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INCREASED CHARGING RATES — 6-VOLT A.C. EQUIPPED MACHINES

During the winter months, when motor cycles are used mainly for short journeys, and parking lights are used more frequently, motor cyclists find, that on A.C. equipped machines, it is sometimes difficult to maintain the battery in a fully charged condition.

It is not possible to increase the maximum output of the alternator (i.e., when the lighting switch is in the headlamp position), but an increase in output is obtainable in the "off" and "pilot" switch positions. This is achieved simply by interchanging the green and yellow (or mid green) and green and black (or dark green) leads at the snap connectors where the alternator leads join the main harness.

A greatly increased charge rate is obtained with the alternative connections and we do, therefore, recommend that they are used only whilst making short journeys during the winter months. If a long journey is necessary, the original connections should be restored.

It is appreciated that changing the leads at the connectors is not entirely convenient. Fortunately, it is possible to modify the wiring to incorporate a switch for this purpose. The wiring modifications are simple, although differing slightly, according to the type of ignition switch fitted to the machine. In each case, however, the same switch, part number 31757, is required. This switch has "Lucar" type terminals, so that "Lucar" connectors will also be required. Connectors and plastic covers can be obtained in packets of 10 under part number 54942078 and 54190042 respectively.

Machines with PRS8 Lighting/Ignition Switch or 63SA or 88SA Ignition Switches

Remove the alternator green and yellow (or mid green) lead from terminal 16 on the lighting/ignition or ignition switch, and connect instead to terminal No. 2 on the changeover switch. (See diagram 1). Connect a new lead from terminal No. 3 on the changeover switch to terminal No. 16 on the light/ignition or ignition switch. Remove the alternator green and black (or dark green) lead from the rectifier terminal, but do not remove the other lead at this rectifier terminal which is connected to the lighting switch.

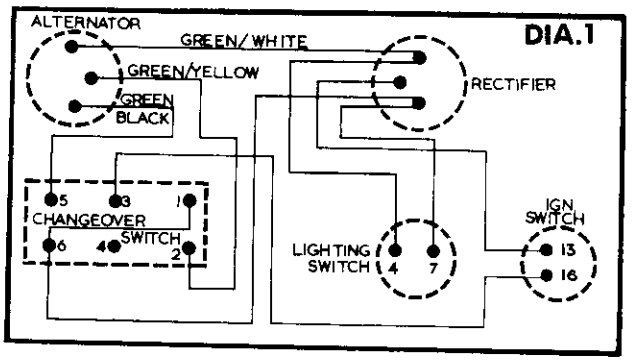
Connect the lead removed from the rectifier to terminal 5 on the changeover switch and a new lead from terminal No. 6 on same switch back to the rectifier terminal from which the alternator lead was removed.

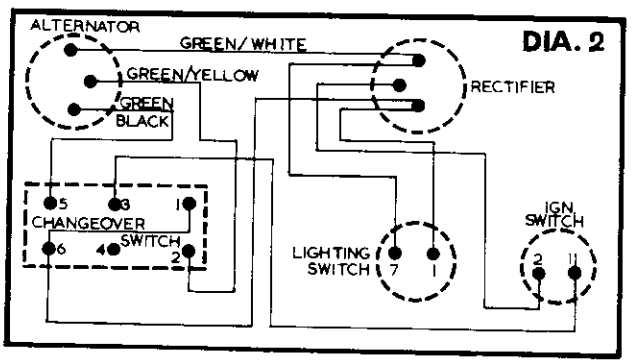
Machines fitted with PR1/2 Ignition Switch

The same instructions as above apply, except that the alternator green and yellow (or mid green) lead is removed from terminal 11 of the PR1/2 switch. (See diagram 2.). This lead is still connected to terminal No. 2 on the changeover switch, whilst the new lead from terminal No. 3 on the switch is now connected back to terminal No. 11 on the ignition switch.

Special Notes:

Due to the type of connections employed on the 63SA and 88SA switches, we recommend that to make these alterations the lead is cut a few inches from the ignition





switch and the new connections made with the aid of snap connectors.

Changeover switch must be in the normal charge position if it is necessary to start the machine in the emergency position, although once the ignition switch has been turned to normal ignition position, the changeover switch can be returned to the high charge position.

IGNITION WARNING DEVICES

Many motor cyclists would like some form of warning device which would indicate that the ignition has inadvertently been left on, a state of affairs which usually results in a flat battery.

With motor cycle A.C. circuits it is not possible to fit, at reasonable cost, an ignition warning light which will function in exactly the same manner as on D.C. equipped machines. But, if a warning light is connected in parallel with the ignition coil, it will remain on as long as the ignition switch is on and would, therefore, provide a reliable warning.

Simple to install, the warning light body is earthed to the frame of the machine and the single lead is connected to the feed lead which connects the ignition switch to the ignition coil. Either the ignition switch or coil terminal would be suitable connecting points.

WIRING MODIFICATIONS — WHEN CONVERTING A.C. EQUIPPED MACHINES FROM COIL TO MAGNETO IGNITION

Some owners preferring magneto ignition modify their coil ignition alternator equipped machines to magneto operation. However, it must be remembered that it is still necessary to turn the ignition key to the "on" position on

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converted machines before the alternator can charge the battery. This could easily be overlooked, and as continuous running in this condition will almost certainly damage the rectifier, we recommend the following wiring modifications depending upon the type of lighting/ignition switches.

Machines fitted with PRS8 combined Lighting/ Ignition Switches

Remove the Brown/Purple or Purple lead from terminal No. 13 on switch and connect into switch terminal No. 12. Remove the lead from terminal 18 and connect instead into terminal No. 16.

Machines fitted with 63SA or 88SA separate Lighting and Ignition Switches

Disconnect the Brown/Purple or Purple lead joined to terminal 13 on ignition switch and connect to the lead joined to terminal 12.

Disconnect the lead at terminal 18 and connect now to terminal 16.

Note:

Due to the type of connections employed on these switches, we recommend that to make these alterations, the lead is cut as close to the switch as possible, and new connections made with the aid of snap connectors.

Machines fitted with 41SA Lighting Switch and PR1/2 Ignition Switch

Move the Brown/Purple or Purple lead from terminal 2 to terminal 4 on the ignition switch, and similarly move the Green and Yellow lead from terminal 11 to terminal 13.

Once the appropriate modifications have been made, the ignition switch will no longer be operative.

RM12 ALTERNATORS

Both the RM12 Series "A" (four lead) and Series "C" (six lead) alternators are now obsolete, but the stators are still being serviced on a repair only basis.

However, it has been necessary to use currently available cable, in order to keep costs to a reasonable figure.

In cases where the stator has been repaired, the new leads should be connected to the main harness, in accordance with the following instructions:

RM12 Series "A" four lead Stator

New Stator Lead Colour	connect to	*Existing Main Harness Cable Colour*
Purple		Purple
Tan		Red
Light Green		Yellow
Mid Green		Green

RM12 Series "C" six lead Stator

New Stator Lead Colour	connect to	*Existing Main Harness Cable Colour*
Purple		Purple
Brown		Buff
Light Green		Yellow
Dark Green		Slate or Grey
Mid Green		Green
Tan		Green

*Connect these leads to Green by using the existing double snap connector.

RM13/14/15 ALTERNATORS

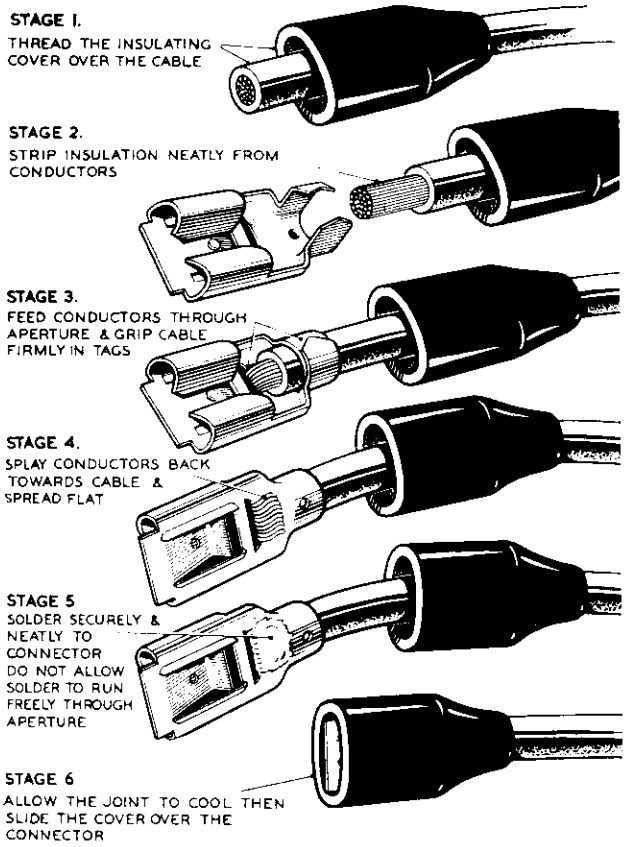
When these alternators were introduced, the three output cables were Light Green, Mid Green, and Dark Green.

It was observed that, after long service, these colours were affected by oil and atmospheric conditions, and it became difficult to distinguish the individual colours. To assist identification, the Mid Green cable was modified to Green and Yellow.

Later, for the same reasons, it was decided to modify both Light Green and Dark Green cables to Green and White, Green and Black respectively.

Original	*Intermediate*	*Later*
Light Green	Light Green	Green and White
Mid Green	Green and Yellow	Green and Yellow
Dark Green	Dark Green	Green and Black

FITTING A "LUCAR" SERVICE CONNECTOR



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USING THE MACHINE FOR TRIALS OR COMPETITION PURPOSES

If the machine does not incorporate A.C. ignition, it can be used without a battery, and in the EMG. position, provided the lead which comes from the main harness and connects to the battery negative terminal, is earthed to the frame of the machine.

If an IA45 alternator is fitted, re-connect leads as shown in Fig. 30.

PRS8 SWITCH — CONNECTIONS

The connector linking terminals "5" and "6" of this switch must be discarded if no connector was fitted between these terminals on the original switch.

Single-Cylinder Machines

The wire-link connections of this switch are arranged to control A.C. Lighting-Ignition Sets as fitted to single-cylinder machines.

Twin-Cylinder Machines

If this switch is required to control an A.C. Lighting-Ignition Set on a multi-cylinder machine, one of the wire-link connections must be modified as follows:

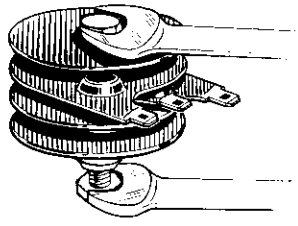
(i) Disconnect and remove the wire which passes across the back of the switch from Terminal 14 to Terminal 19.

(ii) Shorten this wire and re-connect it between Terminal 14 and Terminal 15.

WARNING — USE OF D.C. SUPPLY FOR CONTINUITY TESTS

Under no circumstances should a D.C. supply be used for checking the continuity of the stator windings, unless a bulb of low wattage or resistor, is used in series with the test leads.

SECURING A SILICON DIODE RECTIFIER



The central fixing bolt of the rectifier must make electrical contact with the frame of the motor cycle. When tightening a rectifier hold the spanners as shown in the illustration right. Never disturb the selk-locking nut which clamps the plates together. If the plates are twisted the electrical connections will be broken. Note that the fixing bolt and nut are $\frac{1}{4}$ x 28 U.N.F. thread and are both marked by circles to indicate this thread form.

Fitting Model 41SA Service Replacement Lighting Switch—Part Number 31763

This switch can be used to replace Model 41SA Lighting Switch, Service Number 31754.

It will be seen that this switch has six terminals whereas the original switch had only four terminals. When fitting the new switch, the extra two terminals, numbers "6" and "7", are not used – the remaining four terminals being connected up in the same manner as the original switch.

Fitting Model 41SA Service Replacement Lighting Switch—Part Number 31676

This switch can be used to replace Model 41SA Lighting Switch, Service Number 31626, fitted to some 1956/57 Norton and Ariel Single and Twin Cylinder Motor Cycles.

It will be seen that this switch has six terminals whereas the original switch had only four terminals. When fitting the new switch, the extra two terminals, numbers "6" and "7", are not used – the remaining four terminals being connected up in the same manner as the original switch.

Wiring Connections when fitting PRI/2 – 34095 in place of PRI/1 – 34088

(As used with A.C. lighting-ignition set RM12 fitted to Triumph 5TAC motor cycles 1952/53, frame numbers 33868 – 35334 inclusive).

This 14-Terminal Ignition Switch, PRI/2 34095, is an authorised replacement for the 9-Terminal Ignition Switch, PRI/1 34088, originally fitted to the above motor cycles. Terminals 3 – 14 and 2 – 6 – 8 on the new switch are linked. External connections must be made as follows:

Cable Colour	*Terminal on Old Switch*	Terminal on New Switch
Green	*2*	2
White	*10*	3
Grey (Slate)	*3*	7
Red	*4*	11
Light Blue	*6*	13
Purple	*1*	15

Fitting Model PRI/2 – 34093 Service Replacement Switch

(As used with A.C. lighting-ignition sets RM13 and RM14).

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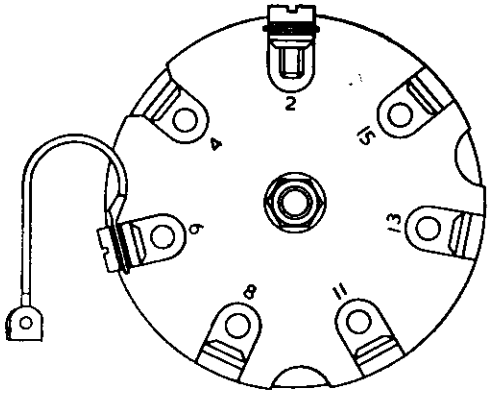
Single-Cylinder Machines

The free end of the link shown attached to Terminal 6 must be connected to Terminal 15.



Multi-Cylinder Machines

The free end of the link shown attached to Terminal 6 must be connected to Terminal 8.

Fitting Model PRS6 – 34087 to Triumph Series "A" Machines

Remove the link connected between terminals "4" and "6" before fitting to a Triumph Series "A" machine.

Velocette Scooter 1961 — Alternator Wiring Connections

All Velocette scooters have the alternator cables connected Green/Yellow to Green/Black; Green/Black to Green/Yellow, to give a continuous maximum charging rate. This is normal procedure and is carried out on the production line at Veloce Ltd.

METHODS OF ADJUSTING THE DAYTIME CHARGE RATE ON RADIO-EQUIPPED MOTOR CYCLES

Six-volt battery charging requirements of motor cycles are normally met by fitting an alternator (or a dynamo) having a maximum output of some $9\frac{1}{2}$ to $10\frac{1}{2}$ amperes. If, in addition to the usual electrical equipment, radio communication apparatus is fitted, some five or seven extra amperes are required to operate the receiver and up to twenty-one to operate the transmitter. The receiver often represents a constant running load on machines used for road patrol duties.

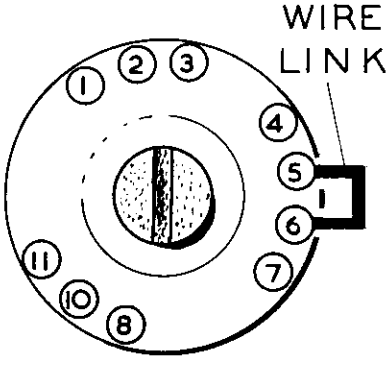


Fig. 44

The running conditions of radio equipped motor cycles vary from high-speed long-distance daylight patrol work to slow-running localised duties involving long periods of night parking. Conditions of the first kind call for a small trickle charge while those of the second demand the highest possible boost charge whenever the engine is running. A high degree of charge-rate flexibility is therefore essential if the generator output is to match all service needs and thus ensure satisfactory battery performance and life. LUCAS alternators have this flexibility. They are designed to provide five alternative daytime charge-rates – the most suitable being selected by interchanging certain external connections. It should be noted that regardless of the charge-rate selected, the maximum output is always developed in the lighting switch position "Head".

The adjustments are simple to make but the responsibility for making them should rest with the Maintenance Personnel who, being familiar with the running conditions and the state of the batteries on machines in their care, are best placed to judge when modifications to the charge-rates are necessary. In the event of doubt, however, advice should immediately be sought from the world-wide Lucas Service Organisation.

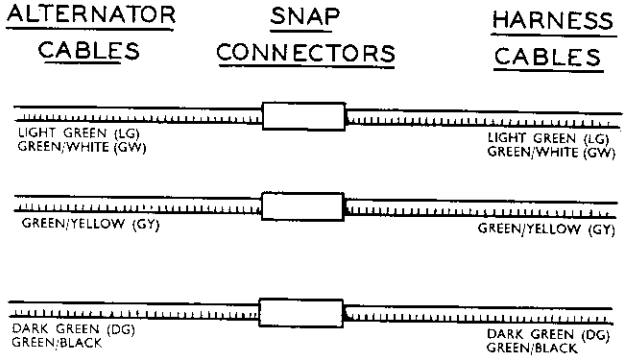


Fig. 45

The alternator stator carries three pairs of series-connected coils. The output in the lighting switch positions "Off" and "Pilot" is adjusted by varying the number of coils connected across the rectifier and battery and either shorting or open-circuiting any remaining coils, according to the tabulated instructions opposite. The number of coils connected across the rectifier and battery can be varied by

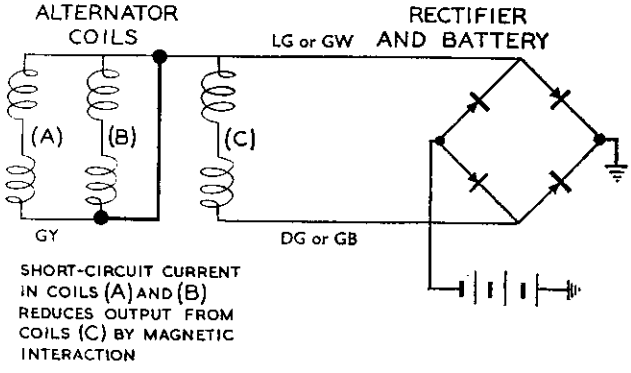


Fig. 46

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transposing connections between the alternator and the wiring harness at the snap-connectors. Any remaining coils can be shorted or open-circuited by inserting or withdrawing the wire link shown connecting the lighting switch terminals "5" and "6" in Fig. 44.

How to make an adjustment

If the state of charge of a battery appears consistently to indicate that the daytime charge-rate is either too high or too low, proceed as follows:

(i) Examine the alternator cables where they join the wiring harness and make a note of the colour of each cable as it enters and leaves its snap-connector.

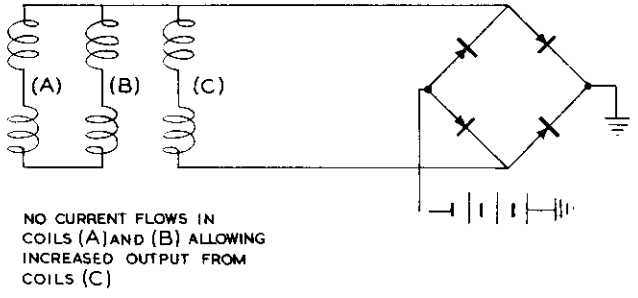

Fig. 47

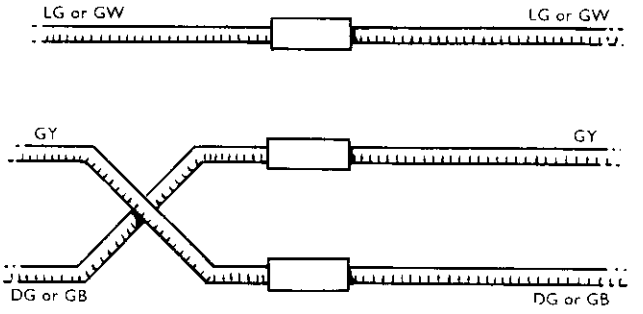

Fig. 48

(ii) Examine the lighting switch and see if terminals "5" and "6" are linked.

(iii) Refer to the table below and note that the five alternative methods of connection are given in columns 1 and 2 – line 1 producing the minimum ouput and line 5 the maximum.

(Some idea of the effect of each method can be gained by reference to columns 3 and 4. Similar effects can be obtained with other alternators in the Lucas range. Reference to the theoretical circuit of each method is made in column 5).

Alternator Connections 1	Lighting Switch Terminals '5' and '6' 2	Model RM14 Output in amperes at: 2,000 r.p.m. 3	5,000 r.p.m. 4	Schematic Diagram 5
1 As Fig. 45	Linked	2·4 – 2·9	2·75 – 3·25	Fig. 46
2 As Fig. 45	Not linked	3·75 – 4·25	4·5 – 5·0	Fig. 47
3 As Fig. 48	Linked	5·25 – 5·75	6·25 – 6·75	Fig. 49
4 As Fig. 48	Not linked	6·5 – 7·0	7·5 – 8·0	Fig. 50
5 As Fig. 51	Not linked	8·5 – 9·0	9·5 – 10·0	Fig. 52

NOTE

The output of alternators connected as in Figs. 46 and 49 increases in the switch positions "Pilot" and "Head". When connected as in Figs. 47 and 50, an increase occurs only in the switch position "Head". When connected as in Fig. 52 maximum output is developed in all positions of the switch.

This latter method of connection is recommended for any small capacity motor cycle carrying a radio receiver. Even though the receiver be of low power and limited range, it does represent a steady additional drain on the battery – a drain to be balanced from the ouput of a single small alternator. If the amount of night riding is considerable, it may also be necessary to arrange for systematic recharging from a separate supply.

Disconnect at the snap connectors the PURPLE, GREEN and YELLOW cables, but leave the BLUE cable connected for ignition purposes. The above readings should be obtained from a satisfactory alternator.

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(iv) Identify the method of connection used on the machine by comparing it with those given in columns 1 and 2, and reconnect the alternator and switch to obtain the next higher or lower charge-rate, as required.

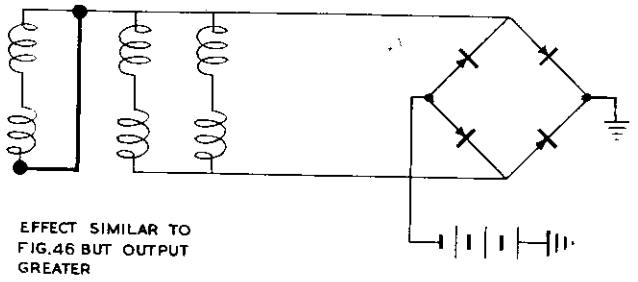

Fig. 49

If, after a representative trial period, the alternator output still does not match the running conditions, repeat the above procedure.

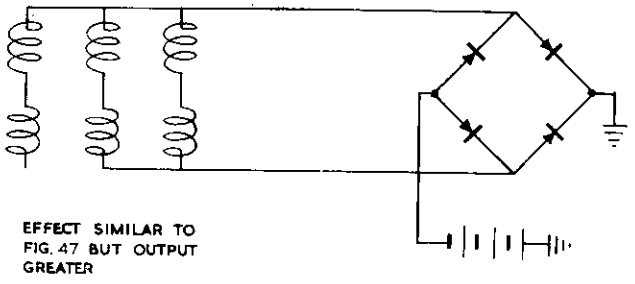

Fig. 50

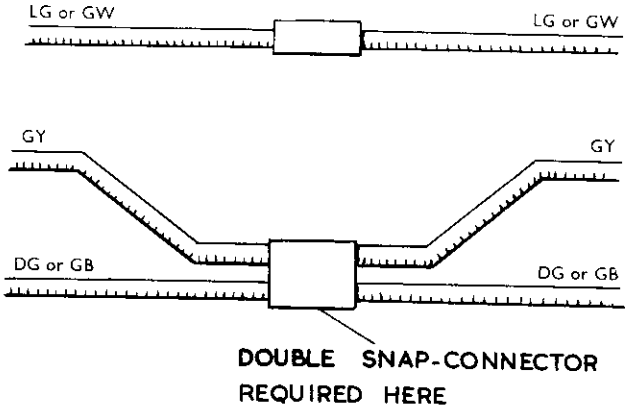

Fig. 51

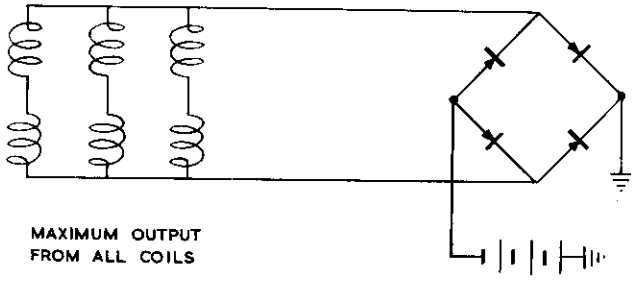

Fig. 52

THE DOUBLE GENERATOR CHARGING SYSTEM

Some machines intended to carry radio communication equipment are fitted by the motor cycle manufacturers with the LUCAS Double Generator System in which the combined outputs of an alternator and d.c. generator are fed into a 6-volt battery. A typical wiring diagram for a coil ignition machine fitted with this system is given in Fig. 53 and that for a magneto ignition machine in Fig. 54.

The system comprises a crankcase-located Model RM13, 14 or 15 alternator with its magnet rotor carried on and eriven by an extension to the crankshaft, and a Model E3L generator mounted either separately and driven at engine speed or forming part of a standard magdyno.

In general, the normal electrical demands are met by the rectified output of the alternator whilst any additional radio loading is met by the generator. The alternator output is controlled by the lighting switch in the usual manner and, depending on the alternator and switch connections, increases automatically in the switch positions "Pilot" and "Head". The generator output is under compensated voltage control.

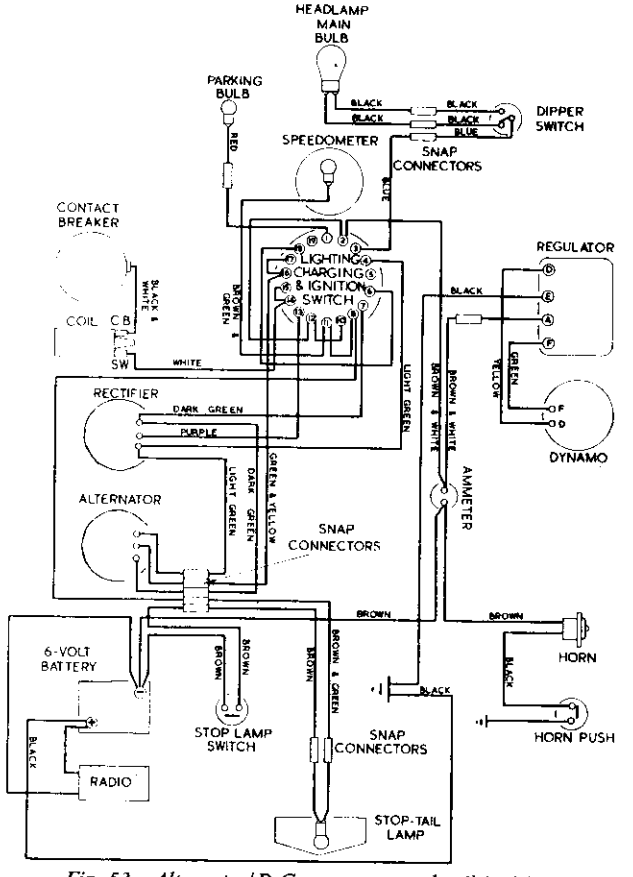

Fig. 53 Alternator/D.C. generator and coil ignition

Providing the generators are driven above their minimum "balancing speeds" (when charge and discharge currents are equal) the battery charging current is additional to the load current and varies from a trickle charge of some 1·5 – 2·5 amperes into charged batteries to 3·5 –

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5·0 amperes into discharged batteries. These combined charging rates are substantially constant for all sizes of battery and, as mentioned above, lamp switching and compensated voltage control cause the output from the generators to increase automatically and balance the load as each item of equipment is switched on.

On leaving the motor cycle manufacturers, the alternator terminal connections are arranged as in Fig. 44 and the lighting switch terminals "5" and "6" are not linked. However, the charge rate can be varied to suit individual requirements as previously described.

High-Output Alternators

Unless special reasons exist for retaining model E3L generator and its associated control box, as in certain export orders, motor cycles requiring additional electrical generating capacity are now fitted with a single high-output alternator and rectifier.

Models 63SA and 88SA Switches

These small switches each comprise two separate lighting and ignition portions having, together, virtually the same terminal numbering as the larger combined ignition and lighting switch model PRS8 shown in the wiring diagrams in Figs. 53 and 54. Terminal connections are made by crimping or soldering.

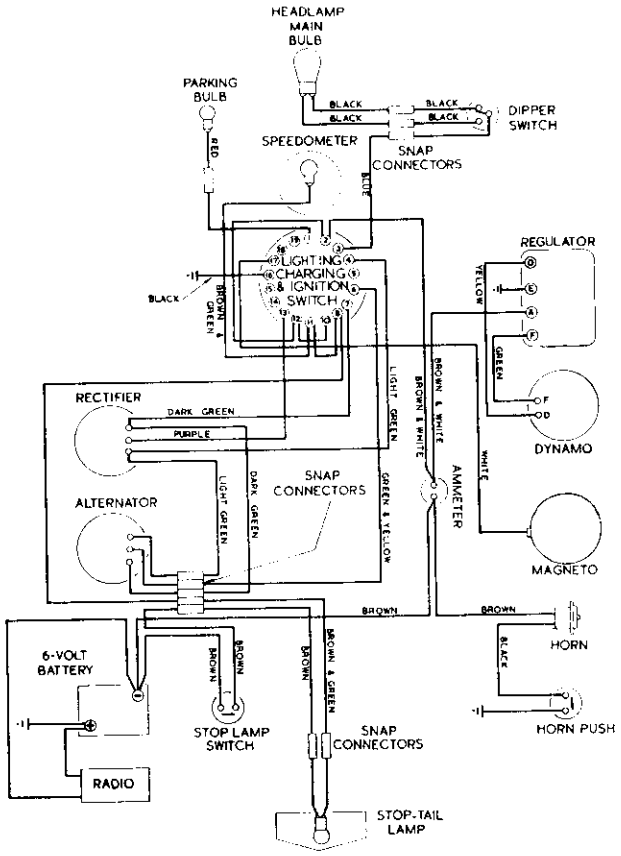

Fig. 54 Alternator/D.C. Generator and Magneto Ignition

Adjustment of Alternator Output

Removal of the wire link shown in Fig. 44 is applicable only to model PRS8 switches, since, with models 63SA and 88SA, the cable from terminal "18" shown in Fig. 53 is taken to terminal "5" and not to terminal "6". The same increase in alternator output can however be obtained with switches 63SA and 88SA by cutting and taping-up the cable from terminal "4". About $1\frac{1}{2}$" should be left attached to the switch to allow for any future re-connection.

Note

Terminal "4" (or, in switch models U39 and 41SA, No. "7") is only used with 3-rate charging systems, i.e., where an increase in alternator output occurs in the Parking Light position. When used, terminal "4" (or "7", U39 and 41SA) must be disconnected before attempting the wiring modifications shown in Figs. 48 and 51, should the higher outputs obtained with these latter methods of connection be required.

Cable Colours

Cables formerly coloured Light Green are now White-with-Green.

Cables formerly coloured Dark Green are now Green-with-Black.

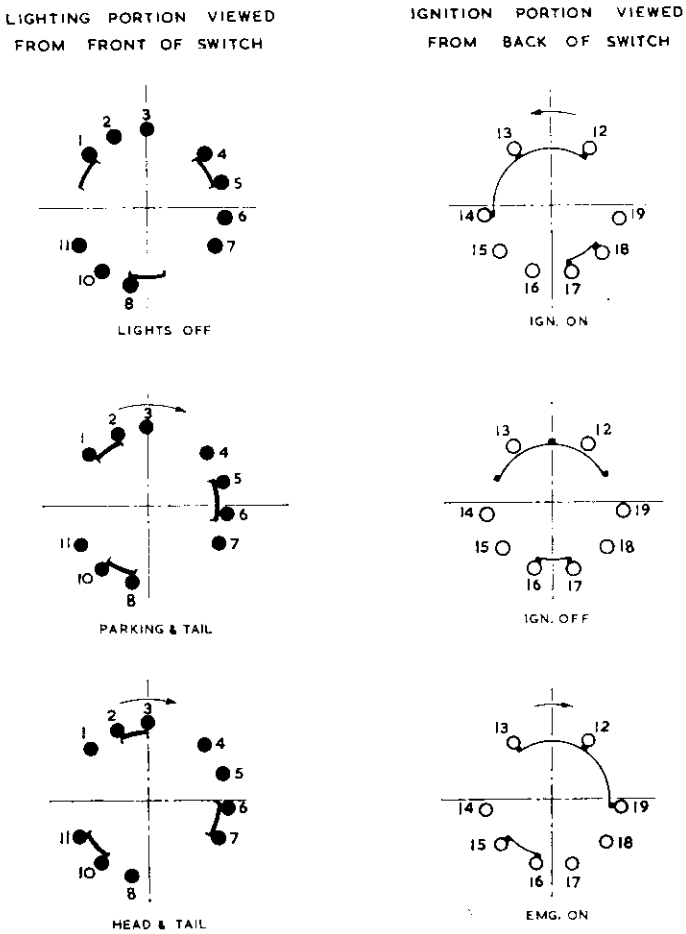

Fig. 55 Internal switch connections of model PRS8 Switch. (Applicable also to models 63SA and 88SA)

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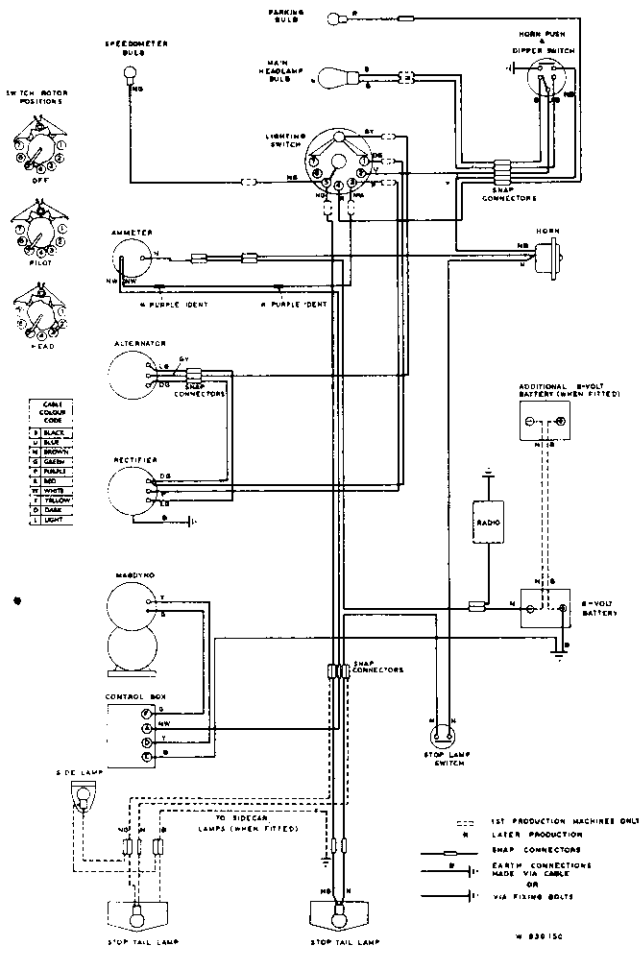

Fig. 56 Double Generator installation with Alternator, Magdyno and, either model U39 or 41SA Lighting Switch. (Note: Cable LG connected to terminal "7" on 3-rate charging systems to give lowest output) (see Fig. 46)

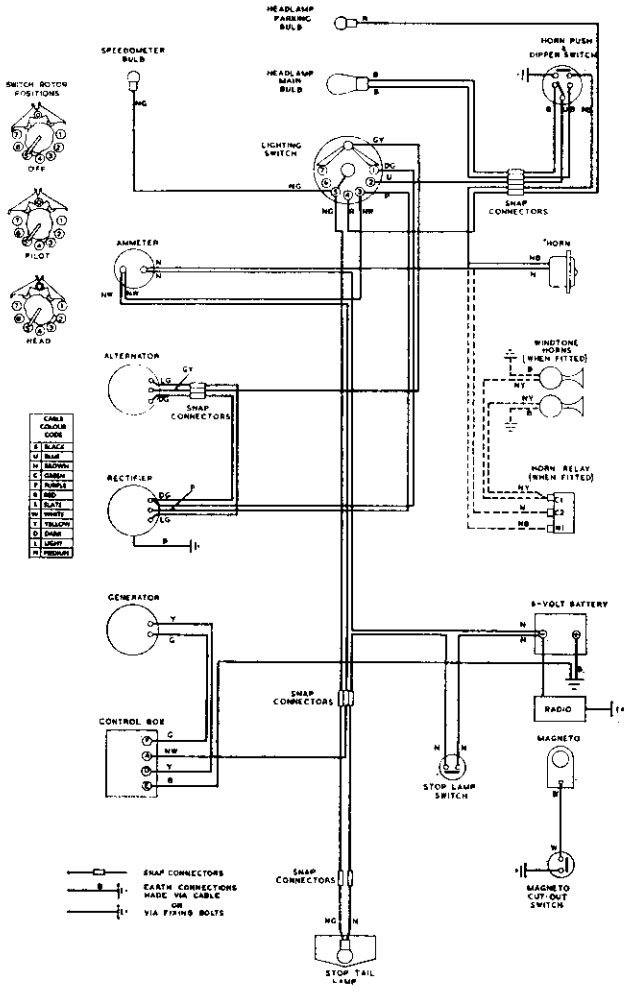

Fig. 57 Double Generator installation with Alternator, D.C. generator, Magneto and, either, Model U39 or 41SA Lighting Switch. Also, alternative connections for Twin Windtone Horns and associated relay (suitable only on double generator machines)

NOMINAL OUTPUT OF MODELS RM13, RM13/15, RM15, AND 5AF ALTERNATORS

Alternator Connections 1	Lighting Switch PRS8 Terminals '5' and '6'* 2	Alternator Output (Rectified) in amperes at: 2,000 r.p.m. 3				5,000 r.p.m. 4				Schematic Diagram 5
		RM13	RM13/15 5AF (6-volt)	5AF (12-volt)	RM15	RM13	RM13/15 5AF (6-volt)	5AF (12-volt)	RM15	
1 As Fig. 45	Linked	1·75–2·0	2·25–2·5	1·25–1·5	2·25–2·5	2·75–3·25	2·75– 3·25	2·5 –3·0	3·0 – 3·5	Fig. 46
2 As Fig. 45	Not linked	3·0 –3·25	3·25–3·5	2·0 –2·25	3·75–4·0	4·25–4·75	4·5 – 5·0	3·75–4·25	4·75– 5·25	Fig. 47
3 As Fig. 48	Linked	3·25–3·5	4·5 –4·75	3·0 –3·25	5·0 –5·25	5·75–6·25	6·0 – 6·5	5·25–5·75	6·0 – 6·5	Fig. 49
4 As Fig. 48	Not linked	5·25–5·5	5·75–6·0	3·75–4·0	6·25–6·5	7·0 –7·5	7·5 – 8·0	6·5 –7·0	7·5 – 8·0	Fig. 50
5 As Fig. 51	Not linked	7·0 –7·25	7·75–8·0	5·0 –5·25	8·25–8·5	9·0–9·5	9·5 –10·0	8·0 –8·5	9·5 –10·0	Fig. 52†

*For U39, 41SA, 63SA and 88SA equivalents, see page 26 and Fig. 56 caption.
†The connections shown in Fig. 52 are also obtained on operating the Maximum Charge Rate Switch fitted to certain single-alternator motor cycles equipped with two-way radio. To avoid overcharging, such switches must only be operated with the radio load connected.

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THE CONVERSION OF EXISTING 6-VOLT MOTOR CYCLES TO 12-VOLT ZENER DIODE CONTROLLED OPERATION

NEW EQUIPMENT REQUIRED

When converting a LUCAS motor cycle alternator circuit from 6-volt to 12-volt Zener Diode controlled operation the electrical units which must be considered are: battery, Zener Diode and its associated heat-sink, rectifier, ignition coil, distributor (or contact breaker unit), lighting equipment, and any extra electrical accessories that may be fitted. Each of these units is considered separately below.

Battery

12-volt motor cycle batteries are available but, another method of obtaining a 12-volt supply is to put another 6-volt battery in series with the existing one. Providing the two batteries are of the same type and capacity, and the old one is in a charged and healthy condition, this arrangement will function satisfactorily. The lowest suitable battery capacity is in the region of six or seven ampere-hours. Two batteries, model MK9E/2, connected in series would give a 12-volt capacity of 7AH. Two of these batteries occupy approximately the same space as one PU7E battery.

Two ML9E batteries could be used. These have a capacity of 12 ampere-hours at the 10-hour rate, but as they are larger the problem of accommodating them on the motor cycle will be greater. For sidecar use, one of the smaller car batteries such as model BHN5A/7/8 could be installed in the sidecar boot.

Battery Model	Voltage per Unit	Ampere-Hour Capacity (10-Hour Rate)	Dimensions in Inches		
			Length	Width	Height
MK9E/2	6	7	$4\frac{13}{16}$	$1\frac{3}{16}$	5
ML9E	6	12	$4\frac{13}{16}$	$2\frac{3}{8}$	$5\frac{3}{8}$
BHN5A/7/8	12	18	$7\frac{3}{16}$	$5\frac{1}{4}$	$7\frac{7}{8}$
PU5A	12	8	$5\frac{5}{8}$	$3\frac{1}{4}$	$5\frac{3}{8}$

Zener Diode and heat sink

A stud-mounted Zener diode, Part Number 49345 will be required. The diode must be bolted to a heat sink (cooling fin) to prevent its working temperature from rising above the designed operating range. The heat sink must be made of copper or aluminium sheet of approximately 16 S.W.G. ($\frac{1}{16}$" thick), have an area of 25 square inches, and be as square as space limitations permit. In practice, it is found that an area of 6" x $4\frac{1}{4}$" (as shown in Fig. 58) can most readily be accommodated. The diode must be mounted as near to the centre of the heat sink as possible. Care must be taken to see that the metal of the heat sink is *flat around the diode fixing hole to ensure maximum heat conduction from the diode. The diode fixing nut should be tightened to a torque between 24 and 28 lbf in. Care should be taken not to exceed this figure otherwise the fixing stud may shear.

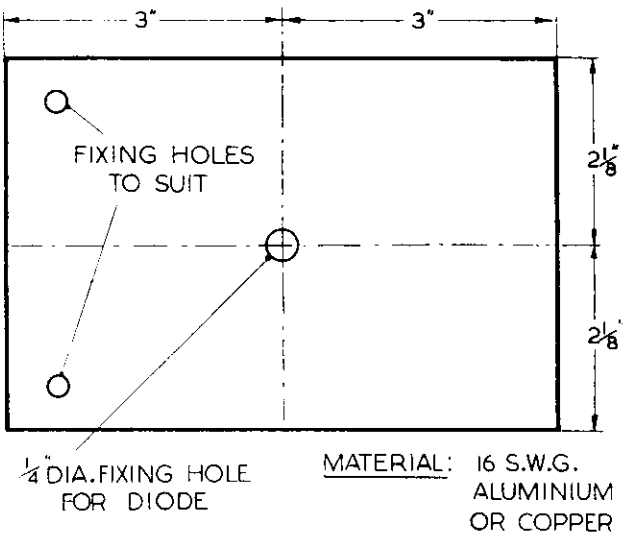


Fig. 58 Outline and dimensions of typical heat sink for Zener Diode

Rectifier

Over the years several rectifiers have been used on alternator equipped machines but only the latest design, Part No. 49072, is definitely suitable for use with Zener diode charge control. This is a black silicon bridge unit, introduced in April 1962, which functions equally well in either 6 or 12-volt circuits. If the existing rectifier is a square selenium unit, Part No. 47132, or one of the earlier selenium types, it should be removed and Part No. 49072 fitted. Lucar terminals, Part No. 54942078, and insulating covers, Part No. 54190042, will be required for connecting up the new rectifier.

Ignition Coil

The existing ignition coil will be a 6-volt unit. This must be replaced by a 12-volt unit.

Replace model MA6 with MA12, Part No. 45101, or model LA6 with LA12, Part No. 45141.

Capacitor

The capacitor fitted in contact breaker unit model 18D1 and distributor model 18D2 is unsuitable for use with 12-volt ignition coils. It must therefore be removed and a new capacitor, Part No. 54441582, fitted externally.

All other capacitors are suitable for 12-volt operation.

Horn

Several 12-volt horns are available, including a 12-volt version of the original horn fitted (probably high frequency horn model 8H), the more powerful high frequency model 6H, and the car type windtone horn, model 9H, which can be used either singly, or as a matched low and high note pair. If a pair of windtone horns is fitted, it will be necessary to use a relay to limit the current passing through the horn button contacts.

*Ensure that the washer is fitted immediately under the nut and not between the diode and heat sink. All burrs must be removed to ensure metal-to-metal contact.

General Servicing Information

Horn model 8H:	Part No. 70164
Horn model 6H:	Part No. 70159
Horn model 9H, Low Note:	Part No. 54068009
Horn model 9H, High Note:	Part No. 54068008
Relay model 6RA:	Part No. 33188 (For use with two windtone horns)

Headlamp

On machines fitted with 7-inch left-hand dip light units (Marked "RIGHT HAND DRIVE"), replace the bulb with Lucas No. 414, 12-volt 50/40 watt.

On machines fitted with 7-inch vertical dip light units (Marked "MOTOR CYCLE"), replace the bulb with Lucas No. 446, 12-volt 50/40 watt, *OR*

(a) Retain existing light unit and fit bulb No. 446, 12-volt 50/40 watt.

The total driving lamp(s) loading should be between 50 and 75 watts.

On machines fitted with $5\frac{3}{4}$ inch vertical dip lights (Marked "MOTORCYCLE LIGHTWEIGHT") replace the bulb with Lucas No. 446, 12-volt 50/40 watt.

Replace parking light bulb with No. 222 12-volt 4-watt.

Twelve-volt speedometer bulbs are obtainable from Smiths Motor Accessories Ltd.

Stop-Tail Lamp

If the bulb holder is designed to accept non-reversible bulbs, use No. 380 12-volt 6/21 watt (with indexed pins). If the bulb holder accepts reversible bulbs, fit bulb No. 381, 12-volt 6/21 watt (but be careful to insert the bulb the correct way round).

Sidecar Lamp

For the Lucas Sidecar Lamp Model 569, use bulb No. 989, 12-volt 6-watt.

Electrical Accessories

The manufacturer of any electrical accessories fitted to your machine should be consulted about their suitability for 12-volt operation before connecting them to the converted circuit.

In the case of lamps, it will of course only be necessary to fit a suitable 12-volt bulb.

INSTALLING THE NEW EQUIPMENT

With the exception of the battery and the Zener diode, the new equipment will replace existing units and fitting should present no difficulty.

Battery

Accommodating an extra battery on the motorcycle will probably be the most difficult problem to solve. Unfortunately, as each machine requires a different approach, it is not possible to make any comprehensive recommendation. The following suggestions may however be helpful:—

On machines equipped with the black "Milam" cased PU7E battery the problem can be solved by using two MK9E/2 batteries which occupy approximately the same space. Where a plastic cased ML9E battery is in use, it may be possible to accommodate a further ML9E battery alongside the original or at some adjacent position.

Note:

The earlier versions of some machines now equipped with ML9E batteries were originally fitted with PU7E batteries. In such instances, it may be possible to obtain the original PU7E battery carrier through your motorcycle dealer.

The batteries could also be mounted in the boot of a sidecar or in a suitably modified pannier.

Care must be taken to ensure that batteries are fixed firmly, as insecure mounting will almost certainly cause failure due to vibration. If the two batteries are mounted side by side, a sheet of thin rubber should be placed between them to prevent chafing, as shown in Fig. 59.

Zener Diode

The diode and its heat sink must be mounted so that a good air stream passes over both sides of the plate to ensure efficient cooling. At the same time its location must be such that the diode will remain reasonably dry and clean.

On many machines these requirements will be met by mounting the heat sink underneath the front of the petrol tank, on the tank mounting bracket. Efficient operation of the diode depends upon the existence of a good earth connection. The use of a separate cable link between the heat sink and the frame of the machine is therefore recommended.

Caution:

The body of the Zener diode is made of copper to ensure maximum heat conductivity. This means that the fixing stud has a relatively low tensile strength, and should not be subjected to a tightening torque greater than 28 lbf in.

CONNECTING-UP

Connection of the new units into the circuit must now be undertaken. (All additional cable used in the conversion should be 28/.012″, or equivalent).

Battery

The two batteries should be connected in series by means of a short link wire which must join the "+ve" terminal of one battery to the "—ve" terminal of the other, as shown in Fig. 59.

The remaining "+ve" terminal should be connected to the Red earth wire, and the "—ve" terminal to the Brown/Blue feed wire to the ammeter or lighting switch.

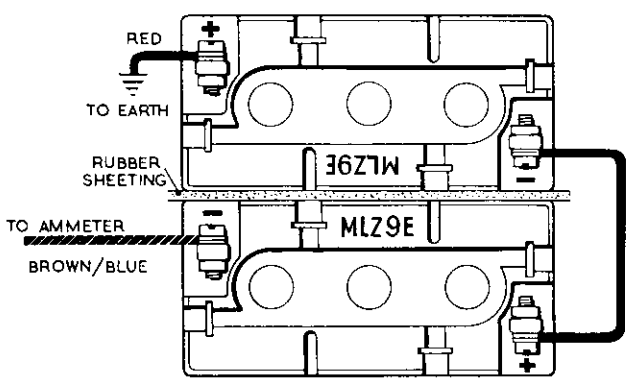


Fig. 59 Two six-volt batteries connected in series for twelve-volt operation

General Servicing Information

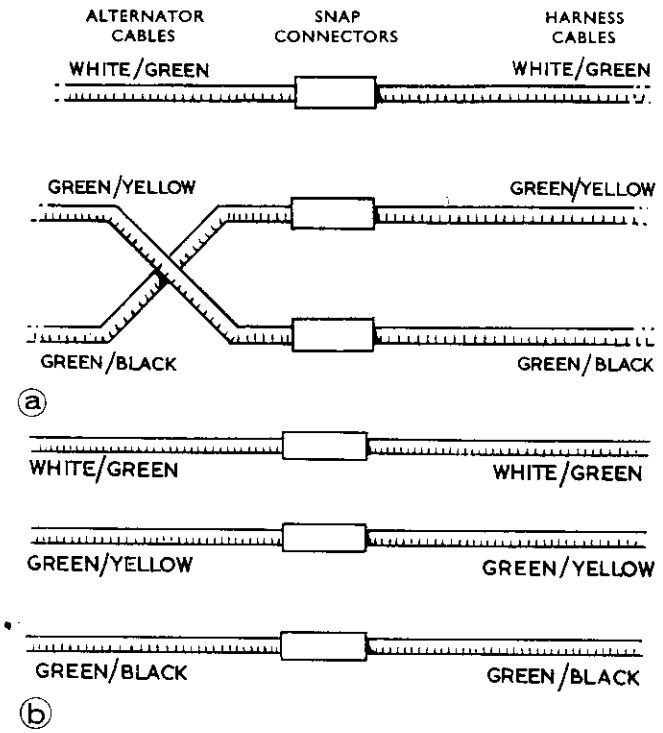


Fig. 61 Alternator to wiring harness connections (a) for coil ignition and (b) for magneto ignition machines

MAINTENANCE

Providing the diode and its heat sink are kept clean, to ensure maximum efficiency, no maintenance will be necessary. Maintenance of the other items of equipment listed in the conversion is dealt with in Booklet No. 2644 which will be supplied upon request.

SPECIAL ALTERNATOR STATOR WINDINGS FOR AMERICAN TERRITORIES

Lucas alternators are designed to develop current outputs to meet differing conditions of machine usage and electrical loading. Thus "high" and "low" output versions of each standard alternator are manufactured, and all are covered in the following tables. In addition, mention must be made of the special "low-low" output alternators fitted to certain motor cycles exported to American territories whose stator windings are designed to obviate overcharging under "Turnpike" riding conditions. Stators produced for this duty are stamped with one of the following Part Numbers: 47171 or 47183, and were fitted on machines up to 1963. These Part Numbers can be seen on removal of the primary chain case. If your machine is equipped with one of these alternators, you must reconnect the cables as shown in Fig. 61(a) and, if fitted, disconnect the short circuit connection, as shown in Fig. 60.

Right-hand dip headlamps

On machines fitted with right-hand dip headlamps (marked "LEFT HAND DRIVE"), replace the bulb with Lucas No. 355, 12-volt 42/36 watt.

1966 TRIUMPH T20SS

How to modify the wiring for trials and scrambles work

This machine is equipped with an alternator having a stator wound with three pairs of coils. The output from the alternator, controlled by the lighting switch, depends on how these sets of coils are interconnected. A higher output is given when the headlamp is switched on and a lower output when the parking light only is used. The smaller output is also given in the switch "OFF" position for feeding the ignition coil, stop-light and battery.

However, if the lighting equipment should be removed, for trials and scrambles work, even less current will be required from the alternator, in fact, just enough to supply the ignition coil and to trickle-charge the battery. To meet this latter condition, provision has been made to enable the owner to make a simple modification to one of the cable harness connections. The modification consists of withdrawing a cable fron one snap-connector and inserting it into another, as explained below.

On inspection, it will be seen that three cables are brought out from the alternator, and these are coloured White-with-Green (terminating in a double snap-connector), Green-with-Yellow and Green-with-Black (terminating in a triple snap-connector). At the snap-connectors these cables are joined, colour for colour, to three similar cables from the harness loom. In addition, a fourth cable, coloured Green-with-White, is brought out from the loom.

For running with lighting equipment fitted, this fourth cable GW must be inserted in the unoccupied portion of the triple snap-connector (see Fig. 62), but, whenever the lighting equipment is removed, cable GW must be withdrawn and plugged into the unoccupied portion of the double snap-connector. This will serve to reduce the alternator output to the correct value, when the lighting switch is in the "OFF" position, as the alternator control coils are in effect short-circuited. Failure to carry out this modification, when running without lighting equipment, could result in an over-charged battery, with possible damage to the machine.

Note

The three portions of the triple snap-connector are electrically separate, but the two portions of the double connector are electrically common.

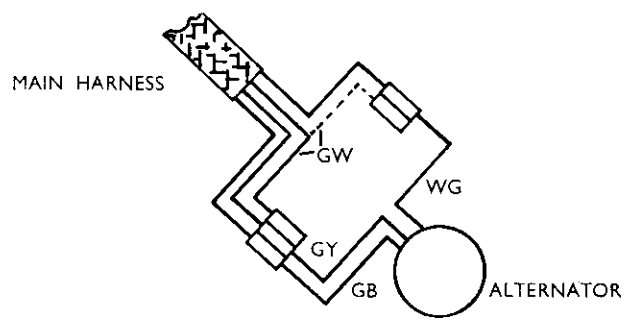


Fig. 62

General Servicing Information

RM12 ALTERNATOR — CONVERTING SERIES "B" MACHINES TO SERIES "C" INCLUDES LATEST IMPROVEMENTS FOR "EMERGENCY" RUNNING

As a direct result of service experience with the new "six lead" RM12 alternator it seemed desirable that provision should be made for continuous operation in the "EMG" switch position. A revision to the equipment was therefore made.

It permits the continuous use of the machine in the "EMG" switch position with full engine performance. Previously it was not possible to do this because the high speed output from the alternator series "B" was too great. This latest improvement protects the electrical circuits from accidental misuse of the "EMG" switch and also helps where riders wish to use the machine temporarily without a battery for "trials" or other sporting events. It should be pointed out that the battery cannot be charged in the "EMG" switch position and, without a battery, it is not possible to use the lighting or horn.

N.B.: Where the equipment is run temporarily without a battery ALWAYS connect the brown battery lead in the harness to earth.

We supply complete kits (Part No. 047504) to our Service Depots so that they can arrange to convert all the machines now in service.

FITTING INSTRUCTIONS

There are four stages in the procedure:

1. Fit new rotor.
2. Fit new resistor and bracket and resistor leads.
3. Modify the alternator feed cables.
4. Fit new switches and switch harness.

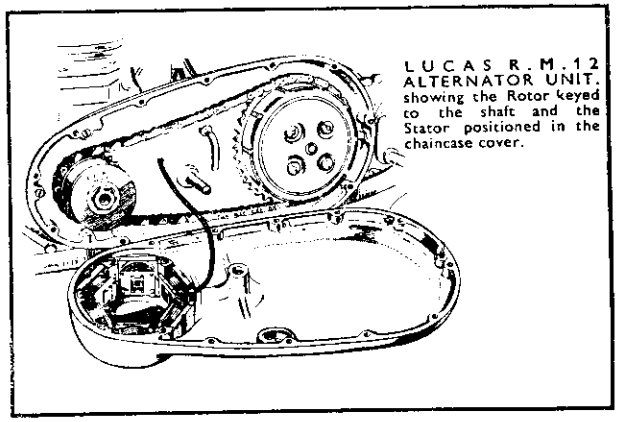
Fitting New Rotor

(*a*) Remove exhaust pipe from L.H. side of motor cycle (alternator side).

(*b*) Remove foot rest.

(*c*) Remove foot brake pedal – by removing brake pedal retaining nut and sliding the brake pedal off the pivot.

(*d*) Take off the chain case – remove screws around case and gently ease off the cover, *taking care not to damage paper gasket.* (If gasket is damaged a new one must be fitted).



LUCAS R.M.12 ALTERNATOR UNIT. showing the Rotor keyed to the shaft and the Stator positioned in the chaincase cover.

Fig. 63

(*e*) Remove rotor fixing bolt – engage top gear and hold back wheel while unscrewing bolt – this prevents the engine shaft turning.

(*f*) Remove rotor – this is a tight fit on the shaft, and must be gently eased off with a large sprocket drawer or two suitable levers.

(*g*) Fit new rotor.
Reverse above procedure for re-assembly – remember to bend up the locking washer tag against rotor fixing bolt.

(*h*) Replace chain case cover – tighten screws evenly and refill with half-pint of SAE 20 engine oil.

(*i*) Finally replace the foot rest and brake pedal. Smear the brake pivot pin with medium grease and tighten the lock nut securely.

Fitting New Resistor

(*a*) Run the sleeved resistor cables from the nacelle over the top of the main harness to the resistor mounting bracket under the saddle.

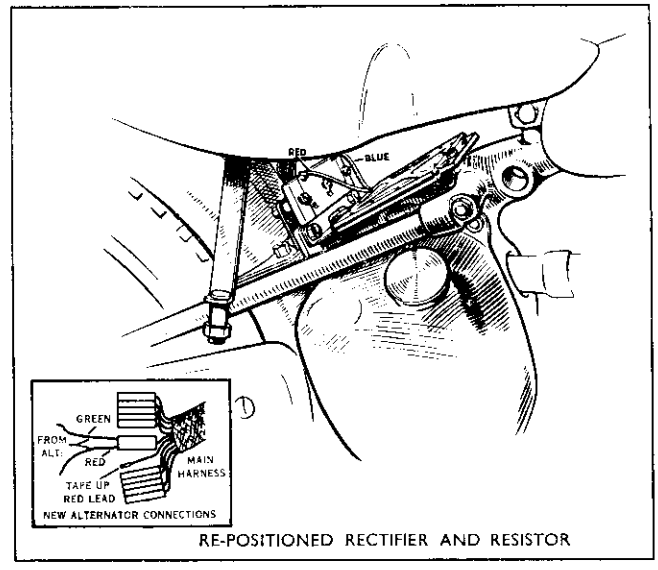
(*b*) Unbolt the rectifier mounting bracket and turn it over (see illustration), take care not to lose the distance piece under the front fixing bolt.

(*c*) Connect red and blue leads to resistor and fit in position shown.

(*d*) Make sure resistor has a good earth by removing any enamel under the fixing bolt.

Reconnecting Alternator Leads

(*a*) Remove both green and both red leads from the connector block under the saddle. Using the double snap connector provided, connect the green and the red lead from the alternator to the green lead in the main harness. Tape up the red lead in the main harness which is no longer required. (See inset illustration, (Fig. 64.)



RE-POSITIONED RECTIFIER AND RESISTOR

Fig. 64

General Servicing Information

Fitting New Switches and Switch Harness

(*a*) Disconnect negative battery lead.
(*b*) Remove light unit.
(*c*) Disconnect speedometer drive cable and bulb holder then remove speedometer from the nacelle.
(*d*) Remove the clip holding the cable harness to left side fork leg.
(*e*) Remove the existing switches from nacelle, unscrew lock nuts and pull switches forward, clear of the nacelle.
(*f*) Disconnect the main harness leads from the two five-way connectors.
(*g*) Disconnect blue lead from lighting switch (terminal 3).
(*h*) Disconnect orange lead from ammeter.
(*i*) Disconnect brown leads from horn and ammeter.
(*j*) Cut off black lead going to lighting switch close to the earthing-eyelet which fastens under the speedometer securing bolt.
(*k*) The two switches can now be completely removed.
(*l*) Connect new switch harness to main harness – (colour to colour); tape up red lead in main harness – no longer required.
(*m*) Connect blue lead from dip switch to terminal (3) on lighting switch.
(*n*) Connect maroon lead from terminal (1) on lighting switch to speedometer illumination bulb holder (remove holder from the old switch harness).
(*o*) Connect brown leads *eyelet* to ammeter, left hand terminal looking into the nacelle.
(*p*) Connect loose end of brown lead to horn.
(*q*) Connect orange lead to other ammeter terminal.
(*r*) Connect resistor red and blue leads to the appropriate terminals on the snap connector block.
(*s*) Fit new switches in nacelle.
(*t*) Clip harness to left hand fork.
(*u*) Refit speedometer in nacelle, and connect up speedometer drive; make sure that the black earth lead eyelet is clamped in position under the fixing bolt.
(*v*) Replace speedometer bulb holder in its housing.
(*w*) Make sure that no switch wires or terminals are touching the speedometer or fixing bracket.
(*x*) Replace light unit.

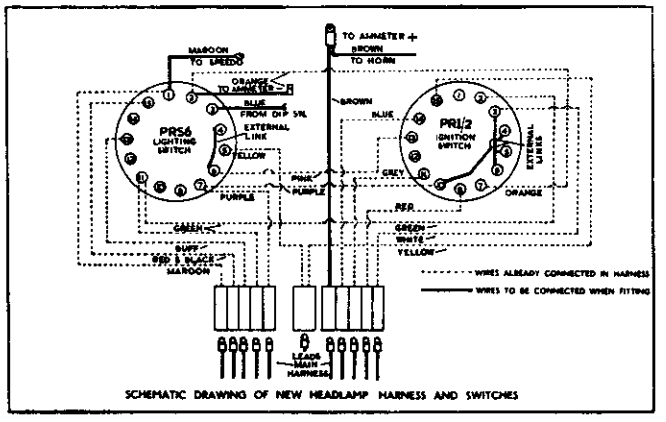


Fig. 65

(*y*) Reconnect the battery lead and test the circuit in each switch position.

TEST EQUIPMENT REQUIRED

In order to carry out our recommended service tests, the following instruments are required:

1. A.C. voltmeter, scaled 0 – 20 volts (moving coil).
2. D.C. voltmeter, scaled 0 – 20 volts (moving coil).
3. D.C. ammeter, scaled 0 – 20 amps. (moving coil).
4. A 1 ohm resistor (non-inductively wound on a hollow asbestos former).
5. A 12 volt battery, 50 ampere-hour (approximately).

High grade moving coil meters should be used with a clear scale, so that the meter can be read accurately to a quarter of a volt, or ampere.

The 1 ohm (non-inductive) resistor should be capable of carrying approximately 10 amps. without overheating.

HOW TO MAKE UP A ONE OHM RESISTOR

The 1 ohm resistor must be accurate otherwise correct voltage (or current) values will not be obtained.

A suitable resistor can be made from 4 yards 18 S.W.G. (·048″ dia.) NICHROME wire together with two flexible leads and suitable crocodile clips, see Fig. 66.

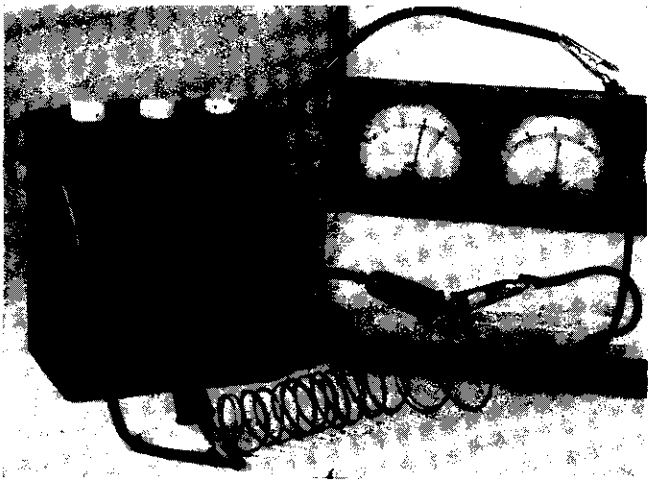


Fig. 66

To Calibrate

Bend the wire into two equal parts.

(*a*) Fix a heavy gauge flexible lead to centre bend of the wire, and connect this lead to the positive terminal of a 6-volt battery.
(*b*) Connect a voltmeter across the battery terminals.
(*c*) Connect an ammeter to the battery negative post.
(*d*) Take a lead from the other terminal of the ammeter, connect a crocodile clip to it, and connect to the free ends of the wire (which should be twisted together).
(*e*) Move the clip along the wire, making contact with both wires until the discharge reading on the ammeter exactly equals the number of volts shown on the voltmeter. The resistance is then 1 ohm.
(*f*) Cut the wire at this point, twist the two ends together and fix a second heavy gauge flexible lead.
(*g*) Wind the wire on to a hollow asbestos former 2″ dia. (approximately).

General Servicing Information

The foregoing gives a general description of the test equipment required and it would perhaps be helpful to mention here that there are a number of compact portable test sets on the market suitable for this class of work. The manufacturers of this equipment will undoubtedly be pleased to supply you with all relevant information upon request.

If any difficulty should arise however, or should you be undecided as to the capabilities of a particular set we shall on receipt of a post card be very pleased to help and advise in your choice of the correct equipment.

SWITCH CONTINUITY TESTS

A 36-watt lighting bulb with leads attached to it can be used for checking the continuity of lighting and ignition switches. Internal connection diagrams for the various types of switches used with the alternator systems are shown on the wiring diagrams contained in this book.

Switches can be checked without the need for removing them from the machine, and if advantage is taken of the fact that harness connections are made to snap connectors external wiring and switch continuity can be established at the same time. Alternatively, remove the switches from the machine and bench test individually.

A 6-volt or 12-volt supply can be used for testing to ensure that switch contacts are working correctly under load. A fault such as a high resistance connection may not be apparent if the switch is not tested with a load current approximately that which it normally carries during use in service.

TESTING PROCEDURE

Until completely conversant with alternator sets it is advisable to carry out all testing progressively in the following sequence:

Test (1) Test the set overall by checking the current input to the battery. Check that battery is in a good state of charge. If battery is faulty it must be temporarily replaced with a good one before testing.

Test (2) Check the output from the individual sets of generator coils.

Test (3) Test the rectifier.

Test (4) Test wiring and continuity through switch positions.

IMPORTANT

All Lucas A.C. sets use a POSITIVE EARTH battery system, i.e., the battery POSITIVE lead is connected to the frame of the machine. Both selenium and silicon rectifiers and semi-conductor devices, if fitted, will be irreparably damaged if the battery is incorrectly connected.

FITTING A CLIPPER DIODE

To ensure maximum life and efficiency from this diode read the following instructions before attempting to fit it to a machine.

Fitting the Diode to a Heat Sink

The diode should be mounted onto a metal plate (heat-sink) made from either aluminium or copper, (the metal plate should be free of paint to allow metal-to-metal contact), the minimum dimensions of which are $\frac{1}{16}$ in. (1.58 mm.) in thickness measuring $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in. (38.10 x 38.10 mm.). A $\frac{3}{16}$ in. (4.76 mm.) hole should be drilled in the centre. The plate should then be fixed to the machine in any convenient position which allows free passage of air around the diode and plate when in motion. Do not position the unit too close to the ground as it may be subjected to dirt and water thrown up by the wheels. Ensure that the plate is properly earthed to the machine. A separate earth lead should be fitted if there is any doubt as to the plate being earthed properly through its fixing bolts.

As an alternative method, the diode could be mounted in the headlamp shell, which would in effect act as a heat-sink. But, only if the radius of the shell is such that when the diode is fitted the whole area of its base is in contact (flat onto the metal shell) with the shell. A suitable hole, $\frac{3}{16}$ in. (4.76 mm.) in diameter should be drilled near the bottom of the shell and the diode placed in position, (with any paint removed so that a metal-to-metal contact is achieved), so that the mounting stud protrudes on the outside of the shell.

CAUTION:

The Diode fixing nut must be tightened to a torque between 8 and 12 lbf in (0.092 — 0.138 Kg-m). Care should be taken when tightening as the copper (threaded) fixing stud will easily break if overstressed.

Soldering a length of Cable to the Diode Terminal

The exact length of cable required will depend on where the diode has been positioned. To solder the cable to the diode terminal a small (instrument type) soldering iron and resin cored solder must be used. Also, a thermal shunt, such as a pair of long-nosed pliers should be used, to grip the diode terminal during soldering, to prevent the possibility of damage due to excessive heating.

Connecting the Diode into Circuit

The main point to remember when connecting the diode into circuit is that it must be connected on the lamp (bulb) side of the lighting switch and *not* the alternator side. If connected to the alternator side of the switch it will be subjected to continuous full loading, with consequent reduction in service life, instead of only being loaded when the lights are switched on. This can be achieved by connecting either into the Tail-lamp feed or the wire supplying the Dipper Switch. If no Dipper Switch is used, the connection would be made directly to the Headlamp bulb feed.

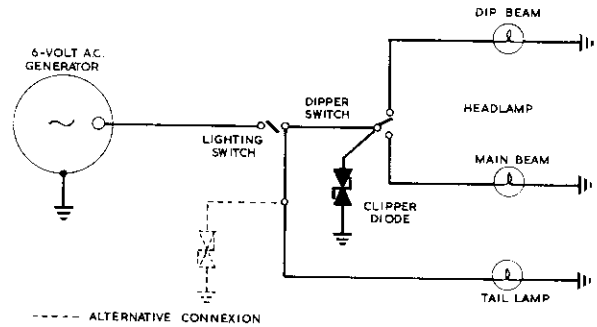


Fig. 67 Method of connecting Clipper Diode in circuit

Note: Fault Diagnosis

A faulty Clipper Diode is self-evident as premature bulb failure, when operating the dipper switch, will ensue. Before fitting a replacement check that wiring connections are clean and tight, particularly the earth cable.