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EQUIPMENT

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WORKSHOP INSTRUCTIONS

CONTROL BOXES

MODELS
RB106-2 AND RB107

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CONTROL BOXES

MODELS RB106/2 AND RB107

1. GENERAL

Control box models RB106/2 and RB107 are of compensated voltage control design, superseding earlier models incorporating the now obsolete LRT9 regulator and cut-out relay unit. Model RB106/2 is normally fitted to cars and light commercial vehicles while model RB107 was fitted to motor cycles, tractors and stationary engines before being superseded early in 1957 by model RB108 (see Section F–5).

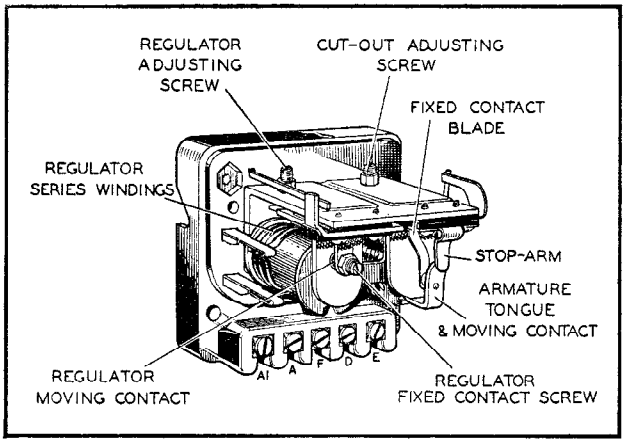

Fig. 1
Control box RB106/2 with cover removed

(a) TEMPERATURE COMPENSATION

The shunt coils of the cut-out relay and voltage regulator consist of many turns of fine copper wire and, consequently, the ohmic resistance of these coils rises and falls as the temperature rises and falls—due in part to ambient working conditions and in part to the normal passage of current. In turn, this causes the operating current and therefore the magnetic pull on the armature to vary inversely with changes in temperature. Thus, to maintain the necessarily close operating limits expected of these units, some form of compensation is required.

The method adopted is to utilise a bi-metal strip either to supplement or to take the place of the armature tension spring—the hinge spring being of steel, copper coated in cut-outs and blue in voltage regulators. The effect of the bi-metal is to cause the spring force on the armature to reduce with rises in temperature and to increase with falls in temperature. This method also compensates for variations in battery voltage with temperature—a higher operating voltage being provided in cold weather.

Early in 1956 the amount of compensation in regulators was reduced by fitting bi-metal strip of 0.010″ thickness, in place of the original 0.012″, thus making necessary the prior identification of units before setting at temperatures other than 20°C. Units can be identified for this purpose by reference to the colour of the bi-metal spring fitted to the voltage regulator, as follows:

0.010″ bi-metal springs are **copper plated**
0.012″ bi-metal springs are **bright and unplated**

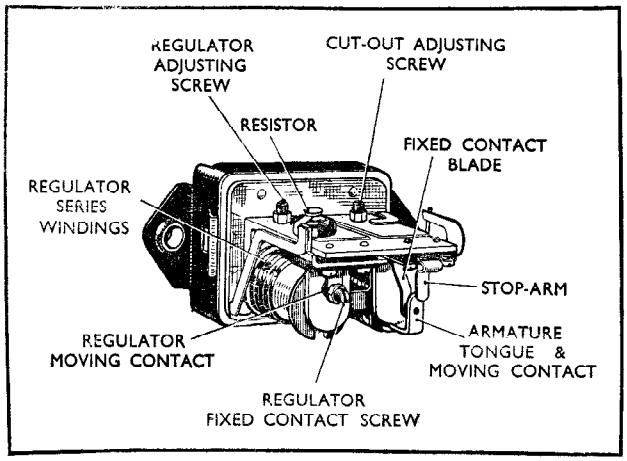

Fig. 2
Control box RB107 with cover removed

2. ELECTRICAL SETTING DATA

(a) REGULATOR

The regulator open-circuit voltage settings quoted in Issue 1 of this Section were applicable to 'regulating point' speeds, i.e., when the voltmeter needle flicks and steadies at around 1,500 generator r.p.m. It can be shown, however, that greater stability and accuracy of setting is achieved if settings are made at a higher speed. The following settings are given for a generator speed of 3,000 r.p.m.

(i) *Units with copper plated bi-metal springs*

	12-volt units	6-volt units
10°C. (50°F.) ...	16.1—16.7 volts	8.05—8.45 volts
20°C. (68°F.) ...	16.0—16.6 volts	8.0—8.4 volts
30°C. (86°F.) ...	15.9—16.5 volts	7.95—8.35 volts
40°C. (104°F.) ...	15.8—16.4 volts	7.9—8.3 volts

(ii) *Units with bright and unplated bi-metal springs*

	12-volt units	6-volt units
10°C. (50°F.) ...	16.3—16.9 volts	8.1—8.5 volts
20°C. (68°F.) ...	16.0—16.6 volts	8.0—8.4 volts
30°C. (86°F.) ...	15.7—16.3 volts	7.9—8.3 volts
40°C. (104°F.) ...	15.4—16.0 volts	7.8—8.2 volts

(b) CUT-OUT RELAY

	12-volt units	6-volt units
Cut-in voltage ...	12.7—13.3 volts	6.3—6.7 volts
Drop-off voltage ...	8.5—11.0 volts	4.8—5.5 volts
Reverse current ...	3.5—5.0 amp.	3.5—5.0 amp.

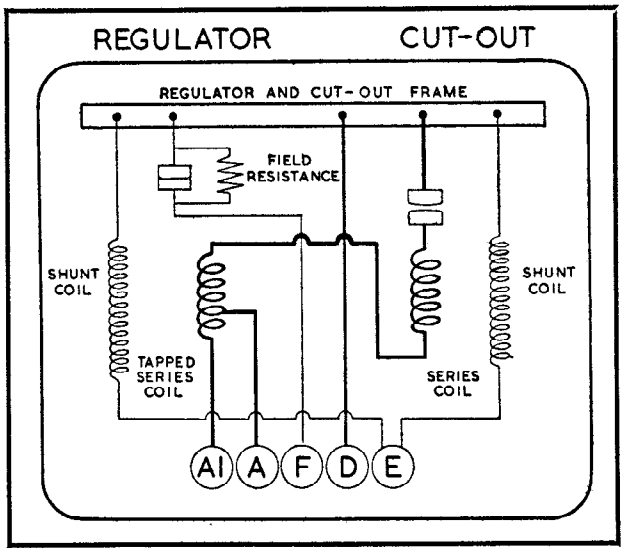

Fig. 3
Internal connections of control box RB106/2

3. SERVICING

(a) PRELIMINARY CHECKING OF CHARGING CIRCUIT

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

(i) Check the battery by substitution or with an hydrometer and a heavy discharge tester.

(ii) Inspect the generator driving belt. This should be just taut enough to drive without slipping.

(iii) Check the generator by substitution or by linking large terminal 'D' to small terminal 'F' and connecting a voltmeter between this link and earth and running the generator up to about 1,000 r.p.m., when a rising voltage should be shown.

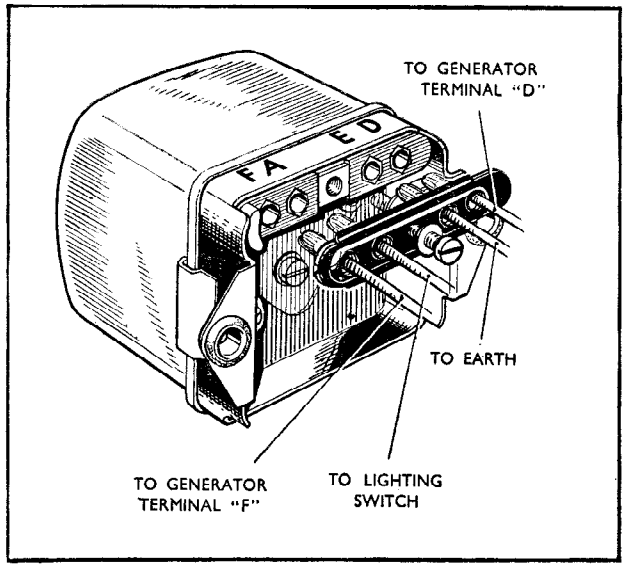

Fig. 4
Terminal arrangement of control box RB107

(iv) Inspect the wiring of the charging circuit and carry out continuity tests between the generator, control box and, when fitted, the ammeter.

(v) Check earth connections, particularly those of the control box.

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

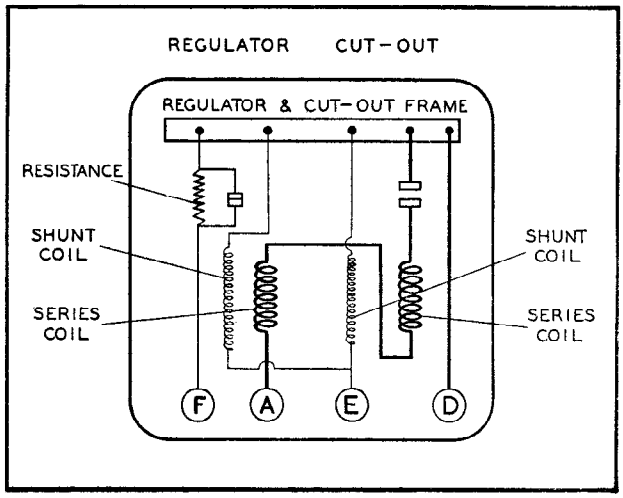

Fig. 5
Internal connections of control box RB107

(b) CHECKING REGULATOR ELECTRICAL SETTING

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

(i) Connect a first-grade 0—20 moving coil voltmeter between control box terminals 'D' and 'E' or, with model RB107, between the larger generator terminal and a good earth.

(ii) With model RB106/2, disconnect terminals 'A' and 'A1', withdraw the cables and connect them together. Start the engine.
With model RB107, disconnect the insulated cable from the battery and (if coil ignition is fitted) run a temporary feed from the battery to ignition coil terminal 'SW'. With the ignition switch in the 'OFF' position, start the engine manually.

(iii) Run the generator at 3,000 r.p.m. and observe the voltmeter reading. This should lie between the appropriate limits given in paras. 2 (a) (i) or (ii)—unless a non-standard setting is specified, when it should agree with the special limits quoted in Section F–1 Part A.
An unsteady reading may be due to unclean contacts but if the reading occurs outside the appropriate limits, an adjustment must be made.

(iv) Stop the engine.

(c) REGULATOR ELECTRICAL ADJUSTMENT

(i) Remove the control box cover.
With model RB107 this necessitates removing the control box from its mounting and withdrawing the plug-in connectors. Slacken the two cover clip securing screws and withdraw the cover.
Refit the plug-in connectors.

(ii) Re-start the engine and run the generator at 3,000 r.p.m.

(iii) Slacken the locknut of the voltage adjustment screw and turn the screw (clockwise to raise the setting or anti-clockwise to lower it) until the correct setting is obtained.
Retighten the locknut.

(iv) Check the setting by stopping the engine and then again raising the generator speed to 3,000 r.p.m.

(v) Restore the original connections and refit the cover.

(d) CHECKING CUT-OUT RELAY ELECTRICAL SETTING

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

(i) Connect a first-grade 0—20 moving coil voltmeter between control box terminals 'D' and 'E' or, with model RB107, between the larger generator terminal and a good earth.

(ii) Remove the control box cover in order to note the instant of contact closure.
Alternatively, switch on an electrical load such as the headlamps when the instant of contact closure will be indicated by a slight drop in the voltmeter reading.

(iii) Start the engine and slowly increase its speed.

(iv) Observe the voltmeter pointer.
If the reading occurs outside the limits given in para. 2 (b), an adjustment must be made.

(v) Stop the engine.

(e) CUT-OUT RELAY ELECTRICAL ADJUSTMENTS

(i) *Method of Cut-in Adjustment*
Remove the control box cover.
With model RB107 this necessitates removing the control box from its mounting and withdrawing the plug-in connectors. Slacken the two cover clip securing screws and withdraw the cover.
Refit the plug-in connectors.
Slacken the locknut of the cut-out relay adjustment screw and turn the screw (clockwise to raise the setting or anti-clockwise to lower it) until the correct setting is obtained. Retighten the locknut and retest the setting by increasing the engine speed from zero.
Restore the original connections and refit the cover.

(ii) *Method of Drop-off Adjustment*
Disconnect the cable from control box terminal 'A' and connect a first-grade 0—20 moving coil voltmeter between this terminal and earth.
Start the engine and run up to 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 given in para. 2 (b). If the drop-off occurs outside these limits, an adjustment must be made. In this event, continue as follows:

Stop the engine and remove the control box cover.
Adjust the height of the fixed contact by carefully bending the fixed contact blade towards the armature 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 setting is obtained.
Restore the original connections and refit the cover.

(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.

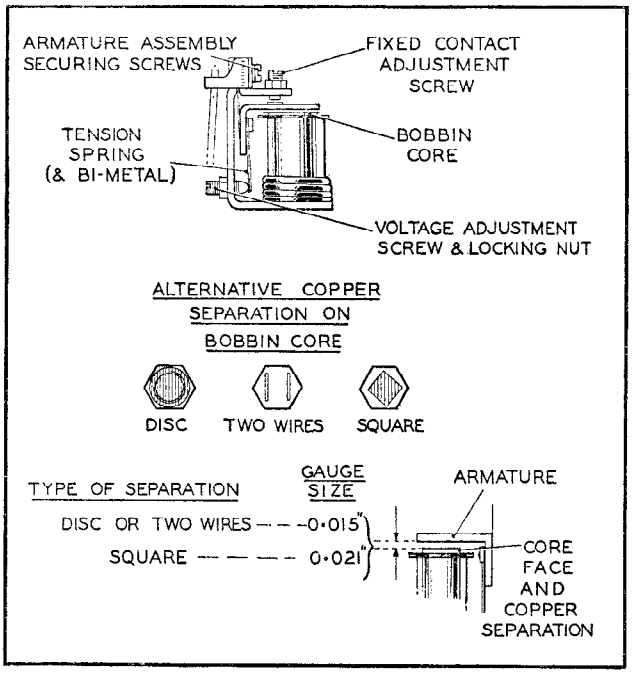

Fig. 6
Mechanical settings of regulator

(g) ADJUSTMENT OF AIR GAP SETTINGS

Air gap settings are accurately adjusted during assembly and should require no further attention. If, however, an armature is removed for any reason, care must be taken to obtain the correct setting on re-assembly.

(i) *Voltage Regulator*

With the armature in the free position and correctly set, the distance between the core face and the underside of the armature is 0.030", of which 0.015" is through air when the copper separation consists of a disc or of two parallel wires, and 0.021" when a square of copper is used. To obtain this air gap, proceed as follows:

Slacken the fixed contact locking nut and unscrew the contact screw until it is well clear of the armature moving contact.

Slacken the voltage adjustment screw locking nut and unscrew the adjuster until it is well clear of the armature tension spring.

Slacken the two armature assembly securing screws.

Refer to Fig. 6 and insert a gauge of appropriate thickness (and wide enough to cover completely the core face) between the armature and the copper separation. Take care not to turn up or damage the copper disc, wires or square.

Press the armature **squarely** down against the gauge and retighten the two armature assembly securing screws.

With the gauge still in position, turn the fixed contact adjustment screw until it just touches the armature contact.

Retighten the locking nut.

Reset the voltage adjustment screw as in para. 3 (c).

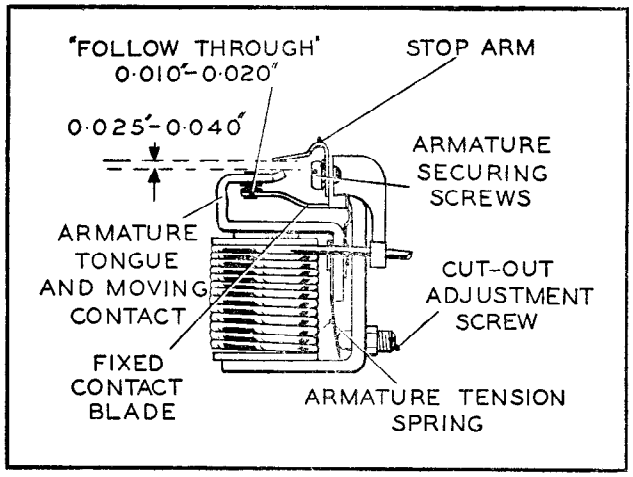

Fig. 7
Mechanical settings of cut-out

(ii) *Cut-Out Relay*

Slacken the adjustment screw locking nut and unscrew the adjuster until it is well clear of the armature tension spring.

Slacken the two armature securing screws.

Press the armature **squarely** down against the core face (copper sprayed in earlier units, fitted with a square of copper in later units) and retighten the armature securing screws. No gauge is necessary.

Press the armature **squarely** down against the core face and, using suitable pliers, adjust the gap between the armature stop arm and the armature tongue to 0.025"—0.040" by carefully bending the stop arm.

Adjust the fixed contact blade to give a 'follow-through', or blade deflection, of 0.010"—0.020" when the armature is pressed **squarely** down against the core face.

Reset the cut-out adjustment screw as in para. 3 (e).

4. RADIO INTERFERENCE SUPPRESSION

Radio interference, due to sparking at the regulator contacts, can be recognised by periods of continuous crackling at the speaker. This can be remedied either by fitting a suppressed control box, or by connecting a Suppressor Unit (Model WS12) in the associated wiring. In no circumstances should a capacitor be connected to control box terminal 'F', to the generator field terminal, or in parallel with the regulator contacts. Attempts to correct regulator interference in this way can affect the charging system and may cause damage to the regulator.

Fig. 8 shows the internal connections of a suppressed control box intended for fitting to radio-equipped vehicles. A filter circuit comprising a capacitor and a choke is incorporated in the design. The electrical values of the filter components are critical, both in regard to regulator performance and to the frequency ranges covered and, if removal becomes necessary, only authorised replacements should be used.

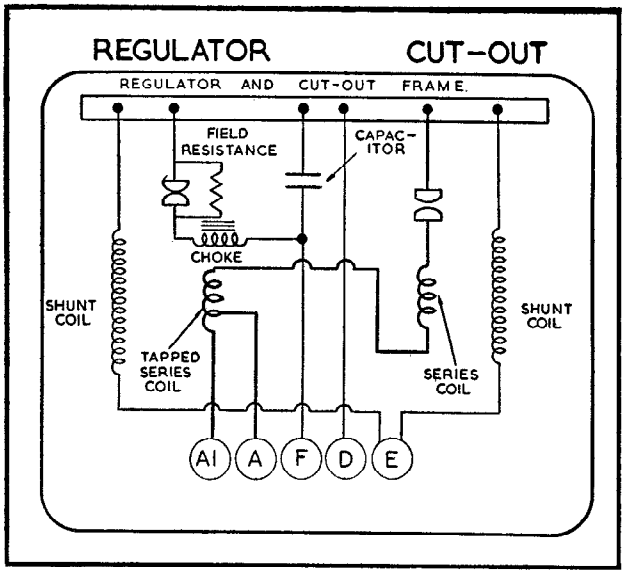

Fig. 8
Internal connections of a suppressed control box