

# LUCAS

*Quality*

## EQUIPMENT

VOLUME 2

### WORKSHOP INSTRUCTIONS

#### DISTRIBUTOR

#### MODEL DM2A4



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JOSEPH LUCAS LTD · BIRMINGHAM 19 · ENGLAND

# LUCAS WORKSHOP INSTRUCTIONS

## DISTRIBUTOR

### MODEL DM2A4

#### 1. GENERAL

The coil ignition equipment comprises a high tension induction coil and a combined distributor, contact breaker and automatic timing control assembly driven at half engine speed via the camshaft. Current flowing through the primary or low tension winding of the coil sets up a strong magnetic field about it. This current is periodically interrupted by a cam-operated contact breaker driven from the engine. The subsequent collapse of the magnetic field induces a high voltage in the secondary winding of the coil. At the same time, a rotor arm in the distributor connects the secondary winding of the coil with one of a number of metal electrodes, from which cables lead to the sparking plugs in the engine cylinders. Thus, a spark is arranged to occur in the cylinder under compression at the exact moment required to produce combustion of the mixture.

Mounted on the distributor driving shaft, immediately beneath the contact breaker, is an automatic timing control mechanism. It consists of a pair of spring-loaded governor weights, linked by lever action to the contact breaker cam. At slow engine speeds, the spring force maintains the cam in a position in which the spark is slightly retarded. Under the centrifugal force imparted by high engine speeds, the governor weights swing out against the spring pressure to advance the contact breaker cam, and thereby the spark, to suit engine conditions at the greater speed.

A vacuum-operated timing control is also fitted, designed to give additional advance under part-throttle conditions. The inlet manifold of the engine is in direct communication with one side of a spring-loaded diaphragm. This diaphragm acts through a lever mechanism to rotate the heel of the contact breaker about the cam, thus advancing the spark for part-throttle operating conditions. There is also a micro-meter adjustment by means of which fine alterations in timing can be made to allow for changes in running conditions, e.g., state of carbonisation, change of fuel, etc. The combined effects of the centrifugal and vacuum-operated timing controls give added efficiency over the full operating range of the engine, with a corresponding economy in fuel consumption.

A completely sealed metallised paper capacitor is utilised in this distributor model. One feature of this

type of capacitor is its property of being self-healing; should the capacitor break down, the metallic film around the point of rupture is vaporised away by the heat of the spark, so preventing a permanent short circuit. Capacitor failure will be found to be most infrequent with this new type.

A measure of radio and television interference suppression is provided by the carbon brush that forms the connection to the rotating electrode of the distributor. This brush, longer than is usual and formed of resistive carbon, has the effect of a suppression resistor in the lead from the coil to the distributor.

#### 2. ROUTINE MAINTENANCE

In general, lubrication and cleaning constitute normal maintenance procedure.

##### (a) LUBRICATION — EVERY 3,000 MILES

**Take great care to prevent oil or grease from getting on or near the contacts.**

Add a few drops of thin machine oil through the aperture at the edge of the contact breaker to lubricate the automatic timing control.

Smear the cam and the pivot on which the contact breaker works with Mobilgrease No. 2.

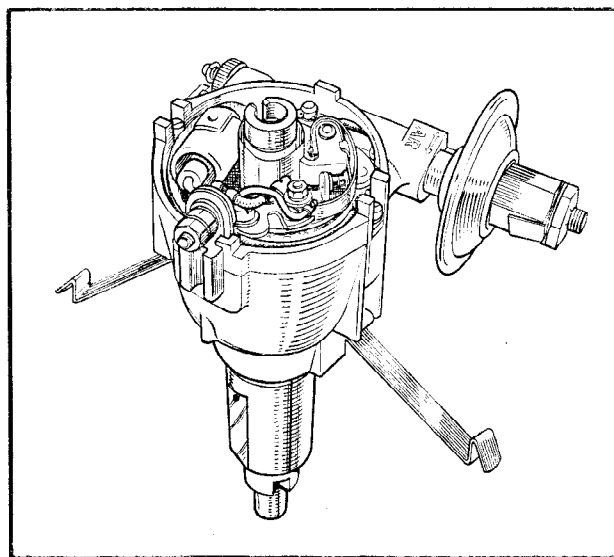


Fig. 1  
Distributor with cover and rotor removed



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Lift off the rotor arm by pulling vertically and apply to the spindle a few drops of thin machine oil to lubricate the cam bearing. It is not necessary to remove the exposed screw, since it is either drilled or affords a clearance to permit the passage of oil.

Replace the rotor arm carefully, locating its moulded projection in the keyway in the spindle and pushing it on as far as it will go, in order to avoid the risk of the moulded distributor cover being burned or tracked.

## (b) CLEANING — EVERY 6,000 MILES

Thoroughly clean the moulded distributor cover, inside and out, with a soft dry cloth, paying particular attention to the spaces between the metal electrodes. Ensure that the small carbon brush moves freely in its holder.

Examine the contact breaker. The contacts must be quite free from grease or oil. If they are burned or blackened, clean them with very fine carborundum stone or emery cloth, then wipe with a petrol-moistened cloth. Cleaning is facilitated by removing the contact breaker lever. To do this, remove the nut, washer, insulating piece and connections from the post to which the end of the contact breaker spring is anchored or, with early types, slacken the screw securing the slotted end of the contact breaker spring. The contact breaker lever may now be removed from its pivot. After cleaning, check the contact breaker setting. Turn the engine by hand until the contacts show the maximum opening. This should measure 0.014" to 0.016". If the measurement is incorrect, keep the engine in the position giving maximum opening, slacken the two screws securing the fixed contact plate and adjust its position to give the required gap. Tighten the screws. Recheck the setting for other positions of the engine giving maximum opening.

## 3. DESIGN DATA

- (a) Firing angles: 0°, 90°, 180°, 270°,  $\pm 1^\circ$   
Closed period:  $60^\circ \pm 3^\circ$   
Open period:  $30^\circ \pm 3^\circ$
- (b) Contact breaker gap: 0.014" to 0.016".
- (c) Contact breaker spring tension, measured at contacts: 20—24 oz.
- (d) Capacitor: 0.2 microfarad.
- (e) Automatic timing control: the operating range of the mechanism varies with each car model, and is given in the Test Data published in Lucas Service Bulletins. The performance of the control may be checked against these figures if the requisite equipment is available.
- (f) For current consumption, etc., of ignition coils, see SECTION C-8.

## 4. SERVICING

Before starting to test, make sure that the battery is not fully discharged, as this will often produce the same symptoms as a fault in the ignition circuit.

## (a) TESTING IN POSITION TO LOCATE CAUSE OF UNEVEN FIRING

Run the engine at a fairly fast idling speed.

Short circuit each plug in turn with, say, the blade of an insulated screwdriver or a hammer head placed across the terminal to contact the cylinder head. Short circuiting the defective plug will cause no noticeable change in the running note. On the others, however, there will be a pronounced increase in roughness.

Having thus located the defective cylinder, stop the engine and remove the cable from the sparking plug terminal.

Restart the engine and hold the cable end about  $\frac{3}{16}$ " from the cylinder head. If sparking is strong and regular, the fault lies with the sparking plug, and it should be removed, cleaned and adjusted, or a replacement fitted.

If, however, there is no spark, or only weak irregular sparking, examine the cable from the plug to the distributor cover for deterioration of the insulation, renewing the cable if the rubber is cracked or perished. Clean and examine the distributor moulded cover for free movement of the carbon brush. If a replacement brush is necessary, see that the correct type is used; the standard non-resistive brush is too short for use with this distributor and will not make contact with the rotating electrode.

If tracking has occurred, indicated by a thin black line, usually between two or more electrodes, a replacement distributor cover must be fitted.

## (b) TESTING IN POSITION TO LOCATE CAUSE OF IGNITION FAILURE

Spring back the clips on the distributor head and remove the moulded cover. Lift off the rotor, carefully levering with a screwdriver if necessary.

Check the contacts for cleanliness and correct gap setting as described in Para. 2 (b).

If an ammeter is fitted, switch on the ignition and turn the engine. Observe the reading, which should rise and fall with the closing and opening of the contacts if the low tension wiring is in order. When the reading does not fluctuate, a short circuit, or contacts remaining closed, is indicated. No reading indicates a broken or loose connection in the low tension wiring or badly adjusted or dirty contacts.

## (c) LOW TENSION CIRCUIT — FAULT LOCATION

If it is determined that the fault lies in the low tension circuit, by the eliminating check (b) above, switch on the ignition and turn the engine until the contact breaker points are fully opened.

Refer to the wiring diagram and check the circuit with a voltmeter (0—20 volts) between the following points (which refer to a normal ignition layout) and a good earth.



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If the circuit is in order, the voltage reading should be approximately 6 or 12 volts, according to the system. No reading indicates a damaged cable or loose connections, or a breakdown in the section under test.

## (i) BATTERY TO AMMETER

Connect the voltmeter between the ammeter terminal "B" and a good earth on the chassis. In some systems this section of the circuit is made by way of the starter switch, in which case a voltage check should also be made at the battery connection to the switch. No reading indicates a faulty lead or loose connection.

## (ii) AMMETER

Check the voltage to earth at the other ammeter terminal "A" and earth. No reading indicates a faulty ammeter.

## (iii) AMMETER TO CONTROL BOX

Connect the voltmeter between the control box terminal "A" and earth. No reading indicates a faulty lead or loose connection.

## (iv) CONTROL BOX

Check the voltage to earth at the control box terminal "A1". No reading indicates a broken connection in the series winding.

## (v) CONTROL BOX TO IGNITION SWITCH

Connect the voltmeter between the ignition switch terminal, to which the lead from the control box is connected, and a good earth. No reading indicates a faulty lead or loose connection.

## (vi) IGNITION SWITCH

Check the voltage between the other terminal of the ignition switch and earth. No reading indicates a fault in the switch.

## (vii) IGNITION SWITCH TO IGNITION COIL

Remove the lead from the ignition coil "SW" terminal, and connect the voltmeter between the free end of the cable and earth.

On systems incorporating control box model RF95, this portion of the circuit is made by way of the control box "A3" terminal, and a voltage check should be made at this point also.

Re-make the connection to the coil.

## (viii) IGNITION COIL

Disconnect the lead from the "CB" terminal of the coil and connect the voltmeter between the "CB" terminal and a good earth. No reading indicates a fault in the primary winding of the coil, necessitating coil replacement. If, however, the correct reading is obtained, remake the cable connection to the coil terminal.

## (ix) IGNITION COIL TO DISTRIBUTOR

Disconnect the low tension cable to the distributor and connect the voltmeter between the end of the

cable removed and earth. No reading indicates a faulty lead or loose connection. Re-connect the cable to the distributor.

## (x) CONTACT BREAKER AND CAPACITOR

Connect the voltmeter across the contact points. If no reading is obtained, re-check with the capacitor removed. If a reading is now given, the capacitor is faulty and must be replaced.

(xi) Measure the contact breaker spring tension. This should be 20-24 oz., measured at the contacts.

## (d) HIGH TENSION CIRCUIT

If, after carrying out these tests, the fault has not been located, remove the high tension lead from the centre terminal of the distributor cover. Switch on the ignition and turn the engine until the contacts close. Flick open the contact breaker lever whilst the high tension lead from the coil is held about  $\frac{3}{16}$ " from the cylinder block. If the ignition equipment is in good order, a strong spark will be obtained. If no spark occurs, a fault in the circuit of the secondary winding of the coil is indicated and the coil must be replaced.

The high tension cables must be carefully examined, and replaced if the rubber insulation is cracked or perished, using 7 mm. rubber covered ignition cable. To fit cables to ignition coils or to distributor covers with vertical outlets, pass the cable through the knurled, moulded terminal, bare about  $\frac{1}{4}$ " of the end of the cable, thread the wire through the brass washer (removed from the original cable) and bend back the strands. Finally screw the moulded terminal into the coil moulding or distributor cover.

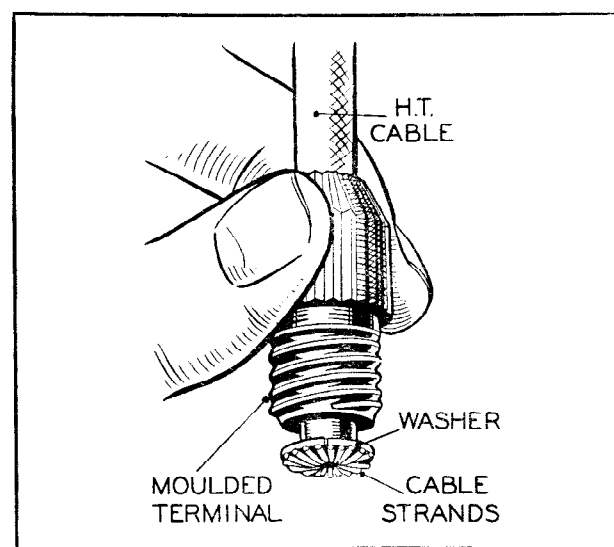


Fig. 2  
Fitting h.t. cable to ignition coils or to distributor covers with vertical outlets



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To make connections to the terminals in distributor covers having horizontal outlets, remove the cover and slacken the screws on the inside of the moulding. Cut the cables to the length required and push firmly home in the holes in the moulding. Tighten the screws, which will pierce the rubber insulation to make good contact with the cable core. The connection to the centre terminal is made accessible by removing the small carbon brush.

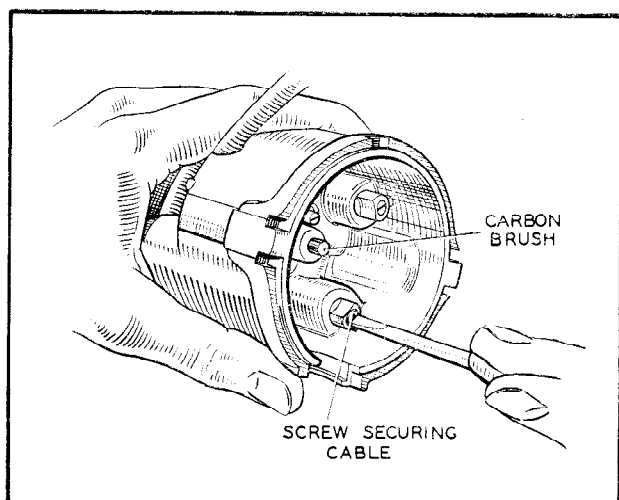


Fig. 3

Fitting h.t. cable to distributor covers with horizontal outlets

The cables from the distributor to the sparking plugs must, of course, be connected in the correct firing order.

## (e) CONTACT BREAKER MECHANISM

Check and adjust as described in para. 2.

Ensure that the moving arm moves freely on the pivot. If sluggish, remove the arm and polish the pivot pin with a strip of fine emery cloth. Replace the arm and lubricate with a spot of clean engine oil.

## (f) DISMANTLING

When dismantling, carefully note the positions in which the various components are fitted, in order to ensure their correct replacement on reassembly. If the driving dog or gear is offset, or marked in some way for convenience in timing, note the relation between it and the rotor electrode and maintain this relation when reassembling the distributor.

(i) Spring back the securing clips and remove the moulded cover. Lift the rotor arm off the spindle, carefully levering with a screwdriver if it is tight.

Slacken and remove the screw securing the end of the contact breaker spring, taking care not to lose the two fibre insulating washers. Lift off the contact breaker lever and the fibre washer beneath it.

Remove the two screws securing the fixed contact plate, and remove the plate. (See note (h) page 5, on

Replacement Contacts.) Withdraw the single securing screw and remove the capacitor.

(ii) Remove the two screws at the edge of the contact breaker base plate.

Remove the split pin securing the vacuum unit link to the rotating contact breaker plate.

Lift the contact breaker base assembly out of the distributor body. Note that the low tension terminal

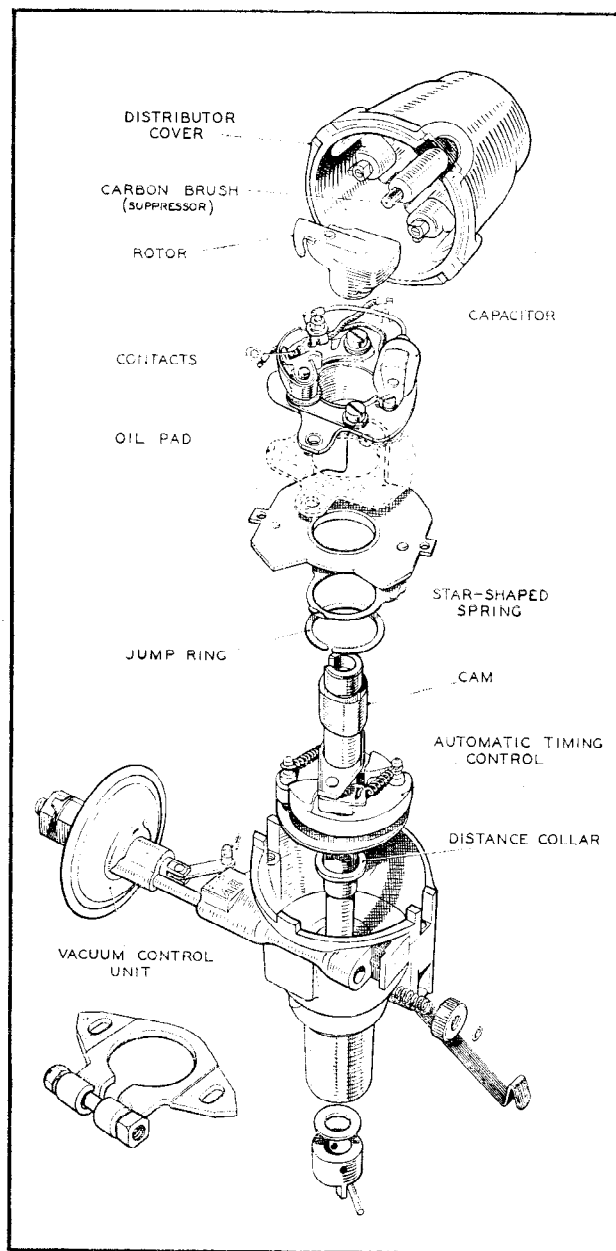


Fig. 4

Distributor, dismantled



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and its moulded block are attached to the lower plate.

(iii) The contact breaker base assembly can be dismantled by removing the circlip and star washer located under the lower plate.

(iv) Remove the circlip on the end of the micrometer timing screw, and turn the micrometer nut until the screw and the vacuum unit assembly are freed. Take care not to lose the ratchet and coil type springs located under the micrometer nut.

(v) Take out the screw inside the cam and remove the cam and cam foot. The weights, springs and toggles of the automatic timing control can now be lifted off the action plate. Remove the driving dog or gear from the shaft, and lift the shaft out of its bearing.

(vi) The single long bearing bush used in this distributor can be pressed out of the shank by means of a shouldered mandrel.

## (g) REASSEMBLY

(i) If the bearing has been removed the distributor must be assembled with a new bush fitted. The bush should be prepared for fitting by allowing it to stand completely immersed in thin engine oil for at least 24 hours. In an emergency this period of soaking may be shortened to 2 hours by heating the oil to 100°C.

Press the bearing into the shank, using a shouldered, polished mandrel of the same diameter as the shaft.

**Under no circumstances should the bushes be overbored by reamering or any other means, since this will impair the porosity and thereby the effective lubricating quality of the bushes.**

(ii) Place the distance collar over the shaft, smear the shaft with clean engine oil and fit it into its bearing.

(iii) Refit the vacuum unit into its housing and replace the springs, milled adjusting nut and securing circlip.

(iv) Reassemble the automatic timing control. See that the springs are not stretched or damaged, and that

there is a washer in position under each toggle. Place the cam and cam foot assembly over the shaft, engaging the projections on the cam foot with the toggles, and fit the securing screw.

(v) Moisten the felt pad underneath the rotating contact breaker plate with a drop of thin machine oil. Fit the rotating plate to the contact breaker base plate and secure with the star washer and circlip. Refit the contact breaker base assembly into the distributor body. Engage the link from the vacuum unit with the bearing bush in the rotating plate, and secure with the split pin. Insert the two base plate securing screws, one of which also secures the earthing lead from the contact breaker plate.

(vi) Fit the capacitor into position. The eyelet on the contact breaker earthing lead is held under capacitor fixing screw. Place the fixed contact plate in position and secure lightly with two securing screws. One plain and one spring washer must be fitted under each of these screws.

Reassemble the terminal screw and eyelets on the fixed contact plate. Take care to position the two insulating washers correctly, so that the eyelets and the screw cannot touch the fixed contact plate.

Place the fibre washer over the contact breaker pivot and refit the contact breaker lever and spring. Set the gap to 0.014"—0.016" and tighten the securing screws of the fixed contact plate.

(vii) Finally fit the rotor arm into position, locating the register and pushing it fully home, and refit the moulded distributor cover.

## (h) REPLACEMENT CONTACTS

If the contacts are so badly worn that replacement is necessary, they must be renewed as a pair and not individually. The contact gap must be set to 0.014"—0.016"; after the first 500 miles' running with the new contacts in position the setting should be checked and the gap reset to 0.014"—0.016". This procedure allows for the initial "bedding-in" of the heel of the new contact breaker lever.

