

BRITISH TELECOMMUNICATIONS ENGINEERING DEPARTMENT

SPECIFICATION

FOR

Dials, Automatic No. 12.....	Drawing No. 90158
" " 13.....	" "
" " 14.....	" "
" " 15.....	" "
" " 16.....	" "
" " 17.....	90214

Note: Specification D 1000 shall be taken as forming part of this specification.

1. CONSTRUCTION

(a) The dials shall be constructed in accordance with the appropriate assembly drawing.

(b) The finish of the dials shall be equal to that of the pattern.

(c) The mechanism of the dials shall run quietly and smoothly at a uniform speed.

(d) The governor shall be assembled so that the governor-spindle is free in its bearings with .02 inches maximum end play.

(e) The Trigger shall be free on its bearing-pin with perceptible end-play but negligible side-shake.

(f) The Main Spring shall be tensioned by rotating the finger-plate until the spring is fully wound and then allowing the finger-plate to return through $1\frac{1}{2}$ revolutions after which the stop-plate adjusting screw shall be screwed down and the finger-plate allowed to return to its normal position.

2. ADJUSTMENT

(a) Trigger Spring (1/DSP/1123)

The trigger spring shall be in such adjustment that the following conditions are met:-

(i) The trigger restraining spring shall lie squarely on the flanges of the trigger and be clear of the lever pivot-screw. With the finger-plate and trigger at normal, the tension of the trigger spring shall be 22-36 grams measured at the free end of the spring.

(ii) After gently pushing the trigger tip away from the pulse wheel, and allowing it to return to rest slowly under the action of the trigger spring, rotation of the finger-plate from normal must result in the tip of the trigger engaging the first tooth of the pulse wheel by .015 inches minimum, as far as can be judged by eye.

(iii) After selecting any number, rotate the finger-plate a little further until the trigger tip is resting on top of the following tooth of the pulse wheel. On releasing the finger-plate slowly from this position, the trigger tip must engage the approaching tooth by .020 inches minimum, as far as can be judged by eye.

During the winding up and pulsing of the dial when retarded by hand, the trigger shall be seen to be clear of the bottom of the teeth of the pulse wheel.

(b) Pulsing Springs

The spring 1/DSP/158 shall exert a contact pressure of 22-36 gms. on spring 1/DSP/157 when the contacts are normal. The correct pressure shall be obtained by adjustment of the outer spring which should be straight and free from kinks. When the springs are adjusted to give the pulse ratio detailed in Table 2 the contact opening during the break period of a pulse shall be .01 inches minimum. The springs must not be moved during the winding up of the dial or during the minimum pause period prior to pulsing.

(c) Switching Springs

When the springs are normal the contact gaps shall be 0.1 inches minimum.

When the springs are operated:-

(i) Springs 1/DSP/154 and 1/DSP/156 shall exert a contact pressure of 22 - 36 gms. on springs 1/DSP/153 and 1/DSP/155 respectively.

(ii) There shall be a gap between spring 1/DSP/156 and the insulating bush on spring 1/DSP/154 to ensure that springs 1/DSP/153 and 1/DSP/154 break first when the dial returns to normal.

The adjustment of the switching springs and the switching lever which operates them shall be such that on the return of the dial to its position of rest the insulating bush on the switching lever does not touch the spring 1/DSP/154 until the pulsing springs have closed at the end of the last pulse.

(d) Auxiliary Spring Set (Dial Auto No. 13... only)

The auxiliary springs shall normally be in contact. When the V-shaped cam-follower is resting on the small step of the auxiliary cam the outer spring (1/DSP/159) shall be clear of its buffer. When the spring set is operated the outer spring shall rest on its buffer and the maximum pressure on the buffer shall be 15 gms. The contact gap shall be .01 inches minimum.

(e) Auxiliary Spring Set (Dial Auto No. 16... only)

The auxiliary springs shall normally be in contact with a gap between the outer spring (1/DSP/159) and its buffer of .002 inches minimum. When the contact is broken there shall be a contact gap of .01 inches minimum, and Spring 1/DSP/159 shall then exert a pressure of 22-36 gms. (measure at the tip of the spring) on its buffer. The adjustment of the springs and the switching lever which operates them shall be such that on the return of the dial to its position of rest the insulating bush on the switching lever does not touch the spring 1/DSP/1126 until the pulsing contacts have closed at the end of the last pulse.

(f) Governor

The speed of the dial shall be adjusted to be within the limits shown in Table 1. The wings of the governor shall be bent from the roots and after adjustment must be straight and free from kinks. The weights must be equidistant from the governor spindle as near as can be judged by eye.

3. LUBRICATION

The dials shall be lubricated with Oil, Bearing No. 16 (Specification M 175). The drop referred to below shall be such as would adhere to a No. 23 S.W.G. copper wire after being dipped into a reservoir of oil of depth $\frac{5}{8}$ inches.

(a) Governor Gear Assembly. One drop of oil shall be applied to the clutch spring and one drop to each pivot.

(b) Governor Assembly. Before the governor assembly is fitted, one drop of oil shall be applied to the worm and one to each pivot. Each governor weight shall be wiped lightly upon a sparingly oiled pad, so that after assembly a thin film of oil from the weights will be deposited upon the friction surface of the governor cup. The total quantity of oil in the governor cup after assembly shall not be sufficient for it to flow visibly from one point to another when the position of the dial is varied.

(c) Main Spindle and Bush. One drop of oil shall be applied when assembled.

(d) Main Spring. The coiled spring shall be immersed in a bath of Oil, Bearing No. 16. The spring shall be drained before assembly in the spring box and no further oil shall be applied.

(e) Trigger Lever Bush and Pivot Screw. Sparingly oil the bearing surfaces.

(f) Trigger Bearing Pin. Sparingly oil the bearing faces of the trigger at each end of the bearing pin.

(g) Trigger Spring. Sparingly oil the flat surface which bears on the trigger.

4. PERFORMANCE

(a) The dials shall produce pulses within the limits of speed and ratio specified in Tables I and II. When examined with an oscilloscope the pulses shall be free of contact chatter.

(b) There should be a minimum pause period of 240 milliseconds between the release of the finger-plate from the position where the edge of the finger hole coincides with the edge of the top of the finger stop after selecting a number, and the transmission of the first pulse on a dial adjusted to 10 p.p.s. This figure is inherent in the design of the dial. It cannot be adjusted and is not subjected to acceptance test.

(c) When the dial is wound up to within $\pm .120$ inches ($\pm .100$ inches for dial Auto No. 17) of the top member of the finger-stop and then released, the correct number of pulses shall be transmitted.

(d) (Dial Auto No. 13.... only)

(i) The Auxiliary spring set shall remain operated during the pulsing of 9 or 0 but shall stay close when any other number is dialled.

(ii) When, during the pulsing of 9 or 0, the direction of motion of the finger-plate is reversed to Control Cam shall move beneath the insulating bush of the trigger and hold the pulsing contact open.

(iii) When, after pulsing 9 or 0, the motion of the finger-plate is arrested before the auxiliary spring set has been reset (but after the tip of the trigger has dropped into the first notch in the pulse wheel) it shall be reset by the bush on the trigger on dialling any subsequent number.

5. INSULATION RESISTANCE

The insulation resistance between any two points that are not required to be electrically connected shall not be less than 100 megohms when tested with 250V DC.

6. LIFE TEST

Each dial should be capable of being operated to figure 9 and returning to normal under the action of its own main spring 500,000 times without failure or major readjustment and without excessive wear of any part.

7. SAMPLES

Samples shall be submitted for examination and approval before bulk manufacture is commenced unless a sample of identical construction has previously been submitted and approved.

8. MARKINGS

Each dial shall be marked on the back with the BT Stock list number, the approved code letters identifying the manufacturer, the year of manufacture and the mark number, eg: 12 FH 51/2

TABLE 1

Pulse Speeds

Dial Auto No.	Speed (pulses per second)
12...	10 ± 1
13...	10 ± 1
14...	10 ± 1
14 LA/2VF	10 ± 0.5
15...	11.75 ± 0.5
16 FA	10 ± 0.5
16 FT3	11.75 ± 0.5
16 FT4	11.75 ± 0.5
17...	10 ± 1

TABLE 2

Pulse Ratios

Dial Auto No.	% Break	
	Nominal	Limits
12	66 2/3	63 - 70
13	66 2/3	63 - 70
14	66 2/3	63 - 70
14 LA/2 VF	66 2/3	64 2/3 - 68 2/3
15 FT 3	78	76 - 80
15 FT 4	50	48 - 52
16 FA	66 2/3	64 2/3 - 68 2/3
16 FT 3	78	76 - 80
16 FT 4	50	48 - 52
17	66 2/3	63 - 70

END OF SPECIFICATION