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LUCAS

Quality

EQUIPMENT

VOLUME 2

WORKSHOP INSTRUCTIONS

WINDSCREEN WIPER
MODEL DR1

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WINDSCREEN WIPER

MODEL DR1 (12 VOLT)

1. GENERAL

The dual arms of the windscreen wiper are driven by a cable rack from a separately mounted motor. The rotary motion of the motor armature is converted to the reciprocating motion of the cable rack by means of a single stage reduction gear, connecting rod and crosshead in the gearbox.

The cable rack comprises an inner steel core carrying a wire helix, the whole being run within rigid connecting tubes between motor and wheelboxes. At the wheelboxes the rack engages with toothed wheels on the wiper arm spindles. The method of arm-to-spindle fixing consists of an internally splined headpiece and a retaining clip mating with a splined driving drum.

A current-operated thermostatic circuit breaker mounted within the motor gives protection against excessive overloading. This device will operate if, for example, the blades are obstructed by ice or packed snow on the windscreen, and normal working will be resumed when the motor has cooled.

A series-connected field resistance is normally included to give two-speed working, Normal or High, the higher speed being intended for use in conditions

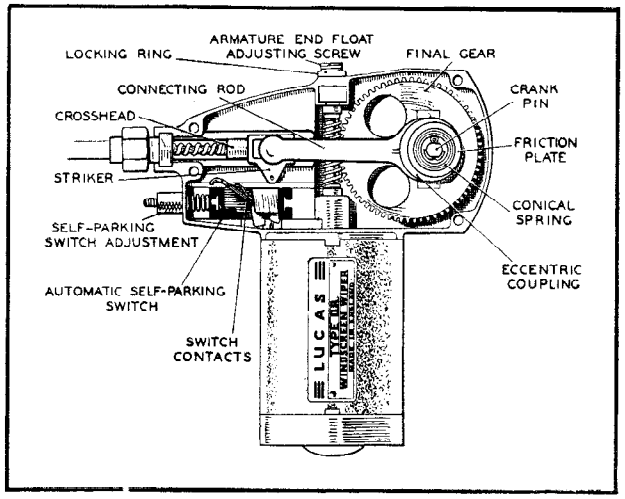


Fig. 1. Model DR Windscreen Wiper Motor with Gearbox Cover Removed.

of heavy rain or snow. The desired speed is selected by operating a facia mounted control switch. In the case of single-speed models the field resistance is left unconnected.

When the control switch is turned to the Park position the direction of rotation of the motor is reversed. This causes an eccentric coupling between the crankpin and the connecting rod to alter the position of crosshead traverse. A striker carried by the crosshead then trips the self parking switch and the blades come to rest in the correct parking position irrespective of their positions at the moment of turning the control switch to Park.

2. MAINTENANCE

(*a*) The only maintenance necessary is an occasional inspection of the rubber wiping elements which after long service become worn and should be renewed. In the case of windscreens with flat surfaces the blades and elements must be renewed as units, but with the articulated 'Rainbow' blades as used with curved windscreens the elements can be replaced without the necessity of fitting a complete new blade (see para 5a).

(*b*) All moving parts are packed with grease during manufacture and need no further attention.

(*c*) If the blades fail to park correctly, the parking position may be corrected by turning the knurled adjusting nut adjacent to the gearbox cable outlet. Turn the adjustor one or two serrations at a time and test for correct operation at each adjustment.

3. TEST DATA

(*a*) Current consumption (motor cold and with cable rack withdrawn from tubing): 3.1 amps. max.
(*b*) Stall current (motor cold and thermostat disconnected): 15-16 amps.
(*c*) Field current: 1.5 amps. (approx.).
(*d*) Field resistance: 7.75-8.25 ohms.
(*e*) Armature resistance (between adjacent commutator segments): 0.26-0.32 ohms.
(*f*) Speed control resistance: 12 ohms.
(*g*) Speed of final gear (motor cold):
Low speed, 45-49 r.p.m.
High speed, 66-74 r.p.m.
(*h*) From cold and with the motor stalled, the protective thermostat should operate within 13 minutes. Normally the thermostat operates at 135°–150°C. and should reclose before the temperature has fallen to not

less than 80°C. The contact pressure should not be less than 50 grammes at 20°C.

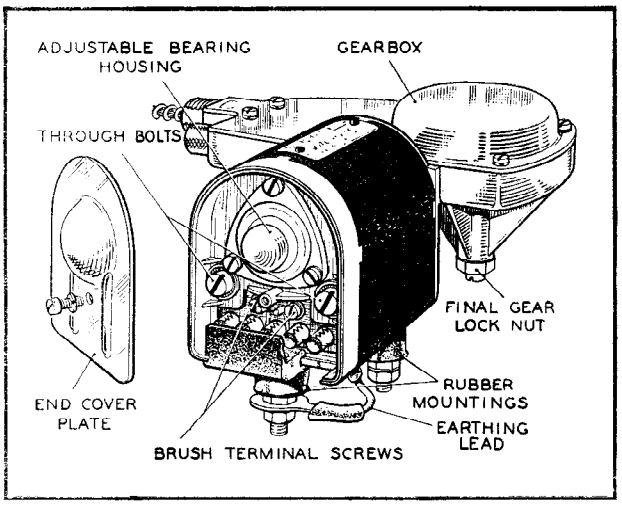


Fig. 2. Wiper Motor with End Cover Plate Removed.

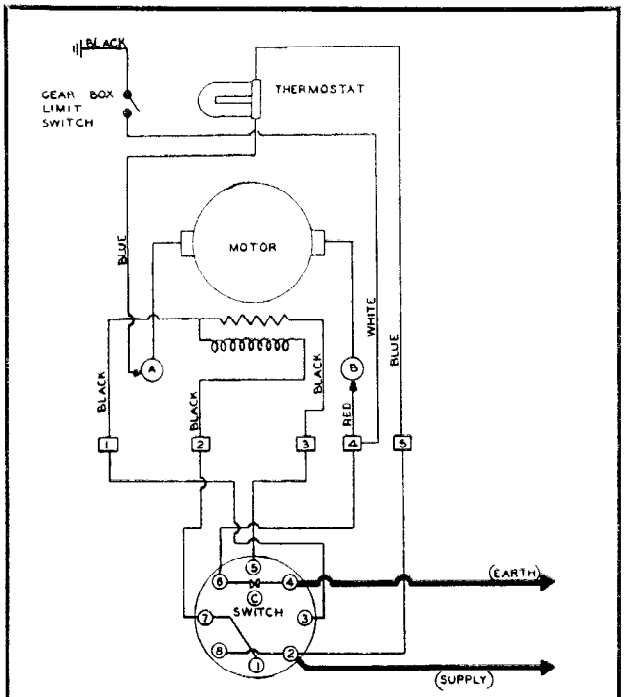
4. SERVICING

(*a*) If any of the following visible faults occur, the switch circuit or its operating mechanism will probably be at fault.

(i) *On switching from Park to Normal the wiper arms continue their downward stroke instead of rising to the normal position of traverse.*
This failure is caused by a faulty control switch—the spring contacts, operated by a cam on the spindle, making contact before the other stud-type contacts have taken up their Normal positions. The motor thus starts in a reverse direction and the striker on the cross-head pushes past the self-parking switch. If this fault is suspected, check by substitution and if necessary fit a new switch.

(*ii*) *On switching from Normal to Park the wiper arms traverse in the Park position, but the motor is not switched off.*
The self-parking switch in the gearbox is faulty and the striker on the cross-head has failed to open the leaf contacts. Examine the self-parking switch and, if necessary, bend the leaf contact spring back into line with the striker. If the spring contact leaf has lost its tension fit a new switch.

(*iii*) *On switching from Park to Normal the wiper arms, instead of rising to their normal positions, traverse in the Park position (or, for a similar reason, the arms continue to operate on switching from Normal to Park).*
The eccentric on the final drive gear fails to operate, when the motor changes from reverse to normal, and the wiper arm traverse continues in the Park position. To check, remove the gear box cover and observe whether the length of the connecting rod alters when the motor is switched from Park to Normal. If the length does not alter, remove the eccentric and connecting rod for examination and, if necessary, replace them with a new unit.



KEY TO SWITCH POSITIONS

HIGH

Terminal 1 connected to terminal 8
Terminal 4 connected to terminal 5
Contacts C closed

NORMAL

Terminal 3 connected to terminal 4
Terminal 7 connected to terminal 8
Contacts C closed

PARK

Terminal 2 connected to terminal 3
Terminal 6 connected to terminal 7
Contacts C open

Fig. 3. Circuit Diagram of Motor and Control Switch.

(*b*) Before proceeding with the following tests, switch on the wiper and note the current being supplied to the motor, using either the instrument panel ammeter or preferably a moving coil ammeter, 0—20 amps., connected in the wiper circuit. Then proceed as follows:—

(*i*) *Wiper takes no current.*
Examine the fuse protecting the wiper circuit. If it has blown, examine the wiring of the motor circuit, and that of all other circuits protected by the fuse, for evidence of chafed leads or short circuits. Replace any leads which are badly worn or chafed, if necessary fitting protective sleeving over the leads to prevent a recurrence of the fault.

If the fuse has not blown, examine the wiring of the motor circuit for breaks. Test the control switch for faulty spring contacts, by connecting a wire between terminal number (4) on the switch and socket number (4) on the motor; if the contacts are faulty, the motor will now work when the switch is turned to Normal.

(*ii*) *Wiper takes abnormally low current.*
First ensure that the battery is not discharged, as this will obviously result in a falling-off in performance of the motor.

Check the field current by connecting an ammeter between socket number (1) on the commutator end bracket and terminal number (3) on the control switch. Disconnect the existing cable. On turning the control switch to Normal the ammeter should give a reading of 1.5 amps. (approx.). Other possible causes are the brushgear, commutator, armature, or the thermostatic circuit breaker. The thermostatic circuit breaker, if the motor is cold and disconnected from the control switch, may be tested for continuity by connecting an ohmmeter between socket number (5) and the blue cable at the commutator end bracket. Next, remove the commutator end bracket, as described in Para. 4(*d*), and examine the brushgear to see that it will bear firmly on the commutator. The tension spring must be renewed if the brushes do not bear firmly on the commutator. The brush levers must move freely on their pivots. If they are stiff, they should be freed by working them backwards and forwards by hand.

Examine the commutator and, if necessary, clean with a petrol-moistened cloth, carefully removing any carbon dust from between the commutator segments. If the armature is suspected, check by substitution.

(*iii*) *Wiper takes abnormally high current.*
The normal current consumption of the wiper is given in Para. 3. If the ammeter reading is greatly in excess of this value, field coil, armature windings or bearings may be at fault.

Check the resistance of the field coil by disconnecting the switch from the motor and connecting an accurate ohmmeter across sockets (1) and (2) on the commutator end bracket. If the field resistance is much below 7.75 ohms there is a short circuit somewhere in the windings and a new field coil must be fitted. Other evidence of a short circuit will be charred leads from the control switch to sockets (1) and (2) on the commutator end bracket.

Check that a blow on the gearbox end bracket has not tightened the armature end float adjustment screw. This screw and lock nut are provided at the gear box end of the armature shaft to take up the end thrust of the armature.
Another bearing which may become out of alignment is contained in the bearing housing on the commutator end bracket. This bearing may be adjusted by loosening the three securing screws one quarter of a turn and, while the motor is running, moving the bearing housing until a minimum current reading is obtained on the ammeter. Both the above faults are rare and under normal conditions adjustment is unnecessary.

Sluggish operation with excessive current consumption may also be caused either by frictional losses in a badly positioned driving cable or by the wiper spindle binding in its bearing in the wheelbox. See that the run of the driving cable contains no sharp bends and, if necessary, add suitable distance pieces under the motor mounting bolts to straighten the run of the cable. The next step is to remove the commutator end bracket and, if necessary, the armature, as described in Para. 4(*d*). Examine and clean the commutator and brushgear, taking particular care to remove any pieces of carbon that may be short-circuiting adjacent segments of the commutator. To test the armature windings the use of a volt drop test and growler is required. If these are not available the armature should be checked by substitution. When dismantling, check all the internal wiring of the motor for evidence of short-circuiting due to chafed or charred insulation. Slip a new piece of sleeving over any charred leads and arrange them so that they do not rub against sharp edges.

(*c*) *Motor operates but does not drive the wiper arms.*

This symptom indicates a break in the transmission which can be located by examining the drive at the gearbox and wheelboxes whilst the motor is running.

(d) *Dismantling.*

(*i*) To remove the motor unit and rack; release the wiping arms from their spindles (para. 5e); undo the nut on the Bundy tubing at the gearbox; remove the nuts from the motor mounting bolts, and withdraw motor and cable rack. The covers can then be removed from the gearbox and commutator end bracket. Withdraw the split pin from the crank pin on the final drive gear being

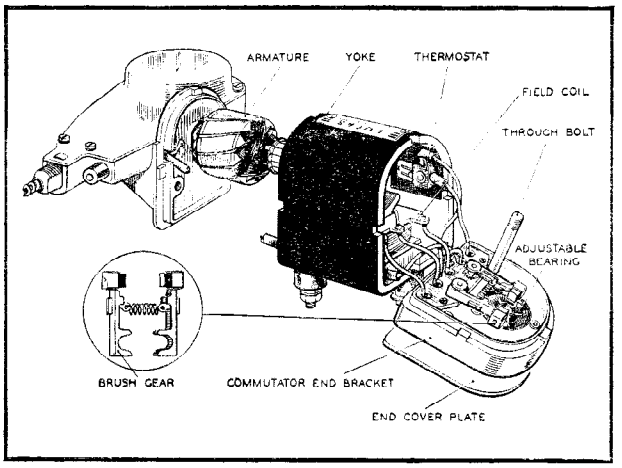


Fig. 4 Dismantled View of Wiper Motor.

careful to retain the conical spring and to note the order in which the parts are removed. The eccentric coupling and connecting rod can now be removed, thus releasing the cross-head and rack. The final gear may now be withdrawn from its bearing in the gearbox casting after its locking nut has been removed.

(*ii*) The gearbox, yoke and commutator end bracket can be separated by the removal of the two through bolts, located one each side of the adjustable bearing housing. When the commutator end bracket is parted from the yoke the brush gear will fall out and care must be taken not to lose the parts. The armature is now free to be withdrawn from its bearings in the gearbox casting. Parting the gearbox and commutator end bracket from the yoke must be done with care in order to avoid damaging the interconnecting cables.

Removal of the adjustable bearing housing from the commutator end bracket is not advisable as this would disturb the manufacturer's setting.

(*iii*) If it is necessary to remove the field coil, mark each end of the pole piece to ensure that it is refitted to the correct polarity. To remove the field coil, unscrew the two mounting plate securing screws and remove the plate. The two screws securing the field coil to the yoke are now accessible and can be unscrewed to release the coil.

(e) *Reassembly.*

(*i*) Locate the yoke with the gearbox casting and slide the armature shaft into the gearbox, arresting it before the commutator has entered the confines of the yoke. Assemble the brushgear on the commutator end bracket pivots then locate the commutator end bracket on the yoke. As the brushes slide over the commutator, allow the armature to slide into the yoke until the complete unit is assembled. Insert the two through bolts and screw them firmly home in the gearbox casting.

(*ii*) Place the adjustable bearing housing on the armature and insert the three securing screws. Before tightening the screws connect the control switch to the motor and place an ammeter in the supply circuit. Switch to Normal and adjust the bearing until a minimum reading is obtained on the ammeter, then tighten the three securing screws.

(*iii*) The reassembly of the gearbox is a reversal of the procedure for dismantling given in Para. 4(*d*).

When reassembling, use Ragosine LZ3 for greasing the final gear, slide and cam, and (sparingly) Oiline B.B.B., for the armature bearings.

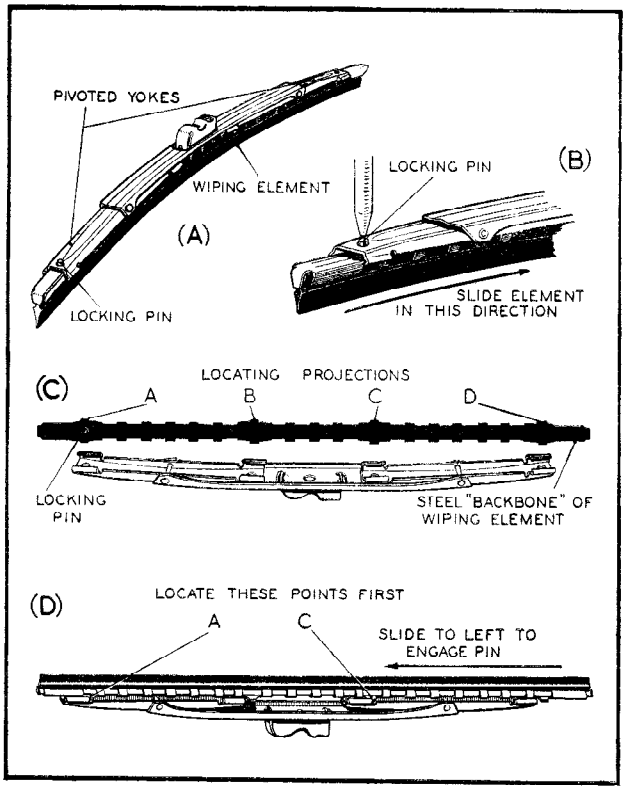


Fig. 5. Method of Replacing Rubber Wiping Element.

5. FITTING AND ADJUSTING WIPER ARMS

(a) *Fitting a new wiping element to a Rainbow blade, as used on curved screens.*

New elements must be handled with care. It is particularly important to keep the rubber clean and free from oil and petrol and to avoid distortion of the metal 'backbone'.

Fig. 5A shows an assembled 'Rainbow' windscreen wiper blade. To replace a defective element proceed as described below:

(*i*) Press down the locking pin and slide the old element in the direction shown in Fig. 5B to free it from the supporting yokes.

(*ii*) There are four pairs of locating projections along the 'backbone' of the new wiping element, as shown in Fig. 5C. When fitting, first locate the element projections 'A' and 'C', afterwards guiding projections 'B' and 'D' into position and sliding the element to the left, as shown in Fig. 5D, until the locking pin is heard to snap into position.

(*b*) *Fitting a blade to a wiper arm.*

Pull the wiper arm away from the windscreen and insert the curved 'wrist' of the arm into the slotted spring fastening of the blade. Swivel the two components into engagement.

(*c*) *Fitting a wiper arm to a driving spindle.*

If necessary, first ensure that the wiper spindles are in the correct parking position by switching on the ignition and turning the wiper control switch to Normal and then to Park.

To fit the arms, press the headpieces on to the spindles at the correct parking angle until the retaining clip is heard to snap over the end of the spindle drum.

(*d*) *Testing.*

Switch on the ignition and turn the wiper control switch to Normal. The two wiped areas should be approximately symmetrical on the windscreen, due allowance being made for high-speed working and the influence of strong side winds.

Turn the wiper control switch to Park. The arms should now come to rest in the correct parking position.

If the factory setting has been altered, the above conditions of wiping and parking will not be obtained.

(e) *To adjust.*

Correct operation can be obtained by adjusting the position of the arms relative to the spindles. If necessary, the position of the arms may be adjusted by removing and re-engaging them with the splined driving spindles, the angular pitch of the splines being 5 degrees.

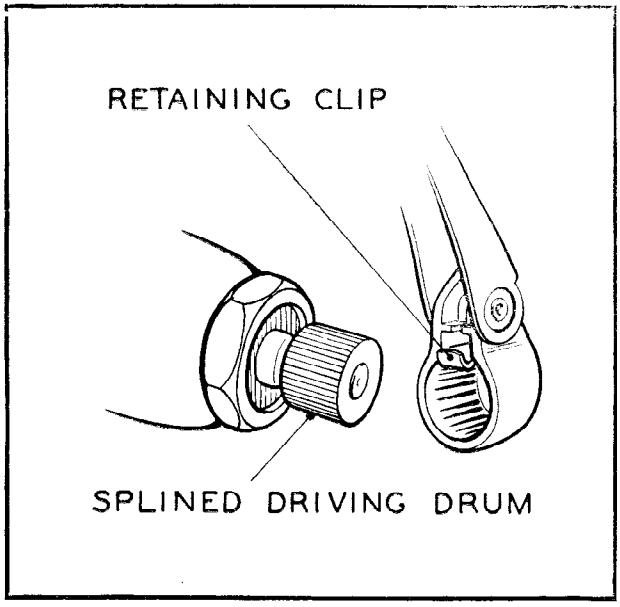


Fig. 6. Method of Arm-to-Spindle Fixing.

Do not attempt to turn the arms whilst in position, but press back the retaining clip (Fig. 6) in the headpieces and withdraw the arms from the driving spindles. Refit in the desired position. The above adjustment may affect the self-parking position. If so, it may be corrected by turning the knurled adjusting nut as described in para. 2(c).

(*f*) *To Reverse Parking Position.*

If it is required to park the arms in the opposite direction, the two internal connections to the brushgear, which can be identified as the red and blue leads on the commutator end bracket, must be reversed and the self-parking switch in the gearbox changed over to its alternative position. The wiper arms must now be reset in accordance with the instructions given in para. 5(e).