# BSA SERVICE SHEET No. 801

*Reprinted Dec. 1958*

## A Group Models
## MAGNETO

These magnetos are of the rotating armature pattern. The magnet is cast into the body, so eliminating joints and improving the weatherproof properties of the magneto. The magnetos also incorporate an automatic timing control.

The automatic timing control (Fig. Y1) employs a driving gear carrying a plate fitted with two pins. A weight is pivoted on each pin and the movement of the weight is controlled by a spring connected between the pivot end of the weight and a toggle lever pivoted at approximately the centre of the weight. Holes are provided in each toggle lever, in which pegs on the underside of a driving plate secured to the magneto spindle are located. This plate is also provided with stops which limit the range of the control. When the magneto is stationary, the weights are in the closed position and the magneto retarded for starting purposes. As the speed is increased, centrifugal force acting on the weights overcomes the restraining influence of the springs and the weights move outwards, causing relative movement to take place between the driving gear and the magneto spindle, so advancing the timing. By careful design of the springs, the characteristics of the control can be arranged to conform more closely with the engine requirements than is the case with other types of control.

### ROUTINE MAINTENANCE
### Lubrication

To be carried out every 3,000 miles.

The cam is supplied with lubricant from a felt pad contained in a pocket in the contact breaker housing. A small hole in the cam, fitted with a wick, enables the oil to find its way on to the surface of the cam. Remove the contact breaker cover and turn the engine over until the hole in the cam can be clearly seen and then carefully add a few drops of thin machine oil. Do not allow any oil to get on to the contacts. When the magneto is dismantled the felt pad should be removed, soaked in thin machine oil and after removing surplus oil, replaced.

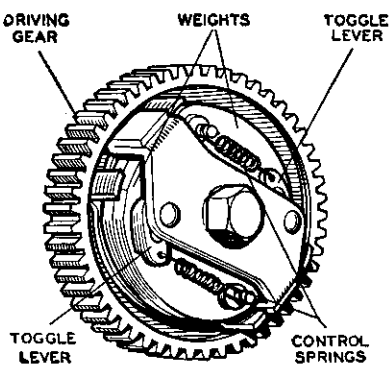

Fig. Y1. Automatic timing control

The contact breaker rocker arm pivot also requires lubrication and the complete contact breaker must be removed for this purpose. Take out the hexagon-headed screw from the centre of the contact breaker and pull the contact breaker off the tapered shaft on which it fits. Then push aside the rocker arm retaining spring, prise the rocker arm off its bearing and lightly smear the bearing with clean engine oil. At the same time, also lightly smear the contact breaker with clean engine oil.

When replacing the contact breaker, take care to ensure that the projecting key, on the tapered portion of the contact breaker base, engages with the keyway cut in the magneto

spindle, otherwise the timing of the magneto will be upset. Tighten the hexagon-headed screw with care ; it must not be too slack, nor must undue force be used.

### Adjustment

To be carried out every 3,000 miles.

Remove the contact breaker cover and turn the engine until the contacts are fully opened. Check the gap with a gauge having a thickness of .012in. If the setting is correct, the gauge should be a sliding fit, but if the gap varies appreciably from the gauge it should be adjusted. Keep the engine in the position to give maximum opening of the contacts, slacken the locknut and turn the contact screw by its hexagon head until the gap is set to the gauge. Finally tighten the locknut and re-check the setting.

### Cleaning

To be carried out every 6,000 miles.

Take off the contact breaker cover and examine the contact breaker. If the contacts are burned or blackened, clean them with fine carborundum stone or with very fine emery cloth, and afterwards wipe away any dust or dirt with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker is removed. Procedure is given above.

Remove the high tension pickups, wipe clean and polish with a fine dry cloth. The high tension pickup brush must move freely in its holder. If it is dirty, clean with a cloth moistened with petrol. If the brush is worn to within $\frac{1}{8}$in. of the shoulder it must be renewed. While the high tension pickup is removed, clean the slip ring track and flanges by holding a soft cloth on the ring by means of a suitably shaped piece of wood, while the engine is slowly turned.

### Replacement of High Tension Cable

If, on inspection the high tension cable shows signs of perishing or cracking it must be replaced by a suitable length of 7 mm. rubber-covered ignition cable.

To fit a new high tension cable to a pick-up terminal, bare the end of the cable for about $\frac{1}{4}$in., thread the knurled moulded nut over the cable, thread the bare wire through the washer removed from the end of the old cable and bend back the strands. Finally screw the nut into the pick-up.

## SERVICING

### Testing Magneto in position on engine

Testing magneto in position to locate cause of misfiring or failure of ignition

Disconnect the cable from one of the sparking plugs and hold it so that the terminal end is about $\frac{1}{8}$in. from some part of the cylinder block while the engine is turned over.

If the spark that jumps from the cable end is strong and regular the fault lies in the sparking plug which must be removed for examination and if necessary cleaned and adjusted or replaced.

Next examine the high tension cable. After long service it may have become cracked or perished and the magneto may be sparking through to a metal part of the engine or frame.

If the magneto has been replaced recently it may be incorrectly timed. Refer to Service Sheet No. 203.

If the performance of the magneto is still not satisfactory, the contact breaker may require cleaning or adjustment. If the contacts are badly burned they should be renewed by a replacement contact set. If the contact breaker is in good order, there may be an internal fault in the magneto (see paragraph below).

**To Dismantle**

First remove the safety gap screw and the earthing brush otherwise the armature and slip ring may be damaged whilst dismantling. The safety gap screw is usually fitted in the underside of the magneto and the earthing brush under the name plate at the contact breaker end.

Remove the high tension pick-ups, secured by spring clips. Take care to retain the gasket fitted under the pick-up for use when reassembling.

Take off the contact breaker cover and remove the contact breaker and cam as follows :—

Unscrew the hexagon headed bolt from the centre of the contact breaker and draw the contact breaker off the tapered shaft on which it fits. The cam can then be pulled out of its housing. The cam is then free to be taken out.

Take out the screws securing the contact breaker housing to the magneto body, and pull the contact breaker housing away from the magneto body. Retain the sealing gasket and shims for use when reassembling.

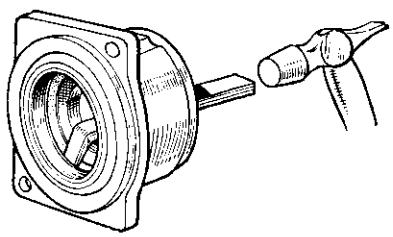

Fig. Y2. Removing outer race

Draw the armature out of the magneto body. There is no need to put a keeper across the magnet, as it retains its properties more or less indefinitely. Although it loses a certain immaterial amount of power on the first removal of the armature, subsequent removals do not affect it.

Do not allow the magneto body to come into close contact with any iron filings as they may become attracted to the magnet and cause the armature to bind.

When the armature is removed it should be examined for mechanical faults such as a cracked or bent shaft. Any defect in the winding or condenser needs special equipment to detect, and in the event of trouble being suspected, a complete service armature should be fitted.

It is important that the two ball bearings which support the armature shaft are in good condition. If they are packed on assembly with a suitable high melting point grease they will stand an almost unlimited amount of normal wear, but if they start to fail due to a bent shaft or other cause, they must be replaced. The balls and cages can readily be removed off the inner races which can then be pulled off the armature shaft using an extractor. The outer races can be removed with an expanding collet type extractor or by means of a tool as shown in Fig. Y2.

Carefully examine the slip ring and if it is damaged in any way it must be replaced. To do this take off the inner race of the bearing using an extractor, lift off the shims and the grease flinging plate and pull the slip ring off the shaft. (Note : When removing the inner race the extractor must bear on the brass shaft extension and not on the electric contact or insulator down the centre of the shaft. A disc of appropriate diameter can be placed across the face of the shaft extension). Carefully straighten the wire coming from the armature and see that the bared end is clean, then fit the new slip ring over the shaft, taking care that the wire enters the hole in the boss in the slip ring and that it goes fully home without bending. Seal the lead-in to the slip ring boss with varnish—a special air drying varnish is used at the works but shellac varnish can be used in an emergency.

Replace the grease flinging plate, the full number of shims and inner race of the bearing.

## Testing

If test apparatus is not available, a rough check of the armature windings can be made by means of a two-volt battery (a tapping across one cell of the motor cycle battery) and an ammeter.

## To check the primary winding of the armature

Screw the contact breaker retaining screw into the end of the armature shaft.
Connect one terminal of the battery to one terminal of the ammeter.
Connect the second terminal of the ammeter to the screw in the armature shaft.
Connect the second terminal of the battery to the metal body of the armature.

The ammeter will record the current taken by the armature primary winding and should be approximately 4 amperes.

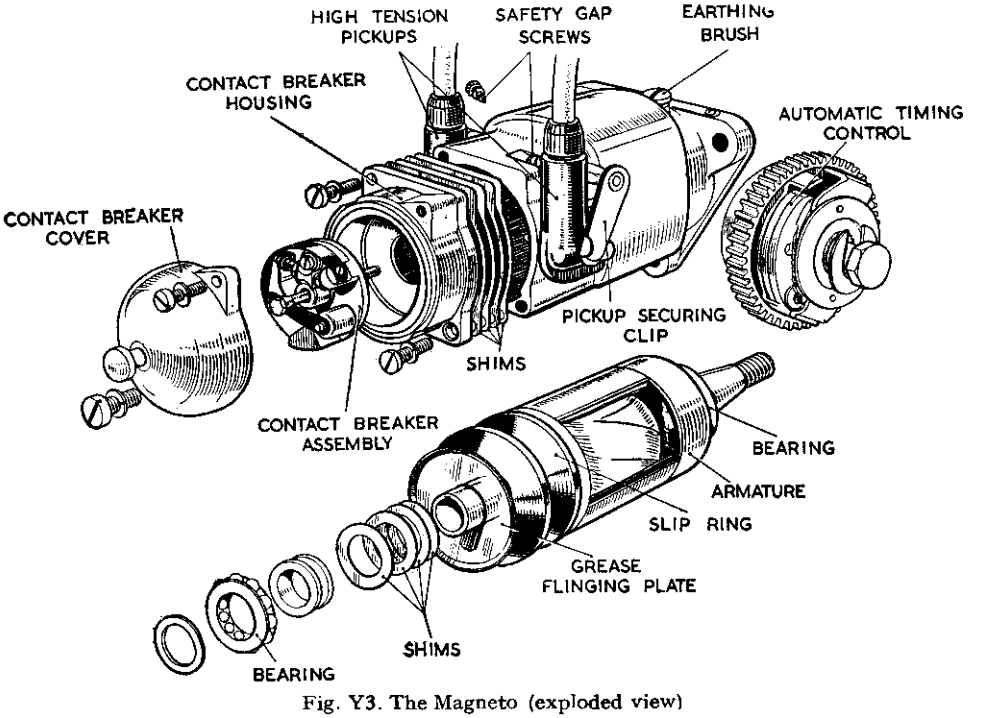


Fig. Y3. The Magneto (exploded view)

**To check the secondary winding of the armature**

Leave the connections as detailed for the primary winding check.

Take a piece of high tension cable about 15in. long and bare one end back about ½in. and the other end about 4in. Wrap the longer bared end round the brass insert of the slip ring and hold the other end about ⅛in. from the body of the armature.

If the lead from the battery which was connected to the armature body to test the primary winding is then flashed quickly on and off the body a spark should occur between the high tension wire and the armature body.

Failure to spark indicates a fault either in the armature windings or the condenser and a replacement armature must be fitted.

An armature test can be carried out by connecting in series an 8-volt accumulator, a four lobe cam and contact breaker (having 45° closed period) and the armature under test, the contact breaker to coil connection being at earth potential. A 0.2 mfd. condenser must be connected across the contacts. Run the contact breaker at 750 r.p.m. giving 3,000 operations of the contacts per minute, and connect the high tension cable from the coil to either a 3-point spark gap or rotary gap set to 13 kv. Regular sparking should occur under these conditions. Explore the surface of the winding with an earthed pointer—no flashover must occur.

It should be noted that in the above test, sparking will occur, provided that the armature winding is in order, even if the condenser in-built with the armature is open-circuited. Disconnect the 0.2 mfd condenser from the supply circuit above when regular sparking should continue. Failure to do so indicates that the armature condenser is faulty and a replacement armature must be fitted.

If satisfactory performance is not obtained during the above test, measurement should be made of the maximum primary running current. To do this, include also in the above series circuit a moving coil ammeter (of not more than 5 amperes full scale deflection) and a variable resistance of approximately 5 ohms (of adequate current rating for cool running). Connect the H.T. cable from the coil to a 3-point spark gap set to 5.5 mm. or a rotary gap set to 9.5 kv. Run the contact breaker as before, and adjust the variable resistance until occasional missing occurs, that is, when the coil is just failing to spark regularly. Under these conditions, the permissible primary current as read on the ammeter should be not more than 1.2 amperes.

In both the above tests, it is important that the supply voltage be maintained at 8 volts, that the cam speed be kept constant, and that the winding under test is not subjected to any external magnetic influence (e.g., it must not be tested on an iron bed-plate).

**Reassembly**

See that the bearings are clean and if necessary wash them in petrol and dry thoroughly. Lightly pack them with high melting point grease. Fit the inner races on the armature shaft using a hand press and a length of tube fitting over the shaft and locating on the race. Fit the balls and cages in position over the inner races. Place a new oil seal in the bearing housing at the driving end of the magneto body and press the outer races

into their housings with a mandrel of the type shown in Fig. Y4, taking care that a suitable serrated insulating washer is positioned between each race and its housing, to ensure that the race is a tight fit in its housing.

See that the slip ring and metal insert are clean ; if necessary carefully wipe it clean with a petrol moistened cloth. See that the inside of the magneto body is clean and free from swarf and insert the armature in the body, drive end first.

Refit the contact breaker end plate taking care that the end plate shims and gasket are in position, and replace and tighten the end plate fixing screws.

Check the armature for end play. It should revolve freely when turned by hand, but no end play should be felt. If necessary adjust by adding or removing shims behind the contact breaker plate until adjustment is correct.

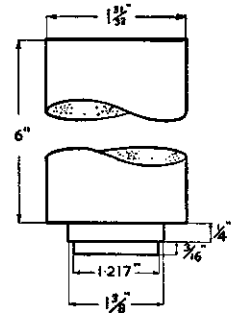

Fig. Y4. Mandrel for replacement of outer races

Replace the cam and contact breaker as follows :—

First add a few drops of thin machine oil to the felt contained in the contact breaker housing.

Insert the cam in the housing so that the broad slot locates over the two pegs in the contact breaker housing. Fit the contact breaker in position, ensuring that the projecting key on the tapered portion of the contact breaker base engages with the keyway cut in the magneto spindle otherwise the magneto timing will be upset. Tighten the hexagon-headed screw with care; it must not be too slack, nor must undue force be used.

Adjust the contacts to the correct setting and replace the contact breaker cover.

See that the pick-ups are clean and the brushes move freely. Place the cork washers in position on the magneto body, followed by the pick-ups and secure by means of the spring arms.

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## B and M Group Models
## MAGDYNO

The Magdyno is a combined generator and magneto unit the generator being mounted above the magneto and driven through gears from the magneto driving shaft. Details of the E3HM generator which is incorporated in the Magdyno are given in Service Sheet No. 809. The Magdyno is arranged for variable ignition by means of hand control.

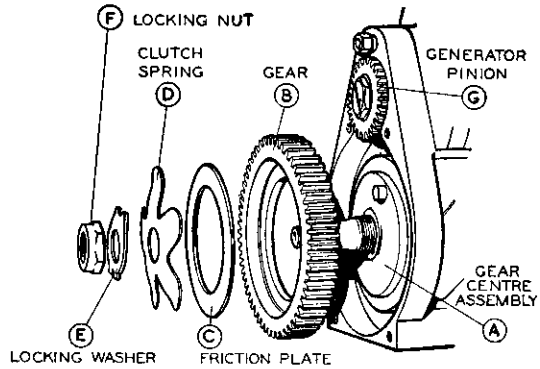

Fig. Y.5. Arrangement of slipping clutch.

A shock absorbing drive is incorporated in the larger of the two gears which take the drive from the magneto shaft to the generator. This considerably relieves the peak loading on the teeth of the driving gear and gives far longer life. The drive is taken from the gear centre 'A' (Fig. Y.5) which is keyed to the magneto shaft, through the fabric gear 'B' which is held against the gear centre under the pressure of a star-shaped spring 'D' to the pinion 'G' on the generator shaft. The effect of a violent overload is to cause the fabric gear to slip relative to the gear centre and so prevent shock from being transmitted to the fabric gear.

### ROUTINE MAINTENANCE

#### Lubrication

To be carried out every 3,000 miles.

The cam is lubricated from a wick contained in the contact breaker base. To reach the wick, take out the screw securing the spring arm carrying the moving contact and lift off the backing spring and spring arm. The screw carrying the wick can then be withdrawn. At the same time, unscrew the contact breaker securing screw, take the tappet which operates the contact spring from its housing and lightly smear with thin machine oil. When replacing, see that the backing spring is fitted on top of the spring arm and that its bent portion is facing outwards.

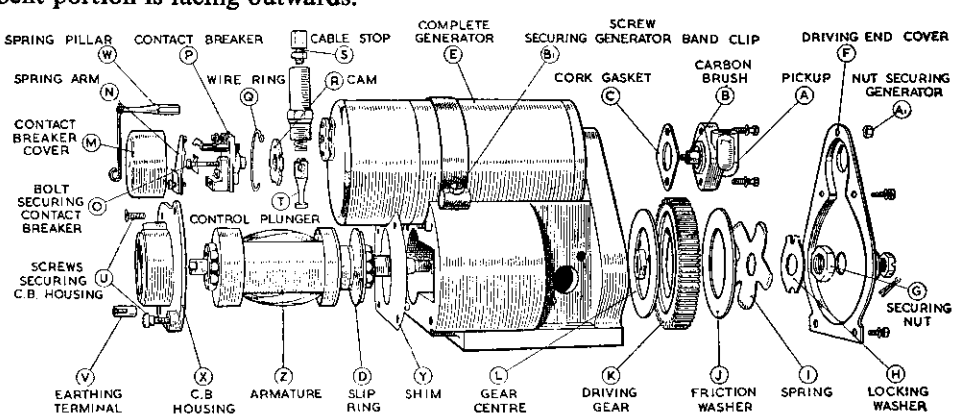

Fig. Y.6. The Magdyno (Exploded view)

### Adjustment

To be carried out every 3,000 miles.

Remove the contact breaker cover and turn the engine until the contacts are fully opened. Check the gap with a gauge having a thickness of .012 in. If the setting is correct, the gauge should be a sliding fit, but if the gap varies appreciably from the gauge it should be adjusted. Keep the engine in the position to give maximum opening of the contacts, slacken the locknut and turn the contact screw by its hexagon head until the gap is set to the gauge. Finally tighten the locknut and re-check the setting.

### Cleaning

To be carried out every 6,000 miles.

Take off the contact breaker cover and examine the contact breaker. If the contacts are burned or blackened, clean them with fine carborundum stone or with very fine emery cloth, and afterwards wipe away any dust or dirt with a petrol-moistened cloth. Cleaning of the contacts is made easier if the moving contact arm is removed. Procedure is given above.

Remove the high tension pick-up, wipe clean and polish with a fine dry cloth. The high tension pick-up brush must move freely in its holder. If it is dirty, clean with a cloth moistened with petrol. If the brush is worn to within $\frac{1}{8}$ in. of the shoulder it must be renewed. While the high tension pick-up is removed, clean the slip ring track and flanges by holding a soft cloth on the ring by means of a suitably shaped piece of wood while the engine is slowly turned.

### Replacement of High Tension Cable

If, on inspection, the high tension cable shows signs of perishing or cracking, it must be replaced by a suitable length of 7 mm. rubber-covered ignition cable.

To fit a new high tension cable to a pick-up terminal, bare the end of the cable for about $\frac{1}{4}$ in., thread the knurled moulded nut over the cable, thread the bare wire through the washer removed from the end of the old cable and bend back the strands. Finally screw the nut into the pick-up.

## SERVICING

### Testing Magneto in position on engine

Testing magneto in position to locate cause of misfiring or failure of ignition:

Disconnect the cable from the sparking plug and hold it so that the terminal end is about $\frac{1}{8}$ in. from some part of the cylinder block while the engine is turned over.

If the spark that jumps from the cable end is strong and regular, the fault lies in the sparking plug, which must be removed for examination and if necessary cleaned and adjusted, or replaced.

Next examine the high tension cable. After long service it may have become cracked or perished and the magneto may be sparking through to a metal part of the engine or frame.

If the Magneto has been replaced recently it may be incorrectly timed. For instructions on retiming refer to Service Sheet No. 604. If the performance of the Magneto is still not satisfactory, the contact breaker may require cleaning or adjustment. (See Routine Maintenance.)

If the contacts are badly burned they should be renewed by a replacement contact set. If the contact breaker is in good order, there may be an internal fault in the magneto.

## To Dismantle

Take off the driving end cover 'F' (Fig. Y.6) by unscrewing the four countersunk head screws. To dismantle the slipping clutch it will be necessary to use a jig (Fig. Y.7) to hold the larger gear whilst the securing nut is being undone. This consists simply of a length of $\frac{1}{4}$ in. diameter mild steel rod bent to a flat U the ends being cut short with their centres $3\frac{3}{16}$ in. apart, so that one can be slipped in the hole in the wheel whilst the other is engaged with the hole in the top of the casting through which the dynamo securing stud usually goes. A $\frac{7}{16}$ in. box spanner can then be used on the securing nut 'G' (Fig. Y.6). Note that the tab of the locking washer 'H' must be bent back first.

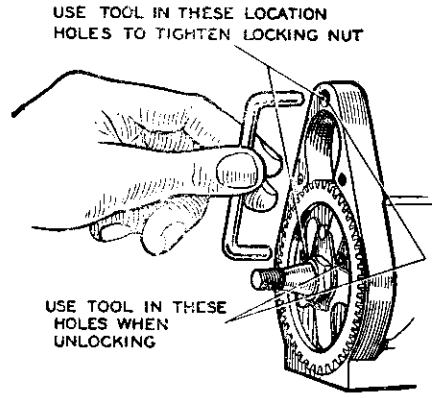


Fig. Y.7. Dismantling slipping clutch

Remove the locking washer 'H', clutch spring 'I', friction washer 'J', and driving gear 'K'.

Take off the contact breaker cover 'M', remove the spring arm 'N' carrying the contact, unscrew the bolt 'O' securing the contact breaker 'P', and draw the contact breaker off the shaft. Spring the wire ring 'Q' securing the cam 'R' out of its location in the contact breaker housing, and remove the cam. The timing control barrel and cable will have been removed when taking the Magdyno off the motor cycle. Remove the control plunger 'T'.

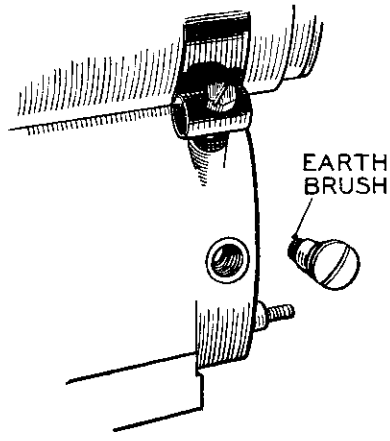


Fig. Y.8. Location of earthing brush

Remove the pick-up holder and the small earthing brush (Fig. Y.8), which will be found on the side of the Magdyno. Unscrew the screws 'U' (Fig. Y.6), earthing terminal 'V' and pillar 'W' from the contact breaker end plate 'X', and remove the plate from the

Magdyno together with the shims 'Y'. The armature 'Z' can then be removed from the machine by tapping the driving end of the shaft with a rawhide mallet to detach it from the gear centre 'L'. There is no need to put a keeper across the magnet as it retains its magnetic properties more or less indefinitely. Although it loses a certain immaterial amount of power in the first removal of the armature, subsequent removals do not affect it. Do not allow the magneto body to come in close contact with any iron filings as they may become attracted to the magnet and cause the armature to bind.

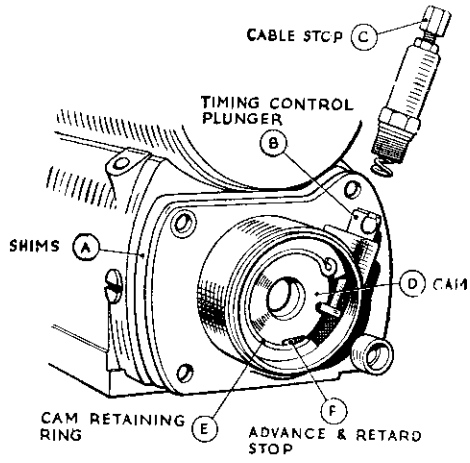


Fig. Y.9. Contact breaker housing, showing timing control mechanism

When the armature is removed, it should be examined for mechanical faults such as a cracked or bent shaft. Any defect in the winding or condenser needs special equipment to detect, and in the event of trouble being suspected, a complete service armature should be fitted.

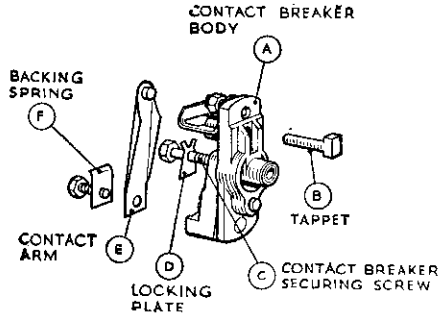


Fig. Y.10. Contact breaker tappet

It is important that the two ball bearings which support the armature shaft are in good condition. If they are packed on assembly with a suitable high melting point grease they will stand an almost unlimited amount of normal wear, but if they start to fail due to a bent shaft or other cause, they must be replaced. The balls and cages can readily be removed off the inner races which can then be pulled off the armature shaft using an extractor. The outer races can be removed with an expanding collet type extractor.

Carefully examine the slip ring and if it is damaged in any way it must be replaced. To do this take off the inner race of the bearing using an extractor, lift off the shims and the grease flinging plate and pull the slip ring off the shaft. (Note: When removing the inner race the extractor must bear on the brass shaft extension and not on the electric contact or insulator down the centre of the shaft. A disc of appropriate diameter can be placed across the face of the shaft extension.) Carefully straighten the wire coming from the armature and see that the bared end is clean and then fit the new slip ring over the shaft, taking care that the wire enters the hole in the boss in the slip ring and that it goes fully home without bending. Seal the lead-in to the slip ring boss with varnish—a special air drying varnish is used at the works but shellac varnish can be used in an emergency.

Replace the grease flinging plate, the full number of shims and inner race of the bearing.

## TESTING

If test apparatus is not available, a rough check of the armature windings can be made by means of a two-volt battery (a tapping across one cell of the motor cycle battery) and an ammeter.

### To check the primary winding of the armature

Screw the contact breaker retaining screw into the end of the armature shaft.

Connect one terminal of the battery to one terminal of the ammeter.

Connect the second terminal of the ammeter to the screw in the armature shaft.

Connect the second terminal of the battery to the metal body of the armature.

The ammeter will record the current taken by the armature primary winding and should be approximately 4 amperes.

### To check the secondary winding of the armature

Leave the connections as detailed above for the primary winding check.

Take a piece of high tension cable about 15 in. long and bare one end back about $\frac{1}{2}$ in. and the other end about 4 in. Wrap the longer bared end round the brass insert of the slip ring and hold the other end about $\frac{1}{8}$ in. from the body of the armature.

If the lead from the battery which was connected to the armature body to test the primary winding is then flashed quickly on and off the body, a spark should occur between the high tension wire and the armature body.

Failure to spark indicates a fault either in the armature windings or the condenser and a replacement armature must be fitted.

An armature test can be carried out by connecting in series an 8-volt accumulator, a four lobe cam and contact breaker (having 45° closed period) and the armature under test, the contact breaker to coil connection being at earth potential. A 0.2 mfd. condenser must be connected across the contacts. Run the contact breaker at 750 r.p.m., giving 3,000 operations of the contacts per minute, and connect the high tension cable from the

coil to either a 3-point spark gap or rotary gap set to 13 kv. Regular sparking should occur under these conditions. Explore the surface of the winding with an earthed pointer—no flashover must occur.

It should be noted that in the above test, sparking will occur, provided that the armature winding is in order, even if the condenser in-built with the armature is open-circuited. Disconnect the 0.2 mfd. condenser from the supply circuit above when regular sparking should continue. Failure to do so indicates that the armature condenser is faulty and a replacement armature must be fitted.

If satisfactory performance is not obtained during the above test, measurement should be made of the maximum primary running current. To do this, include also in the above series circuit a moving coil ammeter (of not more than 5 amperes full scale deflection) and a variable resistance of approximately 5 ohms (of adequate current rating for cool running). Connect the H.T. cable from the coil to a 3-point spark gap set to 5.5 mm. or a rotary gap set to 9.5 kv. Run the contact breaker as before, and adjust the variable resistance until occasional missing occurs, that is, when the coil is just failing to spark regularly. Under these conditions, the permissible primary currect as read on the ammeter should be not more than 1.2 amperes.

In both the above tests, it is important that the supply voltage be maintained at 8 volts, that the cam speed be kept constant, and that the winding under test is not subjected to any external magnetic influence (e.g., it must not be tested on an iron bed-plate).

## Reassembly

See that the bearings are clean and if necessary wash them in petrol and dry thoroughly. Lightly pack them with high melting point grease. Fit the inner races on the armature shaft using a hand press and a length of tube fitting over the shaft and locating on the race. Fit the balls and cages in position over the inner races and press the outer races into their housings with a mandrel of the type shown, taking care to ensure that a suitable serrated insulating washer is positioned between each race and its housing to ensure that the race is a tight fit in its housing.

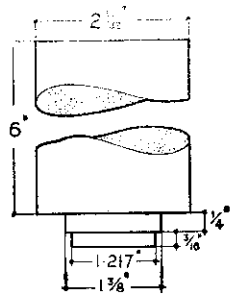


Fig. Y.11. Mandrel for replacement of outer races

See that the slip ring and metal insert are clean; if necessary carefully wipe it clean with a petrol moistened cloth. See that the inside of the magneto body is clean and free from swarf and insert the armature in the body, drive end first.

Refit the contact breaker end plate, taking care that the end plate shims are in position, and replace and tighten the end plate fixing screws. Also replace the pillar carrying the cover fixing arm.

Check the armature for end play. It should revolve freely when turned by hand, but no end play should be felt. If necessary adjust by adding or removing shims behind the contact breaker plate until adjustment is correct.

Replace the cam and contact breaker as follows:

Insert the timing control plunger in its housing, followed by the spring, and screw the timing control tube, together with cable stop, into the housing.

Place the cam in its housing with the formed surface facing outwards, position the broad slot in the cam over the timing range pin and locate the end of the control plunger in the appropriate slot in the cam. Secure the cam by springing the circlip into its location. Note that a recess is provided for the 'eye' at one end of the circlip.

See that the tappet moves freely in the contact breaker body, add a few drops of thin machine oil to the cam lubrication wick, and place the contact breaker body on the end of the armature shaft. Place the specially shaped tag washer over the contact breaker fixing screw and locating the flat side of the washer against the location provided for it in the contact breaker body, screw the bolt home and lock by bending the tags of the washer over the flats on the head of the bolt.

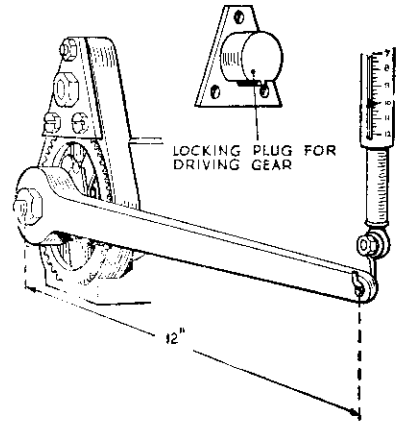


Fig. Y.12. Method of checking clutch setting

Fit the spring arm carrying the contact and also the backing spring (bent portion facing outwards), place a lock washer over the fixing screw, and fully tighten it.

Adjust the contacts to the correct setting (see Routine Maintenance) and replace the contact breaker cover.

See that the pick-up is clean and the brush moves freely. Place the cork washer in position on the magneto body, followed by the pick-up and secure by means of the fixing screws or spring arm.

Check that the earthing brush moves freely in its holder and screw it into the magneto body.

To reassemble the slipping clutch, key the gear centre 'A' (Fig. Y.5) on to the spindle, replace the driving gear 'B', friction washer 'C', clutch spring 'D', locking washer 'E', and secure by tightening the fixing nut 'F' fully. The U-shaped jig must be used to prevent rotation of the shaft while tightening the nut.

After assembling, the setting of the clutch must be checked, This can easily be done by locking the driving gear and applying a steady load on the driving spindle, as shown in Fig. Y.12. The clutch should slip with a torque of 4—10 lbs. feet or more, i.e., a 4—10 lb. pull measured on a spring balance via a spanner 12 in. long. If slipping occurs at a value outside these limits, a new clutch spring must be fitted.

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# BSA SERVICE SHEET No. 803

## Models C10 and C11

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## COIL IGNITION EQUIPMENT

The coil ignition equipment comprises an ignition coil and a contact breaker. The ignition is provided with an automatic timing control which automatically varies the firing point according to the requirements of the engine. A warning light is provided, which lights up when the engine is stationary or running slowly, serving as a reminder to the rider to switch off.

The contact breaker unit has a moulded base, and the shaft is carried in two porous bronze bushes.

The centrifugal automatic timing control is housed in the body of the unit beneath the contact breaker base.

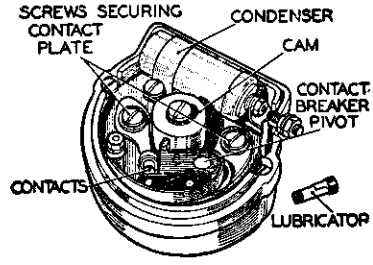


Fig. Y13.
Contact breaker, Model DKX1A

### ROUTINE MAINTENANCE

#### Lubrication

To be carried out every 3,000 miles.

Cam. Smear the surface of the cam very lightly with Mobilgrease No. 2 or, if this is not available, clean engine oil may be used.

Contact breaker pivot. Place a small amount of Mobilgrease No. 2 or clean engine oil on the pivot on which the contact breaker lever works. Do not allow any grease or oil to get on to the contacts.

Shaft. A lubricator is fitted in the shank of the unit, add a few drops of thin machine oil. Later models do not have this lubricator and no attention is required.

Automatic timing control. Add a few drops of thin machine oil through the hole in the contact breaker base through which the cam passes.

#### Cleaning

To be carried out every 6,000 miles. Wipe the inside and outside of the moulding with a soft dry cloth. Examine the contact breaker. The contacts must be free from grease or oil. If they are burned or blackened, clean them with a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this, unscrew the nut securing the end of the contact breaker spring, and remove the nut, spring washer and bush. Lift the contact breaker lever off its bearing. After cleaning, check the contact breaker gap setting.

#### Contact Breaker Gap Adjustment

Turn the engine until the contacts are seen to be fully opened, and check the gap with a gauge having a thickness of .010in.—.012in. If the gap is correct, the gauge should be a sliding fit, but if the gap varies from the gauge, the setting must be adjusted.

To do this, keep the engine in the position giving maximum contact opening and

slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is set to the thickness of the gauge and tighten the two locking screws.

### High Tension Cables

Examine the high tension cables. Any which have the insulation cracked or perished, or show signs of damage in any other way, must be replaced.

## SERVICING

### Testing in position to locate ignition fault

If a failure of ignition or misfiring occurs, first make sure that the trouble is not due to defects in the engine, carburetter, petrol supply, sparking plug, etc. If necessary adjust the sparking plug gap to the setting recommended (see Service Sheet No. 404).

Examine the high tension cable. If the rubber shows signs of deterioration or cracking, the cable should be renewed.

Test plug and high tension cable by removing the plug and allowing it to rest on the cylinder head and observing whether a spark occurs at the points when the engine is turned. It should, however, be noted that this is only a rough test, since it is possible that a spark may not take place when the plug is under compression.

Switch on the ignition, turn the engine and observe the ammeter reading. If an ammeter reading is given which rises and falls with the closing and opening of the contacts, then the low tension wiring is in order. If the reading does not fluctuate in this way a short circuit in the low tension wiring is indicated, or the contacts are remaining closed. When no reading is given, a broken or loose connection in the low tension wiring or badly adjusted or dirty contacts are indicated.

To trace a fault in the low tension wiring, switch on the ignition, and turn the engine until the distributor contacts are opened. Refer to the appropriate wiring diagram (see Service Sheet No. 808) and with the aid of a voltmeter (0—10 volts), fitted with two insulated leads, the ends of which are provided with clips, check the circuit as follows :—

Lead (yellow and black) from the positive battery terminal to terminal B on ammeter. Connect voltmeter between ammeter and earth. No reading indicates faulty lead or loose connections.

Ammeter.

Connect voltmeter to ammeter (white and purple lead) and earth. No reading indicates faulty ammeter.

Lead (white and purple) between ammeter and ignition switch.

Connect voltmeter to terminal A on ignition switch and earth. No reading indicates faulty lead or loose connections.

Ignition Switch.

Connect voltmeter to terminal IG on ignition switch. No reading indicates fault in switch.

Lead (white) between ignition switch and ignition coil.

Connect voltmeter to ignition coil terminal "SW" and earth. No reading indicates faulty lead or loose connections.

Ignition Coil.

Connect voltmeter to ignition coil terminal "CB" and earth. No reading indicates that fault lies in the coil primary winding.

Lead between ignition coil and contact breaker.

Remove the lead from the terminal on the contact breaker, and connect voltmeter between the end of this lead and earth. No reading indicates faulty lead or loose connections. Reconnect lead.

Contact Breaker.

Connect voltmeter across the contacts. If no reading is obtained, remove the condenser and test again. If a reading is now given, a new condenser must be fitted.

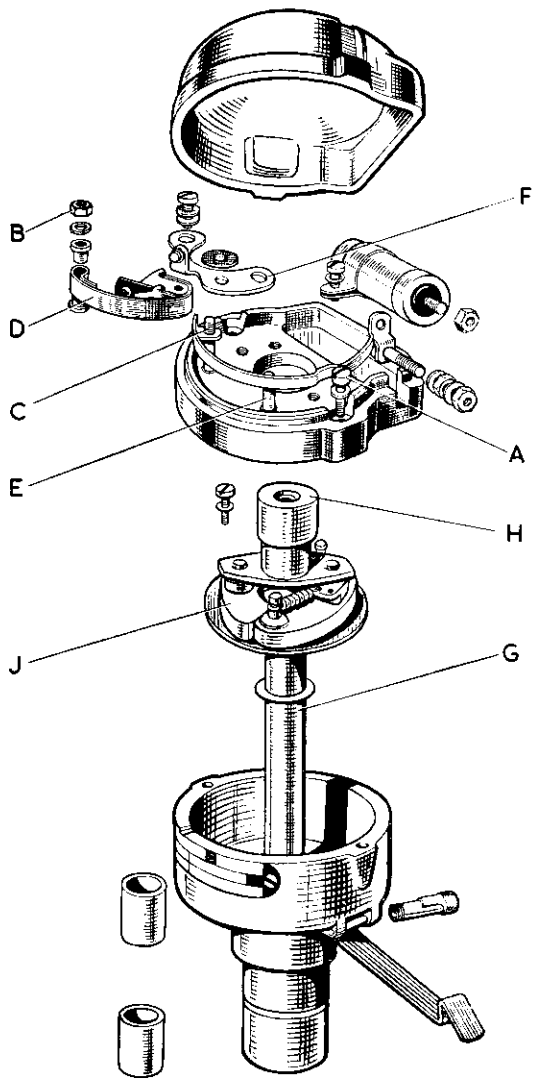


Fig. Y14. Model DKX1A Dismantled

Measure the contact breaker spring tension. This should be 20—24 ozs. measured at the contacts.

If, after carrying out these tests, the fault has not been located, remove the high tension lead from the plug. Switch on the ignition and turn the engine until the contacts close. Flick the contact breaker lever open while the high tension lead from the coil is held about $\frac{3}{16}$in. away from the cylinder block. If the ignition equipment is in order a strong spark should be obtained. If no spark is given, it indicates a fault in the circuit of the secondary winding of the coil and the coil should be replaced.

## To Dismantle

Spring back the securing clips and remove the moulded cap.

To remove the contact breaker base, it is only necessary to withdraw the two screws "A" (Fig. Y14) together with the spring washers. The contact breaker base can be lifted off.

To remove the moving contact, unscrew the nut "B" on the pillar "C" and remove the nut, spring washer and bush. The contact breaker spring "D" can then be lifted off and the contact arm lifted from its pivot "E." The fixed contact is carried on a plate "F" secured by two screws. The condenser can be removed when its terminal nuts and single securing screw are removed.

The shaft "G" carrying the cam "H" and automatic timing control "J" can be removed when the driving dog is taken off.

The automatic timing control should not be dismantled unnecessarily. If it is desired to dismantle the mechanism, carefully note the position of the various components in order that they may be refitted correctly.

**Bearings**

If replacement of bearings is necessary, the following points should be borne in mind. Badly worn bearings are usually indicated by the maximum opening of the contacts varying considerably as the shaft is slowly rotated by hand, while side pressure is applied to the cam.

Porous bronze bearing bushes should be inserted in the body on a highly polished mandrel, which on withdrawal will give the finished bore diameter without machining.

Before use, these bushes should be stored in a covered container, and fully covered with oil of a grade equivalent to Mobiloil Arctic or other good thin mineral oil. The minimum time of soaking should normally be 24 hours ; in case of extreme urgency, this period may be shortened by heating the oil to 100°C., when the time of immersion may be reduced to 2 hours.

**Reassembly**

In the main, reassembly is the reverse of the operations described above. Note that an insulating washer is placed over the contact breaker pivot before the moving contact is fitted.

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# BSA SERVICE SHEET No. 804

*Reprinted May, 1960*

## C10, C11, A, B and M Group Models

## REGULATOR UNIT—Models MCR1 and MCR2

This unit houses the generator voltage regulator unit and the cut-out. Although combined structurally, the regulator and cut-out are electrically separate.

On machines fitted with an E3L Dynamo the regulator unit is type MCR2, this unit is slightly different in construction to the MCR1. The procedure for testing and adjusting is, however, unaltered.

### Positive Earth Lighting System

Some machines have the battery positive terminal connected to the frame instead of the negative terminal. This does not affect the Regulator Adjustment except that the voltmeter connections should be reversed.

### The Regulator

The regulator unit is arranged to work in conjunction with the shunt-wound generators described in Service Sheet No. 809. The regulator is set to maintain a pre-determined generator voltage at all speeds, the field strength being controlled by the automatic insertion of a resistance in the generator field circuit, and a current or series winding on the same regulator compensates this voltage figure in accordance with the output current, to ensure that the battery does not receive an excessive charging current when in a discharged condition. Hence the charging current depends upon the difference between the controlled generator voltage and the battery terminal voltage and is therefore at a maximum when the battery is discharged, automatically tapering off to a minimum as the battery becomes charged and its voltage rises. In addition, a form of temperature compensation ensures that the voltage characteristics of the regulator are matched to those of the battery for large variations in working temperature.

Normally, during day-time running, when the battery is in good condition, the generator gives only a trickle charge, so that the ammeter reading will seldom exceed 1—2 amperes.

### The Cut-Out

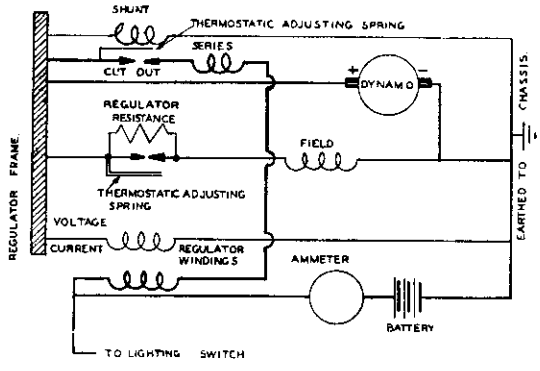


Fig. Y.15. Circuit diagram of charging system

The cut-out is an automatic switch which is connected between the dynamo and battery. It consists of a pair of contacts held open by a spring and closed magnetically. When the engine is running fast enough to cause the voltage of the generator to exceed that of the battery, the contacts close and the battery is charged by the generator. On the other hand, when the speed is low or the engine is stationary, the contacts open, thus disconnecting the generator from the battery and preventing current flowing from the battery through the windings.

**Test Data**

| CUTOUT | MCR.1 | MCR.2 |
|---|---|---|
| Cut-in voltage | 6.2—6.6 volts | 6.3—6.7 volts |
| Drop-off voltage | 3.5—5.3 volts | 4.5—5.0 volts |
| Reverse current | 0.7—2.5 amperes | 3.0—5.0 amperes |

**Regulator**

SETTING IN OPEN CIRCUIT

| | | | |
|---|---|---|---|
| 10°C. | 50°F. | 8.0—8.4 volts | 7.7—8.1 volts |
| 20°C. | 68°F. | 7.8—8.2 volts | 7.6—8.0 volts |
| 30°C. | 86°F. | 7.6—8.0 volts | 7.5—7.9 volts |
| 40°C. | 104°F. | 7.4—7.9 volts | 7.4—7.8 volts |

**Servicing**

TESTING IN POSITION TO LOCATE FAULT IN CHARGING CIRCUIT

If the procedure given in Service Sheet No. 809 shows the generator to be in order, proceed to check further as follows:—

First ensure that the wiring between regulator and battery is in order. To do this, disconnect the wire from the "A" terminal of the regulator (Fig. Y.16). It may be necessary in some cases to remove the regulator from the motorcycle.

Connect the end of the wire removed to the positive terminal of a voltmeter, and connect the negative voltmeter terminal to an earthing point on the machine.

If a voltmeter reading is given, the wiring is in order and the regulator must be examined. If there is no reading, examine the wiring for broken wires or loose connections.

**Regulator Adjustment**

Remove the cover of the regulator unit, insert a piece of paper between the cut-out contacts, and proceed as follows:

Connect the positive terminal of the moving coil voltmeter (0—10 volts) to the D terminal on the regulator and connect the other lead of the voltmeter to an earthing point on the engine.

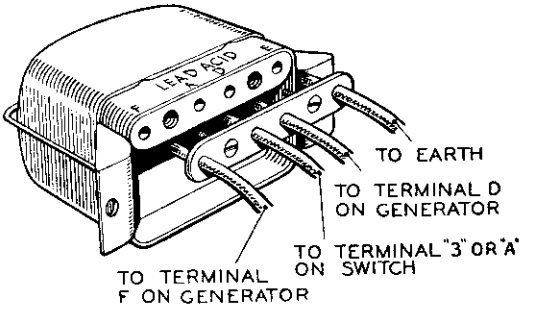


Fig. Y.16. Connections to regulator unit

Start the engine and slowly increase the speed until the voltmeter needle "flicks" and then steadies; this should occur at a voltmeter reading between the limits for the particular atmospheric temperature.

If the voltage at which the reading becomes steady is outside these limits, the regulator must be adjusted.

Shut off the engine, release the locknut "A" (Fig. Y.17) on the regulator adjusting screw "B" and turn the screw in a clockwise direction to raise the setting, or in an anti-clockwise direction to lower the setting. Turn the screw a fraction of a turn at a time and then tighten the locknut.

When adjusting, do not run the engine up to more than half-throttle, as while the dynamo is on open circuit, it will build up to a high voltage if run at a high speed and so a false voltmeter reading would be obtained.

Remove paper from between cut-out contacts.

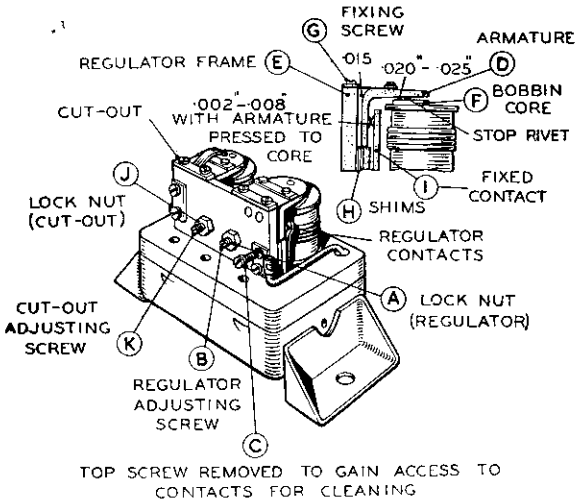


Fig. Y.17. Regulator and cut-out adjustment and setting.

## Cleaning the Regulator Contacts

After long periods of service it may be found necessary to clean the vibrating contacts of the regulator. These are accessible if the top screw "C" securing the fixed contact is removed and the bottom screw slackened to permit the fixed contact to be swung outwards. The contacts can then be polished with fine emery cloth.

## Mechanical Setting of Regulator

The armature carrying the moving contact of the regulator is accurately set and should not be removed. If, however, it does become necessary to re-set the contacts, slacken the two fixing screws "G" Fig. Y.17, and proceed as follows:—

Insert a .015 in. (0.20 in.) feeler gauge between the back of the armature "D" and the regulator frame "E".

Press back the armature against the frame and down on to the top of the bobbin core with the gauge in position, and lock the armature by tightening the two fixing screws "G". Check the air gap between the top of the bobbin core "F" and the underside of the armature "D" (not under the stop rivet). Adjust if necessary to .025 in. (.012"—.020"), by removing shims "H" at the back of the fixed contact on an MCR.1 regulator or by bending the fixed contact bracket on an MCR.2 regulator. The gap between the regulator contacts when the armature is pressed down should now be .002"—.008" (.006"—.017"). Finally check, and if necessary re-set, the electrical adjustment of the regulator.

The figures in brackets refer to the MCR.2 regulator.

## Electrical Setting of Cut-out

If the regulator setting is within the correct limits, but the battery is still not receiving current from the dynamo, the cut-out may be out of adjustment or there may be an open circuit in the wiring of the cut-out and regulator unit.

Remove the cable from the terminal on the regulator marked A. Remove the voltmeter lead from the D terminal of the regulator unit and connect it to terminal A. Run the engine as before: at a fairly low engine speed, the cut-out should operate, when a voltmeter reading should be given of the same value as that when the voltmeter was connected to terminal D. If there is no reading, the setting of the cut-out may be badly out of adjustment and the contacts not closing.

To check the voltage at which the cut-out operates, the voltmeter must be connected between the D terminal and earth. Start the engine and slowly increase its speed until the cut-out contacts are seen to close, noting the voltage at which this occurs. This should be 6.2—6.6 volts.

If operation of the cut-out is outside these limits, it will be necessary to adjust. To do this slacken the locknut "J" (Fig. Y.17) on the cut-out adjustment screw "K" and turn the screw in a clockwise direction to raise the voltage setting or in an anti-clockwise direction to reduce the setting, testing after each adjustment by increasing the engine speed until the cut-out is seen to operate, and noting the corresponding reading.

Tighten the locknut after making the adjustment. If the cut-out contacts appear burnt or dirty, place a strip of fine glass paper between the contacts then, with the contacts closed by hand, draw the paper through. This should be done two or three times with the rough side towards each contact.

## Mechanical Setting of Cut-out

If, for any reason, the armature has to be removed from the cut-out frame, care must be taken to obtain the correct air-gap settings on reassembly. These can be obtained as follows:—

Slacken the two armature fixing screws, adjusting screw "K" and the screw securing the fixed contact. Insert a .014" gauge between the back of the armature and the cut-out frame. (The air-gap between the core face and the armature shim should now measure .011"—.015". If it does not, fit a new armature assembly). Press the armature back against the gauge and tighten the fixing screws. With the gauge still in position, set the gap between the armature and the stop plate arm to .030"—.034" be carefully bending the arm. Remove the gauge and tighten the screw securing the fixed contact.

Insert a .025" gauge between the core face and the armature. Press the armature down on to the gauge. The gap between the contacts should now measure .002"—.006" and the drop-off voltage should be between the limits given in the test data. If necessary, adjust the gap by carefully bending the fixed contact bracket.

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# BSA SERVICE SHEET No. 805

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## All Models

## BATTERY — LEAD-ACID TYPES

The range of Lucas batteries listed here covers those models fitted to B.S.A. motor cycles in recent years.

| | |
|---|---|
| PU5E and LVW5E | Small capacity batteries for lightweight machines. |
| PU7E .. .. | Standard battery for cradle mounting. |
| GU11E .. .. | Larger capacity battery for sidecar machines. |
| SC7E .. .. | Large capacity lightweight battery for machines fitted with starting motors or two-way radio equipment, e.g. police machines. |

All current Lucas motor cycle batteries are 'dry charged', and do not require initial charging. Except that these batteries have porous rubber separators, they are identical with earlier models supplied wet or uncharged and require the same routine maintenance when in service.

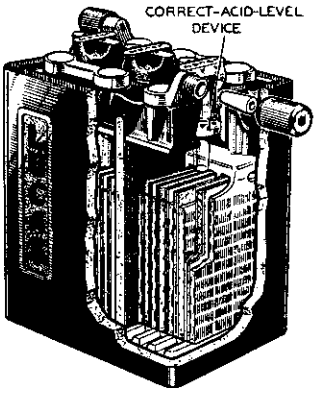


Fig. Y18. Sectioned battery, model PU7E/9

### STORAGE

Used batteries must be fully charged before storing. In temperate climates they should be examined fortnightly, or weekly in the case of model LVW5E and all models when stored in the tropics. If necessary, give them a short refreshing charge.

After a long period of storage, the condition of the battery will often improve if it is put through a 'cycle', as described on page 4.

### MAINTENANCE

Every fortnight, or more frequently in hot climates, examine the condition of the battery. Examine five-plate batteries every week.

Never use a naked light when examining the condition of the cells, as there is a danger of igniting the gas coming from the active materials.

#### Cleaning

Remove the battery cover and clean the cell tops. Examine the connections. If they are loose or dirty, remove them and scrape the contact surfaces clean. Coat them with petroleum jelly before replacing.

Remove the filler plugs and check that the vent holes are clear and that the rubber washer fitted under some plugs is in good condition.

#### Topping-up

During charging, water is lost by gassing and evaporation. Examine the electrolyte level in each cell and, if necessary, add distilled water to raise the electrolyte level with the top edges of the separators.

SC7E batteries have a woven glass pad fitted in each cell to reduce splashing when the battery is gassing during charging. When 'topping-up' this type of battery it is useful to note that the correct electrolyte level is reached when moisture appears through the porous glass pad.

### The Lucas Battery Filler

The use of a Lucas motor cycle Battery Filler will be found helpful in this 'topping-up' process, as it ensures that the correct electrolyte level is automatically attained and also prevents distilled water from being spilled over the battery top.

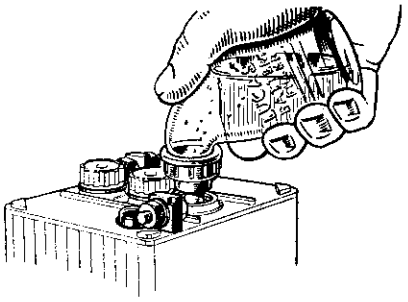

Fig Y19. The Lucas battery filler

### Correct-Acid-Level-Devices

The correct-acid-level-device fitted to some Lucas batteries consists of a central tube with a perforated flange which rests on a ledge in the filling orifice.

When 'topping-up' a battery fitted with these devices, pour distilled water round the flange (not down the tube) until no more drains through into the cell. This will happen when the electrolyte level reaches the bottom of the central tube and prevents further escape of air displaced by the 'topping-up' water. Lift the tube slightly to allow the small amount of water in the flange to drain into the cell. The electrolyte level will then be correct.

If a battery requires 'topping-up' too frequently, the voltage regulator (on machines fitted with d.c. generators) may be out of adjustment, i.e. set too high, and should be checked. Conversely, a persistently low state of charge may be due to a regulator being set too low.

If one cell in particular needs 'topping-up' more than another, it is likely the container is cracked, in which event replace the battery and clean the carrier, using a solution of ammonia or bi-carbonate of soda in water. After cleaning and drying, paint the battery carrier and other surfaces affected by the electrolyte with anti-sulphuric paint.

## TABLES OF SPECIFIC GRAVITIES AND CHARGING RATES

| Battery | Plates per cell | Amp. Hr. Capacity | | Electrolyte to fill one two-volt cell | | Home Trade and Climates Ordinarily below 90°F. (32°C.) Specific Gravity of Acid (corrected to 60°F.) | | Climates frequently over 90°F. (32°C.) Specific Gravity of Acid (corrected to 60°F.) | | Initial Charge Current | Re-charge Current |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | 4 | | 5 | 6 | 7 | 8 | 9 | 10 |
| | | At 10 hour rate | At 20 hour rate | Pint | c.c. | Filling | Fully Charged | Filling | Fully Charged | Amp. | Amp. |
| LVW5E | 5 | 5 | 5.7 | 1/8 | 71 | 1.270 | 1.270–1.290 | 1.210 | 1.210–1.230 | 0.3 | 0.5 |
| PU5E | 5 | 8 | 9 | 1/6 | 94 | 1.270 | 1.270–1.290 | 1.210 | 1.210–1.230 | 0.6 | 1.0 |
| PU7E | 7 | 12 | 13.5 | 1/5 | 113 | 1.270 | 1.270–1.290 | 1.210 | 1.210–1.230 | 0.8 | 1.5 |
| GU11E | 11 | 20 | 22.8 | 1/3 | 189 | 1.270 | 1.270–1.290 | 1.210 | 1.210–1.230 | 1.3 | 2.2 |
| SC7E | 7 | 22.5 | 26 | — | 250 | 1.270 | 1.270–1.290 | 1.210 | 1.210–1.230 | 1.5 | 2.5 |

The maximum permissible electrolyte temperature during charging is given below. Should the temperature of the electrolyte exceed this value interrupt the charge and allow the battery temperature to fall at least 10°F. (5.5°C.) before charging is resumed.

| Climates normally below 80°F. (27°C.) | Climates between 80°–100°F. (27°–38°C.) | Climates frequently above 100°F. (38°C.) |
|---|---|---|
| 100°F. (38°C.) | 110°F. (43°C.) | 120°F. (49°C.) |

The specific gravity of the electrolyte varies with temperature. For convenience in comparing specific gravities, they are always corrected to 60°F., which is adopted as the reference temperature. The method of correction is as follows:

For every 5°F. *below* 60°F., *deduct* 0.002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. *above* 60°F., *add* 0.002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte, and not the ambient temperature.

## SERVICING

### Battery Persists in Low State of Charge

First consider the conditions under which the battery is used. If the battery is subject to continuous discharge, e.g. long periods of night parking with lights on without suitable opportunities for recharging, a low state of charge is inevitable.

A fault in the dynamo or regulator, or neglect during a period out of commission, may also be responsible.

### Vent Plugs

See that the ventilating holes in each vent plug are clear, and that the rubber washer fitted under the plug is in good condition.

### Level of Electrolyte

The surface of the electrolyte should be level with the tops of the separators. If necessary, top-up with distilled water. Any loss of acid from spilling or spraying (as opposed to normal loss of *water* by evaporation) should be made good by dilute acid of the same specific gravity as that already in the cell.

### Cleanliness

See that the top of the battery is free from dirt or moisture which might provide a discharge path. Check that the battery connections are clean and tight.

### Hydrometer Tests

The space between each separator is not wide enough to permit the nozzle of an hydrometer to be inserted. Before taking a sample, tilt the battery to bring sufficient electrolyte above the separators. If the level of the electrolyte is so low that an hydrometer reading cannot be taken, no attempt should be made to take a reading after adding distilled water until the battery has been on charge for at least 30 minutes.

Measure the specific gravity of the acid in each cell in turn. The reading given by each cell should be approximately the same; if one cell differs appreciably from the others, an internal fault in that cell is indicated.

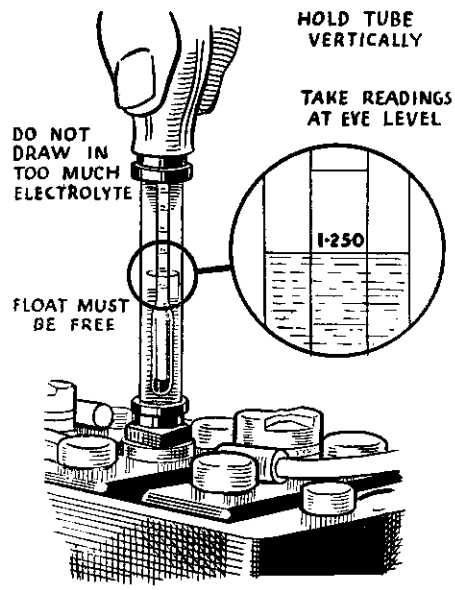


Fig Y20. Taking hydrometer readings

Specific gravity readings and their indications are as follows:

| Climates under 90°F. | | | Climates over 90°F. |
|---|---|---|---|
| 1.270—1.290 | .. | Cell fully charged | 1.210—1.230 |
| 1.190—1.210 | .. | Cell about half discharged | 1.130—1.150 |
| 1.110—1.130 | .. | Cell fully discharged | 1.050—1.070 |

The appearance of the electrolyte drawn into the hydrometer when taking a reading gives a useful indication of the state of the plates: if it is very dirty, or contains small particles in suspension, it is possible that the plates are in a bad condition.

### Discharge Test

Motor-cycle batteries must *not* be subjected to the heavy discharge test, as recommended for motor-car and commercial vehicle batteries.

## RECHARGING FROM AN EXTERNAL SUPPLY

If the hydrometer test indicates that the battery is merely discharged, and is otherwise in a good condition, it should be recharged, either on the motor-cycle by a period of daytime running, or on the bench from an external supply.

If the latter, the battery should be charged at the rate given in the table until the specific gravity and voltage show no increase over three successive hourly readings. During the charge the electrolyte must be kept level with the tops of the separators by the addition of distilled water.

A battery that shows a general falling-off in efficiency, common to all cells, will often respond to the process known as 'cycling'. This process consists of fully charging the battery by passing through it from an external source the appropriate re-charge current given in the table. The battery is then discharged by connecting to a lamp board, or other load, taking a current equal to the normal re-charge current. The battery should be capable of providing this current for at least 7 hours before it is fully discharged, as indicated by the voltage of each cell falling to 1.8. If the battery discharges in a shorter time, repeat the 'cycle' of charge and discharge.

## PREPARING BATTERIES FOR SERVICE

All new batteries are supplied without electrolyte but with the plates in a charged condition. When they are required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required.

### Preparation of Electrolyte

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid. The mixing must be carried out either in a lead-lined tank or in suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. *Never add water to acid*, as the resulting chemical reaction causes violent and dangerous spurting of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

The approximate proportions of acid and water are indicated in the following table:

| To obtain Specific Gravity (corrected to 60°F.) of | Add 1 vol. of acid 1.835 S.G. (corrected to 60°F.) to |
|---|---|
| 1.270 | 2.8 vols. of water |
| 1.210 | 4.0 vols. of water |

Heat is produced by the mixture of acid and water, and the electrolyte should be allowed to cool before pouring it into the battery.

The total volume of electrolyte required can be estimated from the figures quoted in the table on page 2.

### Filling the Battery

Carefully break the seals in the cell filling holes and fill each cell with electrolyte to the top of the separators, *in one operation*. The temperature of the filling room, battery and electrolyte should be maintained between 60°F. and 100°F. If the battery has been stored in a cool place, it should be allowed to warm up to room temperature before filling.

### Putting into Use

Batteries filled in this way are 90 per cent charged. If time permits, however, a freshening charge of four hours at the normal recharge rate given in the table would be beneficial.

During the charge the electrolyte must be kept level with the top edge of the separators by the addition of distilled water. Check the specific gravity of the acid at the end of the charge; if 1.270 acid was used to fill the battery, the specific gravity should now be between 1.270 and 1.290; if 1.210, between 1.210 and 1.230.

### Maintenance in Service

After filling, the battery needs only the recommended attention.

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# BSA SERVICE SHEET No. 806

*Reprinted April, 1960*

## All Models

## LAMPS

### LUCAS LIGHTING

### Headlamps

Although the headlamps fitted to individual models may vary in detail, they remain similar with regard to the general features described below. All headlamps are fitted with a double filament main bulb and a pilot bulb. One of the double filaments provides the main riding beam while the second, brought into operation by means of the dipper switch, provides the dipped beam.

On some models the headlamp incorporates a panel containing the ammeter and lighting switch but if a cowl is fitted then it carries these components externally to the headlamp shell.

Other headlamps contain wire wound resistances for the purpose of reducing the charging rates under certain conditions and these are described under the appropriate lighting circuit.

### Setting and Focusing

The best way of checking the setting of the lamp is to park the motor cycle in front of a light coloured wall at a distance of about 25 feet. If necessary, slacken the bolts securing the headlamp and move the lamp until, with the main driving light switched on, the beam is projected straight ahead and parallel with the ground. With the lamp in this position, the height of the beam centre from the ground should be the same as the height of the centre of the headlamp from the ground.

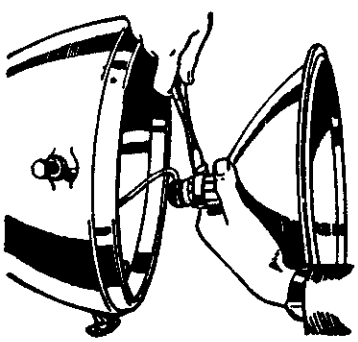

Fig. Y.22 Headlamp Focusing.

The headlamp must be focused so that, when the main driving light is switched on, a uniform beam without any dark centre is given. If the bulb needs adjusting, remove the lamp front and reflector, as described below, and slacken the bulb holder clamping clip at the back of the reflector. Move the bulb holder backwards and forwards until the correct position is obtained, and then tighten the clamping clip.

More sealed beam light units are fitted with the pre-focus type of bulb and therefore no focusing is necessary.

### Removal of Front and Reflector, pre-1948 models

Press back the fixing clip at the bottom of the lamp. The front and reflector can now be taken off. The bulb holder is secured to the reflector by means of two fixing springs. When replacing the front, locate the top of the rim first, then press on at the bottom and secure with the fixing clip.

When fitting a main headlamp bulb, care must be taken to insert it the correct way round, i.e. with the dipped beam filament above the centre filament.

The pre-focus type bulb is located by a flange and there is a notch which engages on a raised portion of the bulb holder to ensure correct positioning.

Where the pilot bulb is contained in an underslung cowl, the metal strip on which the bulb is mounted should be pushed to the rear and lifted away in order to provide access to the bulb.

### Tail Lamps

Where the tail lamp is of the metal type the body or back should be removed by pushing it in, rotating to the left, and pulling away, thus providing access to the bulb. The moulded plastic type of rear lamp can be dismantled by unscrewing the two screws in the cover.

When a stop lamp is fitted, a two-filament type of bulb is employed with offset bayonet type fixing pins to ensure that it can only be fitted correctly.

## MAIN BULBS

### Models A7, A10, B31, 32, 33, 34, C12, C15 and M20, M21.

Lucas No. 168, 6v. 24/24w. (with E3H Dynamo). Lucas No. 169, 6v. 30/30w. (with E3L Dynamo). Lucas No. 312, 6v. 30/24w. (Pre-focus type Bulb).

### Models C10 and C11.

Lucas No. 180, 6v., 18/18w. (with E3H Dynamo). Lucas No. 168, 6v. 24/24w. (with E3L Dynamo).

### Models C11G and D1 (early) Lucas

Lucas No. 312, 6v. 30/24w. (Pre-focus type Bulb).

## PILOT

Lucas No. 200, 6v. 3w. Lucas No. 988, 6v. 3w. (with Sealed Beam Light Unit).

## TAIL

Lucas No. 205, 6v. 6w.
Lucas No. 384, 6v. 6/18w. (Stop/Tail Lamp).

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### 1948 Models (Fig. Y.23)

Press back the fixing clip at the bottom of the lamp, and remove the lamp front. The reflector is secured to the lamp body by means of a rubber bead. When refitting the rubber bead, locate its thinner lip between the reflector rim and the edge of the lamp body. To replace the front, locate the metal tongue in the slot at the top of the lamp, press the front on, and secure by means of the fixing catch.

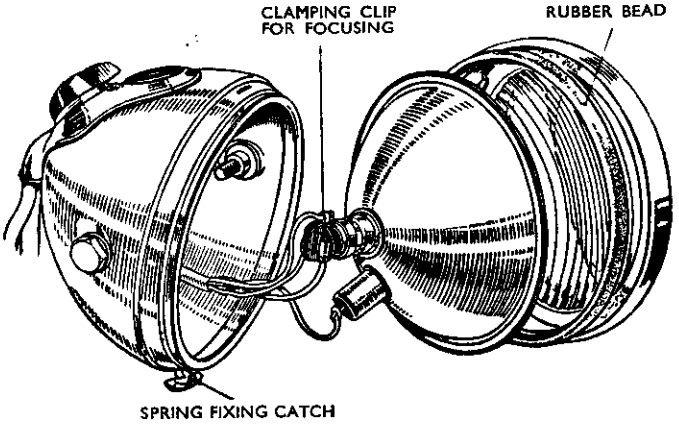


Fig. Y.23.

### Sealed Beam Headlamps

Later models are fitted with a sealed light unit having the reflector and glass sealed together. After slackening the securing screw on the top of the headlamp, the rim, complete with light unit, may be removed. To replace, locate the rim on the lip at the bottom of the lamp body, press the light unit assembly and rim into position and tighten the securing screw. The main headlamp bulb in some of these headlamps is of the pre-focus type and is held in position by a cap with bayonet type fitting. In all cases access to the main or pilot bulbs is obtained by removal of the light unit assembly.

Breakage of the headlamp glass with this type of unit involves replacement of the glass and reflector complete. The light unit may be removed from the headlamp rim after prising out the retaining clips.

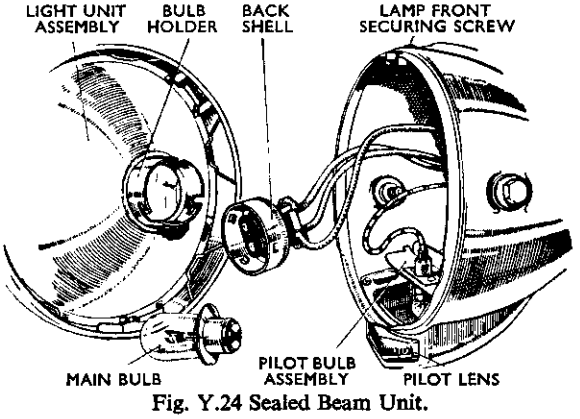


Fig. Y.24 Sealed Beam Unit.

### Replacement of Bulbs

When the replacement of a bulb is necessary, it is important not only that the same size bulb is fitted, but that it has a high efficiency and will focus in the reflector. Cheap and inferior replacement bulbs often have the filament of such a shape that it is impossible to focus correctly; for example, the filament may be to the one side of the axis of the bulb resulting in loss of range and light efficiency.

Lucas Genuine Spare Bulbs are specially tested to check that the filament is in the correct position to give the best results with Lucas lamps. To assist in identification, Lucas bulbs are marked on the metal cap with a number. When fitting a replacement. see that it has the same number as the original bulb.

# BSA SERVICE SHEET No. 807

*Reprinted Oct.*, 1959

**All Models**

## ELECTRIC HORN—HIGH FREQUENCY MODELS

### General

Electric horns are adjusted to give their best performance before leaving the Works, and will give long periods of service without any attention.

### Servicing

If the horn becomes uncertain in action or does not vibrate, it does not follow that the horn has broken down. The trouble may be due to a discharged battery or a loose or broken connection in the horn wiring.

The performance of the horn may be upset by the fixing bolt working loose, or by the vibration of some part adjacent to the horn. To check this, remove the horn from its mounting, hold it firmly in the hand by its bracket and press the push. If the note is still unsatisfactory, the horn may require adjustment, but this should only be necessary after a very long period of service.

### Method of Adjusting

The adjustment of a horn does not alter the characteristics of the note but merely takes up wear of vibrating parts.

If the horn is used repeatedly when badly out of adjustment, due usually to unsuccessful attempts at adjustment, the horn may become damaged, due to the excessive current which it will take. When testing, do not continue to operate the push if the horn does not sound. If, when the push is operated, the horn does not take any current (indicated by an ammeter connected in series with the horn) it is possible that the horn has been adjusted so that its contact breaker is permanently open.

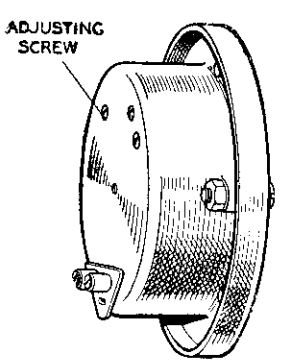


Fig. Y26.
Typical electric horn, showing adjustment screw.

After adjusting, note the current consumption, which must not exceed 3—4 amperes. A horn may give a good note, yet be out of adjustment and taking an excessive current. When adjusting do not attempt to unscrew the nut securing the tone disc or any other screw in the horn.

The adjustment is made by turning the adjustment screw, usually in a clockwise direction. The underside of the screw is serrated, and the screw must not be turned for more than 2 or 3 notches before re-testing. If the adjustment screw is turned too far in a clockwise direction, a point will occur at which the armature pulls in but does not separate the contacts.

Some models have no adjustment screw at the back of the horn. Adjustment is carried out by means of the grub screw and locking collar which are revealed upon removal of the large domed nut on the front of the horn. Take care that the large nut securing the sounding disc is not disturbed. The locking collar requires a special tool, or a large screwdriver with the blade ground so as to leave two projecting prongs, in order that it may be undone. No attempt should be made to loosen the collar without a proper tool as it is very tight and may become damaged so that it cannot be removed. The adjustment should be carried out in a similar manner to that described for the other type of horn, but the locking collar should be firmly tightened after each adjustment as this affects the note.

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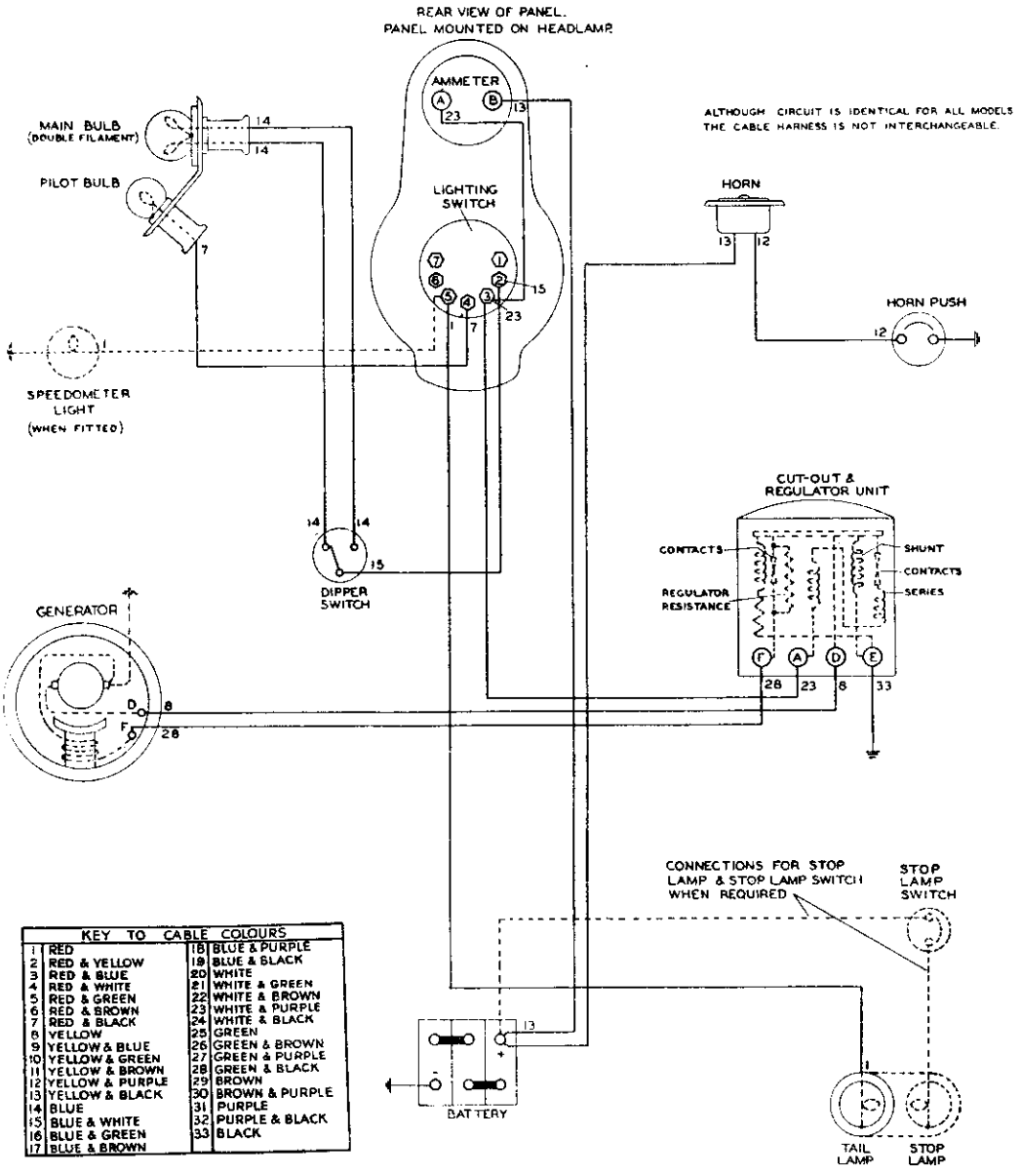
# BSA SERVICE SHEET No. 808

*Oct.*, 1948
*Reprinted March, 1960*

## A, B and M Group Models

## WIRING DIAGRAMS

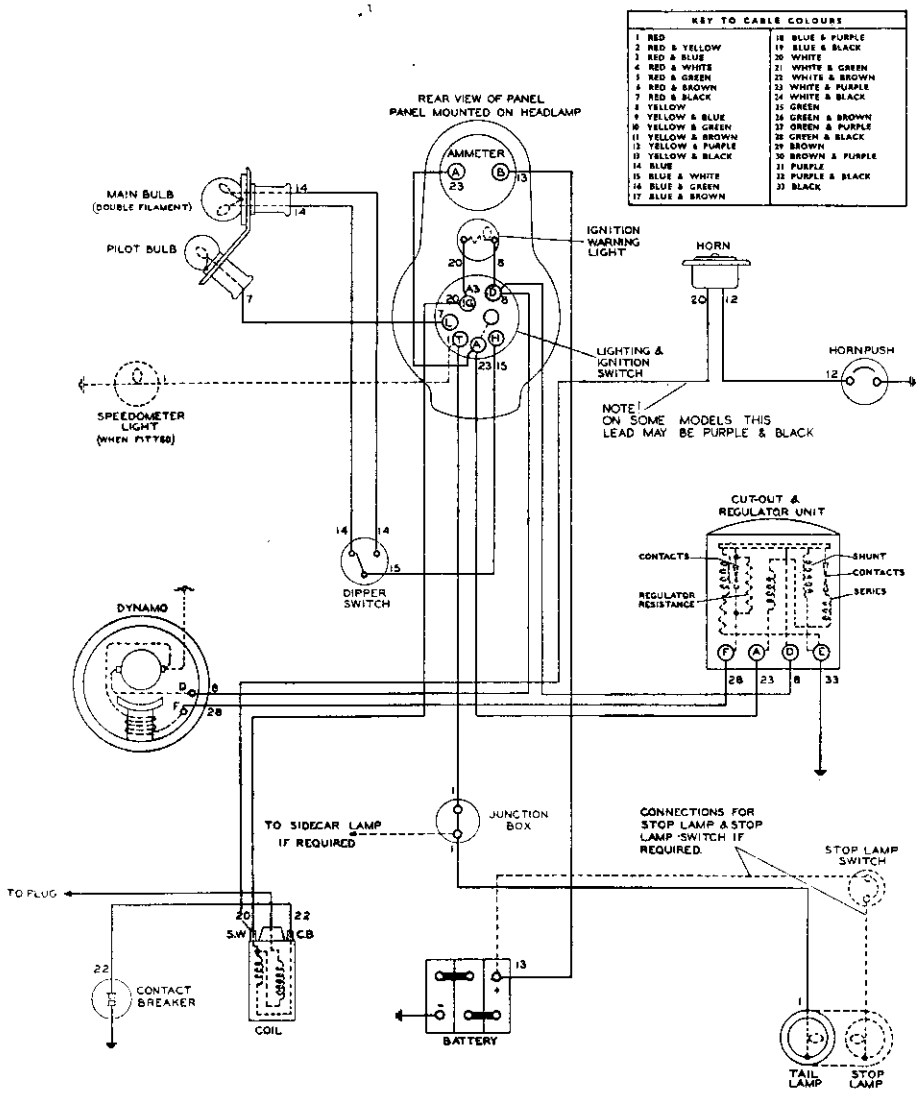
### (NEGATIVE EARTH)




| KEY TO CABLE COLOURS | | | |
|---|---|---|---|
| 1 | RED | 18 | BLUE & PURPLE |
| 2 | RED & YELLOW | 19 | BLUE & BLACK |
| 3 | RED & BLUE | 20 | WHITE |
| 4 | RED & WHITE | 21 | WHITE & GREEN |
| 5 | RED & GREEN | 22 | WHITE & BROWN |
| 6 | RED & BROWN | 23 | WHITE & PURPLE |
| 7 | RED & BLACK | 24 | WHITE & BLACK |
| 8 | YELLOW | 25 | GREEN |
| 9 | YELLOW & BLUE | 26 | GREEN & BROWN |
| 10 | YELLOW & GREEN | 27 | GREEN & PURPLE |
| 11 | YELLOW & BROWN | 28 | GREEN & BLACK |
| 12 | YELLOW & PURPLE | 29 | BROWN |
| 13 | YELLOW & BLACK | 30 | BROWN & PURPLE |
| 14 | BLUE | 31 | PURPLE |
| 15 | BLUE & WHITE | 32 | PURPLE & BLACK |
| 16 | BLUE & GREEN | 33 | BLACK |
| 17 | BLUE & BROWN | | |

*Numbers indicate cable identification colours. See key.*

# C10 and C11 Models
# WIRING DIAGRAM
(NEGATIVE EARTH)




*Numbers indicate cable identification colours. See key.*

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J.U. B4549

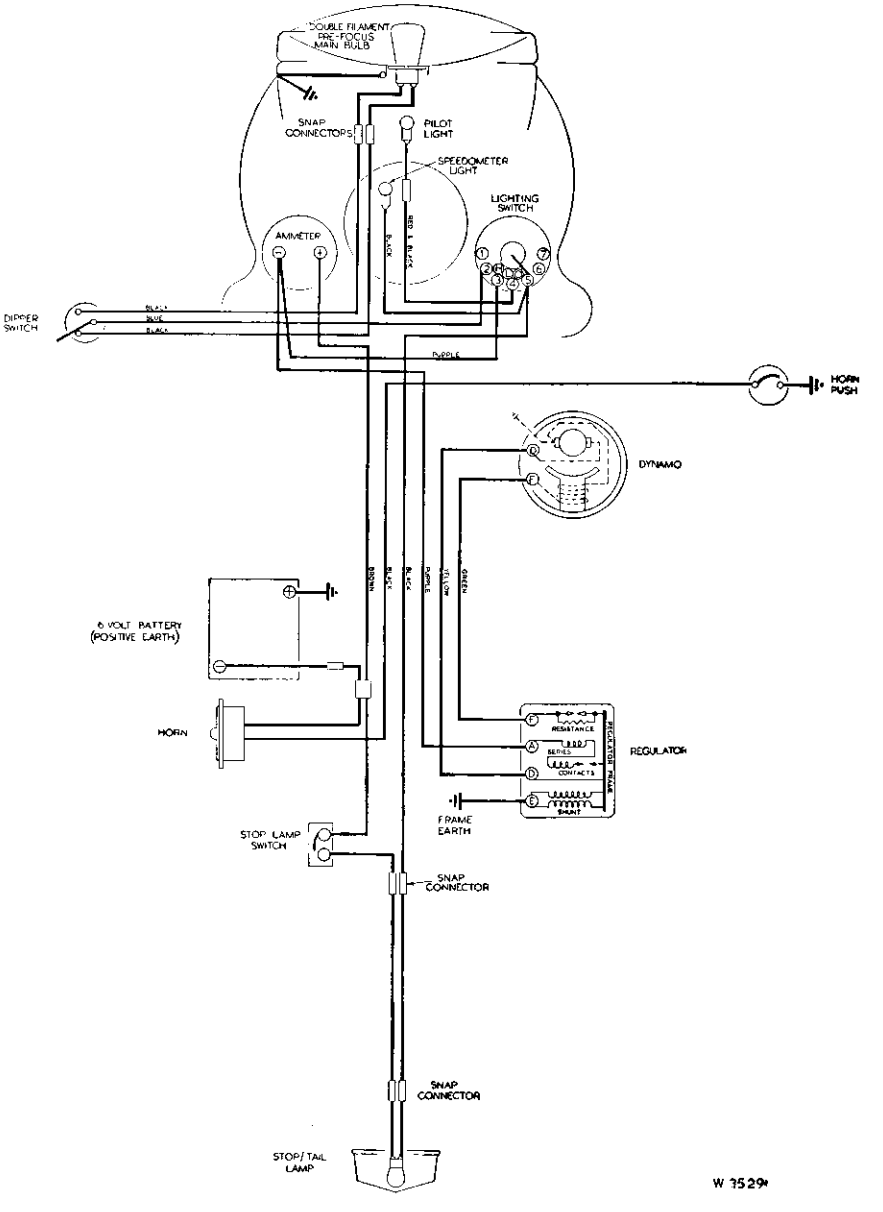
# BSA SERVICE SHEET No. 808A

*Reprinted January, 1960*

## A, B and M Group Models

### WIRING DIAGRAM

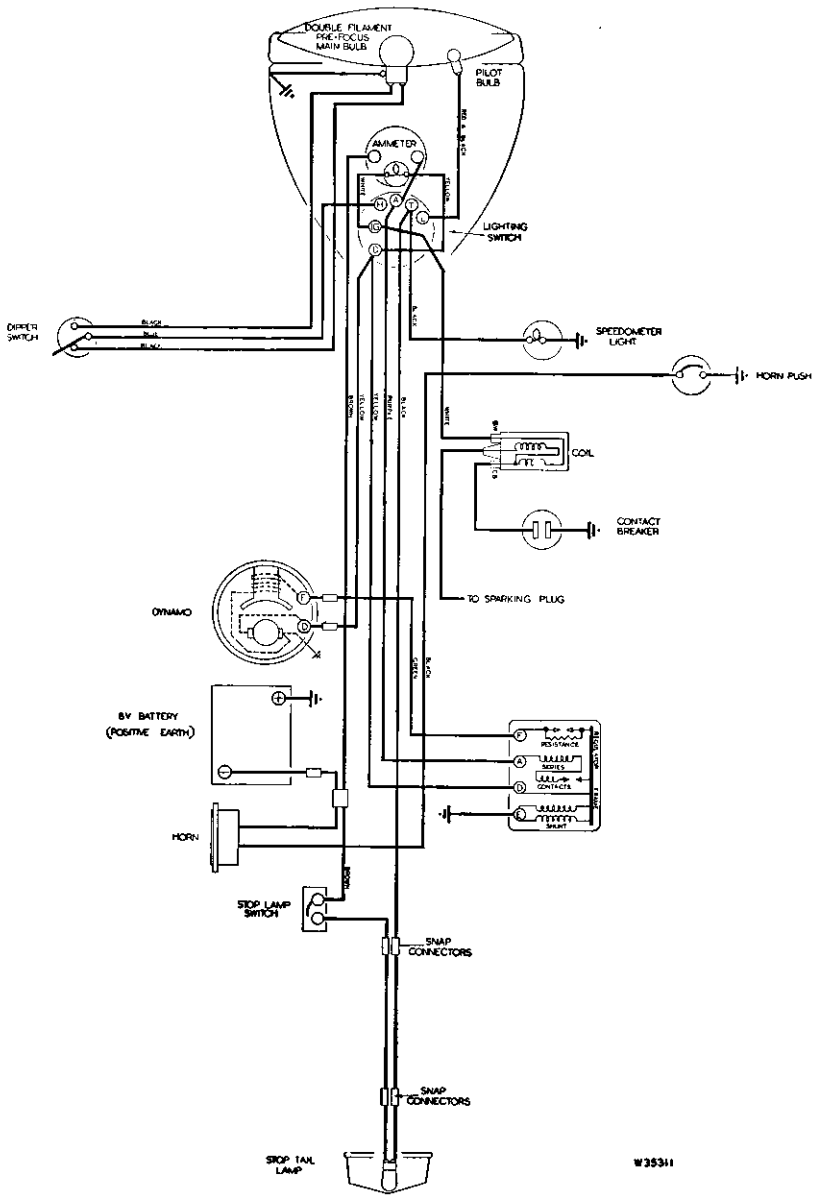
### (Positive Earth System)



# C Group Models

## WIRING DIAGRAM

## (Positive Earth System)

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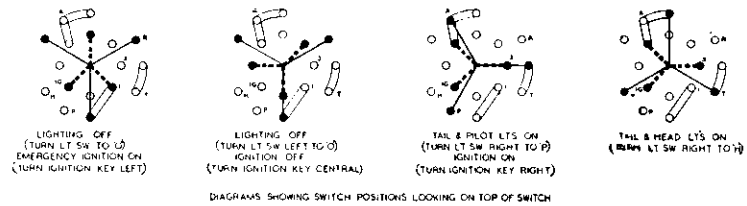
# BSA SERVICE SHEET No. 808B

*Reprinted March 1960*

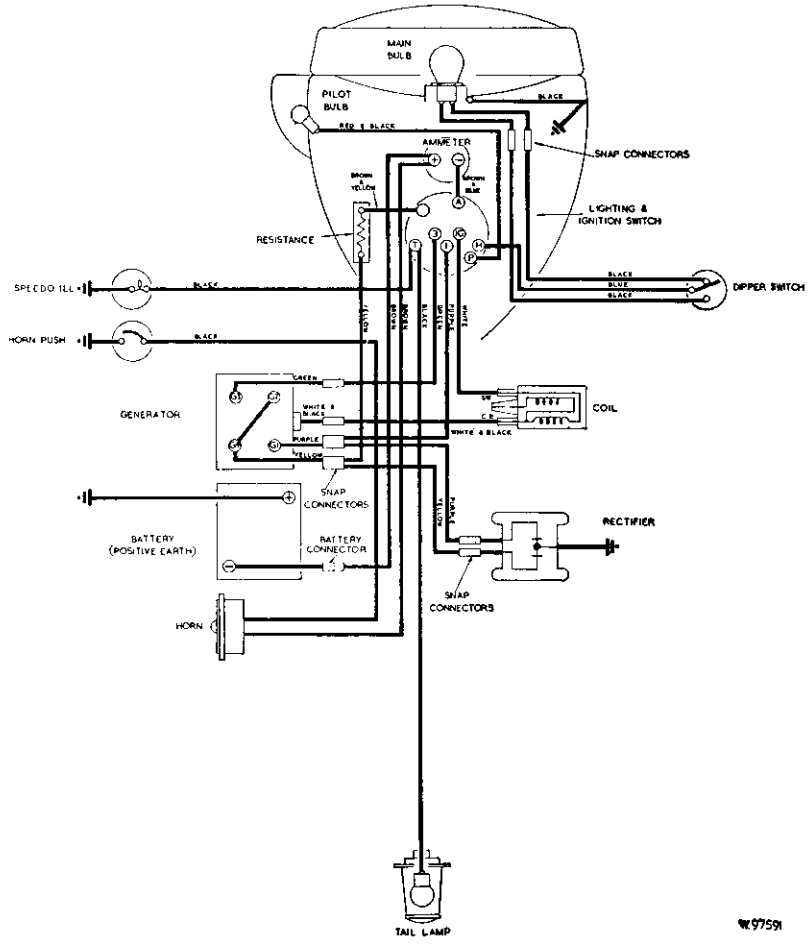
## D Group Models

## WIRING DIAGRAMS

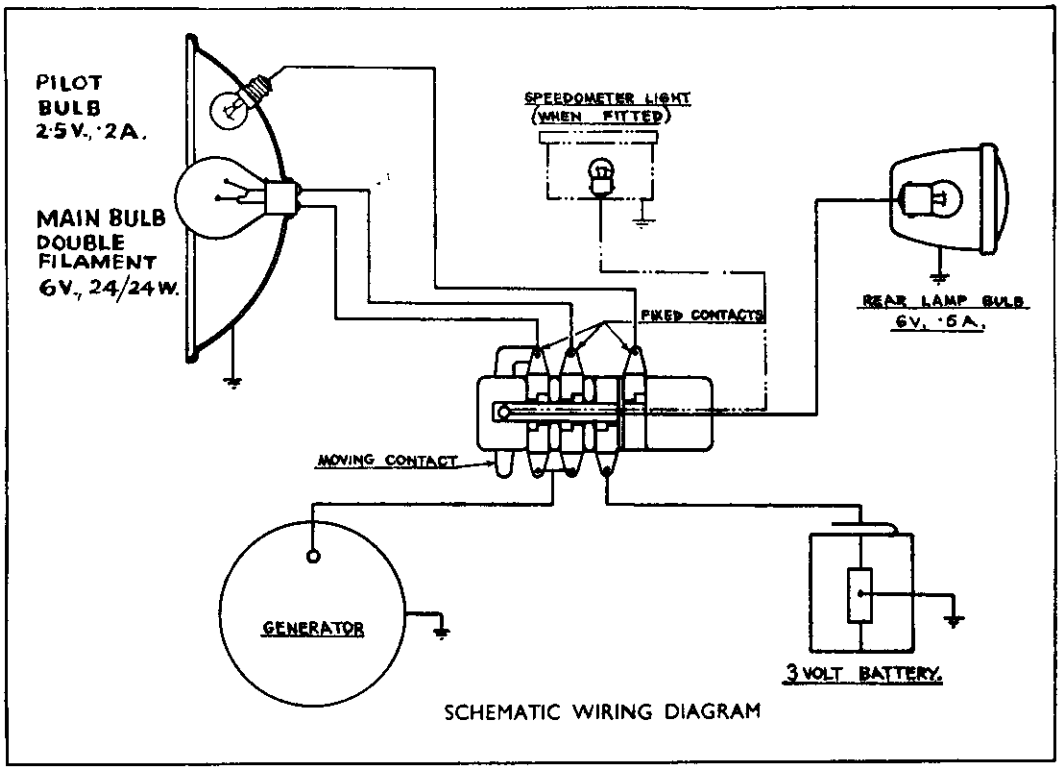
### Lucas D.C. Lighting



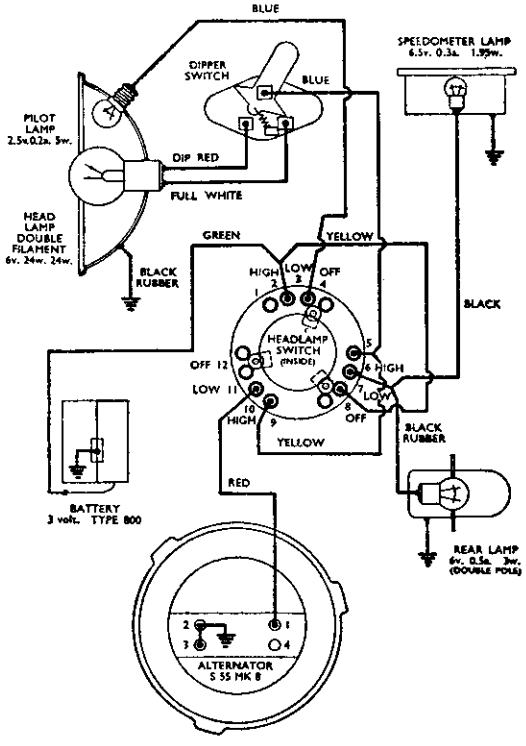

DIAGRAMS SHOWING SWITCH POSITIONS LOOKING ON TOP OF SWITCH



## Wipac A.C. Lighting




SCHEMATIC WIRING DIAGRAM




ABOVE: Wiring diagram for Wipac A.C. lighting when fitted with remotely controlled switch operated by handlebar lever.

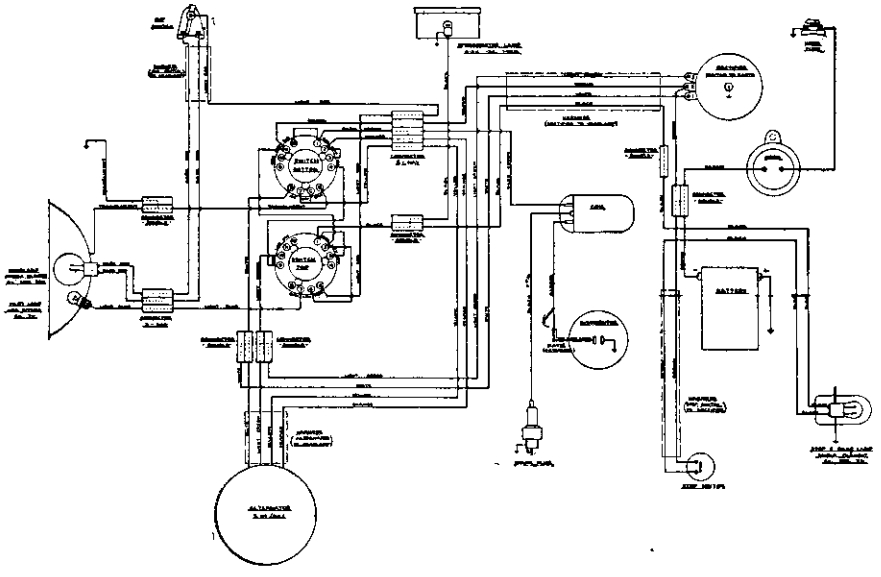
LEFT: Wiring diagram for Wipac A.C. lighting when switch is mounted on top of the headlamp shell.

# BSA SERVICE SHEET No. 808C

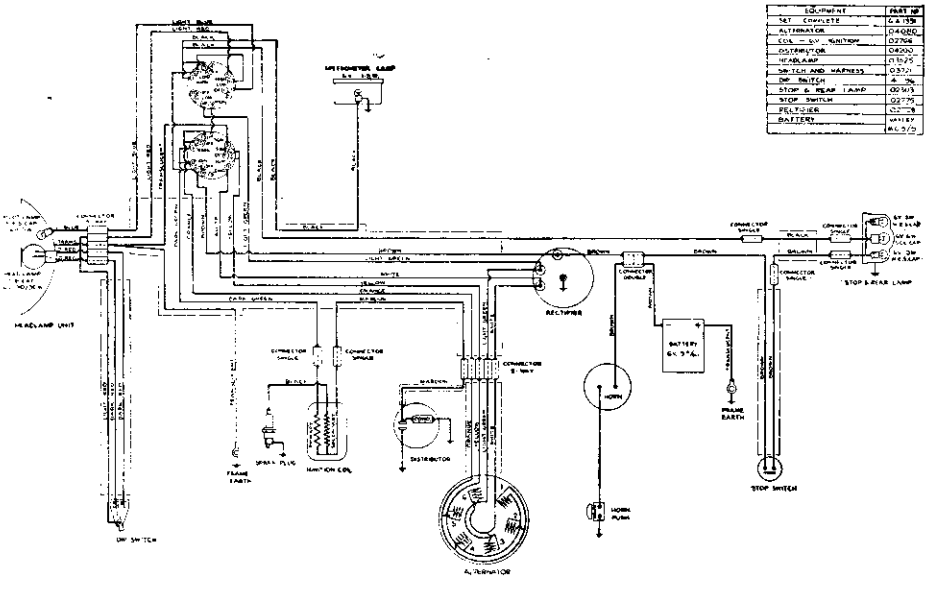
## WIRING DIAGRAMS

*Reprinted January, 1958*

### Model C10L
### (Wipac Lighting)

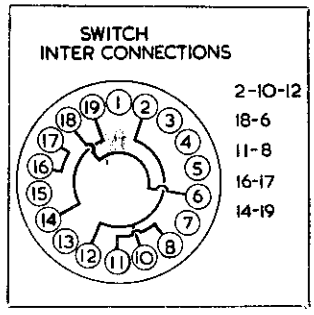


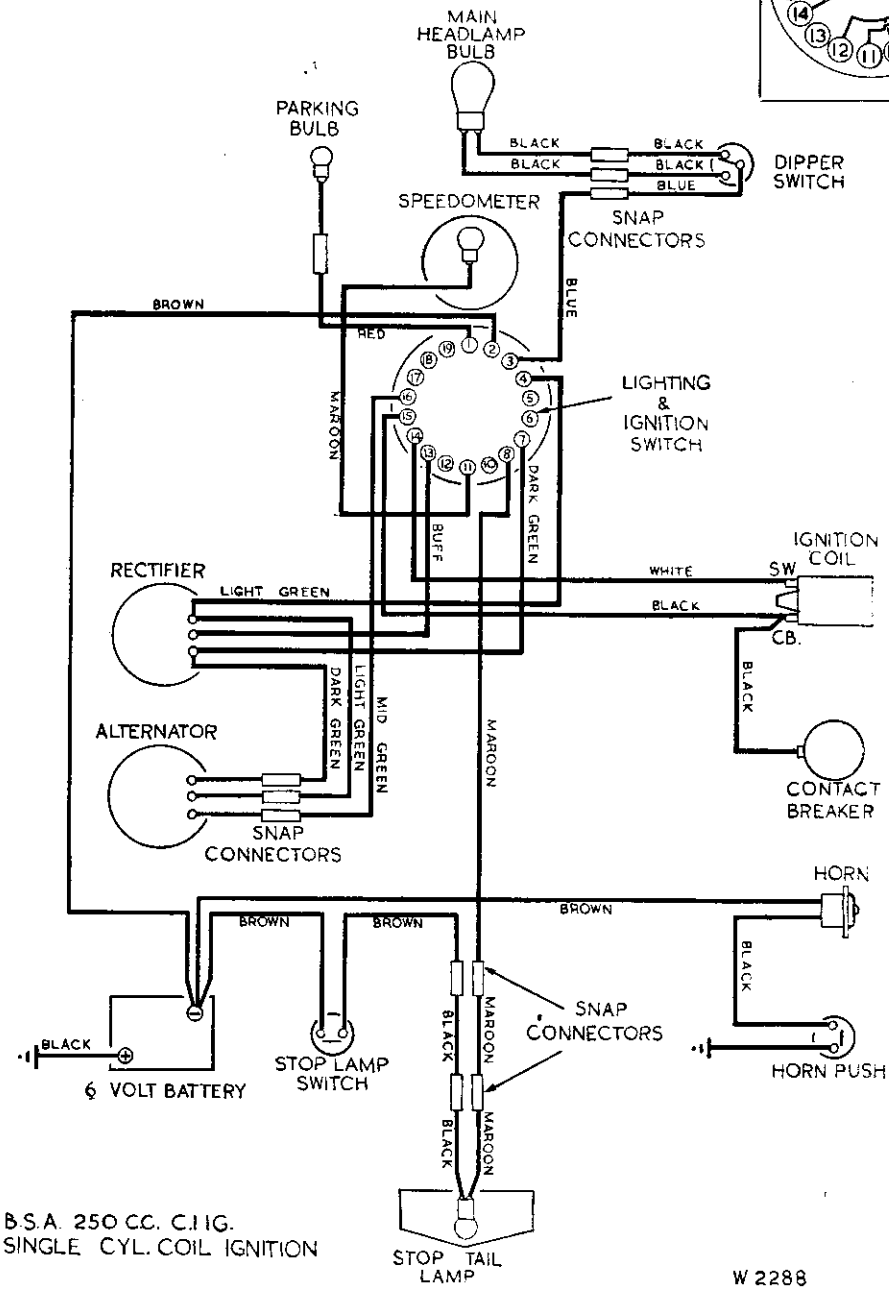
1954 Models



1955 Models

# Model C11G
## (Lucas Lighting)




B.S.A. 250 CC. C.11G.
SINGLE CYL. COIL IGNITION

W 2288

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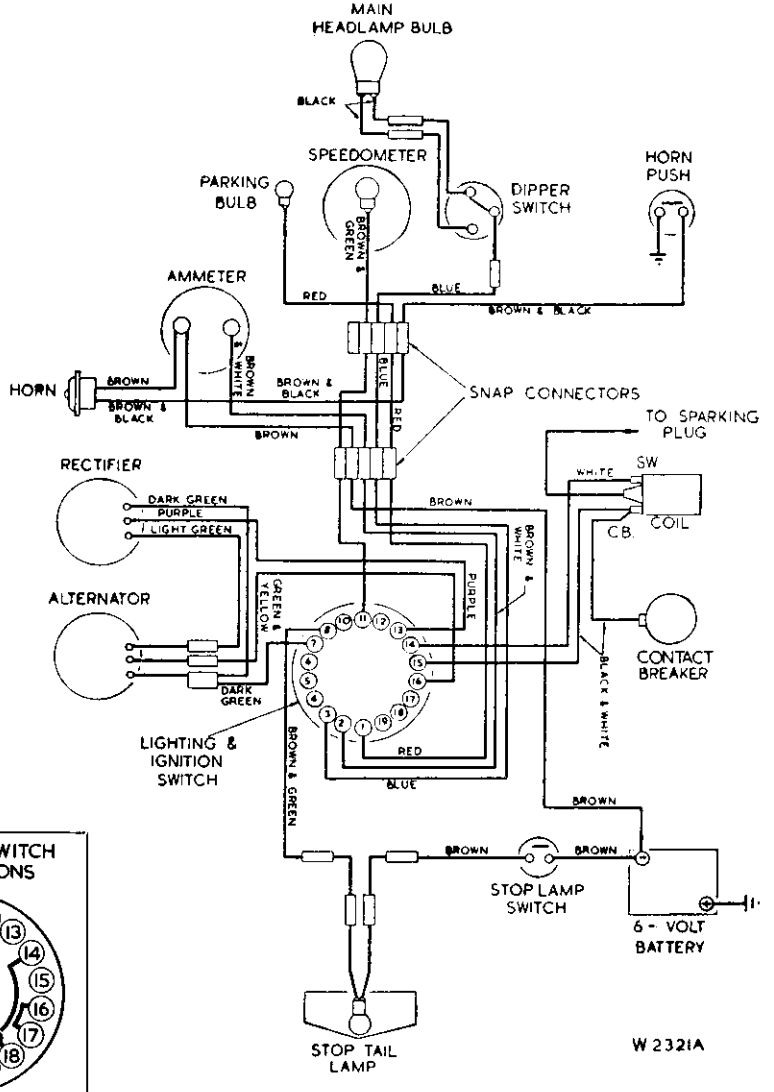
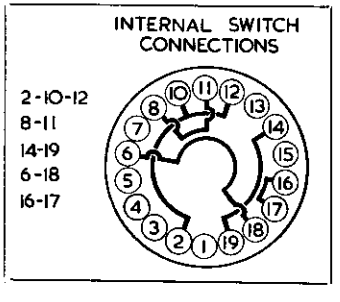
# BSA SERVICE SHEET No. 808D

## 1956 C Group Models

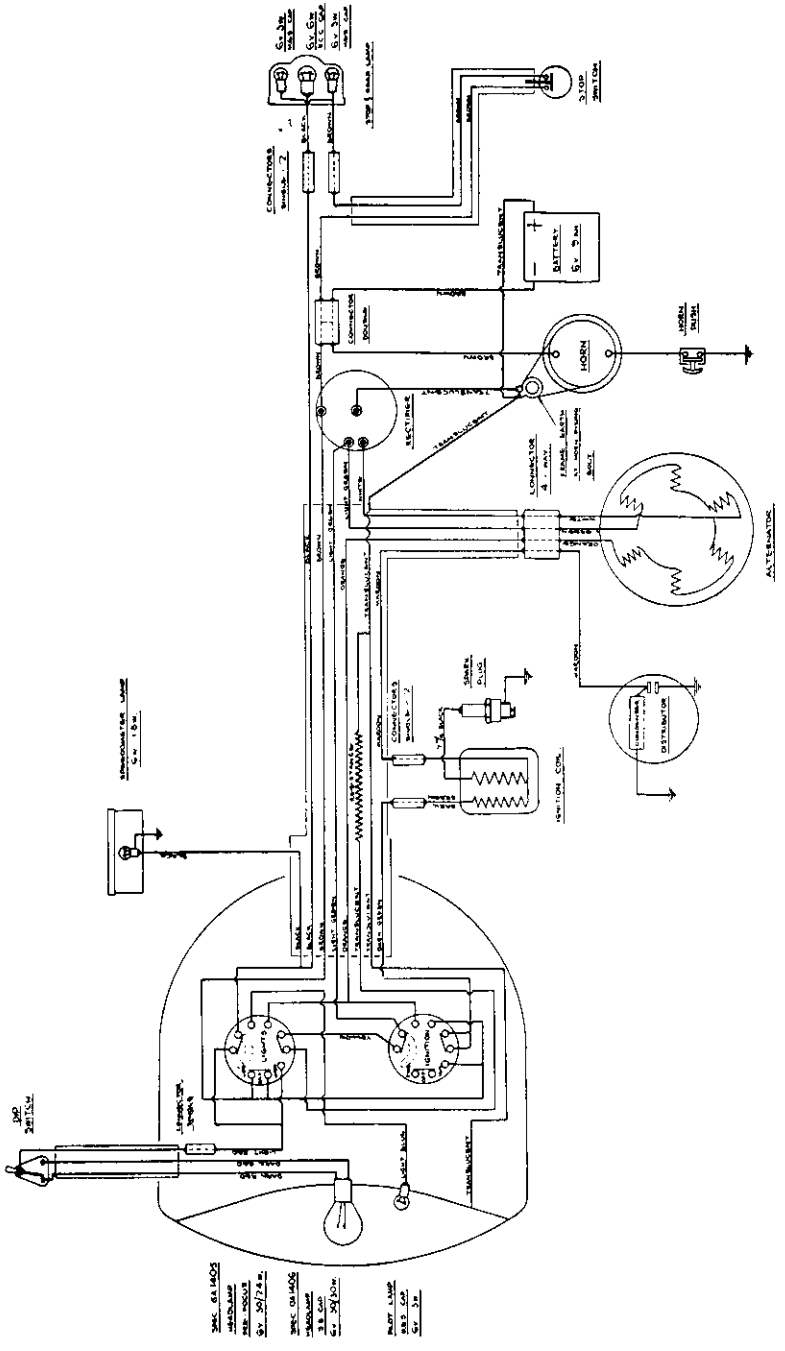
## WIRING DIAGRAMS

## C12



# C10L (1956)


HORN
BATTERY
DISTRIBUTOR
IGNITION COIL
ALTERNATOR
motor
motor

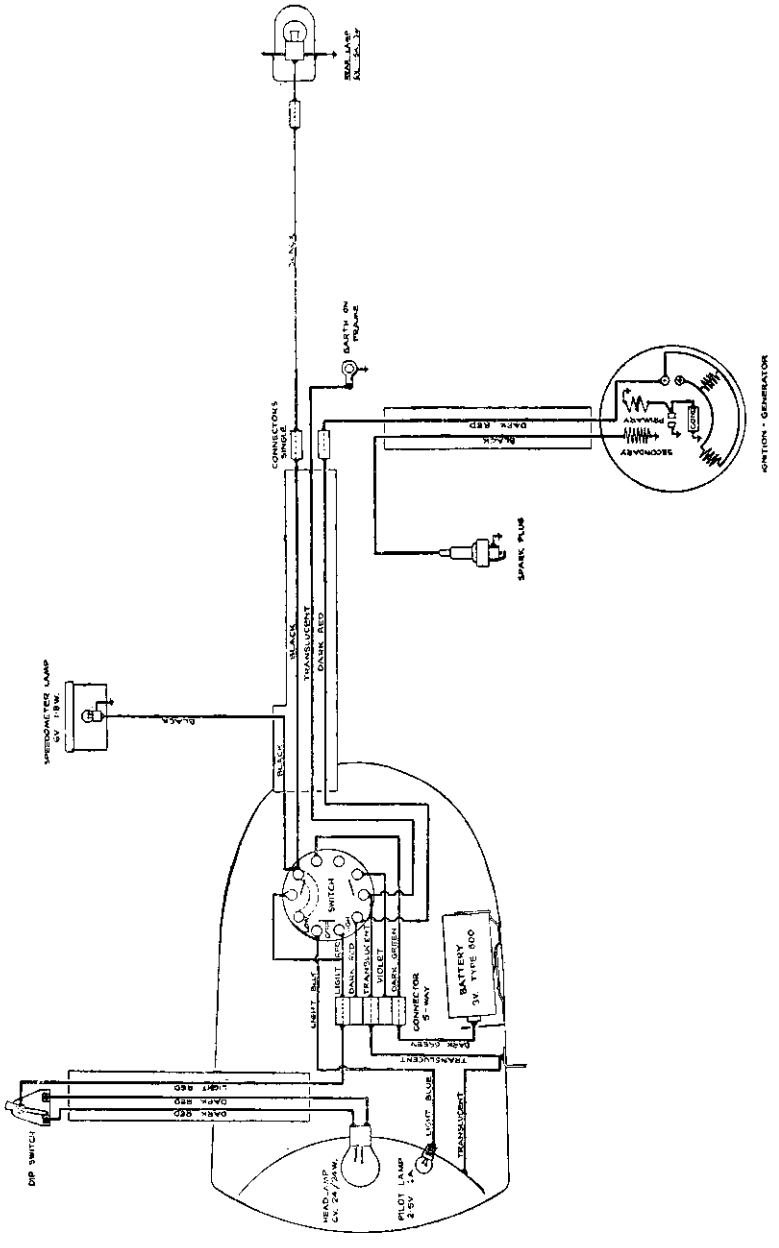
# BSA SERVICE SHEET No. 808E

*Reprinted November*, 1959

## 1956 D Group Models

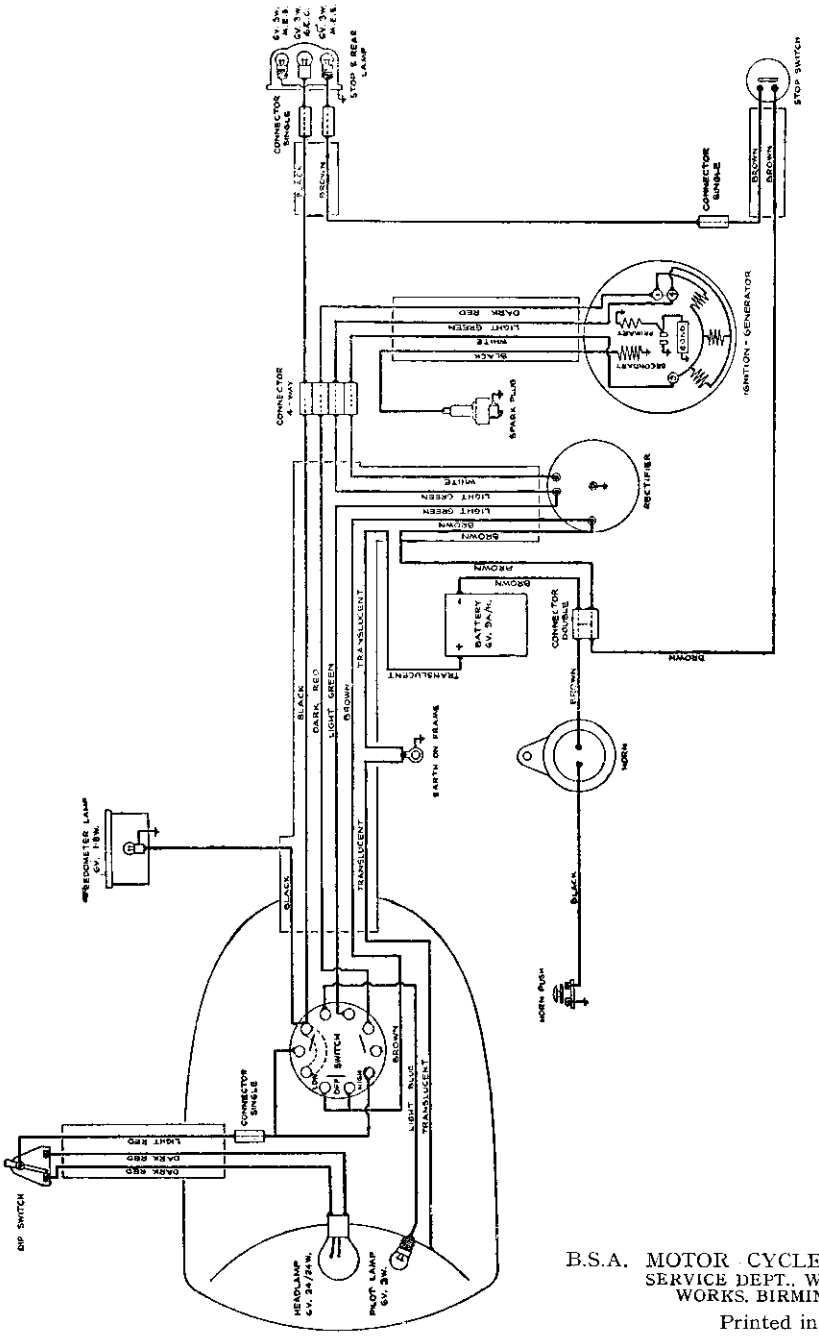
## WIRING DIAGRAMS

## Wipac A.C. Lighting



## Wipac D.C. Lighting

(Positive Earth System)

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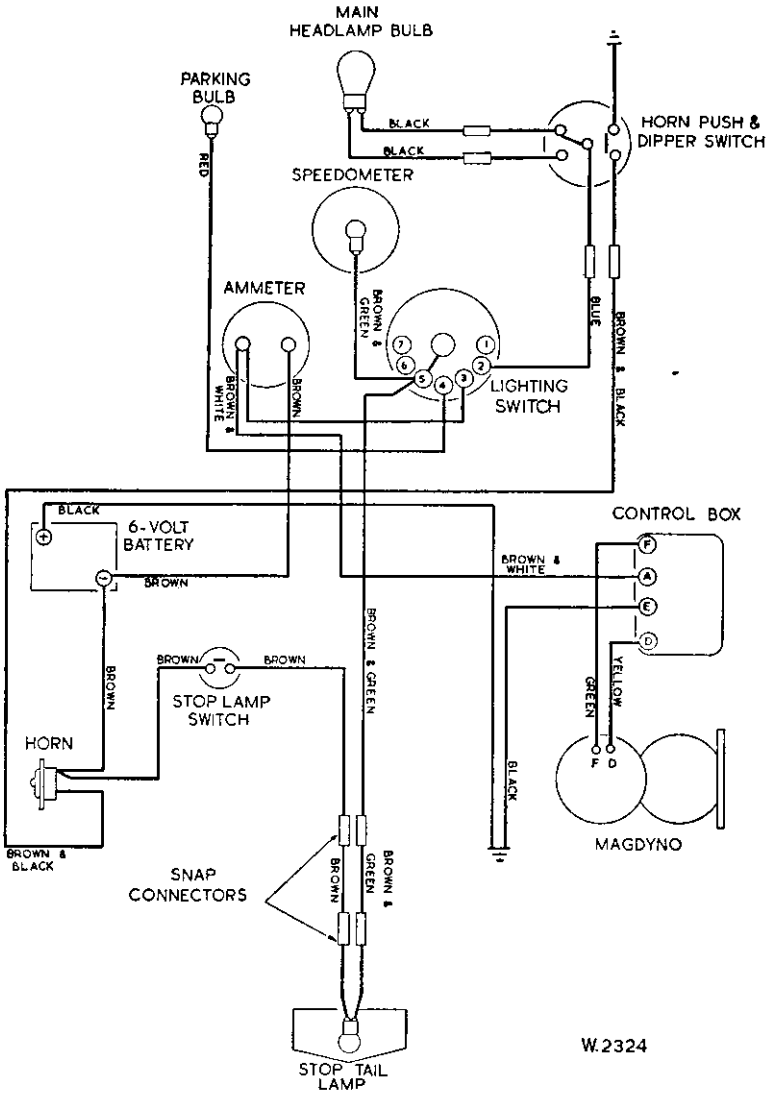
# BSA SERVICE SHEET No. 808F

*Reprinted September* 1958

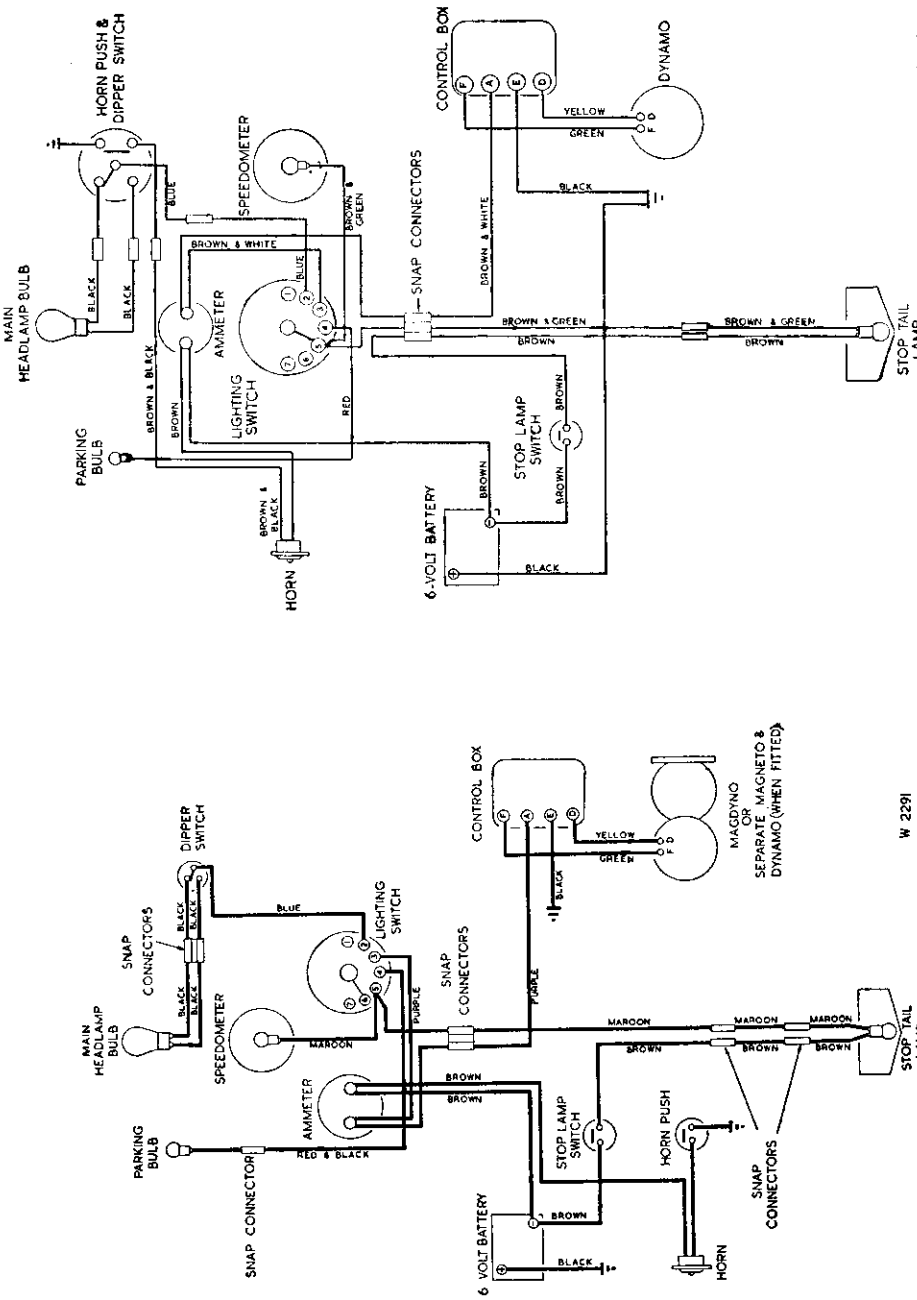
## M Group Models

### WIRING DIAGRAM (Positive Earth System)




1956/57 Models

# A and B Group Models. Wiring Diagrams

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Birmingham 10

# BSA SERVICE SHEET No. 808H

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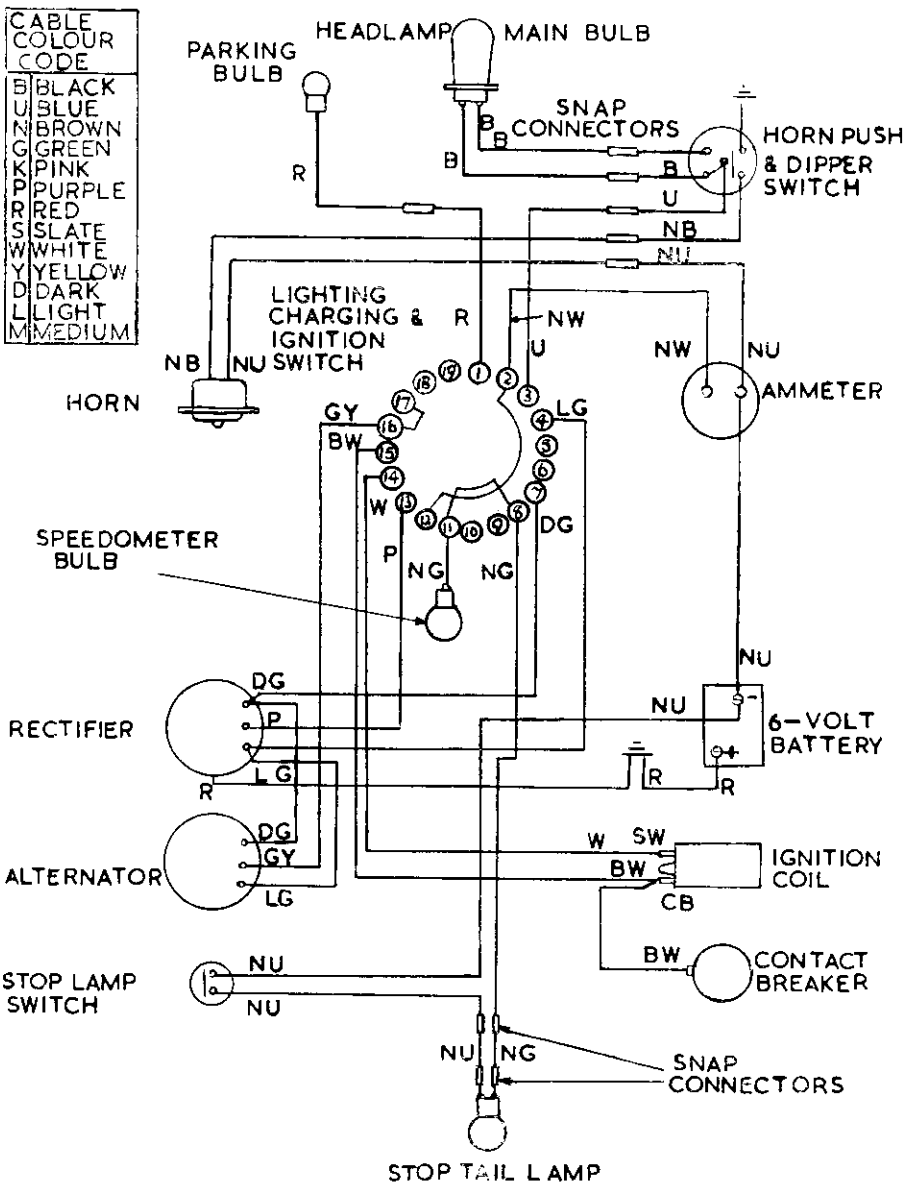
## B Group Models

(FITTED WITH ALTERNATOR)

### WIRING DIAGRAM (Positive Earth System)

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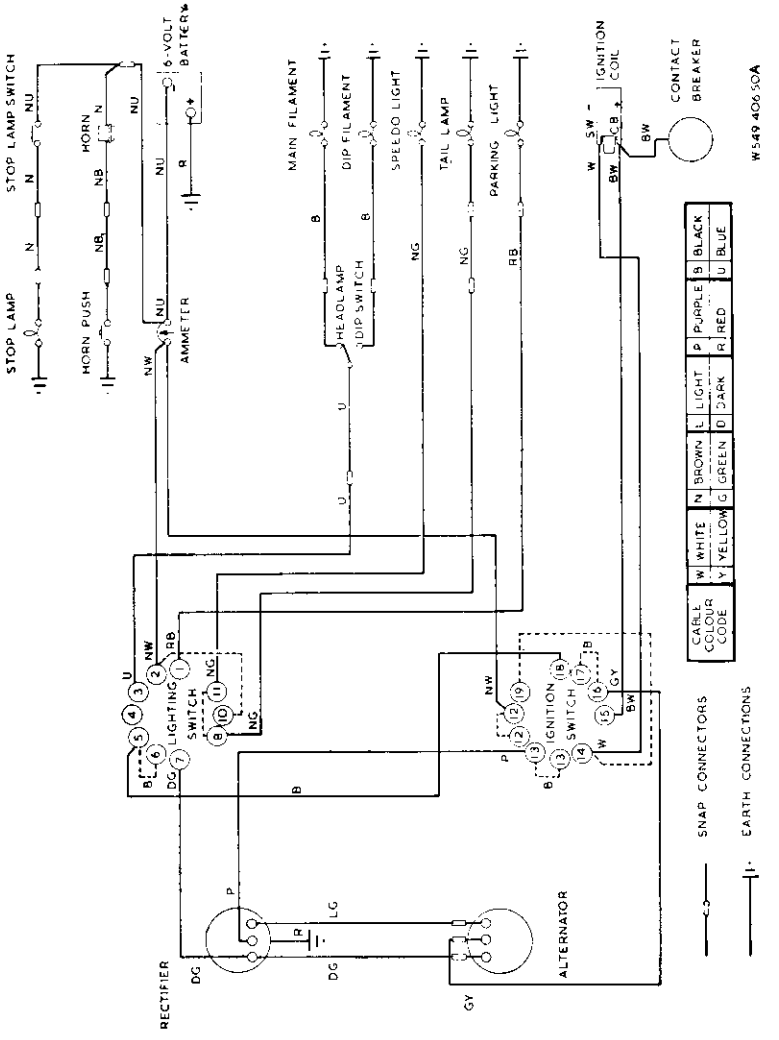
# BSA SERVICE SHEET No. 808J

*Printed December*, 1958

## Model C15

### WIRING DIAGRAM.
### (Positive Earth System)

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# BSA SERVICE SHEET No. 808K

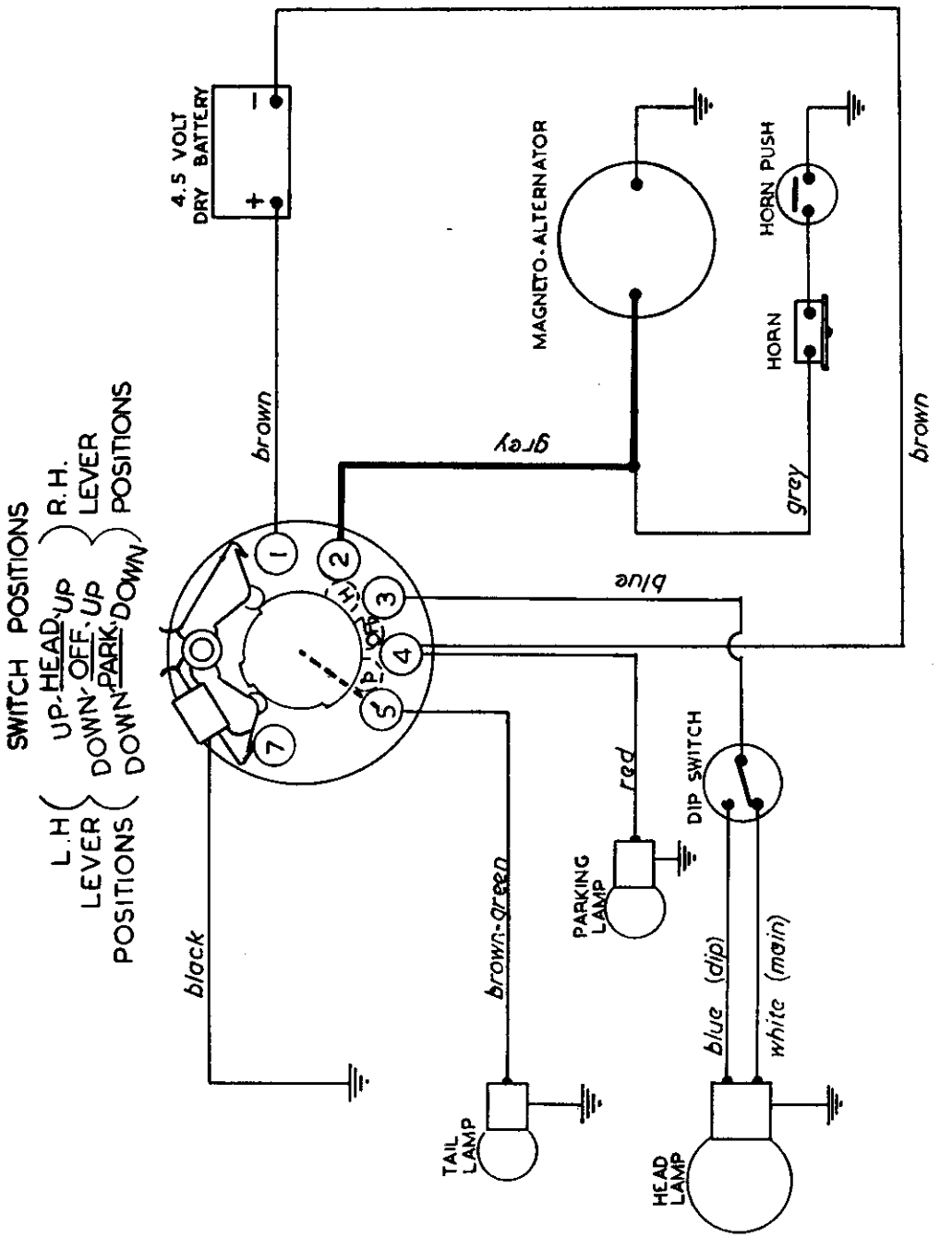
## Dandy 70

### WIRING DIAGRAM

**LUCAS ELECTRICAL EQUIPMENT**
**(Fitted on and after Engine No. DSE14103)**
**(FLYWHEEL MAGNETO-ALTERNATOR MODEL 8FI)**

*Printed November* 1959

*This sheet supersedes previous issue of same number*



# BSA SERVICE SHEET No. 809

*Revised October, 1958*
*Reprinted October, 1959*

## All Models except D1, C10L, C11G, C12, C15 & B group fitted with alternators

## GENERATORS—MODELS E3H and E3HM

The generator is a shunt-wound two pole machine, arranged to work in conjunction with a regulator unit to give an output which is dependent on the state of charge of the battery and the loading of the electrical equipment in use. When the battery is in a low state of charge, the generator gives a high output, whereas if the battery is fully charged the generator gives only a trickle charge to keep the battery in a good condition without overcharging. In addition, an increase of output is given to balance the current taken by the lamps when in use.

Models E3H and E3HM are similar in construction. The former will be found on motor cycles having separate magneto or coil ignition, while Model E3HM is the generator portion of the combined unit known as the "Magdyno".

### ROUTINE MAINTENANCE

#### Lubrication

The lubricator at the commutator end bracket must be given a few drops of good grade thin machine oil every 1,000—2,000 miles. The bearing at the driving end is packed with H.M.P. grease and will last until the machine is taken down for a general overhaul, when the bearing should be repacked.

#### Inspection of commutator and brushgear

About once every six months remove the cover band for inspection of commutator and brushes. The brushes are held in contact with the commutator by means of springs. Move each brush to see that it is free to slide in its holder; if it sticks, remove it and clean

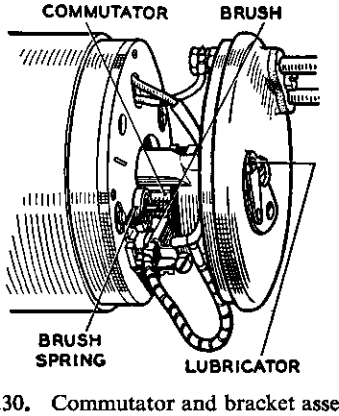



Fig. Y.30. Commutator and bracket assembly

with a cloth moistened with petrol. Care must be taken to replace the brushes in their original positions, otherwise they will not "bed" properly on the commutator. If, after long service, the brushes have become worn to such an extent that the brush flexible is

exposed on the running face, or if the brushes do not make good contact with the commutator, they must be replaced by genuine Lucas brushes. The commutator should be free from any trace of oil or dirt and should have a highly polished appearance. Clean a dirty or blackened commutator by pressing a fine dry cloth against it while the engine is slowly turned over by means of the kick starter crank. (It is an advantage to remove the sparking plug before doing this). If the commutator is very dirty, moisten the cloth with petrol.

### Test Data

Cutting-in speed: 1250—1500 r.p.m. at 7 generator volts.

Output: 6.5 amps. at 1900—2200 r.p.m. at 7 generator volts, taken on 1.1 ohm resistance load. Resistance to be capable of carrying 10 amps. without overheating.

Field resistance 3.2 ohms.

## SERVICING

### Testing in position to locate fault in charging circuit

In the event of a fault in the charging circuit, adopt the following procedure to locate the cause of trouble.

Check that the generator and regulator unit are connected correctly. The generator terminal "D" should be connected to the regulator unit terminal "D" and generator terminal "F" to regulator unit terminal "F".

Remove the cables from the generator terminals "D" and "F" and connect the two terminals with a short length of wire. Start the engine and set to run at normal idling speed.

Connect the positive lead of a moving coil voltmeter, calibrated 0—10 volts, to one of the generator terminals and connect the negative lead to a good earthing point on the generator yoke or engine.

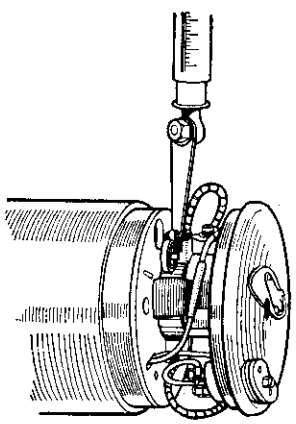


Fig. Y.31. Testing brush spring tension

Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to rise above 10 volts, and do not race the engine in an attempt to increase the voltage. It is sufficient to run the generator up to a speed of 1,000 r.p.m. If there is no reading, check the brush gear as

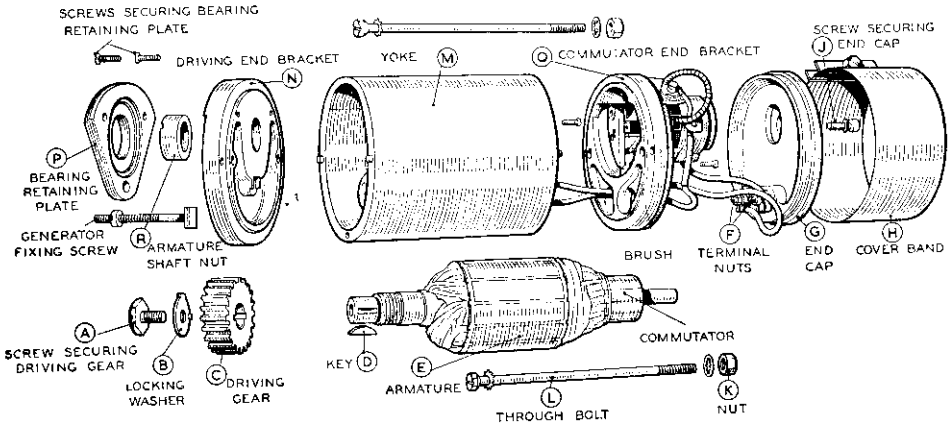



Fig. Y.33. Generator, model E3HM

from the shaft by carefully levering it off or by means of an extractor. Remove the key(s) "D", from the shaft.

Remove the cover band "H", hold back the brush springs and lift the brushes from their holders.

Take out the screw "J", with spring washer, from the centre of the black moulded end cap "G". Draw the cap away from the end bracket, take off terminal nuts "F", and spring washers, and lift the connections off the terminals.

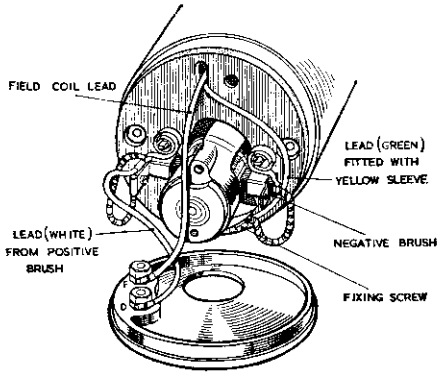
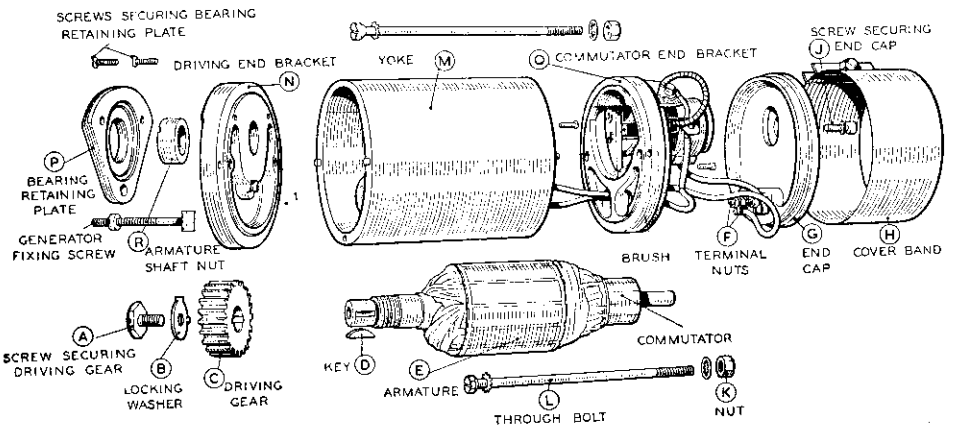



Fig. Y.34. Generator connections

*Note.—On later machines, the white lead is omitted, the brush flexible lead being connected direct to terminal "D"*

Unscrew and remove from the driving end bracket the two through bolts "L" securing the driving end bracket "N" and commutator end bracket "Q" to the yoke "M". Hold the nuts "K" at the commutator end while unscrewing the bolts, and take care not to lose the nuts.

**On E3HM Machines.** Remove the bearing retaining plate (P) from the driving end bracket secured by two screws and a long threaded bolt. Unscrew the nut (R) from the end of the armature shaft and the armature can then be removed from the driving end bracket (N) by means of a hand press.

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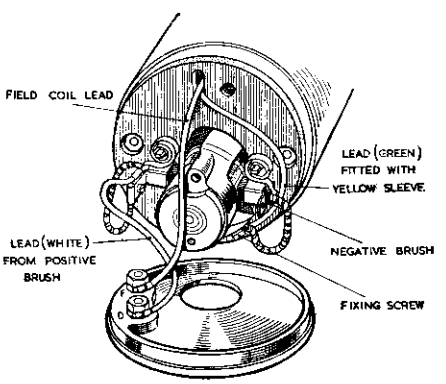


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**On E3H Machines** remove the bearing nut (T) and the oil thrower and washer (S). Withdraw the three screws securing the retaining plate (P). The armature can then be removed from the driving end bracket (N) by means of a hand press.

Take out the screw securing the green field coil lead with the yellow sleeve to commutator end bracket and remove the end bracket "Q", withdrawing the connectors through the slot in the insulating plate.

Unscrew the three screws securing the insulating plate to the commutator end bracket and remove the plate complete with brushgear.

## Commutator

Examine the commutator. If it is in good condition, it will be smooth and free from pits or burned spots. Clean with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of very fine glasspaper while rotating the armature. To remedy a badly worn commutator, mount the armature with or without the drive end bracket in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glasspaper.

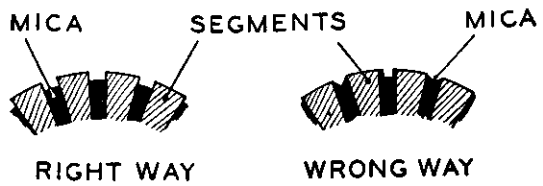


Fig. Y.35 Method of undercutting commutator insulation

Undercut the mica insulation between the segments to a depth of $\frac{1}{32}$in. with a hacksaw blade ground down until it is only slightly thicker than the mica.

## Field Coil

Measure the resistance of the field winding by means of an ohm meter. If this is not available, connect a 6-volt D.C. supply with an ammeter in series across the coil. The ammeter reading should be approximately 1.9 amperes. No reading on the ammeter indicates an open circuit in the field winding.

To check for earthed coil, connect a mains test lamp between one end of the coil and the yoke. If the bulb lights, there is an earth between coil and yoke.

In either case, unless a replacement generator is available, the field coil must be replaced, but this should only be attempted if a wheel-operated screwdriver and pole shoe expander are at hand, the latter being especially necessary to ensure that there will not be any airgap between the pole shoe and the inner face of the yoke.

To replace the field coil, proceed as follows:

Unscrew the pole shoe retaining screw (Fig. Y.36) by means of the wheel-operated screwdriver.

Draw the pole shoe and field coil out of the yoke and lift off the coil.

Fit the new field coil over the pole shoe and place it in position inside the yoke. Take care to ensure that the taping of the field coil is not trapped between the pole shoe and the yoke.

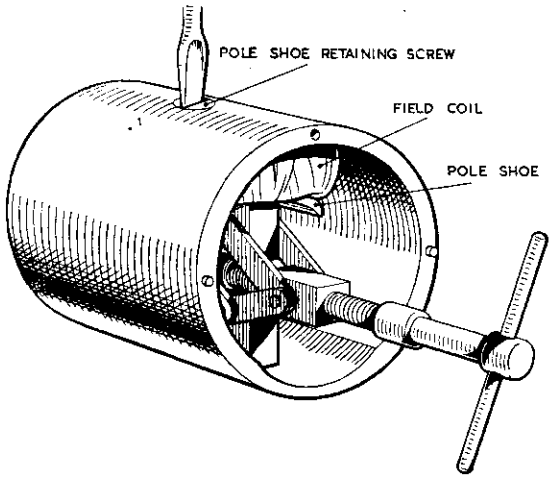


Fig. Y.36. Pole shoe and field coil assembly

Locate the pole shoe and field coil by lightly tightening the fixing screw. Insert the pole shoe expander, open to its fullest extent and tighten the screw. Remove the expander and give the screw a final tightening with the wheel-operated screwdriver. Lock the screw in position by caulking, that is, by tapping some of the metal of the yoke into the slot in the head of the screw.

### Armature

The testing of the armature winding requires the use of a voltdrop test or a growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

### Bearings

A ball bearing is fitted at the driving end and a plain porous bronze bearing bush at the commutator end.

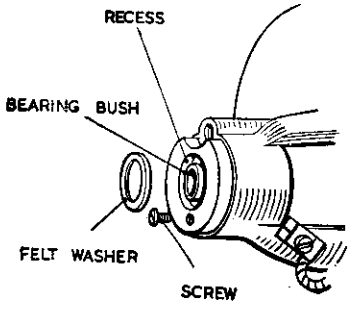


Fig. Y.37. Commutator end bracket with bearing bush

Bearings which are worn to such an extent that they will allow side movement of the armature shaft must be replaced. To replace the bearing bush at the commutator end, proceed as follows:

Remove the screw, press the bearing bush out of the commutator end bracket and remove the felt washer. (See Fig. Y.37.)

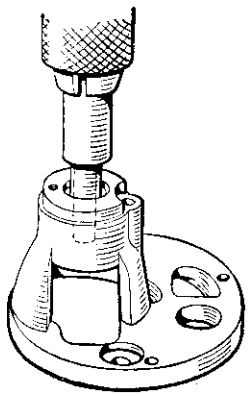

Fig. Y.38. Fitting bearing bush using a shouldered mandrel

Press the new bearing bush into the end bracket using a shouldered mandrel (Fig. Y.38) of the same diameter as the shaft which is to fit in the bearing. (Note: Before use, new bearing bushes should be stored in a covered container and fully covered with oil of a grade equivalent to Mobiloil Arctic, or other good thin mineral oil. The minimum time of soaking should normally be 24 hours, but in cases of extreme urgency this period may be shortened by heating the oil to 100°C., when the time of immersion may be reduced to 2 hours). The bush should be pressed in until it is flush with the face of the end bracket. Fit the felt washer in the space between the bearing and the wall of the bearing housing.

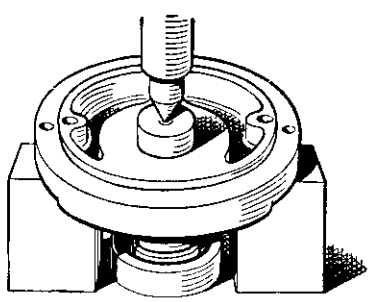

Fig. Y.39. Removing the ball race

The ball bearing at the driving end is replaced as follows:

Remove bearing retaining plate from driving end bracket as previously described.

Press the bearing out of the end bracket, using a metal drift locating on the inner journal of the bearing (Fig. Y.39).

Wipe out the bearing housing and pack the new bearing with H.M.P. grease.

Position the bearing in its housing and press it squarely home, applying pressure on the outer journal of the bearing (Fig. Y.40).

## Reassembly

In the main, the reassembly of the generator is a reversal of the operations described in the paragraph on dismantling, bearing in mind the following points:

The field coil lead fitted with the short length of yellow tubing must be connected together with eyelet of the negative brush to the commutator end bracket by means of the screw provided.

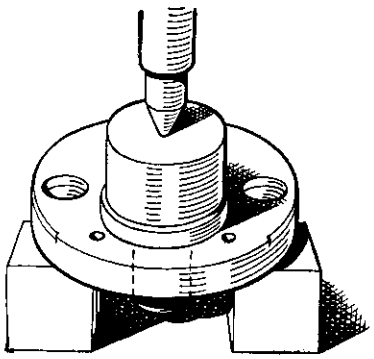

Fig. Y.40. Fitting the ball race

The second field coil lead must be connected to terminal F on the moulded end cap.

The lead (coloured white) from the terminal on the positive brush box must be connected to terminal D on the moulded end cap.

(Note: On later machines, the brush flexible lead is connected direct to terminal D and the white lead is omitted.)

Take care to refit cover band in original position and make sure that the securing screw, when of flush-fitting pattern, does not short on brushgear.

## E3L Dynamo

On some models an E3L dynamo is fitted. This is an higher output machine and the test figures are as follows. Cutting in speed 1050—1200 r.p.m. at 6.5 dynamo volts. Output 8.5 amps. at 1850—2000 r.p.m. at 7 dynamo volts taken on .8 ohm resistance load. Resistance to be capable of carrying 10 amps. without overheating. Field resistance 2.8 ohms. The dismantling and testing instructions are similar to those given for the E3H Dynamo except for the following:

(1) Ball Bearing fitted at commutator end.
(2) Brush Spring Tension, 13—20 ozs.
(3) Testing Field Coils, the ammeter reading will be 2.1 amperes.

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Birmingham, 10
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J.U B.3910

# BSA SERVICE SHEET No. 810

**Model DI** *December* 1948.

UP TO ENGINE No. YD1-40660 *Reprinted Oct.*, 1958.

## WICO-PACY "GENI-MAG" EQUIPMENT

### DESCRIPTION

The 30-watt 'Geni-mag' ignition and lighting unit embodies two assemblies, namely the Flywheel and the Stator which carries the ignition coil, lighting coils, contact breaker unit and condenser. The cam is fitted to the extended crankshaft of the engine and is located by a keyway.

The 'Geni-mag' ignition unit provides a high performance spark output over a very wide range of speeds, special attention having been paid to the needs of the modern light-weight motor-cycle of the 125 c.c. class and of the motorised bicycle. While an excellent spark performance of about 8,000 volts at only 500 r.p.m. rising to 14,000 volts at 6,000 r.p.m. is obtained, it has yet been found possible to maintain an exceptionally large air gap between rotor and stator, thus considerably increasing the probability of a trouble-free system. Additional support is provided for the end of the crankshaft by the inclusion of a self-oiling bearing located in the centre of the stator housing.

A characteristic of the magneto is that its spark output will not vary over a wide timing range, thus rendering frequent adjustment of the contacts unnecessary, and at the same time allowing a fair tolerance for the accuracy of the setting. A further feature of the magneto is the accessibility and ease of adjustment of the contact breaker and other parts without the necessity of removing the flywheel at any time.

No engine timing is necessary; fit the stator housing slots central over the studs on the crankcase, tighten up the nuts, fit the cam which locates on a key in the engine shaft, set the contacts to .015 in., and the engine is timed. Any minor adjustment can be carried out while the engine is running. To advance the magneto, slacken off the stator housing nuts and slightly rotate the magneto in the opposite direction to the rotation of the flywheel.

The lighting coils are energised by the three magnetic units which concentrate a powerful magnetic charge within a small space and volume, the characteristic being such that brilliant lighting is obtained without flickering at a low speed, while the rise of output above the rated wattage is sufficiently low as not to allow the lamps to be seriously over-loaded at maximum engine speeds, which are in the region of 6,000 to 7,000 r.p.m. One of the three magnet units also energises the ignition coil.

### RUNNING MAINTENANCE

The magneto requires very little maintenance and if the following notes are observed the life of the machine should prove trouble free.

Check and if necessary re-adjust the contacts once every 5,000 miles. (See Service Instructions).

Occasionally clean the contacts by inserting a dry smooth piece of paper between them and withdrawing while the contacts are in the closed position. Do not allow the engine to run with oil or petrol on the contacts or they will start to burn and blacken, and if they do, lightly polish with a piece of smooth emery cloth.

Moisten the cam lubricating pad with a few drops of thin oil every 5,000 miles.

Do not run with a faulty or damaged high-tension lead and clean away mud and dirt from around the H.T. insulator when necessary.

If the magneto requires any attention beyond the replacement of contact points and condenser, it is recommended that the complete machine should be sent to us or to an authorised Wico service station. The following information is given for the benefit of those unable to do so:

## SERVICE INSTRUCTIONS

### Checking the Magneto for spark

If the engine fails to start and there is an indication of the magneto causing trouble, the spark can be checked by holding the H.T. lead $\frac{3}{16}$ in. away from a point on the frame. When the engine is kicked over in the usual way, a spark should jump this gap. If no spark is visible, see that the H.T. lead is in good condition and examine the contact breaker. Make sure there are no metallic particles inside the housing and that the contacts are perfectly clean, and the gap is correct to the recommended setting. If the contacts are found to be in a burnt or badly pitted condition, a faulty condenser is indicated. If the contact breaker appears to be in order the stator plate may be removed from the engine complete with coils and the leads of the ignition coil should be examined to ensure that there is no break in the wiring. One lead will be found to be joined to a tab which is clamped underneath one of the nuts which anchor the stator to the stator housing. If this is in order check the other end of the primary ignition coil which is connected to the back of the insulated post which projects into the contact breaker recess at the front of the magneto. The screw which locks this in position will be found underneath the lighting coil on the right-hand side looking at the inside of the stator housing when in its upright position. The condenser lead is also joined to this point. If both these are connected and the tabs are not earthing on the stator plate the ignition coil should be in working order. In the unlikely event of the H.T. insulation of the secondary coil breaking down, it should be possible to detect signs of charring either on the binding tape of the coil, the insulating gaskets or the H.T. insulator.

### Replacement of Coil

To remove the coil, the H.T. insulator which is held by two screws outside the housing must be taken off. The removal of the stator is effected by unscrewing the three clamp nuts. The stator may then be gently eased off the three stator plate studs. Care must be taken not to jerk it, otherwise the lead which connects the lighting coils to the terminal on the stator may be broken. The live end of the primary ignition coil lead must then be disconnected from the contact breaker terminal post. In order to slide the coil from the iron limb, it is necessary to straighten the small brass tab which will be found on the side of the coil which faces the stator housing. If the coil is grasped firmly in one hand with the fingers under the insulator gaskets and on either side of the core, it may be quite easily pulled off. To refit the ignition coil proceed as follows:

(*a*) Hold the coil in the left hand with the brass contact pointing away from the line of vision and the lead wires projecting downwards from the underside, and drop the leads through the rectangular hole in the two insulating gaskets, the extended end of which must point in the same direction as the coil tab.

(*b*) With the other hand push the coil core through the coil making sure that the brass locking tab riveted to the iron is on the same side as the coil contact. Drive the fibre wedge provided in between the core and the coil on the same side as the locking tab and bend over the tab.

(*c*) Connect up the sleeved lead to the terminal post placing the other parts in the following order:

Screw, shake-proof washer, condenser tab, coil lead tab, thick metal washer and insulating washer.

Then holding the outer end of the contact breaker terminal post in the square hole, with the finger of the other hand, drop the screw complete with washers into the round recess at the inner end of the square hole and drive the screw home.

(*d*) Finally, bend both tabs slightly upwards to ensure that they do not make contact with the metal housing, screw down the stator anchoring the lighting and ignition coil earthing leads under the clamp nuts making sure at the same time that the coil insulator gaskets are bent upwards towards the H.T. insulator hole in the stator housing.

(*e*) Make sure that all tabs are clean and all clamped connections are tight, and before lowering the stator see that none of the coil leads become clamped in between the stator and the housing.

**IMPORTANT**

Bend in all stray loops of wire to behind the radius of the stator and push down the condenser wire into the well of the stator housing to ensure that they do not foul the rim of the flywheel. The flywheel rim reaches to within about $\frac{1}{16}$ in. of the head of the insulated lighting terminal stud, and it is important to see that the live wire which is soldered to it is pushed down to well below this level.

(*f*) Re-fit the H.T. insulator.

### Removal of Condenser

To change the condenser it is necessary to lift the stator as before described, and disconnect the lead from the terminal post and unscrew the clamp nut which is located on the contact breaker cover spring post. When replacing, make sure that the condenser lead is pushed down as far as possible into the well formed by the stator housing otherwise there is a danger of the flywheel rubbing and possibly severing it.

### Adjustment and replacement of Breaker Points

The only adjustable part of the magneto is the breaker plate which provides for the setting of the breaker points.

To set these points proceed as follows:

Turn the engine over until the breaker points are fully open and insert the feeler gauge. Slacken off the locking screw which is to be found immediately above the points and if the gauge is tight rotate the eccentric adjuster in an anti-clockwise direction until the correct setting of .015 in. is obtained. Tighten up the adjusting screw.

The breaker point setting should only be adjusted in the manner described and at no time should the fixed contact be bent to provide adjustment.

The moving contact is integral with the breaker arm. If the points need replacement it is recommended that both fixed and movable points be replaced at the same time.

The breaker arm bearing is of the self-lubricating type and it is only necessary to lightly prime the pivot pin with oil or soft grease when assembling. Care must be taken to put in the correct number of thin spacing washers behind the breaker arm, in order to bring the contacts in line with one another. The end of the contact breaker spring is then anchored to the terminal post with a screw and shakeproof washer. Place one of the spacing washers over the pivot on the outer side of the breaker arm and insert the spring clip in its groove.

### The Lighting Coils

In the unlikely event of any fault developing with these coils, the removal and replacement of them is a simple operation and may be performed without disturbing the ignition coil. The windings are in series and are made up in pairs complete with earthing tab and insulated terminal screw. To remove the lighting coils, take off the H.T. insulator and

unscrew the three stator clamp nuts. Take out the insulated terminal screw which projects from one of the cavities on the face of the stator plate. Straighten with a pair of pliers the two outer laminations on each coil core, which are bent outwards to hold the coils in position, and slide off the coil formers after slightly raising the stator on the studs in the stator plate. Replace in the following order:

With the coil which carries the insulated terminal screw on the side nearest to the screw hole in the stator housing, and the slotted flanges of the two coil formers pointing towards the centre of the stator and the slots downwards, slide the two coils on to their cores. Insert the fibre wedges provided into the arc formed between the cores and the coil formers, and bend out the two outer laminations on each leg, taking care not to split the bakelite former on which one of the coils is wound. Push down the stator on to its locating spigot. See that neither the ignition leads nor the lighting coil leads become clamped between the flange at the base of the spigot and the stator. Re-assemble the insulated terminal screw into the stator housing. Finally, tighten up the clamp nuts with the tabs in position and push any wire loops well back behind the working faces of the stator legs to prevent them from fouling the flywheel.

### The Flywheel

The robust construction of the flywheel reduces the possibility of any faults on this unit to a minimum. The three powerful magnet inserts are cast in the rim of the wheel and it is not possible to demagnetise them by ordinary usage. No keepers are necessary when the magneto housing and stator are removed. The boss of the flywheel is located on the crankshaft by a keyed taper and locked by a nut and shakeproof washer. It is unnecessary to remove the flywheel unless at any time the engine has to be dismantled. A thread cut on the outside of the flywheel boss enables the wheel to be removed by use of a special extractor. When replacing, the flywheel must be perfectly clean inside and outside.

### CAUTION

The 27 watt 'Geni-mag' which is purely an A.C. Unit, has now been superseded by the S55/KM8 Ignition Generator.

As the new unit incorporates extra magnets in the Flywheel, all users should make careful note, that although similar in appearance the *Flywheels of the two units are not interchangeable.* The flywheel of the new type generator can easily be indentified because it is clearly marked 'WIPAC AC/DC.'

Care must also be taken to use the correct flywheel with the appropriate Stator Plate, as if the new flywheel is used with the old type 'Geni-mag' Plate, trouble will be experienced with lamps blowing or alternatively if the new Stator Plate is used with the old type 'Geni-mag' Flywheel, insufficient lighting output will be obtained.

B.S.A. MOTOR CYCLES LTD.,
Service Dept., Birmingham, 11.
Printed in England.

# BSA SERVICE SHEET No. 810A

*February* 1953
*Revised March* 1958
*Reprinted July* 1959

## MODELS D1, D3 and D5

## Wipac Flywheel Ignition Generator Series 55 Mark 8

### SPECIAL NOTES.

The Series 55 Mark 8, Spec. No. IG 1130 AC/DC Generator superseded the 27 watt "Genimag," which was purely an AC unit. This change took place on and after Engine No. YD1-40661. As this unit incorporated extra magnets in the flywheel, all users should make careful note of the fact that, although similar in appearance, the **flywheels of the two units are not interchangeable.** If the latter type flywheel is used with the "Genimag" stator plate, trouble will be experienced with bulbs blowing. Alternatively, if the "Genimag" flywheel is fitted with a later type stator plate, insufficient lighting output will be obtained.

On machines manufactured after August 1955, different generators are used for AC and DC equipment. These are marked Spec. No. IG 1452 for AC only (D1, D3 and D5 models), Spec. No. IG 1454 for DC only (D1 models), and Spec. No. IG 1450 for DC only (D3 Swinging Arm models). The two DC units are the same, except for the lengths of the leads.

When the generator complete, or the stator plate Spec. No. IG 1130, is replaced by one of the later DC units, the yellow link between terminals 9 and 11 in the headlamp switch must be removed in order to limit the charge rate in the "Low" position.

As the later type AC and DC stator plates are not interchangeable, it is necessary to specify AC or DC when ordering spares.

From 1950 onwards (Engine No. YD1-40661) the flywheels are the same for AC and DC. For models prior to this, the complete generator should be changed when renewing the stator plate.

The AC generator Spec. No. IG 1452 cannot be converted to DC by means of a Wipac 'Convertakit," unless a new three coil stator plate is also fitted.

### DESCRIPTION.

This ignition and power unit consists of two assemblies, namely the flywheel rotor, and the stator plate which carries the ignition coil, low tension coils, contact breaker and condenser. The cam is fitted to the extended crankshaft of the engine and is located by a key.

Additional support is provided for the end of the crankshaft by the inclusion of a self-oiling bush in the centre of the stator housing.

The unit provides a high performance spark output over a very wide range of speeds. While approximately 10,000 volts at only 500 r.p.m. rising to 15,500 volts at 6,000 r.p.m. is obtained, it has been found possible to maintain a large air gap between rotor and stator to ensure a trouble free unit.

A characteristic of the ignition generator unit is that its spark output will not vary over a wide timing range, thus rendering frequent adjustment of the contacts unnecessary, and at the same time allowing a fair tolerance for the accuracy of the setting.

A further feature of the magneto is the accessibility and ease of adjustment of the contact breaker and other parts, without the necessity of removing the flywheel rotor. In fact, it is unlikely that, at any time, it will be necessary to remove more than the stator cover plate; the stator being so designed that all adjustments, and even condenser replacement, can be made from the front of the unit.

No engine timing is necessary; fit the stator plate slots central on the fixing screws and tighten up these screws, locate the cam on the key in the engine shaft, set the contacts to .015" and the engine is timed. Any minor adjustment can be

made while the engine is running. To advance the magneto, slacken off the stator plate fixing screws and slightly rotate the magneto in the opposite direction to the rotation of the the flywheel rotor.

Occasionally, it may be found that an engine will not start nor run unless the contact breaker points setting is about .006" to .008", instead of the correct figure of .015". This is caused by the points opening before the magnetic flux has been broken, so that no voltage is produced.

The first remedy to try is to reverse the small Woodruff cam key. Should this effect no improvement, a special cam, ground 5° late, can be obtained from the makers.

The low tension coils are energised by the three magnetic units, which concentrate a powerful magnetic charge within a small space. One of these units energises the ignition coil. The generator has been designed to produce AC current directly into a 6v. 30 watt load or, with the aid of a metal plate rectifier in the external circuit, produce DC current for battery charging.

With the IG 1130 generator, a maximum day charge of 2.5 amps is allowed to pass through the battery. During night use with a 6v. 30 watt lamp load, a generated balance against this battery drain is accomplished at approximately 3,000 r.p.m. of the engine. A charge of $\frac{3}{4}$ amp is allowed at maximum engine speed.

The IG 1450 and IG 1454 generators have a higher rate of charge, giving slightly more than 3 amps at maximum engine speed. At night, the full lamp load is balanced at approximately 2,800 r.p.m., and a charge of 1.5 amps is obtained at 4,500 r.p.m. Batteries of 5, 10 or 12 amp-hour rating are equally suitable for use with these generators, the higher capacities being recommended.

## RUNNING MAINTENANCE.

The magneto requires very little maintenance and if the following notes are observed the life of the machine should prove trouble free.

Check and if necessary re-adjust the contacts once every 5,000 miles. (See Service Instructions.)

Occasionally clean the contacts by inserting a dry smooth piece of paper between them and withdrawing while the contacts are in the closed position. Do not allow the engine to run with oil or petrol on the contacts or they will start to burn and blacken, and if they do, lightly polish with a piece of smooth emery cloth.

Moisten the cam lubricating pad with a few drops of thin oil every 5,000 miles.

Do not run with a faulty or damaged high-tension lead and clean away mud and dirt from around the H.T. insulator when necessary.

If the magneto requires any attention beyond the replacement of contact points and condenser, it is recommended that the complete machine should be sent to us or to an authorised Wico service station. The following information is given for the benefit of those unable to do so:—

## SERVICE INSTRUCTIONS.

### Checking the Magneto for Spark.

If the engine fails to start and there is an indication of the magneto causing trouble, the spark can be checked by holding the H.T. lead $\frac{3}{16}$" away from a point on the frame. When the engine is kicked over in the usual way, a spark should jump this gap. If no spark is visible, see that the H.T. lead is in good condition and examine the contact breaker.

Make sure there are no metallic particles inside the housing, and that the contacts are perfectly clean, and the contact breaker gap is correct to the recommended setting.

If the contacts are found to be in a burnt or badly pitted condition, a faulty condenser is indicated. If the contact breaker appears to be in order, the stator plate may be removed from the engine, complete with coils.

To do this the following procedure should be adopted:—

Unscrew the two cover securing screws and remove the cover, unscrew the cam screw and withdraw the cam free of the shaft. The small cam key in some instances may leave its keyway, so care should be taken to make sure of this point when taking the cam from the shaft. Next remove the three stator plate securing screws. The stator can now be withdrawn clear of the engine.

The leads of the ignition coil should be examined to ensure that there is no break in the wiring. One lead will be found to be joined to a tab which is clamped underneath one of the nuts which anchor

the stator coil assembly to the stator housing. If this is in order, check the sleeved lead of the primary ignition coil which is connected to the front of the insulated post, which also carries the condenser lead and contact breaker return spring.

The screw which locks the insulated post in position will be found underneath the low tension coil on the right-hand side looking at the inside of the stator housing when in its upright position.

There is, however, no need to remove this screw for any of the investigations recommended in these instructions. The second screw lying at a larger radius and appearing over the top of the coil is the earthing screw for the No. 2 terminal on the front of the machine.

If the leads joined to the insulated post are in order and firmly clamped and the tags not earthing in any way, the ignition coil should be in working order. Should it be necessary to completely remove the stator plate entirely, the low and high tension leads should be freed from the insulated terminal boards on the front of the unit and the plugs respectively, the former by the loosening off of the grub screws and withdrawing the low tension leads which are coloured through the rubber insulator. The stator plate assembly should then be entirely free of the engine.

In the unlikely event of the H.T. insulation of the coil breaking down, provided this is not internal, it should be possible to detect signs of charring on the binding tape of the coil. If the absence of spark is due to tracking, track burns may be visible on the insulator gasket.

**Replacement of Ignition Coil.**

The removal of the stator coil assembly is effected by first disconnecting the ignition lead from the coil, then freeing the white, red and green low tension leads from the terminals marked 3, 1 and 4 respectively, and unscrewing the two clamp nuts. The live lead of the primary winding of the ignition coil must then be disconnected from the insulated post by removing the securing screw. The stator coil assembly may then be gently eased off the two plate studs.

In order to slide the ignition coil from the iron limb, it is necessary to straighten the small brass tab which will be found on the side of the coil which faces the stator housing. If the coil is grasped firmly in one hand with the fingers under the insulator gasket and on either side of the core, it may be quite easily pulled off.

To refit the ignition coil proceed as follows:—

(a) Hold the coil in the left-hand with the brass contact pointing away from the line of vision and the lead wires projecting downwards from the underside, and drop the leads through the rectangular hole in the insulating gasket, the extended end of which must point in the same direction as the coil tab.

(b) With the other hand, push the coil core through the coil, making sure that the brass locking tab rivetted to the iron is on the same side as the coil contact. Drive the fibre wedge provided in between the core and the coil, on the same side as the locking tab and bend over the tab.

(c) Replace the stator coil assembly in position on the stator plate and before pushing right down on the studs, bring the sleeved low tension lead of the ignition coil inside the base of the right hand stator core stud. This keeps the lead clear of the flywheel rotor. Pass the low tension leads through to the front of the unit. Note also that none of the coil leads become clamped in between the stator and the housing.

(d) Press the core down firmly and tighten down the two clamp nuts anchoring the ignition coil earth lead tab underneath the left-hand nut

(e) Reconnect the sleeved ignition coil lead to the insulated post together with the condenser lead tab and the contact breaker return spring. Firmly screw home the securing screw.

(f) Reconnect the ignition lead to the H.T. terminal of the ignition coil, and reconnect the low tension leads to the appropriate terminals as follows:—

The white lead to No. 3, green to No. 4 and red lead to No. 1 terminal on the front of the unit.

(g) Make sure that all tabs are clean and all clamped connections are tight.

**IMPORTANT: Bend all stray loops of wire to behind the radius of the stator to ensure they do not foul the rim of the flywheel rotor.**

**Removal of Condenser.**

To replace the condenser, remove the condenser terminal nut and free the condenser lead. Unscrew

the condenser bracket fixing screw and withdraw the condenser.

### Adjustment and Replacement of Breaker points.

The only adjustable part of the magneto is the breaker plate which provides for the setting of the breaker points. To set these points proceed as follows:—

Turn the engine over until the breaker points are fully open and insert the feeler gauge. Slacken off the locking screw which is to be found immediately above the points, and if the gauge is tight, adjust the fixed contact plate, by means of a suitable screwdriver engaged in the recess provided, in an anti-clockwise direction until the correct setting of 0.015" is obtained. Tighten up the fixed contact plate locking screw. The breaker point setting should only be adjusted in the manner described and at no time should the fixed contact platform be bent to provide adjustment. The moving contact is integral with the breaker arm. If the points need replacement it is recommended that both fixed and moving points be replaced at the same time.

When assembling the moulded breaker arm to the magneto it is necessary to lightly prime the pivot pin with oil or soft grease and an occasional priming throughout its life will be found to be advantageous.

Care must be taken to put in the correct number of thin spacing washers behind the breaker arm in order to bring the contacts in line with one another. The free end of the contact breaker spring is then anchored to the insulated terminal post with a screw and shakeproof washer. The condenser and primary ignition coil sleeved lead is secured by the same screw and washer. Place one of the spacing washers over the pivot on the outer side of the breaker arm and insert the spring clip in its groove.

### The Low Tension Coils.

These coils are robust in character and are most unlikely to develop fault. In the event of a fault developing in the coil group, the removal more so than the replacement, of the coil or coils may not be an easy operation, and it is likely that further damage to the windings will occur during the removal process. It is advisable before any steps are taken to remove the low tension coils, that the coils be thoroughly checked and proved beyond doubt to be at fault. The coils are secured to the iron core by means of a varnish adherent assisted by a fibre wedge. Paper formers are used, so damage to the windings can occur when being taken off.

In view of this, it is strongly recommended that should a fault occur in the low tension coil group, that application be made for a coil group replacement already secured to the iron core.

The ignition coil can be removed from the stator assembly as previously described and replaced on the new stator core and coil group replacement. Having completed the coil assembly, proceed as instructed under paragraph "Replacement of Ignition Coil."

Care should be taken to see that the wire connections face toward the front of the machine when assembling the stator coil assembly into the housing.

Any wire loops or wires that could come into contact with the flywheel rotor should be pushed back clear to prevent any fouling or electrical breakdown.

Finally, when connecting the low tension leads of the frame wiring to the magneto generator, make sure that the white, red and green leads are placed on the machine terminals already carrying that colour of lead. This is part of a colour coding scheme, the complete scheme of which is given with the wiring diagram.

### The Flywheel Rotor.

The robust construction of the flywheel rotor reduces the possibility of any faults on this unit to a minimum. The three powerful magnet inserts are cast in the rim of the rotor and it is not possible to demagnetise them by ordinary usage. No keepers are necessary when the magneto housing and stator are removed. The boss of the flywheel rotor is located on the crankshaft by a keyed taper and locked by a nut and shakeproof washer. It is unnecessary to remove the rotor unless at any time the engine has to be dismantled. A thread cut on the outside of the rotor boss enables it to be removed by the use of a special extractor. When replacing, the rotor must be perfectly clean inside and out.

B.S.A MOTOR CYCLES LIMITED,
Service Dept., Waverley Works, Birmingham, 10.
*(PRINTED IN ENGLAND)*

# BSA SERVICE SHEET No. 811

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# Models D1, D3 and C10L

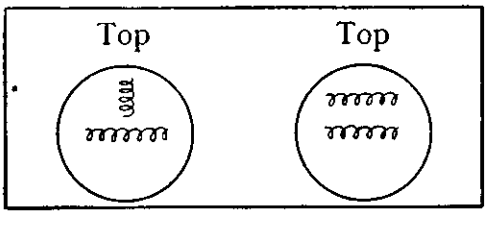
## LAMPS
## (Wipac Lighting)

**Headlamp.**

Two types of headlamp have been employed but they differ only with regard to the headlamp switch. Early models have the body of the switch mounted inside the headlamp shell but remotely controlled through a cable and a lever mounted on the handlebars. Later models have a switch mounted in the top of the headlamp so that it can be reached from the normal riding position.

The reflector and bulb holder assembly are housed in the front rim and to obtain access to the bulbs, loosen the screw situated at the bottom of the lamp rim and lift the rim outwards and upwards. To remove the bulb holder, bend down the small tab which projects from the base of the reflector. The holder can then be removed, after turning it anti-clockwise, making the main and parking bulbs easily accessible. When replacing the main bulb be sure that the word "TOP" on the bulb is uppermost.

If the bulb is not marked, assemble as illustrated:—




Correct way to fit double-filament bulbs.

The correct focus has been incorporated in the design of the headlamp and therefore no provision for adjustment has been necessary.

**Tail Lamp.**

To remove the rim of the lamp, undo the small 6BA screw and turn the rim slightly to the left, it can then be easily withdrawn. On later models a bayonet fitting is employed and it is merely necessary to push the lamp cover in, twist it to the left and then pull it away.

The bulb holder is of the bayonet pattern and the bulb is removed by the usual push and turn method. When a stop light is fitted a double filament bulb is used. Ensure that the bulb is the right way up. The portion marked "TOP" should be uppermost when the bulb is inserted, but if the bulb is not marked, check that it is located correctly by operating the foot brake and ensuring that the brighter filament is illuminated.

**Switching.**

No adjustment of the later type switch is necessary but it may occasionally be required to synchronise the earlier type of switch with the handlebar lever. This can be easily carried out after slackening the locknut on the adjuster which connects the Bowden cable to the lever assembly. Screw the adjuster in or out until the switch positions are synchronised with the lever positions, then tighten the locknut. Four positions are provided on the lever and these correspond to Parking, Head Dipped, Head Full On and Off.

**Parking Battery.**

Where D.C. lighting is employed a Varley accumulator is fitted. On models employing A.C. lighting a dry battery is fitted inside the headlamp shell. This is a 3-volt bicycle battery, type 800. To fit a new battery, hold it so that the vertical contact strip faces towards the lamp, the battery should then be positioned in the holding bracket in such a manner that the vertical contact connects with the metal battery holder at the rear of the lamp, while the horizontal contact fits inside its corresponding contact.

**Replacement Bulbs**

| | | |
|---|---|---|
| Headlamp (main) ... | D1 and D3 | 24/24 watt, double filament, 6/7 volt. |
| | C10L | 30/30 watt, double filament, 6/7 volt. |
| Headlamp (parking) ... | A.C. lighting ... | .25 amp. 2.5 volt M.E.S. |
| | D.C. lighting ... | 6/7 volt, 3 watt, M.E.S. |
| Tail lamp (single filament) ... ... ... | | 6/7 volt, 3 watt S.B.C. |
| (with combined stop light) ... | | 6/7 volt. 18/3 watt, S.B.C. |
| (with separate twin stop lights) ... | | 6/7 volt, 3 watt, M.E.S. |
| Speedometer ... ... ... ... ... | | 6.5 volt, .3 amp. |

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*(Printed in England)*

# BSA SERVICE SHEET No. 812

*Reprinted Nov. 1958*

## Model D.1

## LUCAS ALTERNATING EQUIPMENT

## Alternator Model 1 A 45

### DESCRIPTION

### Inductor Type Alternator

The Lucas Model 1A45 unit, which has a nominal output of 45 watts, makes use of a generator of the inductor type. The consists of a 6-pole laminated steel rotor and a stator, the latter comprising two permanent magnets, a laminated field system and two coil windings housed in an aluminium casing. The rotor, with which is combined the contact breaker Cam, is bolted direct to the engine crankshaft. The Alternator body, which carries the Stator Coils and Contact Breaker Plate, is spigotted into the Crankcase. The Contact-breaker Plate is located by two fixing Screws passing through radial slots, Fig. Y.41.

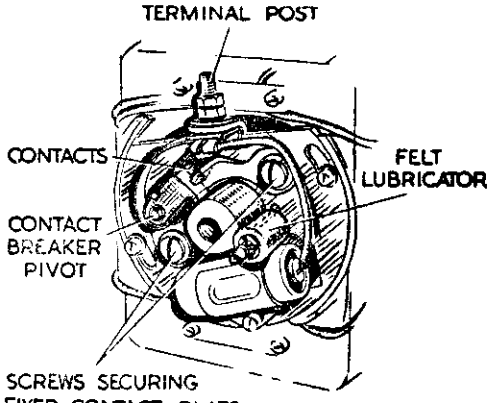

Fig. Y.41. Contact breaker.

The principle of operation of the induction alternator is the same as that of other generators, that is, the reversal of magnetic flux through the coil core which generates an EMF or voltage in the coil winding. In the normal generator, the reversal of flux is achieved by rotating either the magnet or coil, but in this design the coils and magnets are stationary and a laminated steel rotor is used to cause the flux reversals. The rotor is of 6-pole design in order to give as many flux reversals as practicable during one revolution.

Thus the windings are stationary, so avoiding the use of commutator, slip rings or collector brushes, making for greater robustness of construction and hence increased reliability.

The generator reaches its rated voltage at a low engine speed and the voltage is then maintained within close limits over a very wide speed range.

### Coil Ignition—and Easy Starting with a Flat Battery

In addition to supplying the current required by the lamps (which, incidentally, have an increased headlamp bulb wattage of 30, with consequently greater light output than hitherto), the 1A45 unit also supplies power for the coil ignition equipment. The long standing objection to coil ignition on motor cycles, namely inability to start if the battery is run down, is overcome by providing 'emergency start' switching for use on these occasions. By means of this arrangement the battery is temporarily disconnected so that all the available energy from the permanent magnet alternator is applied to the coil, with the result that a slow speed performance approaching that of a magneto enables a 'kick-start' to be achieved. Thus the simplicity and economic benefits of this form of ignition can be utilised to the full.

## Battery Charging

Since batteries can be charged only by direct current, a Selenium metal rectifier is incorporated in the system, and all components then run off direct current from the battery source. Two plates are used in the rectifier assembly to provide full-wave rectification in conjunction with the centre-tapped generator. The rating of the rectifier plates has been thoroughly investigated both in temperate climates, and in the high ambient temperatures of the Middle East. The rectifier is of robust construction and is sealed against water ingress, making it suitable for mounting in a semi-exposed position where it will receive adequate air cooling.

With this equipment there is no need to fit a cut-out as the reverse current through the rectifier is very small, and is a negligible drain on the battery. To avoid even this slight drain, which is very little more than the usual surface discharge across the top of the battery, the ignition switch is arranged to disconnect the battery and alternator when the ignition is switched off.

The ignition switch has three positions: 'Off', 'Emergency Start', and 'Normal Start'. 'Emergency Start' position enables the engine to be started and run with a flat battery.

The alternator has an ample margin of safety but should not be run with the battery removed and/or the ignition switch in the emergency position any longer than is necessary.

NOTE:— SWITCH OFF THE 'HEAD' AND 'PILOT' LAMPS BEFORE STARTING THE ENGINE WITH THE IGNITION. SWITCH IN THE 'EMERGENCY START' POSITION. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN BLOWN HEADLAMP BULBS.

IMMEDIATELY THE ENGINE IS RUNNING TURN THE IGNITION SWITCH SMARTLY BACK TO THE NORMAL RUNNING POSITION THEN SWITCH ON THE 'HEAD' OR 'PILOT' LAMPS AS REQUIRED.

## Two Charging Rates

Reduced charge switching is coupled to the lighting switch so that full output is obtained from the generator only when the lamps are switched on, whilst during day running, a reduced charge resistance is inserted into the circuit.

Since the excitation is by means of permanent magnets, the wattage output for a given speed is limited and a higher battery voltage results in a decrease of charging current rather than an increase, so that the system is to a certain extent self-regulating.

The lighting switch is similar to the standard Lucas U.39 motor cycle lighting switch and provides positions for 'Lights off—Half charge', 'Pilot and Tail lights and Full charge', and 'Head and Tail lights with Full charge'.

## Performance Data

Output 7—10 amperes. Half-charge rate 5 amperes. (With coil ignition the battery will be charged at the rate of 3 amperes when running normally with lights off). Alternator will commence to charge the battery at 600 engine revolutions per minute. Maximum output is attained at approximately 2,000 r.p.m. and is substantially maintained to maximum engine revolution.

## Running Maintenance

Maintenance is restricted to occasional inspection and lubrication of the contact-breaker parts, and normal routine attention to the battery. No adjustment is necessary (or possible) to either alternator or rectifier. Every 1,000 miles (or monthly, whichever is the lesser period) remove the contact-breaker inspection cover for inspection of the contact points.

The contacts must be free from grease or oil. If they are burned or blackened, clean them with a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Reset contact-points to .010 — .012 ins. A few drops of good quality engine oil should be applied to the cam lubricating wick if it is dry. Place a small amount of Mobil grease No. 2 or clean engine oil on the contact-breaker pivot.

If the alternator requires any attention beyond the replacement of contact points and condenser, it is recommended that the complete machine should be sent to an authorised Lucas service station. The following information is given for the benefit of those unable to do so:

## SERVICE INSTRUCTIONS,

### Removal of Alternator

Remove alternator cover. Disconnect all wires at the 'Snap' connectors under the front of the petrol tank. Remove rotor retaining bolt. Insert special rotor extracting bolt supplied with machine and withdraw the rotor until it is just free of the crankshaft. Remove the nuts and spring washer from the through-studs securing the alternator body to the crankcase and lift the complete alternator bodily from the machine.

### Important

THE ROTOR SHOULD ON NO ACCOUNT BE REMOVED FROM THE ALTERNATOR BODY. IF THE ROTOR IS WITHDRAWN IT WILL BE NECESSARY TO RETURN THE COMPLETE ALTERNATOR TO THE MAKERS FOR RE-ASSEMBLY AND RE-MAGNETIZING.

### Stator Coil Removal

Disconnect the four leads from the terminal plate by unsoldering the terminals. Remove the two coil clamp fixing screws at the top and bottom of each coil. Remove clamps. Remove the insulation from the front of the body and the complete coil assembly can be lifted away from the alternator.

### Contact-Breaker Removal

Unscrew the contact-breaker base fixing screws, then lift up the contact plate complete with the condenser. The position of the contact-breaker base relative to the alternator body should be noted and marked to obviate the need for resetting the ignition timing on reassembly.

## INSPECTION AND TEST

### Stator Coils

Replace coils if (a) the insulation is frayed or damaged, leads broken, or open-circuited windings (b) if the coil laminations are damaged and will not fit satisfactorily on to the Stator magnets. A preliminary test of the coil assembly should be made with an OHM-METER which should give a reading of 0.4 ohms. The two coils are not symmetrical and in the event of a fault in one coil, it will be necessary to replace the complete coil assembly consisting of the pair of coils.

During the re-fitting of coils, the laminations should be carefully inspected to make sure they are free of all traces of dirt, grease and especially any magnetically attracted particles such as swarf or filings.

### Rotor

The rotor has no moving parts and is not subject to any wearing process. IT SHOULD NOT UNDER ANY CIRCUMSTANCES BE REMOVED FROM THE ALTERNATOR BODY or loss of magnetism will result. The alternator is designed in such a way as to prevent accidental removal of the rotor.

### Contact Breaker Assembly

Deal with the contact-points as advised in Maintenance Instructions. The condenser is of normal Lucas design with a capacity of .2 microfarads.

### Final Test and Assembly

Assembly of the unit should be carried out reversing the dismantling procedure. Refit the alternator to the engine as follows: Place the assembled alternator on the crankcase so that it locates on the register or spigot. Apply medium pressure to the rotor and rotate it until it registers with the driving key on the engine crankshaft. Insert the alternator body bolts and tighten down evenly.

The final test should be carried out as follows: Remake all connections. The engine should then be started up and run at medium speed—approximately 2,000 r.p.m. Use a moving iron or rectified type voltmeter and test the potential between G2 and G3. See Service Sheet No. 813. A reading of 17 — 18 volts should be obtained. Apply the same test between G1 and G3. A similar voltage reading should be obtained. A further test should be applied across the same terminals with a 6 volt 36 watt bulb, which should light up.

Switch off the ignition and remake all external wiring connections to the alternator in accordance with the Wiring Diagram. A further test should then be made with the rectified type voltmeter and a reading of approximately 20 volts should be obtained between terminals G1 and G2.

Finally when all leads are connected the headlamp should be switched on and the engine run at a speed sufficient to obtain maximum output. Taking into consideration the current consumed by headlamp, tail lamp and coil ignition, the total output of the generator should not exceed 10 amps. In the event of too high an output being given, it can be reduced by partially withdrawing the rotor from the alternator body. THIS WILL BE NECESSARY ONLY IN EXTREMELY RARE CASES, AND UTMOST CARE MUST BE EXERCISED IN WITHDRAWING THE ROTOR. NOT MORE THAN A QUARTER OF THE ROTOR LAMINATIONS SHOULD BE ALLOWED TO PROTRUDE BEYOND THE ALTERNATOR MAGNETS.

### General Precautions

The set is designed for POSITIVE EARTH connection only. If the battery is connected with negative to earth, the rectifier unit will be burnt out or at least badly damaged immediately the ignition is switched on. The alternator set has an ample margin of safety, but should not be run with the battery removed and/or the ignition switch in the emergency position any longer than is necessary. Prolonged operation under these conditions will result in the ignition coil overheating due to higher operating voltage in the primary circuit and will lead to a shorter life of contact-breaker points. In the event of mechanical damage to the rectifier, or damage due to the unit becoming burnt out through incorrect fitting of the battery, it will be necessary to fit a new rectifier. It is not possible to repair a damaged unit.

The new rectifier must be fitted to the machine in the manner and place specified by the makers, i.e. spacer bushes must be used to allow the air free access to both sides of the rectifier, and if the rectifier is fitted to the machine in an inverted position it must be replaced in a similar manner.

### Replacements

| DESCRIPTION | NUMBER | |
|---|---|---|
| Headlamp (Main Bulb) .. .. .. | 309 | 30/30 Watt (Export) |
| Headlamp (Main Bulb) .. .. .. | 312 | 30/24 Watt (Home) |
| Tail Lamp .. .. .. .. | 200 | 3 Watt |
| Pilot Bulb .. .. .. .. | 988 | 3 Watt |
| Alternator 1A45 .. .. .. | 47077D | |
| Westalite Rectifier .. .. .. .. | 2L985 | |

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Service Dept., Birmingham 11
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# BSA SERVICE SHEET No. 812A

*Reprinted September 1959*

## SUPPLEMENT TO SHEET No. 812.

## Lucas Alternator Equipment on B.S.A. Bantam Motor Cycles.

**Type IA45** **Service Reference 47077D.**

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The IA45 Alternator fitted to B.S.A. Bantam Motor Cycles is a development of the Standard Lucas design described in Service Sheet No. 812 and is specified for all Bantam machines fitted with Lucas equipment. A six-pole laminated rotating inductor and laminated stator coil assembly are used as in the standard machine but the modified unit now incorporates a roller steady bearing for the contact-breaker end of the rotating inductor, and the alternator body is secured to the engine with four fixing bolts.

### WORKSHOP INSTRUCTIONS.

Dismantling and re-assembly should be carried out as indicated in Service Sheet 812 but the following should be specially noted:—Provision is made for the easy removal and replacement of the steady bearing and bearing plate; the cam and steady bearing journal are both press fits on to the rotor shaft and can be removed by means of a suitable extractor of standard pattern. On re-assembly, it is imperative that the cam is correctly fitted in relation to the rotor shaft or the performance of the machine will be adversely affected when the engine is run with the ignition switch in the "emergency start" position.

The general procedure for re-fitting the Alternator to the motor cycle is the same as is given in Service Sheet 812 but the following precaution must be taken in order that the steady bearing is correctly aligned. During the re-fitting operation, the four contact plate fixing screws ("A" Fig. 42) should be slackened off and should not be re-tightened until the remainder of the re-fitting operations are completed, i.e., the Alternator fixing bolts and the rotor retaining bolt should be fully tightened before finally tightening the contact-plate fixing screws. The fixing screw holes in the contact plate are drilled oversize and providing the foregoing precautions are observed, the contact plate will automatically align the steady bearing with the rotor shaft

The final test of the machine should be carried out as detailed in Service Sheet No. 812

## IA45 INDUCTOR ALTERNATOR — Parts Details.

| | |
|---|---|
| Alternator complete type IA45, clockwise rotation ... | 47077D |
| Condenser ..... ... ... ... ... ... ... | 465817 |
| Contact Set ... ... ... ... ... ... ... | 407050 |
| Coils, Stator set of two ... ... ... ... ... | 465713 |
| Cam ... ... ... ... ... ... ... ... | 465800 |
| Support Plate for Steady Bearing ... ... .. .. | 465816 |
| Bearing RLS5E ... ... ... ... ... ... ... | 189243 |
| Sundry Parts Set ... ... ... ... ... ... | 465784 |

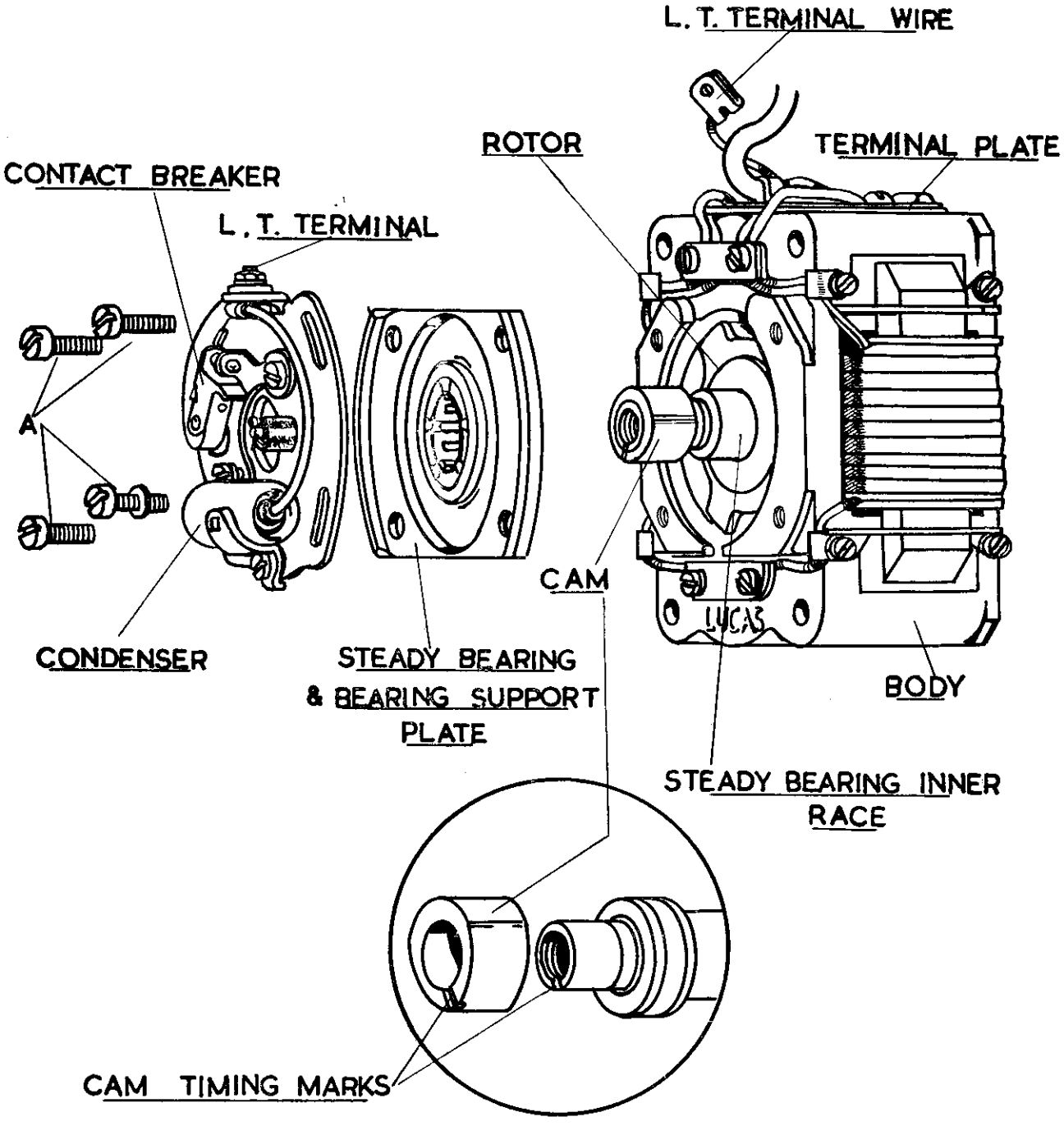



FIG. 42

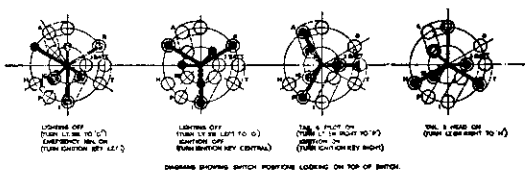
# GENERAL ARRANGEMENT OF IA45 ALTERNATOR

SERVICE REF. No. 47077D FITTED TO B.S.A. BANTAM MOTOR CYCLES

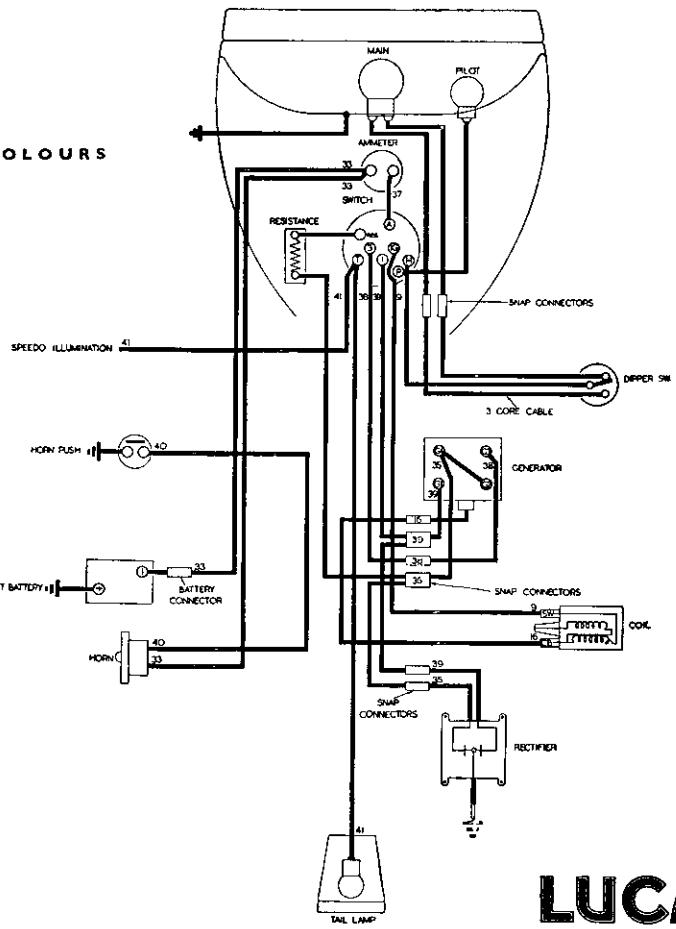
# B.S.A. "BANTAM" MOTOR CYCLE

(1949-52)

## WIRING DIAGRAM



DIAGRAMS SHOWING SWITCH POSITIONS LOOKING ON TOP OF SWITCH.




## KEY TO CABLE COLOURS

1 BLUE
2 BLUE with RED
3 BLUE with YELLOW
4 BLUE with WHITE
5 BLUE with GREEN
6 BLUE with PURPLE
7 BLUE with BROWN
8 BLUE with BLACK
9 WHITE
10 WHITE with RED
11 WHITE with YELLOW
12 WHITE with BLUE
13 WHITE with GREEN
14 WHITE with PURPLE
15 WHITE with BROWN
16 WHITE with BLACK
17 GREEN
18 GREEN with RED
19 GREEN with YELLOW
20 GREEN with BLUE
21 GREEN with WHITE
22 GREEN with PURPLE
23 GREEN with BROWN
24 GREEN with BLACK
25 YELLOW
26 YELLOW with RED
27 YELLOW with BLUE
28 YELLOW with WHITE
29 YELLOW with GREEN
30 YELLOW with PURPLE
31 YELLOW with BROWN
32 YELLOW with BLACK
33 BROWN
34 BROWN with RED
35 BROWN with YELLOW
36 BROWN with BLUE
37 BROWN with WHITE
38 BROWN with GREEN
39 BROWN with PURPLE
40 BROWN with BLACK
41 RED
42 RED with YELLOW
43 RED with BLUE
44 RED with WHITE
45 RED with GREEN
46 RED with PURPLE
47 RED with BROWN
48 RED with BLACK
49 PURPLE
50 PURPLE with RED
51 PURPLE with YELLOW
52 PURPLE with BLUE
53 PURPLE with WHITE
54 PURPLE with GREEN
55 PURPLE with BROWN
56 PURPLE with BLACK
57 BLACK
58 BLACK with RED
59 BLACK with YELLOW
60 BLACK with BLUE
61 BLACK with WHITE
62 BLACK with GREEN
63 BLACK with PURPLE
64 BLACK with BROWN

**LUCAS**
**ELECTRICAL EQUIPMENT**

B.S.A. MOTOR CYCLES LIMITED.
Service Dept., Waverley Works,
Birmingham 10
*(PRINTED IN ENGLAND*

# BSA SERVICE SHEET No. 813

Revised, September 1959

## "C" AND "B" GROUP MODELS (EXCEPT C15 COMPETITION)

## FITTED WITH CRANKSHAFT MOUNTED ALTERNATORS

### LUCAS LIGHTING

The electrical system used on these models provides D.C. for the battery, ignition coil and lights, by passing the A.C. output of the generator through a bridge type rectifier.

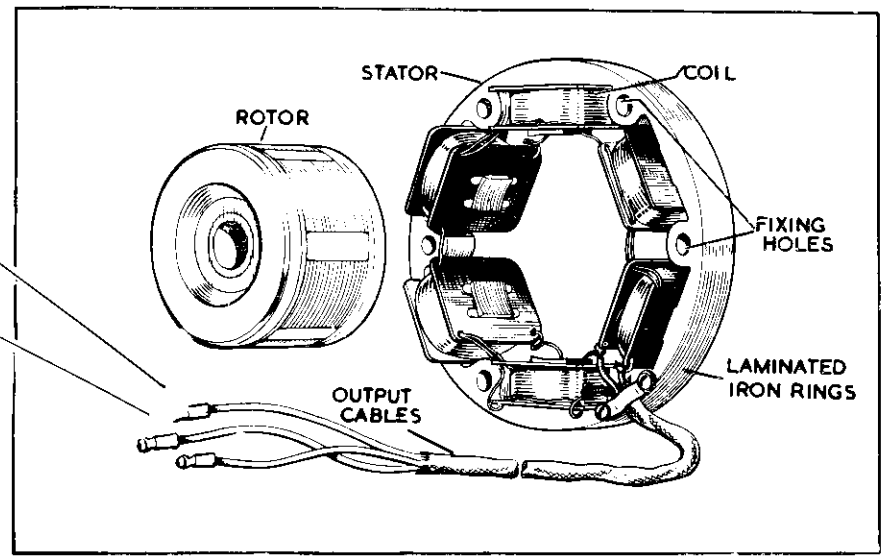
The alternator is connected to a section of the headlamp switch so that the output is automatically matched to the demands of the lighting circuit and the characteristics of the alternator prevent overcharging.

"C" Group except C15

| Cable Colours |
|---|
| Light Green |
| Dark Green |
| Middle Green or Green/Yellow |

"B" Group & C15

| Cable Colours |
|---|
| Green/Black or Dark Green |
| Green/Yellow |
| Green/White or Light Green |




Stator and Rotor of Lucas Motor Cycle Alternator
(RM 13 on C11G and C15, RM 13/15 on C12, and RM 15 on new series "B" group machines)

**Output Control**

The standard circuit has the output wires from the generator connected by their snap connectors to similarly coloured wires on the wiring harness and provides the following output control.

**Lighting Switch in "OFF" Position**

The output is taken from one pair of coils by means of the Light Green and Dark Green wires, and the remaining coils (Light Green and Middle Green wires) (Light Green and Green/Yellow on "B" group) are open-circuited.

**Lighting Switch in "PILOT" Position**

Output taken from one pair of coils by Light Green and Dark Green wires as before and the remaining coils are on open-circuit.

### Lighting Switch in "HEAD" Position

All three pairs of coils are connected in parallel and the maximum output is obtained. **Note.**—To provide an increased charging rate with the lighting switch in the "OFF" position, some models will be found to have the wire joining terminals 5 and 6 of the headlamp switch removed. This means that no coils are shorted out in this switch position and the charging rate is slightly increased.

In circumstances where a considerable amount of low speed running is necessary or there are long periods of parking with the lights on, it is possible to increase the charging rate with the lighting switch in the "OFF" and "PILOT" positions by connecting the Medium Green alternator cable (Green/Yellow for C15) by its snap connector to the Dark Green harness cable and the Dark Green alternator cable to the Medium Green harness cable (Green/Yellow for C15).

The Light Green cables should not be disturbed. These alternative connections considerably increase the charging rate in these switch positions, and the connections should be returned to standard for normal conditions of use or long runs.

Owing to the effects of the above modifications it is essential that the wiring circuit is returned to standard before checking the charging rates during fault finding.

### Emergency Starting

With the ignition switch in the "EMG" position, the battery is not isolated from the alternator and will, in fact, receive a charge whilst the machine is being run.

This arrangement is also a safeguard against continuous running in the "EMG" position. The back pressure of the battery will increase as it is charged, until it is sufficiently strong to affect the working of the ignition system. When this happens misfiring will occur, resulting in poor engine performance. In view of this, always check that the machine is not being run with the ignition switch continually in the "EMG" position, before testing the system for other faults.

### Motor Cycle Trials Events, etc.

When using the machine for trials riding, the alternator can be used continuously in the "EMG" position without a battery, providing the lead from the main harness to the battery negative terminal is earthed to the machine, but contact breaker points are liable to become badly burned.

### Test Procedure

As the lights and other equipment are operated on a normal D.C. circuit they can be checked by normal continuity tests with a battery and bulb.

The following equipment is required to satisfactorily test the charging circuit. The meters used should be accurate moving coil instruments.

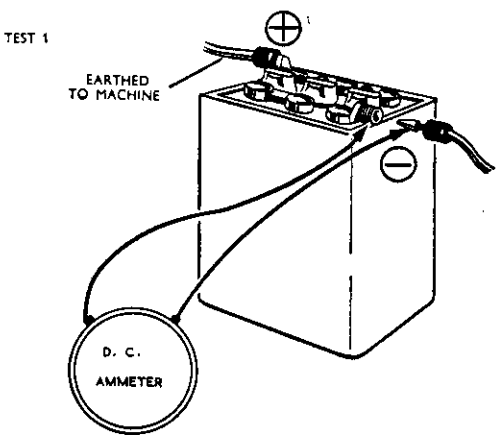
A.C voltmeter scale 0–15 volts.
D.C. ammeter scale 0–15 amps.
D.C. voltmeter scale 0- 15 volts.
1 ohm. load resistance.
12 volt battery and 36 watt bulbs.

When checking the alternator output the engine should be run at approximately 3,000 r.p.m.

If the performance of the alternator has proved unsatisfactory, it is advisable to first check the wiring to make sure that good contact is being made at the various connections and that none of the wiring of alternator coils are shorting to the frame.

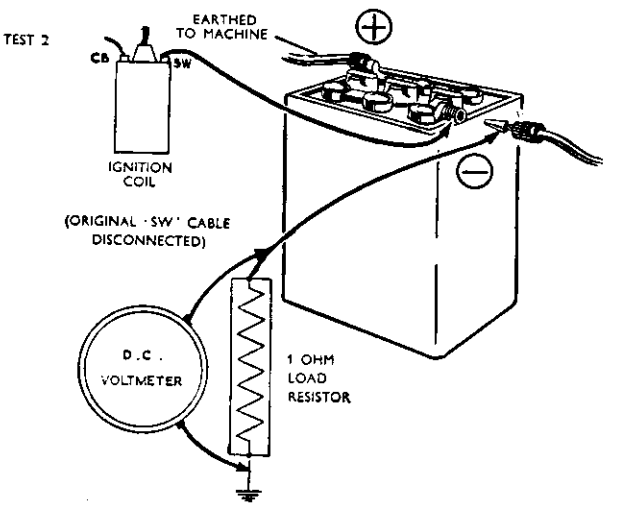
## CHECKING D.C. INPUT TO BATTERY

**Test 1.** Ammeter connected in series with main lead and battery.




If the battery is in poor condition or low state of charge use Test 2.

**Test 2.** Disconnect main lead from battery. Connect 1 ohm resistor in place of battery. Feed ignition coil separately from battery. Turn ignition switch to IGN position.




| Test | Switch Position | Reading Amps. at 3,000 r.p.m. | | |
|---|---|---|---|---|
| | | RM13 | RM13/15 | RM15 |
| 1 | OFF | 1.5 (min.) | 1.75 (min.) | 2.5 (min.) |
| | PILOT | 0.5 (min.) | 0.75 (min.) | 1.5 (min.) |
| | HEAD | 0.25 (min.) | 0.5 (min.) | 2.5 (min.) |

| Test | Switch Position | Reading Volts at 3,000 r.p.m. | | |
|---|---|---|---|---|
| | | RM13 | RM13/15 | RM15 |
| 2 | OFF | 1.5 (min.) | 1.75 (min.) | 2.5 (min.) |
| | PILOT | 1.5 (min.) | 1.75 (min.) | 2.0 (min.) |
| | HEAD | 3.0 (min.) | 3.25 (min.) | 3.0 (min.) |

### Conclusion from these Tests

**Test 1.** If meter readings are as stated, the charging circuit and alternator are satisfactory.
No reading; check the generator.
A low reading can be caused by a faulty battery.
Proceed with Test 2. If readings still low check battery with hydrometer and discharge tester.

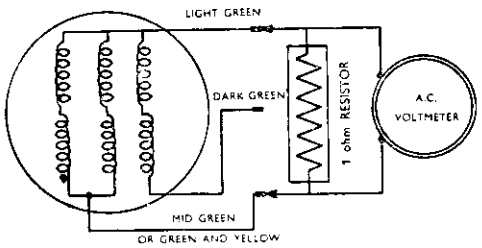
**Test 2.** If meter readings are lower or higher than values stated, check the generator.
No reading on meter; check the rectifier.

### Important

Inaccurate readings can be due to faulty wiring, bad connections at the snap connectors or poor earths. Make a quick visual check of all connections before proceeding with the tests.

Remember it is no use carrying out Test 1 if the battery is faulty or in a low state of charge; if in doubt proceed with Test 2.

# Testing the RM13 Alternator on the Machine, using an A.C. Voltmeter and 1 Ohm Load Resistor




| Test | Voltmeter and Resistor Connected Across | Reading Volts at 3,000 r.p.m. | | |
|---|---|---|---|---|
| | | RM13 | RM13/15 | RM15 |
| 1 | Dark Green and Light Green | 3.0 (min.) | 3.25 (min.) | 4.25 (min.) |
| 2 | Light Green and Mid Green or Green/Yellow | 6.0 (min.) | 6.25 (min.) | 6.75 (min.) |
| 3 | Dark Green and Light Green (with Mid Green or Green/Yellow connected to Dark Green). | 8.5 (min.) | 8.75 (min.) | 9.25 (min.) |
| 4 | Any one lead and Generator Stator (Earth) | No Reading | No Reading | No Reading |

### Conclusions from these Tests

Low reading on any group of coils indicates shorted turns.

Zero reading will indicate open-circuit coil.

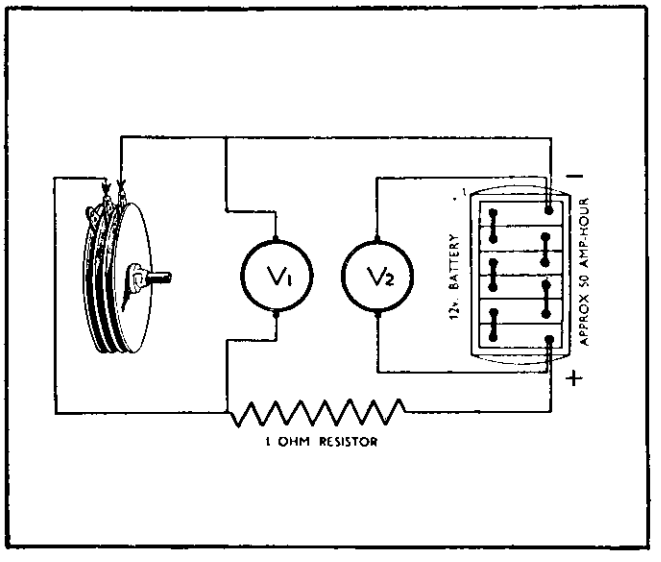
If all coils read low, partial de-magnetisation of rotor may have occurred as a result of faulty rectifier. Check rectifier, and battery earth polarity before replacing rotor.

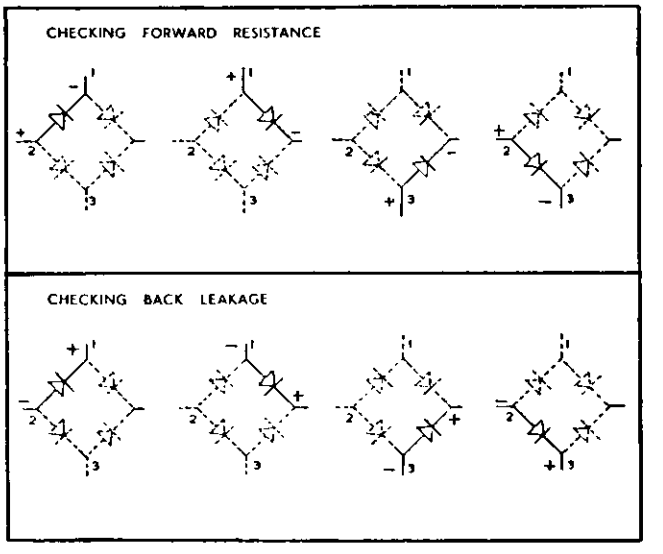
A reading between any one lead and the generator stator indicates an earthed coil. Replace stator or locate earth by isolating and testing individual coils.

### Note

With the engine running at 3,000 r.p.m. (approx.) the output voltages are steady, and even if the engine is running a few r.p.m. faster or slower the values stated will be obtained from a good generator.

# Rectifier—Bench Testing




V1—will measure the volt drop across the rectifier plate.

V2—must be checked when testing the rectifier plate, to make certain the supply voltage is the recommended 12 volts on load.

**It is essential that the supply is kept at 12 volts for these Tests.**

### Forward Resistance Test

**Test 1.** Connect test leads in turn to terminals 2 and 1, bolt and 1, bolt and 3, 2 and 3. Reading in all positions should not be greater than 2.5 volts. Keep the testing time as short as possible to avoid overheating the rectifier cell. **Note.**—If the later type of rectifier, which has no terminal markings, is fitted, the same test procedure is followed. The same voltage values also apply.

### Back Leakage Test

**Test 2.** Proceed as for Test 1, and test each cell in turn, but reverse the test leads. Reading on V1 should not be less than 2 volts below the open-circuit reading on voltmeter No. 2, i.e., 10 volts.

### Conclusion from these Tests

**Test 1.** If the voltage reading on V1 is more than 2.5 volts, on any cell, it is aged and the rectifier should be replaced.

**Test 2.** If the voltage reading on V1 is less than 10 volts, on any cell, the rectifier is shorted and should be replaced.

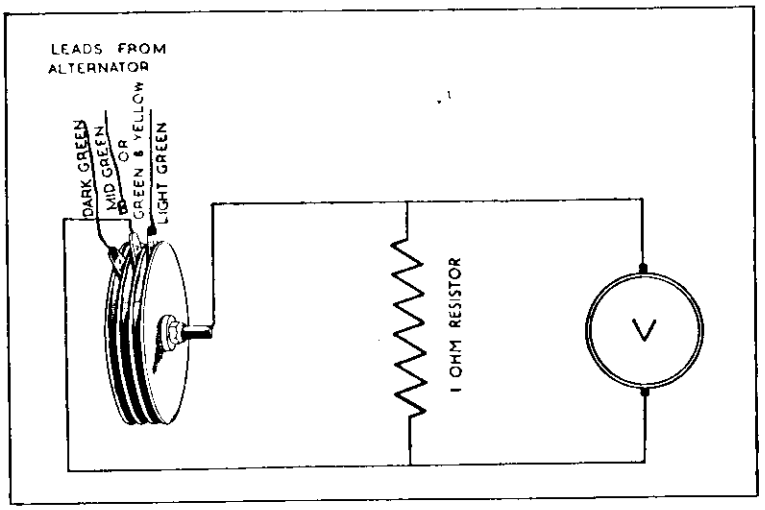
### Important

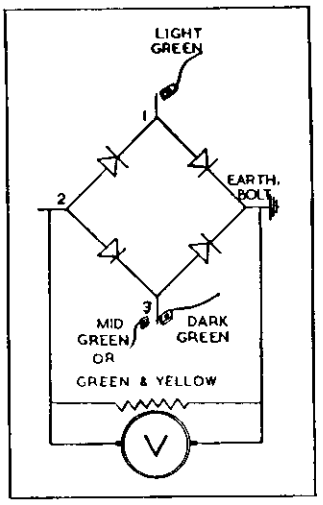
Before fitting a replacement rectifier check the following points:—

1. Check that battery is correctly connected, **Positive** to **Earth.**
2. Check rectifier visually for signs of damage.

**Never** disturb the tension of the nut which holds the elements together on the through bolt. The efficiency of the rectifier depends upon the correct tension of the plates. The tension of the nut is set before leaving the works, and cannot be adjusted correctly in service.

# Checking Rectifier in Position on Machine




| Voltmeter and Resistor Connected Across | Reading with Leads Connected as Shown |
|---|---|
| Terminal No. 2 (or centre terminal on latest type) and frame of machine | 6.5 (min.) RM13<br>7.0 (min.) RM13/15<br>7.75 (min.) RM15 |

**Procedure**

Connect the alternator leads as detailed direct to the rectifier terminals No. 1 and No. 3.

(**Note.**—On the latest type rectifiers the terminals are not numbered, so connect the alternator leads to the outer cranked terminals).

Connect the test leads which must have a D.C. voltmeter with 1 ohm load shunted across, between earth (frame of machine) and terminal No. 2 (centre terminal on latest type rectifier) when the values stated should be obtained with engine running at 3,000 r.p.m.

**Conclusions from these Tests**

If the alternator passes its individual test, but it fails on this test it indicates that either the rectifier is faulty or it is not properly earthed.

Connecting the test leads to the centre bolt will eliminate the possibility of faulty earth connection.

# Testing the External Wiring Circuit

**Using D.C. Voltmeter only**

1. All cables, including battery, to be connected as normal.
2. Connect voltmeter Red test lead to earth.

**Testing Charging Circuit through Ignition Switch**

3. Connect Black test lead to No. 2 terminal on rectifier.
4. Switch ignition to IGN position.
5. Battery volts, i.e., six, should register on voltmeter.
6. If there is zero reading on voltmeter in the above condition, check circuit back through ignition switch, ammeter, etc., to the battery.

**Testing Emergency Start Circuit (Single Cylinder Machine)**

7. Connect Red test lead to earth.
8. Connect Black test lead to C.B. terminal on ignition contact breaker.
9. Open ignition contacts.
10. Switch ignition seitch to EMG position.
11. Battery volts should register on voltmeter.
12. Transfer Black test lead to alternator Mid-Green lead.
13. Battery volts should register on voltmeter.

**Note**

These tests are to be carried out in the case of "No Charge" or "No Emergency Start" if previous tests have been carried out and all is in order.

It is important that both the ignition timing and the rotor timing is correct for efficient operation of Emergency Start.

# Testing the 'Low,' 'Medium' and 'High' Charge Positions

**Using D.C. Voltmeter only**

1. Connect Red test lead to earth.
2. The set, including battery connected as normal, with the exception of the alternator Middle Green cable which should be disconnected at the snap connector under the saddle
3. Connect Black test lead to Mid-Green cable coming from headlamp (i.e., not coming from alternator).
4. With ignition switch in IGN position and lighting switch OFF.
5. A low voltage (i.e., 1—2) should register on voltmeter.
6. With lighting switch in PILOT, zero voltage should register on voltmeter.
7. With lighting switch in HEAD position a low voltage should register on voltmeter.

**Note**

Incorrect switching of these cables will cause incorrect charging rates, i.e., failure of Mid-Green and Dark Green linking together in HEAD position will result in a low charge rate with headlight switched on.

In the case of incorrect switching it is necessary to check the wiring and the switch for correct connections, etc.

### Headlamp Switch

If both the rectifier and alternator appear satisfactory the wiring and switch contacts must be checked most carefully to eliminate any possible faults. The correct headlamp switch connections are shown in Service Sheets

| | | |
|---|---|---|
| No. 808D | ... ... | C12. |
| No. 808C | ... ... | C11G. |
| No. 808H | ... ... | "B" models. |
| No. 808J | ... ... | C15. |

### Alternator Removal and Replacement

The procedure for removing and replacing the alternator is described in Service Sheets No. 314 for "B" group machines and 409 for C11G and C12, and No. 422 for C15. Note that the stator should be assembled with the clip retaining the output cables on the side of the stator next to the engine on C11G and C12 but on C15 and "B" group machines the clip should be on the side away from the engine.

# BSA SERVICE SHEET No. 813A

*Reprinted March* 1960

## C12, A Group and M21 Models

### ADJUSTING THE CHARGING RATE OF LUCAS ALTERNATORS ON RADIO EQUIPPED MACHINES.

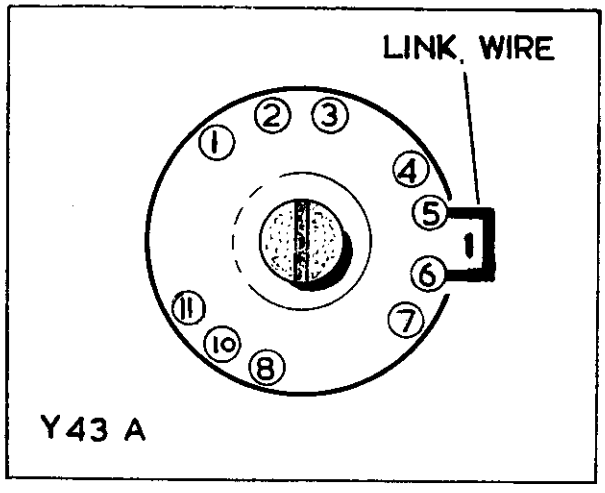
**GENERAL.**

The running conditions of radio equipped machines vary from long distance daylight patrol work with occasional use of the radio, to slow running convoy or short distance local work involving considerable use of the radio and possibly of the lights as well. There is a heavy load on the battery while transmitting, and the receiver may be left switched on for long periods representing a constant drain on the battery.

Obviously, the charging rates necessary to balance these varying loads must differ widely. Lucas alternators are designed to provide three alternative charge-rates which are selected by inter-changing the wiring connections.

The adjustments are simple to perform but the responsibility for making them should rest with the Maintenance Personnel who, being familiar with the running conditions and the state of charge of the batteries, are best placed to judge when any alteration is necessary. In the event of doubt, advice should be sought from Lucas Service Organisation.

It must be emphasised that battery charging from an external source may become necessary if a large proportion of night riding with the radio in use, or transmitting for long periods with the engine stopped is involved.




The C12 is fitted with a Model RM 13/15 Alternator in conjunction with a PRS 8 Lighting and Ignition Switch.

By connecting or removing a wire link between switch terminals 5 and 6, two intermediate charge-rates can be obtained in addition to the three already mentioned.

With the link in place the switch automatically increases the alternator output in the "Pilot" and "Head" positions. When the link is removed, the output increases only in the "Head" position.

If the alternator wiring is connected as in Stage 3 maximum output is developed in all switch positions.

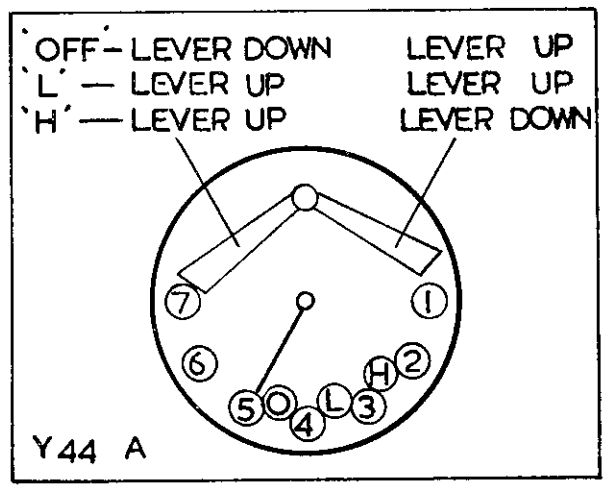
## A GROUP and M21 MODELS.

These machines are fitted with a Model RM 15 Alternator as well as the normal 60w., E3L Dynamo, and have a Model U39 Lighting Switch. This is similar to the switch fitted to standard models, but it is provided with two toggle arms to control the alternator output in the various switch positions.

As on C12, Stage 3, connections give maximum alternator output in all switch positions.

Current for all normal purposes is supplied by the alternator. This is supplemented by the dynamo as necessary when a heavy load is placed on the system. For servicing and testing purposes the two instruments should be dealt with separately, one being disconnected while testing the other.

When the radio is out of use for a prolonged period, it is important that the light green wire from the alternator is disconnected and the end taped up, otherwise the battery will become over-charged.

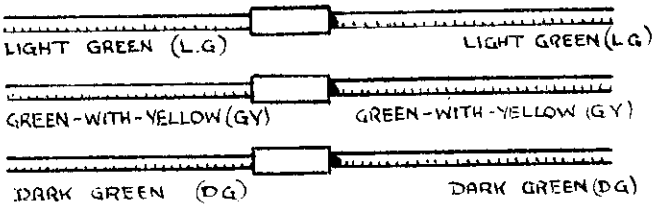



## TESTING.

As the radio is connected directly across the battery, the current taken will not be shown on the ammeter. To check whether the charging ouput is sufficient to balance the load, a second ammeter must be inserted in the cable between battery and radio. The reading on this ammeter must then be deducted from the charge shown on the ammeter fitted to the machine.

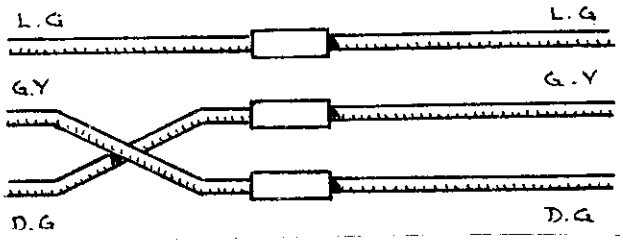
## DAYTIME CHARGING RATES.

### Alternator Cable Connections—Stage 1.



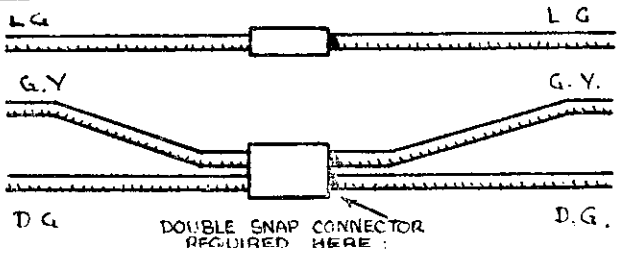

| | OUTPUT IN AMPERES | |
|---|---|---|
| | 2,000 r.p.m. | 5,000 r.p.m. |
| C12 (with terminals 5 and 6 linked) ... ... | 2.4 min. | 2.75 min. |
| C12 (with terminals 5 and 6 not linked) ... ... | 3.75 min. | 4.5 min. |
| A Group and M21 ... ... ... ... ... | 3.75 min. | 4.5 min. |

### Alternator Cable Connections—Stage 2.

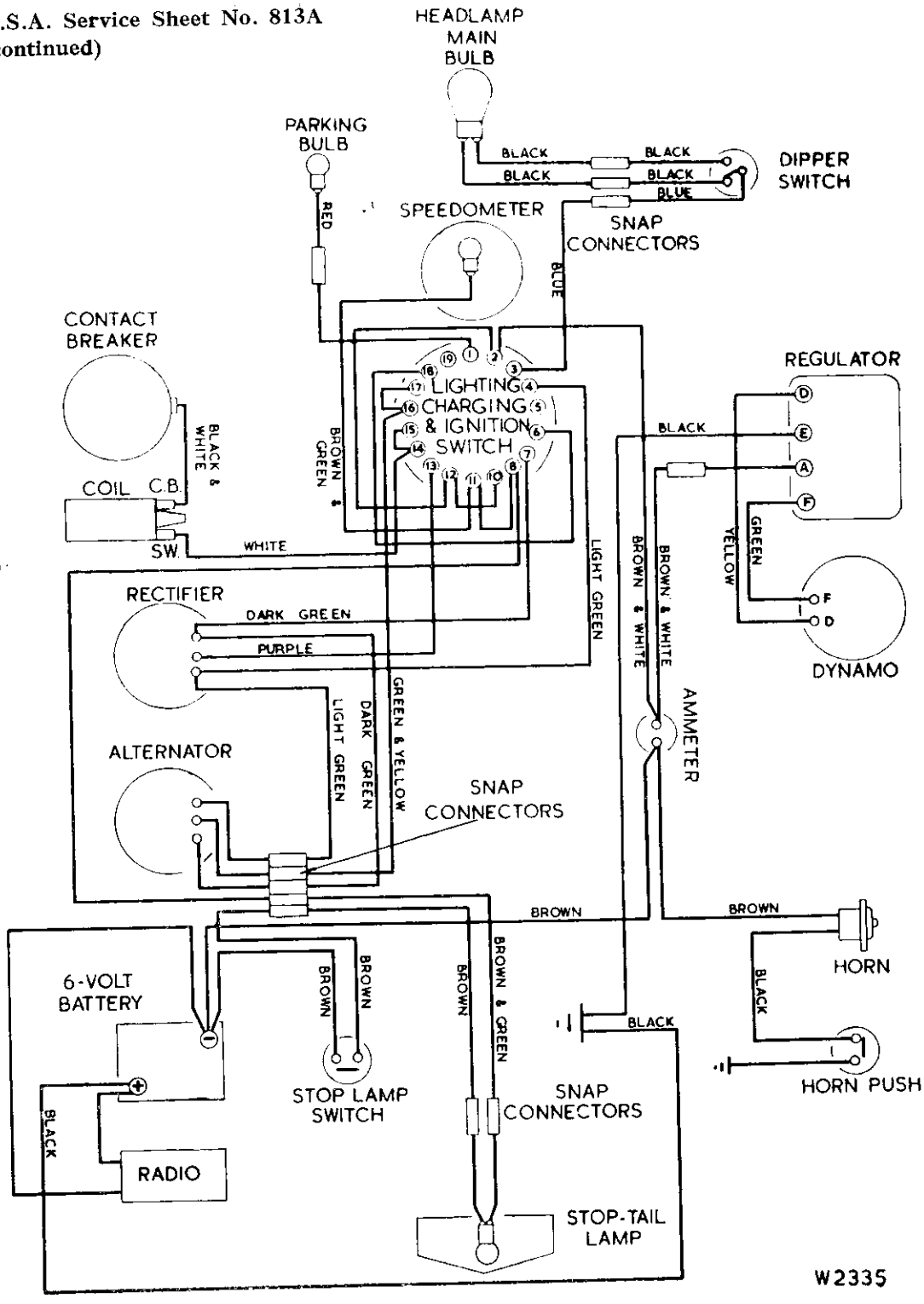



| | OUTPUT IN AMPERES | |
|---|---|---|
| | 2,000 r.p.m. | 5,000 r.p.m. |
| C12 (with terminals 5 and 6 linked) ... ... | 5.25 min. | 6.25 min. |
| C12 (with terminals 5 and 6 not linked) ... ... | 6.5 min. | 7.5 min. |
| A Group and M21 ... ... ... ... ... | 6.5 min. | 7.5 min. |

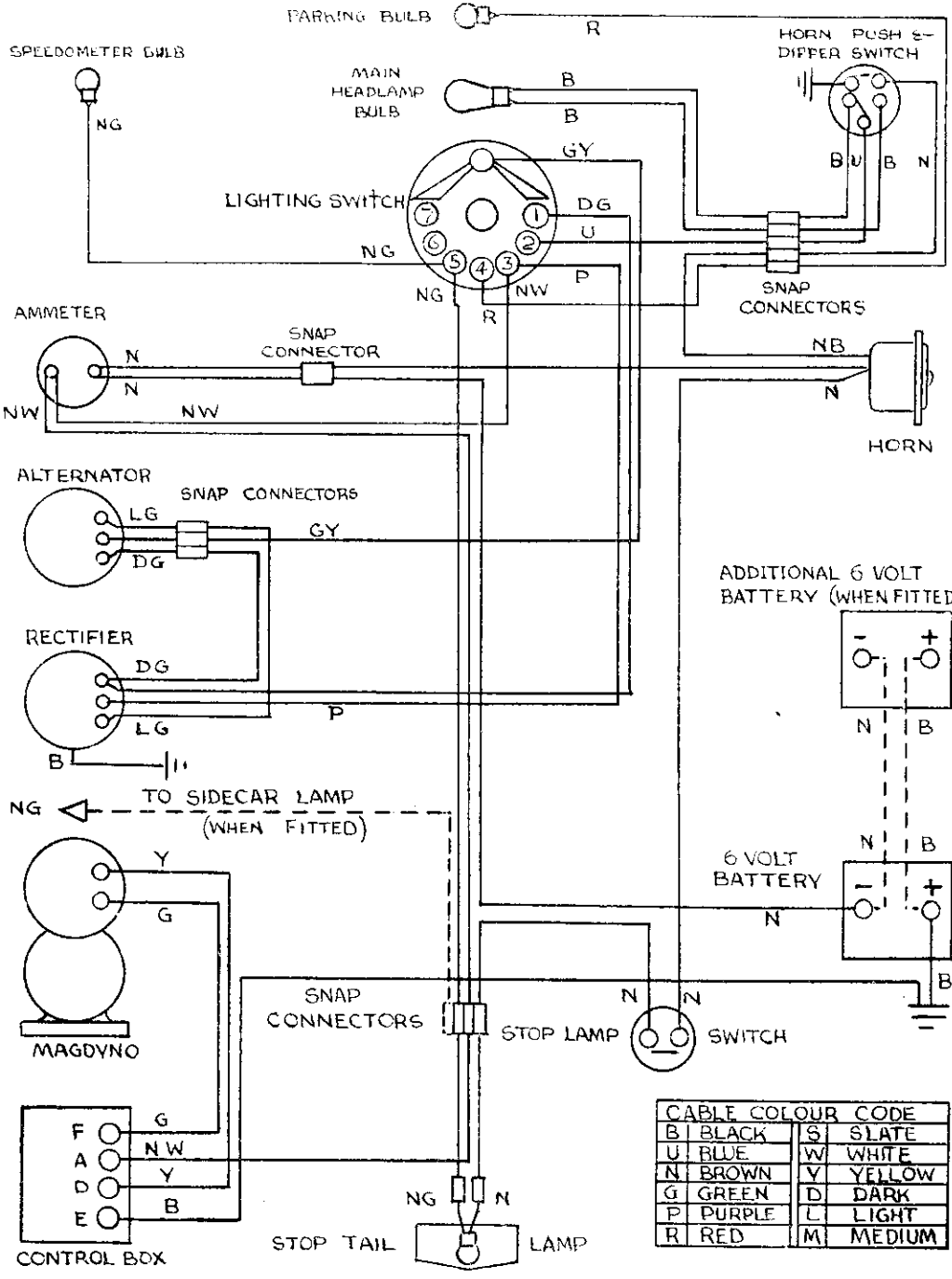
### Alternator Cable Connections—Stage 3.




| | OUTPUT IN AMPERES | |
|---|---|---|
| | 2,000 r.p.m. | 5,000 r.p.m. |
| C12 (with terminals 5 and 6 not linked) ... ... | 8.5 min. | 9.5 min. |
| A Group and M21 ... ... ... ... ... | 8.5 min. | 9.5 min. |

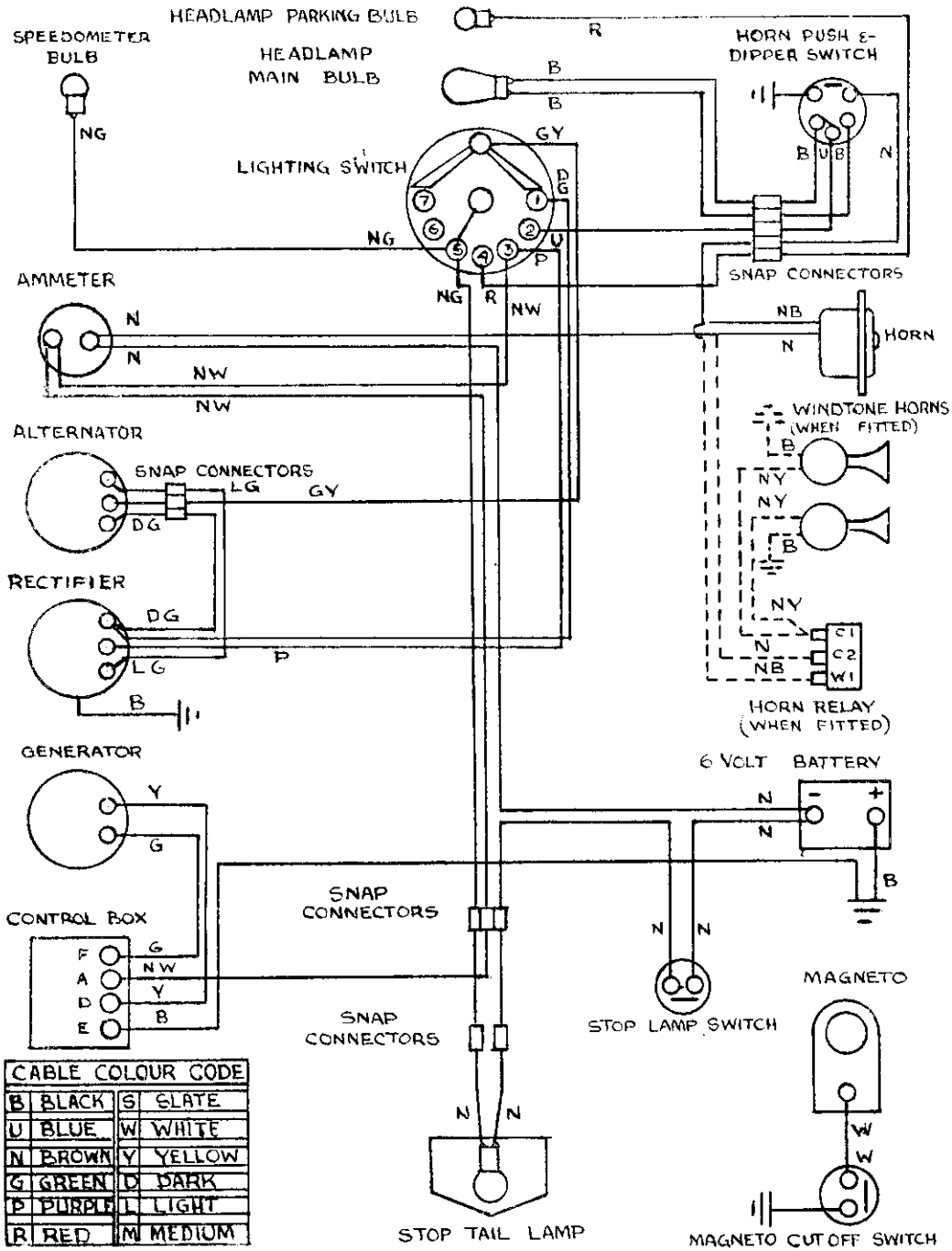



C12 WIRING DIAGRAM




**M21 WIRING DIAGRAM**

B.S.A. MOTOR CYCLES LTD., Service Dept., Waverley Works, Birmingham, 10.
*Printed in England*




| CABLE COLOUR CODE | | | |
|---|---|---|---|
| B | BLACK | S | SLATE |
| U | BLUE | W | WHITE |
| N | BROWN | Y | YELLOW |
| G | GREEN | D | DARK |
| P | PURPLE | L | LIGHT |
| R | RED | M | MEDIUM |

A GROUP WIRING DIAGRAM

# BSA SERVICE SHEET No. 813B

*Printed March 1960*

## C15 COMPETITION MODEL

## ALTERNATOR AND "ENERGY TRANSFER" SYSTEM INTRODUCTION AND SERVICE TESTING PROCEDURE.

### INTRODUCTION

To cater for special machines such as the C15 Competition, which is a high-performance competition and trials machine, Lucas engineers have developed a special RM13 type alternator and " energy transfer " ignition coil. The alternator windings comprise of two sets of series connected coils, one set for direct lighting when this is required, the other set of coils being connected purely for ignition purposes. The alternator and ignition coil are similar in operation to a magneto whilst retaining the physical characteristics of the conventional coil ignition system namely, separate ignition coil and contact-breaker, and are designed for continuous use without a battery in circuit; this is particularly advantageous in competition work.

### • " ENERGY TRANSFER " IGNITION

**Working Principles.** The main feature of an " energy transfer " ignition system is that the ignition coil primary is connected **in parallel** with the contact-breaker points, whereas in the conventional coil ignition circuit the primary winding and contact-breaker are connected in series. In practice this means that the current generated in the alternator ignition coils can flow direct to earth through the contact points, when these are closed, but when they are open its alternative path to earth is *via* the ignition coil primary. The sequence of events which, of course, takes place at high speeds, due to the action of the contact-breaker, is as follows.

With the contact-breaker points closed, the ignition generating coils of the alternator, one end of which is permanently connected to the frame of the machine, are in effect short-circuited causing heavy currents to circulate in them. When the contact-breaker points open the short-circuit effect is removed and the built-up energy circulated in the generating coils is rapidly transferred to the primary of the ignition coil. The effect of this " high energy " pulse in the ignition primary is to induce a high voltage in the secondary winding which, in turn, is transmitted through the H.T. cable to the sparking plug. The contact-breaker is arranged to open only at peak instants in the A.C. generating cycle, to ensure that maximum energy is available for ignition purposes.

Another feature worth noting is that the " energy transfer " system operates on a rising current in the ignition coil primary, and not as in the conventional coil ignition system, on a falling current in the primary winding.

### GENERAL DESCRIPTION

**Stator.** Wound with 4 coils only. Two series connected coils are used for ignition purposes being permanently connected across an " energy transfer " coil model 2 E.T. Diametrically opposite are two coils, similarly connected, of a slightly heavier gauge wire, for use when direct lighting is required; these will supply sufficient current for a 6v 24/24w headlamp bulb together with a 6v 3w or 6v 6w tail lamp bulb, i.e., 27/30w.

As with previous models of the RM13, three wires are brought out from the stator for connecting to the external circuit. One end of the LIGHT GREEN or RED lead is earthed to the frame of the machine, the other end is connected to both the lighting and ignition coils. The DARK

GREEN or BROWN BLUE lead is connected to the lighting switch, when lighting is used, and the GREEN YELLOW or BLACK WHITE lead is connected to the contact-breaker and primary of the " energy transfer " coil.

**Rotor.** The rotor is a standard RM13 unit, but when keyed onto the model C15 Competition crankshaft the magneto timing differs from that of the standard C15.

**Contact-Breaker Cam.** A special short open-period (30°) cam has been designed for use with this alternator to ensure that the maximum of efficiency is obtained from the 2 E.T. "energy transfer" ignition coil to give the high performance characteristic required with this type of competition machine.

**2 E.T. " Energy Transfer " Ignition Coil.** The 2 E.T. has been specially designed for use in " energy transfer " ignition systems. It employs a closed iron circuit and a primary winding whose impedance is closely matched with that of the alternator ignition generating coils, resulting in a high performance characteristic, particularly for starting.

## SERVICE NOTES

**Converting from Standard to Competition Engine.** The model C15 Competition machine has several engine features which differ from those of the standard machine. A special cylinder head and camshaft, etc., are incorporated in the design. Merely fitting a competition alternator and " energy transfer " ignition coil to a standard machine, and advancing the ignition timing will not bring it up to the competition specification. To achieve this the necessary engine parts will also have to be replaced. Also, advancing the ignition in trying to reach competition performance may seriously damage a standard engine.

If a conversion is contemplated a B.S.A. Agent should be approached for the relevant engine conversion details.

**Timing.** It is very important that care is taken when timing, for ignition purposes, a machine fitted with this special RM13 and " energy transfer " ignition system. The C15 Competition has been designed as a high performance machine, for use in competition and trials work and therefore the ignition timing, on which the high performance is very dependant, must be accurately set. Remember, it is not only the piston/spark timing relationship which is involved but also the " magneto " performance (spark energy) of the alternator. This will be appreciated more fully when it is remembered that, as the rotor of the alternator is keyed to the engine crankshaft, which in turn is coupled through the connecting rod to the piston, any movement of the piston during the timing procedure will affect the position of the crankshaft and hence the magnetic timing position of the rotor.

In other words the maximum alternator " magneto " performance can only be obtained when the piston is accurately set to the timing position recommended by the manufacturer (12° B.T.D.C.), engine fully retarded.

## SYSTEMATIC FAULT LOCATION

The following notes recommend the procedure to be adopted in the event of trouble developing with the equipment.

### 1. Engine Fails to Start

1. Remove the H.T. lead connected to the sparking plug and hold it approximately $\frac{1}{8}$" from the engine cylinder block. The gap should spark at normal " kick-start " speed. If it does check that plug gap is correct to manufacturers recommendation, if plug electrodes are worn or insulation cracked, plug should be replaced. Re-connect H.T. lead to plug and again check for sparking with plug resting on cylinder head. If plug gap sparks refit and proceed to check fuel supply, carburation, etc.

   **NOTE**:—It is essential that the correct plug gap is maintained—a wider gap will cause difficult starting or perhaps failure to start. Accurate timing is also a critical factor in starting, the correct setting is 12° B.T.D.C., engine fully retarded.

NOTE.—This test must be done as quickly as possible to avoid damage to coils through overheating, and misleading readings due to increase in coil resistance with temperature rise. It will be found that 2 to 3 seconds duration gives ample time to observe the ammeter readings.

On no account should this test be made with the rotor in position, otherwise partial demagnetisation will result.

4. **Bench Testing—Alternator and 2 E.T. Ignition Coil.**

**2 E.T. Ignition Coil**

The 2.E.T. ignition coil should be tested similarly to the procedure detailed for the S.R. magneto coils except for the test voltage which must be 12 volts, and no ammeter is required.

A four lobe D.K. type contact-breaker having closed periods of not less than 42° and having an operating range up to 750 r.p.m. is required. Also, a 12 volt battery, a 3 point rotary spark gap and 1 ohm resistor approximately 15 watt.

Proceed to test as follows:—

7. Connect the 12 volt battery, contact-breaker, resistor in series with the coil primary winding. Battery polarity should be such that the negative side of battery is connected to the earthed end of the primary.

   Also connect with a jumper lead, the spark gap point that is farthest from the ionising electrode, to the negative side of the circuit.

   Connect the H.T. cable from coil to the 3 point spark gap to the electrode nearest the ionising point.

   Run the contact-breaker at 750 r.p.m. Regular sparking should occur at the spark gap which should be set to 8 m/m (approximately 14 Kv). This test should not be continued for more than 30 seconds because the arcing of the contacts will be fairly heavy, due to the slow running speed and low primary resistance.

**Alternator—Lighting and Ignition Coils.**

**Lighting Coils—D.C. Output Test.**

The lighting coil output can be checked by feeding it through a bridge rectifier standard type—into a 6 volt battery. The battery should have a *rheostat connected across it which should be adjusted as necessary to maintain the 6 volt potential during testing.

Also in parallel with battery, connect voltmeter to measure potential.

The battery and ammeter should then be connected in series with the lighting coils and readings taken at the following alternator speeds.

| *Alternator R.P.M.* | *Output in Amps into 6 volt Battery* |
|---|---|
| 2,000 | 2.8 (Minimum) |
| 5,000 | 5.3 (Maximum) |

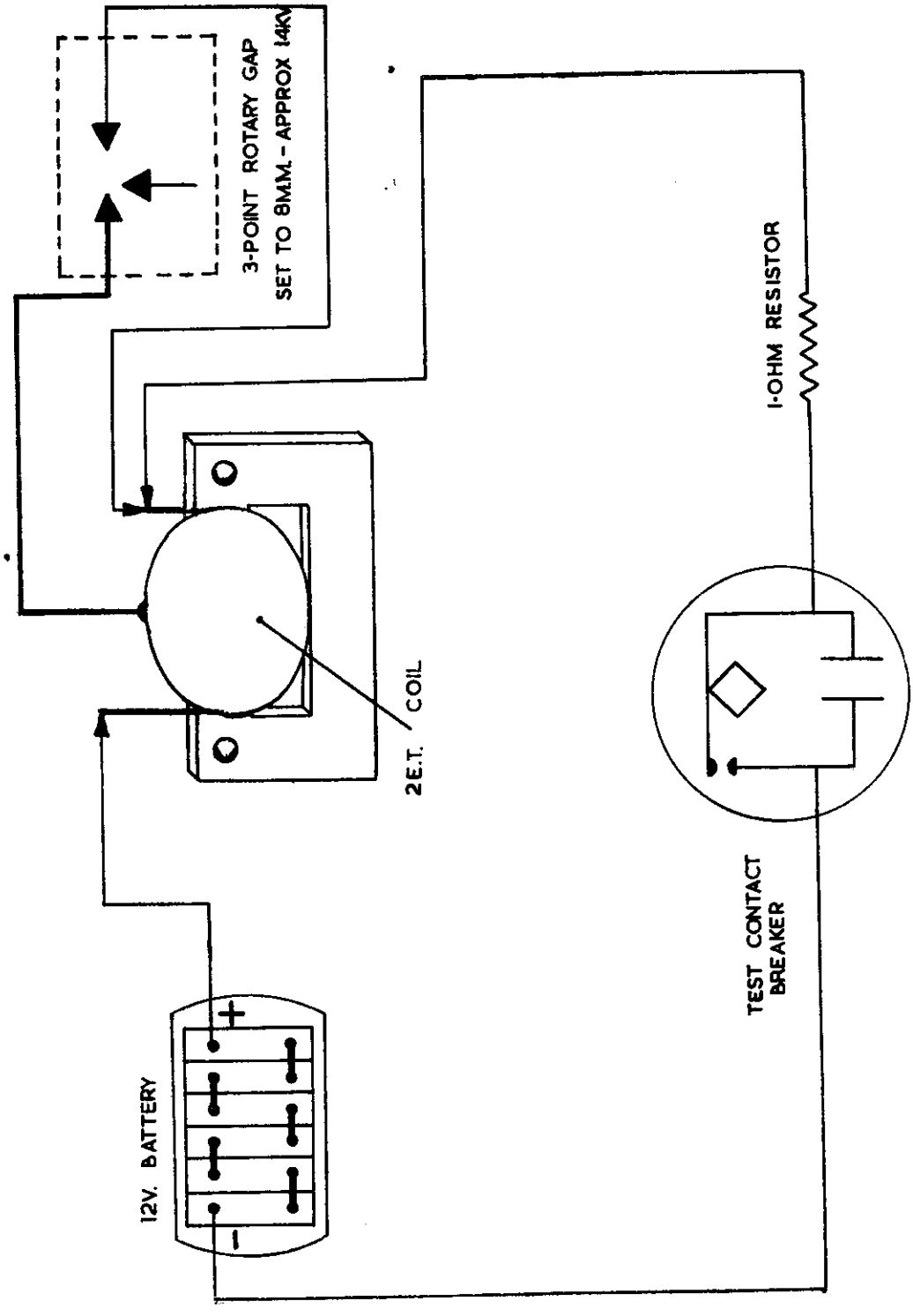
**Ignition Coils—D.C. Output Test.**

Using the same test gear and procedure as detailed for the lighting coil tests, the ignition coil output readings are as follows:—

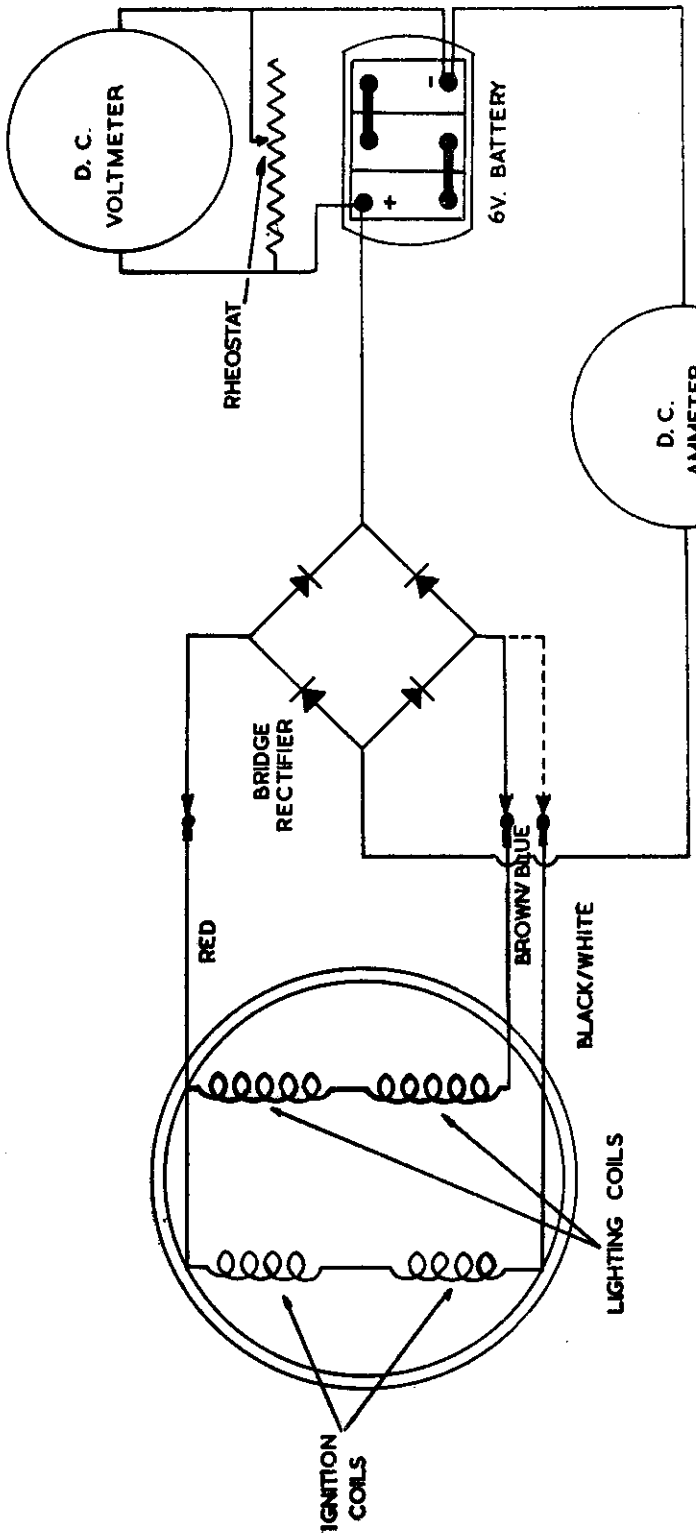
| *Alternator R.P.M.* | *Output in Amps into 6 volt Battery* |
|---|---|
| 2,000 | 1.4 (Minimum) |
| 5,000 | 1.8 (Maximum) |

The stator complete, or individual coils should be replaced if the output readings for either or both the ignition and lighting coils are outside the figures quoted.

* Capable of carrying 10 amps without overheating.



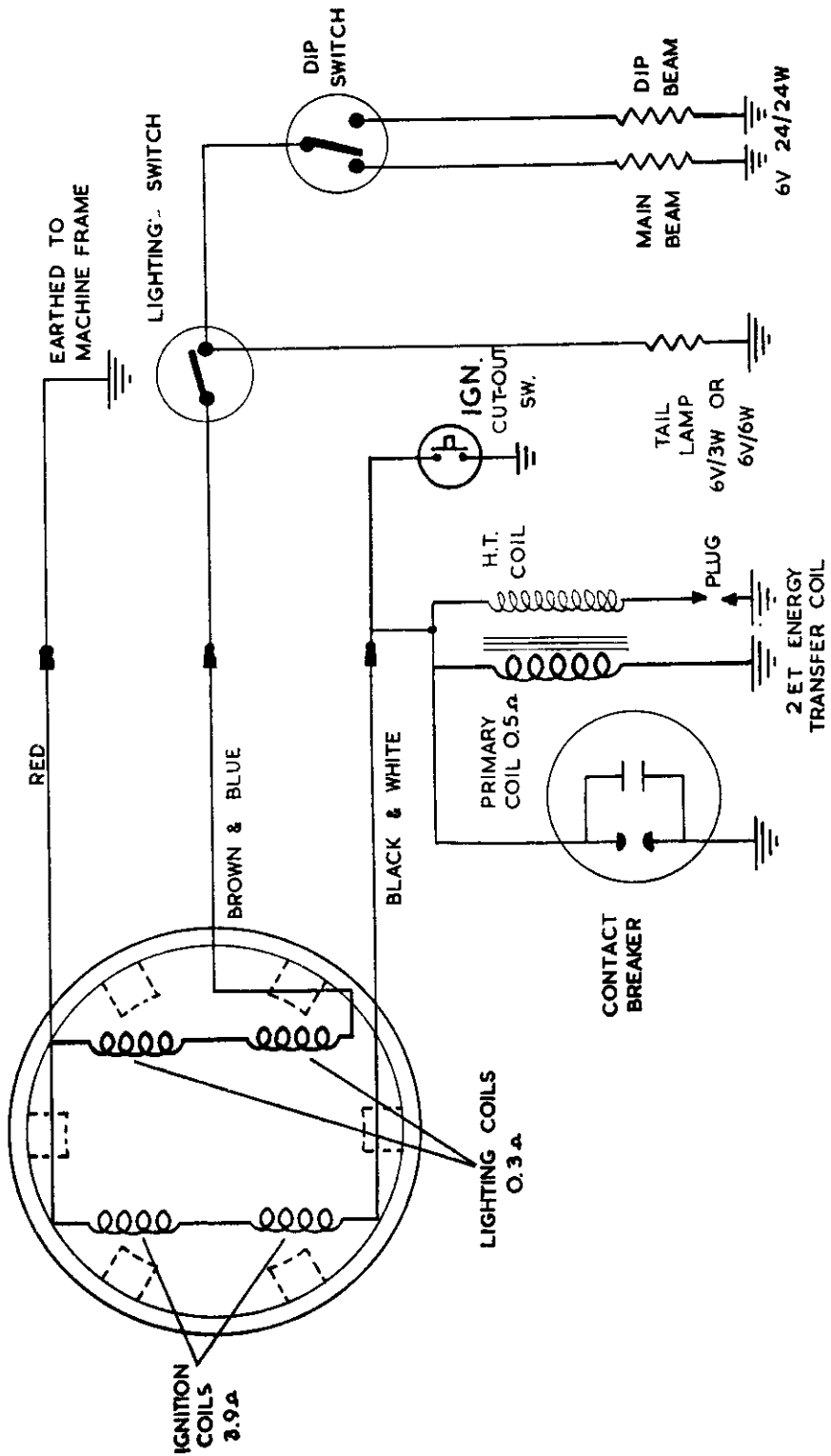

2 E.T. "ENERGY TRANSFER" IGNITION COIL
SPARK PERFORMANCE TEST CIRCUIT




RM 13 (COMPETITION) ALTERNATOR
D.C. OUTPUT TEST CIRCUIT

| LIGHTING COILS | | IGNITION COILS | |
|---|---|---|---|
| ALTERNATOR R.P.M. | OUTPUT IN AMPS. | ALTERNATOR R.P.M. | OUTPUT IN AMPS. |
| 2000 | 2.8 (min) | 2000 | 1.4 (min) |
| 5000 | 5.3 (max) | 5000 | 1.8 (max) |

CIRCUIT DIAGRAM OF RM 13 (COMPETITION) ALTERNATOR AND "ENERGY TRANSFER" IGNITION SYSTEM AS FITTED TO **C15. COMPETION MODEL**



# BSA SERVICE SHEET No. 814

*November, 1954*
*Reprinted April, 1955*

## Model C10L

## WIPAC LIGHTING

The lighting circuit is supplied by an A.C. generator through a bridge type rectifier, so that, except when the headlamp switch is in the "Emergency" position, the coil, battery and lights are supplied with direct current in the normal way.

The generator output is automatically controlled by means of the headlamp switching to match the demands of the circuit and the characteristic of the generator prevents over-charging.

### Alternator

The general arrangement of the alternator is as shown in Fig. Y45 and its dismantling entails removing the primary chaincase (See Service Sheet No. 409). No keeper is required for the magnets when dismantling.

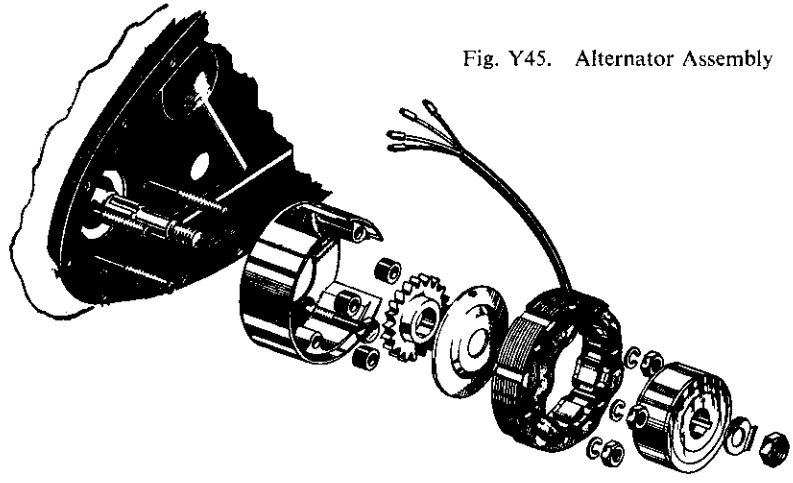


Fig. Y45. Alternator Assembly

The alternator employs six permanent magnets set in a central rotor and six output coils mounted on a surrounding stator. Two of the coils are connected in parallel within the generator and their output is brought out through the green and white leads. These two coils are permanently connected to the rectifier and supply current to the battery in all switch positions.

The remaining four coils are also connected in parallel (terminating in the orange and yellow leads) and are employed only when the headlight is on or when the headlamp switch is in the emergency start position.

**Note:** When replacing the stator, the bracket securing the output leads should be on the side of the stator facing away from the machine.

## Fault Finding

As the lighting circuit operates on the D.C. system, all bulb and electric horn connections can be checked by normal continuity tests with a D.C. Voltmeter or a spare bulb. Note that the system is positive earth.

The charging circuit can only be checked when the engine is running and for test purposes the engine speed should be not less than 2,200 r.p.m.

A suitable ammeter should be placed in series with the battery feed wire to check that the charging rate in each switch position agrees approximately with the following table.

| | |
|---|---|
| Position 1. All Lights Off. | 2.0 amps. |
| Position 2. Lights on Low ("L") (Pilot, Rear and Speedo Bulbs on) | .5 amp. |
| Position 3. Lights on High ("H") (Main, Rear and Speedo Bulbs on) | 5 amp. |

Failure to attain the listed rate in position 1 or 2 may indicate that the green or white lead is earthed at some point, or that one or both coils are earthed internally or are on open circuit.

Less than the correct charge in position 3 when correct charge is obtained in position 1 and 2, may indicate that the yellow or orange leads or any of the four coils are earthed, or are on open circuit.

Unsatisfactory performance in all switch positions is likely to be due to a faulty rectifier but may indicate any of the faults listed above.

**Note:** If a faulty rectifier is found, the tests should be repeated after replacement to ensure that the alternator has not been damaged. Alternatively, a burnt out alternator may be due to a faulty rectifier and the tests should again be repeated, taking care to ensure that the alternator is not again damaged if the rectifier or any other part of the circuit is shorting.

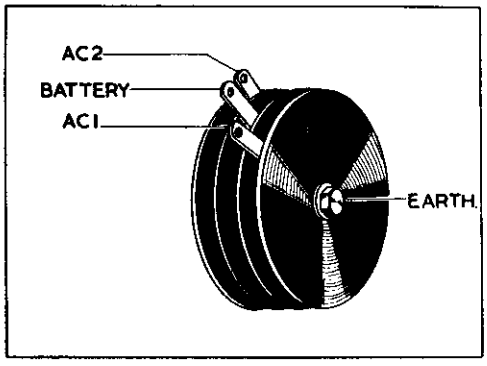
## Checking the Rectifier

Detach the rectifier from the machine and using a 6v. battery in series with a 6v. 3 watt bulb apply the test leads to the rectifier in the following sequence. The rectifier terminals are illustrated in Fig. 46.

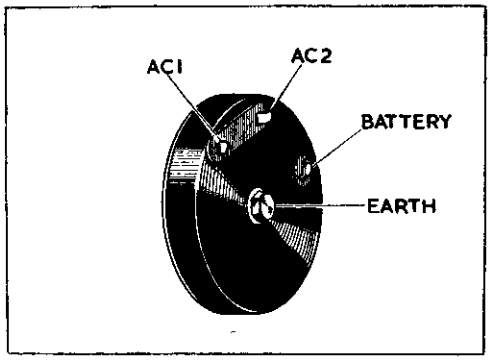
1. Positive lead to leg A.C.1, Negative to EARTH rectifier terminal.
1a. Reverse test leads and repeat above.
2. Positive lead to leg A.C.2, Negative to EARTH rectifier terminal.
2a. Reverse test leads and repeat above.
3. Positive lead to BATTERY rectifier terminal. Negative to leg A.C.1.
3a. Reverse test leads and repeat above.
4. Positive lead to BATTERY rectifier terminal. Negative to leg A.C.2.
4a. Reverse test leads and repeat above.

The bulb should light on the first of each pair of tests and not on the other, e.g. it should light on No. 1 test and not on 1a, and so on.

If the bulb lights in both directions on one or more of the four tests, the plate or plates have shorted.




Rectifier, Finned Type




Rectifier, Pancake Type

Fig. Y46

If the bulb does not light in either direction on one or more of the four tests the plate or plates are in open circuit.

These tests will only check whether the rectifier is on open or short circuit, and will not provide any indication of a partial breakdown, which can only be detected by special equipment.

The rectifier must always be in a position where it can be adequately cooled by the air flow or a major failure may occur due to overheating.

**The Headlamp Switch**

In the event of trouble with this unit it should be inspected carefully for a dry soldered joint or a detached wire. Should neither of these be apparent the fault may be that the spring loaded ball contact of the switch does not make proper contact between two of the switch posts. Rapidly switching on and off several times may overcome this fault but otherwise the complete switch should be replaced.

**The Emergency Start**

If the machine fails to start owing to a flat battery the headlamp switch should be turned to the Emergency Start position "EMG". The machine can then be started in the normal way and when the engine is running at a reasonable speed the switch should be rapidly rotated to the normal running position.

If the battery is badly damaged or missing, the machine may be run with the switch in the "EMG" position but the live battery wire from the rectifier must be connected to earth or the rectifier will be seriously damaged.

When the machine is being run with the switch in the "EMG" position it may be found that its performance is adversely affected. This is due to the affect of phase shift and the symptons will disappear when the switch is returned to its normal position.

**Ignition Coil**

The ignition coil is of the oil filled type and should not require any attention whatsoever. Removal of the two slotted screws will permit the cap to be removed for inspection of the top connections and the suppressor, when fitted.

**Note:** Burning out of bulbs is often due to an imperfect connection between the rectifier and battery or the battery and earth. Check the battery terminals regularly for corrosion, as a faulty connection at these points will cause trouble.

The double connectors used on the lighting system are internally connected so that all four plug-in sockets are interconnected.

B.S.A. MOTOR CYCLES LTD.
Service Dept., Birmingham 11
Printed in England.

U/6383

# BSA SERVICE SHEET No. 815

*January*, 1955.
*Reprinted October*, 1958.

## Models D1, D3 and C10L
## VARLEY BATTERY. TYPE MC5/9.

The Varley battery differs in several ways from the conventional form of lead acid battery and the following description of its construction and the maintenance required will assist in ensuring that its maximum capacity is maintained.

The battery has the same general characteristics of the free-acid lead battery, but is unspillable and less sensitive to vibration by virtue of its construction. The acid in the battery is fully absorbed in the porous material which fills the space between the lead plates, and therefore, there is no free acid which can flow from the vents if the battery is overturned.

### Maintenance

Whilst in service on the machine, the only maintenance required is to add the equivalent of a teaspoonful of distilled water to each cell at intervals of approximately once a month or six weeks. This small addition is to replace the moisture lost by evaporation and electrolysis, and it is essential that excess liquid is not added. All the added liquid should be absorbed within 20 minutes, and if any remains in the vents after this period, it must be removed by syphoning or shaking out. Topping up should not be carried out immediately before a journey.

An overflow of liquid from the Varley battery (usually indicated by a milky white substance on top of the battery) can only be caused by the addition of excess liquid and failure to remove the surplus, or by overcharging, or a combination of both.

As long as the overflow is not excessive and remains white in colour, the battery will probably remain completely unharmed. It should, therefore, be cleaned and any surplus liquid still remaining should be drained off. After spilling of this nature has taken place it may be advisable to add weak battery acid instead of distilled water when next the battery is due for topping up.

If the overflow develops a brown colour it is an indication of very heavy overcharging, and the battery has probably been damaged beyond repair.

In the event of the battery capacity being reduced after a considerable period of service it may prove advantageous to use weak battery acid instead of distilled water for topping up on one or two occasions.

### State of Charge

The state of charge of Varley batteries should be determined by the following voltage readings. It is not possible to use a hydrometer.

| | |
|---|---|
| Fully discharged ... ... ... ... | 5.7 volts or under. |
| Partially discharged ... ... ... | 6.15 volts or under. |
| Fully charged ... ... ... ... | 6.3 volts or over. |
| On charge, fully charged ... ... ... | 7.8 volts or over. |

### Charging the Battery from a Separate Source

All Varley batteries fitted to B.S.A. machines have already been filled and charged before despatch from the Works. A glance at the battery will show exactly when the battery was initially charged as a date code is stamped into each individual battery case.

A letter 'C' on the left-hand bottom corner of the positive side of the battery denotes that the battery has been fully charged by the manufacturer.

On the opposite bottom corner of the same side a letter and figure denote the month and year of the initial charge ('A' for January; 'B' for February; 'C' for March, etc., and '3' for 1953, '4' for 1954, '5' for 1955, and so on). As an example, a battery coded 'C' 'J4' denotes that the battery was filled with acid and initially charged by the manufacturer in October, 1954.

If the battery is subsequently left idle for any length of time without being put into service then it should be given a boost charge in accordance with the table below:

| | |
|---|---|
| Battery idle for 1—2 months ... ... | Charge at 1 amp. for 6 hours. |
| Battery idle for 3—6 months ... ... | Charge at 1 amp. for 12 hours. |
| Battery idle for more than 6 months ... | Charge at 1 amp. for 12 hours. Discharge the battery at 1—2 amps. then immediately re-charge at 1 amp. for 12 hours. |

Under normal conditions the battery should never be allowed to stand idle for more than a month without charging.

Charging the battery on the bench is carried out in exactly similar manner to that adopted for free acid batteries. Add distilled water as necessary and if the battery has been allowed to get abnormally dry it should be topped up before and during charging. When the voltage reading on charge reaches 7.8 volts, continue charging for a further three hours. All surplus moisture should be absorbed into the battery within half an hour of switching off the charging current. If any liquid does remain in the vents it must be removed by syphoning or shaking out.

### Charging a New Battery

If a new battery is to be installed on a machine and it has not already been filled and given its initial charge, then the following procedure must be carried out.

Remove the vent stoppers and fill the battery with pure accumulator acid of a specific gravity which agrees with the table below:

| | |
|---|---|
| Temperate Climate ... ... | 1.270 |
| Warm Climate ... ... ... | 1.250 |
| Tropical Climate ... ... | 1.235 |

The acid will be steadily absorbed into the battery and acid should be added to each cell in turn until the levels remain unchanged for several minutes.

Allow the battery to stand for a period of 2—8 hours. If any of the cells are dry after this period they should again be topped up with acid. It is particularly important that the battery absorbs sufficient acid during this initial period, if it is to give a long life and satisfactory performance. The battery must be put on charge within fifteen hours of the commencement of filling.

For the initial charge the input should be 60 Ah. at a rate not exceeding 1 amp. (i.e., 60 hours at 1 amp. or 80 hours at .75 amp.). During this first charge top up with distilled water only.

The charge should be continuous and it is not advisable for the current to be switched off until completion. If, for any major reason, the charging has to be stopped, the open circuit standing time should be allowed for.

During the final stage of charge, the voltage of the battery should read at least 7.8 volts (i.e., 2.6 volts per cell) and every cell should be gassing freely.

After completion of charge any liquid remaining in the vents should be removed by syphoning or shaking out. The battery should then be cleaned and thoroughly dried. Before replacing the vent stoppers, remove the sealing tape, if any. Grease the terminals slightly with vaseline before connecting up.

B.S.A. MOTOR CYCLES LTD.,
Service Dept., Birmingham 11.
Printed in England.

# BSA SERVICE SHEET No. 816

*March* 1959

## DANDY 70
## LUCAS ELECTRICAL EQUIPMENT
## (Fitted on and after Engine No. DSE14103
## (FLYWHEEL MAGNETO-ALTERNATOR MODEL 8FI)

The flywheel magnèto-alternator model 8FI employs conventional ignition and lighting circuits, and therefore differs from model 6FI previously fitted to these machines. Maintenance and servicing are quite straight forward and will be helped by the following information:—

### MAINTENANCE.

Every 5,000 miles or when the engine is removed for decarbonisation, check and clean the contact breaker.

The felt lubricating pad should be renewed or re-lubricated with clean engine oil (S.A.E. 40/50) every 5,000 miles. Also lightly oil the contact lever pivot.

Should it be necessary to renew the contact breaker, the toothed retaining ring which secures the lever to the pivot post must be prised off and a new ring fitted on re-assembly. The pivot post should first be smeared with Mobilgrease No. 2.

### DATA.

Main bulb: Lucas 387 6 volt 18/18 watt (non-reversible).
Parking bulb: Lucas No. 974, 3.5 volt 0.15 amp.
Rear lamp bulb: Lucas No. 990, 6 volt 3 watt.
Ignition timing: 5/32 in. B.T.D.C.
Contact breaker gap: .014 — .016 in.

### FAULT LOCATION.

**Equipment Required:**

(a) A good quality rectified moving coil voltmeter, scale 0—10 volts, with divisions enabling accurate readings of 0.2-volt to be made.
(b) A 1.2 ohm load resistor, non-inductively wound and capable of carrying 5-amp. without exceeding 5% variation in resistance at that current.
(c) A stationary three-point spark gap (as used for coil ignition testing) set to 4 mm. Alternatively, an approved two-point adjustable spark gap set to 4 mm. can be used for ignition tests carried out with the unit in situ on the engine.
(d) Fully charged 6-volt battery.
(e) Moving coil ammeter, scale 0—20 amp.

**Note.—Under no circumstances must moving iron meters be used, or a D.C. current allowed to flow through the alternator with the rotor fitted.**

### TESTING.

1. **Engine fails to start:**

(i) Set lighting switch to OFF.
(ii) Disconnect H.T. lead at sparking plug and connect 4 mm. spark gap between H.T. lead and earth (i.e., frame of engine block). The gap should spark at normal "foot-start" speed. If it does, remove sparking plug, clean and reset. Also check fuel supply etc., and do not forget that ignition timing is a critical factor in starting.

(iii) If there is no spark, or if engine still cannot be started, check ignition system as follows:—

(a) Remove engine from frame.
(b) Check that contact breaker gap is correctly set.
(c) Remove flywheel using B.S.A. Extractor Tool No. 61-3540.
(d) Connect 4 mm. spark gap between end of H.T. lead and earth on stator.
(e) Connect positive terminal of 6-volt battery to stator earth nearest to ignition coil, using a jumper lead.
(f) Hold contact breaker open by means of a piece of thick card between contacts, then connect one end of a second jumper lead to moving contact arm (take care not to short it to stationary contact which is earthed).
(g) With free end of second jumper lead, quickly make and break circuit to battery negative terminal. (Make this test as short as possible to avoid overheating ignition coil primary winding). A spark should be obtained at two-point gap.

(iv) If only a weak spark, or no spark, is obtained, substitute a new condenser and retest. Since the condenser relies on its electrical connection with clip, outside case should be cleaned with a petrol-moistened cloth. Solvents must not be used for this purpose.

(v) If trouble persists, check coil. To do this, connect a 2-volt cell of battery between primary coil earth connection on stator, and primary coil connection at condenser or on the moving contact arm, with ammeter (item *e*) in series, and contacts remaining separated by the card. Since resistance of primary winding is approximately 1 ohm, a reading of 2 amp, should be given if coil is in order. If reading is zero or low, and cause is not due to faulty external connections at earth point or condenser, an indication is given of an open circuit in coil. A reading in excess of 2 amp. indicates short-circuited primary turns and in either event, a replacement stator will be necessary.

(vi) After any renewal of parts, adjust contact gap and refit flywheel, using B.S.A. Service Tool No. 61–3536. Check by spinning engine over by hand with H.T. lead connected to sparking plug which has been unscrewed and placed on engine block. If possible, bench test magneto-alternator before refitting engine (see para. 5).

2. **Engine difficult to start, or runs intermittently:**
If after checking as detailed in (i) to (iii), trouble persists it will be necessary to proceed as laid down in (iv) to (vi).

3. **No Lights with Lighting Switch in Head or Dip Position and Engine Running.**

(vii) Disconnect alternator main lead from wiring harness, and to it connect one side of voltmeter and also one side of 1.2-ohm load resistor. Connect other voltmeter lead, and that of resistor, to engine block. Voltmeter and resistor are now in parallel across lighting coils.

(viii) Start engine and increase speed slowly. Voltmeter should indicate rising volts with speed, increasing to between 3.5 and 7.5 volts.

(ix) If satisfactory, check headlamp and rear lamp bulbs, by substitution if necessary. Check wiring and connections between headlamp and switch, rear lamp and switch, and alternator and switch, rectifying as necessary. Fit new lighting switch if necessary.

**Note.—Poor earth connections can be particularly troublesome, and will cause high voltages which reduce bulb life. Burnt-out or blackened bulbs often indicate the existence of bad earths, which should be rectified before fitting new bulbs.**

(x) If rising voltage characteristic is not obtained see (viii), alternator will have to be removed from the machine and flywheel taken off. Using one 2-volt cell of test battery, connect positive battery terminal to earth on engine, negative battery terminal to one ammeter terminal, and second ammeter terminal to main output lead of alternator. Reading obtained on ammeter should be approximately 9.5 amp. (lighting coils are connected in parallel with a joint resistance of about 0.2 ohm). **DO NOT ALLOW THIS CURRENT TO FLOW FOR MORE THAN ONE SECOND.**

(xi) A higher reading, in region of 15—20 amp., will indicate short-circuited windings on one or both coils. A reading in the order of 5 amp. will indicate an open circuit in one of the coils and in either event, a replacement stator will be necessary. Zero reading indicates an open circuit, possibly in alternator lead, while a reading lower than 9.5 but exceeding 5 indicates faulty continuity. Check leads and coil earthing points.

**Note.**—This test must be done as quickly as possible to avoid damage to coils through over-heating, and misleading readings due to increase in coil resistance with temperature. It will be found that one second's duration gives ample time to observe the ammeter readings. **On no account must test be made with alternator assembled to a bench testing jig with flywheel fitted, otherwise partial de-magnetisation will result.**

(xii) After renewal of any necessary parts, refit flywheel. If possible, bench test alternator before refitting engine (see para. 4).

## 4. BENCH TESTING.

### (a) Ignition Performance.

This test is made with H.T. lead connected to a stationary three-point spark gap set to 4 mm. Regular sparking should occur at all speeds above 1,000 r.p.m.

### (b) Alternator Output Performance on Load.

Connect one voltmeter lead to alternator main output lead, and second voltmeter lead to stator. Similarly, connect 1.2-ohm load resistor across alternator between main output lead and stator. Run up alternator speed and check output voltages as follows:—

| *R.P.M.* | | *Voltmeter Reading.* |
|---|---|---|
| 2,000 | not **less** than .... | 3.7 |
| 4,000 | not **less** than .... | 5.4 |
| 6,000 | not **less** than .... | 6.0 |
| 8,000 | not **more** than .... | 7.25 |

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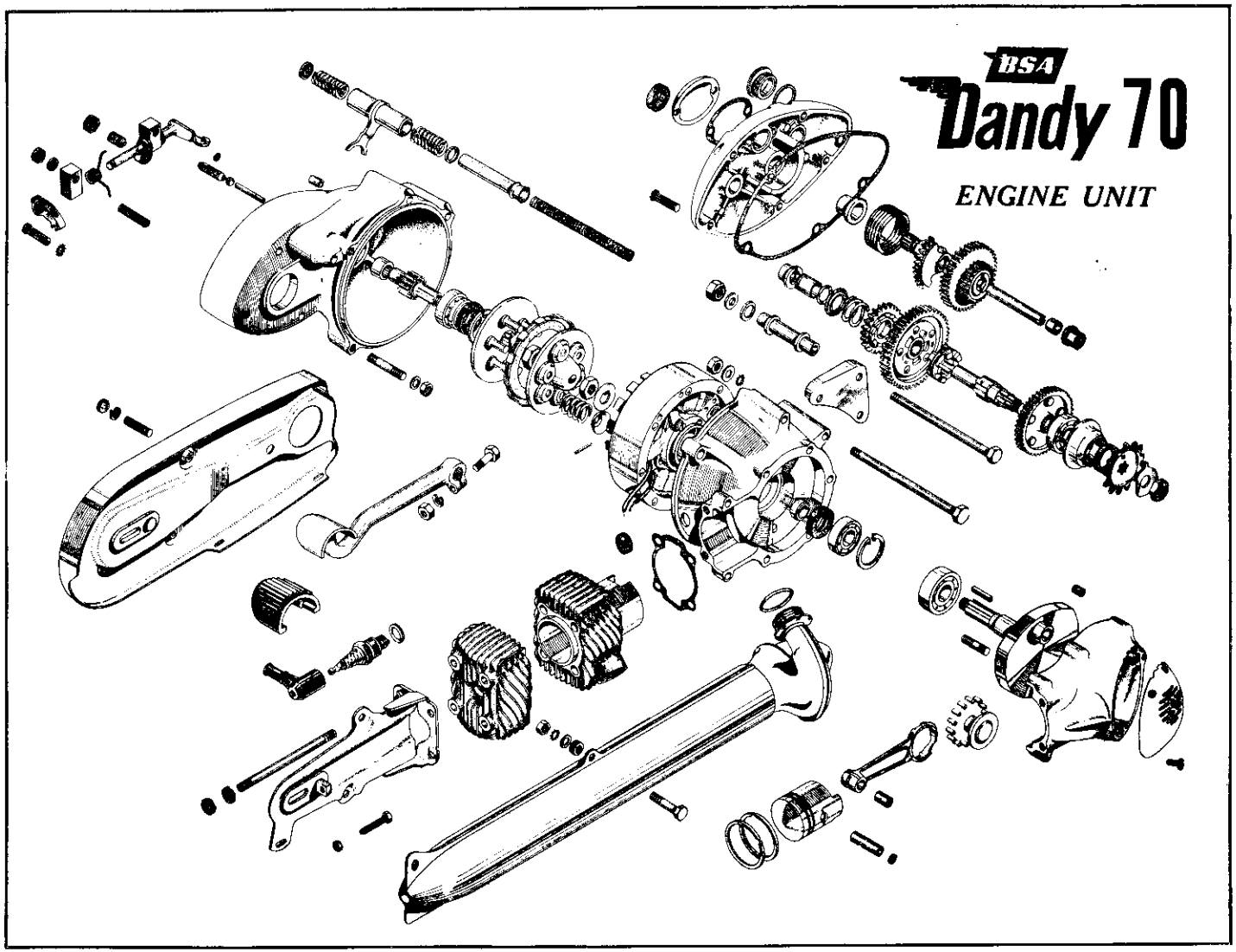


The DANDY Engine and Gearbox (Exploded View)

# BSA SERVICE SHEET No. 902

*June* 1957

# Dandy 70

## DECARBONISATION

To maintain the engine in an efficient condition, it is recommended that decarbonising should be carried out at intervals of approximately 1,500 miles. A two-stroke engine is particularly affected by the formation of carbon. The symptoms indicating an excessive deposit are rough and uneven running of the engine, a tendency to pink when under load, a falling off in power and four or eight stroking when running lightly loaded.

Not only the cylinder head and piston crown will require clearing of carbon, but also the exhaust port and silencing system.

To remove the cylinder head and barrel, first take off the right-hand wheel spindle nut "A," Fig. Z1, and partly withdraw the spindle towards the left-hand side. Unscrew the small nut and bolt "B," holding the silencer to the swinging arm plate, and release the silencer from the cylinder barrel by unscrewing the union nut "C," using the special spanner provided in the tool-kit.

Next remove the two bolts "D," which secure the swinging arm plate to the rear fork, noting the positions of the distance piece, the fork end stiffening plate, and the brake anchor strap. Unscrew the sparking plug and take off the four cylinder head nuts "E." The swinging arm plate and cylinder head can now be drawn away from the barrel. It is best to clear the carbon from the piston crown at this stage, taking care not to score the soft aluminium.

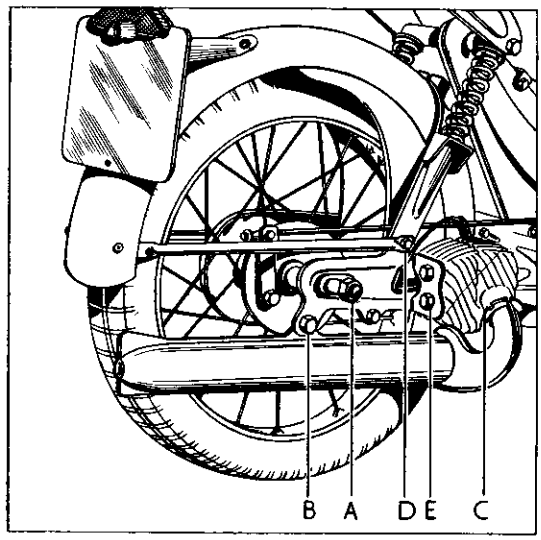


Fig. Z1. Removal of Cylinder Head and Barrel.

The cylinder barrel itself has a long spigot fitting into the crankcase, which has two studs at this point, one above and one below the spigot. The nuts on these studs must be slackened before the cylinder barrel can be withdrawn. As the piston emerges from the cylinder, it must be supported to avoid damage. Inspect the piston rings to see that they are quite free in their grooves. Clean out the various ports in the cylinder, but be careful not to remove any metal by over-enthusiastic scraping.

Wipe all traces of loose carbon from the piston and cylinder bore, apply a little clean oil and re-fit the cylinder, making sure that the piston rings are properly seated with their ends resting either side of the pegs in the grooves. A new cylinder base washer should be used.

Carefully scrape the carbon from the combustion space in the cylinder head, and replace the head on the barrel so that the finning matches up. Follow on with the remaining parts in the reverse order to that in which they were removed, not forgetting to tighten the two nuts at the base of the cylinder after the four cylinder head nuts have been tightened fully.

As the silencer is non-detachable, it must be soaked in a caustic soda solution, preferably overnight, and then thoroughly washed out in running water. On no account should the caustic solution be allowed to touch any of the aluminium or painted parts of the machine.

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# BSA SERVICE SHEET No. 903

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# Dandy 70

## REMOVAL OF ENGINE FROM FRAME, DISMANTLING AND RE-ASSEMBLING

Take off the carburetter cover plate "B," Fig. Z2, which is retained by three screws, and pull the carburetter away from the crankcase leaving the cable and petrol pipe attached. Tie the instrument up out of harms way.

Remove the right-hand wheel spindle nut and the two bolts holding the swinging arm blade to the rear fork (see Fig. Z1, Service Sheet No. 902). Partly withdraw the wheel spindle towards the left-hand side.

Disconnect the lead from the generator at the snap connector which will be found inside the frame behind the large rubber cover. Pull the lead clear of the frame.

Unscrew the six nuts "A," Fig. Z2. Take off the engine plate. The engine can now be drawn away complete with the silencer and the swinging arm blade.

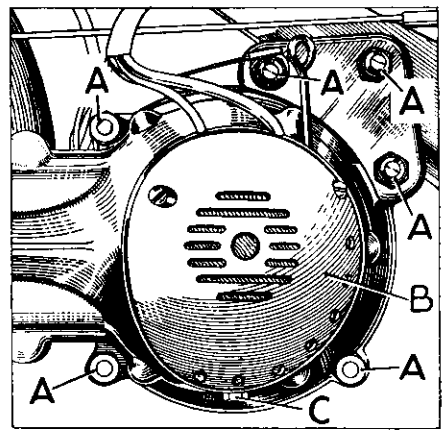


Fig. Z2. Removing Engine.

## CONTACT POINTS -WICO GENERATOR

If the purpose in removing the engine is to clean or adjust the contact-breaker points "B," Fig. Z3, the flywheel must be drawn off. Bend back the locking washer and unscrew the nut, holding the flywheel by inserting Service Tool No. 61-3551 through the two holes in the sides of the clutch driving cup. A suitable tommy bar or long bolt placed in one of the crankcase lugs will prevent rotation.

The mainshaft is a parallel fit in the flywheel, which is keyed in position. To withdraw the flywheel use Service Tool No. 61-3540, or a pair of No. 61-3548 in conjuction with an Extractor No. 61-3256.

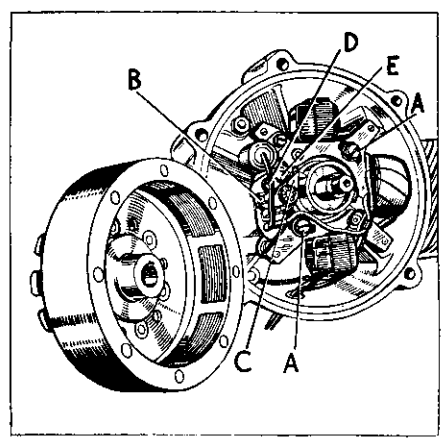


Fig. Z3. Generator (Wico)

Turn the engine until the points are fully open and adjust the gap to .018"—.020" by slackening the fixing screw "D" and turning the eccentric adjusting screw "E." Re-tighten the fixing screw.

To remove the points assembly; take out the fixing screw and detach the two wires which are secured by a small screw and nut. The points can be cleaned by lightly polishing with smooth emery cloth. Lubricate the felt pad by working into it a small quantity of motor transmission grease. Do not use ordinary grease.

## CONTACT POINTS—LUCAS GENERATOR

Models having a Lucas generator can be identified by the letter "L" included in the engine number prefix.

In this case it is not necessary to withdraw the flywheel to check and adjust the points. An opening is provided in the face of the flywheel for this purpose.

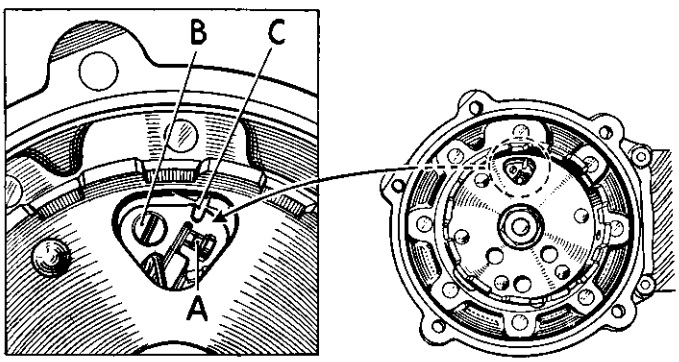


Fig. Z4. Adjusting the Contact Breaker Points (Lucas).

Rotate the flywheel until the opening is in line with the contact-breaker and the points are fully open. Slacken the fixing screw "B," Fig. Z4, place the end of the screwdriver in the slot "C" and move the plate as necessary to obtain the correct points gap of .014"—.016". Re-tighten the fixing screw.

To remove the points assembly, the flywheel must be drawn off as already described. Take out the fixing screw and remove the nut from the terminal post, noting the positions of the various washers. Carefully prise off the return spring and lift off the two wires. The points assembly can then be removed. Very fine emery cloth may be used to clean the points.

The felt pad should be removed or re-impregnated with clean engine oil. Lubricate the contact lever pivot with a spot of engine oil.

**Note.—Before re-fitting the flywheel, make sure that no metallic particles have been attracted on to the magneto. Always use Service Tool No. 61-3536 to avoid placing any strain on the con-rod assembly. Fit a new locking washer under the nut.**

## TO CHECK IGNITION TIMING

Remove the sparking plug and turn the engine in an anti-clockwise direction (looking at the generator side) until the piston is at the top of its stroke. Then turn back until the piston has moved 5/32in. from T.D.C. In this position the cam on the mainshaft should be just commencing to lift the contact-breaker rocker arm "C," Fig. Z3 or "B," Fig. Z5, and the points should be not more than .002in. apart. If they are open more than this, the timing is too far advanced. If they are open less, the timing is retarded.

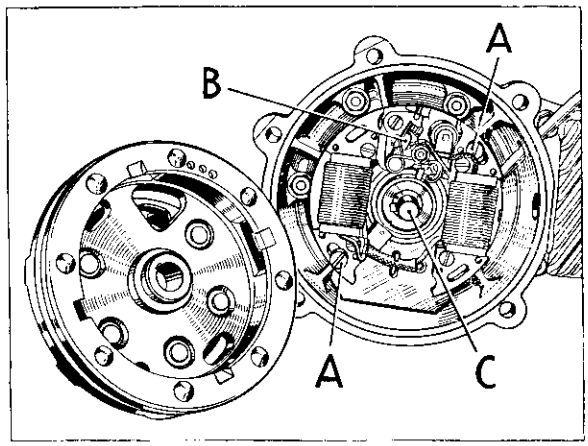

Fig. Z5. Generator (Lucas).

The cam itself is keyed to the mainshaft, but a small adjustment can be made to the timing by slackening the two screws "A," Figs. Z3 or Z5, and moving the stator assembly either way as necessary. After re-timing, tighten the screws firmly.

## COMPLETE DISMANTLING OF THE ENGINE

Take out the two screws "A," Figs. Z3 or Z5, and withdraw the stator assembly, pulling the two leads through the rubber grommet in the housing. Prise off the contact-breaker cam and lever the key out of the shaft with a small screwdriver or similar tool.

Remove the swinging arm blade, cylinder head and cylinder barrel as described in Service Sheet No. 902. The gudgeon pin is secured in the piston by means of circlips. Take out one of these with a pair of thin-nosed pliers, warm the piston by applying a cloth soaked in hot water and press out the gudgeon pin. Support the piston firmly during this operation to avoid straining the con-rod.

Now unscrew the five crankcase stud nuts from inside the generator housing, and also the two nuts at the base of the cylinder. The outer crankcase half can then be drawn away. As the crankpin is of the overhung type, both main bearings are contained in the inner half of the crankcase. Press the mainshaft assembly out of these bearings. Note that the crankpin is not detachable; should it be be necessary to renew the big-end bearing, a complete new mainshaft assembly must be used.

An oil seal is located behind the contact-breaker cam. This can be prised out of the housing after the small ring has been removed from its centre. Both main bearings must be extracted from the right-hand side of the housing by means of a suitable drift or puller. The smaller bearing is retained by a spring ring. Heat the crankcase in hot water before attempting to remove or replace the bearings.

## RE-ASSEMBLING THE ENGINE

Re-assembly is carried out in the reverse order to dismantling; using a new oil seal on the engine mainshaft.

Inspect the piston and rings; discoloured patches on the outer surfaces of the rings indicate a leakage of gas from the combustion chamber and the rings should be renewed. The skirt of the piston should present a dull, even surface. High spots will show up as small bright patches, and these may be very slightly eased with a very fine file. Heavy scores denote a partial seizure, possibly caused by insufficient lubrication, a too weak fuel mixture or retarded ignition, any of which would result in overheating. Fit a new piston after the cause of the trouble has been investigated and cured. Check that the rings are a close fit in the grooves; there should be no noticeable side play. The ring gaps should be not more than .013in., or less than .009in. To measure the gaps accurately, place each ring squarely in the cylinder bore, preferably near the base where the least wear takes place.

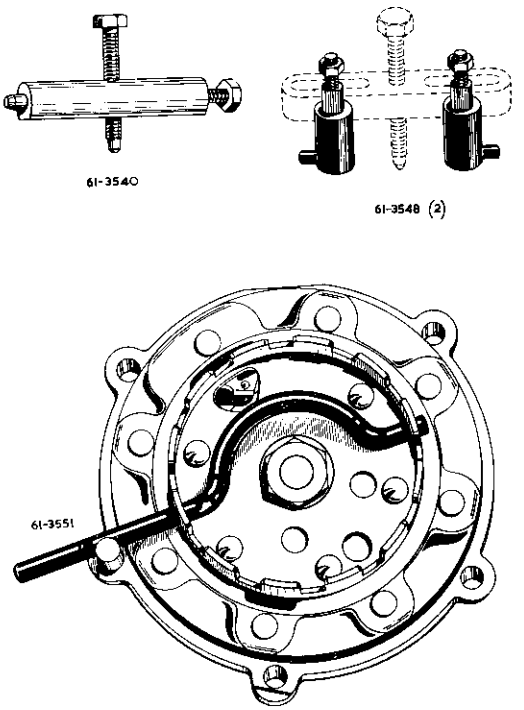


Fig. Z6. Flywheel Removal Tools.

The crown of the piston is marked "EXHAUST" on one side. This side must be next to the exhaust port in the cylinder; that is, on the right-hand side of the engine. Failure to observe this precaution may result in the ends of the rings becoming trapped in the cylinder ports.

Do not forget to adjust the contact points gap before replacing the flywheel on a Wico generator.

A useful tool for turning up the locking washer on to the flywheel nut consists of a substantial flat bar which has the end bent at right-angles and ground to a wedge shape. Rest the wedge behind the washer and strike the flat of the bar with a hammer.

When the re-assembly is completed, replace the engine in the frame and securely tighten all nuts and screws. It will be noticed that the carburetter is a push fit into a plastic sleeve in the crankcase. Two rubber rings in grooves on the carburetter spigot provide a seal. These may require renewing occasionally to ensure an air-tight joint.

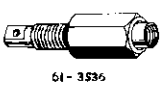


Fig. Z7. Flywheel Assembly Tool.

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# BSA SERVICE SHEET No. 904

*June* 1957

# Dandy 70

## REMOVAL OF GEARBOX FROM FRAME, AND DISMANTLING

First, take out the rear wheel, as described in Service Sheet No. 906. Release the clutch and preselector cables from the handlebar controls. The clutch cable nipple is mounted in a slotted adaptor in the control lever, and can be slipped out once the outer cable is detached from the control body.

Pull off the plastic grip from the preselector control; if this proves to be a tight fit it can be eased by applying a cloth soaked in hot water. Screw in the adjuster at the rear of the gearbox until sufficient slack cable has been obtained to enable the retainer "A," Fig. Z8, to be removed from the end of the twistgrip. The cable adjuster is locked by means of a plate secured to an adjacent stud or, on early models, by a locknut.

Inside the handlebar will be found the cable stop positioning rod "B," which also serves to lock the guide screw "D." Unscrew the rod several turns and take out the guide screw. The cable stop "C" can then be pulled out by means of the rod, and the cable withdrawn from the handlebar. Before drawing the two cables down through the frame, tie a length of stout string to each so that it can be used to assist in threading the cables back again.

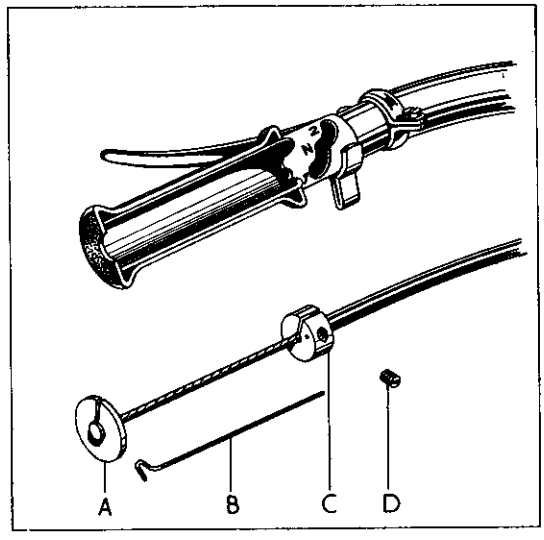


Fig. Z8. Preselector Control Assembly.

An alternative is to detach the cables from the gearbox end, and this is the best method if the intention is to dismantle the gearbox. To do this, the gearbox cover must be removed by unscrewing the five screws around the outer edge, not forgetting to place a tray underneath to catch the oil.

Select second gear and operate the clutch lever, then turn the control to the first gear position but do not touch the clutch lever again. Screw in the cable adjuster until the cable is slack enough to allow the anchor plate to be removed from the outer end of the gear shifter. The adjuster can then be completely unscrewed and the cable pulled out of the gearbox.

Next, the clutch adjuster should be screwed down, and the push-rod adjusting screw slackened right off; so that by lifting the withdrawal lever, the cable nipple may be disengaged. Note that, as soon as the clutch withdrawal lever is lifted, the gear shifter will spring outwards and may push the first gear pinion off its shaft if not held in place. If difficulty is experienced in disengaging the cable nipple due to lack of clearance behind the lever, the two nuts holding the locking arm spindle may be loosened a few turns and the whole assembly moved outwards a small amount. When the cable is free, unscrew the adjuster and take away the cable. Replace the gearbox cover temporarily to prevent the ingress of dirt and to keep the internal parts in place.

Remove the two bolts "A," Fig. Z9, from the rear fork end, and also the bolt "B," which passes through the chaincase into the mudguard valance. There are no loose distance pieces or nuts on the bolts, but there is a distance piece fixed to the mudguard valance, and the chain and chaincase must be guided clear of this as the gearbox is taken away. Unscrew the six nuts "A." (See Fig. Z2, Service Sheet No. 903.)

Pull out the three bolts, and replace them from the opposite side to support the engine. The gearbox complete with chaincase can now be removed.

Should it be desired to remove the engine and gearbox as a unit, carry out the operations described in this Sheet and those in Service Sheet No. 903. Only the two engine plate bolts "D" Fig. Z9 need to be taken out, the pivot bolt and engine plates being left in position on the frame.

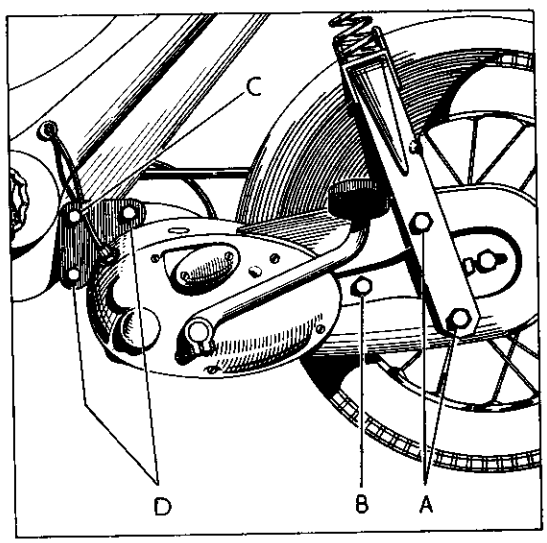


Fig. Z9 Removal of Gearbox.

## DISMANTLING THE GEARBOX

Drain out the oil, if this has not already been done. Slacken the pinch bolt in the starting lever and pull the lever off the splines on the quadrant spindle. Remove the cover and withdraw the quadrant, first noting the location of the return spring. The bush may be pressed out towards the inside of the cover, after the felt oil seal and retaining collar have been prised out.

The first gear pinion and the ratchet pinion are held together by means of a spring, collar and circlip. They can be lifted off the output shaft as a unit and need not be separated unless one of the components is to be renewed. Next, the sliding dog and the gear shifter should be taken out, followed by the locking arm spindle assembly after removal of the two nuts.

The clutch is dismantled quite simply by compressing the springs by hand, one by one, and removing the cotter pins "B," Fig. Z10, the collars "A" and the springs. This releases the pressure plate and the driving plate, leaving the back plate secured by a central nut. Bend back the lock-washer and place Service Tool No. 61–3553 over the six pins in the back plate, with the holes in the arms located over two of the housing studs. Unscrew the nut and lift off the back plate.

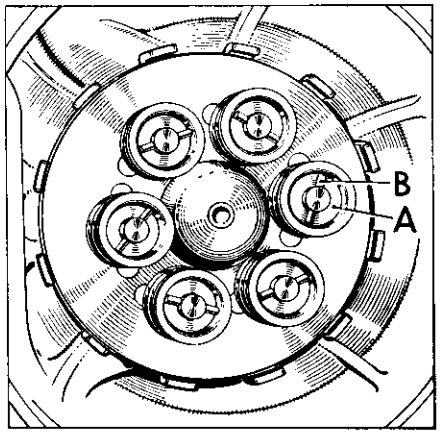

Fig. Z10. Clutch Springs.

It is not advisable to use an ordinary sprocket puller to remove the back plate, owing to the risk of distortion. If the plate is a tight fit on the splines, a sharp tap with a mallet on the end of the shaft will free it.

Behind the back plate will be seen the end of the gear cluster spindle, which is slotted and pinned to prevent rotation. Tap this spindle out, using a suitable drift, and remove the gear cluster.

Unscrew the sprocket securing nut after bending back the lock-washer, holding the sprocket with Service Tool No. 61–3554. Take off the sprocket and press the shaft through towards the inside of the gearbox. The second gear pinion can now be removed. The bearing and oil seal are housed in a steel sleeve in the gearbox casing. Prise out the oil seal and press out the bearing, again towards the inside of the gearbox.

Extract the clutch push rod from the input shaft. This is in two parts with a ball bearing between, the shorter portion having a rubber oil seal ring fitted in a groove. Remove the circlip from the clutch side of the housing and press the shaft out in that direction complete with the bearing, oil seal and oil seal ring. The needle roller bearing, which supports the other end of the shaft, can be pressed out either way.

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# BSA SERVICE SHEET No. 905

*June* 1957

# Dandy 70

## RE-ASSEMBLING THE GEARBOX

Fit the needle roller bearing into its housing and insert the input shaft, place the ballrace over the shaft and press into position. Follow on with the oil seal ring and oil seal, and replace the circlip, then replace the clutch backplate and secure it with the nut and lockwasher. Service Tool No. 61–3553 will hold the backplate while the nut is tightened.

Press the output shaft ballrace into the steel sleeve, pass the shaft through the second gear pinion and into the bearing, making sure that the side of the pinion with which the sliding dog engages is facing outwards.

Place the gear cluster into position, line up the slot in the end of the spindle with the pin in the housing and press it home. To guard against oil leakage, the end of the spindle should be coated with jointing compound.

Next, fit the oil seal, sprocket, lockwasher and nut to the output shaft. Tighten the nut while holding the sprocket with Service Tool No. 61–3554. Always use new lockwashers and turn them up securely against the nuts after tightening. New oil seals should also be fitted when re-assembling.

Complete the clutch assembly by fitting the driving and pressure plates, and the springs, collars and cotter pins. It is preferable to use new springs if the originals have already seen a period of service.

At this stage, the gearbox can be re-fitted to the machine, not forgetting to place the driving chain around the sprocket, with the closed end of the connecting link spring facing forward on the top run. Replace the bolts and nuts shown in Figs. Z2 and Z9, (see Service Sheets Nos. 903 and 904).

Assemble the gear shifter, noting the correct positions of the springs, shown in Fig. Z11. The cranked portion of the fork faces outwards, so that the projection with which the locking arm engages is to the front of the gearbox. Place the sliding dog in the shifter fork and fit the assembly into the gearbox. The sliding dog must engage the splines on the out-put shaft and the shifter tube enter into its housing. Pass the cable through and screw in the adjuster until the anchor plate can be replaced behind the nipple. To obtain the maximum amount of slack cable, the handlebar control should be in the first gear position and the gear shifter pushed right home so that the sliding dog engages second gear.

The shifter tube on early models was without the washer brazed to the inner end which serves to centralise the tube. To fit the modified part, it may, in some cases, be necessary to ream out the housing in the gearbox shell to its full depth, using a standard 13/16in. reamer. With the modified shifter tube, later type springs should also be fitted. These are longer than the originals and are identified by a yellow paint marking.

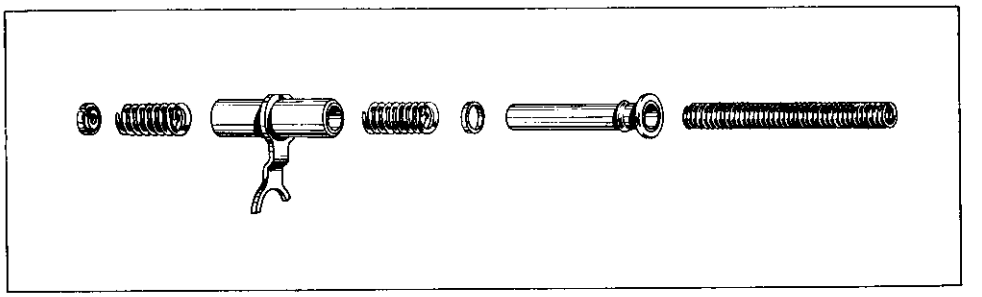

Fig. Z11. Gear Shifter Fork Assembly.

Lightly grease the long clutch pushrod and the ball bearing, and insert them into the hollow input shaft, followed by the short pushrod. The latter has an "O" ring in the middle groove to act as an oil seal; see that this is intact. Take the locking arm spindle assembly and connect the clutch cable to the withdrawal lever. At the same time, fit the two alloy bearing blocks over their studs and start the nuts. One end of the return spring should be located in a hole in the side of the clutch operating arm, while the other end bears on the underside of the top of the gearbox casing. Check that the pushrod adjusting screw is slackened off, and that the locking arm is not fouling the gear shifter. Tighten up the two nuts.

Make sure that the clutch withdrawal lever is at the bottom of its travel. If necessary, slacken the pinch screw "D," Fig. Z12, in the locking arm at the other end of the spindle to prevent the arm being held up by the gear shifter. Screw out the cable adjuster "C," until there is approximately $\frac{1}{8}$in. free play in the cable. Turn the pushrod adjuster "B" in a clockwise direction until resistance is felt; then back off half a turn and tighten the locknut "A."

Replace the first gear assembly on the output shaft. Fit the starter quadrant and spring to the cover and re-fit the cover to the gearbox, using a new gasket and a smear of jointing compound to ensure an oil-tight joint. On early models there will sometimes be a shim inside the hollow quadrant spindle to limit the clearance at the end of the gear cluster spindle. The depth of the spigot hole in the quadrant must be approximately .010in. greater than the length of spindle protruding from the gear cluster. If the clearance at this point is too large, it is possible for the spindle to move outwards until an oil leak occurs past the slotted end.

Set the pre-selector control to neutral and screw the cable adjuster "E" in or out as necessary to bring the gear shifter to the position shown at "N" in Fig. Z12. The measurement from the machined face of the cover to the end of the gear shifter outer tube will then be 3/16in. Tighten the pinch screw "D," making sure that there is a little clearance between the locking arm and the gear shifter. Lack of clearance may result in the clutch being held partly out of engagement, so causing clutch slip when the starting lever is operated.

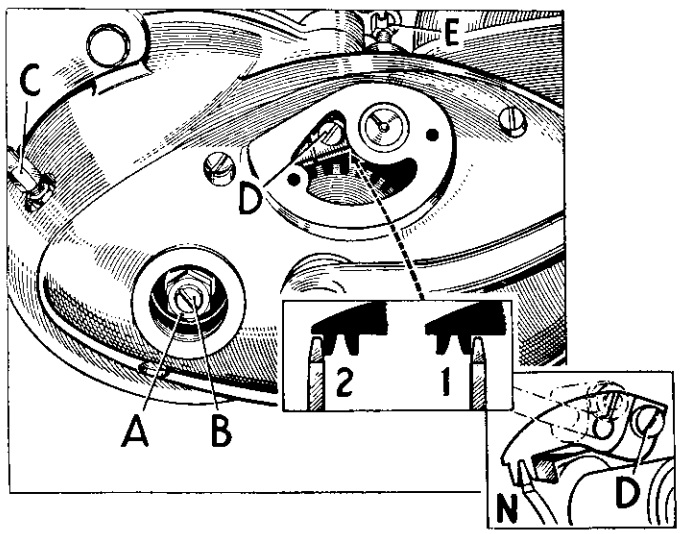


Fig. Z12. Adjusting Clutch and Pre-Selector.

Replace the rear wheel and check the engagement of both gears. It may be found necessary to alter the cable adjustment slightly either way to obtain positive selection.

Finally, refill the gearbox with $\frac{1}{3}$ pint (190 c.c.) of the correct grade of oil (40 S.A.E.). This will bring the level up to the lower edge of the hole provided for clutch pushrod adjustment. Re-fit the starting lever and tighten the pinch bolt.

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# BSA SERVICE SHEET No. 906

*June* 1957

# Dandy 70

## REMOVAL OF WHEELS, ADJUSTING, DISMANTLING, AND RE-ASSEMBLING HUBS AND BRAKES

### FRONT WHEEL REMOVAL AND REPLACEMENT

Screw in the brake cable adjuster and disconnect the cable from the operating lever. Alternatively, the lever itself may be taken off by unscrewing the nut "A," Fig. Z13, from the cam spindle. If a speedometer is fitted, detach the cable by unscrewing the union nut from the drive gearbox. Do not lose the fibre washer from inside the nut.

Take off the wheel spindle nut "B" and pull out the spindle "C." Support the weight of the wheel and withdraw it from the forks. first moving it over towards the right to disengage the brake anchor pin from the suspension arm. Be careful not to damage the speedometer gearbox (if fitted). This is not fixed to the hub, and it can be lifted away as soon as the wheel is clear of the forks.

Replace the wheel by reversing the order of the above instructions. When re-fitting the speedometer gearbox, the driving arm must be located in the hole provided for it in the hub flange.

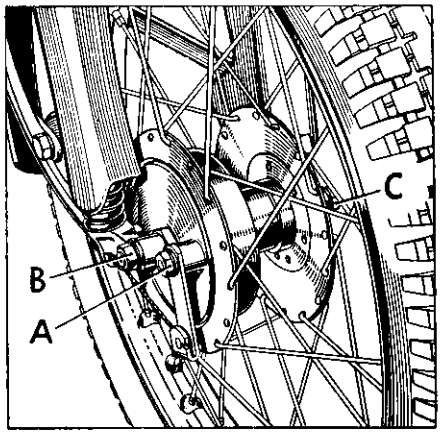


Fig. Z13. Front Wheel Removal

It is important that the brake anchor pin should be correctly engaged with the suspension arm.

### REAR WHEEL REMOVAL AND REPLACEMENT

Slacken the lower bolt "A," Fig. Z14, which secures the brake anchor strap to the fork end, and disengage the strap from the peg in the brake plate. Remove the brake operating rod adjusting nut. Unscrew one of the wheel spindle nuts "B," and pull out the spindle "C." Take out the spacing collar on the right-hand side, move the wheel forward as far as possible and lift the chain off the sprocket. This can be done without disconnecting the spring link. Lean the machine to one side, or raise the rear end, and withdraw the wheel.

Replacement is carried out in the reverse order to that for removal. Between each wheel spindle nut "B" and the fork ends there is a large washer. These washers should be positioned behind the chain adjusting screws "E" as the wheel spindle is passed through, otherwise the chain adjusters would have to be screwed right out to clear the washers.

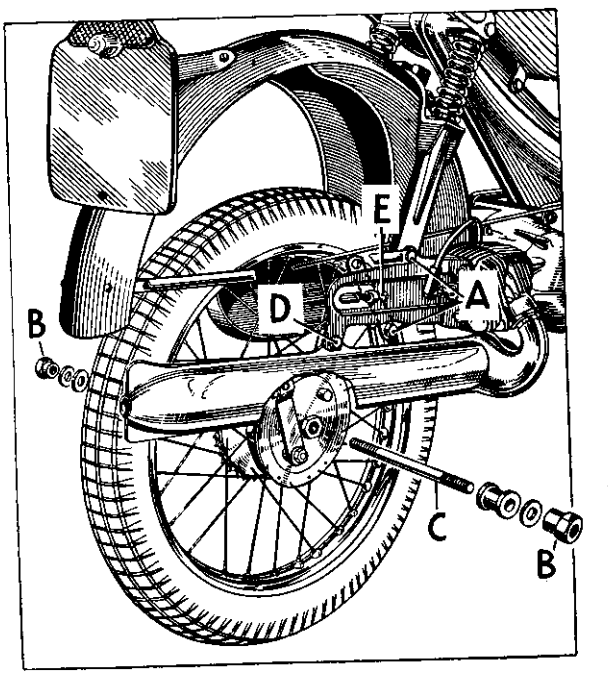


Fig. Z14. Rear Wheel Removal.

## CHAIN ADJUSTMENT

Turn the rear wheel slowly while checking the up and down movement of the chain until the tightest point is found. The total movement at this point should be $\frac{3}{4}$in. To adjust, loosen the wheel spindle nuts slightly and move the wheel backwards or forwards as necessary by means of the chain adjusting screws "E." When the correct setting has been achieved tighten the wheel spindle nuts and the locknuts on the chain adjusters.

## BRAKE ADJUSTMENT

The front brake is adjusted by means of the cable adjuster mounted on the right-hand suspension arm. Release the locknut "A," Fig. Z15, and turn the adjuster "B." Finally, tighten the locknut.

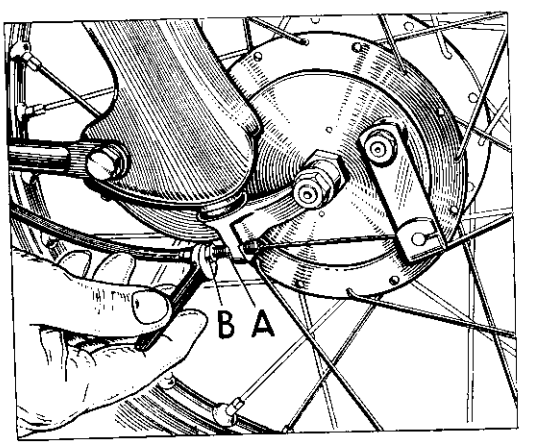


Fig. Z15. Front Brake Adjustment.

Rear brake adjustment is effected by turning the knurled nut at the end of the operating rod.

A further adjustment can be made to both brakes by moving the operating lever to a different position on the cam spindle. The spindle has a squared end, while the hole in the lever is serrated. The best position is that which results in the lever and the cable (or rod) forming a right-angle when the brake is on.

After adjusting the brakes, raise each wheel in turn clear of the ground and check that it spins freely. Binding brakes waste power and, by causing overheating, may distort the brake drums. Also, melted grease from the bearings may impregnate the brake linings.

## WHEEL BEARING ADJUSTMENT

When the bearings are correctly adjusted, there should be about 1/64in. side play noticeable at the wheel rim. The method of adjustment is the same for both wheels.

Slacken the locknut "A", Fig. Z16, on the nearside end of the distance tube and turn the cone by means of the knurled ring "B." Fully tighten the locknut and check the side play. Too tight adjustment will cause serious damage to the bearings.

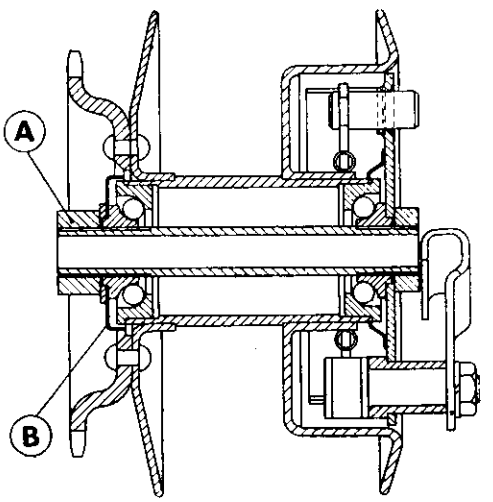


Fig. Z16. Rear Hub Arrangement.

## DISMANTLING THE HUBS AND BRAKES

Front and rear hubs are of similar construction; the cups, cones, ball bearings, brake shoes, springs and brake cams being identical.

Remove the locknut "A," Fig. Z16, and unscrew the adjusting cone "B." The brake assembly with the distance tube, fixed cone and locknut attached, can be withdrawn from the right-hand side of the hub. Take care not to lose the ¼in. ball bearings, of which there should be twelve in each side. The bearing cups are pressed into the hub and can be driven out with a suitable drift. When fitting new cups, ensure that they are pressed squarely into position.

Normal maintenance consists of cleaning out bearings and re-packing with grease at intervals of not more than 10,000 miles. If the machine is used in all weathers, or in very dusty conditions, it is wise to carry out this work more frequently.

The distance tube is detached from the brake plate by unscrewing the locknut; the fixed cone can also be unscrewed if desired. Each brake shoe is retained by a split pin and washer. When these have been removed, the shoes can be prised away from the plate until the spring tension is relieved and the ends of the shoes disengaged from the cam and fulcrum pin.

## RE-ASSEMBLING

Replace the shoes in the same manner, hooking on the springs, place the ends of the shoes in position and press outwards and downwards on to the plate. Refit the retaining washers with new split pins. Brake linings should be renewed before the rivets begin to touch the drums. If the rivets are allowed to score the drums, the efficiency of the brakes can only be restored by fitting new hub shells or by having the surfaces skimmed in a lathe.

Re-assemble the bearings, using the recommended type of grease.

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*June* 1957

# Dandy 70

## FRAME AND FORKS

The front forks are of the leading link type and require no adjustment. The only maintenance necessary is lubrication of the suspension arm bushes every 1,000 miles by applying a grease gun to the nipples provided, as shown in Fig. Z17.

## DISMANTLING THE FORKS

Remove the front wheel as described in Service Sheet No. 906. Detach the brake cable from the right-hand suspension arm by unscrewing the adjuster. Take out the two pivot bolts, which also secure the mudguard stay. Unscrew the two bolts holding the upper ends of the fork springs. These will be found inside the legs of the forks. The arms with springs attached can then be taken away. If it is desired to change the springs, they can simply be unscrewed from the scrolls formed on the arms. The top scrolls are screwed out in a similar manner.

The pivot bearings in the arms are composed of a bush and distance tube, with a dust cap at each end of the bush.

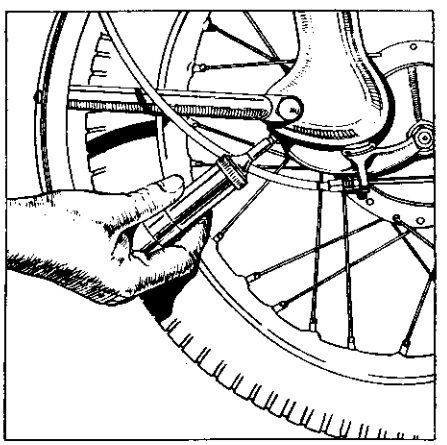

Fig. Z17. Greasing Front Forks.

## RE-ASSEMBLING THE FORKS

Screw the springs firmly on to the top and bottom scrolls. Pass each spring up inside the fork legs and replace the top bolt. Assemble the pivot bearings in the arms and guide them into position, using a suitable piece of rod for lining up with the bolt holes.

## STEERING HEAD ADJUSTMENT

With the front wheel clear of the ground, test for play by grasping the handlebars as shown in Fig. Z18 and attempting to rock the steering head up and down. If any play is present, the bearings require adjustment.

Slacken the locknut "B," Fig. Z19, and turn the adjusting nut "C" until the play has been taken up. Do not over-tighten or the steering will be stiff, and the ball races may be damaged. Tighten the locknut firmly.

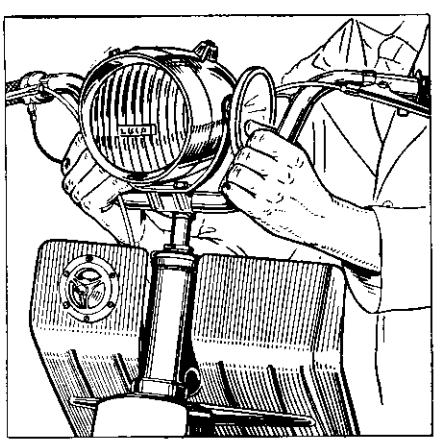

Fig. Z18. Checking Steering Head.

## DISMANTLING THE STEERING HEAD

Remove the front wheel, as described in Service Sheet No. 906. Unscrew the bolt "A," Fig. Z19, a few turns and tap it down to release the handlebar stem expander cone. Pull the handlebars up out of the steering head. Take off the two nuts "B" and "C" while supporting the weight of the forks. Then, lower the forks until the steering column is clear of the frame. Take care not to lose any of the ball bearings; there should be twenty-four 3/16in. balls in the upper cup, and twenty ¼in. balls in the lower cup.

These bearings require cleaning out and re-packing with grease at intervals of approximately 10,000 miles.

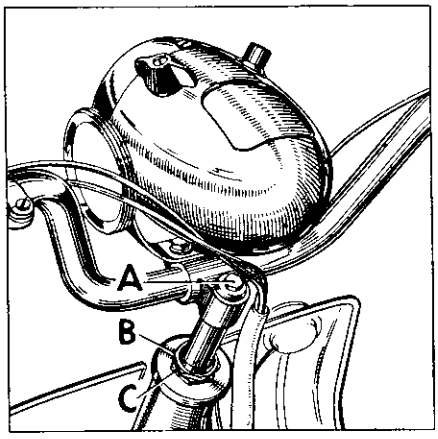


Fig. Z19.
Steering Head Adjustment.

## RE-ASSEMBLING THE STEERING HEAD

Re-assemble the bearings, using fresh grease, and adjust as described above. Replace the front wheel and handlebars. Line up the latter squarely with the wheel and tighten the bolt "A" securely.

## THE REAR FORKS

The lower extremities of the rear forks are held by two bolts on each side to the chain-case and swinging arm plate. The two suspension springs are mounted on top of the forks by means of special fixing plates and nuts and bolts. No lubrication or adjustment is necessary.

The bushes on which the engine and rear forks pivot are of the rubber silentbloc type. These require no attention and have an extremely long life.

## WHEEL ALIGNMENT

At intervals, and particularly after the rear wheel has been moved, the alignment of the wheels should be checked. Set the front wheel straight ahead and place a long straight edge alongside the two wheels. It should touch the tyres in two places on each wheel simultaneously.

An even more accurate method is to measure the distances between the straight edge and the rims at the front and rear of each wheel, since the sides of the tyres may not always be perfectly true. These measurements should all equal.

If the wheels prove to be out of line, it may be that one of the chain adjusters has been screwed in or out more than the other. If this point is in order, then the result must lie in the frame or forks and they should be returned to a B.S.A. Dealer for checking over.

B.S.A. MOTOR CYCLES LTD.,
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# BSA SERVICE SHEET No. 908

*August* 1958.

# Dandy 70

## TECHNICAL DATA

| | |
|---|---|
| Petrol tank capacity | 6 pints |
| Bore | 45 mm. |
| Stroke | 44 mm. |
| Capacity | 69.9 c.c. |
| Compression ratio | 7.25—1 |
| Piston ring gap | min. .009″ max. .013″ |
| Piston clearance (base of skirt) | min. .003″ max. .0048″ |
| Contact breaker gap | Lucas .015″ Wico Pacy .018″ |
| Ignition timing (piston before T.D.C. points just opening) | 5/32″ |
| Spark plug | Champion L7 |
| Plug points gap | min. .018″ max. .020″ |
| Gear ratios | Top 9.7 First 21.2 |
| Wheel rims | G.5–J |
| Tyres size | 20″ × 2½″ |
| *Tyre pressures | Front 18 lbs. p.s.i. Rear 24 lbs. p.s.i. |
| Chain size | ½″ × 3/16″ × 60 pitches |
| Teeth on rear chainwheel | 27 |
| Gearbox sprocket | 13 |
| Total front wheel movement | 2½″ |
| Total rear wheel movement | 2½″ |
| Brake dimensions | 4″ dia. × 7/8″ wide |
| Carburetter bore | 1/2″ |
| Main jet | 35 c.c. |
| Throttle valve | 3 |
| Needle position | 3 |
| Needle Jet | .0745″ |
| Air cleaner | Amal |

*Based on rider's weight of 140 lbs., for heavier load add 2 lbs. per 14 lb. increase for front and 4 lbs. per 14 lbs. increase for rear.

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