HIGH SPEED POSITION

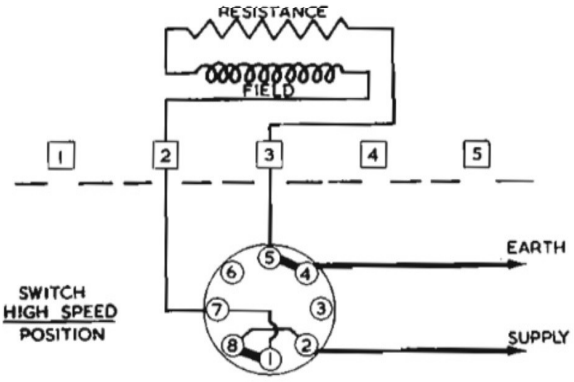
On switching to the 'H' position, high speed wiping is obtained.

This is brought about electrically by the insertion of a resistance in series with the field coil. You remember we pointed out this resistance winding on the field coil a few pages back. It has the effect of reducing the field current and hence the field strength of the motor. With the field strength reduced, the armature turns at a faster speed.

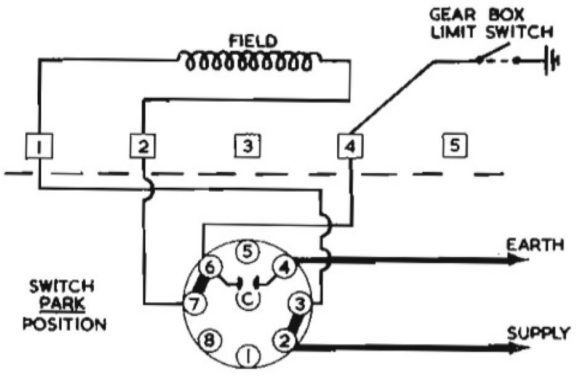
It should be realised that this increase of wiping speed is only obtained by a corresponding reduction in the motor torque. This in turn is compensated by a reduction in the wiper blade load due to the heavy flooding of the windscreen surface such as occurs in exceptionally heavy rain, tropical downpour, etc. If the high speed wipe is maintained under normal conditions of loading, the motor will eventually overheat and the thermostatic switch will finally stop it completely and it will remain stopped until the motor temperature again falls to normal.

Remembering that the armature circuit remains unchanged, now follow out the field circuit with its resistance in series.

Commence from the switch supply terminal No. 2. The current path is via the fixed link to (8), through the rotor segments to (1), through another fixed link to (7), direct to field terminal (2) on motor, through the field and its resistance to motor terminal (3). From there it passes to switch (5) through rotor segment to (4) direct to earth.



TERMINAL 8 CONNECTED TO TERMINAL 1.
" 4 " " " 5.



TERMINAL 2 CONNECTED TO TERMINAL 3
" 7 " " " 6
CONTACTS (C) OPEN

THE PARKING POSITION

This circuit shows the control switch turned to the 'P' or park position. The motor switches off, and the blades park automatically.

As far as the electrical side of the operation is concerned, the field circuit is momentarily reversed; that is, the feed is in the opposite direction. The supply is now switched via terminal 2 and 3 of the control switch to the No. 1 terminal of the field winding, as opposed to No. 2 for 'normal' running. Current will thus flow in the reverse direction through the field circuit, reversing the rotation of the motor, but current will only flow as long as the earth side of the circuit is complete. The contacts 'C' in the control switch are open in this position, the only available earth being provided through the gearbox limit switch. You can follow this from No. 2 terminal of the field winding, through switch terminals 7 and 6 and on via terminal 4 at the motor, to the limit switch and earth.

If this switch contact is now broken, the motor will stop.

CIRCUIT TESTING—STAGE 1.

The Normal Running Position

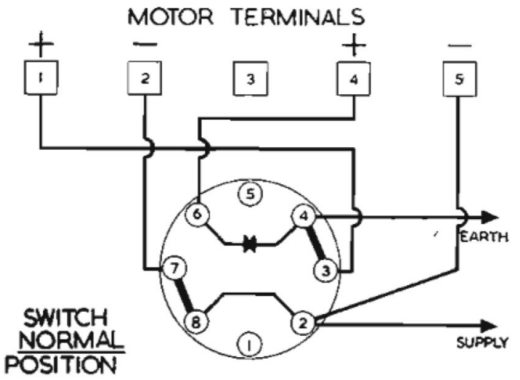
Having examined the motor and switch circuits, we can now formulate a simple routine for testing either or both.

Assuming that our problem is an electrical one, the first thing is to localise the trouble to either the motor, the switch, or the wiring.

To do this the following procedure is recommended:

1. Check the current supply to the circuit. Commencing from the A4 fuse, this can easily be checked with the voltmeter.
2. Turn the switch to NORMAL running position. With the voltmeter, take readings at the wiper motor terminal block. We should expect to find full voltage readings between terminals 1 and 2 (Field) and terminals 4 and 5 (Armature).

This will indicate that the switch itself and its wiring to the motor is in order in the ' N ' position. If a LOW voltage reading is obtained at the Armature terminals 4 and 5 it suggests that the motor is taking excessive current and will generally necessitate its removal. If ' No Voltage ' is obtained from terminals 1 and 2 or 4 and 5 we can assume that an open circuit exists either in the switch, or its wiring, which can be traced by following the circuit shown in this illustration.



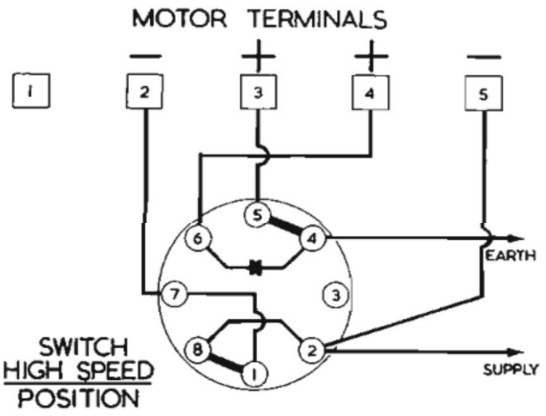
CIRCUIT TESTING—STAGE 2.

The High Speed Running Position

Having checked the wiring and switch for the normal running position, we can now move to the HIGH SPEED position of the switch.

For this condition we should have full voltage at terminals 2 and 3 (Field Resistance) and 4 and 5 (Armature) of the motor terminal block.

If NO VOLTAGE is obtained at either pair of terminals an open circuit exists in the switch or the wiring.



CIRCUIT TESTING—STAGE 3.

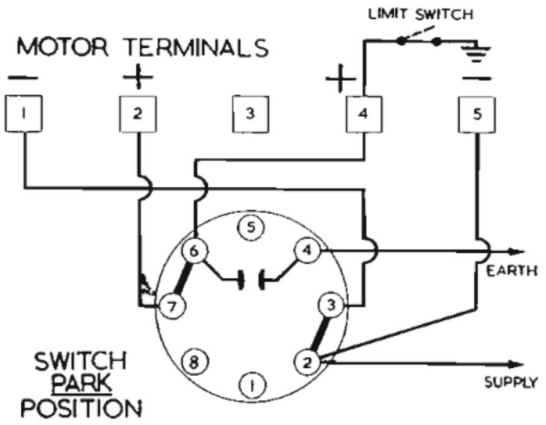
The Parking Position

We can now check the circuit with the switch in the PARK position, which will also check the operation of the limit switch :—

1. Connect voltmeter to terminals 1 and 2 (Field) at motor terminal block.
2. Turn switch to NORMAL position — Voltage reading sho ⊐ ld be obtained.
3. Turn switch onwards to the PARK position when polarity at terminals 1 and 2 will be reversed, the motor rotation will reverse and then the wiper will PARK at the end of the stroke.

If upon changing the switch from NORMAL to PARK the motor stops with no voltage readings at terminals 1 and 2, check the LIMIT SWITCH circuit and the EARTH to the motor body itself.

The circuits we have just examined are applicable to the DR1 wiper motor only. We can now tun to the more recent type DR2 motor and its circuit.



THE DR2 EXTERNAL VIEW

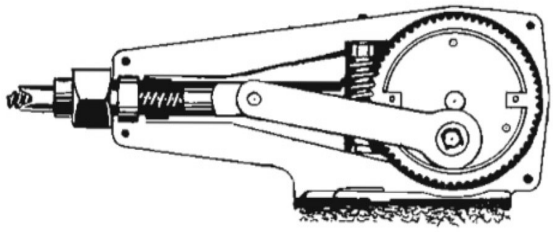
The DR2 is the new model in the DR range, being basically similar to the DR1, and designed to give approximately the same performance. It is suitable for 6, 12 and 24 volt working, with varying angles of wipe from 90° to 130°.

The models so far fitted to vehicles are constructed for single speed operation only.

The DR2 is not thermostatically controlled, since the motor is designed to withstand stall currents for a considerable time.

A different arrangement for self-parking allows a simple ON/OFF panel control switch to be used.

DR2 MOTOR

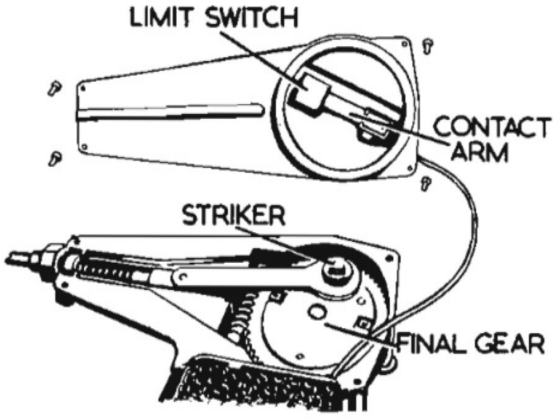


DR2 INTERNAL VIEW — VIEW GEAR BOX

Internally, the construction is very similar to the DR1. An eccentric type motor drives a single nylon final gear through a helix on the end of the armature shaft. Then the design becomes simpler than the DR1 ; there is no eccentrically mounted connecting link to give self-parking. Instead, a plain link transmits the reciprocating movement via the crosshead and cable rack to the wheelboxes. As with the DR1, the rack is housed in ' Bundy ' tubing.

SELF-PARKING ARRANGEMENT

Self-parking of the wiper blades is brought about by moving a simple panel control switch to the ' OFF ' position. With the switch in this position, the motor stops at the end of the wiper arm stroke by virtue of the limit switch shown here, which as you can see is built into the detachable cover of the gearbox. The contact arm of this switch is operated by the head of the crank pin which is an integral part of the final gear. This striker opens and closes the contacts once every complete revolution of the gearwheel.



LIMIT SWITCH CIRCUIT

This diagram will serve to illustrate the method of operation of the Parking Switch.

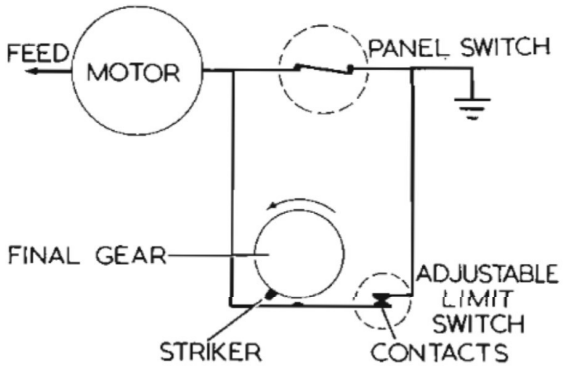
Consider the current path from the Motor to EARTH.

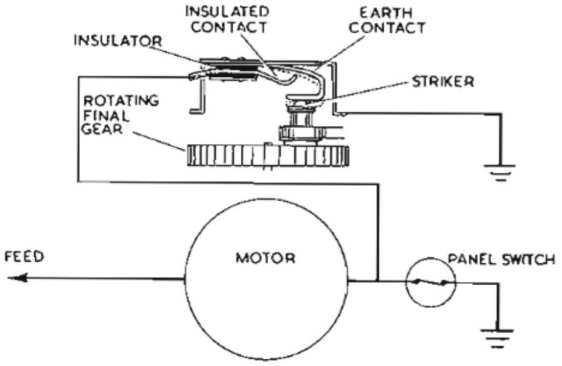
With the panel switch CLOSED the motor circuit is completed.

In order to park automatically a parallel current path and switch is placed in the circuit. To stop movement both of the switches must be open.

In order to stop the operation at any desired position of the stroke, the panel switch is first moved to the OFF position thus breaking one current path. At the end of the stroke a striker operates the blade of the limit switch, which will continue to open and close at each revolution of the crank ; this will not interfere with the operation whilst the panel switch remains in the ON position.

The panel control switch, when in the 'OFF' position, breaks the earth side of the motor circuit, the only remaining path to earth being a parallel one through the limit switch contacts. Thus the motor stops when these contacts are opened.





LIMIT SWITCH CONSTRUCTION

The construction and operation of the LIMIT switch will be apparent from this illustration.

Two spring blades are connected to the motor and the switch respectively as shown at the top, and are in contact until separated by the striker located in the head of the final drive wheel crank pin.

THE LIMIT SWITCH ADJUSTMENT

The limit switch is adjustable, enabling the correct parking position to be obtained.

The switch assembly is released by slackening off the four cover fixing screws. It should then be turned and set so that the motor switches off just after the blades have finished their downward travel and are starting the upward stroke.

It must, however, be remembered that this limit switch is correctly adjusted on the assembly line and re-adjustment should not normally be necessary.

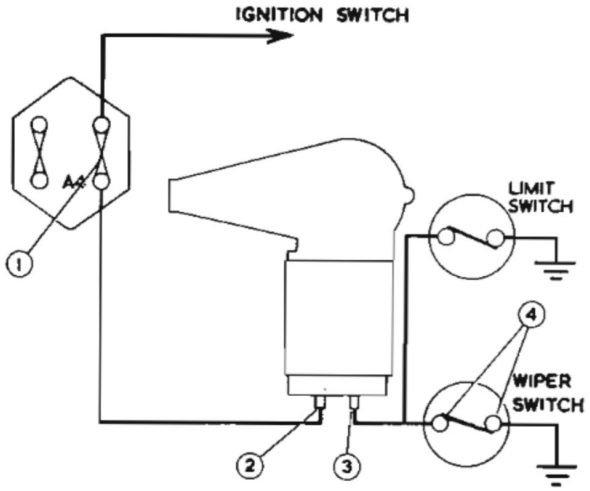
SERVICING THE DR2 WIPER

CIRCUIT TESTING — VOLTMETER TEST

Switch on the ignition and ascertain that current is available at the A4 fuse. This can be easily checked by the voltmeter. With the wiper motor switched OFF we should also have full voltage readings at the wiper motor terminals 2 and 3 in the picture. At the same time when the wiper switch (4) is moved to the ON position the voltage registered at (3) should disappear. If it does not, the wiper switch itself or the earth point is faulty.

If no voltage is registered at the points mentioned it is a simple matter to trace the open circuit by following the wiring sketch shown.

The voltage tests must be supplemented by current consumption tests as we shall now show.



NORMAL CURRENT CONSUMPTION

MOTOR COLD — DRIVING BOTH BLADES ON WET SCREEN.

	DR1 AMPS.	DR2 AMPS.
6 VOLT.	5·0 - 7·3	5·0 - 6·3
12 VOLT.	2·4 - 3·5	2·5 - 3·0

(NORMAL RUNNING)

THERMOSTAT SWITCH TEMPERATURES: OPENS 135 - 150°C. CLOSES 80°C. MIN.

DR1 AND DR2 PERFORMANCE DATA

The correct technical data as shown above will be a very good guide in the event of any unsatisfactory performance.

For instance, any mechanical overloading will be reflected at once by abnormally heavy current consumption by the motor, with possible persistent overheating which may cause damage.

Equally, the approximately correct voltage readings are an infallible guide to defective fuses, wiring, terminals or earth connections.

To take a simple example :— Full voltage test readings, and zero, or very low current readings, would indicate at once badly bedded brushes in the motor, burnt commutator, or worn out brushes.

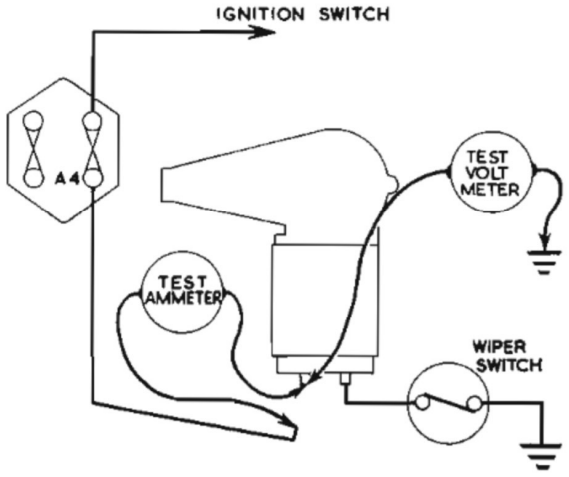
You will notice that the thermostatic switch is not fitted to the DR wiper.

On the DR1 this switch will cut out the operation if the motor temperature rises to between 135 and 150°C., and it will remain open until the motor temperature falls to 80°C., which may take several minutes according to under-bonnet and general prevailing conditions. It should be apparent that if the wiper switch is left in the ON position the motor will re-start automatically.

CIRCUIT TESTING — CURRENT CONSUMPTION

To measure the current consumption whether the motor in question is the DR1 or the DR2, an ammeter is inserted in the A4 feed (GREEN) to the wiper motor, as shown in our sketch. With the motor switched on, the reading shown will fluctuate slightly as the squeegee load varies, but a mean reading can be taken and checked against the chart already given.

It will be necessary at this stage, if the current consumption appears very high, to disconnect the rack from the motor and take a new set of figures. We shall discuss this in more detail.



SERVICING THE DR1 AND DR2 WIPER ASSEMBLIES

From the service point of view the following conditions of unsatisfactory performance may be met :—

1. Sluggish operation or complete seizure.

   Of the several possible reasons for this condition the most likely one is that of a greasy and fouled screen.

   Another is partial seizure of the driving rack resulting from misalignment of the assembly, or kinking or distortion of the Bundy tubing. Lastly, the trouble may rest in the motor and gearbox assembly itself.

In each case an excessive current will generally be taken by the motor in its effort to drive the blades at normal speed.

2. Electrical Faults :—

   True electrical faults are very infrequent but if they do occur they must obviously be either in the motor assembly, the wiring, or the switch, as distinct from the external mechanical faults to which reference has just been made and which may be sufficiently serious to damage the motor electrically if allowed to persist.

A methodical approach to fault diagnosis is essential if the CAUSE of any unsatisfactory performance is to be tracked down.

TEST PROCEDURE AND FAULT FINDING

Sluggish operation or seizure, usually indicated by excessive current consumption may be caused by :—

a. Low Voltage due to defective connections, particularly earth connections.

b. Cable Rack bind in the Bundy Tubing. This may result from flattening, kinking, or over sharp bends (should be 9" minimum radius).

c. Excessive wiper blade loading due to fouled or greasy screen.

d. Wheel-box misalignment or spindles seizing in the bearing housing.

e. Mechanical or electrical faults in the motor and gearbox assembly.

To diagnose the cause of any of these troubles proceed as follows :—

1. Connect a test ammeter and voltmeter in circuit as shown in the last picture :—
   a. Connect test ammeter in series with wiper feed lead. (Green.)
   b. Connect test voltmeter across the green lead terminal of wiper and earth.
2. Switch-on the motor and check for low voltage. Should be 11.5 v. minimum. If lower, examine the fuse, re-make main and earth connections as necessary.
3. Remove both wiper arm and blade assemblies.
4. Switch on the motor and test for current consumption and speed of stroke.

	6 volt	12 volt
DR1	5·0 — 7·3 amps.	2·4 — 3·5 amps.
DR2	5·0 — 6·3 „	2·3 — 2·9 „

c.p.m.

DR1 Normal speed 90-98 (15 — 16 in 10 secs.)
High „ 132-148 (22 — 25 „ „ „)
DR2 Normal „ 90-100 (12 — 17 „ „ „)

If the current take and the speed of operation is now correct the fault lies with a fouled screen. If the current reading remains excessive :—

5. Remove wiper motor gearbox cover and disconnect the driving crank from the crosshead as follows :—
   a. On DR1 Motors, remove the cotter-pin securing the connecting rod to the final gear and withdraw the connecting rod complete with eccentric coupling, conical spring and friction plate.
   b. With DR2 wipers, first remove the gearbox cover and secondly the circlip securing the connecting rod to the final gear. The connecting rod can now be lifted out.
6. With the cable driving rack now disconnected, switch on and test the motor independently, taking a current reading and also a re-count of the number of strokes of the crank pin.

   If it is then found to be correct we can safely assume the trouble to be in the Rack and Bundy tube assembly, or the wiper spindles and wheelboxes.

If the speed is still low replace the motor assembly or check following points :—

a. Armature binding due to thrust screw being out of adjustment.

b. Commutator end bearing out of alignment.

c. Short circuit on commutator due to carbon dust, etc.

TO CHECK THE BUNDY TUBE, DRIVING RACK AND WHEEL-BOX ASSEMBLIES

Sluggish operation or seizing in service is frequently caused by misalignment of the assembly or binding of the driving rack in the Bundy tube.

To test for correct cable rack clearance in the tube proceed as follows :—

If binding exists, the sections of the Bundy tube must be examined. To do this :—

1. Remove arms and blades.
2. Remove wiper motor cover.
3. Extract connecting link between crosshead and final gear.
4. Withdraw cable rack.
5. Remove wheelbox cover.

Insert the Mandrel, which should move freely through each section of Tube.

If the bind is caused by flattening of the tube at a turn it may be possible to clear it by gently reforming the tube carefully in a vice.

If a ' kink ' exists, the complete section of tube will have to be replaced.

In some cases an *emergency repair* can be carried out by filing away the ' kinked ' section by means of a suitable size half-round file. Care should be taken to remove frays from the cut-away edge of the bore and also to wash out all filings and lubricate all moving parts with Duckham's H.B.B. grease.