

UNISELECTOR P.O. TYPE 2 Maintenance Adjustment Instruction

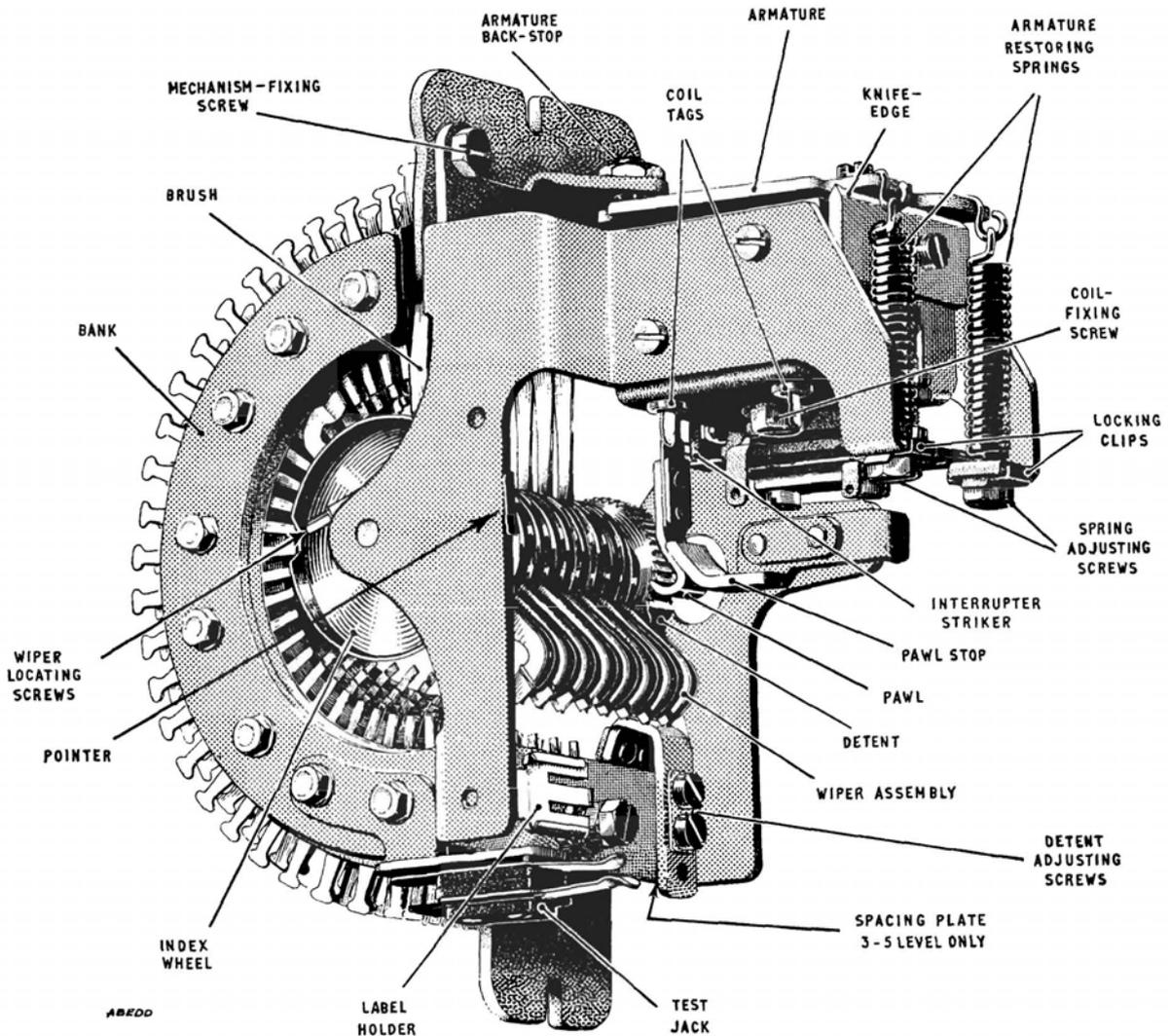
1. Introduction.—This Instruction details the maintenance adjustments of the P.O. Uniselector Type 2, which is used on apparatus other than subscribers' line equipment.

The uniselector is available in two sizes, a small size for banks having 2 to 5 levels and a large size for banks having 6 to 10 levels.

Uniselectors of 10-level type are used only when 5 levels of 50 outlets are required. General views of a P.O. Type 2 uniselector showing the names of the parts are given in Figs. 1 and 2.

The mechanical details of both sizes are identical except for the width of the frame and wiper assembly.

The uniselectors can be obtained to provide 25 or 50 outlets. Uniselectors of the 25-outlet type have double-ended wipers; in one revolution each end of the wiper sweeps over the same level of 25 bank contacts. Uniselectors with 50 outlets have single-ended wipers and by coupling two adjacent and opposite wipers, each wiper will, in turn, sweep over 25 bank contacts, thus providing an availability of 50 bank contacts per revolution.



★FIG. 1

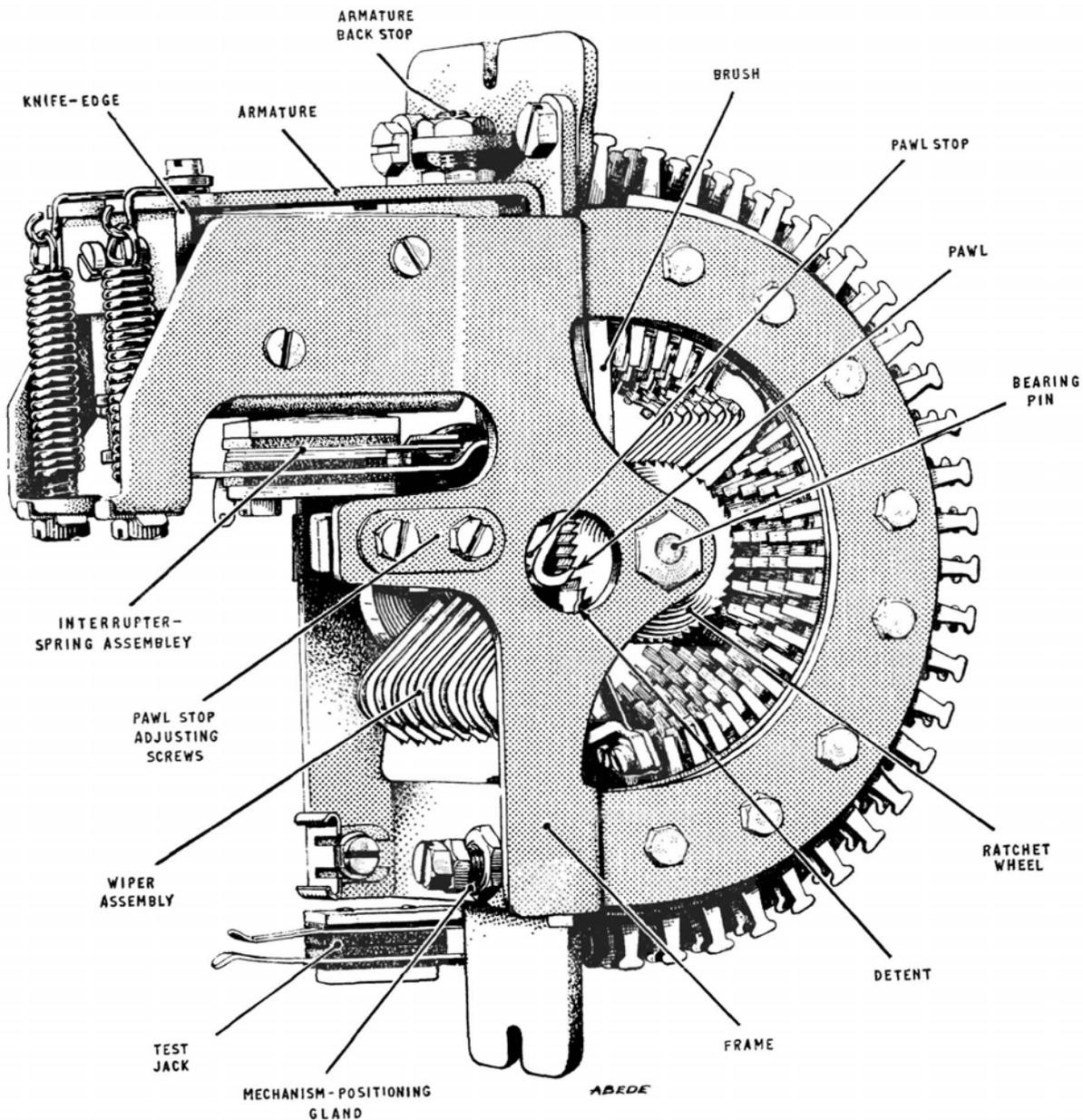


FIG. 2

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MECHANISM ADJUSTMENTS

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

4. **Removing mechanism from bank.**—To avoid any possibility of the wipers fouling the bank and brushes, set the wipers on the lower half of the bank between contacts 15 and 25. Then withdraw the two upper mechanism fixing screws; grip the mechanism with one hand, remove the bottom fixing screw with the other hand, and withdraw the mechanism (see Fig. 3).

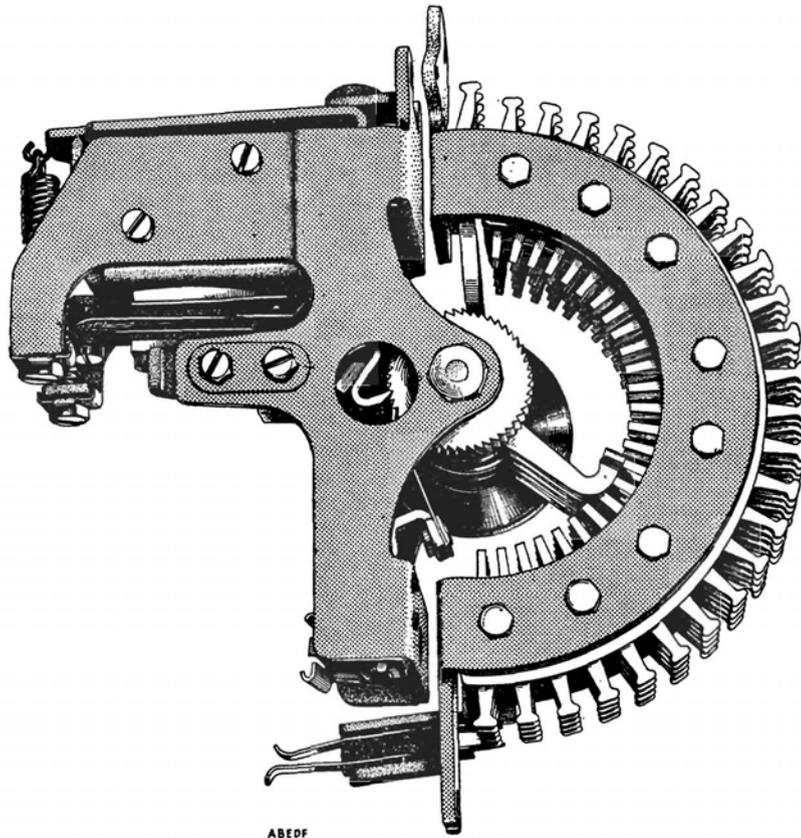


FIG. 3.—REMOVING THE MECHANISM FROM THE BANK

5. Adjustment of brushes.—The two springs of each pair of brush springs should lie flat against each other from their base to a point $\frac{1}{2}$ in. from the tips. From this point, the tips of the two springs should be set outwards so that there is a space of $\frac{3}{16}$ in. to $\frac{1}{4}$ in. between the tips (see Fig. 4). Each pair of brushes should be at right-angles to their mountings.

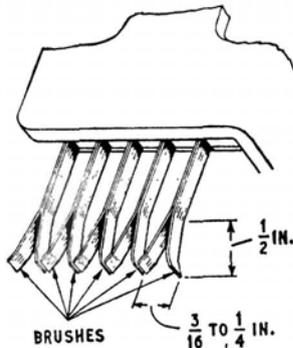


FIG. 4

6. Replacing mechanism in bank.—Place the locating comb over the brushes at a point above the set in the spring (see Fig. 5). Slide the comb downwards until the tips of each pair of brush springs have been compressed (see Fig. 6). The reduced rib of the comb should then be inserted behind the bank frame by sliding the comb upwards (see Fig. 7).

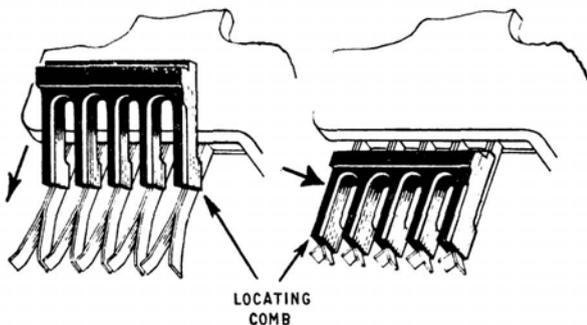


FIG. 5

FIG. 6

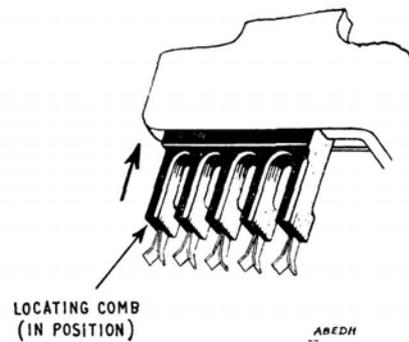


FIG. 7

Set the wipers at a position between 3 and 5, as shown by the index wheel. Pass the heels of each pair of wipers through their respective slots in the comb (see Fig. 8) and move upwards to engage with the first

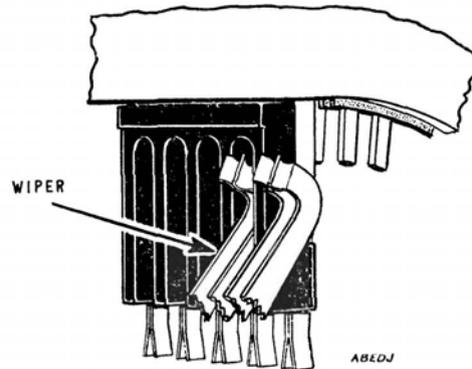


FIG. 8.—REPLACING MECHANISM IN BANK

bank contacts (see Fig. 9), then push the mechanism well home on the bank. Replace the mechanism-securing screws. Then release and remove the comb. Tighten the mechanism-fixing screws securely by means of a box spanner.

Do not attempt to replace the mechanism without fitting a locating comb over the brushes.

7. Brush tension.—The tension of each brush on its collector ring should be 40 ± 20 gm (test) 40 ± 15 gm (readjust), measured as near to the tip as possible (Fig. 10).

(a) *To increase the tension of a brush feed, remove the mechanism from the bank and reset the brushes (see par. 5).*

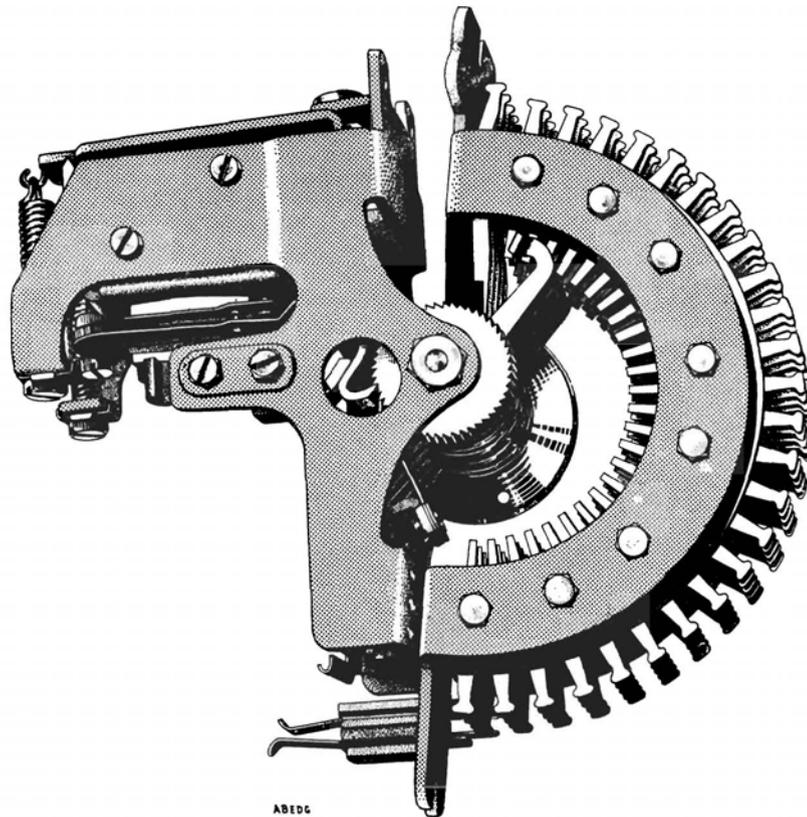


FIG. 9.—REPLACING MECHANISM IN BANK

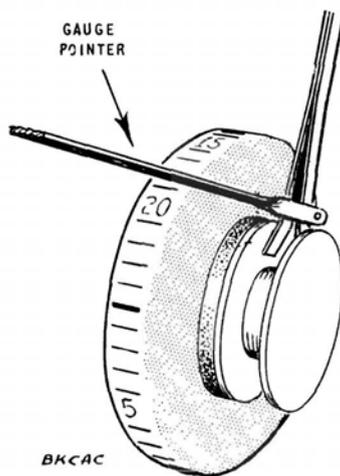
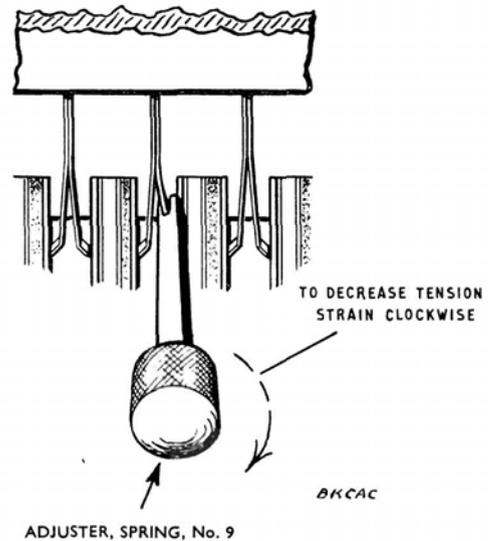


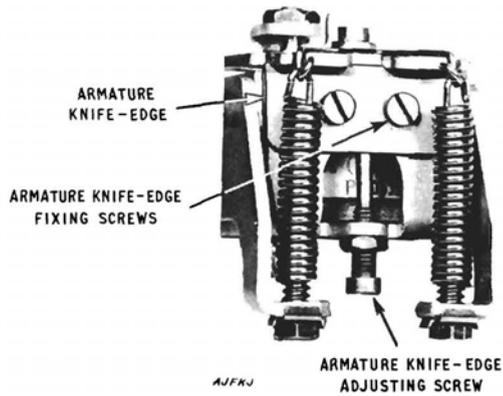
FIG. 10.—MEASURING BRUSH TENSION

(b) To decrease the tension.—Using an Adjuster, Spring, No. 9 gently lever the particular brush spring away from the collector ring as shown in Fig. 11.



ADJUSTER, SPRING, No. 9
FIG. 11.—DECREASING BRUSH TENSION

★8. **Armature knife-edge.**—This should be positioned by means of its adjusting screw (see Fig. 12) so that when the armature is manually operated the following conditions obtain:—



★FIG. 12

(a) The armature is parallel to the side of the coil box (see Fig. 13).

(b) There is a clearance between the sides of the coil box and the armature.

(c) The pawl covers the full width of the ratchet teeth (see Fig. 14).

(d) The operating face of the pawl tip is parallel to the short face of the ratchet teeth.

It is permissible to tilt the knife-edge slightly to meet the above conditions.

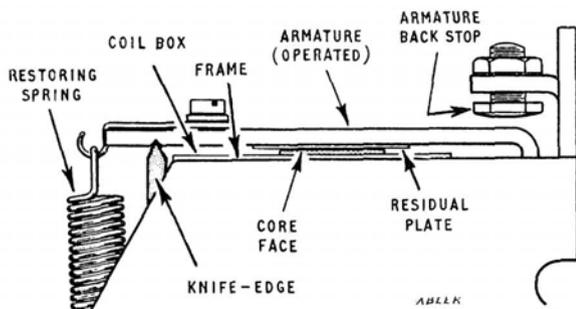
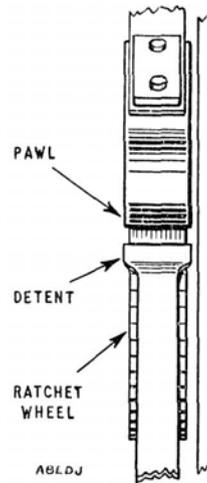


FIG. 13

9. **Detent.**—Position the detent so that the tip of the detent covers the full width of the ratchet teeth (see Fig. 14). The depth of engagement of the detent in the ratchet teeth should be approximately equal to the thickness of the detent.



★FIG. 14

(a) To adjust the detent, insert a 3-mil feeler gauge between the armature and the magnet core and operate the armature electrically. Lightly push the wipers backwards until the operating face of the pawl is resting against the short face of a ratchet tooth. With the wiper assembly held in this position, adjust the detent to rest squarely against the short face of the ratchet tooth, next to the one in which the pawl is resting. When the armature is normal, and with the armature back stop adjusted, the detent spring should rest in the second tooth from the pawl (see Fig. 15).

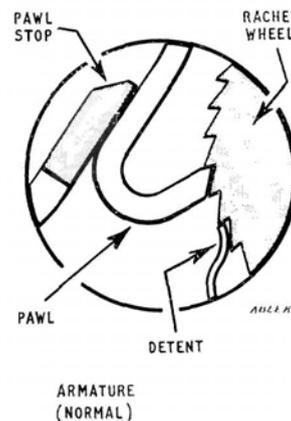


FIG. 15.—DETENT SPRING RESTING IN 2ND TOOTH AWAY FROM THE PAWL

With the detent-fixing screws lightly tightened, fine adjustment may be obtained by inserting the pointed end of an Adjuster, Detent, No. 4 into the hole in the detent and levering the adjuster in the desired direction.

(b) *Tension of the detent.*—The tension exerted on the ratchet wheel should be 80 ± 30 gm (test) 80 ± 20 gm (readjust), measured as near to the tip as possible. Adjust as follows:—

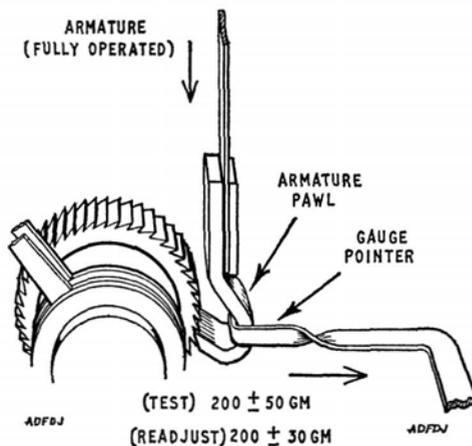
(i) *To reduce the tension.*—Ease the detent away from the ratchet wheel, using the slotted end of an Adjuster, Detent, No. 4.

(ii) *To increase the tension.*—Remove the detent from the uniselector and, using duck-bill pliers, reset the spring at the root.

When measuring the tension, ensure that the tip of the detent is not binding on the short face of the ratchet tooth.

10. Armature back stop.—Adjust the armature back stop so that, when the armature is released, by hand, the detent drops cleanly into the ratchet teeth without allowing any backlash of the wiper assembly. This must be checked on each notch of the ratchet wheel with lubricant applied to the ratchet wheel, pawl stop and armature back stop. Because of slight manufacturing variations in the ratchet teeth, slight backlash is permissible on some steps but not on all steps.

11. Pawl-spring tension.—The tension of the pawl spring should be 200 ± 50 gm (test) 200 ± 30 gm (readjust), measured at the hooked portion of the pawl, with the armature fully operated (see Fig. 16).



★FIG. 16.—MEASURING PAWL-SPRING TENSION

(a) *To reduce the tension.*—With the armature operated, apply an Adjuster, Spring, No. 3 to the root of the spring and gently lever the spring outwards.

(b) *To increase the tension.*—Remove the armature from the uniselector and, with the aid of duck-bill pliers, reset the spring from the root.

12. Pawl stop.—With the armature normal, the pawl should be lightly wedged between the pawl stop and the ratchet wheel. The combined adjustment of the pawl stop and detent should be such that the backward and forward lash in the wiper assembly is only just perceptible on at least one position of the ratchet wheel. The backward and forward lash on any of the remaining positions of the ratchet wheel must not be such that the tips of non-bridging wipers, when lightly moved backwards and forwards, by hand, traverse more than $\frac{1}{3}$ rd the width of a bank contact.

Check by inserting a 5-mil taper feeler gauge between the pawl stop and the pawl and noting that the detent does not drop into the root of the tooth when the armature is manually operated and released. On readjustment the detent should not drop in when a 3-mil feeler gauge is used.

13. Stepping test.—To check the adjustments described in pars. 9 – 12, insert a 3-mil feeler gauge between the armature and core, operate the armature electrically, and check that the pawl steps over the ratchet teeth. With a 7-mil gauge substituted, the pawl should not step over the ratchet teeth. Check this in at least four positions, approximately equidistant, round the ratchet wheel. These values should be considered as readjust values. The test values for maintenance routine purposes are 2 mils and 8 mils, respectively, and if outside these values the uniselector should be readjusted. Recheck that the ratchet drops cleanly into each notch of the ratchet wheel when the armature is operated and released by hand.

14. Location of non-bridging wipers on bank contacts.—The position of the non-bridging wipers on the bank contacts should be such that the radial centre (through the contact portion) rests within the limits of $\frac{1}{3}$ rd and $\frac{2}{3}$ rd of the width of a bank contact (see Fig. 17). To adjust the position of the wipers:—

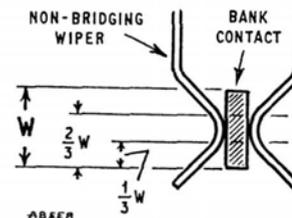


FIG. 17

(a) Move the wipers to contact No. 1 with the wiper locating screw to the front. Using a Spanner, Box, No. 25, loosen the wiper locating screw and move the wiper assembly in the required direction until the wipers rest halfway on the bank contacts. The adjustment can be made by retaining the box spanner over

the screw, levering it upwards (or downwards) until the desired position is obtained; then securely tighten the wiper-locating screw.

(b) When uniselectors are mounted on non-standard mounting centres, it may be difficult to view the position of the wipers on the bank contact and the following tests will determine that the wiper to bank position is correct:—

With the wipers on the last bank contacts, operate the armature and insert a 24-mil gauge (test) 22-mil gauge (readjust) between the armature and armature back stop and allow the armature to restore.

The non-bridging wipers should then be just clear of the leading edge of the first bank contacts (see Fig. 18). Check the position of the wipers by deflecting each blade of the wiper outwards, in turn; its partner blade should follow. This condition will be met if follow on one blade only of a pair is obtained.

WIPER CLEAR OF EDGE
OF 1ST BANK CONTACT



FIG. 18.—WIPER CLEAR OF EDGE OF 1ST BANK CONTACT

(c) With a 14-mil gauge (test) 16-mil gauge (re-adjust) applied as indicated in (b) both partner blades should touch the first bank contact (see Fig. 19). Check by deflecting each blade, in turn; the partner blade should *not* follow.

WIPER JUST TOUCHING
1ST BANK CONTACT

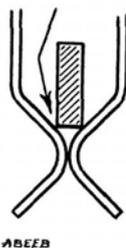


FIG. 19.—WIPER JUST TOUCHING 1ST BANK CONTACT

(d) Rotate the wiper assembly, by hand, to the 25th bank contact. The non-bridging wipers must now occupy the same relative position on this contact as they occupied on the bank contact No. 1.

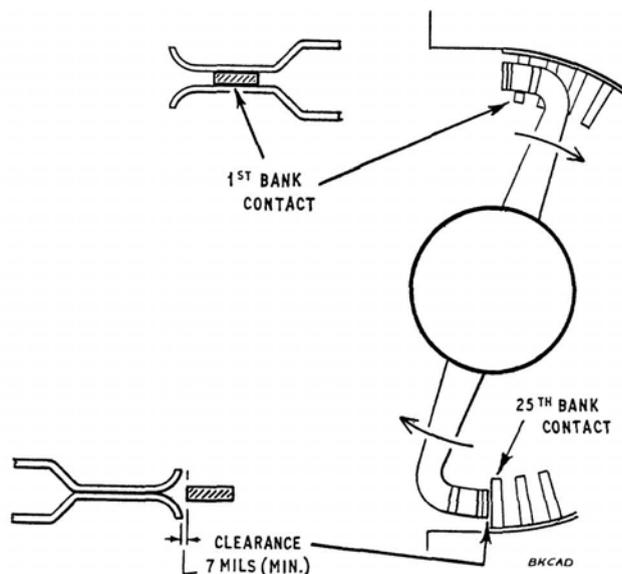
This can be checked by operating the armature when

the wipers are standing on the 24th bank contact and gauging between the armature and back stop as under (b) and (c).

If the wipers do not meet the gauging values, adjust the position of the mechanism relative to the bank, by means of the bank-adjusting gland, until the wiper position is correct. Tighten the gland-locking nut and recheck the position of the wipers on the first bank contacts.

15. Location of bridging wipers.—With the wipers standing on the first bank contacts, check that the extreme tips of the opposite ends clear the 25th bank contacts by 7 mils minimum (see Fig. 20). This clearance may be judged by eye, or, when the uniselector is mounted on a rack, by moving the wiper springs sideways and checking that the flared tips do not touch the bank contacts.

On a wiper assembly having all bridging wipers, the alignment of the wipers on the bank contacts must ensure that the whole width of the bank contacts is embraced within the wiping surfaces of the wipers (see Fig. 20).



★FIG. 20

16. Adjustment of wipers.—

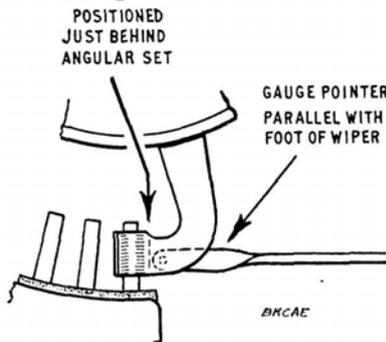
(a) *Wiper entry and flare.*—When the wipers are standing on the 1st bank contacts, the opposite ends should be in alignment with the bank levels, so that they will leave the levels without deflecting in either direction more than the thickness of a bank contact.

The adjustment must be made at both ends of the wiper assembly. The location of the mechanism must be adjusted by means of the two upper mechanism-securing screws, so that the wipers enter the bank levels without appreciable side movement.

After adjustment, the mechanism-securing screws must be securely retightened by means of a box spanner.

(b) *Wiper tips.*—Adjust the wiper tips so that the two contact points lie flat upon each other when off the bank contact. There must be no gap perceptible to the eye between the outermost contact points. Between the innermost contact points, however, there may be a gap of 8 mils maximum (test), 4 mils maximum (readjust).

(c) *Wiper tension.*—When the wipers are standing on the 25th bank contacts, they should exert a pressure of 30 ± 10 gm on the bank contacts. To check this, insert the gauge so that the pointer tip engages a point just in front of angular set of the wiper, and as near to the tip as possible (see Fig. 21). If readjustment is necessary, tension the wipers to exert a pressure of 30 ± 5 gm.



★FIG. 21.—MEASURING WIPER TENSION

(d) *Clearance between wipers and brushes.*—When the wipers are standing on the 23rd bank contacts and the wiper assembly is moved sideways on the spindle, there should be a minimum clearance of 10 mils between the brushes and the adjacent wipers (see Fig. 22).

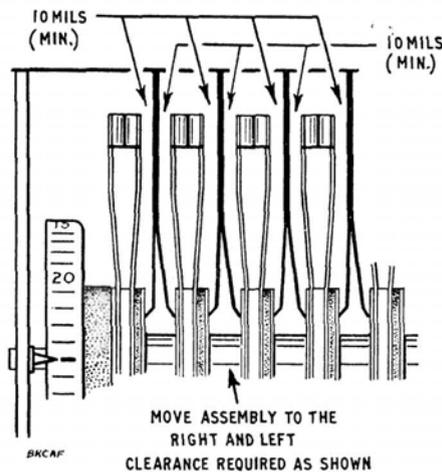


FIG. 22

(e) *Clearance between wipers and adjacent bank contacts.*—When the wipers are standing on the 25th

bank contacts and the wiper assembly is moved sideways on the spindle, the heels of their opposite ends should not touch bank contacts No. 1.

17. *Armature-restoring springs.*—The tension of the two armature-restoring springs must be evenly distributed, by adjustment of the spring-adjusting screws. The tension must ensure that, when the release of the armature is lightly retarded by hand, the wipers will step positively on to the next bank contacts. Excessive tension must be avoided. Locking clips are provided under the heads of the adjusting screws to prevent loss of tension due to the screws turning in the springs in service. If a screw fails to rise when it is turned, the wings of the clips are probably worn and the clip should be changed.

18. *Interrupter-spring assembly.*—The interrupter-spring assembly is of the rocker type which enables the operate time of the contacts to be varied without changing the contact pressures. The following conditions must be satisfied for correct adjustment:—

(a) With the armature operated, the lever spring must cover the full width of the interrupter striker (see Fig. 23).

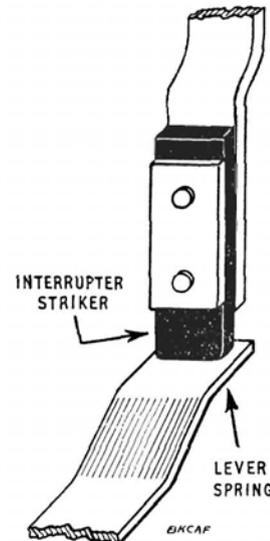


FIG. 23

(b) The contacts must not be out of alignment by more than $\frac{1}{4}$ of the width of a contact (see Fig. 24).

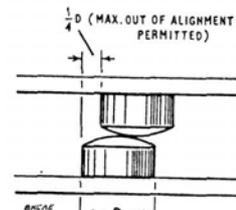


FIG. 24

(c) With the armature normal, the contact spring should be parallel to the clamp plate (see Fig. 25). Adjustment can be obtained by varying the position of the inner buffer.

★(f) With the armature normal, a pressure of 200 ± 50 gm (test) 220 ± 30 gm (readjust) is required to open the interrupter contacts when the contact spring is against the inner buffer. Apply the pointer of the

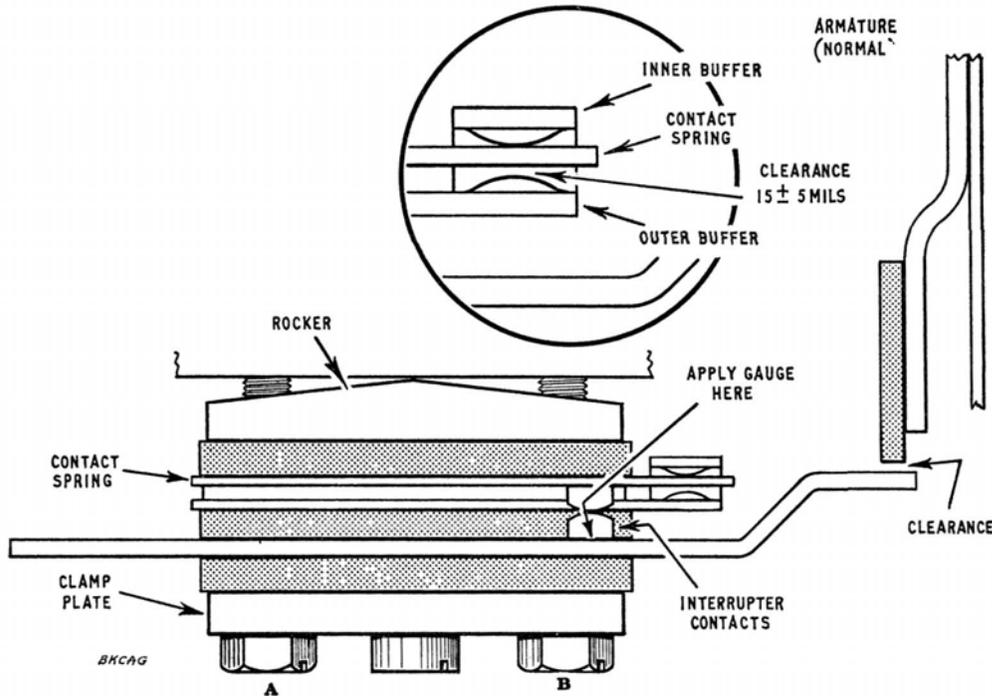


FIG. 25

(d) With the armature normal and with the contact spring resting against the inner buffer, the clearance between the contact spring and the outer buffer is 15 ± 5 mils (see Fig. 25). The buffers should be adjusted, if necessary, using Pliers, Adjusting, No. 1

(e) With the armature operated, and the interrupter contacts open, the contact spring should rest against the outer buffer with a pressure of 30 gm min. (test) 45 ± 10 gm (readjust). Measure the pressure at a point on the contact spring adjacent to the contact (see Fig. 26).

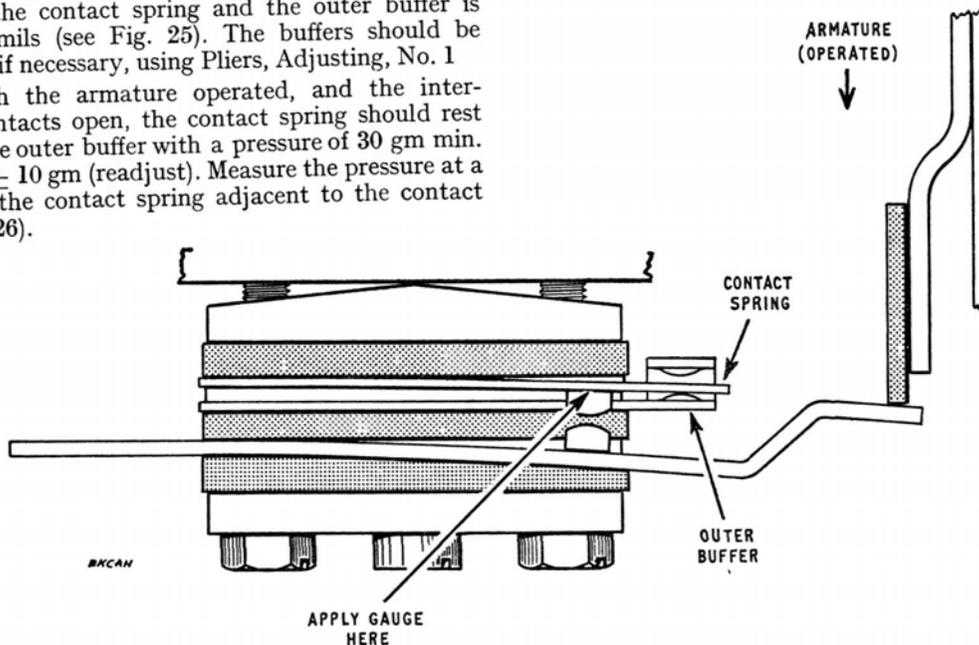


FIG. 26

gauge at a point adjacent to the contacts (see Fig. 25).

(g) With the armature normal, check that the tension of the lever spring causes the contact spring to rest against its inner buffer with a minimum pressure of 10 gm. This should be checked with the pointer of the gauge applied adjacent to the contact on the lever spring (see Fig. 27).

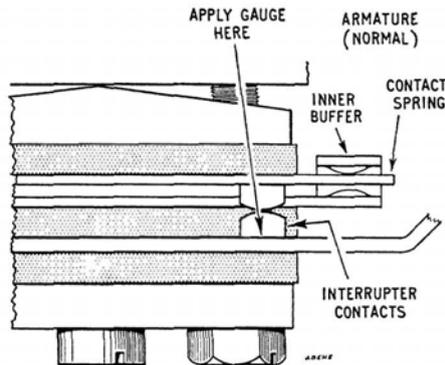


FIG. 27

19. Rocker adjustment.—

(a) Adjust the position of the rocker by means of the screws marked A and B in Fig. 25 so that the instant of contact interruption takes place just before the armature pawl steps over the teeth of the ratchet wheel.

When making this adjustment care should be taken to loosen one screw before tightening the other so as to prevent damage to the screws. To obtain early interruption, slacken screw A and tighten screw B. To obtain late interruption, slacken screw B and tighten screw A.

The instant of interruption should be varied to obtain smooth running consistent with the speed specified in par. 20.

Smoothness in running can be checked by observing that the armature movement from the back stop is regular.

(b) With uniselectors having only two or three wipers, it may be necessary to increase the armature-restoring-spring tensions to obtain smooth running.

(c) With the armature normal, there must be a clearance between the tip of the lever spring and the interrupter striker (see Fig. 25).

20. Running tests should be performed at normal exchange voltage applicable to the unselector under test. When testing a homing-type unselector, the normal homing earth should be disconnected, by insulating the appropriate relay contact with an Insulator, Contact, No. 1.

The combined tensions of the armature-restoring springs and interrupter springs must ensure that:—

★(a) The unselector will start, and the wipers rotate smoothly and reliably, when the operating voltage is applied in series with the magnet coil and interrupter contacts, and 30 ohms (60V and 50V uniselectors) or 18 ohms (40V uniselectors) or 4 ohms (22V uniselectors) or 60 ohms (80V uniselectors).

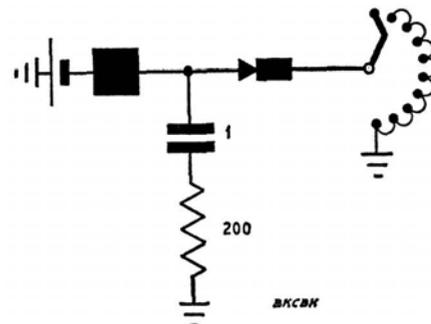
(b) With the operating voltage applied in series with the magnet coil and interrupter contacts, the wipers must rotate smoothly at the speeds specified in Table 1.

TABLE 1

Maximum speed of all uniselectors . .	100 rev/min
Minimum speed of 2-5 wiper „ . .	60 rev/min
Minimum speed of 6-10 wiper „ . .	50 rev/min

(c) The wipers of all homing uniselectors must home reliably and stop accurately on the home position, when connected as shown in Fig. 28.

When testing or adjusting a unselector for running, always verify that the spark quench is in order.



★FIG. 28

21. Location of pointer.—The pointer must be located as follows:—

(a) *Homing uniselectors.*—To indicate the '0' position when the wipers are on the home contacts.

(b) *Non-homing uniselectors.*—To indicate the first position when the wipers are standing on No. 1 bank contacts.

★22. Adjustment to P.O. coder to Dgm. AT 2055.

—The unselector interrupter-spring assembly must be so located that, on the return of the armature, the interrupter contacts do not close until immediately after the non-bridging wipers have left the contacts on which they were resting.

MISCELLANEOUS

★23. **Dismantling.**—The method of removing the mechanism from the bank is described in par. 4. The order in which the parts of the mechanism should be dismantled is as follows:—

- (a) Remove the pawl stop.
- (b) Remove the armature-restoring springs.
- (c) Remove the armature.
- (d) Remove the detent; note the position of the spacing plate (on 2-5 level uniselectors only).
- (e) Remove the spindle, wiper assembly and ratchet wheel from the frame.
- (f) Remove the armature back stop.
- (g) Remove the ratchet wheel from the wiper-assembly hub.
- (h) Remove the knife-edge, knife-edge adjusting screw and locknut.
- (j) Remove interrupter-spring assembly.
- (k) Remove coil box and coil.
- (l) Remove the mechanism-positioning gland.
- (m) Remove the pointer, label-holder and test jack.
- (n) Remove the brush assembly.

★24. **Assembly.**—The adjustment of the mechanism and replacement in the bank are described in pars. 5 to 19. The order in which the parts of the mechanism should be assembled is as follows:—

- (a) Replace the knife-edge, knife-edge adjusting screw and locknut on to the coil box.
- (b) Replace the coil and coil box on to frame.
- (c) Replace the interrupter-spring assembly.
- (d) Replace the pointer.

(e) Lubricate the inner and outer diameter of the ratchet-wheel hub with Oil, Bearing, No. 16 and replace in wiper-assembly hub.

(f) Replace the wiper assembly, ratchet wheel and spindle.

(g) Replace the armature back stop.

(h) Replace the pawl stop; set it well back from the ratchet wheel.

(j) Replace the detent (and the spacing plate on 2-5-level uniselectors only).

(k) Replace the armature on the knife-edge, then its restoring springs. To ensure that the springs will not rust, they should be moistened with Oil, Bearing, No. 16.

(l) Replace the mechanism-positioning gland and locking-screw.

(m) Replace the label-holder and test jack.

(n) Replace the brush assembly on the bank.

★25. **Lubrication.**—Details of the method of lubrication of the uniselector are detailed in B 5137.

26. **Piece parts.**—Details of the piece parts applicable to the uniselector are given in B 5615.

27. **Precautions when returning uniselectors to stores.**—Before returning a uniselector to stores, the wipers must be located on bank contacts No. 21, to protect the wipers from damage.

28. **Tools and their uses.**—A list of tools necessary for the adjustment of P.O. Type 2 uniselectors is given in Table 2. The tools should be used only for the purposes for which they are intended. Any tool that is in such a condition that screws, nuts or springs would be damaged by its use should be changed.

TABLE 2

Rate Book Description	General Description and Use
Adjuster, Spring, No. 3	Spring adjuster, for tensioning pawl spring
Adjuster, Spring, No. 9	Bending tool, for adjusting wipers and brushes
Adjuster, Detent, No. 4	Adjuster, for locating detent
★Cleaner, Contact, No. 8A	Cleaning bank contacts
★Cleaner, Contact, No. 9	Cleaning interrupter contacts
Comb, Locating, No. 1	For 5-level and under uniselectors
Comb, Locating, No. 2	For 6- to 8-level uniselectors
Comb, Locating, No. 3	For 10-level uniselectors
★Comb, Locating, No. 4	For 3-level uniselectors
Gauges, Feeler, No. 10	Strip gauges, for general use
Gauges, Tension, No. 2 }	Pressure gauges, for measuring tension of wipers, brushes, interrupter springs, detent, etc.
Gauges, Tension, No. 3 }	
Pointer, Gauges, Tension, Cranked, No. 5	
Pointer, Gauges, Tension, Cranked, No. 6	Pointer for use with tension gauges

TABLE 2.—(contd.)

Rate Book Description	General Description and Use
Insulator, Contact, No. 1	Insulator, for disconnecting homing earth
★Outrigger, No. 2	Bracket for mounting the mechanism out of bank
Pliers, Adjusting, No. 1	Bent duck-bill pliers
Pliers, Adjusting, No. 2	Straight duck-bill pliers
Pliers, Adjusting, No. 5	Taper nose pliers
Screwdriver, Instrument, No. 1	} For adjustment of wipers, brushes, detent spring, etc.
Screwdriver, Instrument, No. 2	
Screwdriver, Instrument, No. 6	
Screwdriver, Instrument, No. 5	
Screwdriver, Instrument, No. 5	Screwdrivers for coil-box fixing screws, knife-edge fixing-screws, detent-fixing screws, etc.
Spanner, Flat, No. 3	For use inside box spanners
Spanner, Box, No. 1	Spanner, for knife-edge adjusting screw locknut
Spanner, Box, No. 3	Tubular spanner for mechanism-fixing screws, magnet-fixing screw and mechanism-positioning gland
Spanner, Box, No. 14	Tubular spanner, for bank-adjusting gland locknut
Spanner, Box, No. 25	Spanner with wooden handle, for lower mechanism-fixing screw
Spanner, Cranked, No. 11	Spanner with moulded handle, for locating wipers on bank contacts
Spanner, Cranked, No. 3	Spanner with cranked handle, for interrupter-spring assembly, pawl back stop and pointer-fixing screw
Spanner, Cranked, No. 12	Double-ended spanner for armature back stop and wiper spindle nut
Tester No. 80U (22V exchs.)	} Resistance for running tests (see par. 20)
Tester No. 80V (40V exchs.)	
Tester No. 80W (50V exchs.)	
Tester No. 80W (60V exchs.)	

References:—B 5100, B 5137, B 5615
(TPM2/3)

END