

WIRELESS SET NO. 48

GENERAL DESCRIPTION (PROVISIONAL)

NOTE. The information in this E.M.E. Regulation is provisional and is supplied for the use of R.E.M.E. personnel pending the issue of more complete instructions. All errors of whatever sort should, therefore, be notified through the usual channels to the War Office (M.E.10).

Purpose

1. Wireless Set No. 48 is intended primarily for short-range communication within infantry battalions and R.A. regiments and provides facilities for radio telephony and continuous wave telegraphy. It may be used as a ground station for working in the open or from cover, as a man-carried pack set for working on the move, and from vehicles either at rest or on the move, provided that they are suppressed to eliminate interference from their electrical systems.

Basic data

2. The sender, receiver, rod aerial and battery are all carried in one case which is fitted with straps to allow it to be carried on a man's back. A separate battery, which is larger than the one that fits into the set, is provided for use when necessary. The microphone, headphones, key and ground aerial are all carried in a satchel, signals.

3. Frequency range 5.9-9.1 Mc/s.
Intermediate frequency 455kc/s.

Receiver valves : V.1.A.—R.F. amplifier 1LN5
V.2.A.—Frequency changer 1LA6
V.1.B.—I.F. amplifier 1LN5
V.3.A.—2nd detector/BFO 1LD5
V.3.B.—1st L.F. amplifier/AVC 1LD5
V.4.A.—Output 1A5GT

Sender valves : V.4.B.—Master oscillator 1A5GT
V.5.A. and B.—Power Amplifier 1299 (2 valves)
V.3.C.—Modulator/crystal Oscillator 1LD5

Power supply : Battle battery 162/3V.
or generators, hand, 10 watts, Mark II

Consumption at 150 V H.T. and 3 V L.T.

| | H.T. | L.T. |
|------------------------------|------|-------|
| Receiving R.T. | 7mA | 160mA |
| " C.W. | 8mA | 160mA |
| Sending R.T. | 27mA | 385mA |
| " C.W. (key down) | 59mA | 300mA |
| Netting | 15mA | 240mA |
| Calibrating | 25mA | 225mA |

Weights and dimensions

| Wt. lb. | Overall dimensions | | |
|------------------|--------------------|------------------|------------------|
| | Breadth in. | Length in. | Height in. |
| 29 | 11 $\frac{3}{8}$ | 10 $\frac{1}{2}$ | 17 $\frac{3}{8}$ |
| 5 | 9 | 11 $\frac{1}{2}$ | 3 |
| 23 $\frac{1}{2}$ | 11 $\frac{1}{2}$ | 14 $\frac{1}{2}$ | 4 |

Set and battery in case

Satchel Signals containing 2 Rcrs. headgear, 1 microphone, 1 ground aerial, key and plug.

External battery case

Range

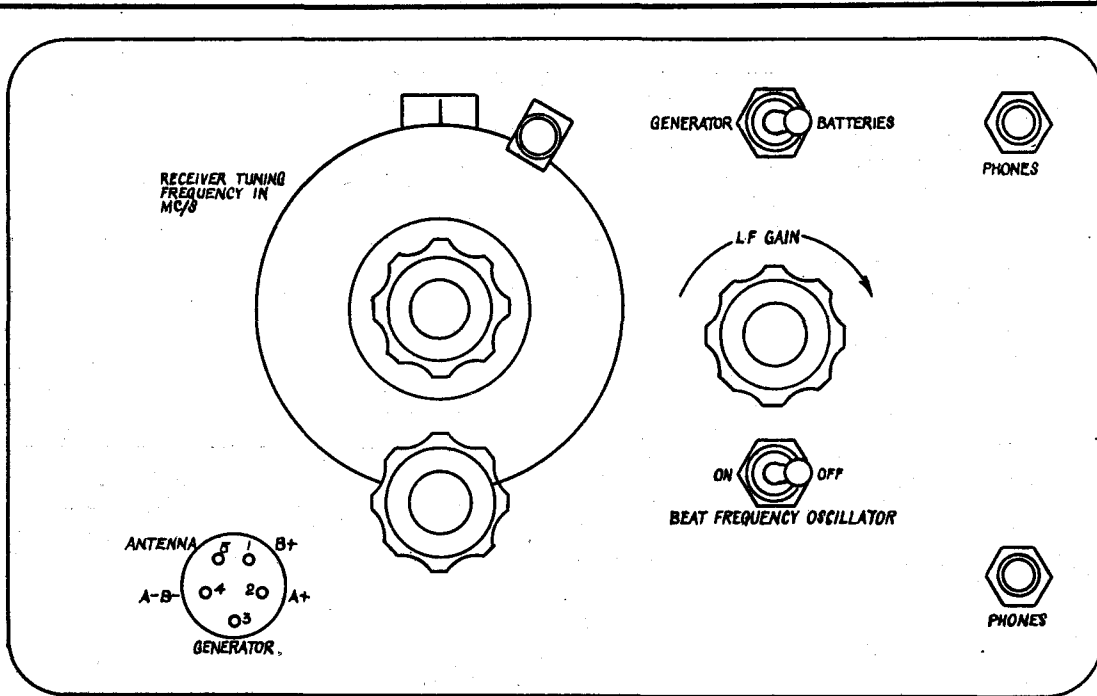
4. The set is designed to work under all conditions up to a range of 2,000 yds., the following being the approximate ranges with the different types of aerial normally used.

| Type of aerial | Range for R/T (miles) | Range for W/T (miles) |
|-----------------------|-----------------------|-----------------------|
| 10-ft. rod | 5 | 10 |
| 6-ft. rod | 2-5 | 4-10 |
| Ground aerial | 1-3 | 2-6 |

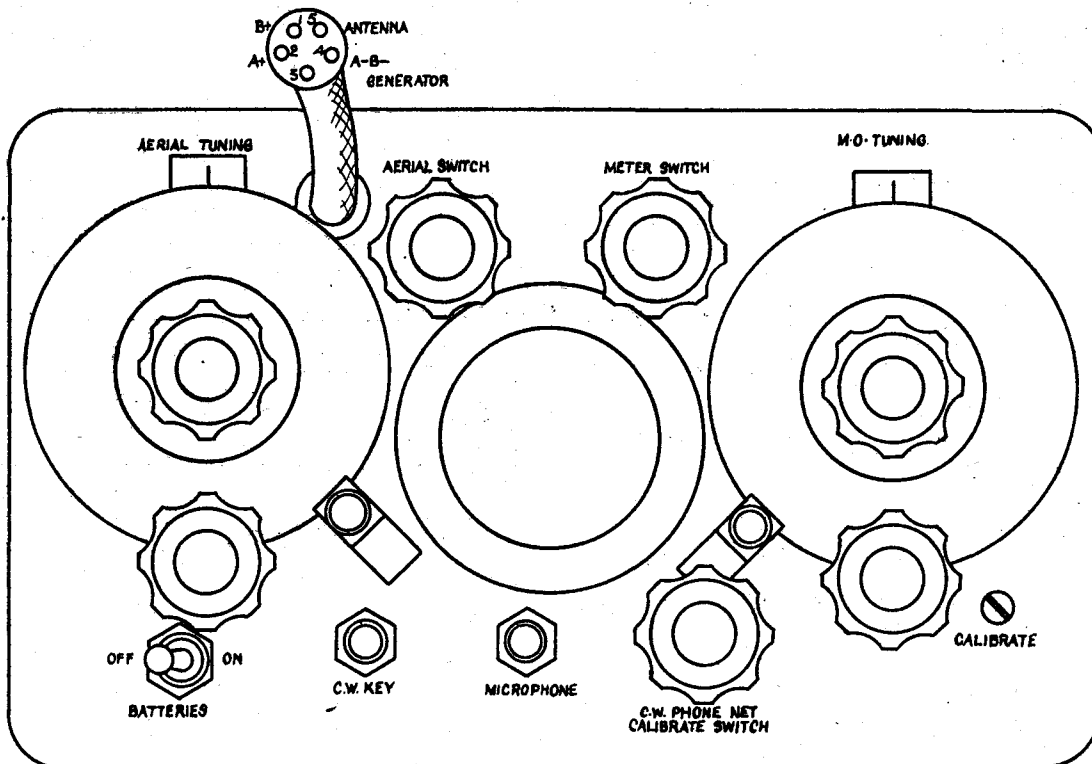
5. If horizontal aerials, either Windom or end-fed, are used, considerably greater ranges can be obtained. Owing to the possibility of interference with distant stations, such aerials should be used only if special orders are issued to do so.

MECHANICAL DETAILS

6. Wireless Set No. 48 is housed in a ribbed steel case embodying a rucksack frame. The front of the case is closed by hinged metal flaps and a canvas hood. This hood, which is open when operating the controls of the set, gives protection against bad weather conditions. The canvas is easily detached for decontamination. The sender slides into the lower section of the case, and the receiver into the upper. Both are held in position by securing screws and may be readily withdrawn for inspection. The rod aerial consists of sections of painted steel tubing. Eleven are carried in a rack at the side of the set. The rod



RECEIVER FRONT PANEL.



SENDER FRONT PANEL

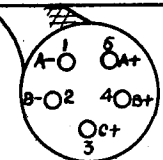


Fig. 1. Sender and receiver front panels.

aerial is mounted on a rotatable moulded plug at the side of the case which allows it to take up a vertical or a horizontal position, so that whether the operator is upright or in the prone position the aerial will be vertical. The rotatable moulded aerial mounting plug is fitted with a spring the purpose of which is to restore the aerial to its normal vertical position if it should be deflected by contact with low-hanging tree branches or other similar obstructions. Provision has been made for fixing its position at different points in the arc of the track for the fixing screw and knurled nut which secures the aerial in position. The aerial sections are spigoted and may be firmly joined together to form a rod aerial up to 10 feet in height. Three tubings of different diameters are used to make up the rod aerial; the largest, of darkest colour, should be at bottom and the smallest, of lightest colour, at the top, when they are assembled. Connection between battery and sender unit and sender and receiver units is completed by using cables terminating in suitable plugs.

ELECTRICAL DETAILS

7. The frequency range, from 5.9 megacycles to 9.1 megacycles (50 metres to 33 metres), is covered in a single band. The signal frequency of the sender is generated by a master oscillator circuit followed by a single power amplifier. The aerial is autocoupled to the power amplifier by aerial taps

on a parallel tuned output circuit. There are thus three tuning controls, the M.O. TUNING, AERIAL TUNING, and AE SWITCH.

THE SENDER

8. The controls are shown in Fig. 1. The ON-OFF SWITCH S2B breaks the 3 V L.T., the 150 V H.T., and the 12 V supplies, from both the sender and receiver units. The AERIAL TUNING dial is associated with the variable condenser C16A, which controls the tuning of the output circuit of the power amplifier, in conjunction with the AERIAL SWITCH. The AERIAL SWITCH selects the correct tapping point on the inductance coil of the power amplifier. The M.O. TUNING dial is connected to a two-ganged condenser C17A, C17B, which controls the tuning of the master oscillator circuit, and is the main control for the setting of the emitted frequency.

Meter switch

9. The METER SWITCH places the meter in any of the five positions (fig. 2).

- (a) M.A. position which connects the meter across R21A. (Resistor, wire wound, 2.35 ohms) and measures the total H.T. battery consumption to the sender or to the receiver. (Connection 1 in SO 1.A.) (fig. 7).

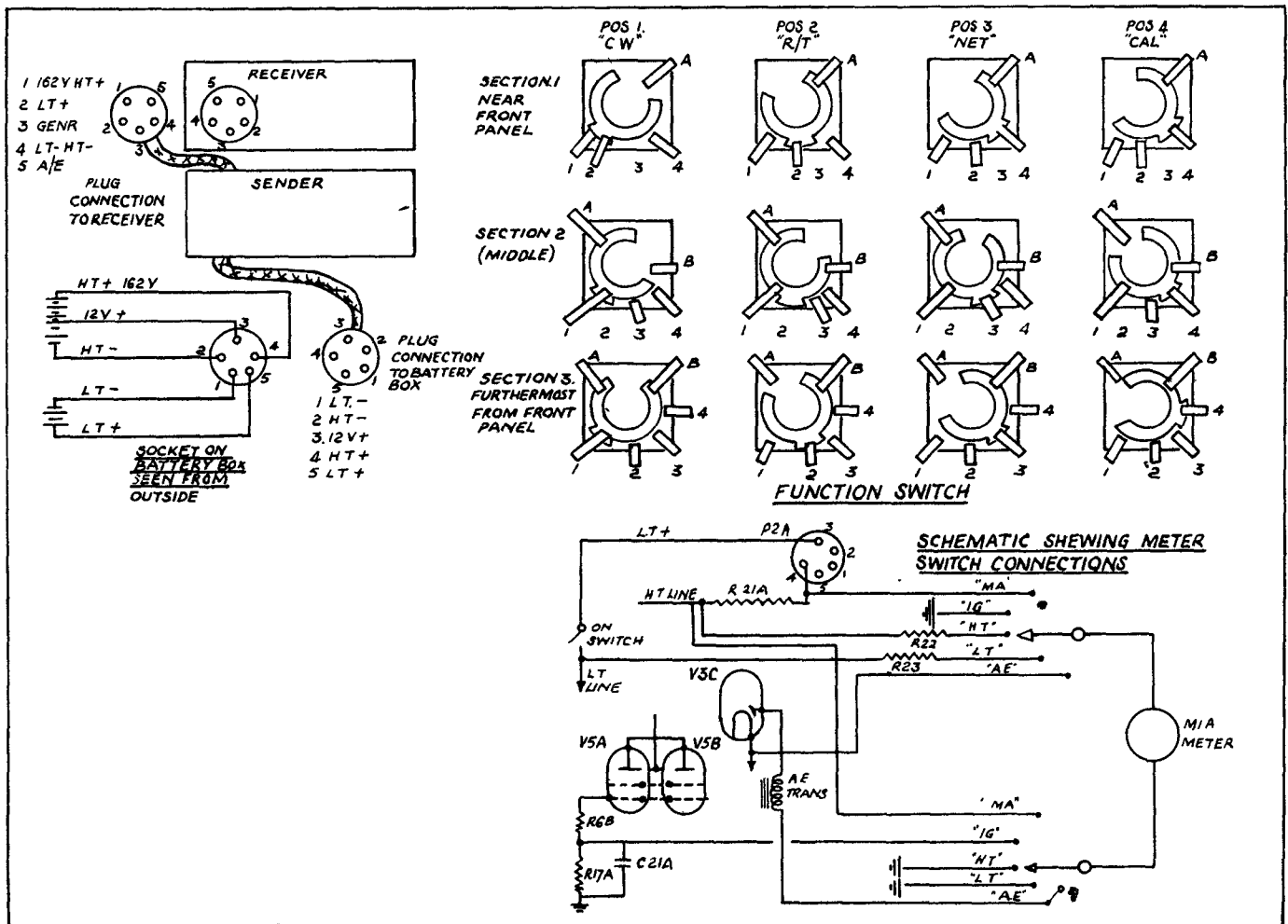


Fig. 2. Key to positions of function switch.

- (b) I.G position which connects the meter across R17A (220Ω) in the grid leak circuit of the P.A. valves (V5A and V5B in parallel) to indicate the grid current for neutralizing the P.A. stage, or for adjusting the drive.
- (c) H.T. position which connects the meter between the H.T. line and chassis *via* suitable series resistance R22 (40,000Ω) to measure voltage of the H.T. battery.
- (d) L.T. position which connects the meter between the L.T. line and chassis *via* R23A (Resistor W.W. ½ W. 7800Ω) to measure the voltage of the L.T. battery.
- (e) AE position which connects the meter in series with an R.F. transformer, and a diode in V3C (modulator valve), to indicate the aerial current.

10. The C.W.-PHONE-NET-CAL control knob operates three ganged rotary switches and has four positions (fig. 2). In the C.W. position the circuit connections are shown in skeleton form in fig. 5. The oscillator tuned circuit is coupled between the signal grid and filament (cathode) of

V4B (1A5G7). The amplified oscillatory voltage in the anode circuit is fed to the grids of V5A and V5B. (Two valves 1299 in parallel.) The suppressor grids of these valves are connected direct to the H.T. line, thus short-circuiting the audio frequency modulator stage (fig. 3, Switch S5A, Section 3, contact 1). The oscillatory power in the anode circuit of the P.A. is applied to the aerial through the aerial switch, the blocking condenser, .004μF, and the "make" contact of relay S6A.

11. The C.W. key and its send-receive switch are mounted together on a base and connected by means of a cord and plug to the C.W. jack of the sender (fig. 3). When the send-receive switch is in the sending position the relay S6A is energised, by the 12 V battery, to connect the sender filaments to the 3 V L.T. battery, and the P.A. to the aerial. No signals are sent out until the C.W. key is depressed to connect the earth connection to the battery.

12. When the send-receive switch is in the receiving position the relay 6A is released and the contacts fall back, switching the aerial and the 3 V L.T. battery from the sender to the receiver.

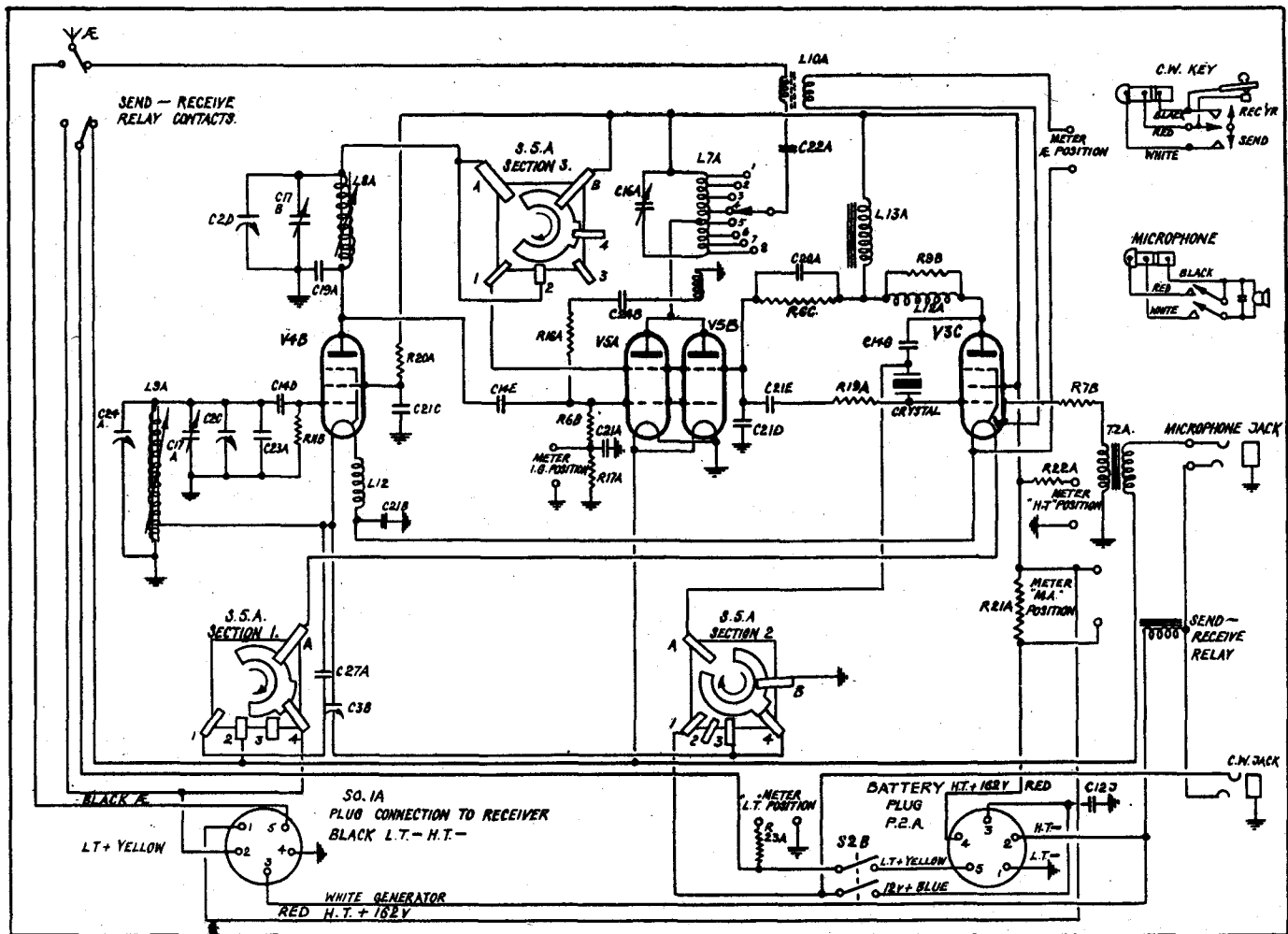


Fig. 3. Schematic diagram of sender.

20. The BEAT FREQ OSC switch (S1A, fig. 8) connects the H.T. supply to the anode of the 2nd detector valve for reception of C.W. This is a fixed beat frequency oscillator; a pre-set adjustment of the core of L3A (fig. 3) determines the C.W. note.

21. The intermediate freq. is 455 kc/s and the band width 17 kc/s. The grid bias for the output valve is derived from the grid current flowing in the oscillator grid circuit. The voltage is developed in R11A (220,000Ω) and R12A and R12B (1 MΩ each) are connected as a fixed potentiometer across R11A. The input to the A.V.C. diode is taken from the anode of the I.F. valve through C14A and the rectified voltage appears across R12C, the A.V.C. load resistance; this voltage is applied to the R.F. and I.F. valves.

22. The two output phone jacks are connected in parallel and both are arranged for automatic selection of impedance to match high or low impedance phones. If H.R. phones are used, a short plug, i.e. No. 9, is fitted; this is just long enough to engage the sleeve and ring, connection thus being made to the outers of the transformer secondary. When L.R. phones are used a long plug, i.e. No. 10, is fitted; the tip connection is then engaged which operates the auxiliary contact, disconnecting the ring contact, and the phones are connected across the low impedance tapping of the secondary.

POWER SUPPLY

23. Power for the set is drawn from dry (primary) batteries. Filament heating is provided by a 3V battery, and a 162V battery, tapped at 12 volts, provides H.T. and relay voltage. The L.T. consumption is 0.32A on send phone, 0.25A on send c.w. and 0.15A on receive. The H.T. consumption is 20mA on send phone, 50mA on send c.w., and 8mA on receive. Assuming a ratio of transmission to reception time of 1 to 3, about 8 to 12 hours of continuous operation of the set is possible without changing batteries. Intermittent working greatly increases the useful life of the batteries.

AERIALS

The rod aerial and ground aerial

24. The aerials normally used with Wireless Set No. 48 are the rod aerial and ground aerial. The rod aerial sections may be mounted on the set for a self-supporting aerial up to 10 ft. in height. The ground aerial consists of 25 ft. of insulated wire, connected to the aerial socket on the set by a single plug at one end of the wire. It is intended primarily for working from trenches and other forms of cover where a vertical rod would be too conspicuous. It is thrown along the ground in the general direction in which communication is desired and may be

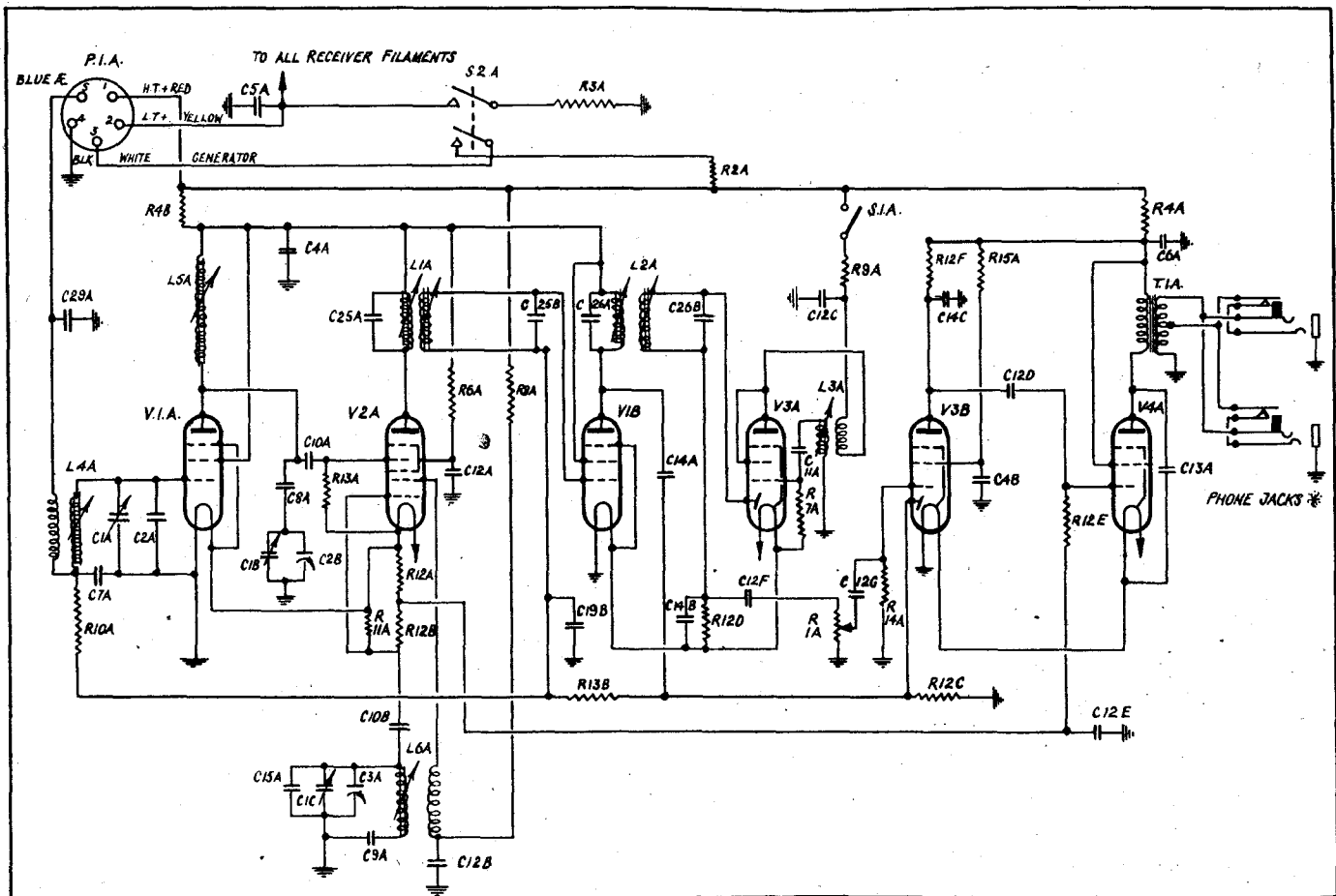


Fig. 8. Schematic diagram of receiver.

NOTE. Phone jacks with H.R. phones use short plug, i.e. No. 9. With L.R. phones the long plug, No. 10, is used.

used in conjunction with the rod aerial. It is normally carried in the Satchel, signals with the headphones and hand microphone.

Rod aerial control

25. The sectional rod aerial is carried, dismantled, on the right-hand side of the case when not in use. The normal operating position, with aerial sections assembled, is vertical in the aerial connector assembly, with the knurled nut on the connector assembly left loose. The aerial may then be adjusted to any position between vertical and 90° from vertical (towards the doors) by grasping and rotating the connector assembly to the desired position and tightening the knurled nut. At the 90° position, however, the aerial will remain in position with the nut loose. With a seven section rod aerial in use, pressing inward on the knurled nut will automatically spring the aerial back to its original vertical position. Provision is made for adjusting the spring tension of the antenna housing to accommodate a full eleven section rod aerial. *This adjustment should be made in the workshop.*

CAUTION. With less than a seven-section aerial in use, the automatic release from the 90° position to the vertical position by pressing inward on the knurled nut *should not be used.* The lowest section should be grasped in one hand and the aerial then allowed to slowly return to the desired position. Failure to do this may result in injury to the operator and damage to the equipment.

Use of a counterpoise earth

26. Wireless Set No. 48 does not normally require an earth connection. In certain circumstances, however, slightly better results are possible using a counterpoise earth attached to the earth terminal fitted on the left-hand side of the sender case. This earth may be an earth mat, a bunch of wires or any convenient metallic object large enough in size. If the ground aerial is not otherwise in use it may serve as a counterpoise when connected to the earth terminal on the set and extended on the ground beneath or near the aerial. To use a counterpoise earth with the ground aerial, connect about 25 ft. of insulated wire to the earth terminal and extend it on the ground in the direction opposite to that of the ground aerial. The straight line formed by the ground aerial and its counterpoise earth should be roughly in the direction of the desired station.

Operation of mobile sets in the open under fire

27. If the operator comes under fire and is compelled to assume a prone position with the rod aerial parallel to the ground it may be found that there is a serious decrease in signal strength. An increase in signal strength may be effected by restoring the aerial to a vertical position, the operator remaining prone. The aerial is held by the lowest section of the rod and rotated on the mounting plug towards the vertical until it locks. When the operator stands upright the aerial should be returned to its original position.

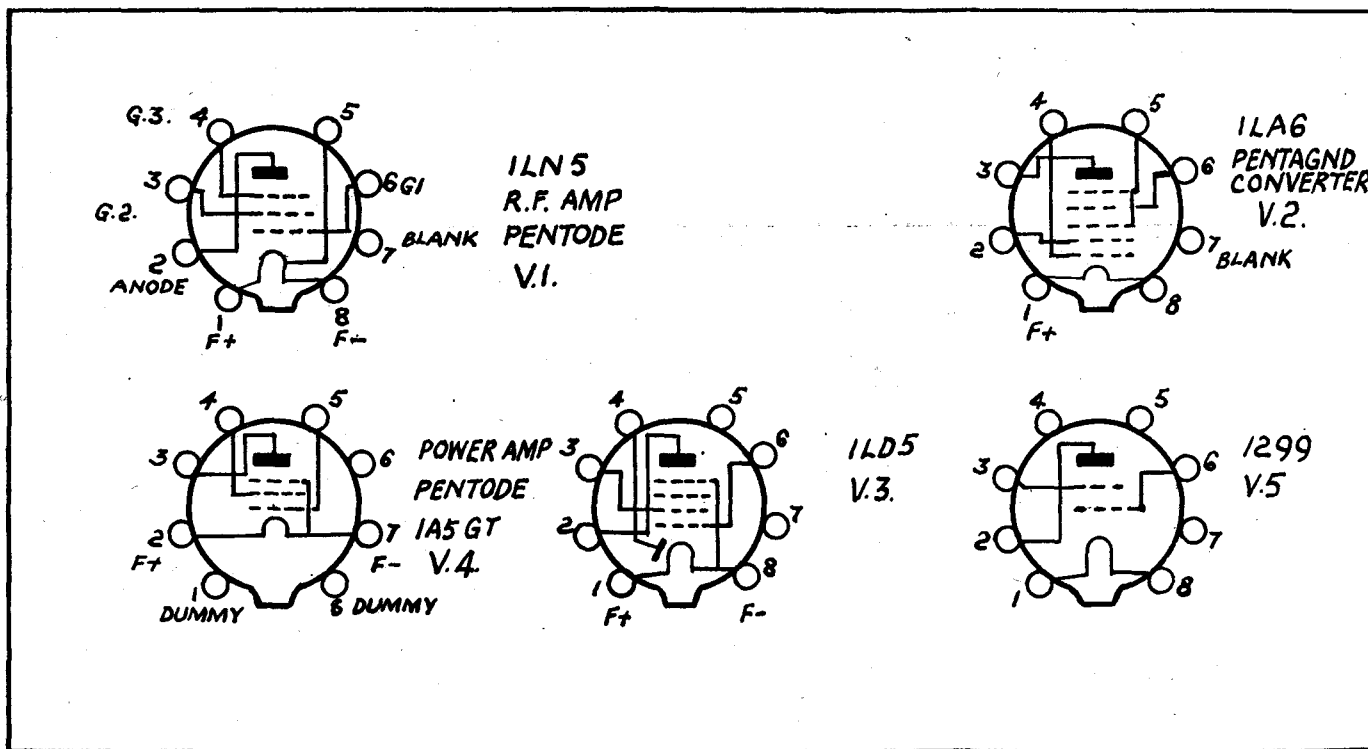


Fig. 10. Details of valve bases and electrode pins.

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