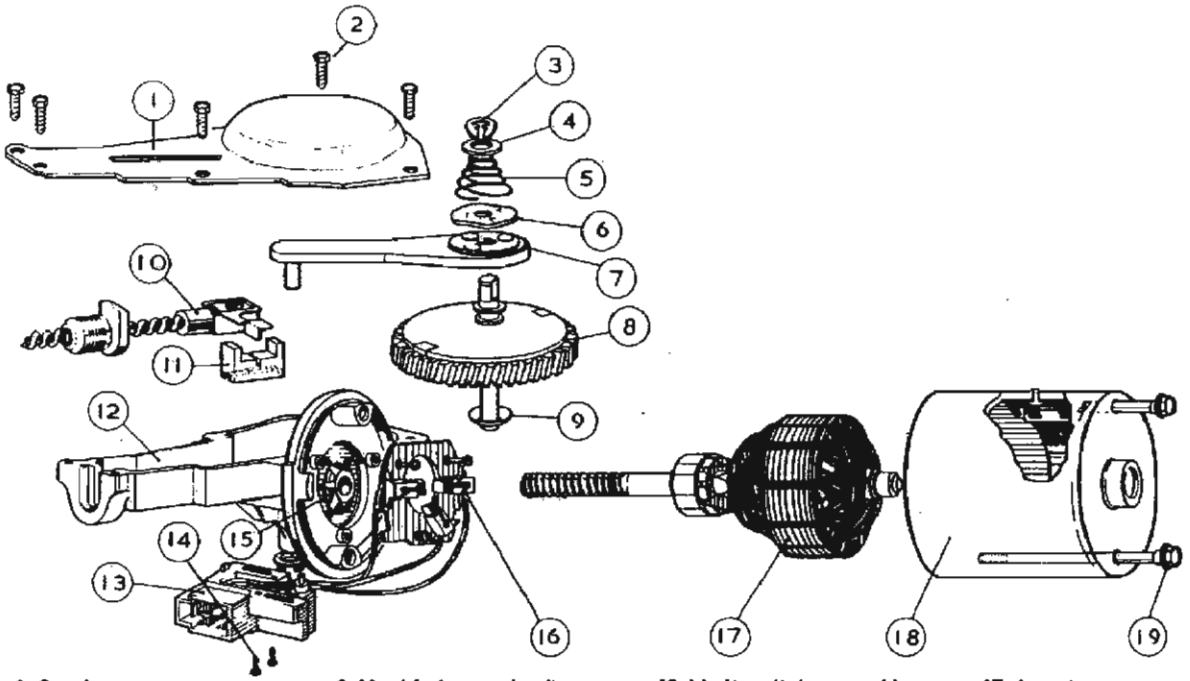
WINDSHIELD WIPER MODEL 16W



1 Gearbox cover
2 Screw (gearbox cover fixing)
3 Circlip
4 Washer
5 Conical spring
6 Friction plate
7 Connecting rod assembly including eccentric cam
8 Moulded gearwheel
9 'Dished' washer
10 Cable rack with crosshead and outer casing ferrule
11 Moulded slider block (cable rack attachment) limit-switch operating
12 Gearbox
13 Limit-switch assembly
14 Screws (Limit-switch fixing)
15 Self-aligning bearing bush
16 Brushgear, comprising: Insul plate and brushboxes, brushes, springs, fixing screws
17 Armature
18 Yoke assembly, comprising: Two permanent-magnet poles and retaining clips and armature bearing bush
19 Bolts (yoke fixing)

Fig. 1 Windshield Wiper Motor Model 16W (two speed)

1. DESCRIPTION

Windshield wiper model 16W comprises a two-speed self-parking 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.

The gearbox incorporates the self-parking mechanism which automatically parks the wiper blades at the end of the wiping cycle in which the manually-operated control is switched off. The self-parking action is achieved by contacts inside the control switch which automatically reverse the polarity of the supply connections to the motor. This causes the motor to operate in the opposite direction to normal rotation during the parking cycle. The reversing action of the motor causes an eccentric cam in the crankpin bearing part of the connecting rod to rotate independently, enabling the connecting rod movement to be extended beyond its normal travel. This extended movement of the connecting rod is used to move a moulded slider-block into a position where a cam on its underside strikes the operating plunger of a limit switch (part of the terminal assembly unit) and first-stage contacts inside the switch are opened to switch off the motor. Following a momentary period during which no contact is made by the limit switch, continued momentum of the motor and further movement of the switch operating plunger closes second-stage contacts inside the switch and this causes regenerative braking of the armature which maintains consistent parking of the wiper blades. Two-speed operation is obtained by switching the positive feed to the third brush (with a stepped contact face) when the second (higher) speed is selected by the control switch.

Note : Alternative Parking Position

To change the parking position of the wiper blades from one side of the windshield to the other (to suit either right-hand or left-hand drive vehicles) the moulded slider-block and limit-switch unit must be repositioned by turning through 180°. To reposition the slider block, first dismantle the connecting rod as detailed in 'Dismantling the Motor', para. 4(b). To reposition the

Windshield Wiper Model 16W

limit-switch unit, the switch operating plunger must be located in the alternative slot provided in the gearbox, after the unit has been turned through 180°. The switch fixing screw holes are elongated to allow adjustment of the switch operating position.

WARNING. Whenever the slider-block or limit-switch and terminal assembly unit are dismantled, it is essential on reassembly to maintain the correct operating relationship between the cam of the slider block and the switch operating plunger, otherwise damage will occur when the motor is started. The slider-block has a slot machined in each of its two end faces, these slots being of unequal depth. To ensure correct operation of the parking sequence the slider-block must be re-assembled with the deeper of these slots facing the switch operating plunger.

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.

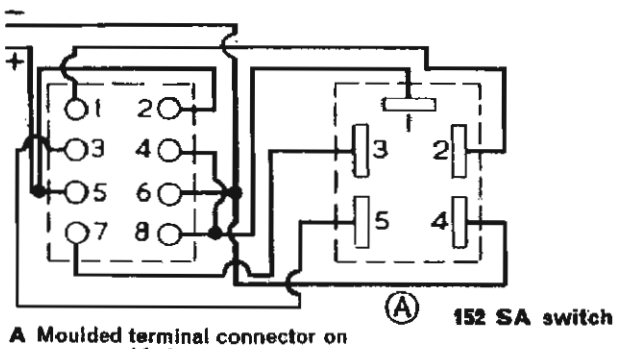
Efficient wiping is dependent upon keeping wiper blades in good condition. Worn or perished blades are readily removed for replacement.

3. TECHNICAL DATA

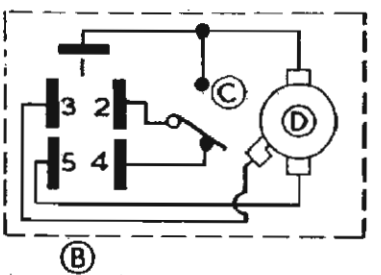
	12-*volt*	24-*volt*
(i) Typical light running current (i.e. with cable rack disconnected) after 60 seconds from cold:	1.5 amp. (normal speed) 2.0 amp. (high speed)	0.8 amp. (normal speed) 1.0 amp. (high speed)
(ii) Light running speed after 60 seconds from cold:	46–52 rev/min 60–70 rev/min	(normal speed)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

4. SERVICING

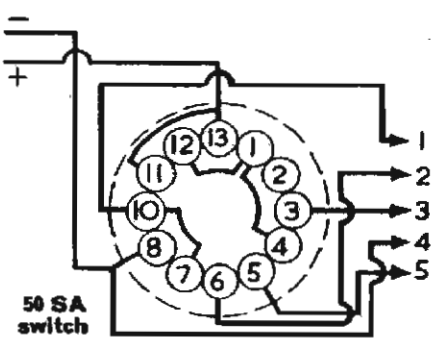
Note: Since the motor is of permanent magnet design, the direction of rotation of the armature depends on the polarity of the supply to its terminals. If it is necessary to run the motor while it is removed from the vehicle, the negative supply cable should be connected to motor terminal number 1 and the positive supply cable to terminal number 5 for normal speed or terminal number 3 for high speed. (See Fig. 2).

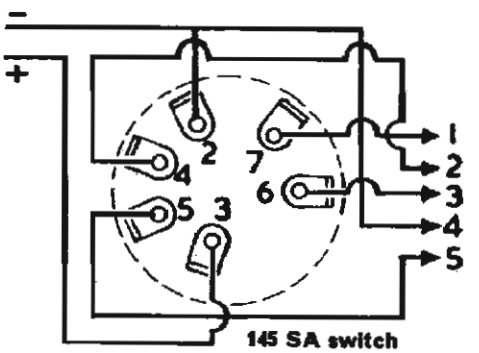


A Moulded terminal connector on cable harness



B Terminal connector on wiper motor
C Limit switch D Armature





ALTERNATIVE SWITCHES INDICATING MOULDED TERMINAL CONNECTIONS

SWITCH INTERNAL CONNECTIONS	OFF	NORMAL SPEED	HIGH SPEED
152 SA	(1–3) (2–4)	(3–5) (4–6)	(5–7) (6–8)
50 SA	(1–2) (5–6) (10–11)	(13–1) (4–5) (8–10)	(12–13) (3–4) (7–8)
145 SA	(4–5) (3–7)	(3–5) (2–7)	(3–6) (2–7)

Fig. 2 Wiring diagram using typical switches

(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(s) should be as given in para. 3.

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 4b & c).

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 crosshead (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 replaced and any bends of less than 9 in. (228 mm) radius must be reformed. 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 gearbox cover fixing screws and lift off the cover.

Prise the circlip from the groove in the gearwheel crankpin and remove, in the following sequence, the flat washer, conical spring, wavy friction-plate, connecting rod assembly and another (smaller) flat washer which fits next to the gearwheel.

Remove the circlip and washer securing the shaft and gear.

Before proceeding further, use a smooth 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.

Note: Before removing the yoke assembly observe how the yoke and gearbox are marked so that it may be re-assembled in its original position.

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 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 is worn to the full width of the brush.

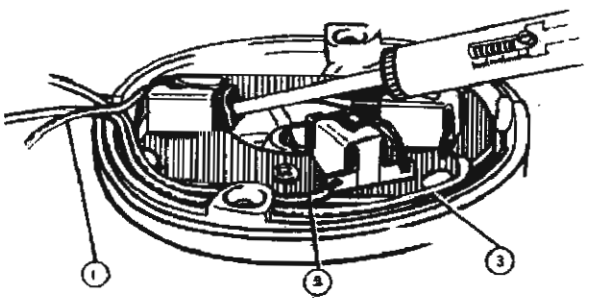
Check that the brushes move freely in the boxes.

(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 necessary 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).



1 Cable colour blue & green 2 Cable colour yellow & green
3 Cable colour red & green

Fig. 3 Checking brush spring pressure

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

(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.

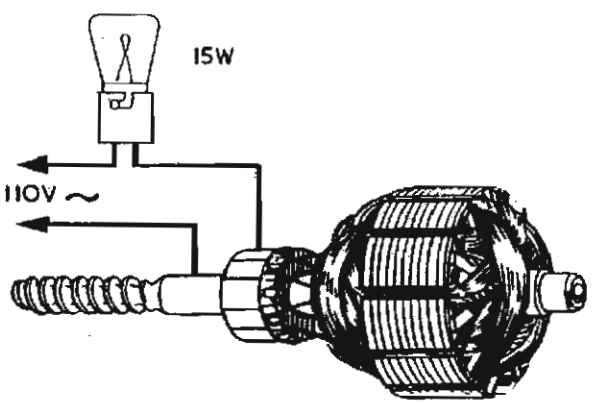


Fig. 4 Armature insulation test

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.

(iv) Inspection of Moulded Gear

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

(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

A liberal quantity of Ragosine Listate grease is necessary for lubricating all moving parts inside the gearbox.

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

Re-assembly of Yoke

Before refitting the armature to the yoke 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 washer 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 replacement is provided with the necessary hole and, if not, make a $\frac{1}{8}$" (3 mm) diameter hole in the centre of the felt. (A felt-oiler without 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-oiler in Shell Turbo 41 oil.

The yoke fixing bolts should be tightened to a torque of 12–16 lbf in. (0.138–0.184 kgf m). If a service replacement armature is being fitted, it is advisable to first slacken the armature end-float thrust screw before tightening the yoke fixing bolts. Afterwards, reset the thrust screw.

Armature End-Float Adjustment

Armature end-float is 0.002"–0.008" (0.05–0.2 mm). To obtain a 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.

Assembly of Gearwheel and Connecting Rod

Ensure that the self-parking mechanism and connecting rod are re-assembled to the crankpin in the sequence of assembly illustrated in Fig. 1. Fit the smaller of the two flat washers beneath the connecting rod.