OUTPUT CONTROL UNITS

INDEX

ALTERNATOR OUTPUT CONTROL MODEL 4TR

1. DESCRIPTION

Model 4TR is an electronic control unit. In effect its action is similar to that of the vibrating contact type of voltage control unit, but switching of the field circuit is achieved by transistors instead of vibrating contacts, while a Zener diode provides the voltage reference in place of the voltage coil and tension spring system. No cut-out is required since the diodes incorporated in the alternator prevent reverse currents from flowing. No current regulator is required as the inherent self-regulating properties of the alternator limit the output current to a safe value.

The control unit and the alternator field windings are isolated from the battery when the engine is stationary, usually either by a special double-pole ignition switch or by means of an isolating relay.

When a temperature compensation device is fitted this takes the form of a thermistor connected in parallel with one of the Zener-biasing resistors. The thermistor is a device whose resistance increases as the temperature falls and vice-versa. Any alteration in its ohmic value will cause the Zener diode to begin to conduct at a modified value of alternator output voltage, so matching the changes which take place in "on charge" battery terminal voltage due to temperature change.

WARNING: The battery must never be disconnected while the alternator is running. Failure to observe this ruling will cause the control unit to be irreparably damaged.

Care must be taken at all times to ensure that the battery, alternator and control unit are correctly connected. Reversed connexions will damage the semi-conductor devices employed in the alternator and control unit.

2. ROUTINE MAINTENANCE

The output control unit does not require any regular maintenance but the moulded cover, can be occasionally be wiped clean and a check made that the terminal connector is secure.

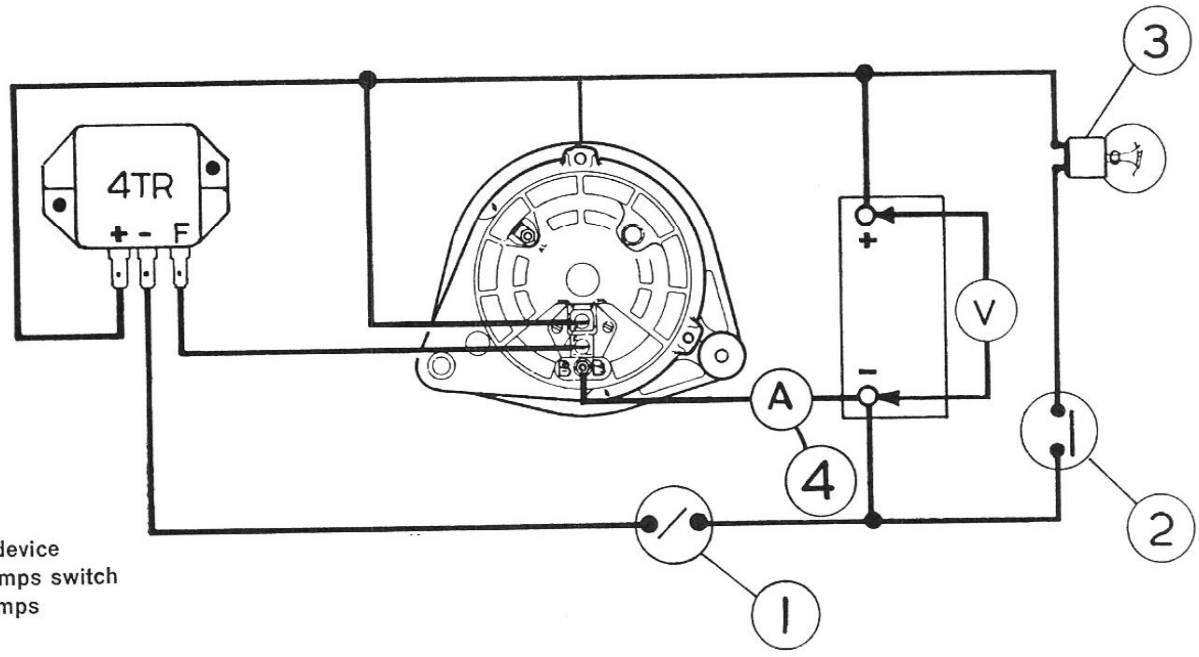
3. CHECKING AND ADJUSTING

Before checking and adjusting the control unit it must be established that the alternator and the charging circuit wiring are in good order (see PART A). Check also the battery-to-control unit wiring which incorporates the field isolating device. To ensure proper working of the control unit, the resistance of this complete circuit — including the isolating device — must not exceed 0.1 ohm. Any unduly high resistance must be traced and remedied.

Checking

Leave the existing connexions to the alternator and control unit undisturbed. Connect a voltmeter of 1% or better accuracy and appropriate range between the battery terminals and note the reading with all electrical equipment switched off. If available, use a voltmeter of the suppressed-zero type, reading 12–15 volts (12-volt installations) or 24–30 volts (24-volt installations).

Unless an ammeter is fitted to the vehicle, insert one, of suitable range, in series with the alternator main output cable.



1. Field isolating device
2. Side and tail lamps switch
3. Side and tail lamps
4. Ammeter

Fig. 1 4TR Control test circuit

Alternator Output Control Model 4TR

Switch on an electrical load of approximately 2 amperes, e.g. side and tail lighting. The test circuit is shown in Fig. 1.

Ascertain the Part Number of the control unit — this is marked on the upper edge of the moulded cover.

Start the engine and run the alternator at approximately 3,000 rev/min for at least eight minutes. (This will ensure that the system voltage has stabilised.) If the charging current is still greater than 10 amperes, continue to run the engine until this figure is reached. Now compare the voltmeter reading with the appropriate setting limits given in the following table.

Part No.	*Voltage Setting Limits*
*37423, *37449	13.9 – 14.3
37429	13.7 – 14.1
*37444, *37502	27.9 – 28.3

*Fitted with thermistor.

If the reading obtained is stable but outside the appropriate limits the unit can be adjusted to control at the correct voltage (see **'Adjusting'**).

If, however, the voltmeter reading remains unchanged (at open-circuit battery terminal voltage) or, conversely, increases in an uncontrolled manner, then the control unit is faulty and a replacement must be fitted. Component parts are not serviced individually.

Adjusting

Stop the engine and withdraw the control unit mounting screws. Invert the unit and carefully scrape away the sealing compound which conceals the potentiometer adjuster (see Fig. 2). Check that the voltmeter is still firmly connected between the battery terminals. Start the engine and, while running the alternator at 3,000 rev/min, turn the potentiometer adjuster slot — clockwise to increase the setting or anti-clockwise to decrease it — until the required setting is obtained. Use care in making this adjustment — a small amount of adjuster movement causes an appreciable difference in the voltage reading.

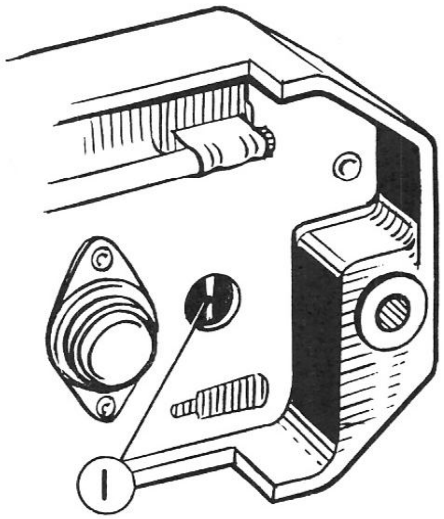


Fig. 2 4TR Control rear view
1 Potentiometer adjuster

Re-check the setting by first stopping the engine, then again starting and running the alternator at 3,000 rev/min.

Refit the control unit and disconnect the voltmeter.

IMPORTANT

Precaution to be observed when using a fast-charger

Before using a fast-charger, either to boost the battery or to start the engine, first withdraw the three-way connector from the control unit terminals. Do not re-connect the terminals until the charger has been disconnected and, in the case of assisted starting, the engine speed reduced to tick-over.

Failure to observe this precaution may result in irreparable damage of the semiconductors in the control unit.

Note: Originally, three separate connectors were used at the control unit. When disconnecting these, make sure that

(i) the disconnected ends do not contact either each other or any other part, and

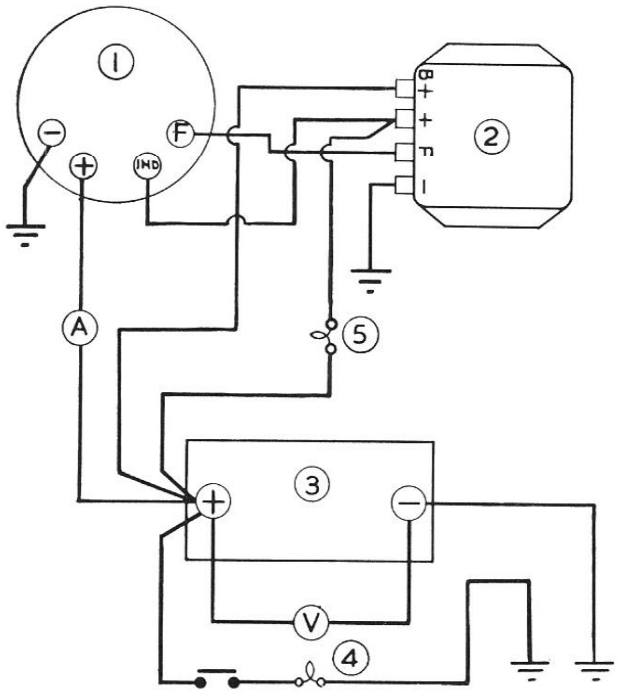
(ii) are correctly re-connected subsequently.

ALTERNATOR OUTPUT CONTROL MODEL 4TR

PART NO. 37527

1. DESCRIPTION

This addition to the range of 4TR output control units is designed for use with '9-diode' alternators, e.g. models 15AC and 16AC. The unit is similar to previous 4TR units, described earlier in this section, except that the thermistor is omitted and the unit is not adjustable. In addition, it carries a fourth terminal by means of which battery voltage is sensed directly from the battery connection at the starter solenoid. This avoids the necessity for an external relay or separate contacts on the ignition switch, and ensures more accurate sensing of battery voltage. The drain on the battery created by the permanent connection is negligible.



1 Alternator
2 Output control unit
3 12 V 9-plate battery
4 Side and tail lighting (if required)
5 Warning light

Fig. 1 4-terminal 4TR Control test circuit

2. CHECKING THE VOLTAGE SETTING

Before checking the voltage setting of the control unit it must be established that the alternator and the charging circuit wiring are in good order (see Part A). In particular the circuit resistance must not exceed 0.04 ohm between regulator '—' terminal and battery '—' terminal or 0.003 ohm between alternator '—' terminal and battery '—' terminal.

For the following test the vehicle battery must be in a well-charged condition, or temporarily replaced by a 9-plate battery that is well charged.

Leave the existing connections to the alternator and control unit undisturbed. Connect a voltmeter of 1% or better accuracy and appropriate range between the battery terminals. If available, use a voltmeter of the suppressed-zero type, reading 12–15 volts. Unless an ammeter is fitted to the vehicle, insert an ammeter of 0–40 range in series with the alternator main output (+) cable at its connection with the starter solenoid. Make the ammeter connections firmly so that, when at charging speed, there is no risk of disconnection taking place due to vibration. See 'PRECAUTIONS' in Section A-4.

Start the engine and run the alternator at approximately 5,000 rev/min until the ammeter shows an output current of 5 amperes. If, on starting the engine, the charging rate is already below this value, switch on a light external load, e.g. side and tail lamps. The test circuit is shown in Fig. 1.

The voltmeter should now give a reading of 14.3–14.7 volts. If the reading obtained is unstable or is outside these limits, the control unit is faulty and a replacement unit must be fitted.

The control unit is not adjustable and its component parts are not serviced individually.

OUTPUT CONTROL UNIT MODEL 6GC

1. GENERAL

Model 6GC Output Control Unit has now superseded model RB310 both for use as initial equipment with some C.A.V. generators and also as a replacement for Lucas and C.A.V. RB310 units already in service. Units are identified as 'Lucas' or 'C.A.V.' by their cover marking.

Internally, model 6GC retains the same regulator and cut-out assembly as RB310, but this assembly is mounted on an RB340 type baseplate.

An extension foot enables model 6GC to be used as a direct replacement for RB310. Terminals are normally of 'Lucar' pattern, although certain units supplied as service replacements have screw terminals for direct interchangeability.

2. TECHNICAL DATA

From the foregoing it will be seen that existing RB310 servicing instructions remain generally applicable to 6GC. However, to obviate the need for referring to earlier Workshop Manual sections statistical information covering the present range of 6GC units is given overleaf.

Notes concerning the use of the tables overleaf:

1. The electrical checking and setting of all Lucas 6GC units and C.A.V. units with Part Numbers 37506-8-9-10-11-15 must be carried out with their terminals uppermost. All remaining 'C.A.V.' units with terminals lowermost.
2. Some units have voltage-regulator open-circuit voltage reset limits which differ from the checking limit figures given in the preceding column. Adjust these units to the closer (reset) limits **only if the open circuit voltage is found to be outside the checking limits.** Units that are satisfactorily controlling the output voltage **within** the checking limits MUST NOT BE DISTURBED.

   When electrically resetting ANY unit, aim for the mean voltage of the limits given.
3. For ease of identification resistors are painted at one end with a particular colour.

   The colours, nominal values and duties of the resistors employed with 6GC units are:

Blue	...	240 ohms	Contact resistors.
Orange	...	100 ,,	
Red	...	60 ,,	
Green	...	30 ,,	Swamp resistor. ★
Yellow	...	40 ,,	Field parallel resistor. ★

★ *Amendment to previous issue ('Swamp' and 'Field Parallel' resistor figures and colouring reversed.)*

Output Control Unit Model 6GC

Part No.	Voltage	Voltage Regulator Open-Circuit Voltage (at 20°C): Checking Limits	Reset To	Generator Rev/Min	Current Regulator: Setting Amperes	Generator Rev/Min	Cut-Out: Cut-In Voltage	Drop-Off Voltage	Armature-to-Core Airgap Setting: Voltage Regulator	Current Regulator	Resistor Value (Ohms): Contacts Resistor	Swamp	Field Parallel
37433, 37434, 37453, 37454, 37455, 37465, 37506, 37511, 37513, 37515	24	28.0–28.5	28.0–28.5	3000	14–15	3000	26.5–27.0	19.0–23.0	0.025″–0.028″	0.025″–0.028″	240	★ 30	★ 40
37435, 37436, 37456, 37457, 37507	24	28.0–28.5	28.0–28.5	3000	17–18	3000	26.5–27.0	19.0–23.0	0.025″–0.028″	0.025″–0.028″	240	30	40
37437, 37458, 37459	24	28.0–28.5	28.0–28.5	3000	21–22	3000	26.5–27.0	19.0–23.0	0.025″–0.028″	0.025″–0.028″	240	30	40
37441, 37462, 37492	12	14.1–14.5	14.1–14.5	3000	19–20	3000	13.0–13.5	9.5–11.0	0.017″–0.020″	0.020″–0.023″	100	—	—
37442, 37463, 37466	12	14.1–14.5	14.1–14.5	3000	24–25	3000	13.0–13.5	9.5–11.0	0.017″–0.020″	0.020″–0.023″	100	—	—
37469	12	14.8–15.1	14.8–15.1	1500	29–31	4000	12.7–13.3	9.5–11.0	0.019″–0.022″	0.019″–0.022″	60	—	40
37470	12	14.8–15.1	14.8–15.1	1500	35–36	4000	12.7–13.3	9.5–11.0	0.019″–0.022″	0.019″–0.022″	60	—	40
37471, 37477	12	14.6–15.8	14.9–15.5	3000	24–26	4000	12.7–13.3	9.5–11.0	0.017″–0.020″	0.017″–0.020″	60	—	—
37472, 37475, 37483	12	14.6–15.8	14.9–15.5	3000	21–23	4000	12.7–13.3	9.5–11.0	0.017″–0.020″	0.017″–0.020″	60	—	—
37473, 37485	12	14.2–14.8	14.2–14.8	1500	33–35	4000	12.7–13.3	9.5–11.0	0.019″–0.022″	0.019″–0.022″	60	—	40
37474, 37478	12	14.6–15.8	14.9–15.5	3000	18–20	4000	12.7–13.3	9.5–11.0	0.017″–0.020″	0.017″–0.020″	60	—	—
37476, 37481	12	14.4–15.0	14.4–15.0	3000	28.5–31.5	4000	12.7–13.3	9.5–11.0	0.019″–0.022″	0.019″–0.022″	60	—	40
37490	12	14.6–15.8	14.9–15.5	3000	10.5–11.5	4000	12.7–13.3	9.5–11.0	0.019″–0.022″	0.019″–0.022″	60	—	—
37504	12	14.6–15.8	14.9–15.5	3000	19–21	4000	12.7–13.3	9.5–11.0	0.017″–0.020″	0.017″–0.020″	60	—	—
37505	12	14.2–14.8	14.2–14.8	1500	33–34	3000	12.7–13.3	9.5–11.0	0.019″–0.023″	0.019″–0.022″	60	—	40
37508, 37510	24	28.0–28.5	28.0–28.5	3000	11–12	3000	26.5–27.0	19.0–23.0	0.025″–0.028″	0.025″–0.028″	240	30	40
37509	24	28.0–28.5	28.0–28.5	3000	13–14	3000	26.5–27.0	19.0–23.0	0.025″–0.028″	0.025″–0.028″	240	30	40

★ *Amendment to previous issue ('Field Parallel' and 'Swamp' headings reversed.)*

DYNAMO OUTPUT CONTROL UNITS

Models RB106/2 and RB108

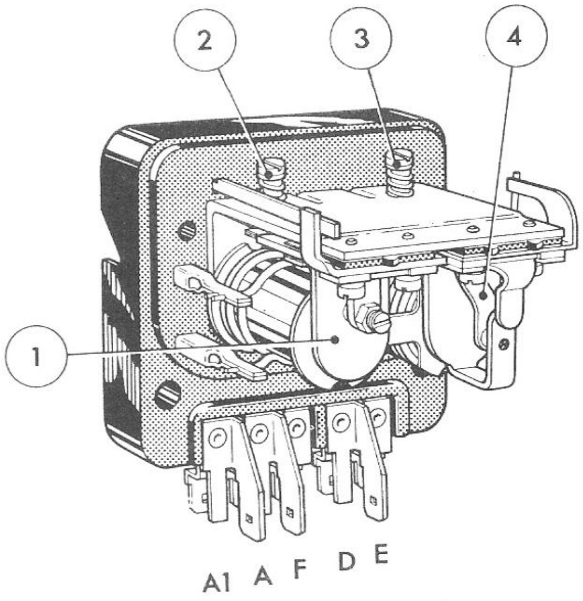


Fig. 1a Model RB106/2

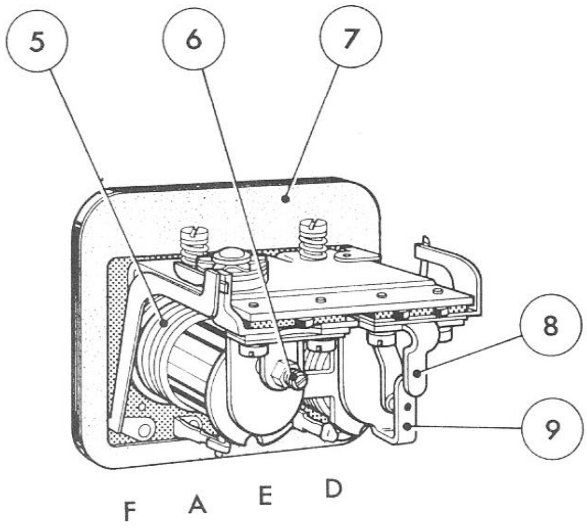


Fig. 1b Model RB108

1 Regulator moving contact
2 Regulator adjustment screw
3 Cut-out adjustment screw
4 Fixed contact blade
5 Regulator series windings
6 Regulator fixed contact screw
7 Gasket
8 Stop-arm
9 Armature tongue and moving contact

1. DESCRIPTION

These two control units are of the two-bobbin, compensated voltage control design and differ only in their base assembly and terminal arrangement. The RB106/2 is normally fitted to cars and light commercial vehicles to control the C40 dynamo. The RB108 is fitted to earlier motor cycles in 6 volt form, and tractors and stationary engines in 12 volt form. It is used to control lower output dynamos, i.e. E3 (motor cycle) and C40A (tractors etc.).

The regulator automatically controls the dynamo output to safe limits by varying the strength of the field circuit. This is effected by the action of opening and closing a pair of contacts to insert a resistance in the field circuit.

The voltage regulator has two regulating windings (one shunt and one series) wound on the voltage regulator bobbin. The shunt (or voltage) winding is connected directly across the dynamo armature (between terminal 'D' and earth). The series winding which carries dynamo output (battery charge and any load current), is wound on the bobbin in the same direction as the 'shunt' winding. Compensation is by means of the series winding which assists the shunt winding to make and break the regulator contacts.

The cut-out is an automatic switch which disconnects the dynamo from the battery when the dynamo terminal voltage is lower than that of the battery.

2. SERVICING

(a) Preliminary Check of Charging Circuit

Before disturbing any electrical adjustments, examine as follows to ensure that the fault does not lie outside the control box:

Check the battery by substitution or with a hydrometer.

Check the condition and tension of the dynamo driving belt.

Check the dynamo by disconnecting the cables from the two terminals on the commutator end bracket and, using an ammeter, link the large terminal 'D' to the small terminal 'F'. Connect a voltmeter between terminal 'D' and earth. Run engine, slowly increasing speed until the voltmeter reads battery volts. Ammeter should read 2–3A.

Inspect the wiring of the charging circuit and carry out continuity tests. Check the control box earth connections.

In the event of reported undercharging, ascertain that this is not due to low mileage.

(b) Checking the Regulator Electrical Setting

Connect a first-grade 0–20V moving coil voltmeter between control box terminals 'D' and 'E'.

Dynamo Output Control Units

Models RB106/2 and RB108

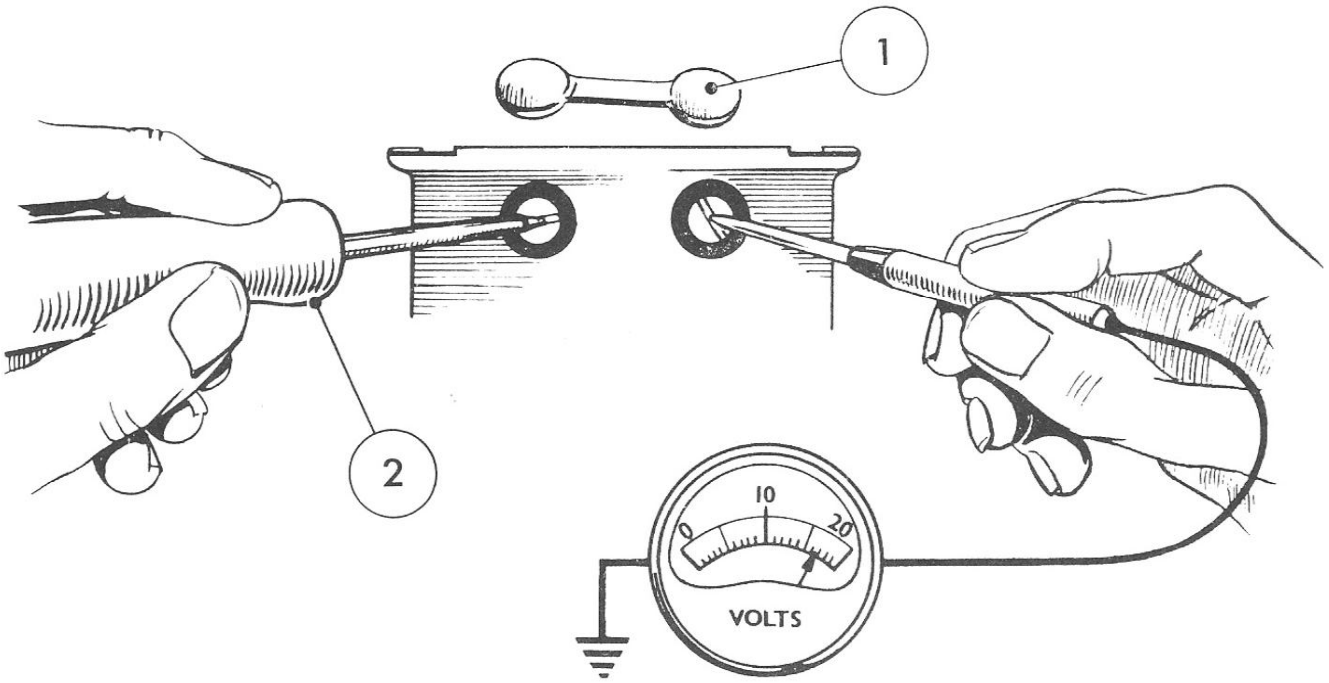


Fig. 2 Adjustment for RB108 Regulator

1 Linked rubber blanks
2 Screwdriver with insulated blade

Disconnect the cables from control box terminals 'A' and 'A1' and join them together. With model RB108 disconnect the cable from the 'A' terminal and ensure that the end of the cable does not contact any earthed parts of the vehicle.

Start and run the engine so that the dynamo is driven at 3,000 rev/min. Observe the voltmeter reading. This should lie between the following limits:

12V Units ...	...	16.0–16.5 volts
6V Units ...	...	8.0– 8.5 volts

NOTE 1. Refer to table on page 4 for special settings.

NOTE 2. Earlier RB108's (plug-in terminals) — remove the linked rubber blanks from the control box cover, and use test prods to measure the voltage between the exposed head of one of the adjustment screws and a good earth (see Fig. 2).

An unsteady reading may be due to dirty contacts (see 'Cleaning Contacts', para. 2f), but if the reading is outside the appropriate limits an adjustment must be made. Stop the engine.

(c) Regulator — Electrical Adjustment

Remove the control box cover (RB106/2).

With the voltmeter still connected as in the previous paragraph, re-start the engine and run the dynamo at 3,000 rev/min.

Turn the voltage regulator adjustment screw (clockwise to raise the setting or anti-clockwise to lower it), until the correct setting is obtained. Check the setting by reducing the dynamo speed (engine at tickover), and then again raising it to 3,000 rev/min.

NOTE. When the model RB108 is in an upright position, the right-hand hole gives access to the voltage regulator adjustment screw.

Restore the original connections and refit the cover (RB106/2) or rubber blanks (RB108).

(d) Checking Cut-out Relay Electrical Setting

Connect a first-grade 0–20V moving coil voltmeter between control box terminals 'D' and 'E'.

NOTE. Earlier RB108's (plug-in terminals) — remove the linked rubber blanks from the control box cover, and use test prods to measure the voltage between the exposed head of one of the adjustment screws and a good earth.

Switch on the headlamps to load the charging system, and to give a more easily recognisable flick back of the voltmeter pointer at the instant of contact closure.

Dynamo Output Control Units

Models RB106/2 and RB108

Start the engine and while slowly increasing its speed observe the voltmeter pointer. The flick back should occur within the limits 12.75–13.25 volts, or 6.3–6.7 volts (6 volt units). If it does not an adjustment must be made.

Stop the engine.

(e) Cut-out Relay Electrical Adjustments

(i) Method of Cut-in Voltage Adjustment

Remove the control box cover (RB106/2) or remove the rubber blanks (RB108). Keep the voltmeter connected as in the previous paragraph. Turn the cut-out relay adjustment screw (clockwise to raise the setting or anti-clockwise to lower it) until the correct setting is obtained.

Recheck the setting by increasing the engine speed slowly from zero.

Stop the engine, disconnect the voltmeter and either refit the cover (RB106/2) or the rubber blanks (RB108).

(ii) Method of Drop-off Adjustment

RB106/2 — Disconnect the cables from the control box terminal 'A' and 'A1' and join the cables together. RB108 — Remove cable to terminal 'A'.

Connect the voltmeter between terminal 'A' and earth.

Start the engine and run up to charging speed.

Slowly decelerate and observe the voltmeter pointer. Opening of the contacts, indicated by the voltmeter pointer dropping to zero should occur between the limits 8.5–11.0 volts, 4.8–5.5 volts (6 volt units).

If the voltmeter reading is within the limits, stop the engine and restore the original connections. If the drop-off occurs outside these limits, remove the control box cover and adjust the contact pressure as follows:

Stop the engine, RB106/2 — Remove the control box cover. RB108 — Remove the control box from its mounting and remove the cover, secured to the base by a rolled-over edge.

Adjust the height of the fixed contact by carefully bending the fixed contact blade towards the bobbin to reduce the drop-off voltage or away from it to raise the drop-off voltage.

Recheck the setting and if necessary, re-adjust until the correct drop-off voltage setting is obtained.

Restore the original connections and refit the cover. With the RB108, refit the cover, bending back the rolled-over edge into its former position round the base.

(f) Cleaning Contacts

(i) Regulator Contacts

To clean the voltage regulator contacts, use fine carborundum stone or silicon carbide paper.

(ii) Cut-out Relay Contacts

To clean the cut-out relay contacts use a strip of fine glass-paper, never carborundum stone or emery cloth.

(g) Adjustment of Air Gap Settings

Air gap settings are accurately adjusted during assembly and do not normally require any further attention. If, however, an armature is removed for any reason (e.g. contact renewal) care must be taken to obtain the correct setting on re-assembly.

(i) Voltage Regulator (Fig. 3)

Slacken the two armature securing screws and screw back the voltage adjustment screw until it is clear of the armature tension spring. Unlock the fixed contact until it is clear of the armature contact. Insert a 0.021″ (0.533 mm) feeler gauge between the armature and the core face. Press the armature down squarely on to the gauge and re-tighten the armature securing screws. Keeping the gauge in position and the armature pressed down, screw in the adjustable contact until it just touches the armature contact and lock it in this position.

Finally, re-adjust the voltage regulator electrical setting as described in para. 2(c).

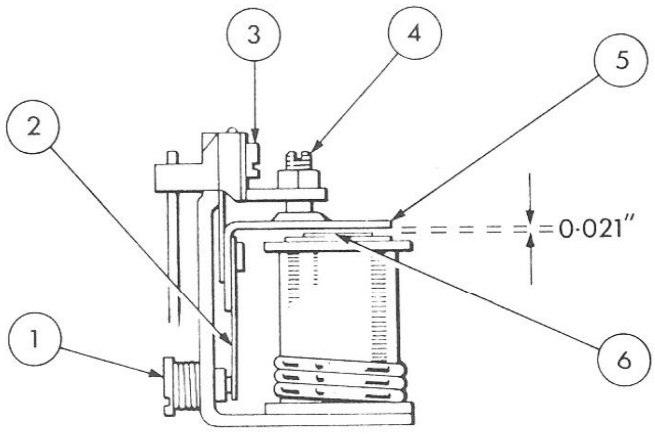


Fig. 3 Voltage Regulator Adjustment

1 Voltage adjustment screw
2 Armature tension spring
3 Armature securing screws
4 Fixed contact adjustment screw
5 Armature
6 Core face and shim

(ii) Cut-out Relay (Fig. 4)

Slacken the two armature securing screws and screw back the adjustment screw until it is clear of the armature tension spring. Press the armature squarely down against the core face (no gauge required) and re-tighten the armature securing screws. With the armature pressed down against the core face, adjust the gap between the armature stop arm and the armature tongue to 0.025″–0.040″ (0.63–1.02 mm). The gap is adjusted by bending the stop arm. Release the armature and screw in the voltage adjustment screw until the armature tongue contacts the stop arm.

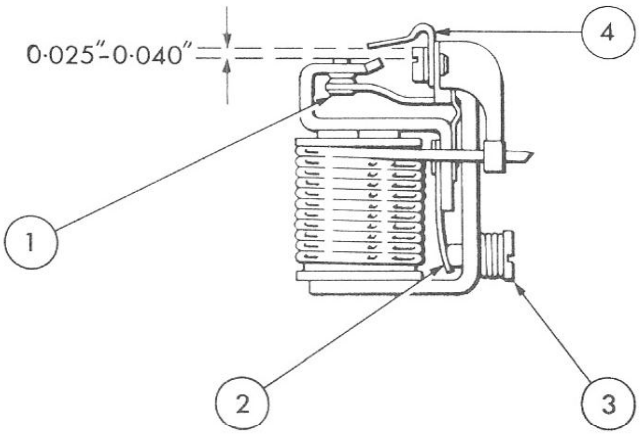


Fig. 4 Cut-out Adjustment

1 'Follow-through' 0.010″–0.020″
2 Armature tension spring
3 Cut-out adjustment screw
4 Stop arm

Adjust the fixed contact blade to give a 'follow-through' or blade deflection, of 0.010″–0.020″ (0.25–0.51 mm) when the armature is pressed squarely down against the core face.

Finally, re-adjust the cut-out relay electrical settings as described in para. 2(e).

3. TECHNICAL DATA

Resistance Values at 20°C (68°F)

Carbon Resistors

6 volt units	36–45 ohms
12 volt units	60–75 ohms

Wire Wound Resistors

6 volt units	27–33 ohms
12 volt units	55–65 ohms

Shunt Winding Resistance

Check between terminals 'D' and 'E'

6 volt units	13–15 ohms
12 volt units	50–56 ohms

Special Settings

Part No.	*Associated Dynamo*	*Regulator O/C voltage at 20°C 3,000 rev/min*
37272	C45P5	17.2–17.8
37274	C45P5	17.0–17.4
37381	C45P6	16.0–16.3

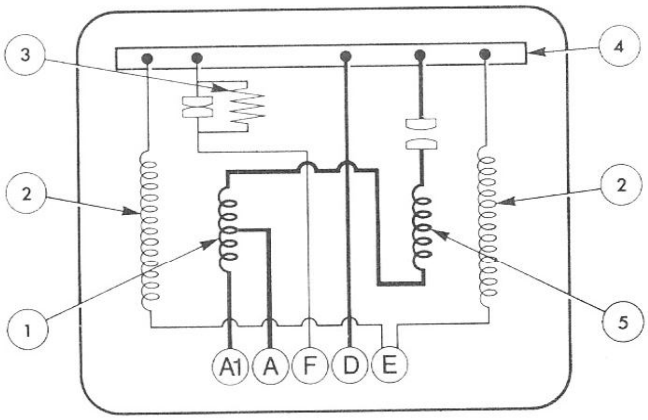


Fig. 5 Regulator Internal Connections Model RB106/2

1 Regulator tapped series coil
2 Shunt coils
3 Field resistance
4 Regulator and cut-out frame
5 Cut-out series coil

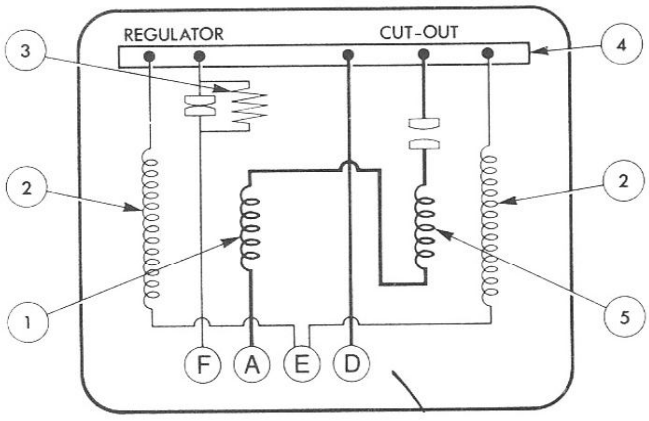


Fig. 6 Regulator Internal Connections Model RB108

1 Regulator series coil
2 Shunt coils
3 Field resistance
4 Regulator and cut-out frame
5 Cut-out series coil

DYNAMO OUTPUT CONTROL UNIT MODEL RB340

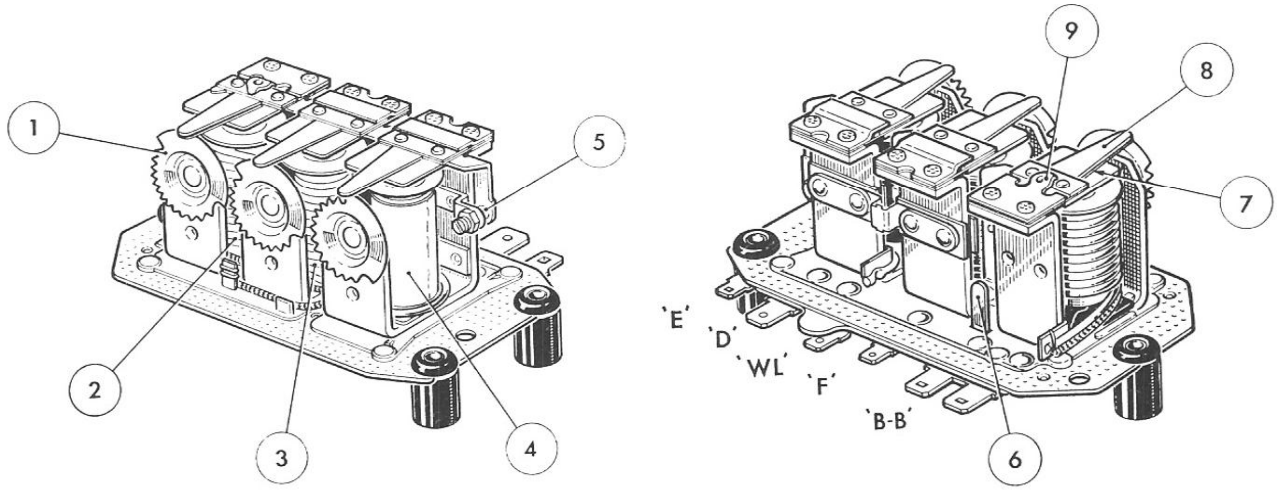


Fig. 1 Current-Voltage Regulator Model RB340
(Flat armature type)

1 Adjustment cams
2 Cut-out relay
3 Current regulator
4 Voltage regulator
5 Voltage regulator contacts
6 Fixed contact bracket
7 Bi-metal backing spring
8 Armature control spring
9 Armature stop

1. DESCRIPTION

The model RB340 is a three-bobbin control unit containing a voltage regulator, a current regulator and a cut-out. Later units have been modified internally by incorporating 'Flat' instead of conventional 'L'-shape armatures. Externally the revised control box is identical to the earlier type except for the part number.

RB340 control boxes, with part number 37563 onwards, incorporate the 'Flat' armature.

The current-voltage control system ensures that the battery is charged at a constant current until a predetermined battery voltage is reached. The voltage regulator then takes over, gradually reducing the charge current to a trickle. This system gives the advantage of maintaining a maximum safe dynamo output for a longer period of time.

The RB340 consists of a shunt (or voltage) winding and a series (or current) winding mounted on separate bobbins. There are two sets of regulator points connected in series. Each contact set is mounted on a separate bobbin.

The contacts are made to open and close under the magnetic influence of the energised windings around each bobbin. The series winding is responsive to variations in dynamo output current and the shunt winding to dynamo voltage.

The cut-out prevents the battery from discharging through the armature windings when the engine is stationary or is running at tick-over speed.

2. SERVICING

(a) Preliminary Check of Charging Circuit

Before disturbing any electrical adjustments, examine as follows to ensure that the fault does not lie outside the control box:

Check the battery by substitution or with a hydrometer.

Check the condition and tension of the dynamo driving belt.

Check the dynamo by disconnecting the cables from the two terminals on the commutator end bracket, and, using an ammeter, link the large terminal 'D' to the small terminal 'F'. Connect a voltmeter between terminal 'D' and earth. Run engine, slowly increasing speed until the voltmeter reads battery volts. Ammeter should read 2–3 amps.

Inspect the wiring of the charging circuit and carry out continuity tests between the dynamo, control box and battery.

Check the control box earth connection.

In the event of reported undercharging, ascertain that this is not due to low mileage.

(b) Voltage Regulator

Checking and Adjustment of the Open-Circuit Setting

IMPORTANT: The open-circuit (O.C.) setting of the voltage regulator varies according to the temperature of the unit and, ideally, the unit should

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be 'cold' (i.e. at ambient temperature) when a check of the O.C. voltage is made. The O.C. voltage of a correctly set regulator will then be between the limits given in Col. 2 of the table (according to the ambient temperature given in Col. 1). However, when the regulator is at a higher-than-ambient temperature and cooling time is not available, check the O.C. voltage given in the temperature range 26°–40°C.

An O.C. setting that falls outside these limits BY NO MORE THAN 0.5 VOLTS and is non-fluctuating should be reset to the nearer end (i.e. the maximum or minimum) of the appropriate limits. For example, a regulator checked at 20°C and found to have an O.C. voltage of between 14 and 14.4 volts should be reset to 14.5 volts. It is inadvisable to reset any unit in which the O.C. setting departs from the limits given in Col. 2 by more than 0.5 volts. Such extreme deviation from the normal setting indicates a constructional fault and the control box should be replaced by another of the same part number.

Ambient Temperature	*O.C. Voltage*
0° – 25°C (32° – 77°F)	14.5 – 15.5
26° – 40°C (78° – 104°F)	14.25 – 15.25

Checking and, if necessary, adjusting should be completed as rapidly as possible so that false readings do not result due to heating of the coil windings.

Withdraw the cables from control box terminal blades 'B'.

NOTE 1. If the ignition switch is fed from terminal 'B', it will be necessary to join the ignition and battery feeds together with a suitable 'jumper lead', to enable the engine to be started.

Connect a first-grade 0–20 volt moving-coil voltmeter between control box terminal 'D' and a good earthing point.

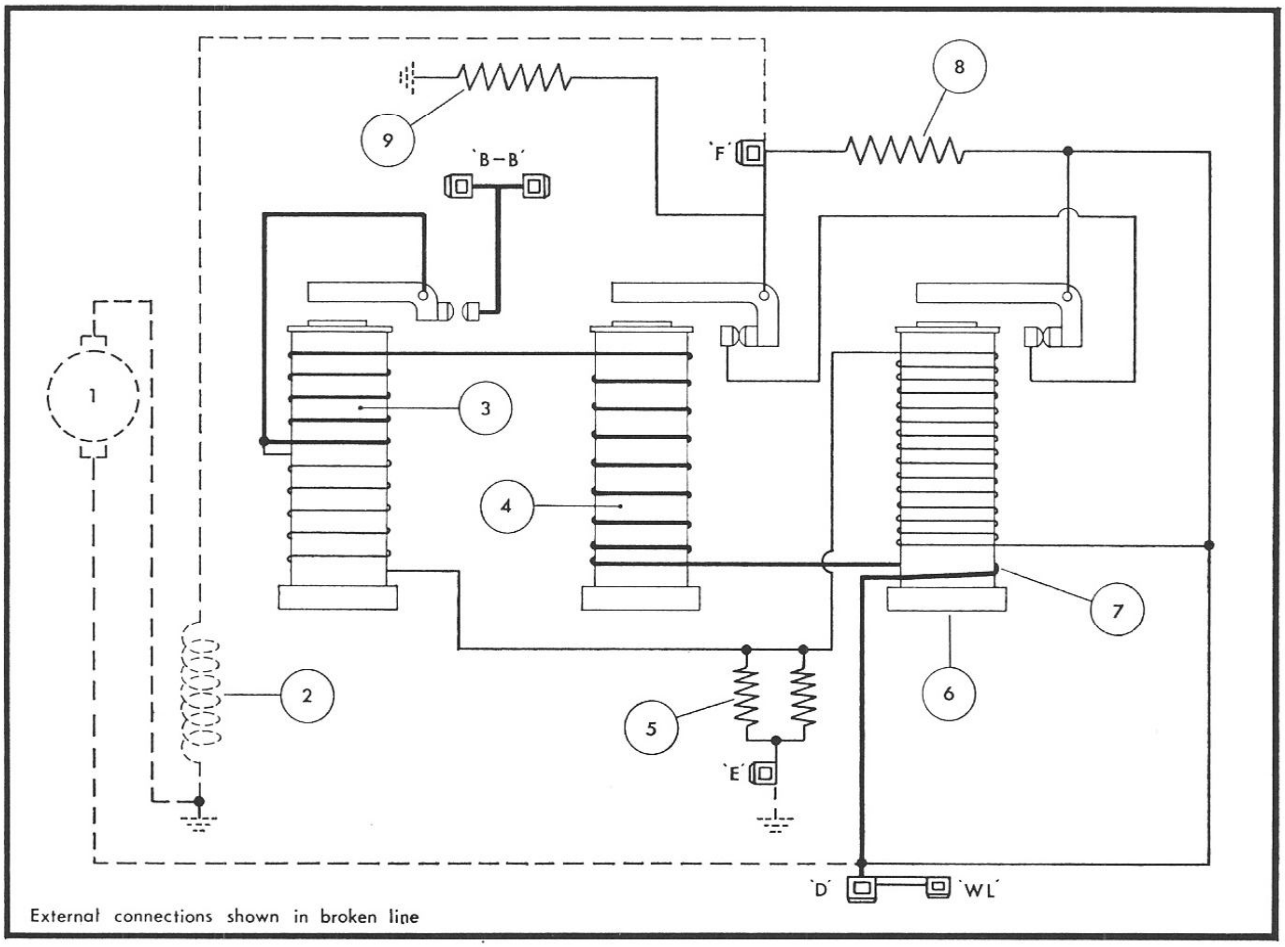

Fig. 2 Regulator internal connections

1 Dynamo armature
2 Dynamo field
3 Cut-out relay
4 Current regulator
5 Swamp resistor
6 Voltage regulator
7 Additional series turn (flat armature type only)
8 Field resistor
9 Field parallel resistor

NOTE 2. A convenient method of making this connection is to withdraw the cable from control box terminal 'WL' and to clip the voltmeter lead of appropriate polarity to this terminal, which is electrically common with terminal 'D'.

Start the engine and run the generator at 3,000 rev/min.

At this speed the voltmeter reading should be steady and lie between the appropriate limits given in Col. 2. An unsteady reading may be due to dirty contacts (see para. F). If the reading is steady but occurs outside the appropriate limits, adjust the unit as follows:

Stop the engine and remove the control box cover by pressing the centre core through each of the two 'Rokut' rivets. The rivets (and thus the cover) can then be lifted off. Re-start the engine and run the dynamo at 3,000 rev/min.

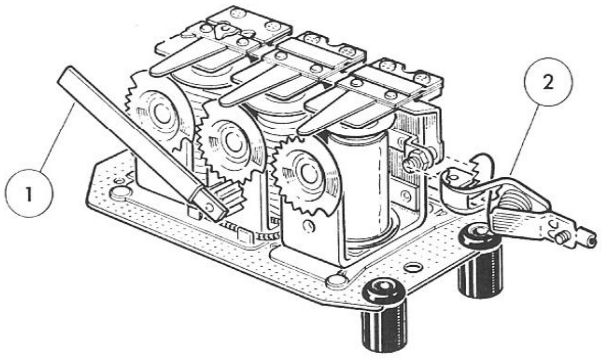

Fig. 3 Current regulator adjustment

1 Setting tool **2** 'Bulldog' clip

Using a suitable tool (e.g. Lucas No. 54381742, see Fig. 3), turn the voltage adjustment cam until the correct setting is obtained – turning the tool clockwise to raise the setting or anti-clockwise to lower it.

Check the setting by reducing the dynamo speed (engine speed at tickover), and then again raising it to 3,000 rev/min. Finally, restore the original connections and refit the cover.

(c) Current Regulator

(i) On-Load Setting

The current regulator on-load setting is equal to the maximum rated output of the dynamo. A table giving the current rating for all RB340 control boxes is given on pages 6 and 7.

NOTE: **Flat Armature Type only.** The closed circuit voltage of the charging system (with the current regulator in operation) can be higher than the open-circuit setting of the voltage regulator. This is due to the single series turn which is wound round the voltage regulator bobbin (in opposition to the voltage regulator shunt winding) to improve the charging and load balancing characteristics.

(ii) Method of Checking and Adjustment

The dynamo must be made to develop its maximum rated output, irrespective of the state of charge of the battery. The voltage regulator must, therefore, be rendered inoperative by clamping the contacts together with a bull-dog clip (see Fig. 3), or alternatively (without removing the cover) by connecting a 0.5 ohm resistor with a rating of not less than 30 amps, across the battery terminals. Withdraw the cables from control box terminal blades 'B'. Using a suitable 'jumper lead', connect the cables to the load side of a first-grade 0–40 amp moving-coil ammeter. Connect the other side of the ammeter to one of the control box terminal blades 'B'.

NOTE: Ensure that terminal 'B' carries only this one connection. All other load connections (including the ignition coil feed) must be made to the battery side of the ammeter.

Start the engine and run the generator at 4,500 rev/min.

The ammeter should indicate a steady reading equal to the maximum current rating of the dynamo. An unsteady reading may be due to dirty contacts (see para. F). If the reading is too high or too low, an adjustment must be made. In this event, continue as follows:

With the cover removed, use the cam adjustment tool to turn the cam until the correct setting is obtained – turning the tool clockwise to raise the setting or anti-clockwise to lower it.

Switch off the engine and restore the original connections.

Refit the control box cover.

(d) Cut-Out Relay

(i) Electrical Settings

(i) Cut-in voltage: 12.7 – 13.3

(ii) Drop-off voltage: 9.5 – 11.0

(ii) Method of Cut-in Adjustment

Checking and adjustment should be completed as rapidly as possible to avoid errors due to heating of the operating coil.

Connect a first-grade 0–20 volt moving-coil voltmeter between control box terminal 'D' and a good earthing point (see Note 2, para. 2b).

Switch on an electrical load, i.e. headlamps.

Start the engine and slowly increase its speed.

The voltage should rise steadily and then drop slightly at the instant of contact closure. The cut-in voltage is that which is indicated immediately before

the pointer drops back. It should occur between the limits 12.7–13.3 volts. If the cut-in occurs outside these limits, reduce engine speed to below cut-in value and adjust as follows:

Remove the control box cover. Turn the cut-out relay adjustment cam – clockwise to raise the setting or anti-clockwise to lower it. Repeat the above checking procedure until the correct setting is obtained.

Switch off the engine, restore the original connections and refit the cover.

(iii) Method of Drop-off Adjustment

Withdraw the cables from control box terminal blades 'B' (see Note 1, para. 2b).

Connect a first-grade 0–20 volt moving-coil voltmeter between control box terminal 'B' and earth.

Start the engine and run up to approximately 3,000 rev/min. Slowly decelerate and observe the voltmeter pointer.

Opening of the contacts, indicated by the voltmeter pointer dropping to zero, should occur between the limits 9.5–11.0 volts. If the drop-off occurs outside these limits adjust as follows:

Stop the engine and remove the control box cover. Adjust the drop-off voltage by carefully bending the fixed contact bracket. Reducing the contact gap will raise the drop-off voltage; increasing the gap will lower the drop-off voltage. Re-test and, if necessary, re-adjust until the correct drop-off setting is obtained.

Restore the original connections and refit the cover.

(e) Adjustment of Air Gap Settings.

Air gap settings are accurately adjusted during production of the control box and should require no further attention. If the original settings have been disturbed, it will be necessary to reset as follows:

(i) Armature-to-Bobbin Core Gaps of Voltage and Current Regulators (Fig. 4)

Turn the adjustment cam to the point giving minimum lift to the armature tensioning spring, i.e. by turning the tool anti-clockwise. Slacken the adjustable contact locking nut, and screw back the adjustable contact.

Insert a flat steel feeler gauge of 0.054″ ±0.002″ (1.37 ±0.05 mm) – Standard type, or 0.022″ ±0.003″ (0.559 ±0.076 mm) – Flat armature type, between the armature and the core face. Insert the gauge as far back as the rivet heads on the underside of the armature. Retain the gauge in this position and press the armature down squarely on to it, screw in the adjustable contact until it just touches the armature contact. Retighten the locking nut and withdraw the gauge.

Carry out the electrical setting procedure.

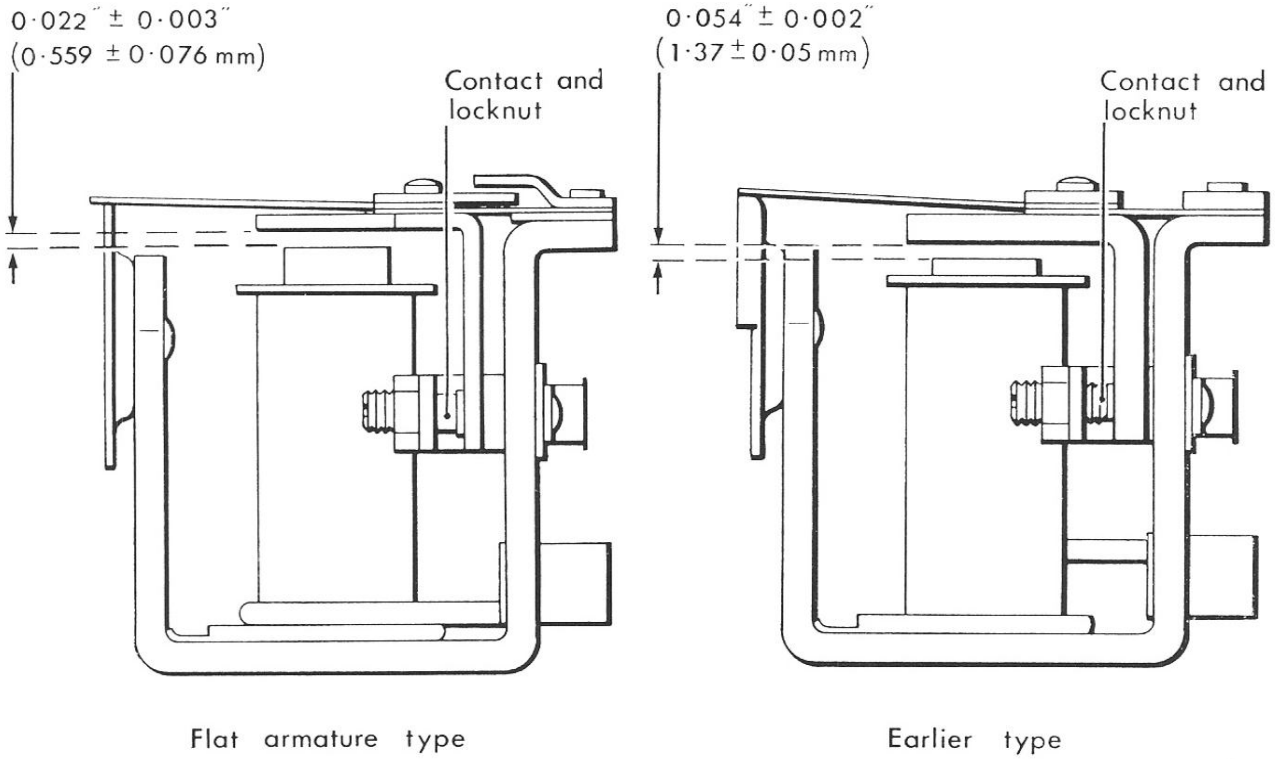

Fig. 4 Current and voltage regulators

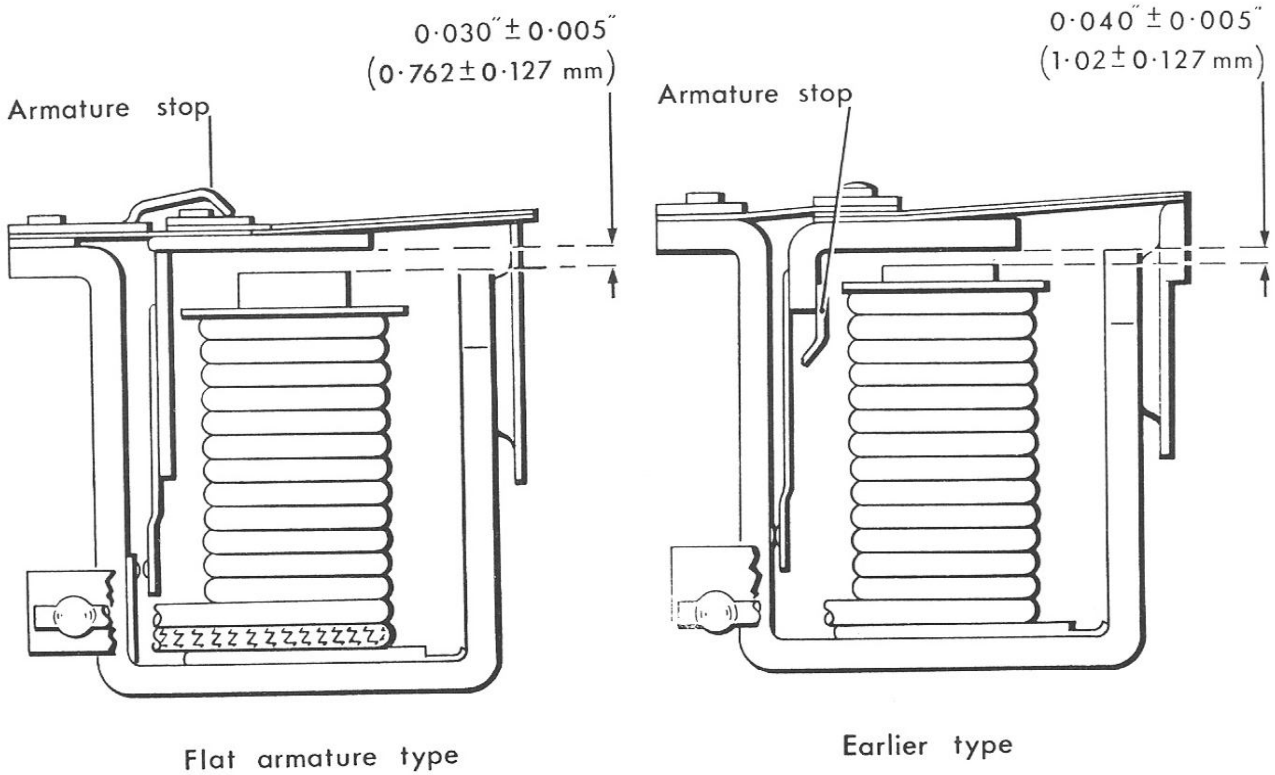

Fig. 5 Cut-out relay

(ii) Armature-to-Bobbin Core Gap of Cut-out Relay (Fig. 5)

Insert a flat steel feeler gauge of 0.015″ (0.38 mm) between the head of the core and the armature, using the rivet heads as a datum. Press the armature down and bend the fixed contact bracket until the two contacts just touch. (This is a preliminary setting for contact 'follow-through').

Check that the top gap, controlled by the armature stop and using the nearest rivet as a datum, is 0.040″ ±0.005″ (1.02 ±0.127 mm) – Standard type, or 0.030″ ±0.005″ (0.762 ±0.127 mm) – Flat armature type. Adjust the armature stop as necessary.

Check the cut-in and drop-off voltage settings.

(f) Cleaning Contacts

(i) Regulator Contacts

To clean the voltage or current regulator contacts, use fine carborundum stone or silicon carbide paper followed by methylated spirits (denatured alcohol).

(ii) Cut-out Relay Contacts

To clean the cut-out relay contacts, use a strip of fine glass paper – never carborundum stone or emery cloth.

(g) Resistance Values at 20°C (68°F)

(i) Contacts Resistors	*Resistance in ohms*	*Colour Identification*
As fitted to units controlling dynamos having 4.5 ohm field winding ...	37 – 43	Yellow
As fitted to units controlling dynamos having 5.25 or 6 ohm field windings	55 – 65	Red
As fitted to C48 dynamos	75 – 85	Violet

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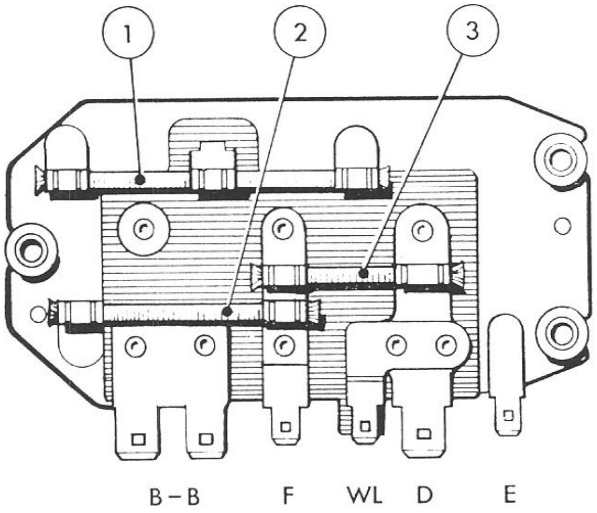

Fig. 6 Underside view of control box

1 Swamp resistor
2 Field parallel resistor (when fitted)
3 Contacts resistor

(ii) Swamp Resistors	*Resistance in ohms*	*Colour Identification*
Measured on unit between centre tag and base (terminals 'D', 'F' and 'WL' disconnected)	13.25 – 14.25	
Replacement resistor measured between end tags before fitting to unit ...	53 – 57	
(iii) Field Parallel Resistors		
As fitted to units controlling Model C48 dynamos and C42 Part Number 37517	95 – 105	Orange
(iv) Shunt Windings		
Voltage regulator ...	10.8 – 12.0	
Cut-out relay	8.8 – 10.5	

RB340 – CURRENT RATINGS AND ASSOCIATED DYNAMOS

Earlier Type

Part No.	*Associated Dynamo*	*Current Setting (Amps) at 4,500 rev/min*	*Part No.*	*Associated Dynamo*	*Current Setting (Amps) at 4,500 rev/min*
37331	C42	30 ±1	37451	C40T (5 turn)	22 ±1
37342	C40L	25 ±1			
37344	C40	22 ±1	37493	C40	19 ±1
37347	C42S	35 ±1	37497	C42	30 ±1
37354	C48	35 +0 —2 (4,000 rev/min)	37498	C40L	25 ±1
			37499	C42	30 ±1
			37500	C40T (7 turn)	18 ±1
37362	C40	22 ±1	37501	C40	19 ±1
37363	C42	30 ±1	37503	C40A (7 turn)	10.5 ±0.5
37374	C42	30 ±1			
37378	C42	30 ±1	37517	C42	30 ±1
37392	C40	22 ±1	37522	C40R	28 ±1
37419	C48	35 +0 —2 (4,000 rev/min)	37528	C40	22 ±1
			37529	C40L	25 ±1
			37530	C42	30 ±1
37430	C40R	28 +2 —0	37542	C40	22 ±1
			37543	C40L	25 ±1
37431	C40A (7 turn)	10.5 ±0.5	37544	C40T (5 turn)	22 ±1
37432	C40A (5 turn)	10.5 ±0.5			
37450	C40T (7 turn)	18 ±1	37547	C40T (5 turn)	22 ±1

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Flat Armature Type

Part No.	*Associated Dynamo*	*Current Setting (Amps) at 4,500 rev/min*	*Part No.*	*Associated Dynamo*	*Current Setting (Amps) at 4,500 rev/min*
37563	C40	22 ±1	37573	C40T (5 turn)	22 ±1
37568	C40L	25 ±1			
37569	C40	22 ±1	37574	C40L	25 ±1
37570	C40	22 ±1	37575	C42	30 ±1
37571	C40T (5 turn)	22 ±1	37576	C42	30 ±1
			37577	C40A	10.5 ±0.5
37572	C40T (5 turn)	22 ±1	37578	C40T (7 turn)	19 ±1