

LUCAS ELECTRICAL SERVICES, Inc.



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Foreword . . .

We hope that this booklet will serve to show you a systematic way in which faults in the charging system on British cars can be diagnosed and corrected without in many cases removing any of the units from the automobile. We are not stating that ours is the only system, but do stress the value of making the tests in a systematic manner. The booklet is not intended for the private owner, but for the service manager and his mechanics. Because of its size, its scope is strictly limited, but very full detailed instructions are contained in our workshop manual which is available on request.

SYSTEMATIC FAULT LOCATION

CONSTANT VOLTAGE CONTROL SYSTEM

The tests to be undertaken must be carried out with a Moving Coil Voltmeter, the scale of which should be accurate enough to ensure accurate readings to within .2 of a volt.

Meters reading 0-20 volts suitable for British cars using 12 volt equipment are also suitable for checking 6 volt sets on motorcycles.

Generator Test with Machine in Position

VOLTMETER CONNECTION	READING	ACTION
<p>TEST 1.</p> <p>Disconnect leads from generator. Connect one lead of voltmeter to D terminal and the other to a good ground.</p> <p>Start engine and raise speed gradually to approx. 1500 R.P.M.</p> <p>When vehicle has a positive ground system positive meter lead must be grounded.</p>	<p>A. 1.5 — 3 volts as engine is revved up.</p> <hr style="border: 0.5px solid black;"/> <p>B. Zero reading.</p> <hr style="border: 0.5px solid black;"/> <p>C. Rising volts with rising speed.</p>	<p>Armature connections O.K. proceed to Test 2.</p> <hr style="border: 0.5px solid black;"/> <p>Examine brushes and make sure they are free in their boxes making good contact on the commutator. If still no reading fault is in armature.</p> <hr style="border: 0.5px solid black;"/> <p>Internal short between D and F terminals.</p>

VOLTMETER CONNECTION

TEST 2.

Connect meter as in Test 1.

Link terminals D and F on generator.
Speed up engine very gradually.

TEST 3.

Reconnect leads at generator.

Remove leads from D and F terminals at the control box.

Connect one side of voltmeter to end of D lead, the other to a good ground.

TEST 4.

Leave voltmeter connected as in Test 3.

Join D and F wires together.
Raise engine speed very gradually.

READING

A. Rising volts with rising speed — full scale reading at fast tick-over.

B. 1.5 — 3 volts as engine is revved up.

C. Zero volts.

A. 1.5 — 3 volts.

B. Zero reading.

C. Rising volts with rising speed.

A. Rising volts with rising speed.

B. Zero reading.

C. 1.5 — 3 volts.

ACTION

Generator in order, proceed to Test 3.

Open circuit in field coils.

Grounded field coils or field connection.

D. Lead from generator to control box is in order. Proceed to Test 4.

Rewire D lead which is open-circuited.

Locate short between D and F cables.

Cables from generator to control box are in order. Proceed to Test 5.

Earthed F lead.

Open circuit in field lead between generator and control box.

Regulator Test with Units in Position

On no account must these tests be taken with the battery in circuit.

To isolate the battery from the generator put a piece of paper between the cut-out points. Remember the output of the generator, that is the current in amps flowing from the generator to the battery is dependent on the state of the battery. The generator will give a high output when the battery is in a low state of charge and a low output when the battery is full charged. Regulator setting must therefore always be done on open main circuit which is most easily obtained by inserting the piece of paper as described above.

This is very important because an alteration of 0.5 volts will affect the generator output 5 amps.

VOLTMETER CONNECTION	READING	ACTION
<p>TEST 5.</p> <p>Connect one lead of voltmeter to terminal A the other to terminal E on the control box after reconnecting leads from generator to control box. Engine stationary.</p>	<p>A. Battery voltage.</p> <p>B. Less than battery voltage, or zero reading.</p>	<p>Regulator ground connection in good order. Proceed to Test 6.</p> <p>Rectify bad ground or broken ground wire between terminal E and chassis.</p>

VOLTMETER CONNECTION	READING	ACTION															
<p>TEST 6.</p> <p><i>Proceed to test regulator setting.</i></p> <p>Isolate the battery. Connect one lead of voltmeter to terminal D (or frame of regulator) and the other lead to a good ground.</p>	<p>A. Voltage will rise steadily with engine speed and at about 1500 R.P.M. remain constant within the following limits.</p> <table border="1" data-bbox="597 295 1003 501"> <thead> <tr> <th data-bbox="597 306 727 348">TEMPERATURE</th> <th data-bbox="732 306 873 348">6 VOLT EQUIPMENT</th> <th data-bbox="878 306 1003 348">12 VOLT EQUIPMENT</th> </tr> </thead> <tbody> <tr> <td data-bbox="597 359 727 391">50°F</td> <td data-bbox="732 359 873 391">7.9-8.3</td> <td data-bbox="878 359 1003 391">16.5</td> </tr> <tr> <td data-bbox="597 394 727 426">68°F</td> <td data-bbox="732 394 873 426">7.8-8.2</td> <td data-bbox="878 394 1003 426">15.6-16.0</td> </tr> <tr> <td data-bbox="597 429 727 461">86°F</td> <td data-bbox="732 429 873 461">7.7-8.1</td> <td data-bbox="878 429 1003 461">15.4-15.8</td> </tr> <tr> <td data-bbox="597 464 727 496">104°F</td> <td data-bbox="732 464 873 496">7.6-8.0</td> <td data-bbox="878 464 1003 496">15.2-15.6</td> </tr> </tbody> </table>	TEMPERATURE	6 VOLT EQUIPMENT	12 VOLT EQUIPMENT	50°F	7.9-8.3	16.5	68°F	7.8-8.2	15.6-16.0	86°F	7.7-8.1	15.4-15.8	104°F	7.6-8.0	15.2-15.6	<p>Regulator in order.</p> <p>Proceed to Test 7.</p>
TEMPERATURE	6 VOLT EQUIPMENT	12 VOLT EQUIPMENT															
50°F	7.9-8.3	16.5															
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104°F	7.6-8.0	15.2-15.6															
	<p>B. Voltage remains constant, but outside the given limits.</p> <hr/> <p>C. Voltage does not rise with engine speed, or is erratic.</p>	<p>Adjust regulator by turning the adjusting screw clockwise to increase or counter-clockwise to lower the setting.</p> <hr/> <p>Check air-gap settings. Put .018 feeler gauge between the crank of the armature and the L shaped frame, and .014 gauge between the top of the core and the underside of the brass shim on the armature. Loosen the screws holding the regulator armature to the top of the L shaped frame. Press downwards and backwards. Tighten the screws.</p>															

VOLTMETER CONNECTION

READING

ACTION

D. Rising volts with rising engine speed up to 1500 R.P.M. and beyond.

Suspect broken shunt winding in regulator bobbin.

The ground lead from control box terminal E is common to both shunt windings (regulator and cut-out).

Hold a screwdriver near top of the bobbins and test for magnetic pull.

If there is pull on the one bobbin core and not on the other suspect open circuit on the latter.

If no pull on either check for open circuited ground lead.

Return defective regulator to Lucas Electrical Services Inc.

E. Reading approx. half setting.

Suspect regulator contacts not passing current causing the 63 ohm resistance to be in circuit the whole time. To test, bridge the contacts with screwdriver. This closes the circuit between D and F and we should get rising volts with rising speed thus proving the points are burnt or corroded.

VOLTMETER CONNECTION	READING	ACTION				
<p>TEST 7.</p> <p>Remove paper from between cut-out contacts.</p> <p>Connect voltmeter to terminal A on control box and a good ground. Engine stationary.</p>	<p>Battery voltage.</p>	<p>Proving that circuit from battery through ammeter to A terminal is OK. Proceed to Test 8.</p>				
<p>TEST 8.</p> <p>Leaving voltmeter connected as for Test 7. Start engine and watch voltmeter.</p>	<p>A. As cut-out closes the reading should increase .5 to 1 volt above battery voltage, and increase to the regulator setting in Test 6.</p> <p>B. No voltage or very low voltage is recorded when cut-out points close.</p>	<p>Cut-out is in order. Proceed to Test 9.</p> <p>Clean and adjust cut-out contacts so that they meet correctly.</p>				
<p>TEST 9.</p> <p>Connect one lead of voltmeter to D terminal of regulator or to the regulator frame itself.</p> <p>Other voltmeter lead to a good ground.</p>	<p>A. Cut-out points close when voltage is within the following limits.</p> <table data-bbox="657 791 964 851"> <tr> <td>6 volt</td> <td>12 volt</td> </tr> <tr> <td>6.3-6.7</td> <td>12.7-13.3</td> </tr> </table>	6 volt	12 volt	6.3-6.7	12.7-13.3	<p>Cut-out is in good order.</p>
6 volt	12 volt					
6.3-6.7	12.7-13.3					

VOLTMETER CONNECTION	READING	ACTION
	<p data-bbox="618 181 1036 238">B. Cut-out points close outside above limits.</p> <hr data-bbox="618 295 1036 298"/> <p data-bbox="618 334 943 355">C. Cut-out does not close.</p>	<p data-bbox="1127 181 1544 274">Adjust by turning adjusting screw in to increase or out to decrease the setting.</p> <hr data-bbox="1127 295 1544 298"/> <p data-bbox="1127 334 1544 390">Send control box to Lucas Electrical Services Inc. for exchange.</p>

The Function of the Fuses in the Auxiliary Circuits in 12 Volt Systems

Two fuses are incorporated in the control box. The main feed is via the ammeter to the A terminal on the control box, then through the series winding in the box to A1 terminal.

Terminal A1 is also the feed to the ignition switch and from there to A3 via internal connections in the control box through the fuse to A4 terminal.

Any accessories connected to A2 will work irrespective of the ignition switch position. Accessories connected to will operate only when the ignition is switched on.

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