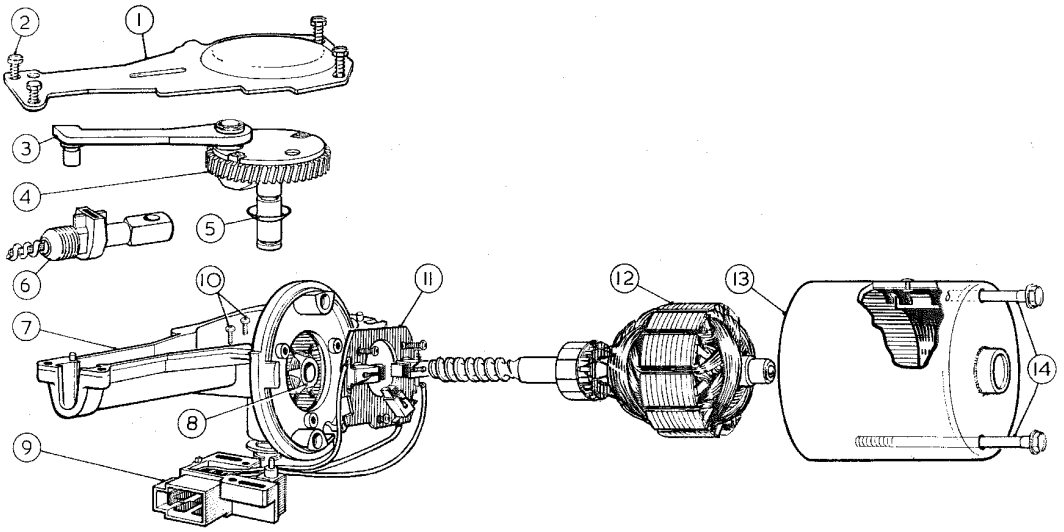
WINDSHIELD WIPER MODEL 14W



1 Gearbox cover
2 Screw (gearbox cover fixing)
3 Connecting rod
4 Shaft & Gear
5 Dished washer
6 Cable rack with crosshead & outer casing ferrule
7 Gearbox
8 Self-aligning bearing bush
9 Limit switch assembly
10 Screws (limit switch fixing)
11 Brushgear, comprising: insul plate & brushboxes, brushes, springs, fixing screws
12 Armature
13 Yoke assembly, comprising: two permanent-magnet poles & retaining clips & armature bearing bush
14 Bolts (yoke fixing)

Fig. 1 Windshield Wiper Motor Model 14W (two speed)

1. DESCRIPTION

Windshield wiper model 14W comprises a self-switching power unit which drives two wiper arm wheelboxes by means of a flexible cable rack running through a rigid tube. The two-pole motor has a permanent magnet field consisting of two ceramic magnets housed in a cylindrical yoke. A worm gear formed on the extended armature shaft drives a moulded gearwheel within the die-cast gearbox. Motion is imparted to the cable rack by a connecting rod and crosshead actuated by a crankpin carried on the gearwheel.

Associated with the terminal assembly is a self-switching limit switch unit. Two-stage contacts inside the switch are operated by a plunger, which in turn is actuated by a cam on the underside of the moulded gearwheel inside the gearbox. When the manually-operated control switch is moved to OFF (or park) the motor continues to operate under the automatic control of the limit switch. When the wiper blades reach the parked position, the first-stage contacts open and the motor is switched off. A momentary period follows during which no contact is made by the switch, then the second-stage contacts close causing regenerative braking of the armature which maintains consistent parking of the blades.

The motor is produced in single and two-speed form. To provide the latter requirement, the brush-box plate is fitted with a third brush to which the armature positive feed is switched when the second (higher) speed is required.

2. ROUTINE MAINTENANCE

All bearings are adequately lubricated during manufacture and require no maintenance.

Oil, tar spots or similar deposits should be removed from the windshield with methylated spirits (denatured alcohol). Silicone or wax polishes must not be used for this purpose.

Efficient wiping is dependent upon keeping wiper blades in good condition. Worn or perished blades are readily removed for replacement.

3. TECHNICAL DATA

	12-*volt*	24-*volt*
(i) Typical light running current (i.e. with cable rack disconnected) after 60 seconds from cold:	1.5 amp. (normal speed) 2.0 amp. (high speed)	0.8 amp. (normal speed) 1.0 amp. (high speed)
(ii) Light running speed after 60 seconds from cold:	46–52 rev/min (normal speed) 60–70 rev/min (high speed)	

4. SERVICING

Note : Since the motor is of permanent magnet design, the direction of rotation of the armature depends

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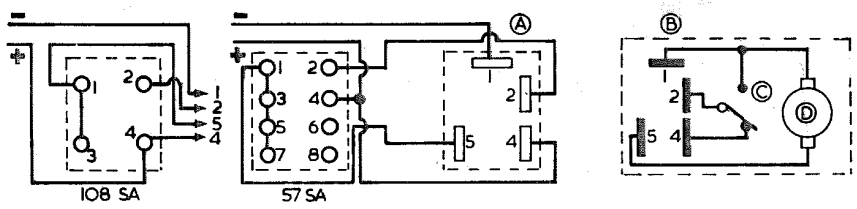
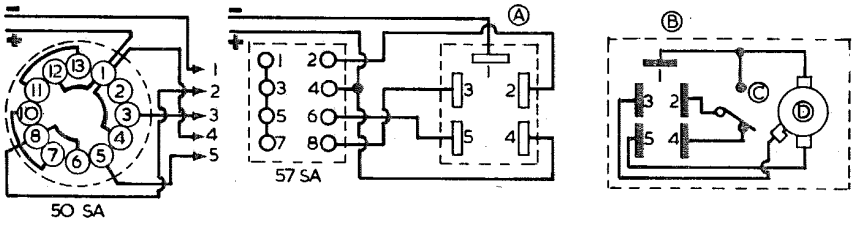


SINGLE SPEED



TWO SPEED

A Moulded terminal connector on cable harness
B Terminal connector on wiper motor
C Limit switch
D Armature

SWITCH INTERNAL CONNECTIONS	OFF	NORMAL SPEED	HIGH SPEED
57 SA (Single speed)	(1-2) (5-6)	(3-4) (5-6)	— —
108 SA " "	(1-2)	(3-4)	— —
57 SA (Two speed)	(1-2) (5-6)	(3-4) (5-6)	(3-4) (7-8)
50 SA " "	(1-2) (5-6) (10-11)	(13-1) (4-5) (8-10)	(12-13) (3-4) (7-8)

Fig. 2 Wiring diagrams for single and two-speed 14W wipers using typical switches

on the polarity of the supply to its terminals. If it is necessary to run the motor while it is removed from the vehicle, the negative supply cable must be connected to motor terminal number 1 and the positive supply cable to terminal number 5 for normal speed or terminal number 3 for high speed. (See Fig. 2).

(a) Systematic Check of Faulty Wiping Equipment

Unsatisfactory operation (if the supply voltage to the motor is adequate) may be caused by a fault that is mechanical or electrical in origin. Before resorting to dismantling, consideration should be given to the nature of the fault.

The symptoms and remedial procedure associated with the more common causes of wiper failure (or poor performance) are described in (i) and (ii) below.

(i) Frictional Wiper Blades

Excessive friction between apparently satisfactory wiper blades and the windshield may result in a marked reduction in wiping speed when the blades are operating on a windshield that is only partially wet.

A further symptom is that the blades become noisy at each end of the wiping arc. When possible the blades should be temporarily replaced with a pair known to be in good condition. If this rectifies the fault, fit new blades.

(ii) Low Wiping Speed or Irregular Movement of the Blades

To determine whether a low wiping speed is due to excessive mechanical loading or to poor motor performance, the cable rack must first be disconnected as described at the commencement of Dismantling the Motor in 4(b).

Measuring Light Running Current and Speed

Connect a first-grade moving-coil ammeter in series with the motor supply cable and measure the current consumption. Also check the operating speed by timing the speed of rotation of the moulded gear. The current consumption and speed should be as given in para. 3. With a two-speed motor check also the higher speed and current.

If the motor does not run, or current consumption and speed are not as stated, an internal fault in the motor is indicated and a replacement unit should be fitted or the motor removed for detailed examination. See para. 4(b).

If current consumption and speed are correct, check the cable rack and wheelbox spindles.

Checking Cable Rack and Tubing

Remove the wiper arms and blades and push the cable rack fully home in its tubing.

Hook a spring balance in the hole on the cross-head (into which the pin on the connecting rod normally locates) and withdraw the rack with the balance. The maximum permissible force required is 6 lbf (2.72 kgf).

Badly kinked or flattened tubing must be re-placed and any bends of less than 9 in (228 mm) radius must be re-formed. Examine the cable rack for signs of damage to the helix.

Checking Wheelboxes

Check the wheelbox spindles for freedom of rotation. Seized units, or those suspected of having damaged gear teeth, must be replaced.

(b) Dismantling the Motor

Withdraw the four gearbox cover fixing screws and lift off the cover.

Remove the circlip and flat washer securing the connecting rod to the crankpin.

Withdraw the connecting rod, taking care not to lose the second (larger diameter) flat washer positioned beneath it on the crankpin.

Remove the circlip and washer securing the shaft and gear.

Before proceeding further, use a fine file to remove any fraze from the gear shaft. Failure to do this may result in the bearing being scored when the gear is withdrawn.

Remove the gear taking care not to lose the dished washer fitted beneath it.

It is normally unnecessary to detach the crank-pin mounting plate — which is an integral part of the gear shaft — from the moulded gearwheel, since these are serviced only as an assembly. However, should the shaft and gearwheel become separated for any reason it is essential, on reassembly, to ensure the correct angular relationship between the crankpin and the gearwheel-cam so that correct parking of the blades will be maintained. Fig. 5 shows the two positions (180° apart) in which the crankpin plate can be assembled to the gearwheel to give parking with cable rack fully extended or fully retracted.

Unscrew and remove the two fixing bolts from the motor yoke and carefully remove the yoke assembly and armature. While removed, the yoke must be kept well clear of swarf, etc., which may otherwise be attracted to the pole pieces.

Remove the screws which secure the brushgear and the terminal and switch unit and detach from the gearbox both assemblies, linked together by the connecting cables.

(c) Bench Inspection

After dismantling, examine individual items.

(i) Brush Replacement

The original specified length of the brushes is sufficient to last the life of the motor. If, due to accidental damage to the brushes or to faulty commutator action, it becomes necessary to renew the brushes, the complete brushgear service assembly must be fitted. The brushgear assembly must be renewed if the main (diametrically-opposed) brushes are worn to $\frac{3}{16}$ in (4.8 mm), or if the narrow section of the third brush (2-speed units only) is worn to the full width of the brush.

Check that the brushes move freely in the boxes.

(ii) Checking Brush Springs

The design of the brushgear does not allow for easy removal of the brush springs. This is due to the fact that, similar to the brushes, the springs are expected to last the life of the motor and should not normally require renewing. In the unlikely event of the spring pressure failing to meet the specified requirements, the complete brushgear service assembly must be replaced, in a similar manner to that detailed for servicing the brushes.

To check the spring pressure press on the end face of the brush with a push-type spring gauge (see Fig. 3) until the bottom of the brush is level with the bottom of the slot in the brush box, when the spring pressure reading should be 5–7 ozf (140–200 gf).

Note : In the event of the brushgear being re-newed, it is important to re-connect the cables in accordance with Fig. 3.

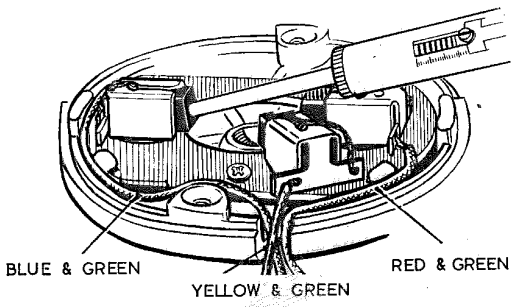


Fig. 3 Checking brush spring pressure

(iii) Testing and Servicing the Armature

Use armature testing equipment to check the armature windings for open and short circuits.

Test the soundness of the armature insulation by using a mains test lamp (Fig. 4). Lighting of the lamp indicates faulty insulation.

If the commutator is worn, it can be lightly skimmed while the armature is mounted in a lathe.

Afterwards, clear the inter-segment spaces of copper swarf.

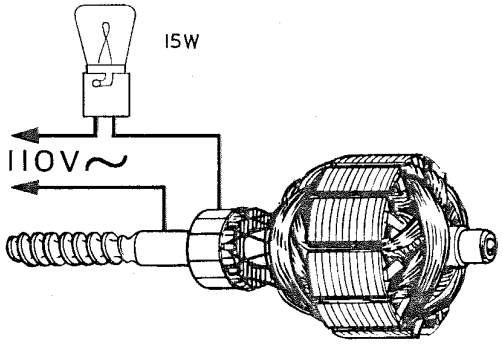


Fig. 4 Armature insulation test

(iv) Inspection of Moulded Gear

Examine the gearwheel, especially the teeth, for signs of wear or damage. If necessary, a replacement must be fitted.

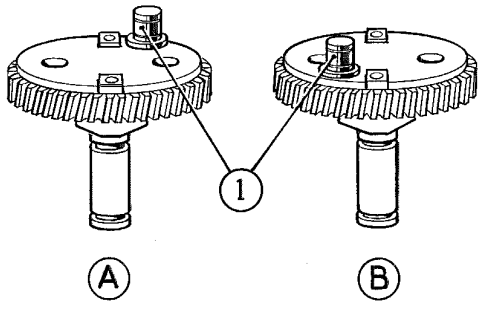


Fig. 5 Alternative positions of crankpin (1) to give
A Parking with cable rack retracted
B Parking with cable rack extended

(d) Re-assembly

This is generally a reversal of the dismantling procedure detailed in 4(b) but special consideration should be given to the following:

Lubrication

Apply Ragosine Listate grease to the gearwheel teeth and cam, armature shaft worm gear, top of the connecting rod and its connecting pin and the crosshead slide.

Apply Shell Turbo 41 oil to the bearing bushes, armature shaft bearing surfaces (sparingly), gearwheel shaft and its crankpin and the felt-oiler washer in the yoke bearing (thoroughly soak).

Refitting the Yoke

Before refitting the armature to the yoke (or vice versa) inspect the inside of the yoke and ensure that the thrust disc and the felt-oiler washer are in place in the yoke bearing. The correct method of assembly is with the thrust disc flat against the end face of the bearing, followed by the felt-oiler which must have a hole in the centre to allow the captive ball bearing in the end of the armature shaft to contact the thrust disc.

If the felt-oiler is renewed, check that the service replacement is provided with the necessary hole, and, if not, make a $\frac{1}{8}$ in (3 mm) diameter hole in the centre of the felt. (A felt-oiler not incorporating a hole, could result in the armature end-float becoming excessive in service due to the ball bearing wearing away the felt after the end-float adjustment has been made). Soak the felt in Shell Turbo 41 oil.

IMPORTANT: to ensure correct rotation of the motor, the marking on the yoke must be adjacent to the arrow-head marking on the gearbox rim.

The yoke fixing bolts should be tightened to a torque of 12–16 lbf in. (0.138–0.184 kgf m).

Armature End-float Adjustment

A service replacement armature should be provided with a thrust screw and locknut as a packaged sundry. This adjustable type thrust screw is for use in replacing the original non-adjustable type, as adjustment to the armature end-float will probably be necessary after renewing the armature.

Armature end-float is 0.002-0.008 in (0.05-0.2 mm). To obtain satisfactory end-float adjustment with the motor and gearbox completely assembled, position the unit with the thrust screw uppermost, tighten the thrust screw until abutment takes place and then slacken it off one quarter turn and secure it in this position by tightening the locknut.

Should the adjustable-type of thrust screw and lock-nut not be available, an alternative method of adjusting the end float is as follows:—

To increase the end-float gap, fit one or more shim washers between the head of the original thrust screw and the gearbox casting.

To decrease the gap, relieve a suitable amount of metal from the underside of the screw head, preferably by mounting the screw in a lathe.

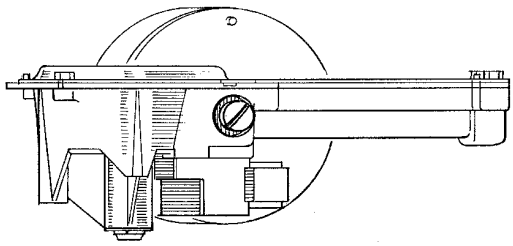


Fig. 6 Armature end-float adjusting screw