2. DYNAMIC OR STROBOSCOPIC TIMING PROCEDURE

All Distributors

(a) Clip the strobe HT to No. 1, or manufacturer designated cylinder spark plug.

(b) Connect the remaining strobe leads to the appropriate battery terminals.

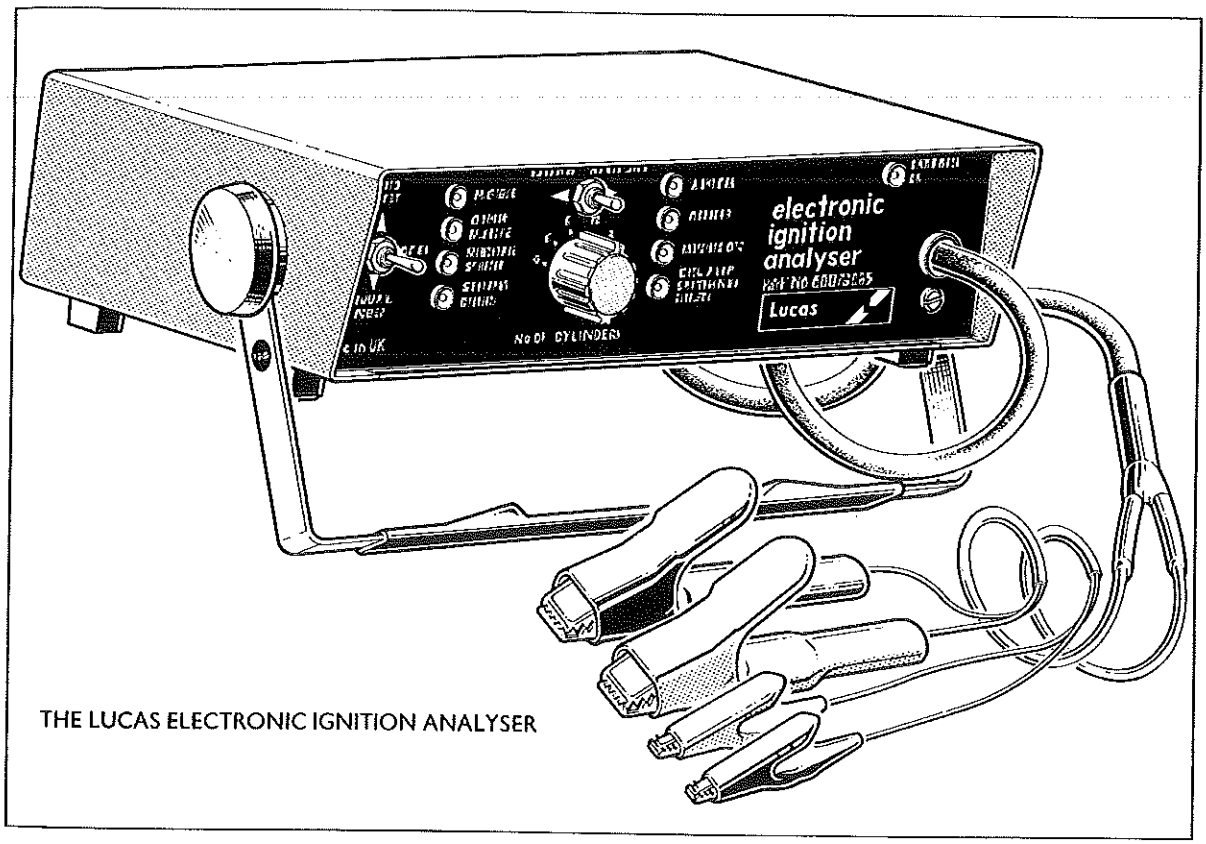
(c) Disconnect vacuum pipe (when fitted).

(d) Start the engine and run at the manufacturer's specified idling or strobe checking speed.

(e) Direct the strobe flashing beam onto the timing marks and check the degrees of advance against the specified figures.

If figures are incorrect adjust timing by using the same procedure as outlined in "Static Ignition Timing Procedure", then re-check using the strobe lamp.

Note: The strobe light can be used to check the centrifugal and vacuum mechanisms are operating correctly. To do this, the figures obtained must be compared to those specified for the particular vehicle. Refer to the manufacturer's "Workshop Manual" for full details.



THE LUCAS ELECTRONIC IGNITION ANALYSER

ALTERNATIVE TEST PROCEDURES

The Lucas recommended test procedures for all ignition systems entails the use of measuring instruments i.e. voltmeters etc. which can be obtained in specialised sets, voltmeter, ammeter and perhaps an ohmmeter.

Some checks to the system can be carried out using a test bulb, but such a test is not ideally suitable as a replacement for a voltmeter. In the majority of cases, checking with a test bulb is not practical on electronic ignition systems.

As manufacturers of electronic ignition equipment, Lucas has developed an Electronic Ignition Analyser. This unit enables on-vehicle checks to be made quite simply, both in the garage and with the vehicle running on the road. It is ideal for detecting intermittent faults that can sometimes occur.

Full details of the relevant test procedures are supplied with each unit.

CHARGING

DYNAMO/CONTROL BOX

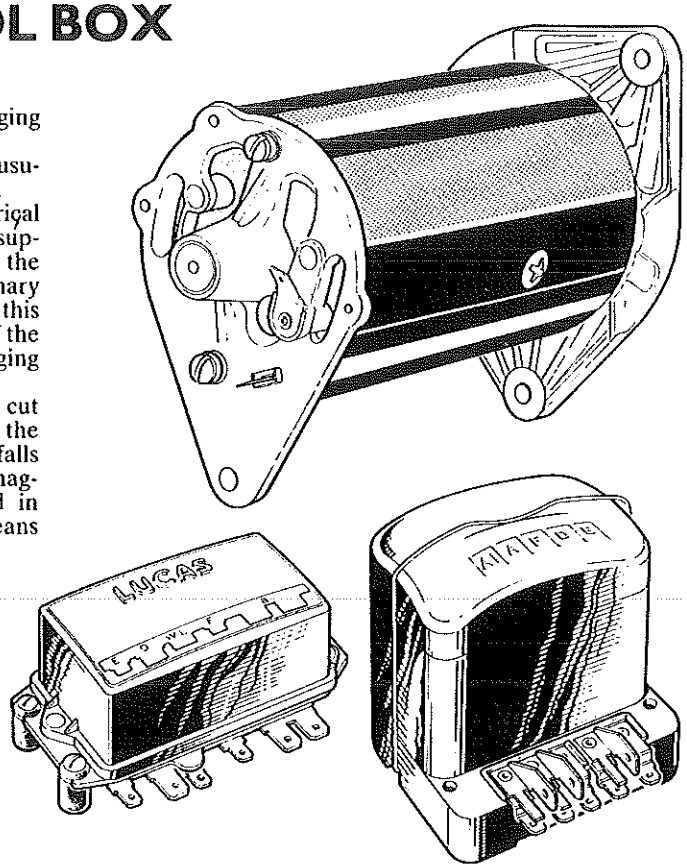
INTRODUCTION

Apart from the battery, the DC (dynamo) charging circuit consists of a dynamo and a control box.

The dynamo is an electrical machine which is usually driven by the engine via a belt arrangement.

It converts mechanical energy into electrical energy to produce usable voltage and current to supply the vehicle electrical system and also charge the battery. An armature is rotated inside the stationary field coils to produce AC (alternating current) but this is rectified to DC (direct current) by the action of the commutator and is therefore suitable for charging lead-acid batteries.

The control box includes the electromagnetic cut out device which disconnects the dynamo from the battery automatically when dynamo output falls below battery voltage. It also houses the electromagnetic contact arrangement which is connected in series with the dynamo field circuit and is the means for controlling dynamo output.



TEST EQUIPMENT

Basic test equipment required is:-

(i) Hydrometer
(ii) Voltmeter, scale 0–20V
(iii) Ammeter, scale 5–0–40A
(iv) Short jump leads, 2 off

PRELIMINARY CHECKS

Check all connections within the charging system. Ensure they are all clean and tight. Replace, resolder or make new leads as required.

Inspect generator drive belt for signs of splitting or wear. Renew if required.

TEST 1: Battery Test

Using a hydrometer, check that the battery is at least 70% charged. The full battery test procedure is outlined in Part 1.

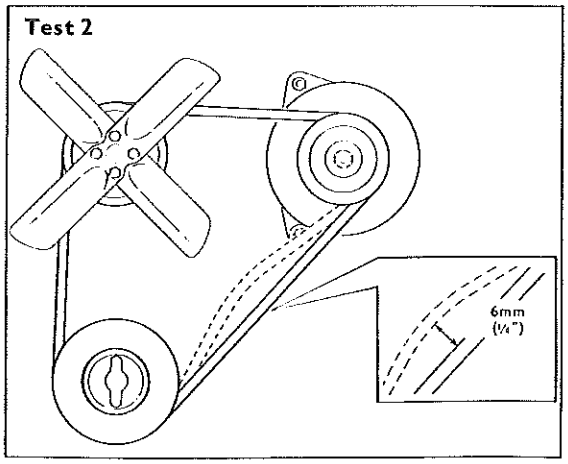
TEST 2: Driving Belt Tension

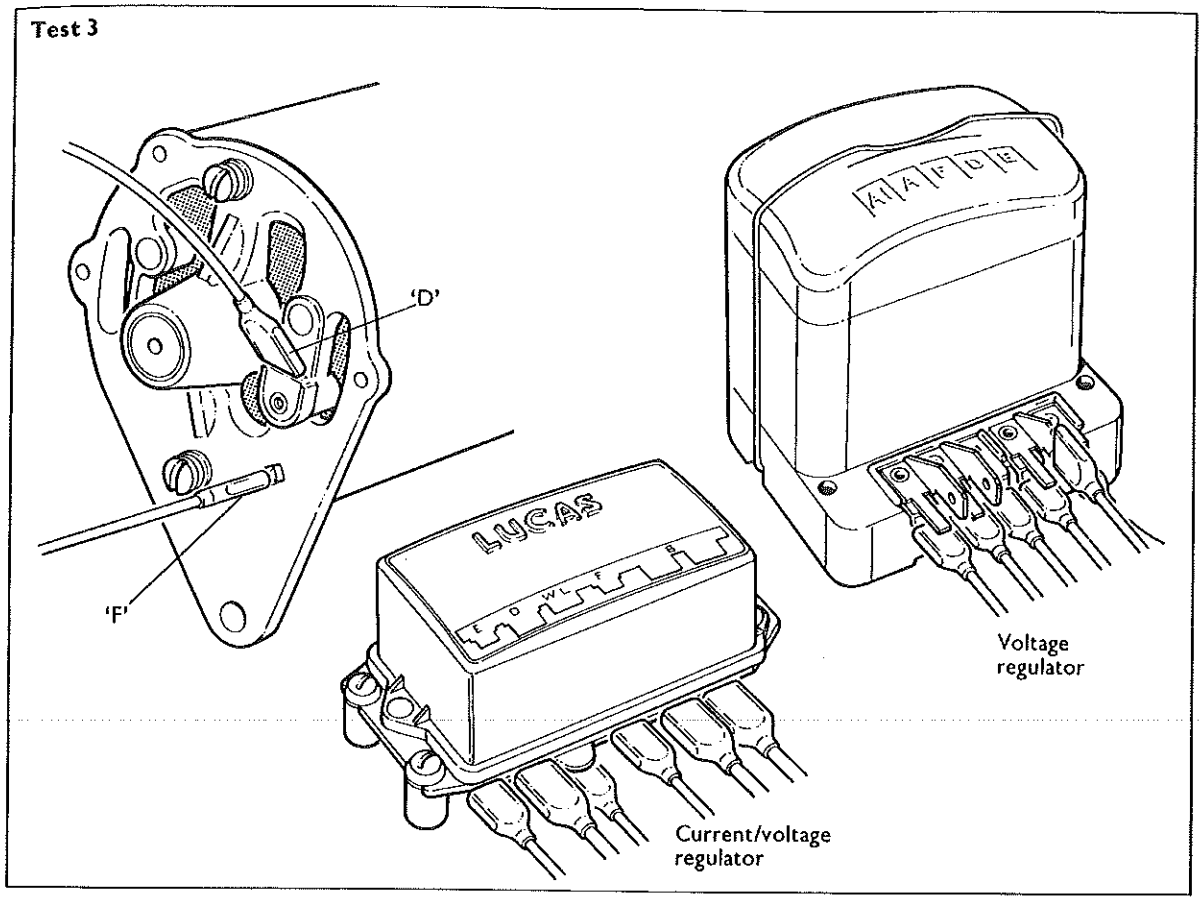
If the battery remains in an under-charged state, the first thing to check is the dynamo belt.

When the belt is too slack the dynamo will not supply its rated output. However, the bearing or water pump gland may be damaged if the belt is too tight. So, the tension of the belt must be checked carefully. When moderate hand pressure is applied to the longest side between the two pulleys, there should then be a deflection of about 6 mm (0·25").

If the belt touches the bottom of the pulley, both the belt and the pulley may be badly worn and should be replaced.

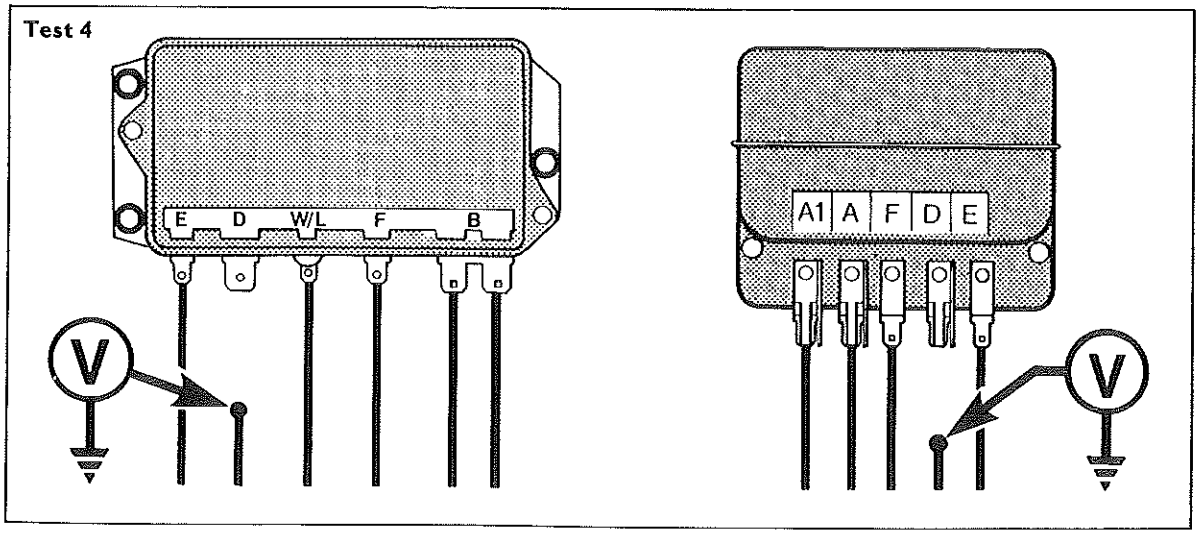
To adjust the belt tension, slacken the two dynamo securing bolts and the bolt of the slotted adjustment strap. A gentle pull outwards enables the correct tension to be applied. Tighten the adjusting strap bolt while the belt tension is maintained, then tighten the two securing bolts.





TEST 3: Connections

Check for broken, loose and/or dirty connections at the dynamo and control box. Any faults found should be rectified as necessary.



TEST 4: Voltage at 'D' of Control Box

This test checks the armature circuit and the 'D' lead betwen the dynamo and the control box.

Disconnect the 'D' lead at the control box and connect a voltmeter between the 'D' lead terminal and a good earth point.

Start and run the engine at approximately 1500 rev/min. The voltmeter should show 1·5–3V proving the dynamo armature circuit and the 'D' lead are satisfactory, so proceed direct to TEST 6.

If the voltmeter does not show 1·5–3V either the armature circuit or the 'D' lead is faulty, so proceed to TEST 5.

TEST 5: Voltage at 'D' of Dynamo

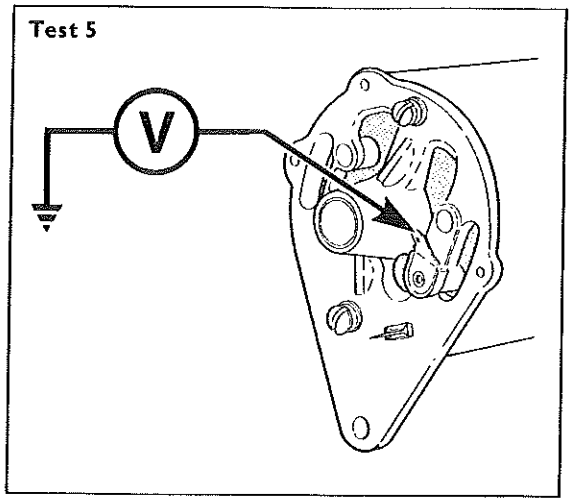
This test checks the armature circuit only.

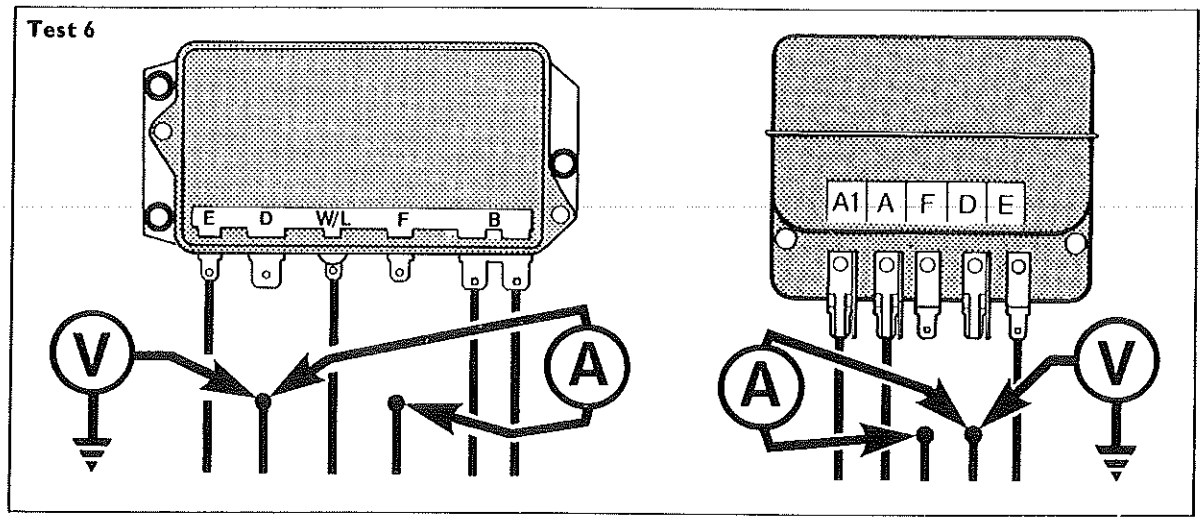
Disconnect the 'D' and 'F' leads at the dynamo and connect the voltmeter between the dynamo 'D' terminal and earth.

Run the engine at approximately 1500 rev/min when the voltmeter should show 1·5–3V.

If the correct voltage is shown the armature circuit in the dynamo is satisfactory. Therefore, the 'D' lead must be the cause of the incorrect reading in TEST 4. Check the 'D' lead for open circuit, short to earth or short between the 'D' and 'F' leads and rectify as necessary.

If the voltage reading is outside the limits, remove the dynamo for repair. Suspect excessively worn or sticking brushes, or a faulty armature.





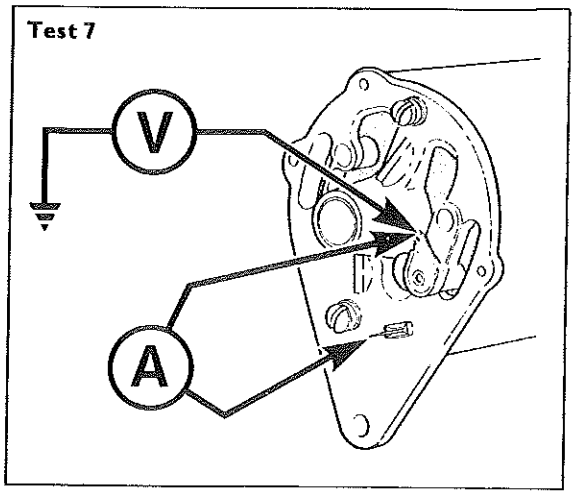
TEST 6: Dynamo Field Circuit and Leads

Both the dynamo field circuit and the 'F' lead are checked in this test.

Disconnect the 'F' lead at the control box and connect an ammeter between the terminals of the 'D' and 'F' leads. Leave the voltmeter connected between the 'D' lead terminal and earth as in TEST 4.

Start the engine and slowly increase its speed. Providing the ammeter shows 2–2·5A when the voltmeter shows 12V the dynamo field circuit and the 'F' lead are satisfactory, so proceed to TEST 8. Reconnect the 'D' and 'F' leads.

If the test is not satisfactory either the 'F' lead or the dynamo field circuit is faulty, so proceed to TEST 7.



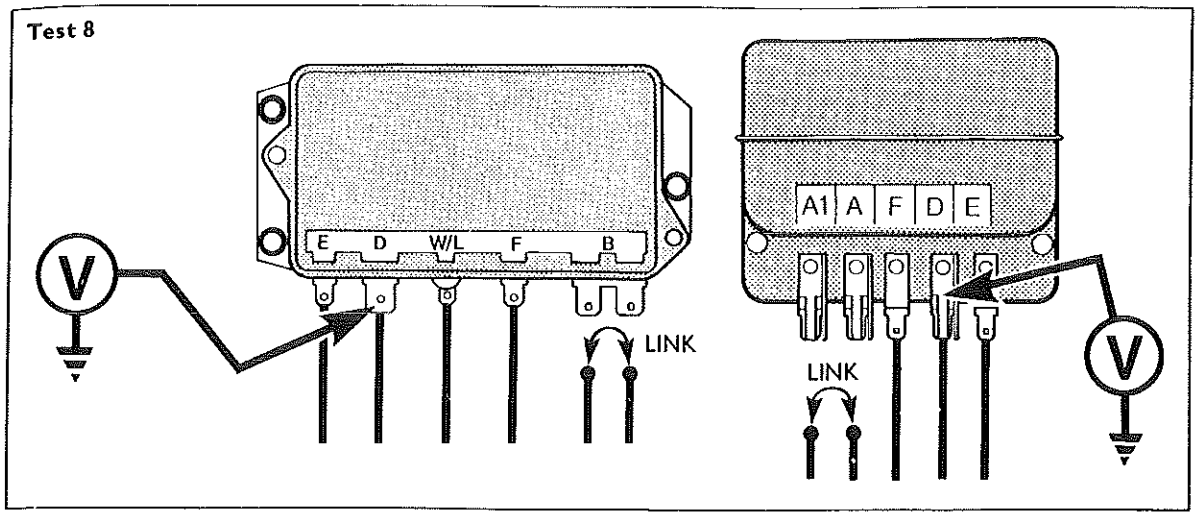
TEST 7: Dynamo Field Circuit

This test checks the dynamo field circuit only.

Disconnect the 'D' and 'F' leads at the dynamo and connect the ammeter between the 'D' and 'F' terminals at the dynamo, with the voltmeter connected between the 'D' terminal and earth. Start the engine and slowly increase its speed until the voltmeter shows 12V and the ammeter 2–2·5A.

If the correct result is obtained the dynamo is satisfactory. Therefore the fault shown in TEST 6 must be due to a faulty 'F' lead. Check this lead for short between 'D' and 'F' leads, short to earth or open circuit.

If the meter readings are outside the limits remove the dynamo for repair. Suspect open circuit or a short to earth in the field coils.



TEST 8: Open Circuit Voltage Setting

This test is to check the voltage at which the voltage regulator operates.

Disconnect the 'A' and 'A1' leads for an RB106 type or 2 bobbin control box or the 'B-B' leads for an RB340 or 3 bobbin control box and link the disconnected leads together. Connect the voltmeter between the control box 'D' terminal and earth, but do not remove the 'D' lead from the control box terminal.

Start and run the engine at approximately 3,000 rev/min. Voltmeter should show:-

16·0–16·5V for RB106 and RB108
15·0–15·5V for RB310 and 6GC
14·5–15·5V for RB340

If the correct result is obtained, the voltage setting is satisfactory so proceed to TEST 10.

If the voltage is outside the limits, adjustment is probably necessary. Before making any adjustments refer to Notes 1 and 2 and after the regulator has been set correctly proceed to TEST 10. Remember to reduce the engine speed to idle before re-checking the setting after an adjustment has been made. If the correct setting cannot be obtained, proceed to TEST 9.

Note 1. For RB310, 340 and 6GC, reduce the setting by 0·25V for ambient temperatures above 20°C (68°F).

Note 2. If RB340 setting is 0·5V above or below limits, reset to nearest limit.

TEST 9: Control Box Earth

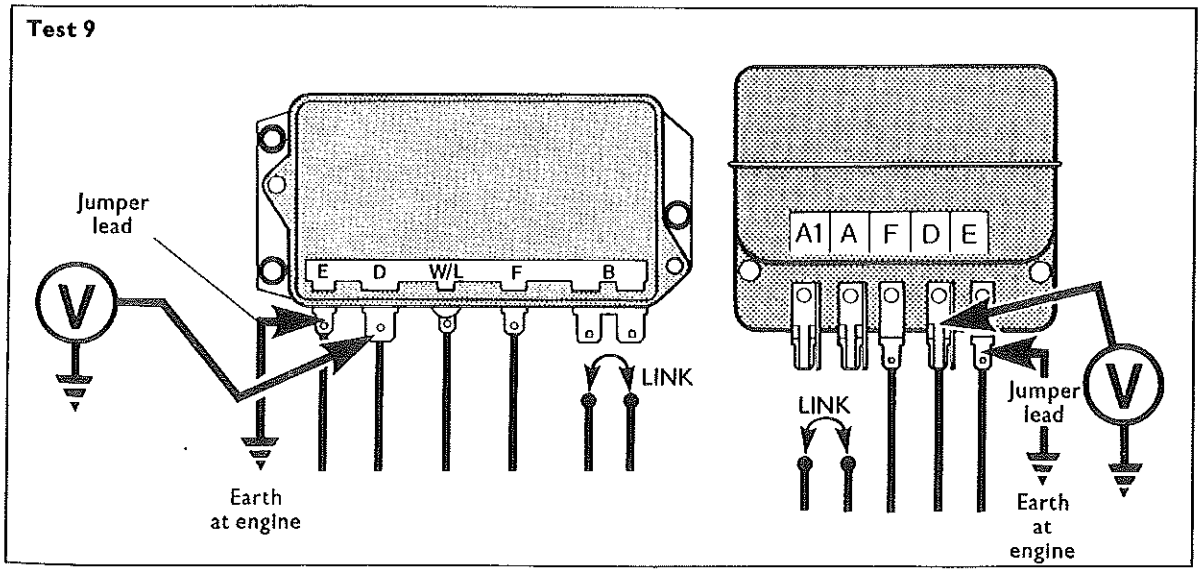
An incorrect or non-adjustable regulator setting may be due to a faulty control box earth.

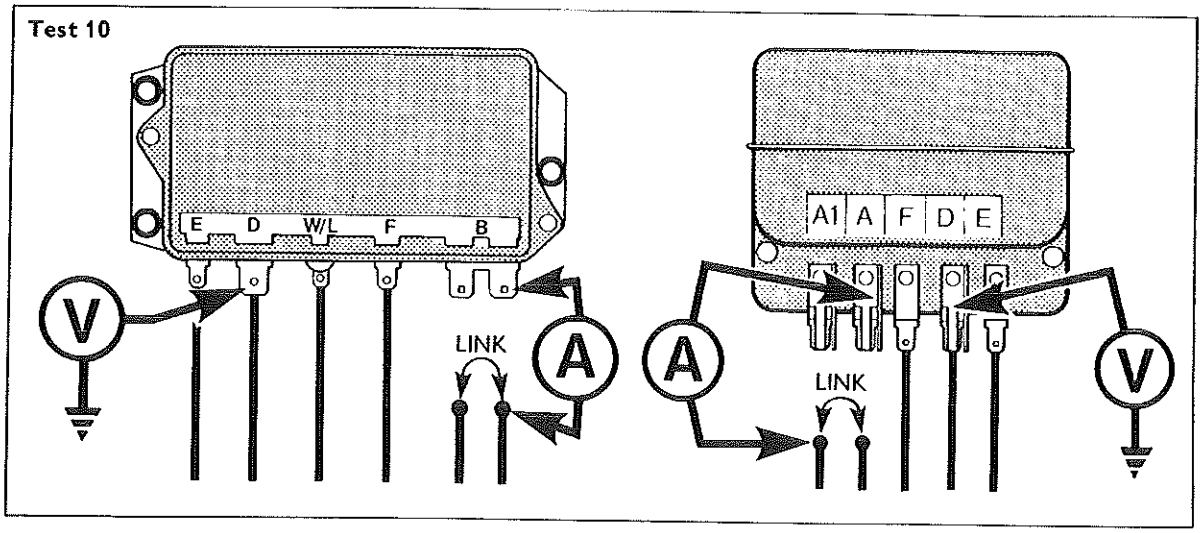
With the voltmeter and leads connected as for TEST 8, connect a suitable jumper lead between the control box 'E' terminal and a good earth point on the engine.

Again run the engine at approximately 3000 rev/min.

If the voltmeter now shows the correct voltage setting or can be adjusted to the correct setting, clean or make new control box earth connection. Remember to reduce engine speed to idle before re-checking settings each time an adjustment has been made. Proceed to TEST 10.

If the voltage setting is still outside the limits and cannot be adjusted replace the control box.





TEST 10: Cutting in Voltage

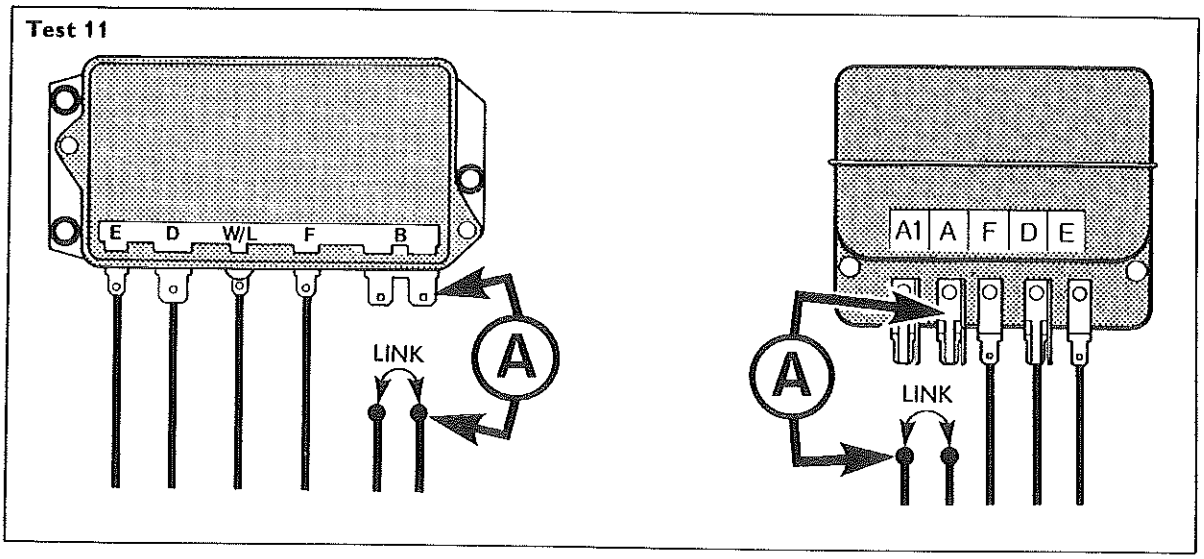
This test checks the voltage at which the cut-out contacts close.

With the voltmeter connected as for TEST 8, (between the control box 'D' terminal and earth), connect an ammeter between the control box 'A' or 'B' terminal and its disconnected leads.

Start engine, switch on the headlamps and slowly increase the engine speed. As the cut-out contacts close the voltmeter needle should flick back between 12·7–13·3V.

If the test is satisfactory proceed to TEST 11.

If the cut-out contacts close outside the limits, stop the engine, adjust the setting and re-check. If the correct setting cannot be obtained replace the control box.



TEST 11: Reverse Current

Reverse current assists the cut-out contacts to open when dynamo output falls.

Disconnect the voltmeter, but leave the ammeter connected as for TEST 10, i.e. between control box 'A' or 'B' terminal and the appropriate leads.

Slowly decrease engine speed from charging speed. The ammeter needle should show approximately 5A reverse or discharge current when the cut-out contacts open, indicated by the ammeter needle returning to zero.

If the test gives a satisfactory result for control boxes– RB340, RB310, 6GC etc. proceed to TEST 12. RB106, RB108 etc. proceed to TEST 13.

However, if the test is not satisfactory the control box should either be removed for a detailed check in the workshop or else replaced.

TEST 12: Current Regulator Setting

This test applies to current voltage (3 bobbin) control boxes only. The dynamo must produce maximum output irrespective of the battery state of charge.

Use a suitable clip to short together the voltage regulator contacts to prevent the voltage regulator operating. The ammeter must be connected between the 'B' terminals of the control box and the linked leads as in TEST 11.

Start and run the engine at approximately 3000 rev/min. The ammeter should show rated output of the dynamo (see chart).

Associated Dynamo	*Nominal Setting*
C40/1 (Fan 4½" or 114·3 mm) dia.	20A
C40/1 (Fan 5" or 127 mm) dia.	22A
C40A	10·5A
C40L	25A
C42	30A
C47	30A
C48	35A
C45PV/6	25A
C40T	22A
C40T 22762 & 22769	18A

If a satisfactory result is obtained, remove the clip, disconnect the ammeter and remake all connections before proceeding to TEST 13.

Adjust the setting of the regulator if the ammeter reading is too high or too low. Reduce engine speed to idle after making an adjustment, then re-check the setting. Remove clip, disconnect the ammeter and remake all connections when the correct setting is obtained.

If the regulator setting cannot be adjusted, replace the control box.

TEST 13: Charging Circuit — Supply Line Voltage Drop

The voltage drop along the insulated or supply line must be kept as low as possible.

Disconnect the lead from dynamo 'D' terminal. Connect:

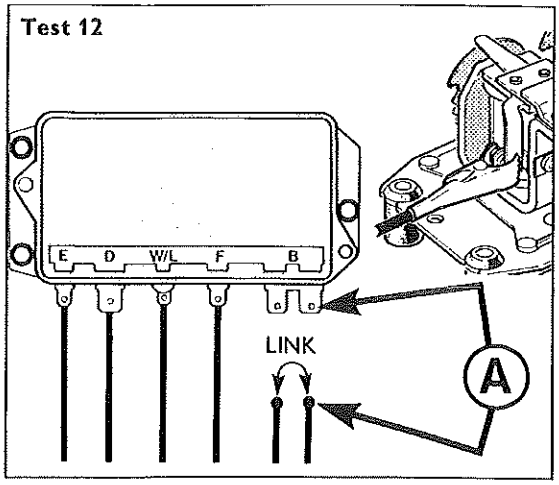
1. Ammeter between the dynamo 'D' terminal and its disconnected lead.
2. Voltmeter between the supply terminal of the starter solenoid and the 'D' lead.

Start engine and increase its speed. The voltmeter should indicate not more than 0·75V when the ammeter shows 10A.

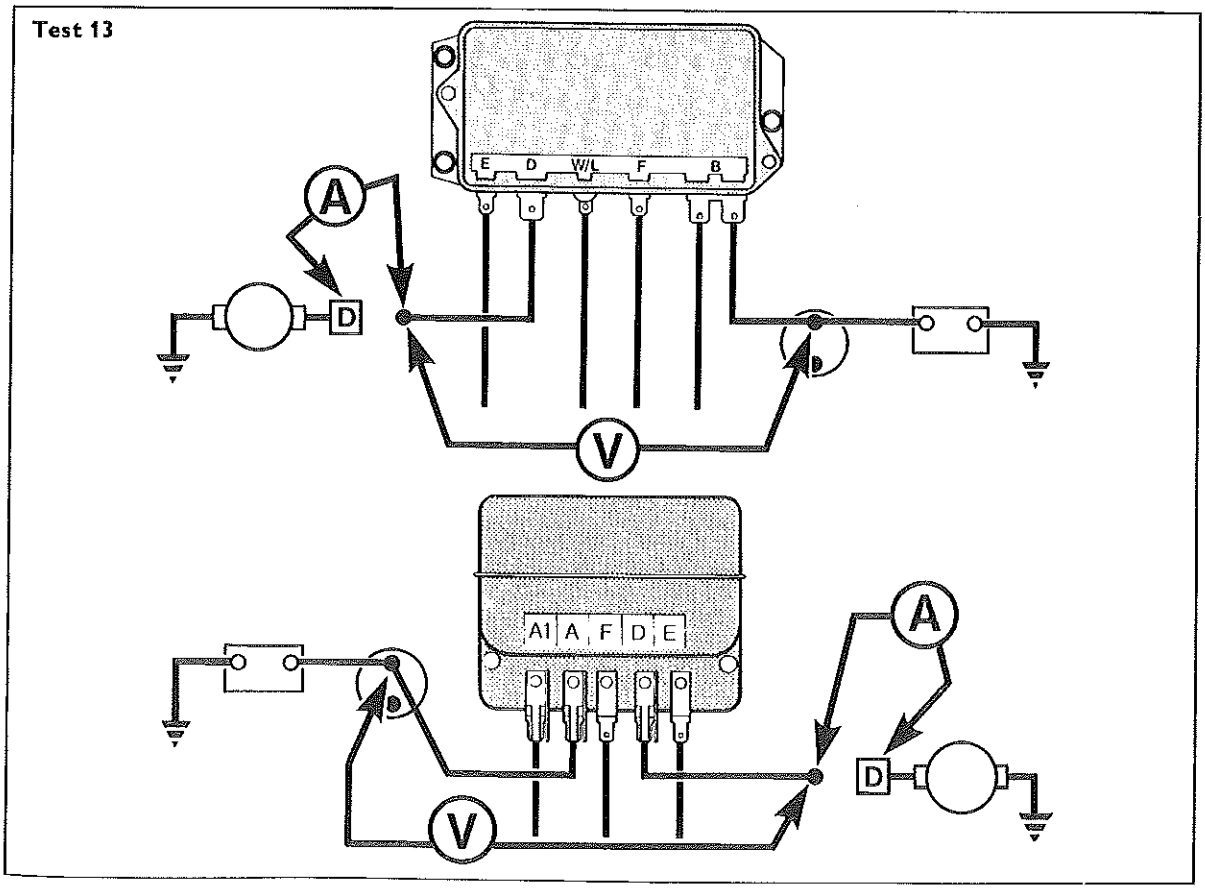
If more than 0·75V is shown on the voltmeter, check for poor connections etc. in the main insulated line and rectify as necessary.

Reconnect the dynamo.

Test 12



Test 13



ALTERNATORS

INTRODUCTION

The alternator produces alternating current which is converted to direct current before being connected to the vehicle electrical system. In this respect the alternator and dynamo are similar, since the current generated in the armature windings of the dynamo is also alternating current which has to be converted to direct current before it can be used to charge the vehicle battery.

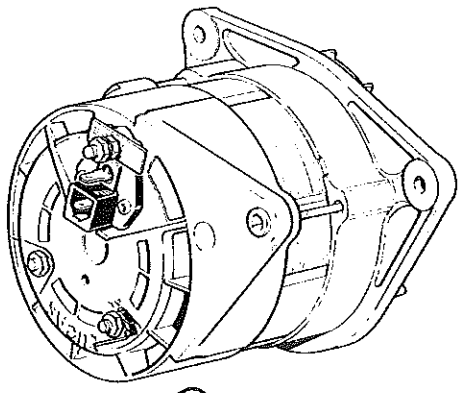
In the case of the dynamo, the alternating current is rectified by means of a commutator and brush-gear. The output of the alternator is rectified by semi-conductor devices, which allow electricity to flow in one direction only – and so supply uni-directional current to the vehicle electrical system.

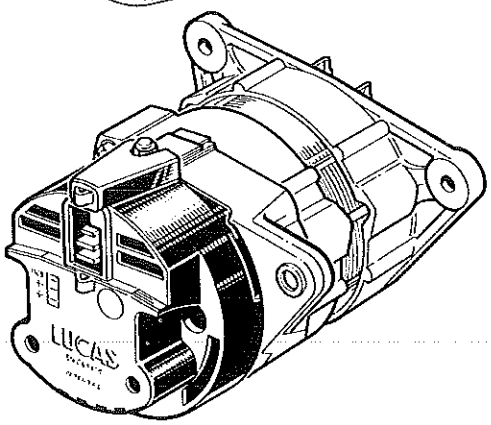
The alternator output is controlled by a voltage regulator which is completely electronic, having no vibrating contacts. The use of printed circuits and semi-conductor devices make this type of regulator more reliable and more stable than the conventional type of mechanical regulator used with dynamos.

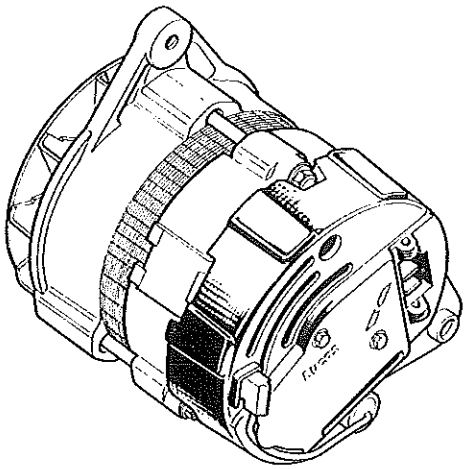
No cut-out is required with this type of control since the semi-conductor devices prevent reverse currents from flowing. Also, the self-regulating properties of the alternator limit the output current to a safe value so that there is no need for a current regulator.

The latest alternators represent an important development in design as the alternator and voltage regulator are combined to form a single unit, the regulator being housed within the end cover of the alternator. This simplifies the charging circuit without changing the operating principles.

Alternator design and construction allows a wider speed range and utilisation of higher pulley ratios, which in turn enables the battery to be charged at lower engine speeds. This can be beneficial in high density traffic conditions and on modern vehicles with high electrical loads.







TEST EQUIPMENT

Basic test equipment required for fault diagnosis on an AC charging system is:-

(i) Hydrometer
(ii) Voltmeter, scale 0–20V for nominal 12V systems.
(iii) Ammeter, scale 0–100A
(iv) Small jump lead

PRELIMINARY CHECKS

Check all connections within the charging system.

Inspect generator drive belt for signs of splitting or wear. Renew if required.

TEST 1: Battery Test

Using a hydrometer, check that the battery is at least 70% charged. The full battery test procedure is outlined in Part 1.

TEST 2: Drive Belt Tension

Allow 6·0 mm (0·25") play when moderate finger pressure is applied to the longest run of belt.

The alternator will not charge the battery if the drive belt is too slack. On the other hand, an excessively tight belt may damage the bearings of the alternator itself, the water pump or both.

If the belt is worn or oily, it should be replaced with a premium grade type.