WIRELESS SET NO. 128

TECHNICAL HANDBOOK - GENERAL DESCRIPTION

GENERAL

1. The Wireless Set No. 128 is a tropicalised, partly miniaturised, immersion proofed transceiver, and is intended for use as a man-pack set, the set being carried on the operator's back by means of a carrier assembly. The set was initially designed to operate from a dry battery, but provision has since been made for operation from a vibrator power supply. The use of water-proof cable connectors, panel gaskets and control shaft glands renders the whole assembly immersion proof. A junction box, externally to the set, provides for remote send-receive switching for man-pack operation.

2. The set covers the frequency band of 2.0 to 4.5 Mc/s, providing R.T.(A.M.), M.C.W. and C.W. facilities over an approximate range of 4 to 5 miles under normal operating conditions.

3. Although the tuning facilities provide for matching a long wire aerial, the set is normally used with a vertical rod aerial. A flick control mechanism provides for the locking of three preselected frequencies in positions A, B and C respectively as selected by the flick selector control on the front panel.

BRIEF ELECTRICAL DESCRIPTION (See Fig. 1)

4. The receiver is a six valve superhetrodyne, consisting of an R.F. stage, a mixer with a separate oscillator, two stages of I.F. amplification and a detector. The audio signal is amplified in the second I.F. stage by application of the "reflex" principle. The intermediate frequency is 1,600 Kc/s.

5. The sender operates on the sender mixer principle, in which the master oscillator output (F + 1,600 Kc/s) is mixed with the 1,600 Kc/s crystal oscillator output. The signal frequency is selected from the mixer output, amplified and used to drive the power amplifier. The master oscillator section of the mixer valve may also be crystal controlled.

6. Power is obtained from either a single block dry battery, HT/LT of 163/3 volts, or a vibrator power unit which is energised by a 6 volt, 25 ampere-hour light weight accumulator, depending on the type of wireless set in use, viz:-

(a) Wireless Set No. 128, battery operated.
(b) Wireless Set No. 128, vibrator operated.

The approximate current consumption of the wireless set is:-

L.T. - 250 mA on receive, 400 mA on send M.C.W., key down.
H.T. - 16 mA on receive, 46 mA on send M.C.W., key down.

The approximate current drain from the 6 volt battery, when the set is vibrator operated is 2.7 A on receive, 3.3 A on send M.C.W., key down.

MECHANICAL DESCRIPTION

7. The complete set is housed in a metal case assembly, the base of which is detachable and houses the dry battery or vibrator supply unit, and is fitted with outlet sockets, cables and on-off switch box. The complete assembly is 15-1/2 in. high, 11 in. long and 5-3/4 in. wide, and when fitted with a dry battery weighs approximately 32 lbs. The carrier assembly weighs 3 lbs.

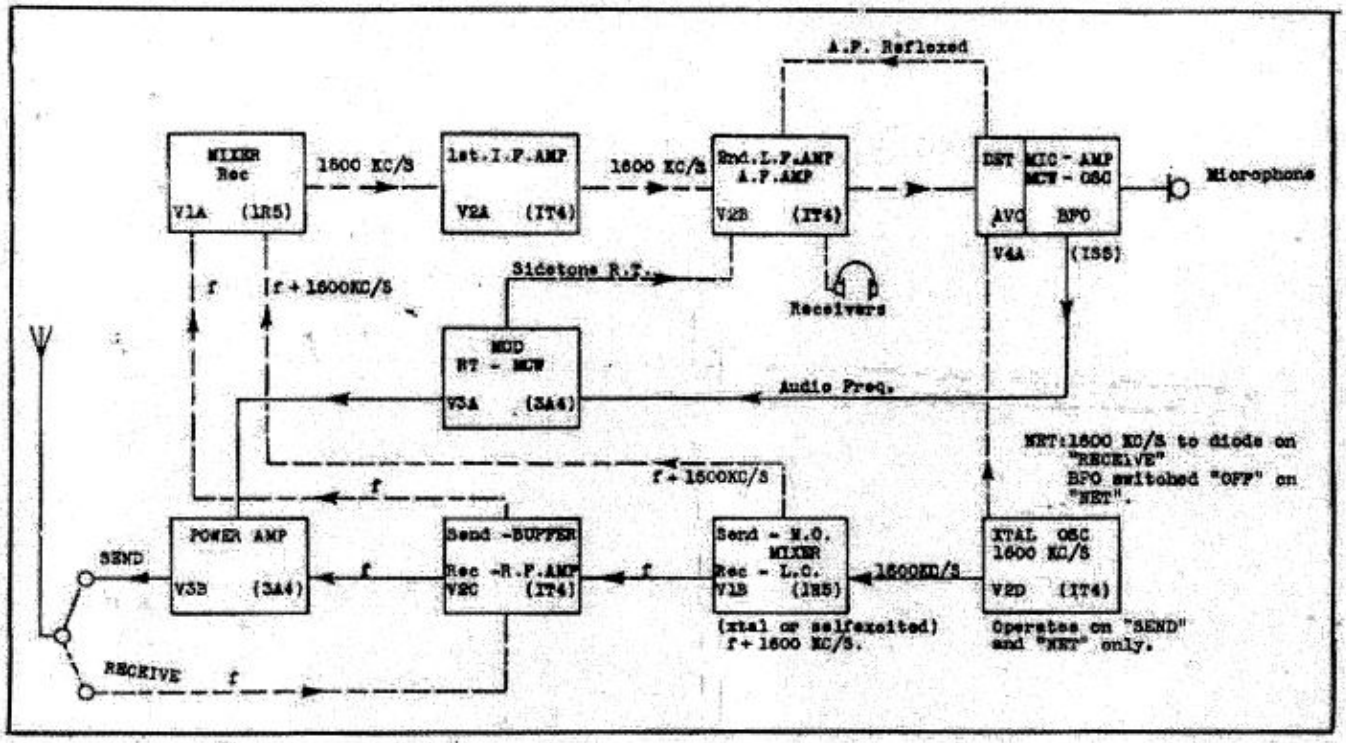


FIG. 1 - BLOCK DIAGRAM

CONTROLS (See Fig. 2)

8. All control knobs fitted to the front panel are of the rotary type and from right to left are:-

(a) MO/XTAL switch (S4A): Selects X1, X2 or X3 for crystal operation.

(b) VOLUME control (R29A): Receiver audio control.

(c) FLICK SELECTOR: Selects and allows the appropriate cam and lever to locate in position when the tuning dial is rotated. In the OFF position all levers are disengaged.

(d) FLICK LOCK: Engages the appropriate gear and locks the flick mechanism after tuning to the preselected frequency.

(e) COARSE TUNING control (C22A-D): Four-gang tuning condenser.

(f) NET switch (S2A).

(g) FINE TUNING control: Vernier adjustment of the main tuning dial.

(h) DIAL LOCK: Locks the tuning condenser when adjusting the flick lock control.

(i) METER switch (S1A).

(j) AERIAL TUNING control (L1A): Variable inductor for tuning the aerial circuit to resonance.

(k) DIAL LIGHT switch (S5A).

(l) EMISSION switch (S3A): R.T., M.C.W., C.W. system switch.

(m) HET. TONE control (C23A): Alters the beat note on C.W. reception, by varying capacity in the beat oscillator circuit.

Also on the front panel are the meter (M1A), tuning dial window, aerial socket mounting and earth terminal.

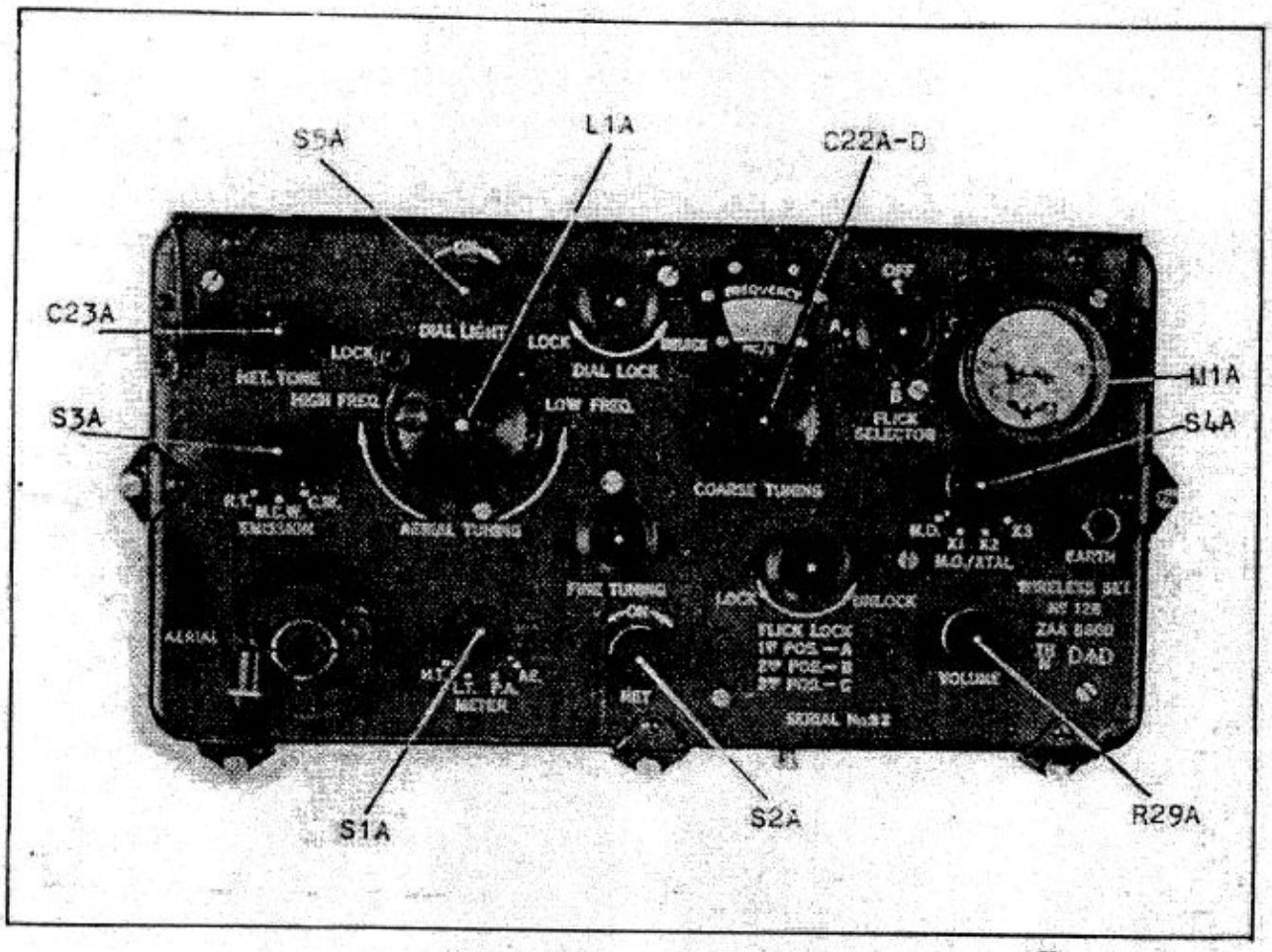


FIG. 2 - FRONT PANEL LAYOUT

TECHNICAL DESCRIPTION

AERIAL CIRCUIT

9. The aerial is tuned by the variable inductance L1A which is common to Sender and Receiver. Signals are fed via the primary of the metering transformer L5A and RL1/1 (send/receive relay) to primary of the RF transformer L8A; the secondary L8A is tuned to resonance by C22C and trimmer C21C. Voltages developed across this circuit are fed via C15C to the grid of V2C and amplified.

RECEIVER

10. The radio frequency amplifier consists of valve V2C, the plate circuit of which is tuned by L7A and C22B and trimmer C21B, and coupled via C12A to the grid of V1A. Condensers C15B and C12A prevent short circuiting of the AVC voltage applied to the grid of V1A via R2B. (Fig. 3). Valve V1A operates as a mixer and obtains its oscillator voltage, via C16A at received frequency plus 1,600 Kc/s (see Note), from V1B which is either crystal or master oscillator controlled depending on the position of the MO/XTAL switch. The voltages developed across the tuned circuit L7A, C22B are fed via condenser C12A and C15B to the grid G3 of V1A. (Fig. 4). A heterodyne frequency of 1,600 Kc/s exists in the plate circuit and is selected by the first IF transformer L2A and L2A1. In the mixer circuit R4A is the grid (G1) resistor. High tension for the screen is reduced by resistor R5A; condenser C13B provides RF by-pass. The primary L2A of the first IF transformer forms the plate load for V1A. R8A is the plate dropping resistor, together with condenser C13C provides decoupling. The variable condenser C21E is for netting

error compensation.

NOTE:- When fitting crystal holder, crystal frequency is channel frequency plus 1,600 Kc/s.

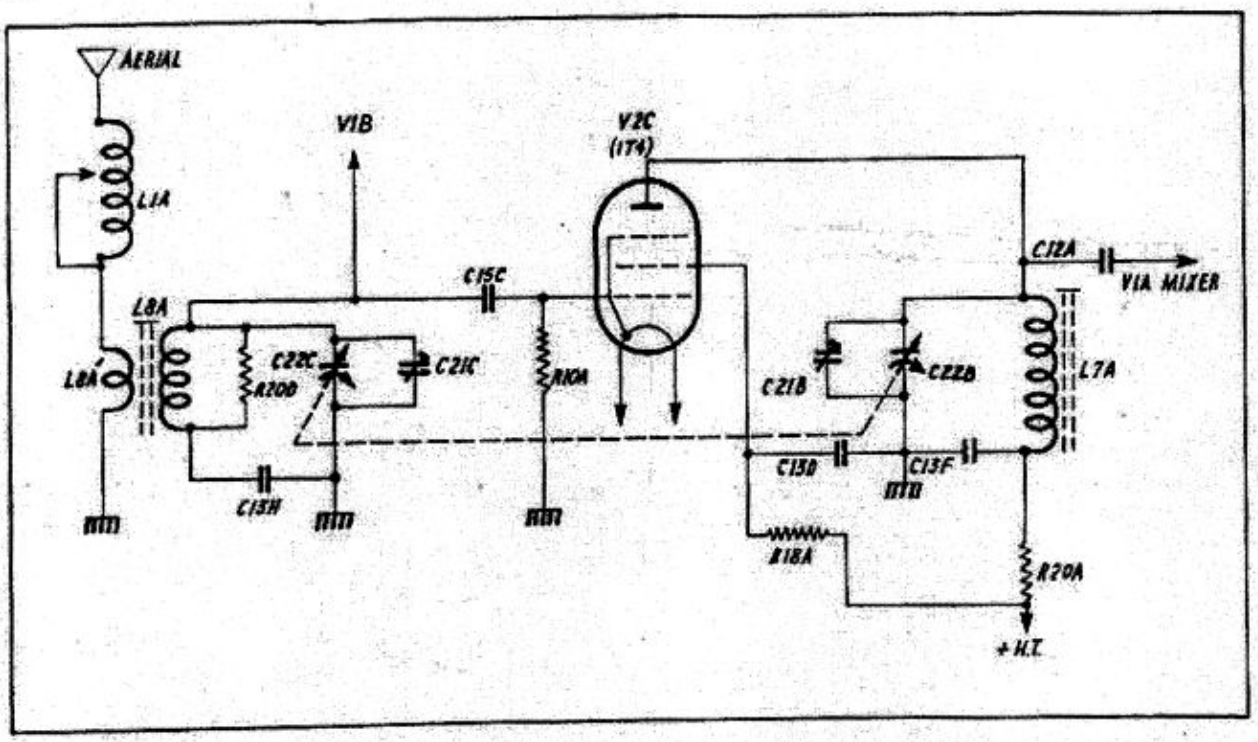


FIG. 3 - RECEIVER - R.F. AMPLIFIER

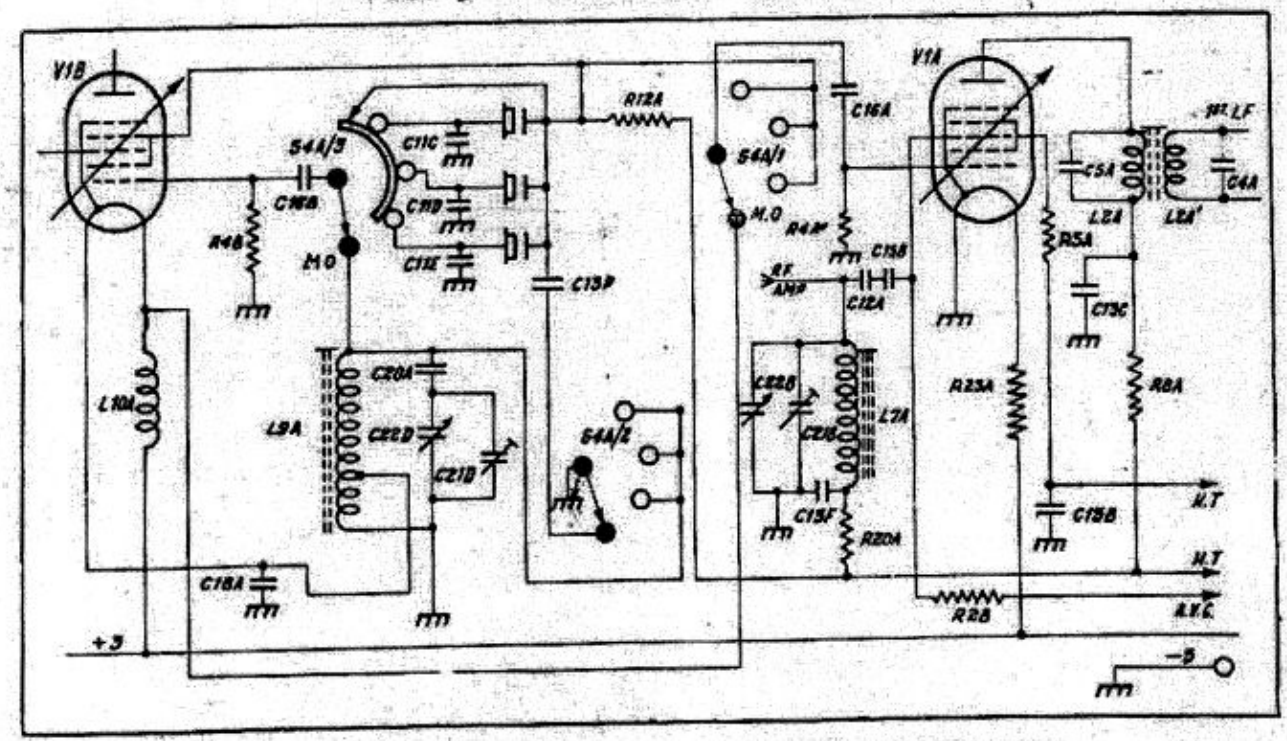


FIG. 4 - CONVERTER SECTION OF RECEIVER

11. The two stage intermediate amplifier consists of valves V2A and V2B coupled by three IF transformers tuned to 1,600 Kc/s. The IF amplifier valve V2B is "reflexed" for audio amplification. (Fig. 5). The output of the receiver is controlled by resistor R29A varying the screen-voltage to valves V1A and V2A. High tension voltage is reduced for the plate of V2A by resistor R20B, and in conjunction with condenser C13G provides decoupling. C13E serves as screen by-pass. AVC bias is fed to the control grid, condenser C3A serving as RF by-pass to earth also as AVC filter condenser. The primary L2C of the third IF transformer forms L2C1 feeds the diode rectifier of V4A.

Condenser C9A provides RF path to earth, but presents a relatively high reactance path to audio frequency. Resistor R4D is the screen-dropping resistor; condenser C1D provides screen by-pass; condenser C10A serves as RF earth-return for the control grid circuit.

The amplified signal from the third IF transformer is fed to the diode of V4A; a rectified voltage is developed across the diode load resistor R15A; condenser C15D serves to by-pass RF to earth. The audio component is fed through R7C and L2B to the grid of V2B and amplified. The rectified voltage developed across the diode load R15A is also used for automatic volume control. This voltage, which varies in accordance to signal strength, is fed in the form of bias through a filter network consisting of R2A and R2B, and C3A to the grids of V2A, V1A and V2B.

This bias controls the gain of the valves V1A and V2A, maintaining a level audio output for any large variation of signal input.

12. Amplification of the audio frequency is achieved by a method known as "REFLEX". The valve V2B serves the dual purpose of second IF amplifier and audio amplifier. The primary of the audio frequency transformer T1A forms the plate load for V2B at audio frequency; R20C and C1E provide decoupling for this plate circuit. On C.W. and M.C.W., resistor R7E and condenser C7A combine to form a tone control attenuating the high frequency audio response. The output transformer T1A consists of a primary winding and two secondary windings. The primary impedance is 360,000 ohms at 400 cycles. This high impedance is necessitated by the high plate impedance of V2B. One Secondary has an impedance of 130 ohms at 400 cycles to match the Receivers, Headgear, HS.30. (Fig. 6).

A crash limiter is provided to restrict the output of the receiver to 1mW. This level is maintained by simultaneous operation of the AVC and crash limiter. The limiter consists of a biphase centre - Tapped rectifier (W3A) circuit, fed by the second secondary winding of T1A. A tapped voltage divider is formed by R3A and R14A connected across the three volt filament supply. This provides a 1 volt bias for the rectifier which will conduct only when the peak voltage on the secondary is greater than 1 volt. When conduction occurs, the effective load on T1A is such that a mismatch causes limited output to the receivers.

13. In the "Receive " C.W. position, the pentode section of V4A functions as a triode oscillator; resistor R7F is switched into circuit reducing the applied plate voltage. This section of V4A, together with the tapped coil L5A and condenser C6A, form a stable "high C" shunt fed Hartley oscillator circuit at 1,600 Kc/s. (Fig. 6). Variation of frequency by condenser C23A (C.W. heterodyne control) allows adjustment of the heterodyne note.

14. The netting facility consists of beating the received signal against the 1,600 Kc/s crystal oscillator.

NOTE:- Oscillator V2D operates on "NET" and "SEND" ONLY.

Operation of the netting control switches on the filament of V2D, removes the plate voltage of V4A and reduces the plate voltage to V2D by bringing R25A in circuit. Removing the plate voltage of V4A ensures that the incoming signal does not mix with the BFO, the frequency of which can be varied by C23A (C.W. heterodyne). The plate voltage for V2D is reduced to limit the 1,600 Kc/s oscillator output which would otherwise block the receiver and prevent netting to a weak signal. Compensation for the difference in the receiver and the transmitted frequency is provided by the variable condenser C21E. This frequency variation is caused by the effective change in capacity of the oscillator circuit, due to changes in the electron stream when the plate voltage of V1B is removed on receive, and V1A is switched off on send. If C21E were omitted, the transmitted frequency would be higher than the received signal frequency.

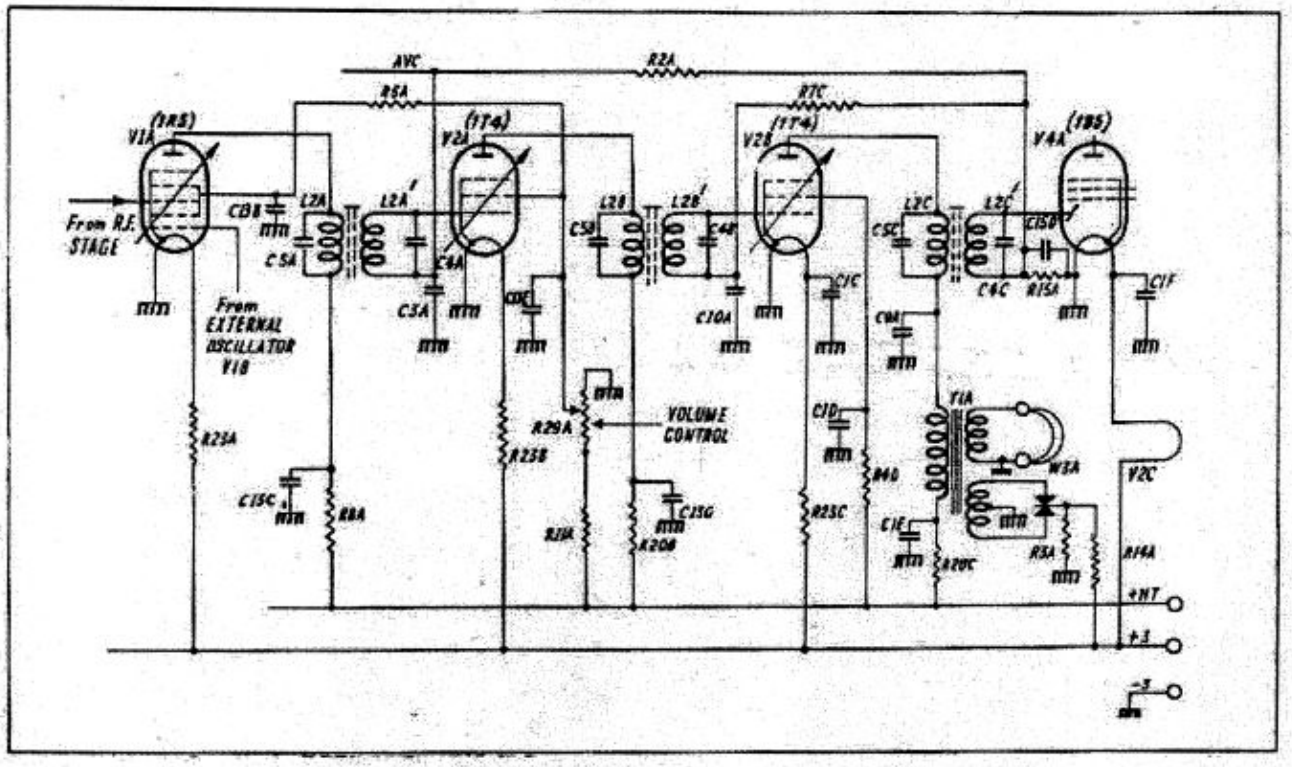


FIG. 5 - I.F. AMPLIFIER STAGE - DIODE DETECTOR AND REFLEX AMPLIFIER

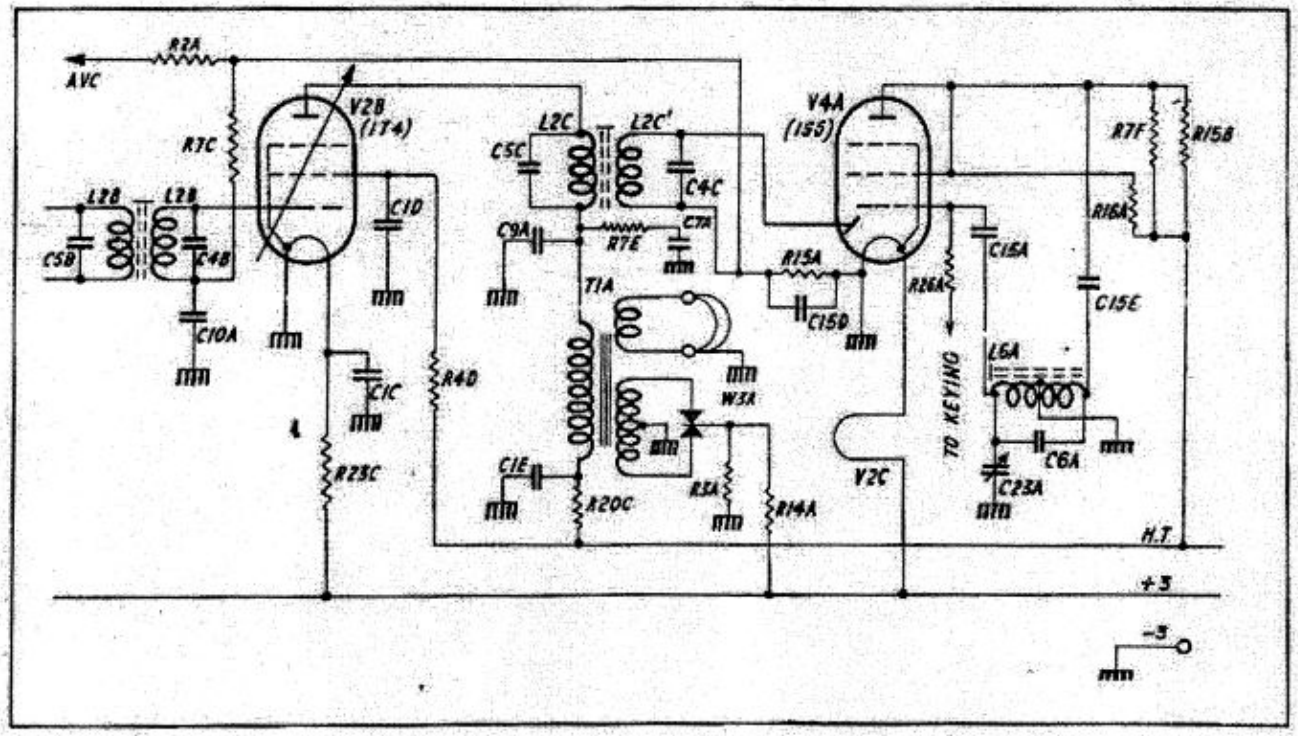


FIG. 6 - REFLEXED I.F. STAGE - DIODE DETECTOR AND B.F.O.

SENDER

15. The signal frequency on "Send" is produced by application of the heterodyne principle. (Fig. 7).

Valve V1B is a "pentagrid converter" type used as the mixer, the oscillator section of which is tuned to signal frequency plus 1,600 Kc/s. It is crystal controlled on three frequencies operating as a Pierce oscillator, and in the "MO" position of the MO/XTAL switch, acting as a cathode coupled oscillator. The 1,600 Kc/s signal is fed from L4A[1] to the grid (G3) and the plate circuit L8A and C22C is tuned to signal frequency. (see Fig. 8). Operating in the "MO" position, the frequency of the V1B oscillator is controlled by the coil L9A and variable gang condenser C22D and trimmer C21D. To ensure stability of this circuit, a condenser C18A having negative temperature coefficient is connected to compensate for positive temperature coefficient of associate components. Condenser C13P provides screen by-pass; this condenser is left "floating" on crystal operation. RF choke L10A maintains the filament at RF potential, and also serves as a filament dropping resistor. On crystal operation the master oscillator circuit is shorted-out by switch S4A/2 to prevent inter-action. Optimum oscillation is ensured by the connection of condensers C11C, D or E, which allow greater feed-back. Self bias is produced by resistor R4B; condenser C16B is the oscillator grid coupling capacitor.

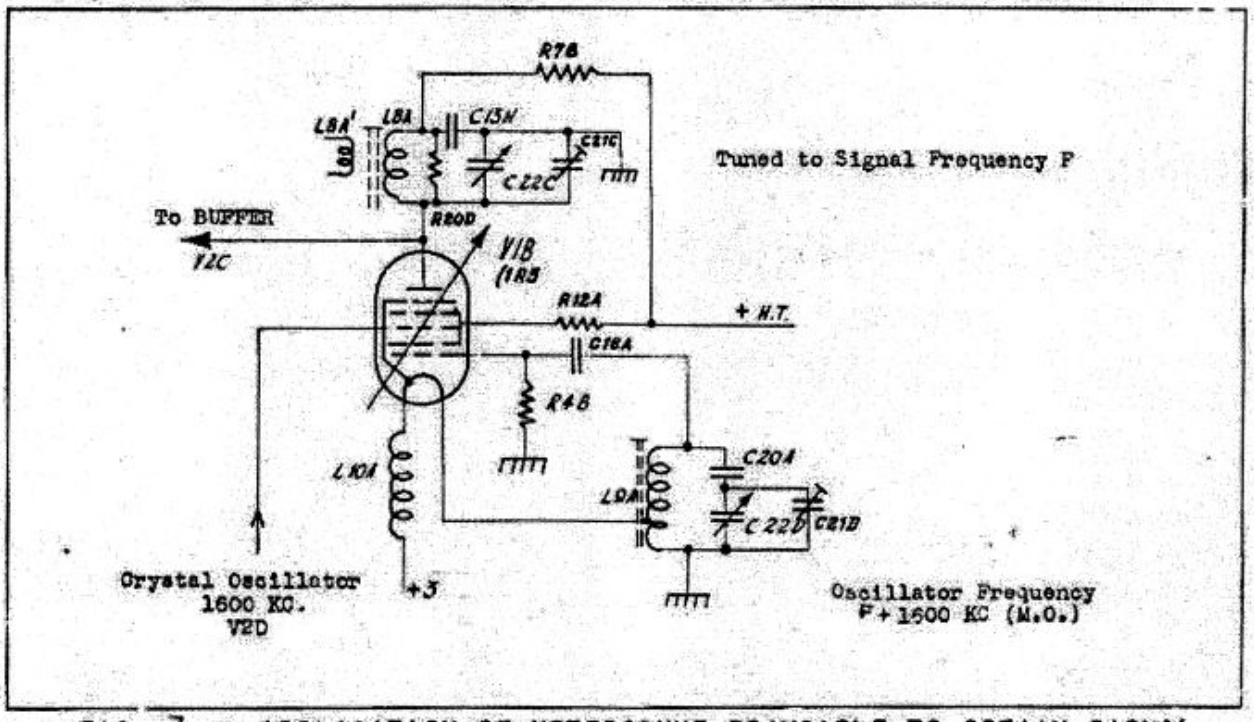


FIG. 7 - APPLICATION OF HETERODYNE PRINCIPLE TO OBTAIN SIGNAL FREQUENCY ON "SEND"

16. The voltage appearing across the resonant circuit L8A-C22C is capacitively coupled by C15C to the Buffer amplifier valve V2C (type 1T4) - R10A serves as grid resistor. The plate circuit is tuned by L7A and C22B; condenser C13F and resistor R20A provide decoupling. Resistor R18A is the screen dropping resistor; condenser C13D serves as screen by-pass. The Buffer amplifier and Power amplifier are capacitively coupled by C12A.

17. The Power amplifier consists of a valve V3B type 3A4. The amplified signal from V2C is fed through the resistor R9A; this resistor suppresses parasitic oscillations. Grid bias for the power amplifier is fed via RF choke L11B wound on the resistor R7A, which serves as former (Fig. 9). The PA tank circuit comprises the coil L3A, the fourth section of the gang condenser C22A, the trimmer C21A and padding condenser C11A. The output to the aerial is coupled by winding L3A[1], via metering transformer winding L5A and aerial loading coil L1A. Resistor R1A is the screen dropping resistor and is by-passed for audio and radio-frequency by C1A. Resistor R7G serves as former for choke L11A that effectively prevents RF from entering the modulator stage. Condenser C14A is the RF by-pass for this portion of the circuit, and is of such a value that attenuation of the high audio frequency is not too severe.

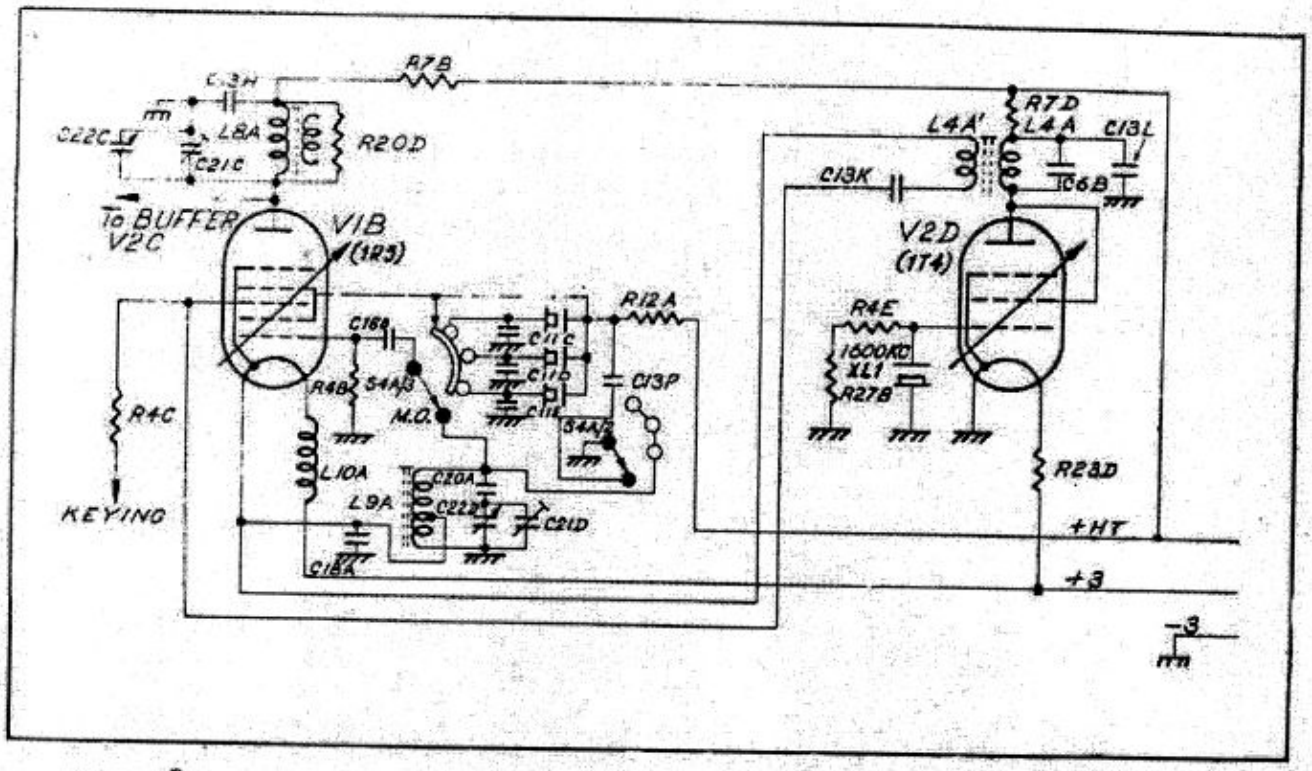


FIG. 8 - MASTER OSCILLATOR AND CRYSTAL CONTROLLED 1,600 Kc OSCILLATOR

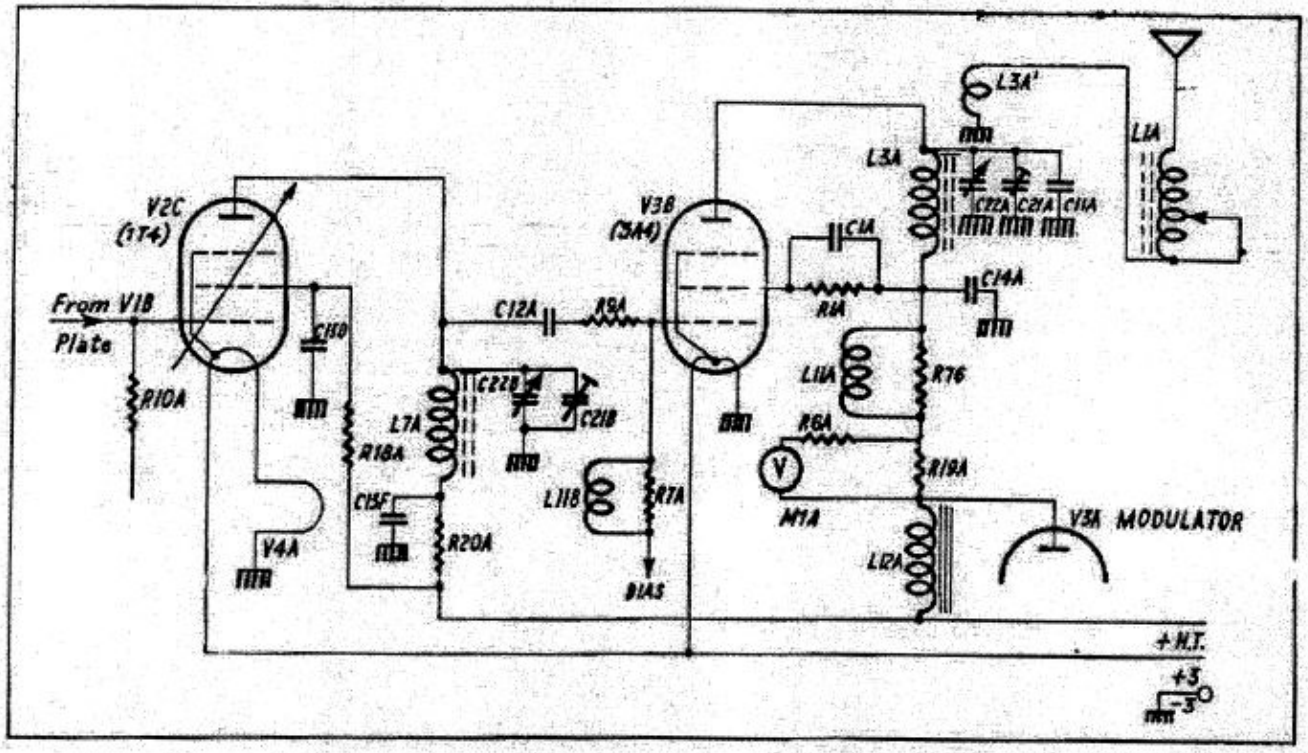


FIG. 9 - SENDER, BUFFER AND P.A. STAGE SHOWING HEISING SYSTEM OF MODULATION

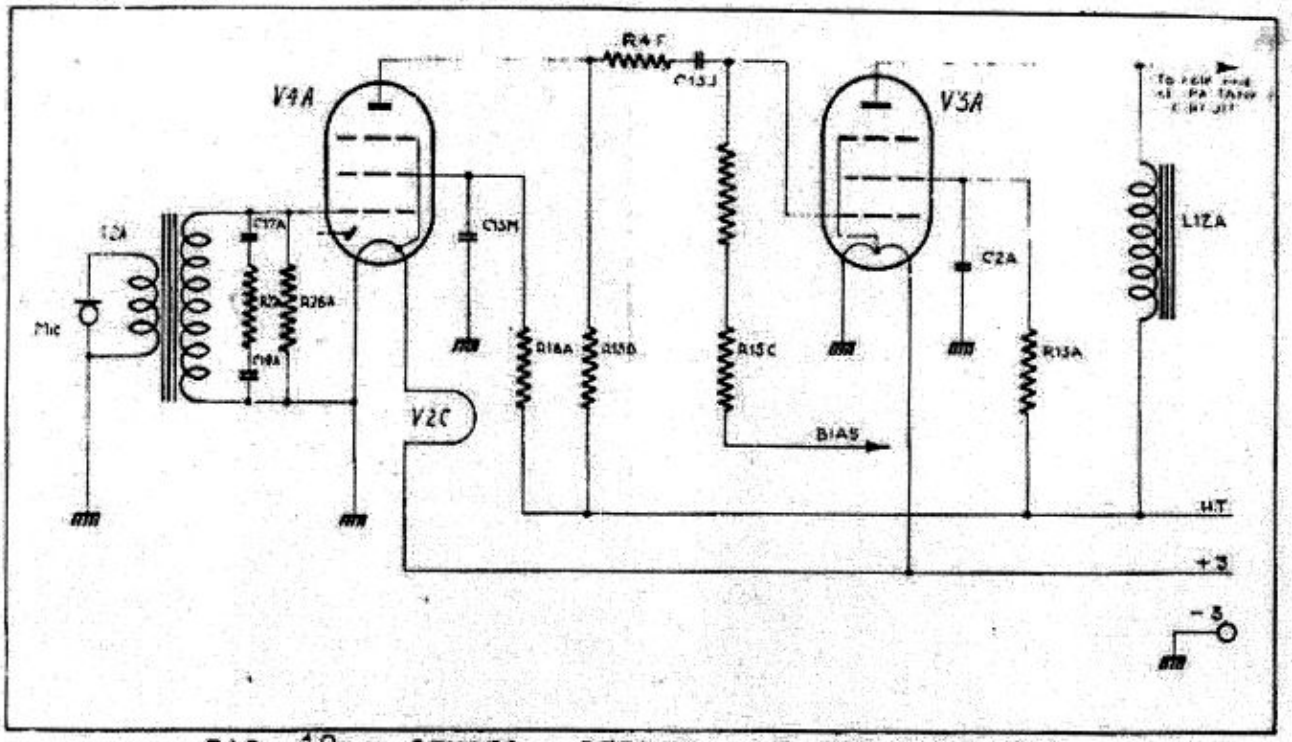


FIG. 10 - SENDER - PREAMPLIFIER AND MODULATOR

18. The power amplifier is Heising modulated by valve V3A type 3A4. Output from the dynamic microphone is fed into audio transformer T2A connected to the pentode section of V4A, which is resistance capacity coupled to valve V3A. (Fig. 10). High tension is supplied via modulation choke L12A to the plate of V3A, also to both plate and screen of V3B, modulation voltage appearing across L12A effectively modulate V3B. (See also Fig.9) Operating M.C.W., the secondary of T2A is switched to form a Colpitts type of oscillator, tuned by condensers C17A and B to a frequency of 1,000 cycles; R27A serves as a RF suppressor. (Fig. 11). To prevent this circuit oscillating on "Receive", resistor R25E is placed across the primary.

SIDETONE

19. The high frequency response for C.W. and M.C.W. reception is effectively reduced by the condenser C7A.

(a) M.C.W.
Valve V4A oscillates at 1,000 cycles and a small voltage appears through inter-electrode coupling within the valve in the diode circuit. This voltage is fed via R7C to the grid of V2B, amplified, and appears as side tone in the headphones. The grid return circuit of V4A is keyed.

(b) R.T.
Audio voltage on the grid of the modulator valve V3A is fed via C17C, R16B and R16C to the diode circuit of V4A. This voltage is then fed back to V2B, amplified, and appears as side tone in the headphone. The amount of side tone voltage is determined by the values of R30A and R15C which form a voltage divider in the grid circuit of the modulator.

(c) C.W.
The generation of side tone during C.W. "Send" depends on the mixing of the RF voltage generated by V4A functioning as the C.W. heterodyne oscillator, and the 1,600 Kc/s crystal controlled oscillator V2D. The mixing occurs in the diode circuit of V4A, coupled through the internal valve capacity to the C.W. oscillator. The crystal controlled 1,600 Kc/s oscillations are fed via C11B and R4G to the diode circuit.

KEYING AND GRID BIAS

20. Fixed bias on "Send" is obtained in the HT return circuit. (Fig. 12). Normal grid bias for valves V3A and V3B is developed across resistor R28A on RT and M.C.W. When operating C.W., the filament of modulator valve V3A is open-circuited by S3A/5. The resulting difference in HT current drain is compensated by additional bias developed across R24A switched into circuit by S3A/2. Operating C.W. and M.C.W., 50 volts keying bias is developed across R1B. This bias, applied directly to the grids of valves V1B, V2C and V4A, effects complete "cut-off". "Key-down" short-circuits R1B for transmission. The condenser C13K is included, otherwise D.C. path through L4A[1] would prevent keying of V1B.

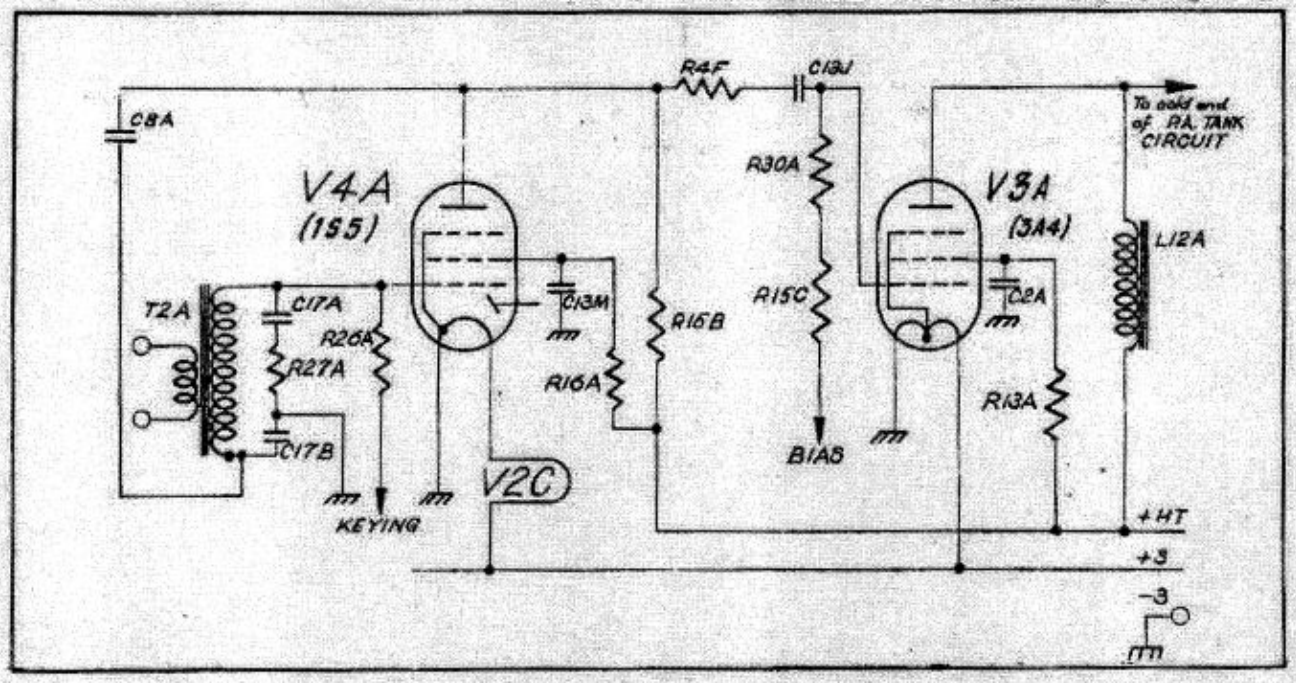


FIG. 11 - M.C.W. OSCILLATOR (1,000 CPS) AND MODULATOR ON "SEND"

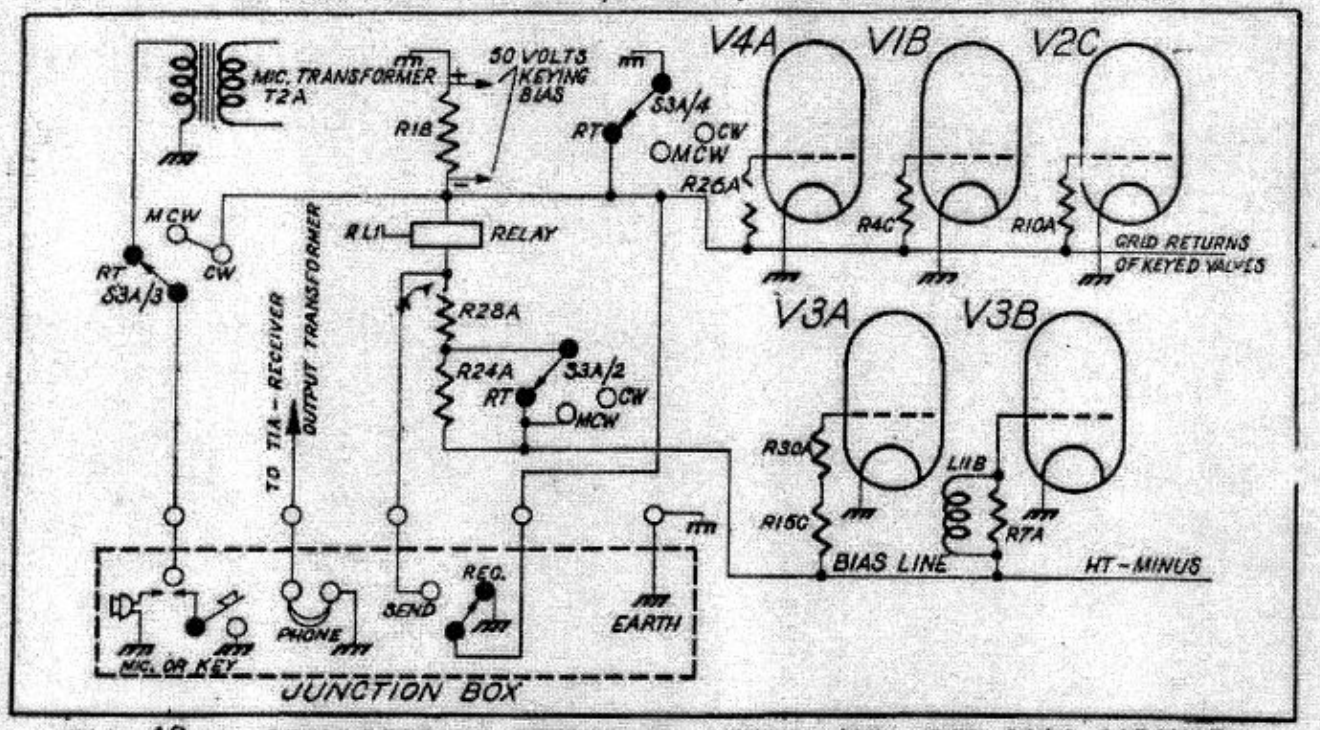


FIG. 12 - SEND-RECEIVE SWITCHING, KEYING AND GRID BIAS CIRCUIT

METERING

21. Indication of Aerial current, Power amplifier current, low tension voltage and high tension voltage may be selected by the four position "metering" switch and read from the meter M1A; the meter indicates on Send only. A brief description of the four circuits is as follows:-

(a) A.E. - R.F. energy to the aerial via L5A induces a current in L5A[1]. The induced voltage is rectified and fed to the meter in series with the 200 ohm resistor R14B; the .01 μF condenser C13A provides by-pass.

(b) P.A. - (Full scale 25 milliamps).
The meter in series with the 700 ohm resistor R6A, is connected in parallel with the 100 ohm resistor R19A. This resistor is in series with H.T. fed to the Power amplifier valve V3B.

(c) L.T. - When the relay RLI/ is in the Send position, the meter, in series with R21A of L.T. 9,800 ohms, is connected across the 3 volt L.T. supply.

(d) H.T. - When the relay RLI/3 is in the Send position, the meter, in series with R22A of .5 megohms, is connected across the 162 volt H.T. supply.

SWITCHING

22. There are six switch controls; the circuits controlled are as follows:-

SWITCHES

			Valve Circuit
Metering			
2 pole 4 way Wafer.	S1A/1.	Metering Switch (plus pole).	
	S1A/2.	Metering Switch (minus pole).	
Net			
3 pole 2 way.	S2A/1.	Filament Switch of Crystal Osc.	V2D.
	S2A/2.	Plate Voltage Reduction.	V2D.
	S2A/3.	H.T. supply to BFO ON-OFF.	V4A.
Emission			
9 pole 3 way Wafer.	S3A/1.	V4A change over 1,600 Kc/s Osc. to 1,000 cps. Osc.	V4A.
	S3A/2.	Bias correction for C.W.	
	S3A/3.	Microphone/key selector.	
Wafer 2.	S3A/4.	Automatic short circuit of keying bias on R.T.	
	S3A/5.	Filament Switch.	V3A.
	S3A/6.	Side tone control.	
Wafer 3.	S3A/7.	Change over R.T. amplifier, 1,000 cps., 1,600 Kc/s.	V4A.
	S3A/8.	Change over R.T. amplifier, 1,000 cps., 1,600 Kc/s.	V4A.
	S3A/9.	Change over R.T. amplifier, 1,000 cps., 1,600 Kc/s.	V4A.
MO/XTAL			
3 pole 4 way Wafer 1.	S4A/1.	MO Crystal Output Selector.	V1B.
	S4A/2.	Shorting MO Circuit for Crystal Operations.	V1B.
3 pole 4 way Wafer 2 plus shorting bar	S4A/3.	Crystal Selector.	V1B.
2 pole 1 way	S5A.	Pilot Light On-Off Switch.	

Send-Receive Relay		Valve Circuit
RL1.	Send-Receive Relay.	
RL1/1.	Aerial Send-Receive Switch-over.	
RL1/2.	Filament " "	V3B.
RL1/3.	Modulation " "	V3A.
RL1/4.	Send, C21E earthed/1,000 cps. damping on M.C.W. Receive.	

The Send-Receive relay RL1 is connected in the H.T. return circuit. It is in circuit on "Receive" and shorted-out on "Send".

VIBRATOR UNIT

23. Consists of a 6 volt synchronous full-wave type (V5211) of vibrator connected to power transformer T3A. Chokes L13A and L13B with condensers C24A and C24B, form an effective "hash" filter network in the primary circuit of T3A. (Fig. 13). Resistors R3B and R3C connected across the vibrator contacts in the primary circuit suppress "sparking". Chokes L10B and L10C, with condensers C13P and C13Q, form the "hash" filter network in the secondary circuit. The high tension supply is fed into a smoothing filter network consisting of choke L14A and condensers C27A, C27B and C27C. A gaseous low discharge valve VR150 provides voltage regulation. The chokes L15A and L15B in series with R30A and R31A form a load which is connected across the 6 volt supply. The two chokes and condenser C26A form a smoothing filter network. The low tension 3 volt supply for the filaments of the set is obtained from the junction of R30A and R31A. A standard 7 point socket and plug connect the vibrator unit to the switch box. One spare vibrator (V5211) is carried in the unit compartment.

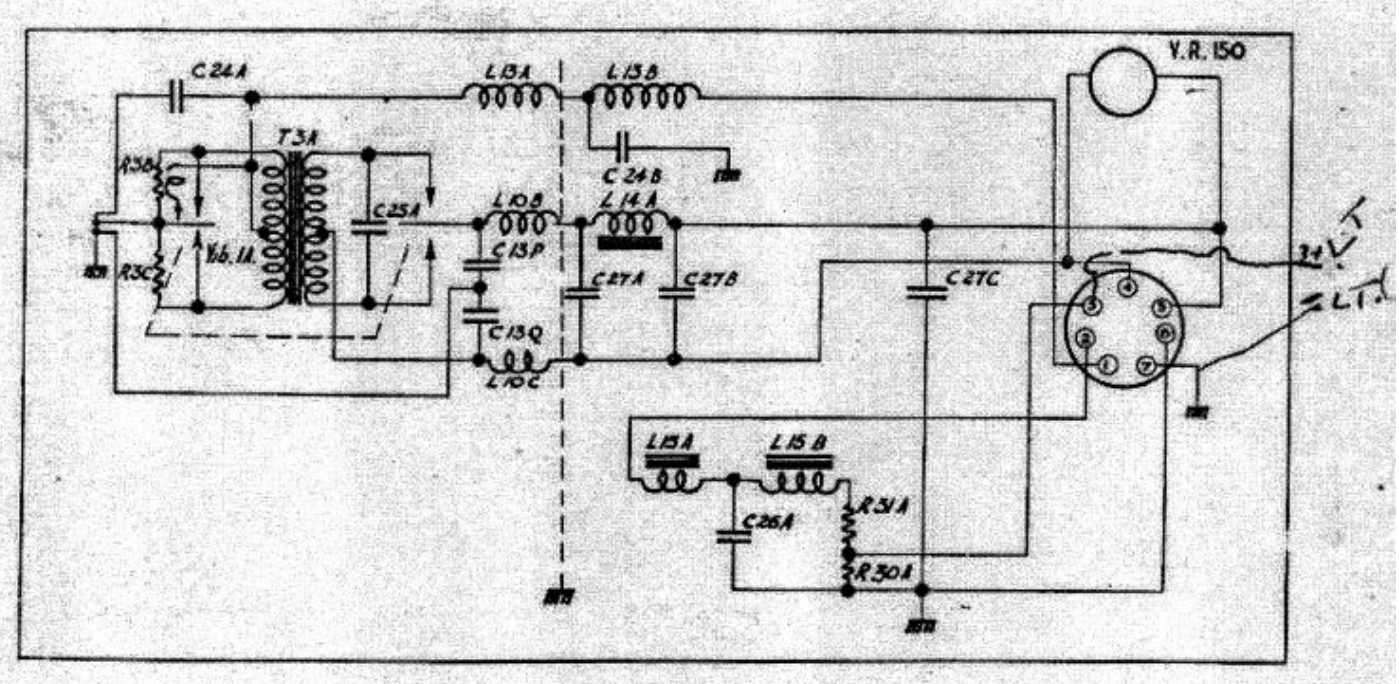


FIG. 13 - UNIT H.T. VIBRATORY NO. 3 (AUST) - CIRCUIT DIAGRAM

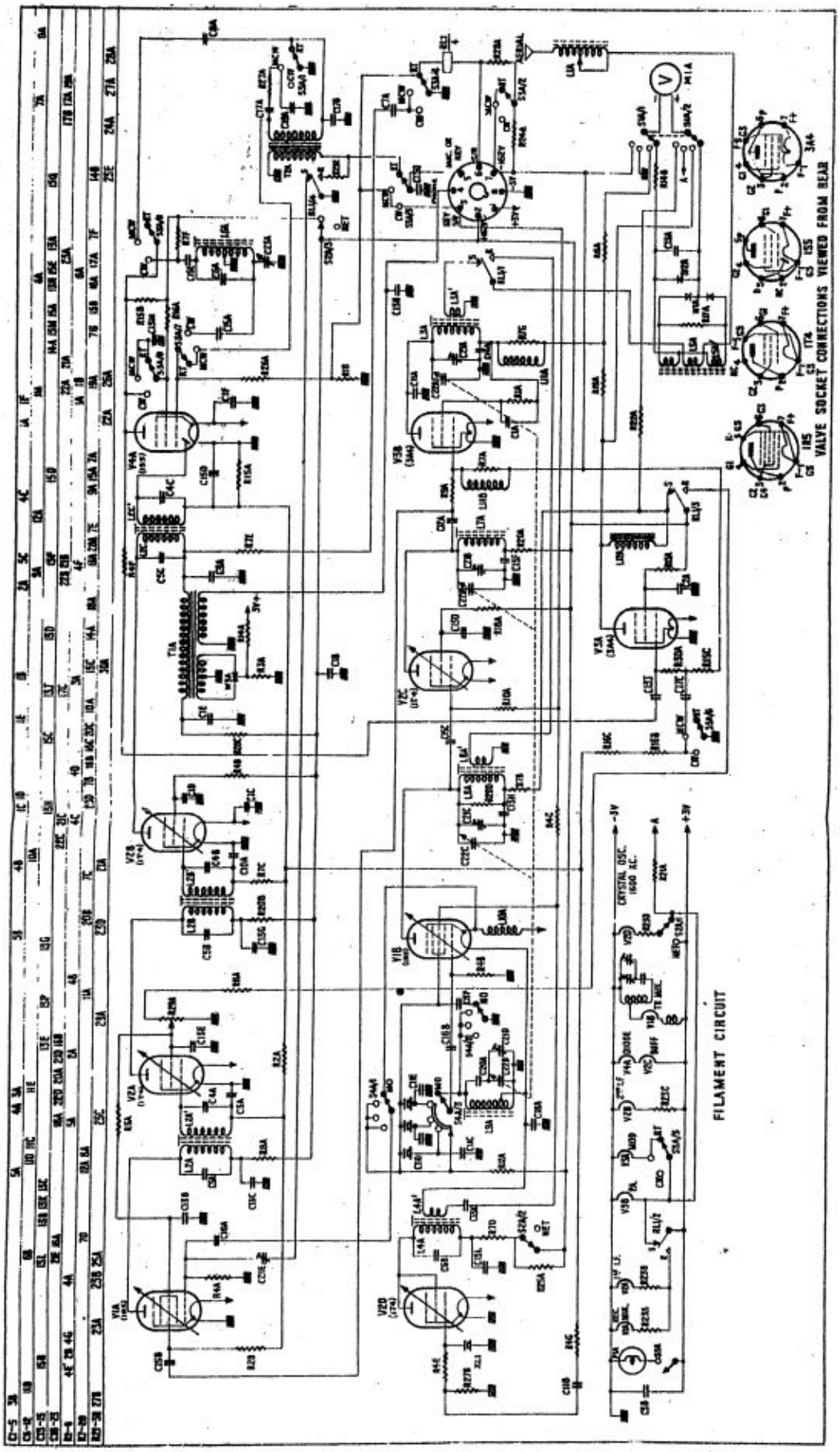
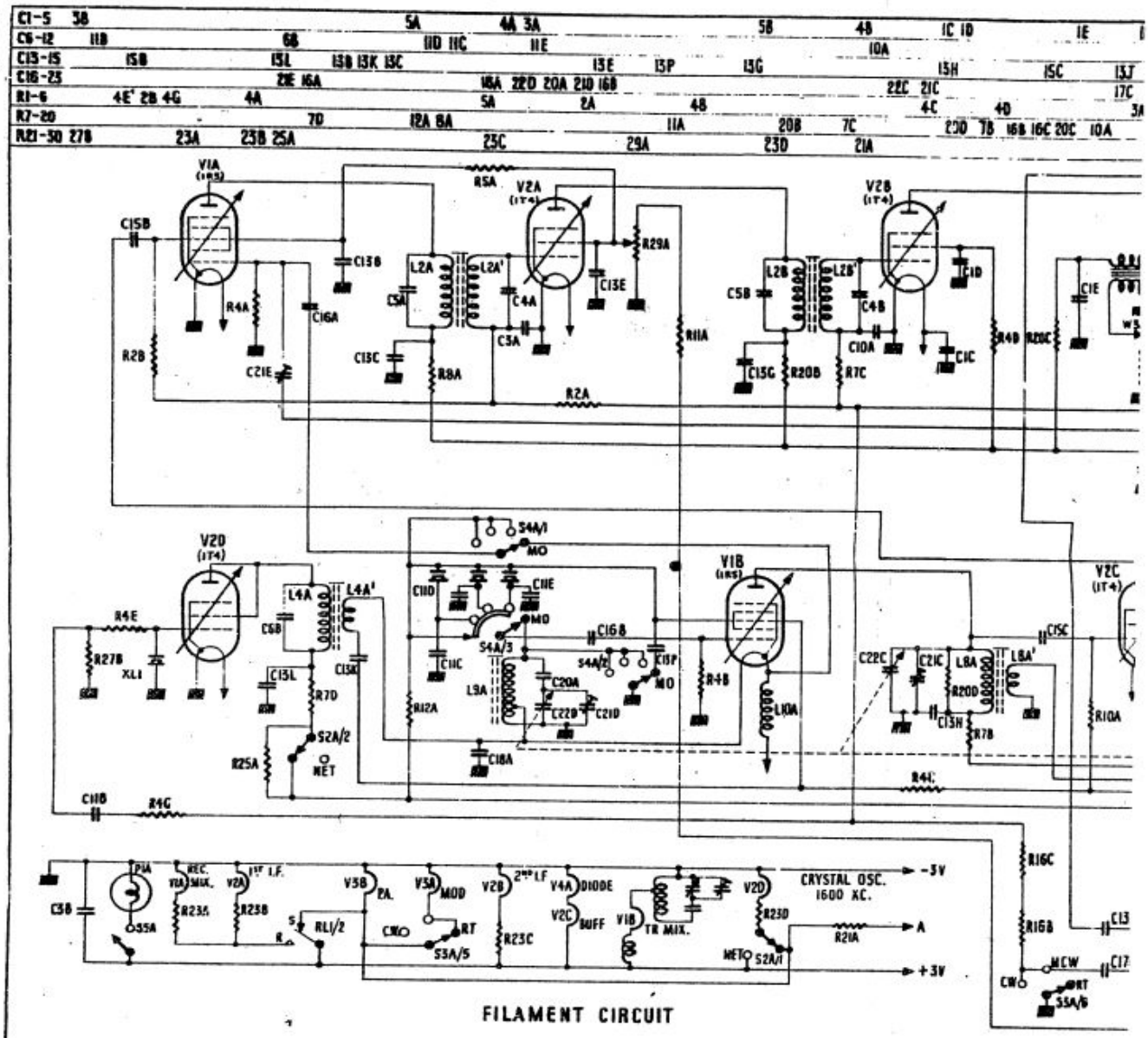
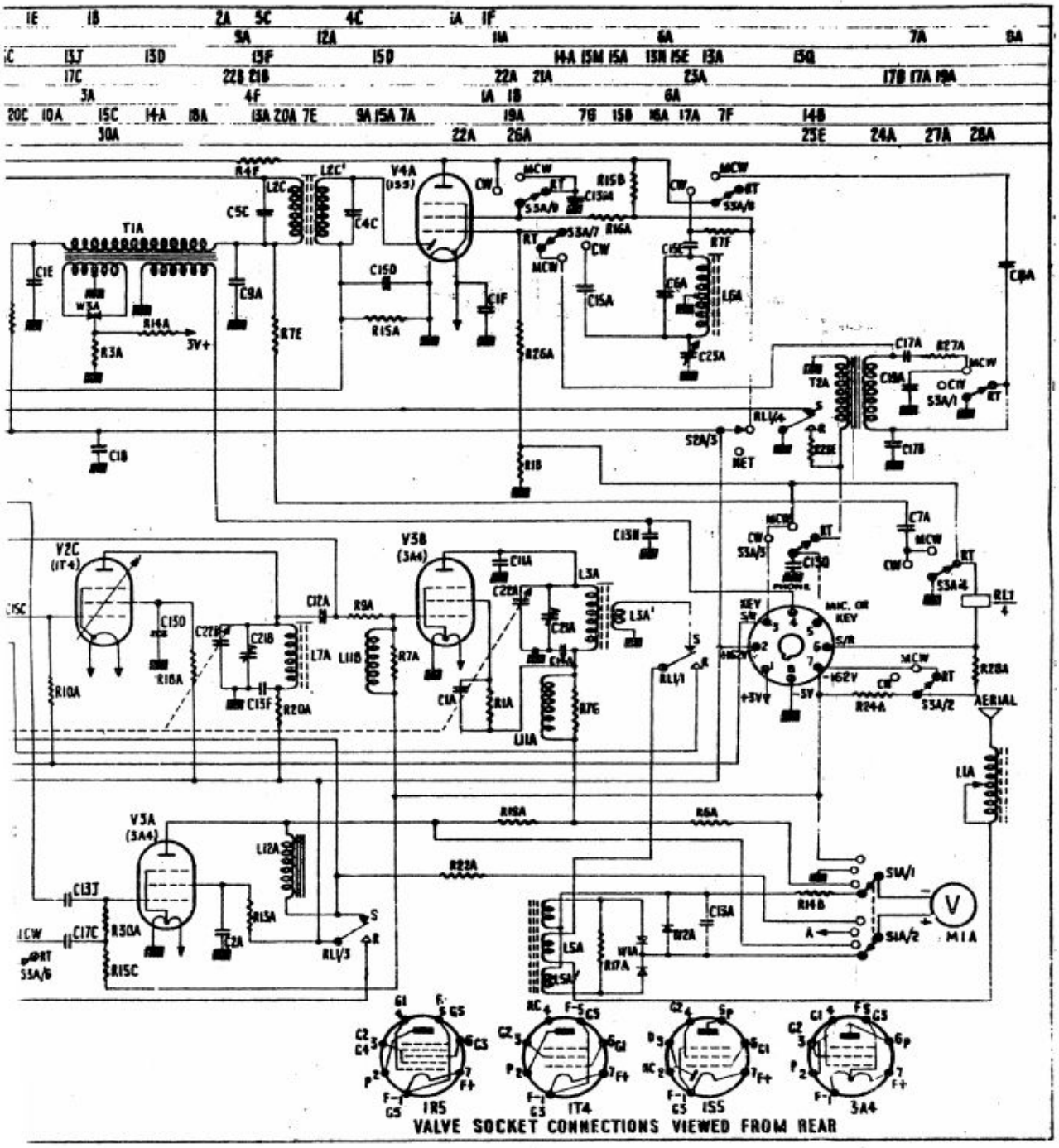


FIG. 14 - CIRCUIT DIAGRAM



FILAMENT CIRCUIT

FIG. 14 - CI



CIRCUIT DIAGRAM

TABLE 1 - LIST OF COMPONENTS (REFER FIGURE 13)

Circuit Reference	Value	Working Voltage	Tolerance	Type
FIXED CAPACITORS				
C13P, Q	0.01 µF	350V	± 10%	Moulded, Mica.
C24A	0.5 µF	200V	± 10%	Tubular, Paper.
C25A	900 pF	200V	± 10%	Tubular, Paper.
C26A	500 µF	6V wkg., 12V peak		Electyte, semi-dry, met. case.
C27A, B, C	24 µF	350V peak	-10% + 40%	Electyte, semi-dry.

Circuit Reference	Value - Ohms	Wattage	Tolerance	Type
RESISTORS				
R30A	2.8	5.0 W		
R31A	0.150	5.0 W		
R32A, B	100	1.0		

Circuit Reference	Impedance	Type
CHOKES		
L10B, C	1.35mH	R.F. Pie-wound.
L13A, B	10.0 µH	R.F. Layer-wound.
L14A	6.0 H	Filter, high-tension.
L15A, B	18.0 mH	Filter, low-tension.

Circuit Reference	
MISCELLANEOUS	
T3A	TRANSFORMER, vibrator (Wireless Set No. 128). VALVES, electronic CV216 (CD3/VR150; VR150-30), voltage regulator. VIBRATOR, synch., 6 volt, V5211, 7 pin base.

TABLE 2 - LIST OF COMPONENTS (REFER FIGURE 14)

Circuit Reference	Value	Working Voltage	Tolerance	Type
CAPACITORS				
C1A-F	0.1 µF	200V	± 10%	Tubular, paper, dielectric
C2A	0.25 µF	200V	± 10%	Tubular, paper, dielectric
C3A	0.05 µF	200V	± 10%	Tubular, paper, dielectric
C4A-C	45 pF	350V	± 5%	Silvered mica, dielectric
C5A-C	40 pF	350V	± 5%	Moulded mica, dielectric
C6A-F	500 pF	350V	± 5%	Moulded mica, dielectric
C7A	0.001 µF	350V	± 10%	Moulded mica, dielectric
C8A	0.002 µF	350V	± 10%	Moulded mica, dielectric
C9A	300 pF	350V	± 10%	Moulded mica, dielectric
C10A	150 pF	350V	± 10%	Moulded mica, dielectric
C11A-E	10 pF	350V	± 10%	Moulded mica, dielectric
C12A	25 pF	350V	± 10%	Moulded mica, dielectric
C13A-Q	0.01 µF	350V	± 10%	Moulded mica, dielectric
C14A	0.004 µF	350V	± 10%	Moulded mica, dielectric
C15A-E	100 pF	350V	± 10%	Moulded mica, dielectric
C16A-B	100 pF	500V	± 10%	Ceramicon, dielectric

TABLE 2 - (CONTD)

Circuit Reference	Value	Working Voltage	Tolerance	Type
CAPACITORS - (CONTD)				
C17A-C	0.0015 uF	350V	± 5%	Moulded mica, dielectric
C18A	50 pF	500V	± 5%	Ceramicon, dielectric
C19A	50 pF	350V	± 5%	Moulded mica, dielectric
C20A	320 pF	350V	± 1%	Moulded mica, dielectric
VARIABLE CAPACITORS				
C21A-E	2.5-27 pF			Variable trimmer
C22A-D	10.0-220 pF			Variable 4 gang
C23A	4-11 pF			Variable trimmer

Circuit Reference	Value - Ohms	Wattage	Tolerance	Type
RESISTORS				
R1A-B	10K	1/2		Carbon
R2A-B	2M	1/2		Carbon
R3A	100	1/2		Carbon
R4A-G	100K	1/2		Carbon
R5A	5K	1/2		Carbon
R6A	4.7K	1/2		Carbon
R7A-G	50K	1/2		Carbon
R8A	40K	1/2		Carbon
R9A	2K	1/2		Carbon
R10A	200K	1/2		Carbon
R11A	15K	1		Carbon
R12A	30K	1		Carbon
R13A	25K	1		Carbon
R14A-B	200	1/2		Carbon
R15A-C	500K	1/2		Carbon
R16A-C	3M	1/2		Carbon
R17A	75	1/2		Carbon
R18A	60K	1/2		Carbon
R19A	100	1/2		Carbon
R20A-D	20K	1/2		Carbon
R22A	500K	1/2		Carbon
R23A-E	32	1/2		Carbon
R24A	140	3		Wire wound
R25A	750K	1/2		Carbon
R26A	1M	1/2		Carbon
R27A-B	10K	1/2		Carbon
R28A	350	3		Wire wound
R30A	1.5M	1/2		Carbon
VARIABLE RESISTORS				
R29A	50K			Carbon

Circuit Reference	Type	Function
TRANSFORMERS		
L2A-L2A[1]	Intermediate-frequency	1st filter stage.
L2B-L2B[1]	" "	2nd filter stage.
L2C-L2C[1]	" "	3rd filter stage.
L3A L3A[1]	Radio frequency	P.A. plate tuning. Coupling coil to aerial.
L4A L4A[1]	" "	Crystal Osc. tuning. Coupling coil transmitter mixer.

TABLE 2 - (CONTD)

Circuit Reference	Type	Function
TRANSFORMERS - (CONTD)		
L5A-L5A[1] L8A-L8A[1]	Aerial current Radio frequency	Metering circuit Receiver-aerial input Transmitter-mixer tuning

Circuit Reference	Type	Function	
		Send	Receive
VALVES			
V1A	CV782(1R5) - Converter	-	Mixer
V1B	CV782(1R5) - Converter	Mixer (crystal controlled or self-excited)	Local oscillator
V2A	CV785(1T4) R.F. Pentode	-	1st I.F. amplifier
V2B	" " " "	Sidetone - R.T.	2nd I.F. amplifier and audio amplifier
V2C	" " " "	Buffer amplifier	R.F. amplifier
V2D	" " " "	1,600 Kc/s crystal controlled oscillator	NRT only (as for Send)
V3A	CV807(3A4) Pentode	Modulator	
V3B	" " "	Power amplifier	
V4A	CV784(1S5) Diode Pentode	Audio amplifier R.T. Audio oscillator MCW	Second detector B.F.O. (Pentode)
MISCELLANEOUS			
W1A	Rectifier copper oxide	Aerial current metering	
W2A	" " "	" " "	
W3A	" " "	Audio limiting voltage	
M1	Micro-ammeter 0-500 uA, 1-1/2 in. dial, 240 ohms int. resist.	Voltage and current measurements	
P1A	Bulbs 3V	Pilot lamp	
T1A	Audio frequency	Receiver output	
T2A	" "	Microphone input	

Circuit Reference	Value	Type	Function
INDUCTORS			
L1A		Radio frequency	Aerial loading
L6A		Radio frequency	B.F.O. tuning inductor
L7A		Radio frequency	Buffer tuning inductor
L9A		Radio frequency	Oscillator tuning inductor
L10A	1.35 mH	Radio frequency	Stopper, filament circuit
L11A	0.5 mH	Radio frequency	Stopper, plate circuit
L11B	0.5 mH	Radio frequency	Stopper, grid circuit
L12A	5.5 mH	Audio frequency	Modulation inductor

Circuit Reference	Type	Switch Reference	Function
SWITCHES			
S1A	Double-pole, single wafer, 4 way	S1A/1	Metering circuit (- pole)
		S1A/2	Metering circuit (pole)
S2A	Three-pole, single wafer, 2 way	S2A/1	Crystal Osc. filament switch
		S2A/2	Plate voltage reduction
		S2A/3	B.F.O. ON-OFF switch
S3A	Nine-pole, three wafer, 3 way	S3A/1	Oscillator change over
		S3A/2	Bias correction for C.W.
		S3A/3	Microphone - key selector
		S3A/4	Key bridging switch
		S3A/5	Filament switch
		S3A/6	Side tone control
		S3A/7	Amplifier change over switch

TABLE 2 - (CONTD)

Circuit Reference	Type	Switch Reference	Function
SWITCHES - (CONTD)			
S3A (Contd)		S3A/8 S3A/9	Amplifier change over switch " " " "
S4A	Three-pole, 2 wafer, 4 way	S4A/1 S4A/2 S4A/3	Crystal - M.O. output selector M.O. bridging switch Crystal selector
S5A	Two-pole, 1 way	S5A	Pilot light ON-OFF
Circuit Reference	**Type**	**Contact Reference**	**Function**
RELAYS			
RL1	Type 3,000, four-pole 2way Coil resistance 2,000 ohms	RL1/1 RL1/2 RL1/3 RL1/4	Aerial change over, send-receive Filament " " " " Modulation " " " " Send, C21E earthed Receive, M.C.W. damping

END

INSTRUCTION SHEET FOR HEADSET HS—30—U

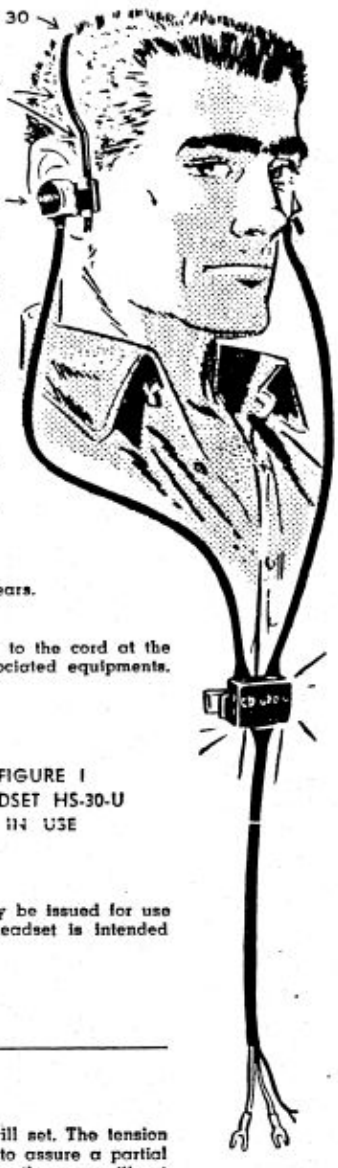


FIGURE 1
HEADSET HS-30-U
IN USE

SECTION I
DESCRIPTION

1. GENERAL

Headset HS-30-U is issued for use with Helmet M-1 (Infantry) and crash helmets used by the Infantry and Armored Forces.

2. HEADBAND HB-30

Headband HB-30 is a thin band of relatively soft steel that can be bent to fit the contour of the wearer's head. Sliding clips at each end of the headband hold the receivers and provide for their adjustment.

3. RECEIVER R-30-U

a. Two magnetic type receivers, connected in series, are used in Headset HS-30-U. Each receiver consists of a receiver unit, cap and receiver housing.

b. The receiver units consist of a diaphragm, permanent magnet and associated coils and pole pieces built into a water tight brass case.

4. INSERT M-300

Soft rubber Inserts M-300 are attached to each receiver and are designed to fit into the wearer's ears.

5. CORD CD-620-U

Cord CD-620-U is a rubber insulated two conductor cord. A saw-toothed clothing clip is attached to the cord at the "Y" junction. Terminals TM-163 are provided at the ends of the cord for attaching the headset to associated equipments.

6. COMPONENTS

Quantity	Name of Component
1	Headband HB-30
2	Receivers R-30-U
1	Cord CD-620-U
4	Inserts M-300 (2 in use, 2 Spare)

NOTE: In addition to above items, associated cords, plugs, transformers, and/or junction boxes may be issued for use with different equipments. Such items will be issued with the equipment for which the headset is intended for use.

SECTION II
INSTALLATION AND OPERATION

7. OPERATION

a. Wear the receiver holders of the headband *in front* of the ears as illustrated.

b. Bend or shape the headband to fit the head at the level where the sweatband of the helmet will set. The tension of the headband is correct when there is just enough pressure of Inserts M-300 against the inner ears to assure a partial seal against external noise. When properly bent into shape and correctly worn, the pressure exerted on the ears will not be uncomfortable.

c. Fasten the clip to the clothing to support the weight of the associated transformer or junction box. Allow enough slack so that the head can be turned without adding to the pressure of the inserts in the ears.

SECTION III
MAINTENANCE

UNSATISFACTORY PERFORMANCE OF THIS EQUIPMENT WILL BE REPORTED IMMEDIATELY ON WD, AGO FORM NO. 468. IF FORM IS NOT AVAILABLE SEE TM38-250.

8. LUBRICATION

Lubrication of this equipment is not required.

9. MOISTUREPROOFING AND FUNGIPROOFING

a. Disassembly.

(1) Remove Insert M-300 from the receiver cap.

(2) Unscrew receiver cap from receiver case.

(3) Pull receiver unit out of receiver case.

(4) Unscrew the two receiver unit terminal screws.

This headset used with the 128
The origonal sheet was include in box of spare earphone inserts.

b. Masking.

(1) Receiver cap.

(a) Mask threads inside of receiver cap.

(b) Mask acoustic silk inside of receiver cap and cover central hole.

(c) Mask hole on outside of receiver cap.

(2) Receiver case.

Mask screw threads on outside of receiver case.

(3) Receiver unit.

Mask terminal screw holes and adjacent area normally covered by head of terminal screws.

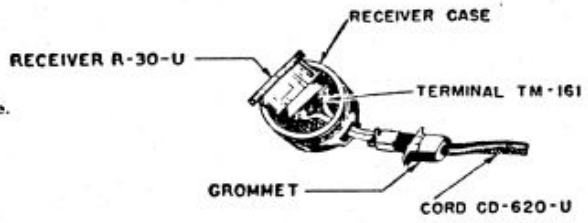


FIGURE 2
RECEIVER R-30-U
EXPLODED VIEW

c. Drying.

Dry all parts previously disassembled (except those not to be treated) for a period of two to three hours at 160 degrees F.

d. Moistureproofing.

(1) Apply three coats of moistureproofing varnish by means of a suitable brush as follows:

(a) All parts of receiver cap except those masked.

(b) All parts of receiver case except that part which is masked.

(c) All unmasked portions of the receiver unit except the diaphragm.

NOTE: Diaphragm must be kept free of varnish or impaired operation will result.

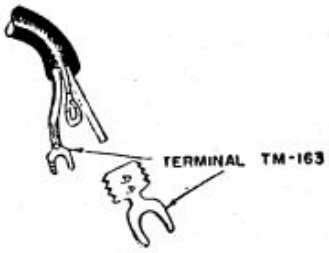


FIGURE 3
TERMINAL TM-163

e. Reassembly and test.

(1) Remove masking tape.

(2) Reassemble using reverse of procedure given in subparagraph a.

(3) Test for proper operation.

f. Marking.

Mark each headset treated with the letters MFP and the date of treatment.

10. REPLACING TERMINAL TM-161

a. Unscrew the receiver cap, and pull the receiver unit free of the case.

b. Remove the terminal screw and washer from the damaged terminal.

c. Remove the damaged terminal from the cord.

d. Place the wire from which the terminal was removed over the two projections of the new terminal.

e. Fold the sides of the terminal over the wire with a pair of pliers. Make sure that the wire is centered in the terminal and that the two projections pierce the insulation.

f. Reassemble by reversing the procedure given in subparagraph a and b above.

11. REPLACING TERMINAL TM-163

a. Remove damaged Terminal TM-163 from the end of the cord (fig. 3).

b. Replace the terminal as described in paragraph 10 d and e above.

SECTION IV
SUPPLEMENTARY DATA

12. MAINTENANCE PARTS LIST FOR HEADSET HS-30-U

Signal Corps. stock No.	Name of part and description	Running spares	Organizational stock	3d echelon stock	4th echelon stock	5th echelon stock	Depot stock	Quantity per unit
2B1300	Insert M-300				*	*	*	2
3Z10161	Terminal TM-161				*	*	*	4
3Z10163	Terminal TM-163				*	*	*	2

* Indicates stock available.