

- (b) Unscrew the contact screws marked "BUZZER" and "CHOPPER" about two turns by means of the small knobs.
  - (c) Turn the "BUZZER" knob slowly clockwise until buzzing starts.
  - (d) Clamp the "BUZZER" by its locking ring.
  - (e) Turn the small knob controlling the "CHOPPER" contact screw clockwise until a clear reliable note is heard in the headphones on depressing the morse key.
- Important.**—When adjusting the buzzer contacts, care must be exercised not to force the contact screw hard on to the armature contacts or the platinum contacts will be damaged and the buzzer put out of action.
- (f) Clamp the "CHOPPER" by its locking ring.
  - (g) To check the adjustment, operate the "PULL-ON" knob with the morse key pressed. When the knob is out, a clear and steady note should be heard in the headphones.

NOTES.—i. No undue force must be used in locking the knobs, a quarter of a turn of the locking rings being sufficient to lock or release them.

**Light pressure only is required to lock.**

ii. If it is impossible to obtain a clear and reliable note in the headphones, when the morse key is pressed, unlock the "BUZZER" knob by means of the locking ring and re-adjust it until the buzzer gives a steady note. Lock the "BUZZER", press the morse key and adjust the "CHOPPER" knob until the desired result is obtained; then lock. If necessary repeat the whole of these operations, as care is needed to obtain a reliable note in the headphones.

**2. To send and receive.**—

- i. Remove the short circuiting wire from the terminals  $L_1$ ,  $L_2$  and connect the Fullerphone in the selected line circuit.

NOTE.—In order to facilitate connecting-up, the terminal markings of the Superposing Units (One Transformer), Fullerphones, and telephone sets are reproduced in the diagrams (Figs. 1-9).

- ii. Plug in the headphones and pull the "PULL-ON" knob.

- iii. Eliminate any permanent buzz heard in the headphones not due to the distant station when the key is *up* by setting the reversing switch to the position "A" and adjusting the potentiometer until the continuous buzz is cut out. If the noise increases or only decreases when the potentiometer knob is rotated, set the switch to position "B" and adjust the potentiometer until the steady noise is eliminated.

NOTE.—Normally, when the potentiometer is not required, the reversing switch should be left in the centre position to avoid battery wastage.

- iv. To send, operate the morse key in the usual manner, when side-tone should be heard in the headphones.
- v. To receive or stand-by listen in the headphones.

**Important.**—No call can be received unless the buzzer is working and the "CHOPPER" properly adjusted; this can be checked by means of the side-tone.

3. *Bunching a number of Fullerphones together to a single pair of headphones for listening in quiet periods.*—

- i. Connect the output of the Fullerphones in parallel by connecting a twin lead, terminating at each end with a Plug Single No. 9, between the telephone jacks of each instrument.
- ii. Plug the headphones into the vacant jack on the first or last Fullerphone of the group.
- iii. Switch on, by means of the "PULL-ON" switches, all Fullerphones working on metallic circuits and see that the buzzer-chopper of each is working correctly. With Fullerphones working on earth return circuits it is only necessary to switch on the Fullerphone at the opposite end of the group to which the phones are plugged.
- iv. A message coming in on any Fullerphone circuit will then be heard by the operator, who must proceed to locate the particular circuit, plug his receivers into the appropriate Fullerphone, having removed the plugs connecting to the other Fullerphones.
- v. Immediately a message is taken the whole group of Fullerphones must be re-connected together to avoid any delay on further calls which may be coming in on other circuits.

4. *Tests.*

i. *Potentiometer.*

- (a) Short-circuit the terminals  $L_1$  and  $L_2$ .

- (b) Pull on the "PULL-ON" switch. Do not work the morse key.
- (c) Move the reversing switch to "A" and a buzz should be heard in the headphones which varies in strength as the potentiometer knob is turned.
- (d) Move the reversing switch to "B" and a buzz should be heard in the headphones which varies in strength as the potentiometer knob is turned.
- (e) If there is no variation on turning the potentiometer knob with the reversing switch at "A" or "B", check the connections to the potentiometer battery  $B_2$  (Plate II). If these connections are correct and the buzzer-chopper contacts are properly adjusted there is probably a disconnection in the set or the potentiometer is faulty. If all connections in the instrument are sound the potentiometer should be checked for continuity (see Sec. 4, Maintenance, para. 4).

ii. *No signals.*—

If the Fullerphone is correctly connected up and switched on, when the morse key is operated, signals should be heard in the headphones. If no signals are heard, and only clicks when the morse key is pressed, readjust the buzzer-chopper. If it is impossible to get buzzing by adjusting the "BUZZER" knob, then there is a disconnection, or the battery is run down. See that the battery terminals are clean and tight. If the battery  $B_1$  (shown in Fig. 1 and Plate II) is run down replace it with a new one, but if no new cell is available change the position of the old one with the potentiometer battery ( $B_2$  Plate II).

If with the buzzer working no signals are heard when pressing the morse key, readjust the "CHOPPER" knob and then the "BUZZER" knob; continue these adjustments until a clear note is heard in the headphones when the morse key is depressed.

NOTE.—No signal will be heard in the headphones when the morse key is depressed, unless the terminals  $L_1$  and  $L_2$  are connected to a line (connected to another Fullerphone) or short-circuited.

The buzzer should start readily when the "PULL-ON" switch is operated. If no results are obtainable with the Fullerphone all connections should be carefully checked.

#### 4. Maintenance and Repair

1. *General.*—The apparatus should be kept clean and dry. Any parts which require replacement can be renewed if spares

are available, but winding failures should be replaced by Ordnance Workshops.

2. *Battery compartment.*—It is essential that the battery compartment be kept thoroughly clean and any corrosion should be removed from the batteries. This is of importance since, if battery corrosion continues for any length of time, some difficulty may be experienced in removing the old batteries for replacement.

3. *Buzzer-chopper (Buzzers F, Mk. II).*—Buzzer-chopper failure should be overcome by replacement by another Buzzer F, Mk. II, if possible, before any attempt is made at repairs. The buzzer is removed from the instrument by releasing the spring holding clip and drawing it forward.

NOTE.—On no account must the buzzer be pulled from the instrument by the adjusting knobs.

Small parts of the buzzer which are attached by screws (not riveted) such as the bakelized cover plate, adjusting and locking knobs, armature, springs, etc., may be replaced if necessary.

Any coil replacements should be carried out by Ordnance Workshops.

The contacts of the buzzer, if they have become pitted or dirty, may be cleaned with a contact file or refaced on an oilstone. It is essential that the surfaces of the contacts be perfectly flat and if no suitable tools are available then the contacts should be left for the attention of Ordnance Workshops.

The threads of the adjusting knobs and locking knobs should be kept free from dirt and grit.

4. *To replace the potentiometer, condensers, etc. (see Plate III).*

- i. Disconnect the four leads from the batteries and the three leads from the morse key.
- ii. Remove the four 6 B.A. cheese-headed screws from the front panel and the two 6 B.A. cheese-headed screws at rear on the top panel of the instrument.
- iii. Lift away the top and front panels as a unit.

All the components of the Fullerphone are now accessible and can be easily unsoldered and replaced. Before the potentiometer can be replaced the two chokes CH1 and CH2 will have to be removed. These are held in position by eight countersunk screws through spacing pieces.

## APPENDIX I.—LIST OF MAIN COMPONENTS

Description (1)	Reference			Value (5)	Remarks and V.A.O.S. nomenclature (6)
	Symbol (2)	Figure (3)	Plate (4)		
Batteries ..	B1 & B2	I	II	2 cells 1.5 volts each	Cells, Dry, X, Mk. II, or Cells, Inert, S, Mk I. (Sect. W2).
Boxes, carrying ..			I		Fullerphones Mk. IV Boxes Mk. I* (Sect. Y). Earlier models of this instrument were supplied with fabric covered wood- en boxes.  The later model has a metal bound wooden box.
Buzzer-chopper ..		1	I, II, IV & V	30 ohms (two coils in series).	Buzzers F, Mk. II (Sect. Y).
Choke .. ..	CH1	1	III	200 ohms resistance.	Fullerphones Mk. IV Chokes 200 ohms (Sect. Y).
Choke .. ..	CH2	1	III	200 ohms resistance.	Fullerphones Mk. IV Chokes 200 ohms (Sect. Y).
Condenser ..	C1	1	III	1 $\mu$ F	Condensers 1.C (Sect. Y).
Condenser ..	C2	1	III	2 $\mu$ F	Condensers 2.D (Sect. Y).
Condenser ..	C3	1	III	1 $\mu$ F	Condensers 1.C (Sect. Y).

## APPENDIX I—(continued.)

Description (1)	Reference			Value (5)	Remarks and V.A.O.S. nomenclature. (6)
	Symbol (2)	Figure (3)	Plate (4)		
Headphones ..			I		Receivers, Head gear C.L.R. double Mk. III (Sect. Y).
Morse key ..			I & II		Keys W.T. 8- amp No. 2 (Sect. Z).
Potentiometer ..	R	1	I, II, & III	500 ohms	Fullerphones Mk. IV Potent- iometers(Sect. Y).
Pull-on switch ..	S1	1	I & II		Fullerphones Mk. IV Switches, ON and OFF (Sect. Y).
Reversing switch	S2	1	I, II, & III		Keys No. 212 (Sect. Y).
Sling .. ..			I		Straps carrying F (Sect. Y). Earlier models of the instru- ment were sup- plied with leather slings as shown in Plate I. These slings are now of webbing material.
Telephone sockets					Fullerphones Mk. IV Sockets Telephone (Sect. Y).

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