly is exactly repeated during re-assembly.

Careful layout during dismantling for inspection prior to re-build must therefore be planned at this point.

As it is necessary to protect the rotor shaft ends against sideways impact a design for a straight forward engine stand is shown at Fig B13. **DO NOT ATTEMPT TO DISMANTLE THE POWER UNIT WITHOUT THE USE OF SUCH A STAND,** as the stand protects the rotor shaft end clear of all working surfaces.

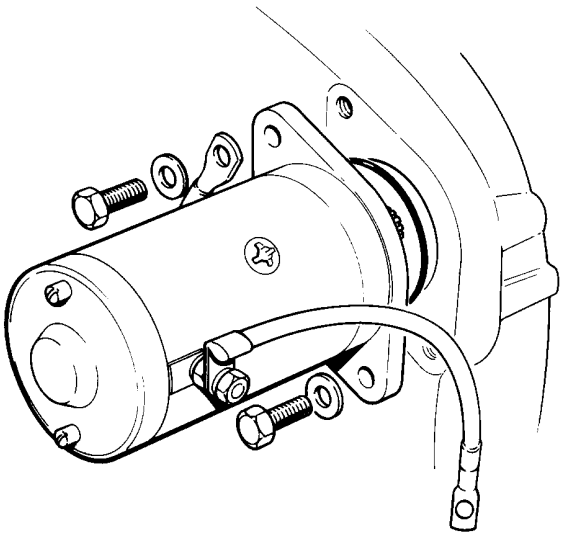


Fig. B12. Removing the starter motor

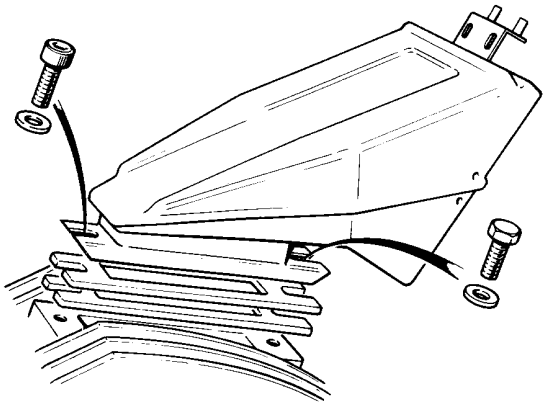


Fig. B11. Removing the air filter box

Ensure the rotor shaft woodruff key and drive sprocket shims are removed from the right end of the rotor shaft and retained in a secure place. Remove the air filter box by releasing the bolts situated to the front and rear of the air filter box base. Remove the starter motor noting the position of the live and earth leads Fig. B12.

The power unit can now be turned onto its right side with the rotor shaft end positioned in the support stand recess. All further dismantling will be carried out in this position.

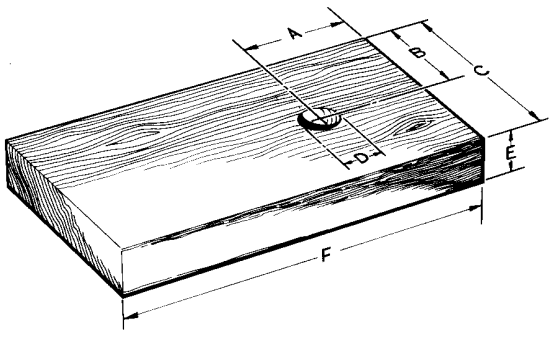


Fig. B13. Suggested engine support stand
Dimensions A 107 mm
B 90 mm
C 240 mm
D 60 mm
E 50 mm
F 360 mm

Remove the stainless steel exhaust manifold by releasing six socket headed bolts securing the manifold to the rotor housings. Withdraw the stainless steel liner tubes from the exhaust ports (Be sure to re-fit liner tubes when re-assembling the power unit). Remove the two oil feed pipes from the intermediate plate and remove the throttle butterfly return springs.

Fig B15 shows a design for laying out the seals and springs removed from the rotors. It is important to keep them in strict order for re-assembly. Carefully remove the rotor side seals, springs and apex seal corner pieces and store in their appropriate positions. It is essential that the two pieces of each apex seal remain identified and re-used as a pair.

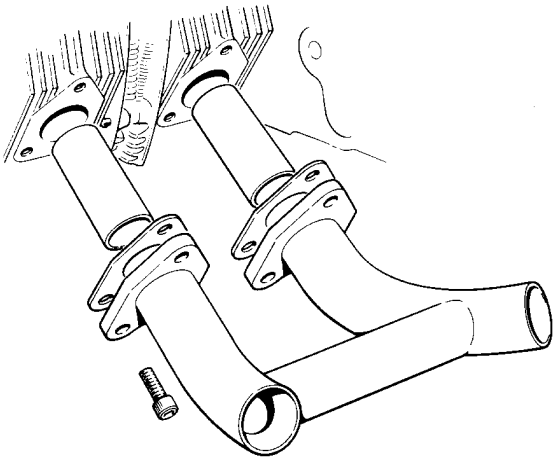


Fig. B14. Removal of exhaust manifold and stainless steel liners

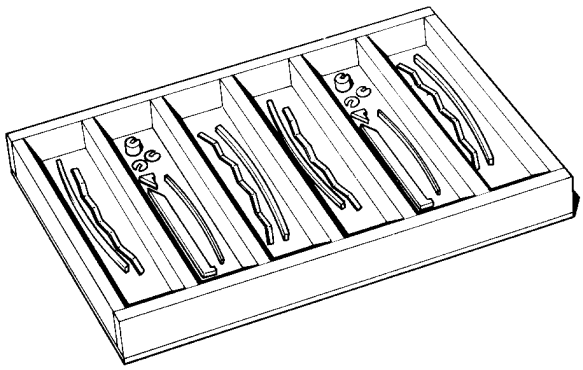


Fig. B15. Suggested rotor seal identification layout

Having previously removed the auxiliary flywheel (Section B1) on twin rotor idle models, remove the flywheel retaining nut and washer and two of the six flywheel/generator bolts (opposing two bolts). Using the extractor – Part No 50-0408 with M6 x 1.0 x 45 bolts provided, draw the flywheel/generator rotor assembly from the rotor shaft. The engine through stud nuts will now be visible on the left engine end plate. Remove these noting the position of spacers and washers. Very gently lever the left end plate and rotor housing apart (this will probably be necessary due to jointing compound used on mating surfaces), and lift the end plate off the studs, being careful to retain any rotor side seals and springs which may adhere to the end plate running surface due to surface tension of the lubricant. It is not necessary to remove the woodruff key.

Gently lever the left rotor housing clear of the intermediate plate and lift off the studs. Remove the apex seals and springs and lift the rotor and rotor bearing off the rotor shaft. Remove the side seals and springs and store in their correct order.

Remove the intermediate plate and right rotor housings as described for the left end plate and rotor housing, carefully storing the side and apex seals and springs.

Carefully lift the rotor shaft and the right rotor assembly out of the right main bearings being careful to retain the side seals and springs.

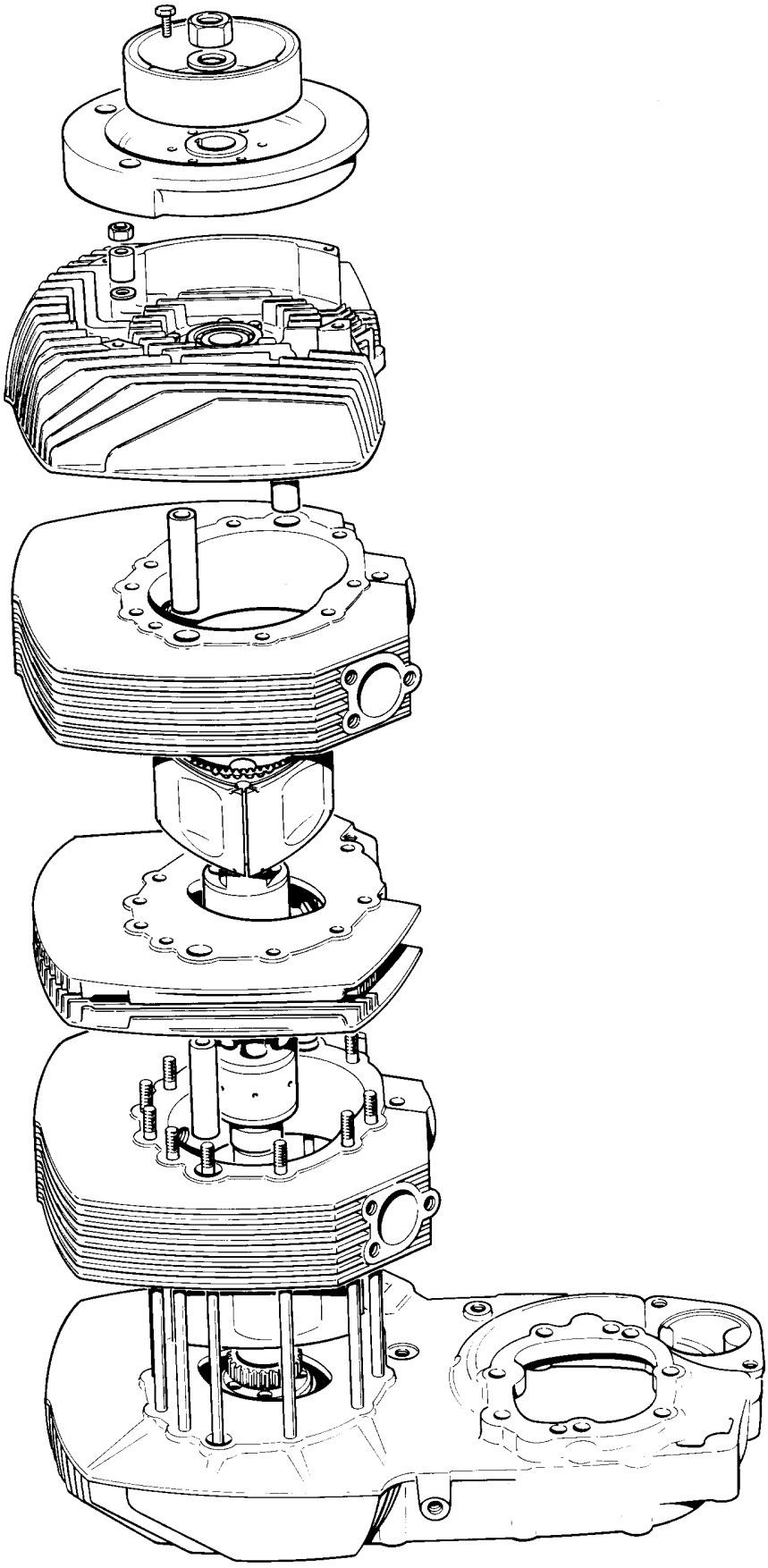


Fig. B16. Exploded view of the engine components

SECTION B3

REMOVING AND REPLACING MAIN BEARINGS AND OIL SEALS

The rotor shaft main bearings should not need replacement during the normal life of the machine. If however, the main bearings and oil seals should need to be replaced, always replace **all** main bearings. It is false economy to attempt to run with one new and two old main bearings.

Remove the nine bolts securing the left main bearing oil seal housing and stationary gear to the left engine end plate. This will allow the oil seal housing and 'O' ring to be removed. The main bearing oil seal may be pressed out of its housing for replacement. Gently heat the left engine alloy end plate to 150° C and carefully press the stationary gear/main bearing assembly out of the alloy end plate.

To remove the main bearing from the stationary gear use the Service Tool Part Number 00-5901 as shown in Fig. B17 (a). The main bearing must be PRESSED out as illustrated with the flange of the stationary gear well supported in a receiving cup. Any damage to the flange may result in the misalignment of the main bearing and the meshing of the rotor gear.

This will provide clearance for removal of the bearing. The replacement bearing should be pressed back into place, ensuring it is fully home in the housing.

When pressing the replacement oil seal into the left side oil seal housing, ensure the seal garter spring is towards the bearing. ie. solid face outboard.

Removal of the right main bearing is accomplished in a similar manner to that of the left described above, the right side housing an addition ball bearing fitted within the oil seal housing, utilised to control the available end float and positive location of the rotor shaft. Removal of the axial bearing (as it is called) is achieved by first removing the oil seal

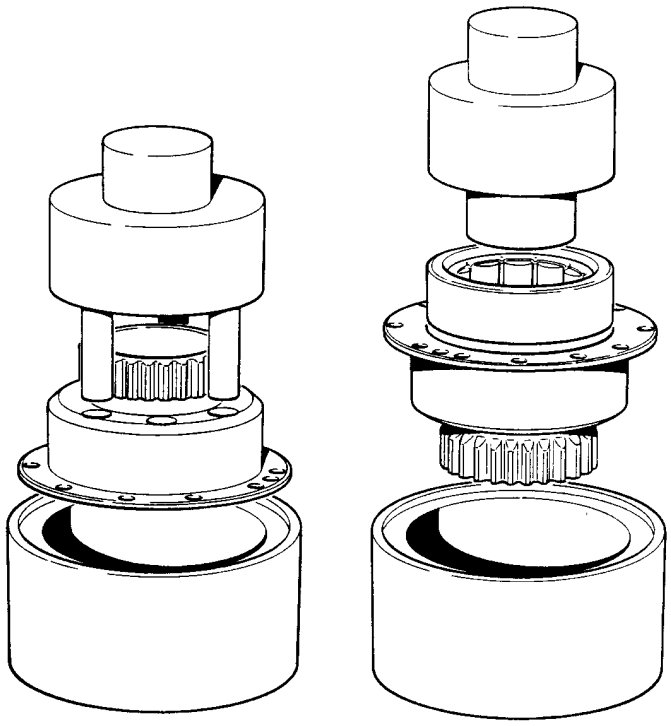


Fig. B17. (a) Removing the rotorshaft main bearings (b) Replacing the main bearings into the stationary gear.

followed by removal of the bearing location circlip. The bearing can then be lifted free.

Place the new axial bearing in position and locate with the circlip. Fit the new oil seal with garter facing the axial bearing. ie the solid seal face towards the stationary gear.

After removal of the stationary gear and main roller bearing as described for the left side assembly, replacement of the stationary gear assembly for both left and right side is as follows.

To refit stationary gear/main bearing assemblies screw two M5 studs into two of the nine bolt holes in the end plate, this will help the alignment of the stationary gear to the dowel and the bore (Fig B18)

Gently heat the end plate to 150°C and press the stationary gear/main bearing assembly fully home.

Taking care not to restrict the two oil holes (Fig B18) thinly apply the recommended sealing compound (See General Data) to the axial bearing/oil seal housing and refit using the correct grade of 'Loctite' on the securing bolts.

CAUTION

The flange at the stationary gear and its mating face on the End Plate must be scrupulously clean to avoid any possibility of misalignment of the main bearing and rotor gear mesh.

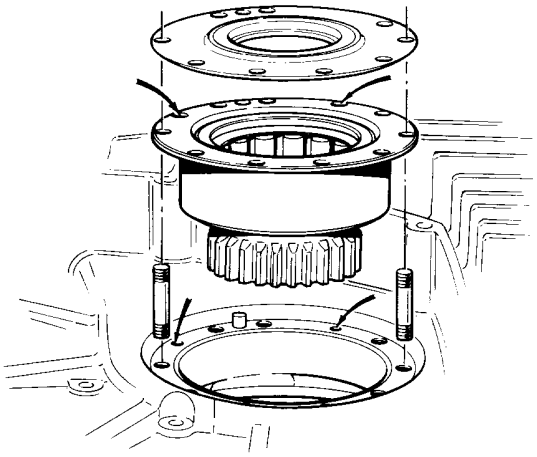


Fig. B18. Aligning the stationary gear during assembly into the housing, illustrating the use of guide studs, and the importance of keeping clean the oil supply holes (arrowed).

SECTION B4

INSPECTION

Basic component dimensions are given in the GENERAL DATA section at the beginning of this manual. Maximum permissable wear measurements are detailed in this section under the appropriate headings.

Rotors

The rotors should be inspected for any obvious signs of damage:

1. Examine the drive gear teeth for wear. (there should be little or no sign of wear. Any wear that has taken place will be immediately noticeable). The rotor must be replaced if the ring gear is damaged in any way.

2. Examine the bearing surface for deterioration or wear. Examine also for signs of ovality using an internal micrometer.

   Maximum allowable ovality 0.015 mm.

3. Examine the side, apex and corner seal slots for undue wear.

   See 'General Data' for seal groove dimensions.

4. Examine the rotor casting for any signs of deterioration and wear.

Using a wire brush,clean the combustion faces and using a fine stone ease the edges of the rotor to clean off any metal 'burring' which may have taken place during cleaning. Wash the rotors thoroughly and keep very clean for re-assembly.

Re-mark each rotor 'right' or 'left' for re-assembly.

Rotor Seals

Whilst the engine is dismantled it is advisable to inspect the apex side and corner seals and springs as these must be removed from the rotors during the normal course of inspection. If however, the seals are found to be in good condition then there is no reason why they should not give many more miles of useful service, **provided they are re-fitted in their original position on the rotors.** It is advisable to fit new replacement seal springs whenever an engine is stripped and rebuilt for examination or overhaul.

Strip Examination and Replacement

1. **Apex seals** Examine for end wear and signs of the top surface wearing. Check also for signs of wear caused by the seal chattering (moving backwards and forwards within its locating groove).

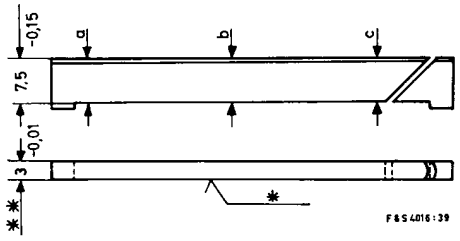


Fig. B19. Apex seal
Max. permissible wear depth.–1.5 mm (0,060 in) at a, b & c. Max allowable difference between a & c – 0.2 mm (0.008 in).
*** Width – 0.02 mm (0.008 in).**
**** Max. allowable unevenness 0.02 mm (0.008 in).**

2. **Side Seals** Check to ensure the seals have not become jammed in their grooves and that the specified end float exists between the side seal and the corner seal. (See Fig. B33).

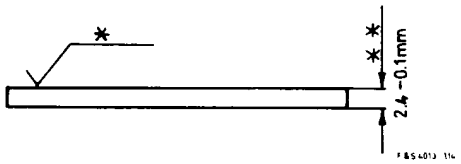


Fig. B20. Side Seal
Max permissible wear:
**** Depth – 0.2 mm (0.008).**
*** Permissible unevenness 0.1 mm (0.004 in).**

3. **Corner seal pins** Examine for signs of wear. Check also that the apex seal end pieces have not jammed in their seal pins, and that the seal pins are free to operate in the rotor. (Fig. B33).

The sealing pins must be evenly worn. Check with a micrometer.
Max. permissible unevenness:
*** 0.05 mm (0.002 in)).**
Max permissible wear:
**** 0.3 mm (0.012 in)**

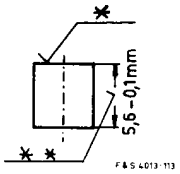


Fig. B21. Corner seal pin

4. **Springs** Examine and replace. It is always advisable to renew the springs at every engine strip down and repair even if found to be in good condition during strip examination.

NOTE:

Jammed side, apex and corner seals may occur and usually result from the use of an incorrect grade of engine oil. The correct grade oils recommended for use with this engine can be found in Section A2 "Recommended Lubricants". **Do not under any circumstances use a multi-grade type of oil. Use only the Recommended Lubricants to the specifications listed in Section A2.**

Rotor Shaft

Examine the rotor shaft for signs of any evident main and rotor journal wear. Examine also the overall dimensions of the rotor shaft. Wash the rotor shaft thoroughly and keep very clean for re-assembly. Check dimensions with those given in General Data - Engine Section.

ROTOR SHAFT RECONDITIONING

Reconditioned rotor shaft assemblies are available on an exchange basis through the Factory Service Department.
These assemblies comprise the rotor shaft, rotors,rotor Bearings, flywheel and balance weight.
It is not possible to re-grind the rotor shaft using normal machine shop facilities. The bearings are carefully matched with the rotor shaft at the factory and are machined to very close tolerances in order to maintain accurate rotor needle roller bearing clearances and alignment. We strongly advise that full use be made of the factory reconditioning service as only parts reconditioned and supplied by Norton Motors carry the Norton warranty.

Rotor Bearings

In order to examine the rotor bearings, it is necessary to remove them from the rotors. To ensure the bearings are refitted the original way round and to their appropriate rotor, it is advisable to mark the end of the rotor and bearing cage with paint.
If replacement of the rotor bearings proves to be necessary, carefully label the bearings L.H. and R.H., and return them to the Factory Service Department where it can be determined which size of bearing is required to maintain the specified running clearances.

Note:
Always replace rotor bearings in pairs. Never attempt to run one old and one new bearing together.

Main Bearings

Clean & examine for any signs of wear. Check the bearing tracks for pitting and replace if necessary.

Note:
Always replace main bearings in pairs, never attempt to run one old and one new bearing together.

Main Bearing Oil Seals

Clean thoroughly. Examine for signs of wear, rupture or deterioration of the oil seal material. Replace as necessary.

Rotor Housings

Carefully examine the trochoid track for any signs of damage to the plated surface. Any carbon deposits can be removed with a petrol (gasoline) soaked cloth. The housing will require replacement if the Elnisil plating of the sliding surface has become damaged due to dirt or foreign matter. If the housing is to be replaced, new apex seals must be used in the rotor.

Clean the carbon deposits from the exhaust ports.

Examine the condition of the throttle butterflies, spindles and bushes and replace if worn beyond the limits given in the General Data. Examine the throttle levers for wear and replace as necessary.

End & Intermediate Plates

Carefully remove any carbon deposits on the wearing surfaces, wash thoroughly and blow dry. Note that the original rotor side bearing faces in the alloy were originally subject to an 'etching' process to produce oil retaining pores and pockets in the surface. (See below)

Examine the machined wearing surfaces for any signs of 'picking up' and scoring.

Examine the oil passages to ensure they are clean and not blocked.

The end and intermediate plates do not normally wear appreciably during service but nevertheless should be checked. Limitations can be found in the 'General Data' section.

Re-Finishing the End and Intermediate Plates

Should any deep scores (over 0.25 mm deep) be found on the wearing surfaces then the affected end or intermediate plate should be replaced. If suitable equipment is available the working surfaces can be reground. (See General Data – End and Intermediate Plates). Reconditioned end and intermediate plates are available on an exchange basis at reasonable cost and can be obtained from the factory.

Should it be found necessary to refinish the wearing surfaces use the following procedure:-

The left end plate and the intermediate plate can be surface ground to the limitations given in 'Important Note'. The right end plate which is also the primary chaincase can be ground to within the limits given but extreme care must be taken to position the end plate on the machine finished side of the primary chaincase in order that the end plate can be ground parallel.

IMPORTANT NOTE:

Surface finishing of the end and intermediate plates should never require the removal of more metal than 0.013 mm (0.005 in) per plate surface.

In extreme circumstances where damage has occurred, the total surface metal removed from one plate running surface should not exceed 0.25 mm (0.010 in) and from the total of all plate running surfaces must never exceed 1.0 mm (0.04 in) otherwise internal running clearances will be reduced below designed safe limits.

When material has been removed from the end and intermediate plates, the end clearance of the locating dowels must also be checked and material removed from the dowel ends if necessary to clear the plates and allow complete tightening down of the end and intermediate plates against the rotor housings.

The effective stud (11) length is also affected by material removal from the end and intermediate plates. The total stud protrusion through the left end plate must never exceed 222/223 mm, and must be assembled accordingly.

Etching the Wearing Surfaces

When the wearing surfaces of the end and intermediate plates have been surface ground, the ground finish must be chemically etched. The chemical etching process is used to provide an oil retaining finish to the wearing surface.

Procedure

Prepare a paste by dissolving approximately one teaspoonful of sodium hydroxide crystals in 500 cc of hot water, into which has been gradually stirred sufficient "Ronstrip" or similar caustic powder until a medium consistency paste is achieved. Heat the end or intermediate plate to the point when the component can still be handled without gloves and place the end or intermediate plate wearing surface uppermost. Carefully spread the paste evenly on to the working surface (taking care not to apply to the housing joint faces). Leave to act for 15 mins. Wash the plate thoroughly in hot clean water. When using this process do not allow any of the solution to touch the paint finish on the component as the chemical reaction will bleach the paint finish leading to discolouration.

WARNING

Caustic Soda (Sodium Hydroxide) is a dangerous chemical which gives off poisonous gases when being used and is highly corrosive. Wear protective clothing and work in a well ventilated area when handling this chemical.

SECTION B5

SU CARBURETTER – DESCRIPTION

How the SU Carburetter applies the Variable Choke System.

A variable choke orifice is obtained in the SU carburetter by the vertical movement of a close fitting piston positioned above the fuel jet in the middle of the body casting. A suction disc integral with the piston works in a concentric chamber bolted to the body casting. Drillings in the piston transmit any depression existing within the choke area to the chamber above the suction disc. The underside of this disc is vented to atmosphere. As the choke orifice size is varied over wide limits by the movement of the piston, so must the fuel orifice size be varied. This is achieved by means of a profiled needle attached to the piston and projecting into the jet. Correct discharge areas are obtained by accurate dimensioning of this needle.

Opening the throttle allows manifold depression to be communicated to the choke area of the carburetter and also to the chamber above the suction disc. The piston will rise, allowing a mixture of air and fuel to pass underneath it to relieve the depression, and will continue to rise until the depression has reached a value which is just sufficient to balance the weight of the piston. It will be appreciated that approximately the same depression will be obtained whatever the demand and that the piston height will be governed by the mass of mixture flowing beneath it. This depression is arranged to be of sufficient value to ensure that good atomization is obtained, but small enough to ensure adequate engine filling at high engine speeds.

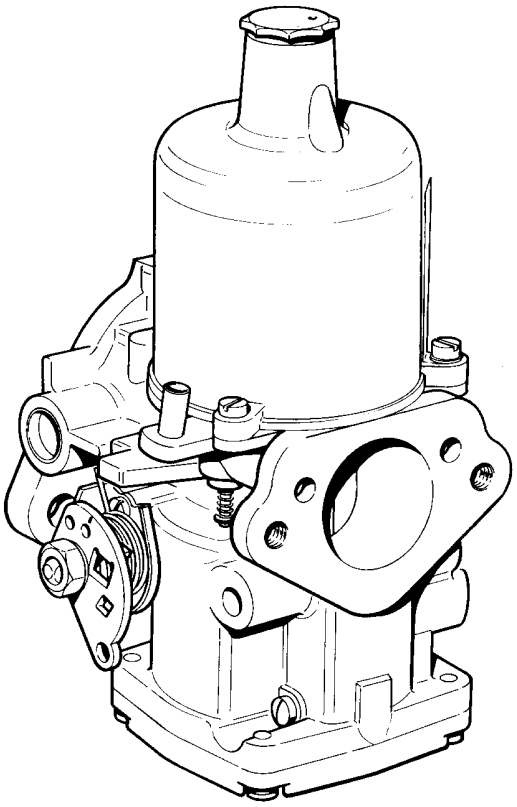


Fig. B22. The S.U. HIF carburetter

Enrichment necessary during rapid opening of the throttle is provided by means of hydraulic damper.

This restricts the rate of piston lift, thereby increasing the depression acting over the jet.

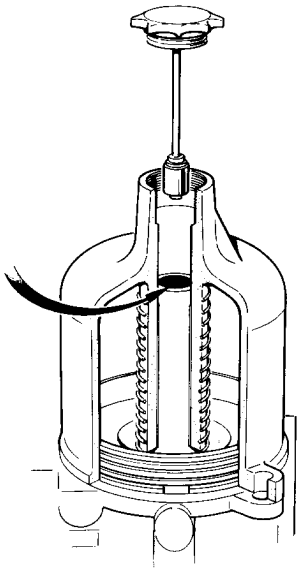


Fig. B23. Removal of the carburetter damper piston

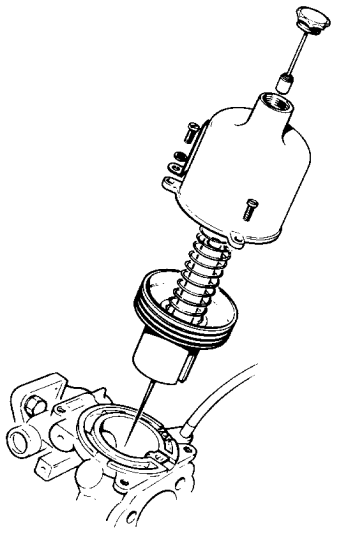


Fig. B24. Removal of the suction chamber

NOTE
A general fall off in performance for no immediately apparent reason could indicate the need for the suction chamber (Fig B24) and suction chamber pistons to be thoroughly cleaned (Section B7, para 27) due to becoming coated in engine oil and lacquer from the frame plenum chamber, finding its way to the carburetter inlets, thereby restricting the freedom of the piston to provide a positive response to throttle variations. Servicing procedures are described in section B7.

SECTION B6

REMOVING AND REFITTING THE CARBURETTERS

REMOVAL

1. Lift the seat and remove the side panels (Sections E1 and E2).

2. Turn the left and right fuel supply tap to the 'off' position, and the right vacuum operated tap to the 'on' position.

3. Disconnect the fuel pipe from the right carburetter to the left carburetter and disconnect the fuel feed pipes at the fuel taps. Disconnect the vacuum feed pipe to the right fuel tap and remove the fuel tank. (See Section E2).

4. Remove the left engine cover by removing the socket headed screw in the left engine mounting/air transfer port. Remove the two socket headed screws securing the left intake manifold to the frame and, holding the inlet pipe in place carefully pull the carburetter away from the frame approx 3 ins. (7.5cm), and then from the inlet pipe and idle pipe (where fitted). Disconnect the choke cable from the quadrant on the frame side of the carburetter. Place the complete assembly in an upright position.

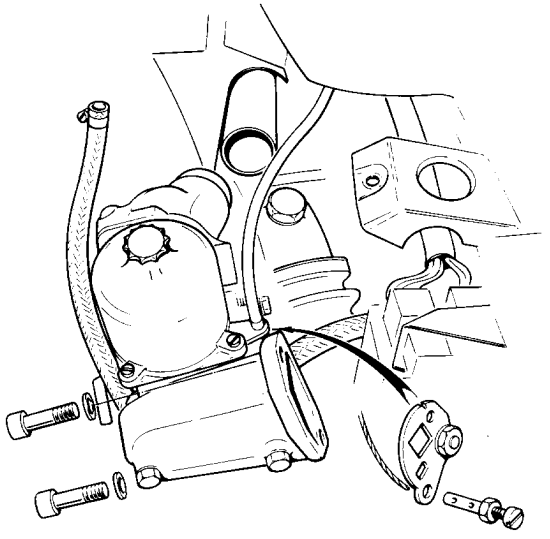


Fig. B25. Removal of the left carburetter

5. Remove the right carburetter in the same way following removal of the right hand engine cover and battery, being careful to disconnect the fast idle operating rod from the throttle fast idle lever clip before removing the two socket headed bolts which secure the right intake manifold to the frame. Caution: Do not disturb the adjustment of the fast idle operating rod length. This is factory set and should not be altered.

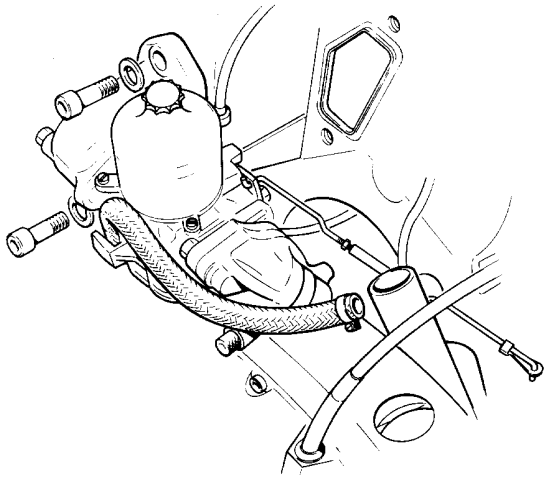


Fig. B26. Removal of the right carburetter

REFITTING

1. Refit the left carburetter. Lubricate the manifold end of the inlet pipe to ease fitting of the carburetter/manifold assembly. The choke cable is then fitted to the choke quadrant situated on the inner most side of the carburetter, and the carburetter and manifold assembly fitted in place, ensuring the manifold is seated correctly on the frame. (See para 6). Lubricate the idle pipe (engine end) and push into place, positioning the pipe so that it runs above the inlet pipe (engine end) and below the inlet pipe (carburetter end).

2. On single rotor idling machines, the idle pipe from the carburetter outlet manifold to the left engine housing is not fitted.

3. Lubricate the seal end of the right hand inlet pipe with engine oil and push into place in the engine right hand inlet port. Similarly lubricate the idle pipe (engine end) and push into place positioning the pipe so that it runs from above the inlet pipe (engine end), to below the inlet pipe (carburetter end).

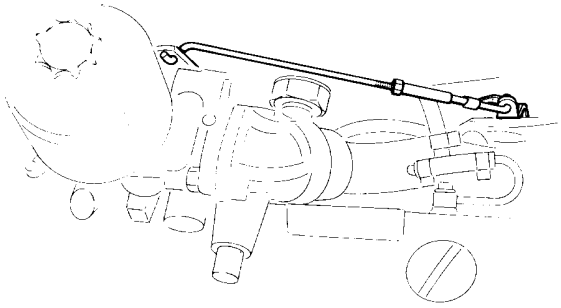


Fig. B27. Re-fitting the fast idle rod

4. Now fit the choke cable as described previously and fit the fast idle rod (long end to the choke bell crank) in position. Lubricate the inlet and idle pipe ends and push the right hand carburetter inlet manifold assembly onto the pipes, being careful to avoid bending the fast idle rod.

5. The right side carburetter can now be bolted into position and the fast idle rod clipped in place on the butterfly fast idle lever. (Fig B23).

6. When refitting the choke cable ends through the abutments in the left and right carburetter bodies, engage the inner cables through the solderless nipples entered through the choke lever quadrant. When refitting the inner cables, allow 2.5mm (0.10 in) free movement of the inner cables before the choke begins to function.

NOTE:

The fast idle lever should not normally need adjustment. If however the rod has been replaced refer to section B12 "Setting and Adjusting the Fast Idle Rod".

7. Re-fit the fuel tank (Section E2) and reconnect the fuel pipes to the left and right carburetter and to the fuel taps. Refit the fuel tap vacuum feed pipe.

8. Re-fit the side panels and replace the seat into position.

SECTION B7

CARBURETTER SERVICING

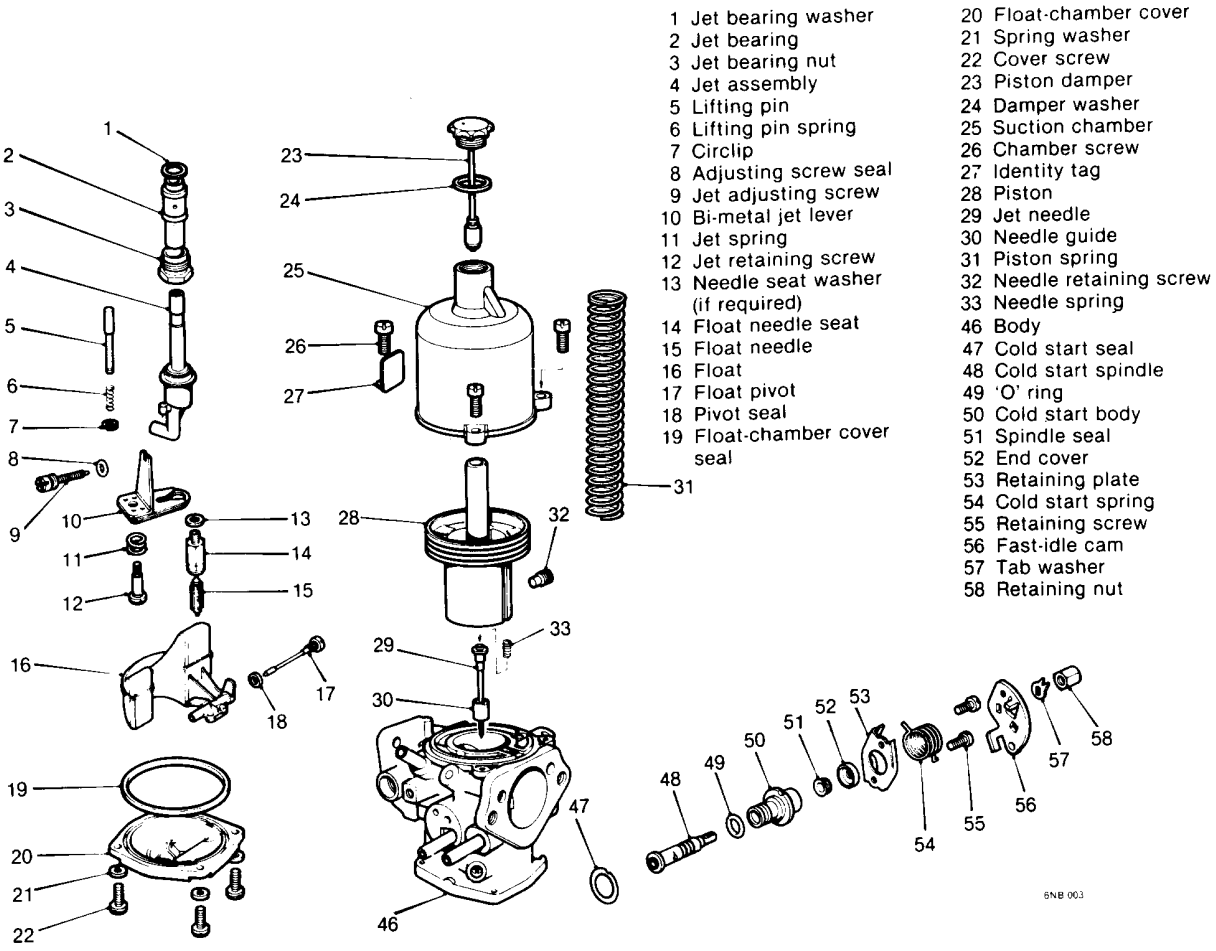


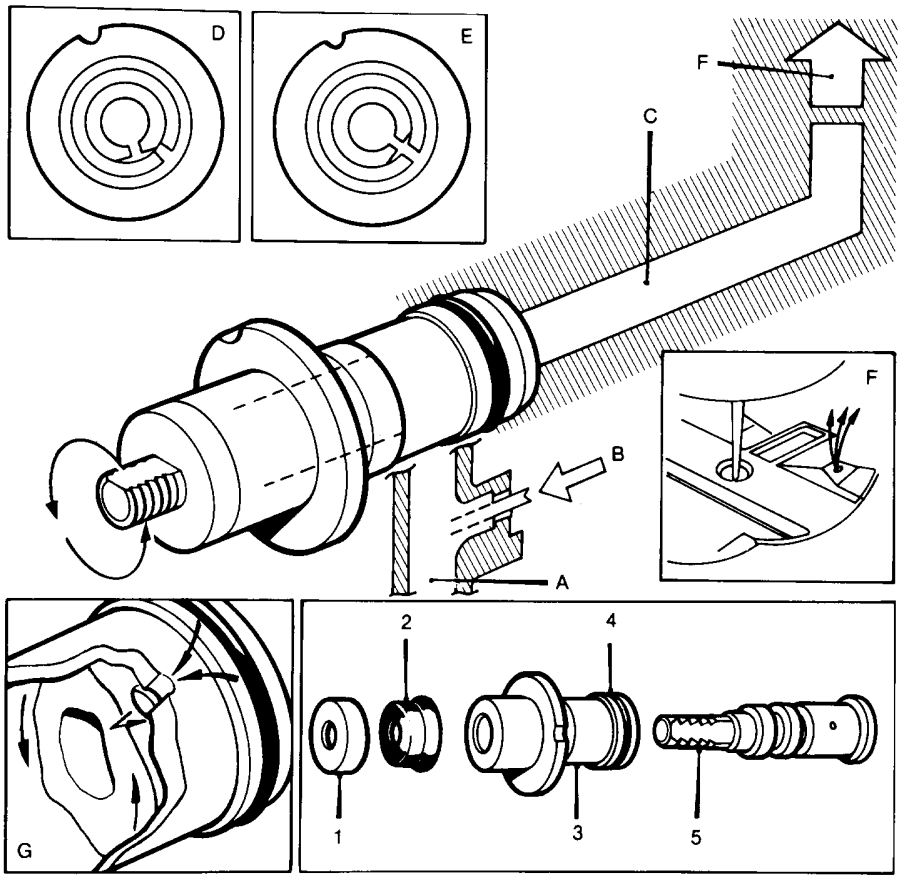
Fig. B28. Carburetter components

SERVICING - TYPE HIF CARBURETTERS

DISMANTLING

1. Thoroughly clean the outside of the carburetter.
2. Remove the piston damper with its washer.
3. Unscrew the suction chamber retaining screws.
4. Lift the chamber assembly vertically from the body without tilting it.
5. Lift out the piston assembly.
6. Empty the oil from the piston rod.
7. Note the position of the needle guide etch mark in relation to the piston transfer holes for correct re-assembly and unscrew the needle guide locking screw.
8. Withdraw the needle, guide and spring.
9. Mark the bottom cover-plate and body to ensure correct re-assembly, unscrew the retaining screws and remove the cover complete with sealing ring.
10. Remove the jet adjusting screw complete with 'O' ring.
11. Remove the jet adjusting lever retaining screw and spring.

Cold Start Enrichment Device



Cold start enrichment device

1 End seal cover
2 End seal
3 Starter valve body
4 'O' ring
5 Valve spindle

A Fuel supply
B Air bleed
C Fuel delivery to jet bridge
D Commencement of enrichment
E Maximum enrichment
F Enrichment outlet
G Fuel flow through valve

Fig. B29. Cold start unit assembly

12. Withdraw the jet complete with bi-metal adjusting lever and disengage the lever.

13. Remove the float pivot spindle and aluminium washer.

14. Withdraw the float.

15. Remove the needle valve and unscrew the valve seat.

16. Unscrew the jet bearing locking nut and withdraw the bearing complete with fibre washer.

17. Note the location of the ends of the fast idle cam lever return spring.

18. Unlock and remove the cam lever retaining nut and locking washer.

19. With the return spring held towards the carburetter body, prise off the cam lever and remove the return spring.

20. Unscrew the starter unit retaining screws and remove the cover plates.

21. Withdraw the starter unit assembly and remove its gasket (Fig B29).

22. Withdraw the valve spindle and remove the 'O' ring, seal and dust cap.

INSPECTION

23. Examine the float needle and seating for damage and excessive wear; renew if necessary.

24. Examine all rubber seals and 'O' rings for damage or deterioration, renew as necessary. **THE COVER PLATE SEALING RING MUST BE RENEWED.**

25. Check condition of all fibre washers and gaskets; renew as necessary.

26. Examine the carburetter body for cracks and damage and for security of the brass connections and the piston key.

27. Clean the inside of the suction chamber and piston rod guide with fuel or methylated spirit (denatured alcohol) and wipe dry. **ABRASIVES MUST NOT BE USED.**

28. Examine the suction chamber and piston for damage and signs of scoring.

NOTE:

The following timing check need only be carried out if the cause of the carburetter malfunction which necessitated the dismantling has not been located.

29. Temporarily plug the piston transfer holes.

30. Fit the piston into the chamber without spring.

31. Fit a nut and screw, with a large flat washer under the nut, into one of the suction chamber fixing holes, positioning the washer so that it overlaps the chamber bore.

32. Fit the damper and washer.

33. Check that the piston is fully home in the chamber, invert the assembly to allow the chamber to fall away until the piston contacts the washer. Check the time taken for the chamber to fall the full extent of the piston travel. For carburetters of $1\frac{1}{8}$" (38mm) to $1\frac{1}{8}$" (47.6mm) bore the time taken should be 5 to 7 seconds.

34. If the times are exceeded check the piston and chamber for presence of oil, foreign matter and damage. If after rechecking the time is still not within these limits, renew the suction chamber assembly.

REASSEMBLING

35. Reverse the procedure in 1 to 22 noting the following

a) Starter unit valve is fitted with the cut-out towards the top retaining screw hole and its retaining plate is positioned with the slotted flange towards the front of the machine. Apply a smear of oil to the starter 'O' ring prior to assembly, as this will obviate force being applied with consequent damage to the 'O' ring.

b. When fitting the jet assembly to the adjusting lever ensure that the jet head moves freely in the bi-metal cut-out.

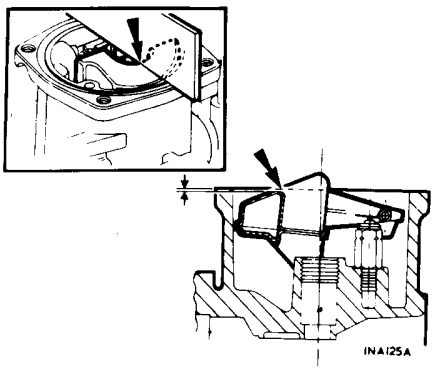


Fig. B30. Setting the Float level

c. After fitting the float and valve, invert the carburetter so that the needle valve is held in the shut position by the weight of the float only. Check that the point indicated on the float (see illustration Fig B30) is 0.04/0.02 in (1.0/0.5 mm) below the level of the float chamber face. Adjust the float position by carefully bending the brass pad. Check that the float pivots correctly about the spindle.

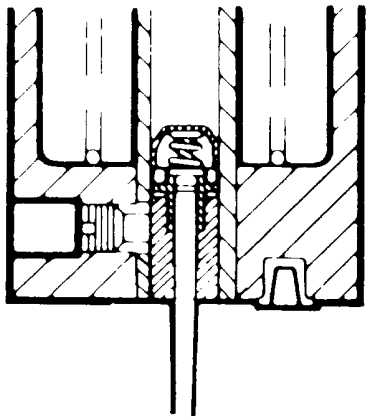


Fig. B31. Needle guide setting to be flush with piston lower face

d. Use a new retaining screw and new needle guide ensuring that the needle guide gives the needle bias in the direction of the rear of the machine. Before tightening the retaining screw, check that the level of the top of the guide is correct relative to the piston face - ie. flush with the face of the piston. Fig. B31.

c. Unscrew the cap and withdraw the damper. Top up with lubricating oil (see Section A2 – Recommended Lubricants) until the level is 13.0 mm ($\frac{1}{2}$ in) above the top of the hollow piston rod, refit the damper and screw the cap firmly into the suction chamber.

SECTION B8

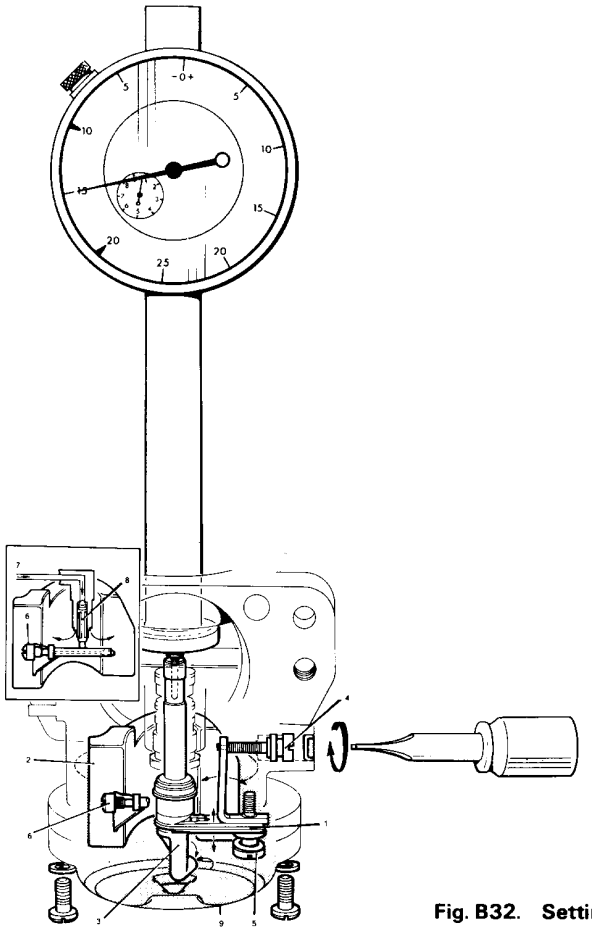
SETTING THE MIXTURE STRENGTH

The mixture strength is set at the factory and will not, in the normal course of events require adjustment, as the carburetters incorporate a built in fuel temperature compensation device. Should the mixture at any time need to be re-set, the following procedure should be followed.

1. Remove the damper piston, suction chamber piston and spring, as described in the previous section B7 items 1-6.

2. Ensure that the mixture needle shoulder is level with the base of the suction piston. (Section B7, item 35d).

3(a). Initial jet setting without jet height gauge. Position the end of a steel rule above the main jet orifice, screw the mixture control **out** until the main jet block just contacts the steel rule. At this point the main jet block will be level with the carburetter venturi base. Screw the adjuster in $3\frac{1}{4}$ turns. This will give the required 0.110 in. (2.79 mm) for the left carburetter, and approximately the 0.120in (3.05mm) specified for the right main jet height below the venturi base. (This measurement can be achieved more accurately using a height gauge fitted with dial indicator).



A diagrammatic enlargement of the float-chamber layout

1 Bi-metal assembly
2 Concentric float
3 Jet head
4 Jet adjusting screw
5 Bi-metal pivot screw
6 Float fulcrum screw
7 Fuel inlet
8 Needle valve
9 Bottom cover-plate

Fig. B32. Setting the main jet

3(b) Main Jet Setting - using a height setting gauge as shown in Fig B32.

Adjust the main jet setting using the recommended height setting gauge as shown in Fig B32, turning the adjuster to provide the specified settings (below) with the main jet rising to the required setting

	Single Rotor idle	Twin Rotor idle
Left carburetter	2.79 mm (0.110 in)	3.20 mm (0.126 in)
Right carburetter	3.05 mm (0.120 in)	3.20 mm (0.126 in)

In the case of single rotor idle models, the difference in settings between the carburetters results from the auxiliary feed to the idle speed control being fed from the right hand carburetter only.

4. Replace the suction chamber and pistons, top up the damper pistons with the recommended lubricant and run the engine until normal running temperature is reached.

A suggested alternative guide for initial carburetter setting if a height setting gauge is not available – Single rotor idle machines (for twin rotor idle machines proceed direct to Section B12–Twin Rotor Idle).

5. Disconnect the right hand spark plug lead and set the engine to run at 2,000 r.p.m. This is best acheived by using the throttle cable adjustment.

6. Turn the mixture control screw **in** ¼ turn and then slowly screw **out** until the engine speed just starts to fall, then screw back **in** one full turn.

7. Refit the right spark plug lead and remove the left spark plug lead. Repeat the above procedure with the right carburetter.

8. Refit the left spark plug lead and re-set the idling speed by turning the adjusting screw on the right inlet manifold in or out to lower or raise the engine speed, after returning the throttle cable adjuster to its original setting. Final adjustment is in accordance with Section B12–Single Rotor Idle Adjustment.

SECTION B9

REASSEMBLING THE ENGINE UNIT

MOST IMPORTANT

Ensure that the area you are using to assemble the engine is cleared and thoroughly cleaned and that all tools and equipment to be used are ready and clean. The slightest ingress of dust or foreign bodies to this engine could initiate extensive damage. Remember a little care now may save a lot of work later.

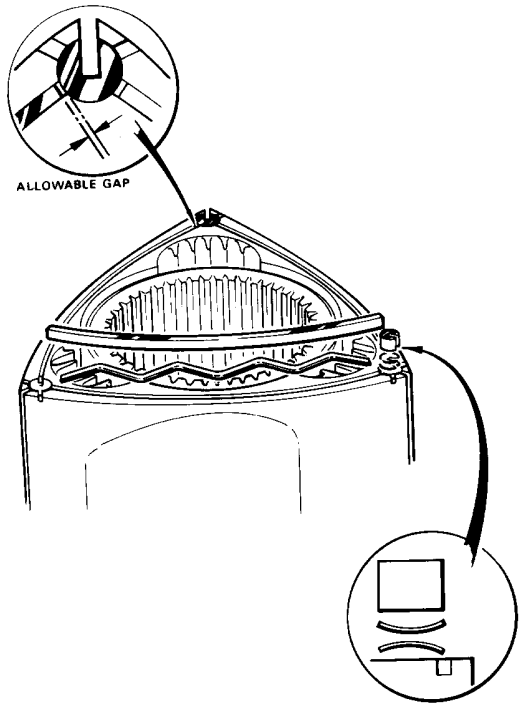


Fig. B33. Refitting the rotor side seals

Refit the needle roller bearings to each rotor ensuring they are replaced in the positions from which they were removed by reference to the recommended paint identification marks placed on the bearings during dismantling. It is essential that the bearings are fitted to the correct rotors and that the bearings are installed into the rotors facing the right direction.

Take both rotors and place them gearside up on a clean surface. Smear the side seal, apex seal pin and apex seal slots with petroleum jelly (vaseline). Fit the apex seal pin springs either 'wish bone' or twin concave discs fitted back to back (with the convex faces towards each other) into the seal pin recesses. Fit the apex seal pins being careful to align the slot in the seal pin with the apex seal slot in the rotor (See Fig B33). This can be achieved by using the apex seal to locate the seal pin slot.

Fit the side seal springs into their seats with the end of the spring facing in towards the rotor. Fit the side seals to the slots with the polished surface uppermost. Check the specified allowable gap between the corner seal pin and its end of the side seal. With the side seal pushed fully against one corner seal pin, the measured allowable gap must not exceed 0.127 – 0.178 mm (0.005 – 0.007 in). See Fig. B33.

Carefully turn the rotors over and repeat the above operation. There should be a clearance between the side seal and the apex seal pins. The seals should move slightly in their slots without binding.

Check that all side seals and apex seal pins can be depressed below the level of the rotor face to ensure full and free movement of the seals.

Ensure the seals now in the lower grooves **do not drop out.**

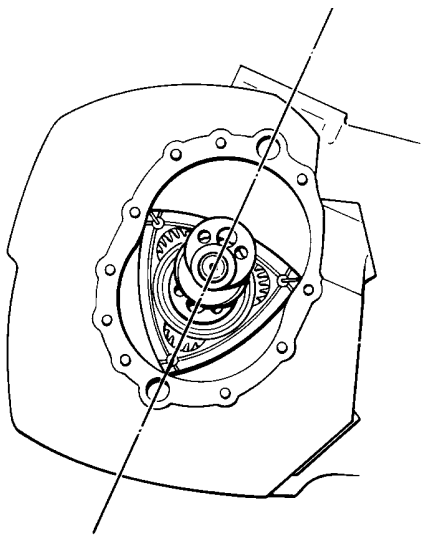


Fig. B34. Positioning the first rotor and eccentric shaft.

Lubricate the rotor bearings with engine lubricant. Fit the right rotor to the drive side of the rotor shaft.

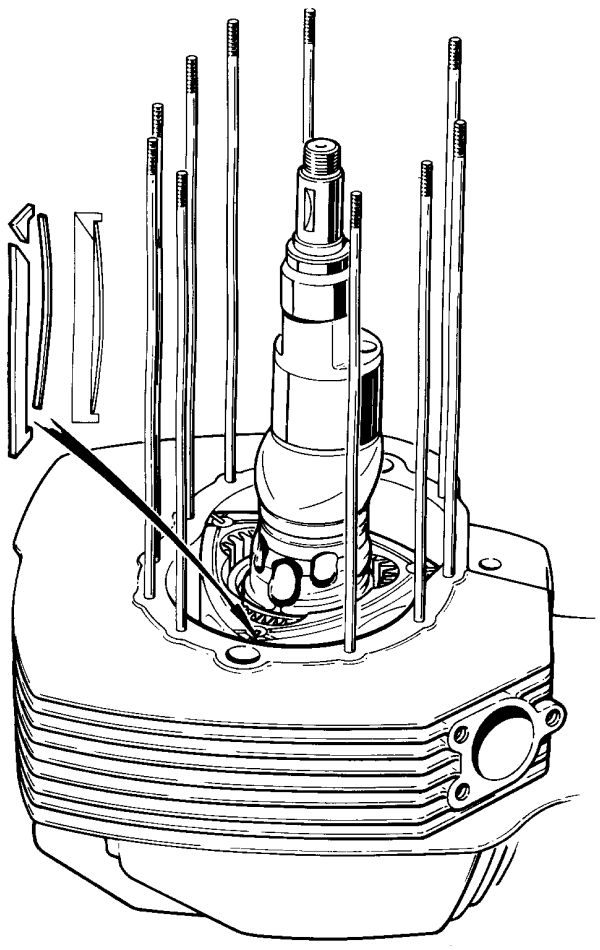


Fig. B35. Fitting the apex seals, seal springs and apex seal corner pieces

Lubricate the right end plate running surface with engine oil. The rotor shaft and rotor should now be inserted (gear side down) through the roller bearing to engage the stationery gear, with the shaft centre cooling holes aligned with the rotor apex and the top dowel hole as shown in Fig B34

AT THIS POINT CHECK TO ENSURE THAT NO SEALS HAVE BEEN DISLODGED.

Smear the mating surfaces of the right end plate and right rotor housing with the recommended jointing compound and fit the housing in place on the studs. Re-fit the top and bottom locating dowels in the rotor housing (if removed). Turn the rotor shaft through 90° to facilitate the subsequent assembly of the intermediate plate and fit the apex seals and seal springs with the convex face towards the centre of the rotor (ie. the ends of the spring should contact the ends of the apex seal – see Fig B35), and slide into position between the rotor slot and the apex seals. Finally position the apex seal corner pieces. Push the apex seal corner pieces home, as these will be held in place by apex seal spring pressure. Smear jointing compound onto the intermediate plate joint face, lubricate the intermediate plate running surface with engine oil and set the throttle levers pointing to the top of the engine (to clear the oil pipes). Assemble the plate over the studs, ensuring the two location dowels are fully engaged, checking all seals are in position before finally pushing home the intermediate plate. Rotate the rotor shaft through a further 90° to align the centre air passage with the bottom dowel. Carefully offer up and assemble the second rotor (LH) gear side uppermost to the eccentric shaft, with one of the apex slots aligned to the lower dowel centre line, in a similar manner to that indicated in Fig B34.
Smear the left rotor housing joint faces with jointing compound and assemble over the studs ensuring the throttle levers are engaged as shown in Fig B36.
Check the rotor side seals are still located correctly in the grooves, and assemble the apex seals (again as shown in Fig B35). Slide the seal springs into position with the convex side towards the rotor. Fit the seal corner pieces, pushing them home and closing the assembly by pressing the seal pins against their seal springs. Apply jointing compound to the mating surfaces and having lubricated the intermediate and end plate running surfaces, refit the LH end plate. Fit the spacers over the end plate studs (all but top two). Fit the nuts and torque load to 10lbs/ft. (1.4 KgM).

REFITTING THE FLYWHEEL ALTERNATOR AND STARTER MOTOR

Refit flywheel and alternator assembly and torque load nut to 150 lbs/ft. Do not refit the auxiliary flywheel until later. Pump engine oil through the oil pipes to the intermediate plate and position the engine the right way up. It should be possible to rotate the flywheel by hand without the spark plugs fitted with minimal resistance. Any unusual resistance to movement probably indicates an incorrectly fitted rotor seal and warrants immediate investigation. Refit the throttle butterfly return springs and set the throttle lever gap at: (See Fig B36)

Single rotor idle models 1.5mm (0.060in).
Twin rotor idle models 0.125mm (0.005in).

Refit the exhaust liner tubes (Fig B37) and, using new manifold gaskets, refit the exhaust manifold. Refit the air box assembly using the recommended Silicone Sealant. Do not over-tighten the securing screws.

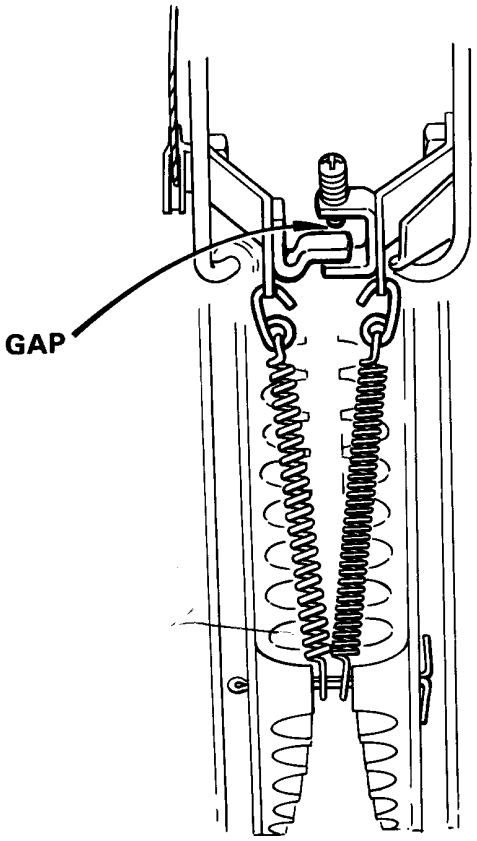


Fig. B36. Throttle butterfly gap and return springs

Refit the starter motor (Fig B38) to the power unit using the recommended sealant and ensuring the live and earth cable are secure and routed correctly as these cables are inaccesible once the engine is in place.

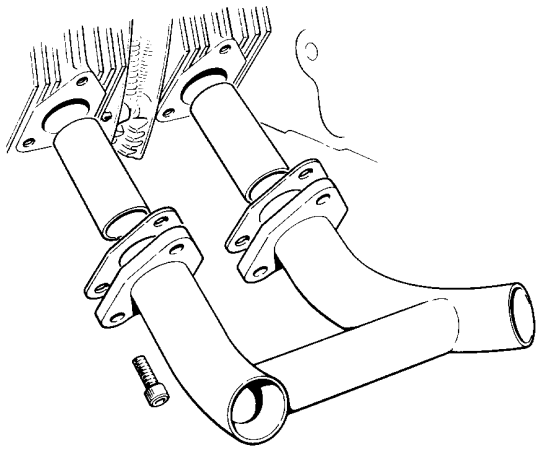


Fig. B37. Refitting exhaust liner tubes and manifold

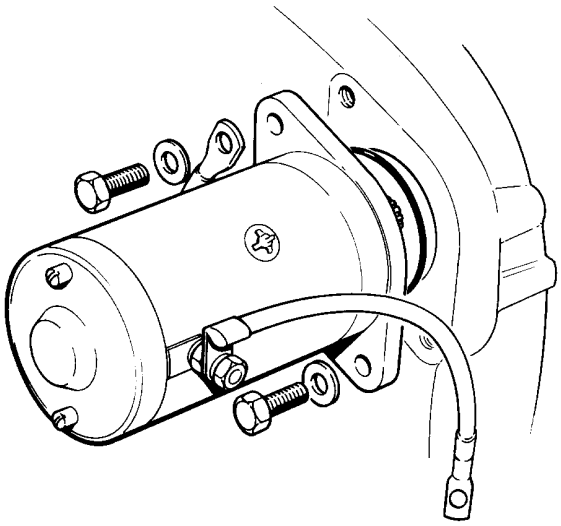


Fig. B38. Refitting starter motor

IDLE VALVE AND OIL METERING UNIT

On single rotor idling machines do not attempt to instal the single rotor idling valve, hose and adaptor in place until the power unit is fitted as these items can foul the frame during installation of the power unit. Fit the metering unit flexible pipes, connect and clip to their respective engine oil feed pipes, priming the clear plastic feed pipe with the recommended engine lubricant prior to assembling the metering unit to ensure a supply of lubricant to the engine on initial start up. The metering unit can be held in place in the generator magnetic rotor whilst re-fitting the power unit to avoid accidently trapping any feed pipes between the engine and gearbox.

CAUTION

Do not excessively pressurise the oil pipes when priming as this can result in damage to the one-way valves.

SECTION B10

REFITTING THE ENGINE UNIT

Clean the gearbox end plate and apply the recommended sealant to the mating surfaces, ensuring that sealant is prevented from entering the mounting bolt holes. Offer up and refit the power unit to the gearbox from the right hand side of the machine locating the primary drive case on the two locating dowel pegs, in the gearbox end plate (Fig B39). Using the recommended liquid locking agent on the gearbox bolts, torque load to the figure given in the 'General Data' -Torque Wrench Setting.

Ensure when fitting the engine in place, that the side stand wiring harness is positioned between the left rotor housing and the gearbox casting.

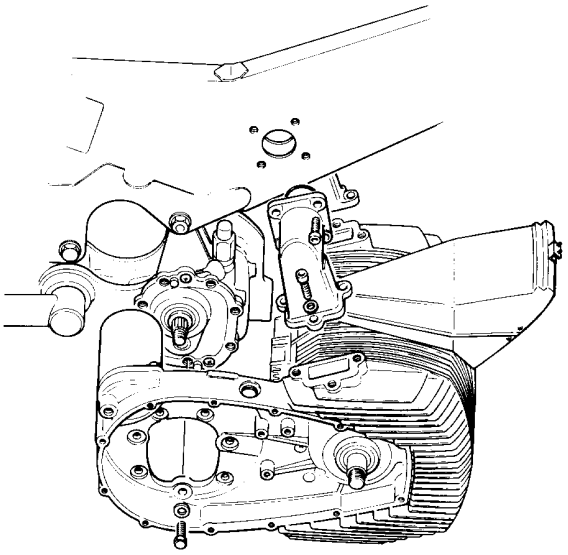


Fig. B39. Replacing the engine unit

On machines incorporating single rotor idle, fit the single rotor idling valve micro-switch. Fit the ignition trigger unit (Fig B40), setting the air gap to the recommended clearance as given in 'General Data'. Refer to Section B11 for adjusting micro-switch.

Refit the single rotor idling valve assembly to the left rotor housing.

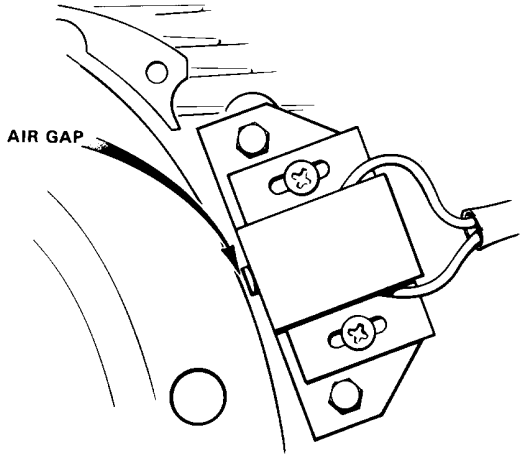


Fig. B40. Replacement of the ignition trigger unit and by-pass micro switch.

Refit the throttle butterfly cable (Fig B41) by positioning the inner cable roller nipple end (B) in the throttle butterfly operating lever to allow the outer cable to be positioned in the cable abutment bracket (A).

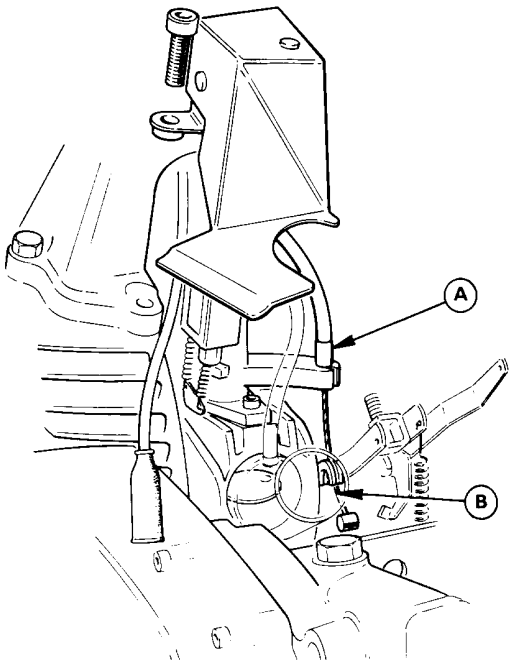


Fig. B41. Replacing the throttle butterfly cable, single and twin rotor idle models.

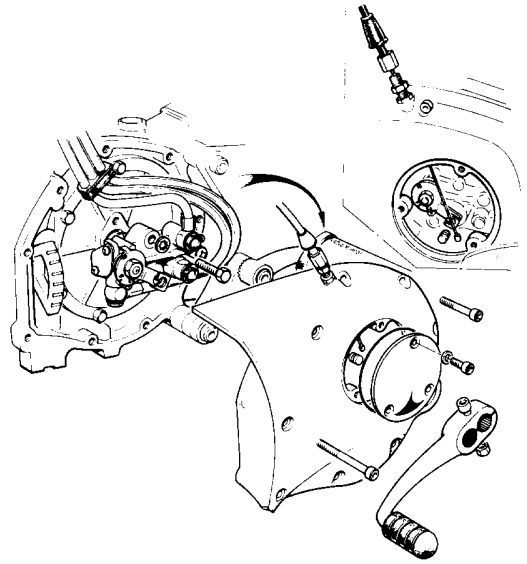


Fig. B42. Replacing the oil metering unit

Refitting the Carburetters
Refer to Section B6 – Removing and Refitting the Carburetters

Final Assembly – Single Rotor Idle Models
Fit the idle valve hose to the valve and fit the elbow to the hose. Fit the gasket and fasten to the port in the frame.

Single and Twin Rotor Idle Models
On both versions, now replace the aluminium alloy air transfer ports, re-connecting the temperature sensor on twin rotor idling models and ensuring all masking has been removed and fit the engine covers and horns. Re-fit the air box support screws and the air box cover/ coils into place. Re-connect thermocouple lead to the white multi pin plug at the instrument binnacle. Raise the choke lever knob fully, to pre-tension the cable and refit the fuel tank (E2) ensuring that no cables are trapped between the tank and the frame, and that the vacuum pipe is securely connected from the right hand port to the right hand fuel tap.
Refit the clutch and primary transmission (Section C2) and in the case of twin rotor idle models, now replace and fit the auxiliary flywheel. Ensure the shallow hexagon socket-headed clutch cover bolt is fitted adjacent to the left hand footrest position. Refit clutch cable and adjust (refer to Section C5).

NOTE:
It is important to assemble the clutch to the gearbox mainshaft and fully tighten in position prior to refitting the oil metering pump unit to obviate any possibility of damage to the metering unit. Do not forget to torque load the engine sprocket nut and clutch centre nut to the recommended figure. (See General data -Torque Wrench Settings).

Refit the oil metering unit to the left gearbox end plate (Fig B42) as described in Section A5, ensuring the drive spigot is aligned with the slot positioned in the end of the gearbox mainshaft. Fit the oil supply pipe to the oil tank outlet. Slacken the posidriv headed bleed screw at the metering unit and allow the lubricant to bleed through to fill the tube to the metering unit. Re-tighten the posidriv headed bleed screw.
Refit the gearchange cover assembly and refit the oil metering unit operating cable using the recommended sealer. Refit the alternator cover being careful not to trap the alternator leads (the leads can be connected in any order at the plug) and replenish the gearbox and primary drive oil levels with the recommended quantity and type of lubricant (recommended lubricants Section A2). Re-position the footrests (Section E19), fit the exhaust silencers (Section E10) and right foot brake pedal mounting plate (Section E20). Replenish the engine oil tank with the recommended lubricant. (Recommended lubricants - Section A2).

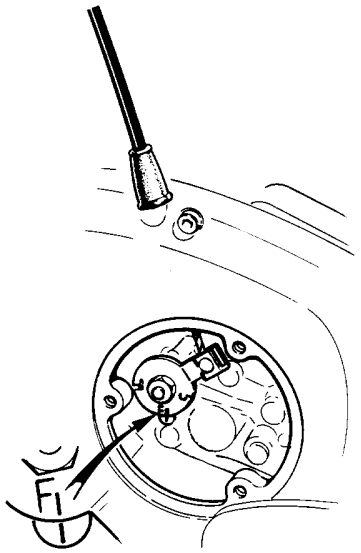


Fig. B43. Oil metering unit - initial setting at first start up following engine rebuild

Initial Starting Up

Apply the choke and with the oil metering access cover removed, hold the operating lever in the 'F' position (Fig B43) with the engine running at no more than 2000rpm. This will allow the engine lubrication system to prime itself and provide ample lubricant allowing the engine to be run until warmed up sufficiently to enable resetting of the oil metering unit. Continue to run the engine with the oil pump operating lever in the 'F' position until normal running temperature is reached

(100-150° C) when the engine should idle. During warm up try not to let the engine revs exceed 2000rpm. If new running components have been used within the engine the oil pump should be set 2 mm 'rich'' – beyond the 'C' mark at 2000 r.p.m., and re-set back to the recommended normal after a further 1000 miles. The oil metering unit should then be adjusted and set in accordance with the instructions contained in Section A6 'Adjusting the oil metering unit'. Blue smoke from the exhaust on initial start up is normal but should clear once the oil metering unit has been correctly set and the machine has been ridden a couple of miles.

EXCESSIVE SMOKING

If after normal running, excessive smoking persists, then examination of the frame oil scavenge suction pipe is recommended. Remove the oil scavenge pipe from the frame (immediately above the single rotor idling valve assembly) and from the left inlet pipe. Using an air line or similar equipment, blow the pipe clear. This action should clear any temporary blockage that may have existed in the scavenge pipe causing a build up of engine oil in the frame being drawn intermittently through in larger quantities, causing excessive smoking from the exhaust.

SECTION B11
SINGLE ROTOR IDLING MODELS

DESCRIPTION

The Norton Rotary engine is generally free from the normal frictional loads imposed on a reciprocating engine and, because of this, the idling speed naturally tends to be high. Twin rotor idling machines incorporate an auxiliary flywheel and additional ignition advance/ retard facilities, whereas on those machines incorporating single rotor idling, the fuel/air supply to the left rotor is designed to be cut off at idling speed initiating parasitic drag produced by the left rotor thereby lowering the overall idling speed of the engine. When the throttle is in the closed position a lever attached to the throttle butterfly valve spindle operates a micro switch which in turn opens a solenoid operated air by-pass valve in the inlet port of the left rotor housing thereby preventing combustion in the left rotor chambers. This has the effect of consequently lowering the idle speed. Adjustment of this micro switch is described below and any maladjustment will affect throttle response. The original factory adjustment is retained by Loctite application.

Access to the micro-switch is shown in Fig B44.

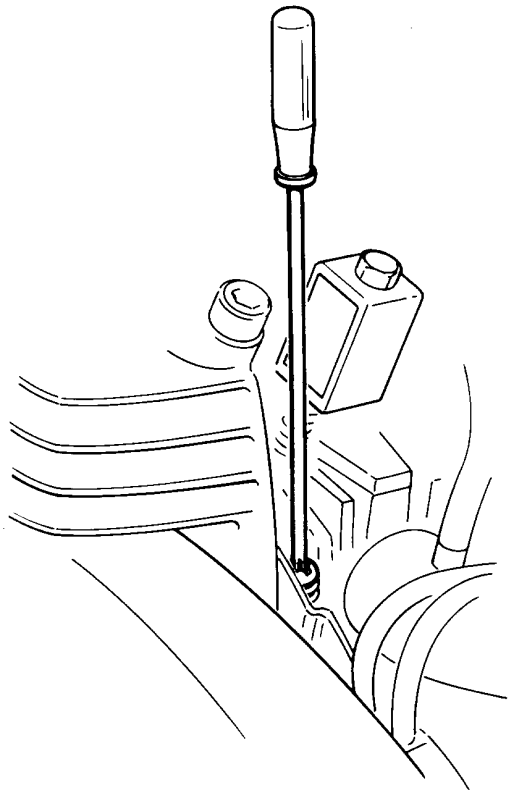


Fig B44. Micro-switch adjustment (Single rotor idle models).

ADJUSTING THE MICRO-SWITCH

Switch on the ignition and unscrew the micro switch adjustment as far as possible without screwing it out of the lever. Re-apply a small drop of Loctite to the adjuster and screw back in with the throttle closed until the single rotor idling valve is seen (and heard - a pronounced 'click' - to operate (Fig B44)). Screw the adjuster in a further quarter of a turn only and very gently open and close the throttle. The idling valve should operate the instant the throttle lever moves off its stop, but just before the right throttle butterfly lever actuates. It is stressed that exact adjustment of this switch is essential to smooth engine pick-up from closed throttle and hence great care must be taken when carrying out the final adjustment.

SECTION B12

FAST IDLE ADJUSTMENT – SINGLE ROTOR IDLE MODELS

On machines fitted with single rotor idling, the idle speed control is positioned so that the rider may adjust the idle speed to his requirements whilst astride the machine. The idle should be set to the lowest speed at which the engine will run evenly without stalling, with all lights and direction indicators on, and the clutch lever pulled in.

Twin rotor idle machines are pre-set and do not provide rider adjustment facility.

With the choke pressed fully home, and the engine at normal working temperature, with headlamp switched 'on', idle speed should be between 1000 and 1100 R.P.M.

Should the idling become erratic or unreliable at any time, the idle screw should be removed and the rubber sealing 'O' rings replaced. Lubricate the seals with high melting point grease prior to refitting the screw.

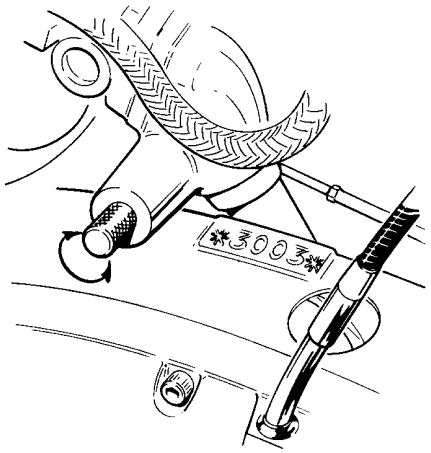


Fig. B45. Fast idle adjustment

IDLE ADJUSTMENT – TWIN ROTOR IDLE MODELS

Ensure the throttle cable is adjusted correctly (Section G3) with 2.5mm (0.10 in.) free play at the twistgrip end. Run the engine until 100°C is indicated on the temperature gauge.

Connect both arms of a damped 'U' tube manometer (50 cm - 24 in approx) to both inlet port tapping points (See Fig B46)

For this operation, the recommended manometer fluid is paraffin (kerosene), and the specified damping jets installed at the tapping point end of the 'U' tube connecting arms must each be restricted to 0.75 mm (0.030 in) jet orifice bore (See Fig B46).

With the engine running at a constant 800-900 R.P.M., the indicated engine temperature at 100°C (ie the Temperature Sensor capsule is controlling the ignition retard unit at fully retarded), gradually adjust both idle screws to give a balanced liquid level (to within 40 mm - 2 ins). If the level is too high on one arm of the manometer, *unscrew* the idle adjuster screw on the side to which that manometer arm is connected.

When a steady level has been achieved, take up the slack in the throttle cable by gently rotating the twistgrip (thereby taking up the slack in the throttle linkage) and continue until the engine reaches 2000 R.P.M.

At this point the 'U' tube manometer may 'unbalance' if the operation of the throttle valves within the inlet ports is slightly un-coordinated.

Compensate for any imbalance on the affected idle adjuster screw to within 40 mm (2 in approx) on the manometer. Re-check with the throttle closed.

Again rev the engine up to 2000 R.P.M. If more than 80 mm (4 in approx) is now shown, then the throttle valves are unbalanced and require attention.

It is essential to ensure the action of the throttle valves, rods and levers are co-ordinated, and that both throttle valve discs move from the closed position at exactly the same instant when the throttle is operated. (See Fig B36) Where throttle linkage adjustment has been found necessary, repeat the above procedure.

The engine should now run evenly at 700-800 R.P.M. with no appreciable change in 'U' tube manometer levels. Remember there will be a slight delay between idle adjustment and manometer fluid level stabilisation. Remember also, after running the engine up to 2000 R.P.M., there will be an increase in temperature at the alloy transfer port, housing the temperature sensor, which in turn controls the ignition advance and retard. It is advisable to wait a few seconds for the temperature and full ignition retard to re-stabilise prior to attempting any final re-adjustment.

Note: During the above procedure, the engine temperature must not be allowed to exceed 150°C.

CONSTRUCTING A 'U' TUBE MANOMETER

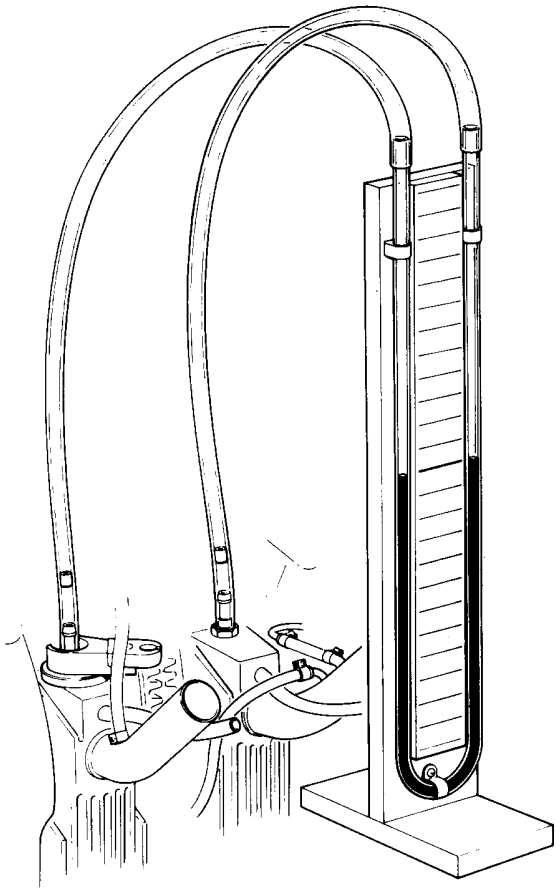


Fig B46. 'U' Tube Manometer with damping jets in connecting tube arms used to set idling adjustment on Twin Rotor Idling machines.

Obtain a standard 600 mm (24 in) commercial 'U' tube, or gently bend under a mild flame a 1200 mm (48 in) length of 6 mm (1/4 in) bore glass tube to form a suitable 'U' tube as shown in Fig B46.

A glass tube is preferred for this application, but if not available may be substituted by using 6 mm bore clear plastic tubing.

The 'U' tube should then be carefully mounted onto a flat strip maintained in a vertical position, preferably on a portable stand as illustrated, with a graduated measuring scale fixed between the two arms of the tube.

The scale should be calibrated from a central zero position, and the measuring fluid filled to a level at that point. The recommended fluid for the Idle Adjustment operation is paraffin (kerosene).

The connecting arms (approximately 2 m - 6 ft long), preferably of clear plastic tube must incorporate damping jets each with a 0.75 mm (0.030 in) orifice, inserted and held at the tapping point ends of each connecting arm.

Note: The balance and response of the manometer may be impaired if the damping jets become wetted or blocked if sudden impulses have been allowed to seriously upset the fluid level. The connecting tube arms should be detached and blown dry and clear.

SETTING AND ADJUSTING THE FAST IDLE ROD

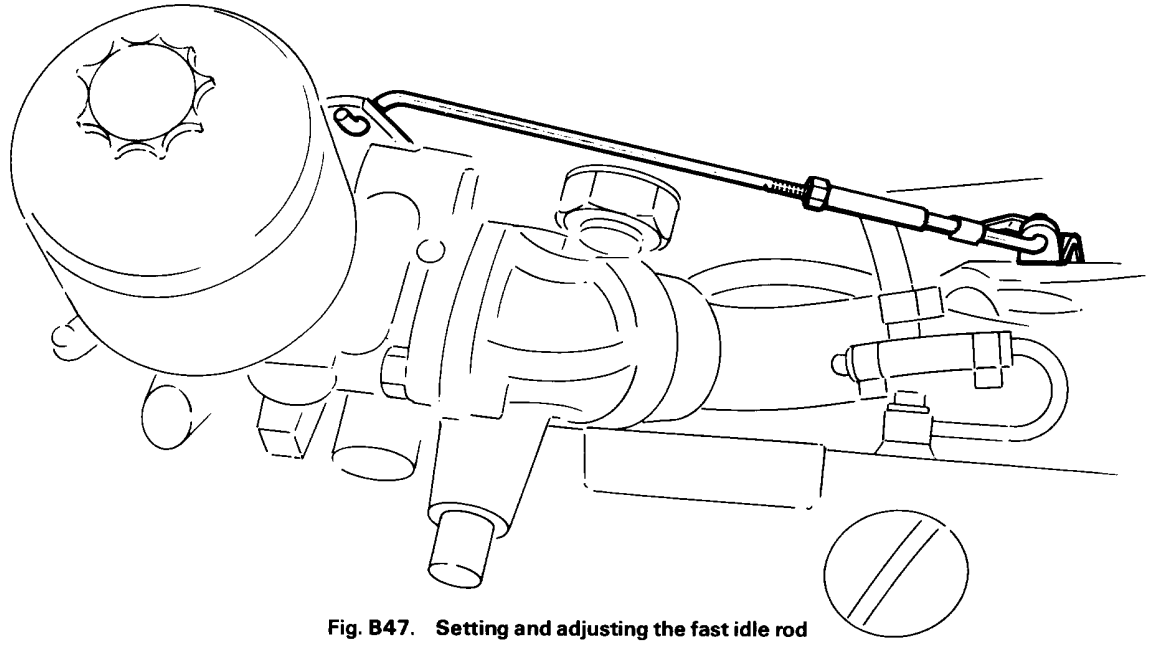


Fig. B47. Setting and adjusting the fast idle rod

The choke cable divides along its length and connects to the fast idle cam on both carburettors. Operation of the choke cable rotates the carburettor idle cam to which is additionally attached (on the right side carburettor) the fast idle rod, which connects directly to the right side throttle spindle fast idle lever. Forward movement of this lever under the influence of choke cable operation and consequent idle cam rotation lifts the right housing throttle lever assembly, and partially opens the throttle valve.

When replacing an idle rod, the effective length and therefore setting, is extremely important. The length of the rod assembly must be adjusted and firmly secured by means of the locknut provided to ensure the throttle linkage is operated in relation to the operation of the choke cable.

In the case of single rotor idle models, the adjustment should be set to just initiate the audible "click" from the left hand idle by-pass micro-switch when the choke cable has reached the full-out position.

Operation of the micro-switch as described assumes the correct linkage gap (Section B9 – Fig. B36) has already been made.

The fast idle rod adjustment on twin rotor idling machines should be set to ensure maximum engine rpm does not exceed 3000 with choke full out, when starting a COLD ENGINE.

Once correctly adjusted, there should be no further need to alter the final setting.