

2000-TYPE SELECTORS

Overhaul

[Maintenance Routine Instruction (M.R.I. No. R 151)]

1. General.—This Instruction details the procedure for overhauling 2000-type selector mechanisms. The clearances and tensions quoted in the following paragraphs are 'test' values and any necessary re-adjustments should be made in accordance with TELEPHONES, Automatic, B 5156 (M.A.I. No. 56). When a particular re-adjustment has been made, other dependent adjustments should be checked to ensure that they are still within limits. Particular attention should be paid to frictionally-locked pawl-stops and adjusting screws to ensure that they are secure.

The selector should be removed from the rack and overhauled on the bench.

2. Cleaning and general inspection.—Remove all dust and excessive or dirty lubricant, using a "Duster, Check" and a "Brush, Cleaning". It will be found helpful to remove the detent guard and assembly when doing this. Examine the mechanism, including the contacts of mechanically operated spring-sets, for excessive wear, loose bearing pins, cracked frame, etc., and renew any defective parts, as required.

3. Shaft and carriage assembly.

Check that:—

(a) there are at least two fibre washers on the shaft
(b) the shaft has no play in the conical seating
(c) the carriage assembly is free when raised and lowered in the 12th rotary position; any side-play on the shaft should be only just perceptible

(d) with the carriage normal, there is a gap of at least 3 mils (checked by eye) between the extended lug on the comb-plate and the rotary disk, to ensure that the carriage rests on the shaft clamp

(e) the projecting stud of the anti-bounce plate is approximately central in the hole, and that the plate is in contact with the bridge-plate at a point adjacent to the shaft

(f) any gap between the free end of the anti-bounce plate and the bridge-plate does not exceed 20 mils.

4. Vertical detent.

Check that:—

★(a) the full width of the vertical detent engages the vertical ratchet near the left-hand side

(b) (i) with a *square-cut rotary disk*, the disk enters the comb-slot on levels 1, 5 and 0 with a drop of approximately 5 mils

(ii) with a *chamfered rotary disk*, the disk enters the comb-slot on levels 1, 5 and 0 with no more than very slight rise or fall

(c) the tip of the detent just touches the root of the vertical tooth, but does not move inwards when the carriage is rotated to the first rotary position.

5. Rotary detent.

Check that:—

(a) the detent is so positioned that, with the carriage normal, the upper projection latches securely behind the rotary disk, and the lower edge is just clear of the rotary hub

(b) the detent just clears the short face of the first rotary notch when the carriage is raised. (The gap should be less than 5 mils)

★(c) the detent clears the long face of the first rotary notch when the carriage is raised and in position 5: 5 the depth of engagement is at least two-thirds of the short face.

★6. Vertical adjustments.

(a) Check that the pawl engages the full width of the vertical ratchet, but does not foul the ratchet when the armature is operated with the carriage rotated one step.

(b) Check that the pawl strikes the root of each vertical tooth squarely without sliding along either face of the notch.

(c) Check that, when the vertical armature returns to normal against the back-stop, the pawl just trips over the vertical tooth without causing the carriage to rise on any step.

(d) With the carriage on level 2, withdraw the vertical detent, and check that the rotary disk enters the comb-slot freely.

(e) Operate the vertical armature electrically and check that there is no vertical play in the carriage assembly and that, when the armature commences to restore, the carriage assembly does not rise or fall. (To allow for slight variations of the ratchet due to manufacture, however, a maximum drop of 5 mils is permissible on some steps *but not on all*).

(f) From the side insert a 2-mil "Gauge, Feeler, No. 10" between the armature and front pole-face of the vertical magnet. (The old type of single-cranked 2-mil "Gauge, Feeler, No. 1" is also suitable for this check, but the newer double-cranked type is too short). Operate the armature electrically, withdraw the detent and check that the carriage is locked (i.e. movement is not perceptible, when an attempt is made to move the carriage vertically by hand).

(g) Replace the 2-mil gauge by a similar 9-mil gauge; operate the armature electrically, withdraw the detent and check that the carriage is not locked (i.e. movement is perceptible when an attempt is made to move the carriage vertically by hand).

[NOTE:—The tests in (f) and (g) prove that the vertical pawl strikes the pawl front-stop before the armature strikes the magnet face.]

7. Rotary adjustments.

(a) Check that the pawl-locking projection does not project above the extended lug on the comb-plate.

(b) With the rotary armature operated, check that the pawl clears the upper edge of the rotary hub when the carriage is returning on the normal level.

(c) With the carriage raised and rotated one step, check that the pawl strikes squarely into the fourth rotary notch, sliding $\frac{1}{3}$ to $\frac{2}{3}$ along the long face of the tooth.

(d) Check that the tip of the rotary pawl just clears the long face of the third rotary notch when the carriage is raised from normal.

(e) Check that the pawl-locking projection does not bind on the extended lug of the comb-plate on rotary steps 1-11 on levels 1 and 0.

(f) With the carriage held, by hand, against the rotary detent in the 12th position, check that when the armature is operated electrically, the pawl-locking projection locks behind the extended lug of the comb-plate.

(g) Insert a 2-mil "Gauges, Feeler, No. 1 or 10" between the armature and the front pole-face of the magnet; operate the armature electrically; withdraw the rotary detent and check that the carriage is locked.

(h) Replace the 2-mil gauge by a similar 9-mil gauge; operate the armature electrically; withdraw the detent and check that the carriage is not locked.

8. Mechanism spring tensions.—Check that the tensions of the mechanism springs are within the limits given in Table 1.

9. Mechanically-operated spring-sets (except interrupter springs).

(a) Position the selector, by hand, on different levels and in different rotary positions, so as to operate the various mechanically-operated spring-sets. Check that the contacts "twin", and make or break satisfactorily with adequate follow and contact clearance, and that change-over contacts do not "bunch".

(b) When the first contact unit of a spring-set is a change-over or break unit, check that the operating lever has perceptible play between the back-stop and the spring-operating buffer (but not more than 12 mils for Type 1 spring-sets, or 6 mils for Type 2 spring-sets).

[NOTE:—This does not apply to Type 2 N.P. operating levers, which should rest on the back-stop.]

(c) Check that the operating arms (or rollers) are clear of the associated cams in their non-operated positions.

★10. Interrupters Nos. 1 and 2.

Check that:—

(a) the contact pressures are within the limits 25 to 55 gm. (measured near the contact)

(b) contact clearances are not less than 10 mils (judged by eye)

(c) change-over or make-before-break spring-sets operate in correct sequence

(d) the interrupter will trip in each direction with a pressure of 220 gm. applied in front of the operating stud, but will not trip with 150 gm.

(e) a clearance of not more than 5 mils exists between the operating striker and the buffer, both when the armature is normal and when operated electrically, the interrupters being in the appropriate normal or operated position.

★11. Interrupters Nos. 4 and 5.

Check that:—

(a) the contact pressures are not less than 35 gm. (measured on the outer contact spring immediately in front of the contact)

(b) contact clearances are not less than 10 mils (judged by eye)

(c) there is a clearance of not less than 5 mils between the shoulder of the operating lever and the tip of the outer contact spring (with interrupters operated, or normal, as appropriate)

(d) change-over or make-before-break springs operate in correct sequence

(e) the interrupter will trip in each direction with a pressure of 125 gm. applied to the shoulder in line with the loop spring, but will not trip with 45 gm.

(f) there is a clearance of not less than 5 mils between the operating lever and the operating striker both when the armature is normal and when operated electrically, the interrupters being in the appropriate normal or operated position.

12. Inspection of relays.

(a) Make a general examination of the selector relays and check that 'follow' is satisfactory. Pay

TABLE 1

Spring	Tension (gm.)	Measured at
Vertical pawl	60 to 140	Tip of spring with armature operated
Vertical detent	70 to 150	Tip of detent
Rotary detent	90 to 170	Tip of upper projection
Rotary pawl	110 to 190	Tip of pawl
Vertical armature restoring	290 to 390	Tip of spring
Rotary armature restoring	290 to 390	Tip of spring

particular attention to contacts in the transmission circuit.

(b) Clean the contacts of pulsing relays.

13. Lubrication.—If the general appearance of the mechanism indicates that there is insufficient lubrication, lubricate in accordance with TELEPHONES, Automatic, B 5137.

14. Selector frames.—Check by using a “Tester No. 23 . . .” that the frame is not in contact with earth or battery.

★15. Functional test.—Verify that all screws, nuts, etc., are tight, and that ‘N’ links make good contact. When replacing the selector, check that the jack springs are not distorted, and that the selector jacks into the cradle without undue friction. Check the positioning of wipers. Apply a functional test, by manual tester or routiner, in accordance with the appropriate M.R.I. Check spark-quench circuits by observing that excessive sparking does not occur at contacts.

References:—TELEPHONES, Automatic, B 5137, B 5156
(Tp 2/4)

16. Summary of overhaul operations.

- (a) Clean and inspect
- (b) Shaft
- (c) Carriage (free and resting on clamp)
- (d) Anti-bounce plate
- (e) Vertical detent (left-hand side, engagement and cut-in)
- (f) Rotary detent (height, long face and short face)
- (g) Vertical adjustments (pawl position and engagement, back and forward lash, gauge armature gap, back-stop)
- (h) Rotary adjustments (pawl position and engagement, pawl projection locking, gauge armature gap, back-stop)
- (j) Mechanism spring tensions
- (k) Mechanically-operated spring-sets
- (l) Interrupters (spring tension, contact clearance, tripping tension and striker gap)
- (m) Relays (examination, and cleaning of pulsing contacts)
- (n) Lubrication
- (o) Insulation of selector frame
- (p) Functional test.

END