

UNISELECTOR P.O. TYPE 4
Maintenance Adjustment Instruction

1. Contents

GENERAL		Par.
Introduction .. .. .	..	2
Tolerances .. .. .	..	3
 MECHANICAL ADJUSTMENTS		
Removing uniselector from jack ..	..	4
Replacing uniselector into jack ..	..	5
Removing the bank from mechanism ..	..	6
Replacing the bank on mechanism ..	..	7
Residual air gap .. .. .	..	8
Armature bearing .. .. .	..	9
Hinge air gap .. .. .	..	10
Ratchet stop .. .. .	..	11
Pawl .. .. .	..	12
Armature travel .. .. .	..	13
Pawl reach .. .. .	..	14
Pawl tension .. .. .	..	15
Detent .. .. .	..	16
Interrupters .. .. .	..	17
Position of wipers on contacts ..	..	18
Wiper assembly .. .. .	..	19
Armature restoring spring .. ..	..	20
Runnings tests .. .. .	..	21
Pointer .. .. .	..	22

MISCELLANEOUS

		Par.
Dismantling .. .. .	..	23
Assembling .. .. .	..	24
Lubrication .. .. .	..	25
Piece parts .. .. .	..	26
Tools .. .. .	..	27

2. Introduction.—This Instruction details the maintenance adjustments of the P.O. Type 4 uniselector. It is of the miniature type and its dimensions are such that it occupies the same mounting space as one 3000-type relay.

The mechanism is of the reverse drive type; the wipers step over three arcs of 12 outlets. The bank is of moulded construction. The bank contacts and the feeds to the mechanism pass through the moulding and are brought out to form a 42-way plug, which enables the complete uniselector to be jacked in or out as required. Figs. 1 and 2 are views of the uniselector showing the names of the principal parts.

3. Adjustment tolerances.—The terms 'test' and 'readjust' used in this Instruction are defined in B 5100.

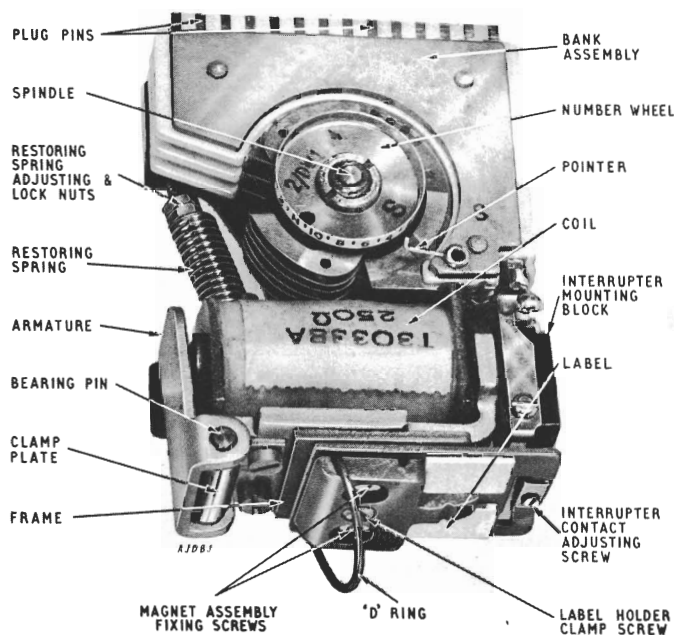


FIG. 1

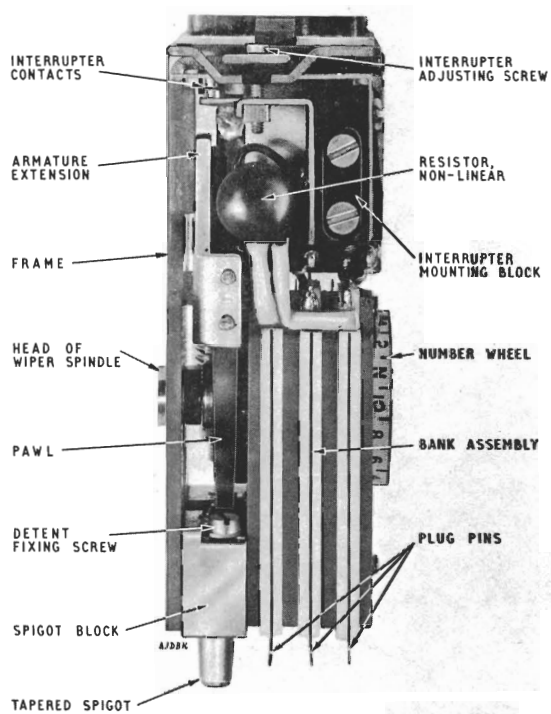


FIG. 2

MECHANICAL ADJUSTMENTS

4. Removing the uniselector from its jack.—

Before removing the uniselector it should first be ascertained that the associated relay-set or selector is free; when this is confirmed the circuit concerned should be busied in the appropriate manner. To remove the uniselector, release the retaining clip by inserting a small screwdriver between the frame and the retaining clip and withdraw the uniselector from the jack by gripping the mechanism firmly and applying a steady pulling action at right angles to the mounting plate. A wire 'D' ring is fitted to the front of the mechanism to assist withdrawal of the uniselector. Fig. 3 shows the Jack No. 89A and details of the numbering of the uniselector plug.

5. Replacing uniselector into its jack.—

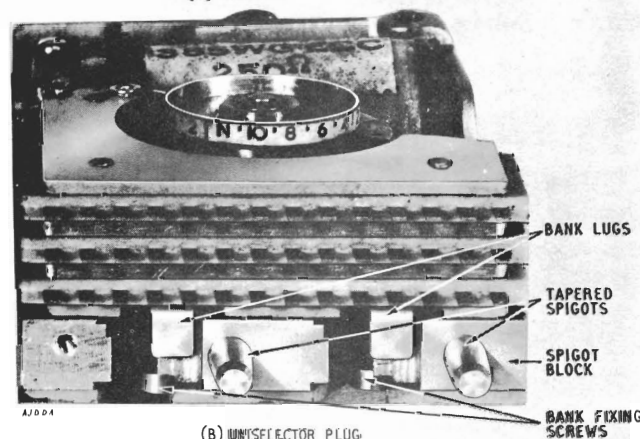
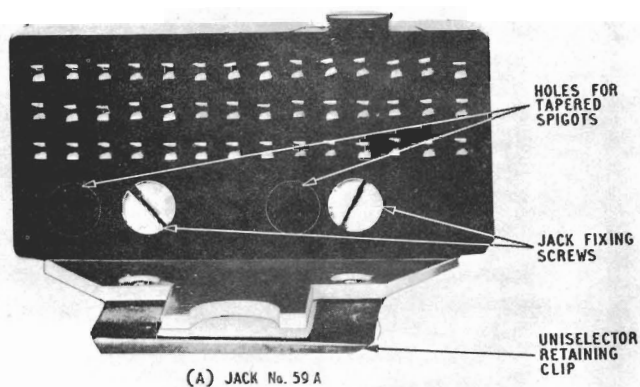
Before attempting to replace the uniselector, carefully straighten any bent plug pins using duckbill pliers and position the wipers on the home contact. To replace the uniselector locate the tapered spigots on the uniselector in the corresponding holes on the jack and then push the uniselector fully home. The retaining clip must lock behind the head of the wiper assembly spindle.

6. Removing bank from mechanism.

(a) Position the wipers on outlets 2 or 3.

(b) Slacken the two bank fixing screws. (When slackening or tightening these screws the uniselector must not be placed number-wheel side down on the bench otherwise the number wheel may be damaged).

(c) With the number wheel uppermost, slide the mechanism clear of the bank. Care should be taken to prevent breakage of the wire connexions between the mechanism and bank. Note that the wiper assembly is no longer captive on its spindle.



KEY TO CONNECTIONS													
	MAGNET & INTERRUPTERS	FEEDER SEGMENTS											
		NORMAL POSITION											
		OUTLET											
LEVEL 1	42	-	-	-	-	-	-	-	-	-	-	-	29
LEVEL 2	28	-	-	-	-	-	-	-	-	-	-	-	15
LEVEL 3	14	13	12	11	10	9	8	7	6	5	4	3	2

(C) PLUG PIN NUMBERING

FIG. 3

7. Replacing bank on mechanism.—Position the wiper assembly with one set of wiper tips in line with the pawl tip. Replace the bank by inserting the ends of its feeder segments between the heels of the appropriate wiper blades then ease the bank contacts between the wipers while, at the same time, stepping the wipers by manually operating and releasing the armature. When the bank is fully home with the lugs on the bank side plate in contact with the seatings on the spigot block, tighten the bank fixing screws. Check that the wipers, when viewed from the number-wheel side, rotate approximately concentrically with the moulded insulation of the bank and that a minimum clearance of 10 mils, as judged by eye, is maintained between the wiper tips and bank insulation. If the rotation is not concentric slight adjustment can be obtained by repositioning the bank bolts sideways in the slots of the spigot block. (For position of wiper tips on bank contacts see par. 18.) The Resistor, Non-linear, No. 2 and the wire connexions between the mechanism and bank must be positioned so that they neither project beyond the side plate of the uniselector nor foul the armature during its operation and release.

8. Residual air gap.—The phosphor bronze residual stud should be securely fixed to the armature and fulfil the following conditions.

(a) *Maximum value.*—If the air gap exceeds 4 mils, change the armature.

(b) *Minimum value.*—The air gap must not be less than 1 mil. Difficulty will be found in measuring such a small gap, but if a gap as judged by eye exists the residual stud should be considered satisfactory.

9. Armature bearing.—The bearing pin must be securely clamped, projecting equally at either side of the armature which should move freely about it. Any play between the armature and its bearing must not be such as to cause incorrect operation of the uniselector.

10. Hinge air gap.—With the armature operated its underside must be parallel to the yoke with an air gap of 2 mils (see Fig. 4). Check as follows:—

(a) With a 3-mil gauge inserted into the hinge air gap and the armature operated manually, the gauge should be gripped at the hinge when the residual stud touches, or attempts to touch, the core face.

(b) With a 4-mil gauge inserted between the residual stud and core face it should be possible to insert a 2-mil gauge into the hinge air gap.

If readjustment is necessary proceed as follows:—

(i) Loosen the armature-bearing clamp-plate fixing screws.

(ii) Insert a 2-mil feeler gauge into the hinge air gap, the tip of the gauge extending to cover the core face.

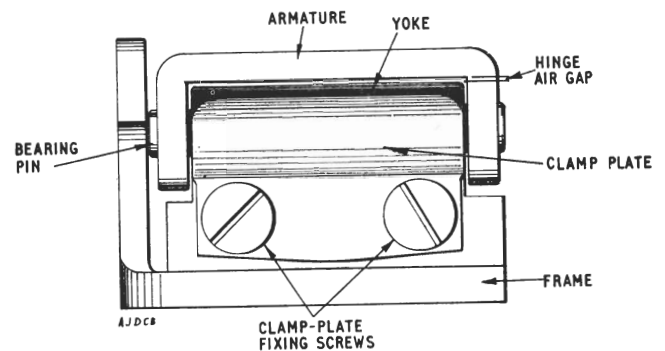


FIG. 4

(iii) Operate the armature manually to grip the gauge simultaneously between the residual stud and the core face and the armature and yoke end.

(iv) Re-tighten the armature bearing clamp-plate fixing screws.

11. Ratchet stop.—The tip of the stop must lie flat on, and cover the full width of, the ratchet teeth.

12. Pawl spring.—This must be free from twists or kinks and engage across its full width the root of each ratchet tooth in turn.

13. Armature travel.—With the armature normal the gap between the core face and the centre of the residual stud must be 26 to 31 mils (test), 27 to 30 mils (readjust), (see Fig. 5).

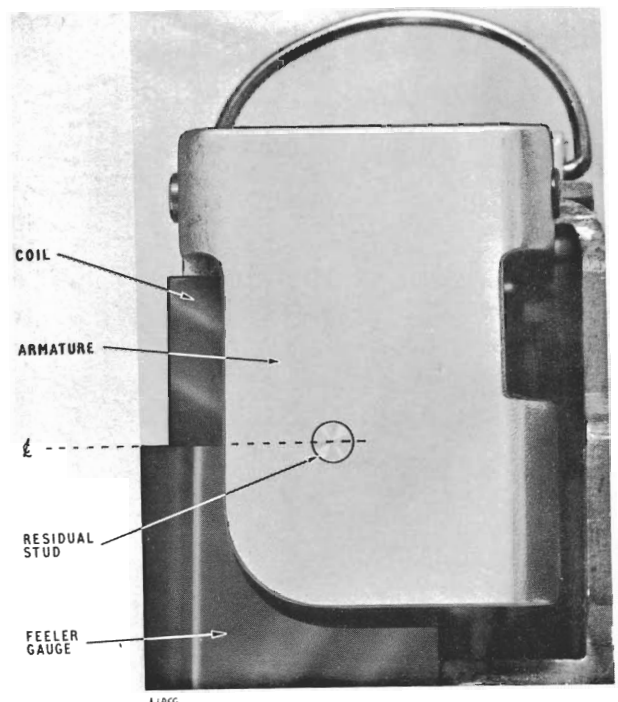


FIG. 5

If readjustment is necessary proceed as follows:—

(a) Check that the mechanism is in adjustment in accordance with pars. 8 and 9.

(b) Remove the bank and the detent.

(c) (i) Tension the armature restoring spring so that sufficient pressure is applied to hold the armature in the normal position.

(ii) Check that the arm carrying the restoring spring does not foul the lug in the frame and that the arm is securely riveted to the armature. Although it is permissible to move this arm (if some force is applied) to clear the lug in the frame, it is not designed to pivot freely about its rivet and any armature failing in this respect should be changed.

(d) Lift the tip of the pawl over the crest of a ratchet tooth so that the ratchet stop engages the root of a tooth. Note that this increases the travel to be measured by approximately 4 mils.

(e) Slightly slacken the label holder and magnet assembly fixing screws and position the magnet assembly in the frame so that

(i) the ratchet stop and pawl are approximately flush with the outside edge of the ratchet wheel when the wiper assembly is in contact with the spindle locknut, and

(ii) the gap between the armature clamp plate and the edge of the frame is as small as possible. This will give the maximum travel obtainable which must

be reduced to 31 to 34 mils by gently levering the armature clamp away from the frame edge (see Fig. 6). It is most important that the magnet assembly fixing screws are only just sufficiently slack to allow the magnet assembly to be moved, otherwise measurement of the travel cannot be made with accuracy.

(f) Securely tighten the magnet assembly and label holder fixing screws.

(g) Restore the pawl to the root of a tooth.

(h) Replace the parts removed.

14. Pawl reach.—This must be such that when the armature is operated and released manually the tip of the ratchet stop comes to rest at a point between $\frac{1}{8}$ and $\frac{3}{8}$ along the face of a ratchet tooth (see Fig. 7). If readjustment is necessary proceed as follows:—

(a) Remove the bank and wiper assembly.

(b) Increase, or decrease, the reach of the pawl by setting it from its root towards, or away from, the wiper assembly spindle.

(c) With the pawl engaging the root of a tooth, check that its curvature is such that it does not foul the crest of the succeeding tooth.

(d) Replace the parts removed.

15. Pawl tension.—With the armature fully operated the pawl must exert a pressure of 10 to 60 gm (test), 20 to 60 gm (readjust), on the long face of

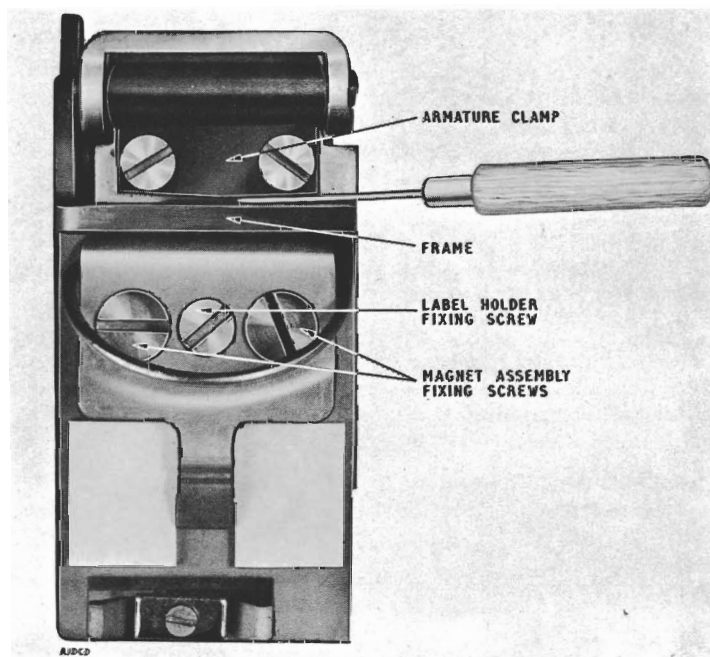


FIG. 6

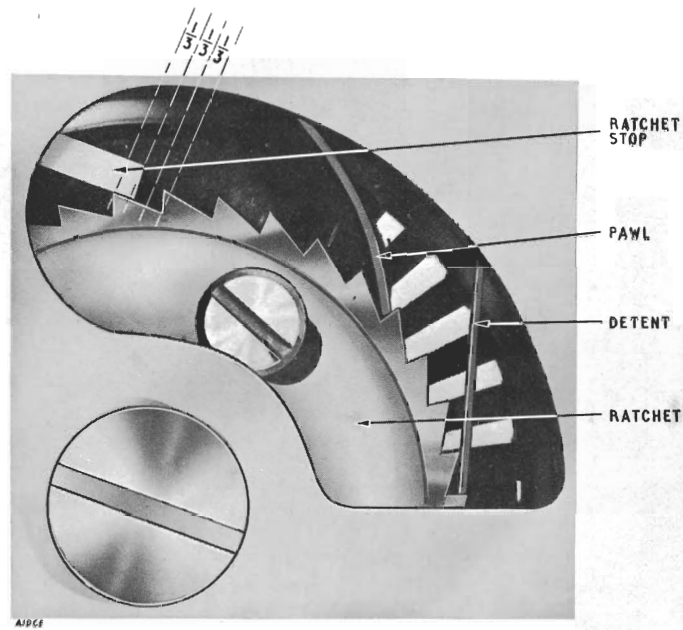


FIG. 7

a ratchet tooth. This should be measured in a radial direction from the ratchet-wheel as near to the pawl tip as possible. If the overhang of the tip is insufficient to permit this measurement the wiper assembly may be moved along its spindle, flexing the wiper blades in the bank, to give access for the pointer of the tension gauge to the pawl tip.

If readjustment is necessary the pawl pressure may be increased, or reduced, by reducing, or increasing, the radius of the pawl. This adjustment should be made between the mid point and the tip of the pawl and care must be taken

- (a) to maintain the smooth curve in the pawl, and
- (b) not to affect the adjustments detailed in par. 14.

The bank and wiper assembly should be removed when making this adjustment.

16. Detent.—This must

- (a) be reasonably straight and free from twists or kinks
- (b) fully engage the short face of the 3rd tooth in advance of that occupied by the pawl when the armature is normal (see Fig. 8)
- (c) drop cleanly into each tooth in turn, when the uniselector is stepped manually
- (d) permit no backlash in at least one position of the ratchet wheel
- (e) permit no forward lash in any position of the ratchet wheel, and
- (f) exert a pressure of 35 ± 15 gm (test), 35 ± 10 gm (readjust), on the ratchet teeth with the armature normal. This should be measured centrally on the lug

provided at the detent tip. When making this measurement take care to ensure that the detent tip is not locked against the short face of a ratchet tooth. Tension in the detent may be reduced, *in situ*, by gently levering the tip away from the ratchet wheel. If it is necessary to increase the tension the detent must be removed and reset.

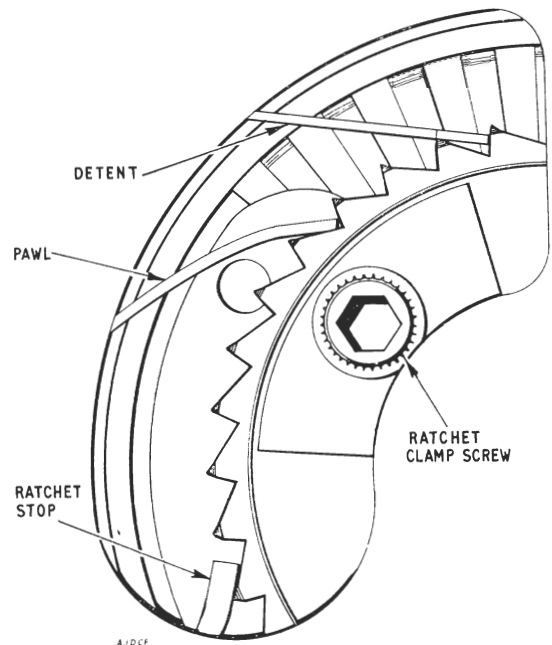


FIG. 8

17. Interrupters.—The individual springs of the interrupters should lie flat on, and be securely fixed to, the mounting block. The contacts should not be out of alignment by more than $\frac{1}{3}$ rd of their diameter (see Fig. 9). The contact pressure as measured at the top

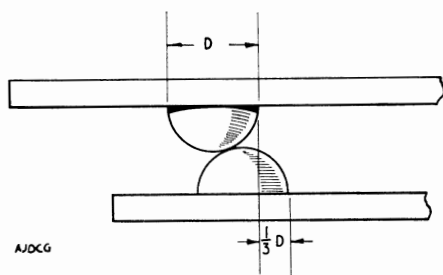


FIG. 9

of the moving spring must be 130 ± 40 gm (test), 130 ± 30 gm (readjust). The contact opening should be approx. 15 mils when the armature is operated manually. If readjustment is necessary proceed as follows:—

(a) Slacken the interrupter adjusting screw.

(b) Tension the moving spring so that the measured contact pressure is towards the lower end of the tolerance. If it is necessary to reduce the tension this may be done by gently levering the moving spring outwards, but if it is necessary to increase the tension, the spring must be removed and then given an inward set.

(c) With the armature normal, reposition the interrupter mounting block along its elongated fixing holes until a gap of approximately 5 mils exists between the interrupter striker and the moving spring.

(d) With the armature operated manually, tighten the interrupter adjusting screw until a contact opening of approximately 15 mils exists. Note that this is an interim adjustment that may be modified later when the contact opening is adjusted for correct electrical operation (see par. 21).

(e) Re-check the interrupter contact pressure.

18. Position of wipers on contacts.—The wiper assembly must rotate smoothly on its spindle. Note that the wiper assembly and spindle are a matched pair and if it is necessary to change either, both must be changed.

(a) *Non-bridging wipers* (see Fig. 10).—The outermost contact points must be within the 1st third of the bank contact width.

(b) *Bridging wipers* (see Fig. 11).—The trailing edge of the outermost contact points must

(i) clear the preceding contact by at least half the distance between contacts, and

(ii) not be in advance of the entering edge of the contact on which it is standing.

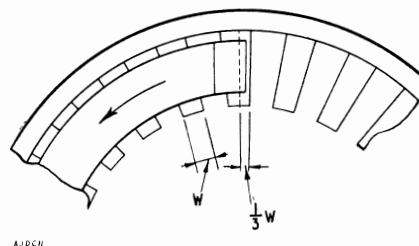


FIG. 10

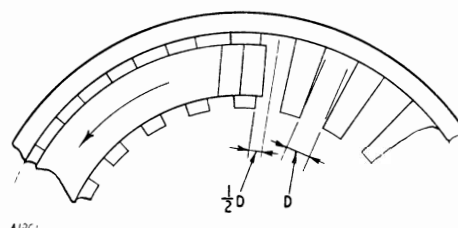


FIG. 11

These conditions should be judged by eye on the wiper blade nearest to the number wheel, each limb of the wiper assembly being checked, in turn, in the normal position and on the last outlet.

(c) Where bridging and non-bridging wipers are mixed on a wiper assembly though conditions (a) and (b) still apply, it will only be possible to fully check the wiper position of the non-bridging wiper which is fitted nearest to the number wheel. The bridging wiper on the lower arc can only be checked by viewing through the frame when positioned on contacts 1 to 5.

If readjustment is necessary support the wiper assembly on its spindle, slacken the ratchet wheel clamping screw (see Fig. 8) and rotate the wiper blades until the correct conditions are obtained. Re-tighten the clamping screw.

19. Wiper assembly.—When the wipers are in the bank the wiper assembly floats on its spindle giving a clearance of approximately 15 mils between the hub and the spindle nut if the wipers are in correct adjustment as follows:—

(a) *Wiper entry and flare* (see Fig. 12).—With one limb of the wipers standing in the normal position the blades of the limb that has just left the bank must be in alignment with the bank levels so that the blades will leave the levels without deflecting in either direction more than the thickness of a bank contact. This adjustment must be checked on all three limbs of the assembly.

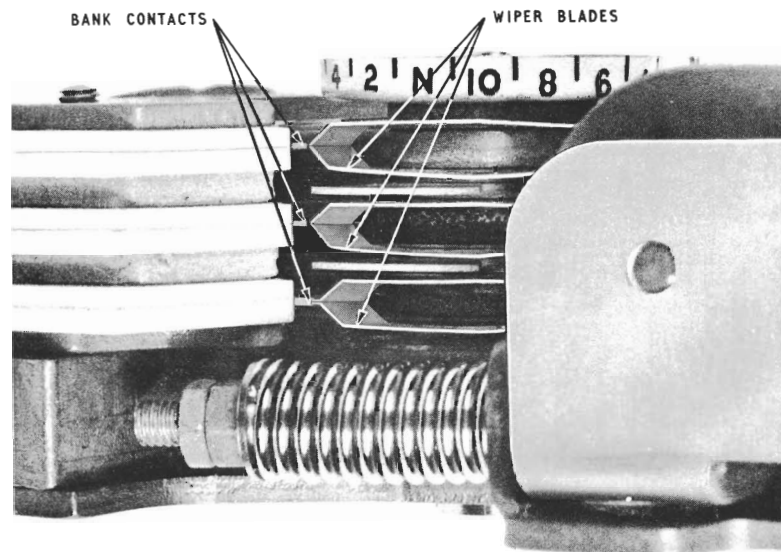


FIG. 12

(b) *Wiper tips* (see Fig. 13).—The tips of each pair of blades should be adjusted so that they touch at the outermost contact points. Between the innermost contact points there may be a gap, not exceeding 6 mils, as judged by eye.

(c) *Clearance* (see Fig. 13).—The wiper blades

should be reasonably straight throughout their length and be free from twists or kinks. There should be adequate clearance between the heels of adjacent blades and they must not foul the contacts when in the bank. The insulating separators between adjacent wipers should be intact.

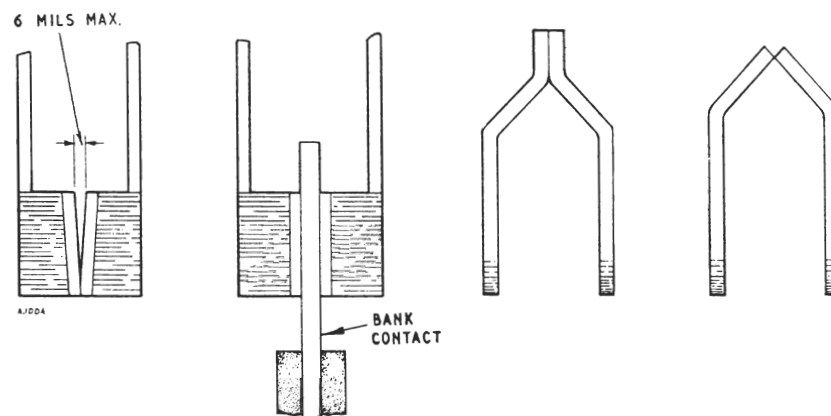


FIG. 13

(d) *Wiper tension*.—When the wipers are standing on the last outlet each blade must exert a pressure of 18-35 gm (test), 25-35 gm (readjust), on the contacts, measured at the wiper tip at a point just in front of the angular set in the blade (see Fig. 14). If readjustment is necessary the tension may be varied by setting the blades from a point as near their root as possible.

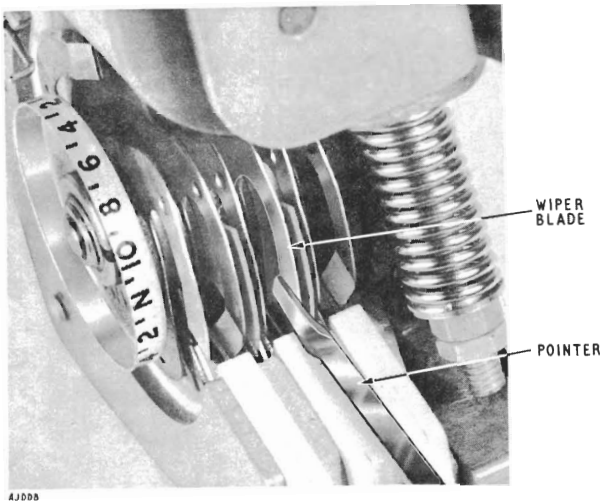


FIG. 14

20. Armature restoring spring.—When the armature is operated and released manually the tension in the restoring spring must be just sufficient to step the wipers to the next bank contact. The release of the armature should not be retarded and the tension must be checked on all contact positions with each limb of the wiper assembly. If readjustment is necessary reposition the restoring spring adjusting nut and locknut until the required conditions obtain.

21. Running tests.—Before making running tests ensure that the Resistor, Non-linear, No. 2 connected across the magnet coil is effective. When carrying out tests (a) and (b) on a homing uniselector *in situ* the normal homing earth must be disconnected by insulating the appropriate relay contact with an Insulator, Contact, No. 1. When convenient, the uniselector may be unplugged and taken to a repair bench for running tests. The uniselector should be plugged into a Jack No. 89A, mounted on an Adapter No. 22 fitted to a Stand, Testing, No. 8A.

(a) With the normal exchange voltage (50V) connected in series with the magnet coil and the interrupters, adjust the interrupter contact opening by the interrupter adjusting screw so that the wipers rotate smoothly and reliably at a speed between 80 and 120 rev/min [see par. 17 (d)].

(b) With the normal exchange voltage (50V) con-

nected in series with the magnet coil, the interrupters and a non-inductive resistance of 100 ohms (Tester No. 80X) the wipers should rotate smoothly and reliably.

(c) The wipers should stop accurately on the normal position when connected as in Fig. 15. Check on all three limbs of the wiper assembly.

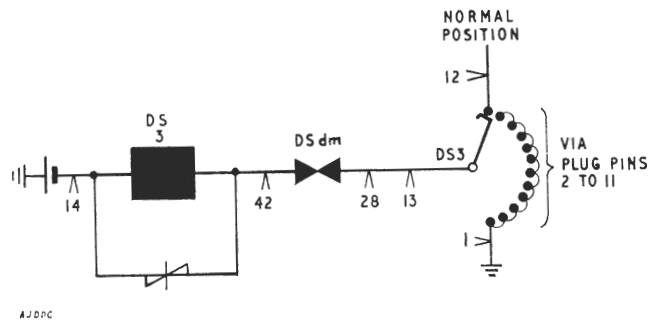


FIG. 15

22. Pointer.—When the number wheel is viewed directly from the front with one limb of the wipers standing on the normal position the pointer must be adjusted to indicate the 'N' position.

MISCELLANEOUS

23. Dismantling.

(a) Remove the bank from the mechanism (see par. 6). The bank may be broken down into individual arcs if required.

(b) Remove the wiper assembly.

(c) Slacken the interrupter adjusting screw and then remove the interrupter spring assembly. This assembly may be broken down into its individual parts if required.

(d) Remove the plate carrying the 'D' ring together with the handle, the label and the interrupter adjusting screw mounting plate.

(e) Slacken the armature restoring spring locking and adjusting nuts until there is play in the restoring spring. Remove the magnet assembly from the frame, easing the spindle carrying the armature restoring spring through the gate in the frame extension. The magnet assembly may be broken down into its individual parts if required.

(f) Remove the detent.

(g) Remove the spindle.

(h) Remove the spigot block.

24. Assembling.—When adjusting the mechanism at the stages indicated below, replacement and removal of parts referred to in the adjustment paragraphs may be ignored.

- (a) Replace the spigot block.
- (b) Replace the wiper spindle. (Note that the wipers and spindle are a matched pair.)
- (c) Reassemble the magnet assembly, locating the armature restoring spring adjusting nut and locknut on the first few threads of the arm carrying the restoring spring. Check that the arm carrying the spindle is securely riveted [see par. 13 (c)].

Adjust as from pars. 8 to 10.

- (d) Replace the magnet assembly, setting the assembly in the frame with the armature clamp plate as close as possible to the edge of the frame.

- (e) Lubricate the spindle with Oil, Bearing, No. 16 and replace the wiper assembly. Note that the wiper assembly is not captive on its spindle.

Adjust as from pars. 11 to 15.

- (f) Replace the detent locating it in the root of a tooth as a temporary adjustment.

Adjust as from par. 16.

- (g) Reassemble and replace the bank (see par. 7).

- (h) Reassemble the interrupter assembly, locating the adjusting screw in the first few threads of the square nut.

- (j) Replace the interrupters.

- (k) Replace the interrupter adjusting screw mounting plate followed by the plate carrying the 'D' ring and the label.

Adjust as from pars. 17 to 20.

25. Lubrication.—Details of the points of lubrication of the uniselector are given in B 5137.

26. Piece parts.—Details of the piece parts of the uniselector are given in B 5618.

27. Tools.—Those necessary for the adjustment of the uniselector are listed in Table 1. They should only be used for the purpose for which they are intended; any which are in such a condition that screws, nuts or springs would be damaged by their use should be changed.

TABLE 1

Tool	Use
Adapter No. 22	Running tests in conjunction Stand, Testing, 8A and Jack No. 89A
Adjuster, Spring, No. 9	Wiper blades
Gauges, Feeler, Nos. 1 and 10	Feeler gauges for general use
„ Tension, No. 2	} Tension gauges for general use
„ „ No. 3	
Insulator, Contact, No. 1	Running tests
Pliers, Adjusting, No. 1	Duckbill pliers
„ „ No. 5	Taper nose pliers
Screwdriver, Inst., No. 1	General use
„ „ No. 2	„ „
Spanner, Cranked, No. 15	Spindle locknut
„ Flat, 4-6BA(Two)	Restoring spring adjusting nut and locknut
Stand, Testing, No. 8A	With Adapter No. 22
Tester No. 80X	Running tests
Wrenches, Hexagon, No. 1	Wiper clamp screw

References:—B 5100, B 5137 and B 5618
(TPM2/3)

E N D