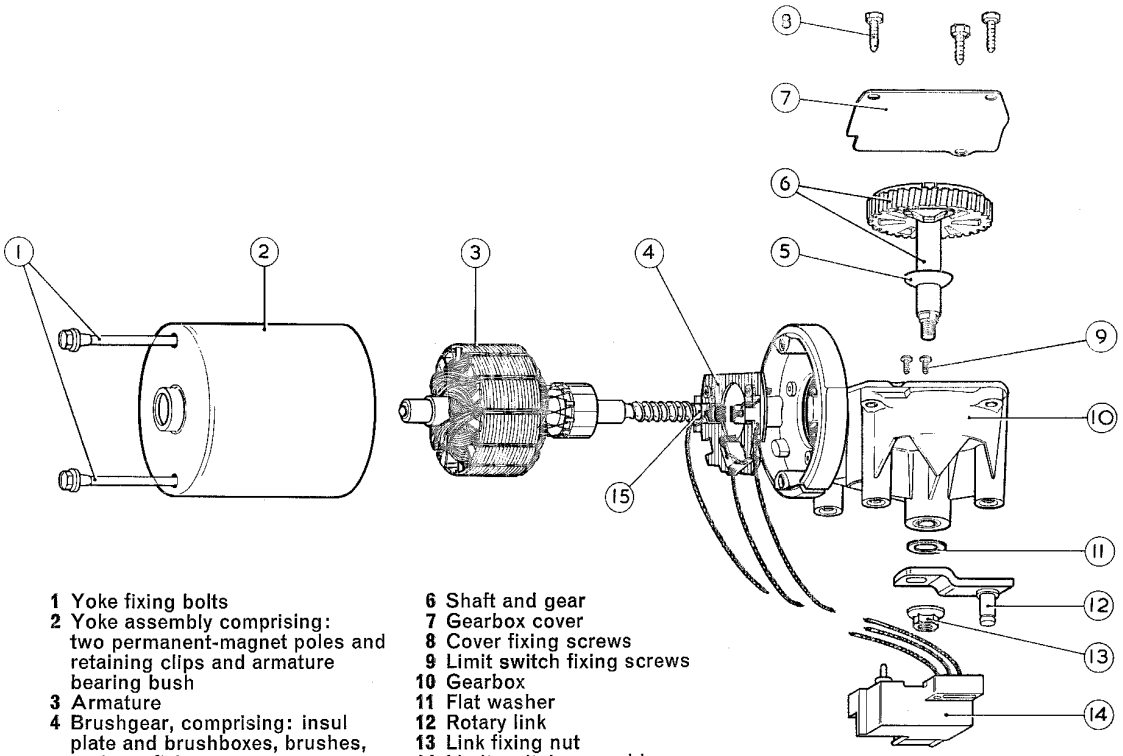
WINDSHIELD WIPER MOTOR MODEL 15W



1 Yoke fixing bolts
2 Yoke assembly comprising: two permanent-magnet poles and retaining clips and armature bearing bush
3 Armature
4 Brushgear, comprising: insul plate and brushboxes, brushes, springs, fixing screws
5 'Dished' washer
6 Shaft and gear
7 Gearbox cover
8 Cover fixing screws
9 Limit switch fixing screws
10 Gearbox
11 Flat washer
12 Rotary link
13 Link fixing nut
14 Limit switch assembly
15 Nylon thrust cap

Fig. 1 Windshield Wiper Motor Model 15W (two-speed)

1. DESCRIPTION

Windshield wiper motor model 15W is designed to operate a link-type wiper installation. The motor is self-switching to the OFF (or park) position. A two-pole permanent magnet field is provided by two ceramic magnets which form part of the yoke assembly. Inside the motor gearbox a worm gear on the armature shaft drives a shaft-and-gear assembly comprising a moulded gearwheel assembled to a location-plate-and-shaft. Power from the motor is transmitted through the gearwheel, location-plate-and-shaft to, finally, a rotary link which serves as a coupling between the motor and the links which operate the wiper arm spindles.

Associated with the terminal assembly is a two-stage plunger operated limit switch. The plunger 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. As the wiper blades near the parked position the first-stage contacts open and the motor is switched off but continues to rotate under its own momentum. The second-stage contacts, to which are connected the positive and negative brushes, then close and regenerative braking of the armature takes place to maintain consistent parking of the blades.

The motor is produced in single and two-speed form. Two-speed operation is provided by a third (stepped) brush incorporated in the brushgear assembly. When the main control switch is moved to the high speed position, the positive feed to the normal brush is transferred to the third brush, and a higher-than-normal wiping speed is obtained. (The higher speed should not be used in heavy snow or on a partially wet windshield).

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.

Windshield Wiper Motor Model 15W

3. TECHNICAL DATA

	12-volt	*24-volt*
(i) Typical light running current (i.e. with the rotary link disconnected from the transmission) 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 of the rotary link (or moulded gearwheel) 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 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).

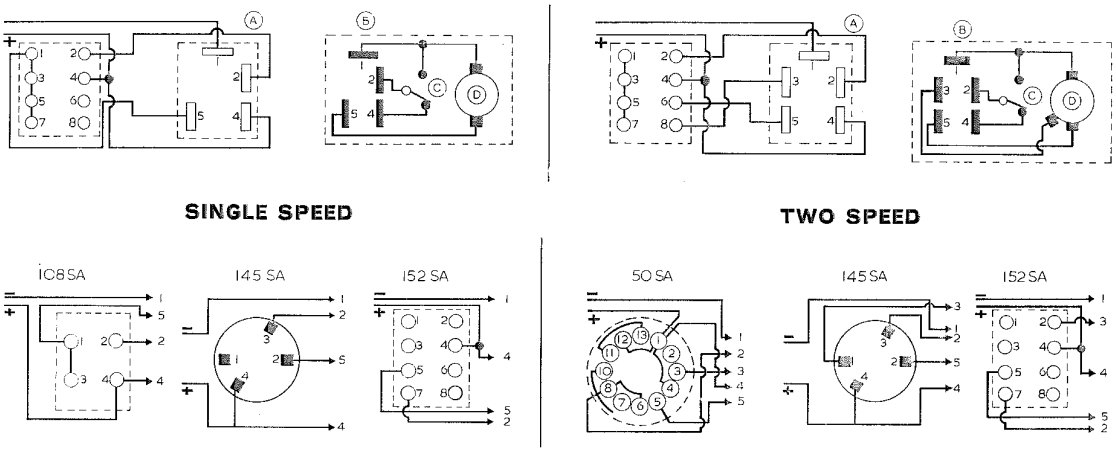
(a) Systematic Check of Faulty Wiping Equipment

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



ALTERNATIVE SWITCHES INDICATING MOULDED TERMINAL CONNECTIONS

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)	—
145 SA "	(2–3)	(2–4)	—
152 SA "	(5–7)	(4–5)	—
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)
145 SA "	(2–3)	(2–4)	(1–4)
152 SA "	(5–7)	(4–5)	(2–4)

Fig. 2 Wiring diagrams for single and two-speed 15W wipers using typical switches

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 rotary link must first be disconnected from the transmission linkage and the light running current and speed of the motor can then be checked under no load conditions.

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 rotary link or moulded gearwheel. The appropriate current consumption and speed are given in 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 4(b).

If current consumption and speed are correct, check for proper functioning of the transmission linkage and wiper-arm spindles.

(b) Dismantling

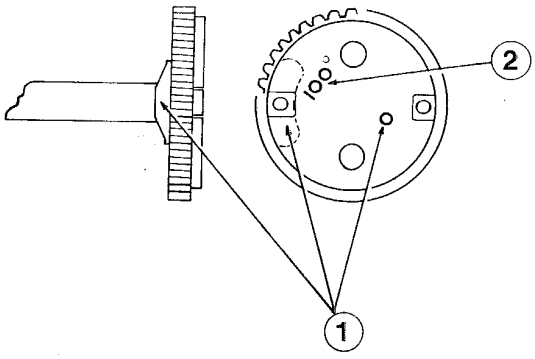
Remove the gearbox cover.

The rotary link may be fitted to the gearwheel shaft in one of two positions (180° apart) depending on the parking requirement of the windshield wiper installation. To ensure that the original parking position is maintained, the position of the rotary link in relation to the zero mark on the gearwheel location plate must be noted before removing the link.

IMPORTANT : The moulded gearwheel inside the gearbox must be prevented from moving while the rotary link fixing nut is slackened (or, on reassembly, tightened). This is most easily achieved by securing the rotary link in a vice while the nut is turned.

Remove the fixing nut and withdraw the rotary link and flat washer.

Remove the shaft-and-gear from the gearbox, taking care not to lose the dished washer fitted beneath the gearwheel. It is not normally necessary to dismantle the shaft-and-gear assembly since this is serviced only in an assembled condition. However, should it become necessary to assemble the moulded gearwheel to the location-plate-and-shaft, it is essential to fit the gearwheel in the correct one of the two alternative positions to maintain the original parking position of the wiper blades. The gearwheel is correctly fitted to the location-plate-and-shaft when the 'zero' mark on the location plate (see Fig. 3) is positioned furthest away from the gearwheel cam.



1 Position of gearwheel cam relative to position of zero mark on location plate

2 Gearwheel reference

Fig. 3 Shaft-and-gear assembly

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.

Undo the two sets of fixing screws and remove from the gearbox the brushgear and the terminal and switch unit 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.

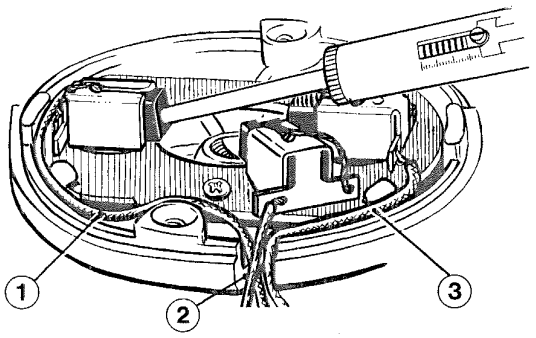
Check that the brushes move freely in the boxes.

(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 renewed, 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. 4) 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 renewed, it is important to re-connect and position the cables in accordance with Fig. 4.



1 Negative brush cable **2** Third brush cable
3 Positive brush cable

Fig. 4 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. 5). 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.

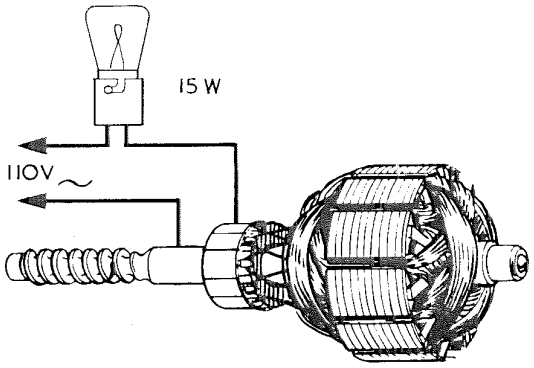


Fig. 5 Armature insulation test

(iv) Inspection of Moulded Gear

Examine the gearwheel, especially the teeth, for signs of wear or damage. If the gearwheel needs renewing, a shaft-and-gear service replacement assembly will have to 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 the gearwheel teeth, the gearwheel cam and the worm gear on the armature shaft. The total quantity of grease must not be less than 15 cc.

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.