## 5.7 Voltage Regulators

# LUCAS VOLTAGE REGULATORS

Dennis Wray

## Types of Regulators

Early two brush equipment used a Lucas MCR1-type regulator. With the introduction of the larger capacity generator, the MCR2 unit was introduced. These can be used as replacements for the MCR1 units.

## Lucas Regulator Terminals

There are four terminals. The positioning may be laid out F A D E. It is essential that terminals be connected as follows:

| Reguator terminal: | Connects to: |
|---|---|
| F | F generator terminal |
| A | Ammeter |
| D | D generator terminal |
| E | Earth |

## Generator Terminals

The two plug-in terminals are marked D and F. The D terminal is from the insulated brush and supplies a charge via the cut-out section of the voltage regulator unit, through the ammeter and thence to the battery. The F terminal is the insulated end of the field coil circuit. The other end of the field coil is earthed, together with the earth brush lead.

## How the Voltage Regulator works

The voltage regulator contact points are in the field coil circuit between generator D and F terminals and regulate the amount of current that flows through the field coil. During operation, except at very low r.p.m. and when the battery is in a low state of charge, the regulator contacts are continuously vibrating, opening the field coil circuit when the voltage rises to approximately 8 volts. This causes an immediate drop in voltage and the spring pressure causes the points to make contact again. This again completes the field coil circuit. This operation repeats continuously and the voltage is limited to the setting determined by the spring pressure adjustment.

It is inadvisable to tamper with the regulator unless the procedure for adjusting is fully understood and the need for adjustment is indicated by failure to charge, under-charging or over charging.

Firstly, eliminate other more likely sources of trouble, such as loose or corroded battery terminals and poor wire connections. Check the plug-in terminals at the generator, to make sure these are snug in their sockets, as well as the regulator terminals and battery earth. Check that the wire from regulator E terminal is making a good earth connection.

There are two adjusting screws. Looking at these, the left-hand screw adjusts the cut-out spring pressure; the right-hand screw, the spring pressure for the regulator points.

## Cut-out Adjustment

Normally, this only needs altering when points stick together after motor speed has dropped below generator charging speed, revealed by a discharge reading on the ammeter. In this event, turn cut-out adjusting

screw in slightly (clockwise). Failure of cut-out points to close readily can be due to excessive spring pressure, or excessive contact gap.

### Causes of Faulty Regulator Adjustment

If low charging-rate has been the trouble, bridge the two regulator contacts with a screwdriver, with the motor running, and observe the charging rate. If a high rate is shown on the ammeter, it indicates that the spring pressure is insufficient, or the regulator contacts are dirty. In any event it is advisable to clean the regulator contacts before adjusting This should be done with very fine emery paper. Pressing down on the regulator top plate will separate the points sufficiently to insert a strip of emery paper. This should be drawn through the points a few times, then turned over and the operation repeated to clean both points. After this, a strip of clean paper should be passed through, to remove any loose particles.

### Regulator Adjustment without Voltmeter

Have the battery fully charged and install. Make sure that the terminals are well-tightened and clean, and that there is a good earth contact.

If under-charging is the trouble, proceed as follows: slacken the right-hand adjusting screw lock-nut (except on the later model regulators which have spring-loaded screws) and turn screw clockwise, about a tenth of a turn at a time. Retighten the locknut and test. Repeat until a maintained maximum charge of 5 to 6 amps is shown on the ammeter when the motor speed is equivalent to about 40 m.p.h. road speed. When this charging rate is indicated, the spring pressure is too great. The adjusting screw should be gradually turned anti-clockwise until the charge is reduced to about 2 amps. This is the maximum that should be developed when the battery is fully charged.

If over-charging has been the problem, proceed as follows: set the motor running at approximately 40 m.p.h. road speed. Gradually screw out the right-hand adjusting screw until the ammeter shows a charge of about 2 amps. Now retighten lock-nuts, where they are fitted.

### Regulator Adjustment with Voltmeter

Take the following steps:

1. Open battery circuit, either by disconnecting one battery terminal, or by placing a clean piece of paper between the cut-out points (which are on the left-hand side of the unit as one looks at the adjusting screws).
2. Connect the negative lead of the voltmeter to D terminal at the generator (on positive earth equipment). Leave the wires in place at the generator. If the screw which holds these terminals is slackened right off, the fibre pad can be pulled away, thus allowing the voltmeter lead to be clipped on to the generator D terminal. Make sure these plug-ins fit snugly in the generator. If not, withdraw, slip off the end-caps and bare more wire by removing plastic insulation, folding it over to give a snug fit.
3. Connect other voltmeter lead to a good earth contact on the engine or the generator body.
4. Start the engine up and accelerate slowly until the voltmeter flicks and settles down. Note the voltmeter reading, which should be within a range of 7.8 to 8.00 volts. If the voltmeter reading is below 7.8 volts, stop the engine, turn the right-hand adjusting screw clockwise very slightly, restart the engine and note reading at which the voltmeter

settles down. Repeat this procedure until the needle settles at between 7.8 and 8.00 volts.

5. If the voltmeter reading is above 8.00 volts, adopt the same procedure, but turn the screw anti-clockwise.
6. Atmospheric Temperature Setting Allowance. The 7.8 to 8.00 volt setting is correct where average atmospheric temperatures range between 60 and 80 degrees Fahrenheit. If the air temperature is appreciably below 60 degrees F., adjust to 8.00 to 8.20 volts. Where the air temperature is high, in the vicinity of 100 degrees F., set to 7.60 to 7.80 volts.

Since the above adjustment is made with an open battery circuit, it matters not whether the battery is in the machine; but the battery *generator* circuit must be opened by one of the methods earlier described. Be sure that the light switch is in the OFF position, so that the circuit is not completed from generator to lights. Restore the battery circuit, after adjusting, by reconnecting terminal, or removing the paper from between the cut-out points.

**Regulator Air-Gap Settings**

In normal service these will not require re-adjustment. If, however, the regulator contacts have been replaced, after servicing, the air-gap adjustments should be checked and reset to original dimensions. In such cases, air-gap settings should be effected before the regulator voltage settings.

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## ADJUSTING THE MCR. 2. VOLTAGE REGULATOR

by *J. Holmes*

The MCR.2. is easily adjusted using a 4BA spanner, small screwdriver, and voltmeter reading 0 to 12 volts. On removing the regulator cover, two wound bobbins will be seen. The bobbin having normally closed contacts is the regulator, and the bobbin having normally open contacts the cut-out.

To adjust the regulator insert a piece of paper between the cut-out contacts, and connect the voltmeter between terminal D on the regulator and earth on the bike frame. Run the engine at approx. 1,500 r.p.m. when the meter should read between 7.8 volts and 8.2 volts. If the reading is not between these limits slacken the lock nut at the rear of the regulator bobbin and turn the adjusting screw slightly, Clockwise to raise the voltage, counter clockwise to lower voltage. Then retighten the lock nut and re-check. When this setting is correct the cut-out can be adjusted as follows.

Leaving the paper between the cut-out contacts and the voltmeter connected as before, check that the cut-out contacts close when the engine speed is raised and the voltmeter reads between 6.3 volts and 6.7 volts. If not slacken the lock nut at the rear of the cut-out bobbin and adjust as before. Relock the lock nut and re-check. Next remove the paper separating the cut-out contacts and connect the voltmeter between terminal A on the regulator and earth. When the engine speed is raised the meter should read as the cut-out contacts close and the reading should rise to the regulator setting i.e. 7.8 volts-8.2 volts. The adjustment is now complete.

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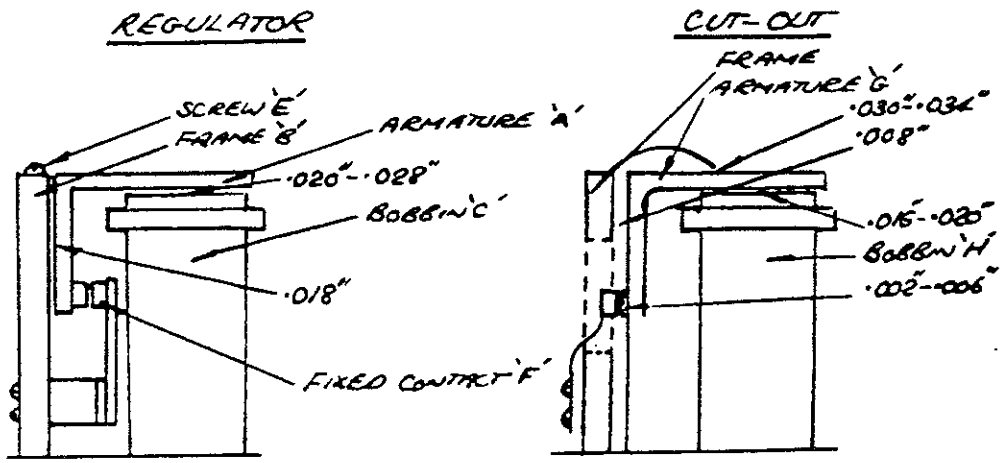
# THE MCR 2 VOLTAGE REGULATOR




Regulator contacts occasionally need cleaning and adjusting, and it is useful to know how to do so.

To clean the regulator contacts, remove the two armature fixing screws (E), and lift the armature (A), from the regulator frame (B). Remove the upper of the two screws holding the fixed contact (F) to the regulator frame and swing the contact outward. The two contacts can now be cleaned by means of a fine carborundum stone or fine emery cloth. After cleaning, replace the upper fixed contact screw and tighten securely. Refit the armature and replace the two fixing screws loosely. To adjust the contacts, insert a .018" feeler gauge between the back of the armature and the regulator frame. Press the armature back against the feeler gauge and down on to the top of the bobbin (C) and tighten the two fixing screws. Next, check the gap between the armature and the bobbin. If a small rivet is fitted to the underside of the armature, the gap should be .010"—.018". Finally remove the feeler gauge and press the armature down, when the contacts gap should be .006"—.017". The electrical setting should now be re-checked.

The cut out contacts may be cleaned 'in situ' by a strip of fine glass paper. If the contacts have to be removed, the air gap settings are as shown. The contact-gap of .002"—.006", is obtained with a .030" feeler gauge placed between the arms ature (G) and the top of the bobbin (H). If a brass shim is fitted to the underside of the armature, the air gap should be reduced to .011"—.015". As with the regulator, the electrical setting should be re-checked if the mechanical settings are altered.