

HANDBOOK OF

# RADIO CIRCUITS

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RECEIVERS, TRANSMITTERS, TEST EQUIPMENT,  
POWER PACKS, TRANSCEIVERS, EMERGENCY EQUIPMENT,  
ETC. ETC.

FULLY ILLUSTRATED, WITH CHARTS & DIAGRAMS.  
SPECIALLY PREPARED

FOR THE  
SERVICES

AND RADIO  
ENGINEERS

No. 22

BERNARDS (Publishers), LTD

77, THE GRAMPIANS,  
WESTERN GATE,  
LONDON, W.6.

B.J. Collins.



2/-

### SPECIAL NOTE TO PAGE 6.

With reference to theoretical diagram on page 6, it should be noted that care be taken not to earth the code practice oscillator to a physical earth. The earth shown in the diagram is simply intended to denote the actual metal chassis.

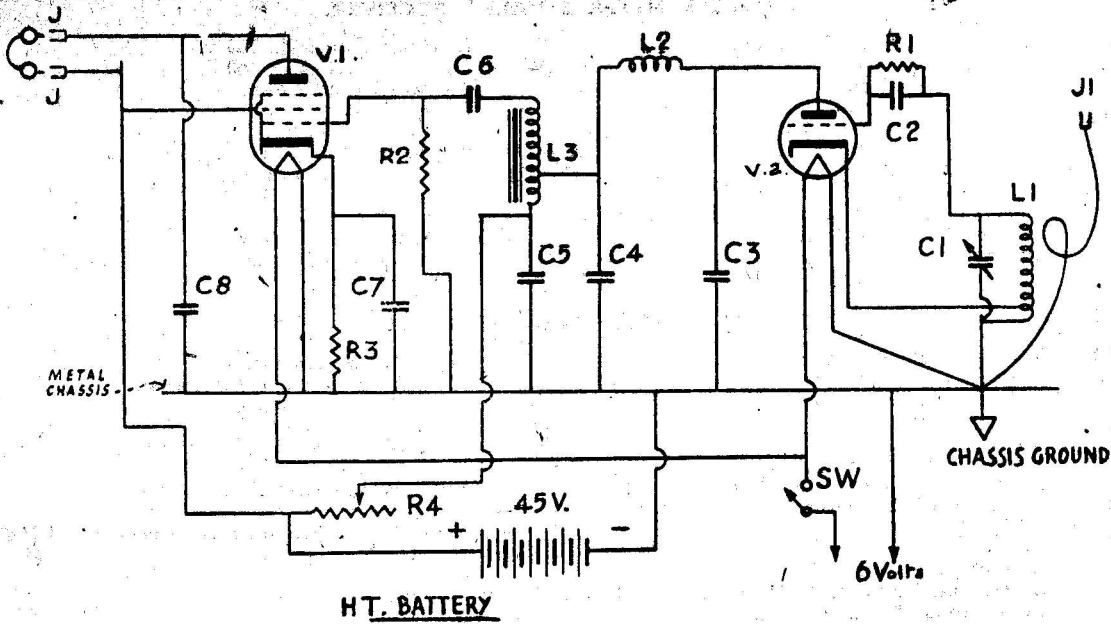
(1) **SIMPLE 5 METER 2 VALVE RECEIVER.**

- |  |  |
|--|--|
| C1 — .00015 mfd. Variable Condenser.   | C7 — Condenser, 1.0 mfd., 200 v.           |
| C2 — Condenser, .00004 mfd.  | C8 — " .01 mfd., 400 v.                    |
| C3 — " .0005 mfd.  | R1 — 2 mges., $\frac{1}{2}$ watt Resistor. |
| C4 — " .0005 mfd.  | R2 — 1 meg., $\frac{1}{2}$ watt "          |
| C5 — " 1.0 mfd., 200 v.  | R3 — 1,000 ohms, 1 watt "                  |
| C6 — " .01 mfd., 400 v.  | R4 — Variable Resistor, 250,000 ohms.      |
| L1 — $6\frac{1}{2}$ turns 14 S.W.G. Copper Wire, $\frac{5}{8}$ " inside dia., 1" long, tapped $\frac{1}{4}$ turn up for cathode. |  |
| L2 — Lattice-wound R.F. Choke, 60 mh.  |  |
| L3 — Audio Coupling Impedance, 3 to 1 ratio L.F. Auto-Transformer.   |  |
| J1 — Insulated tip jack for aerial.  | V1 — American Type 38 Valve.               |
| J-J — Jack for headphones.   | V2 — " " 955 "                             |
| SW — Filament Control S.P.S.T. Switch.   |  |

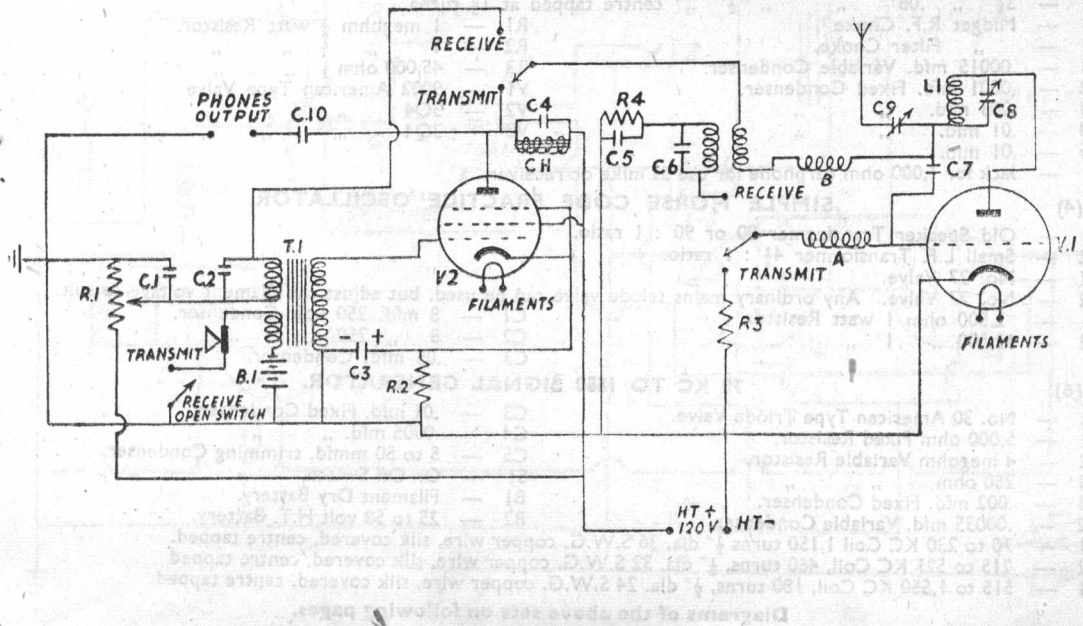
(23) **2 $\frac{1}{2}$ -5 METER TRANS-RECEIVER.**

- |  |  |
|--|--|
| R1 — $\frac{1}{4}$ megohm Volume Control.  | C8 — .00001 Variable Condenser.                                      |
| R2 — 400 ohm 1 watt Resistor.  | C9 — .00002 Aerial Trimming Condenser.                               |
| R3 — 5,000 ohm 1 watt "  | C10 — .1 mfd. Fixed Condenser.                                       |
| R4 — 1 megohm 1 watt "   | CH — 25 hy. 100 ma. Choke.   |
| C1 — .1 mfd. Fixed Condenser.  | T1 — Triple Winding 4-1 L.F. Transformer.                            |
| C2 — .00025 mfd. Fixed Condenser.  | B1 — 4.5 volt Battery.   |
| C3 — 12 mfd. 200 volt Electrolytic Condenser.  | V1 — American type 6C5 Valve.  |
| C4 — .01 mfd. Fixed Condenser.   | V2 — " " 6F6 "   |
| C5 — .0001 mfd. " "  | A — 78 turns, 34 S.W.G. d.s.c. Wire close wound $\frac{1}{8}$ " dia. |
| C6 — .001 mfd. " "   | B — 78 " 34 " " " " " " "  |
| C7 — .0001 mfd. " "  |  |
| L1 — 2 $\frac{1}{2}$ metre band 3 turns, 12 S.W.G. Enamelled Wire $\frac{1}{8}$ " dia. 1 $\frac{1}{2}$ " long. |  |
| 5 metre band 8 " 12 " " " " " " "  |  |

Diagrams of the above sets on following pages.



DIETER TRANSMITTER



(3)

### 2½ METER TRANSRECEIVER.

- |  |                                |
|--|--------------------------------|
| L1 — 2¼ turns .08" Copper Wire ½" dia. close wound. This coil is mounted so as to vary coupling with L2. |                                |
| L2 — 3¼ " .08" " " ½" " centre tapped at 1⅝ turns.   |                                |
| L3 — Midget R.F. Choke   | R1 — 1 megohm ½ watt Resistor. |
| L4 — " Filter Choke.   | R2 — 1 " ½ " "                 |
| C1 — .00015 mfd. Variable Condenser.   | R3 — 45,000 ohm ½ " "          |
| C2 — .0001 mfd. Fixed Condenser.   | V1 — 9002 American Type Valve. |
| C3 — .003 mfd. " "   | V2 — 3Q4 " " "                 |
| C4 — .01 mfd. " "  | V3 — 3Q4 " " "                 |
| C5 — .01 mfd. " "  |                                |
| J — Jack for 1,000 ohm earphone for use as mike or receiver.   |                                |

(4)

### SIMPLE MORSE CODE PRACTICE OSCILLATOR.

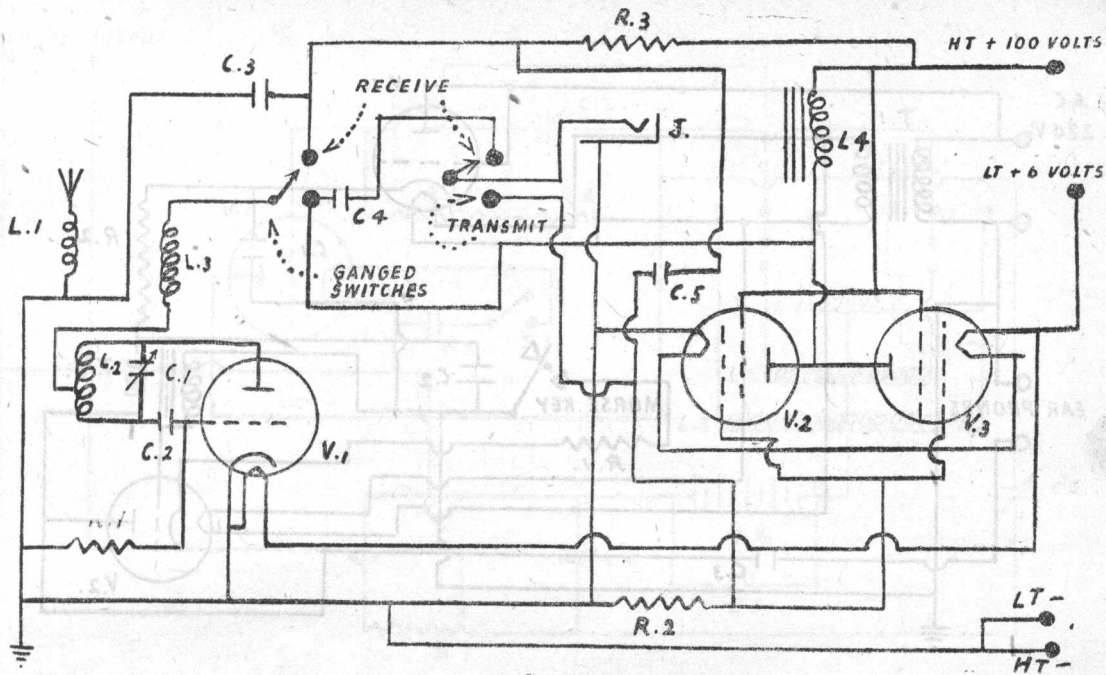
- |  |                                 |
|--|---------------------------------|
| T1 — Old Speaker Transformer 80 or 90 : 1 ratio.   |                                 |
| T2 — Small L.F. Transformer 4½ : 1 ratio.  |                                 |
| V1 — No. 27 Valve.   |                                 |
| V2 — No. 27 Valve. Any ordinary mains triode valve can be used, but adjust the filament voltage to suit. |                                 |
| R1 — 2,500 ohm 1 watt Resistor.  | C1 — 8 mfd. 250 volt Condenser. |
| R2 — 12,500 " 1 " "  | C2 — 8 " 250 " "                |
|  | C3 — .05 mfd. Condenser.        |

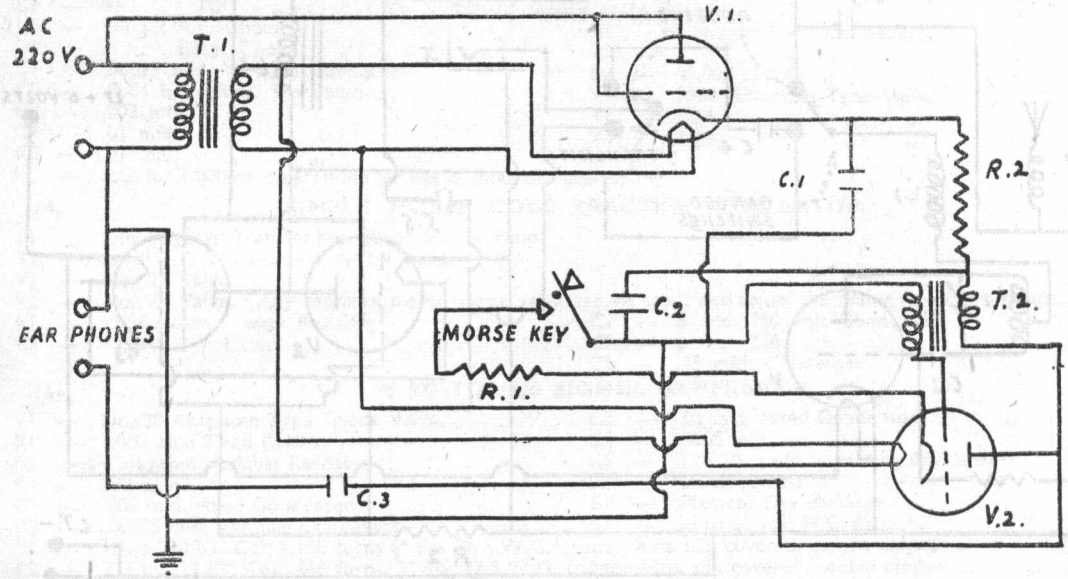
(6)

### 70 KC TO 1550 SIGNAL GENERATOR.

- |   |  |
|---|--|
| V1 — No. 30 American Type Triode Valve.   | C3 — .01 mfd. Fixed Condenser.         |
| R1 — 5,000 ohm Fixed Resistor.  | C4 — .0005 mfd. " "                    |
| R2 — 4 megohm Variable Resistor.  | C5 — 5 to 50 mmfd. trimming Condenser. |
| R3 — 250 ohm " "  | S1 — On-Off Switch.                    |
| C1 — .002 mfd. Fixed Condenser.   | B1 — Filament Dry Battery.             |
| C2 — .00035 mfd. Variable Condenser.  | B2 — 25 to 50 volt H.T. Battery.       |
| L1 — 70 to 230 KC Coil 1,150 turns ½" dia. 36 S.W.G. copper wire, silk covered, centre tapped.    |  |
| L2 — 215 to 525 KC Coil, 460 turns, ½" dia. 32 S.W.G. copper wire, silk covered, centre tapped    |  |
| L3 — 515 to 1,550 KC Coil, 180 turns, ½" dia. 24 S.W.G. copper wire, silk covered, centre tapped. |  |

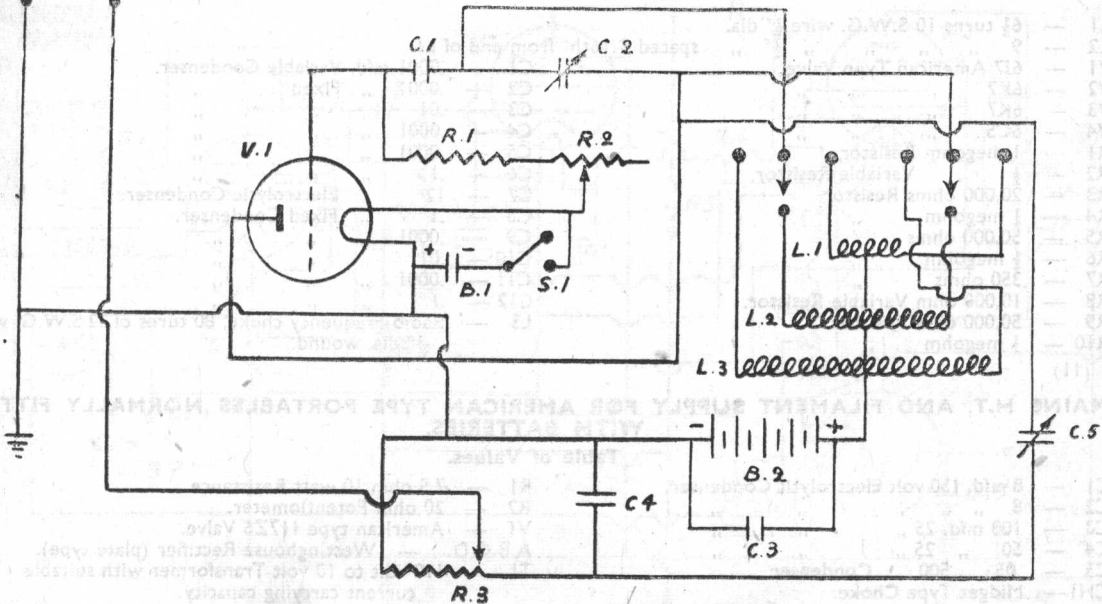
Diagrams of the above sets on following pages.







SIGNAL OUTPUT



(8)

## RESISTANCE COUPLED. 5 METRE SUPERHET RECEIVER.

L1	—	6½ turns 10 S.W.G. wire ½" dia.	C1	—	.0001 mfd. Variable Condenser.
L2	—	9 " " " " spaced 3/16th" from end of L1.	C2	—	.0001 " Fixed "
V1	—	6J7 American Type Valve.	C3	—	.01 " " "
V2	—	6K7 " " "	C4	—	.0001 " " "
V3	—	6K7 " " "	C5	—	.0001 " " "
V4	—	6C5 " " "	C6	—	.1 " " "
R1	—	1 megohm Resistor.	C7	—	12 " Electrolytic Condenser.
R2	—	½ " Variable Resistor.	C8	—	.1 " Fixed Condenser.
R3	—	20,000 ohms Resistor.	C9	—	.0001 " " "
R4	—	¼ megohm " "	C10	—	.01 " " "
R5	—	50,000 ohms " "	C11	—	.0001 " " "
R6	—	¼ megohm " "	C12	—	.1 " " "
R7	—	350 ohms " "	L3	—	Radio Frequency choke, 80 turns of 32 S.W.G. wire, ½" dia. wound.
R8	—	10,000 ohm Variable Resistor.			
R9	—	50,000 ohm Resistor.			
R10	—	¼ megohm " "			

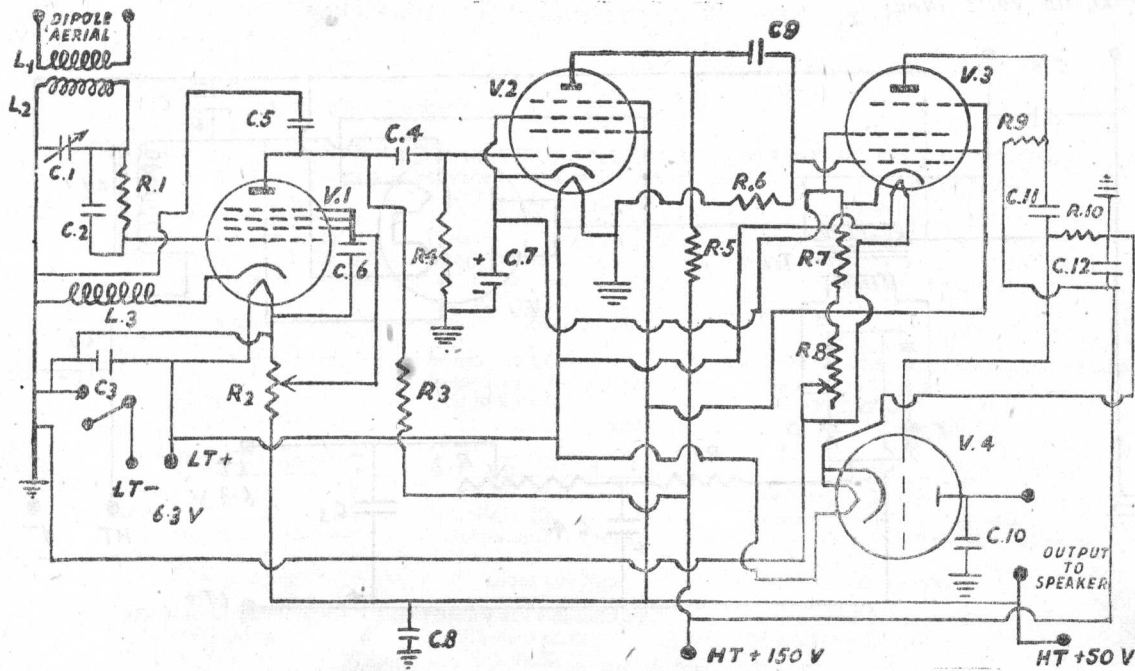
(11)

## MAINS H.T. AND FILAMENT SUPPLY FOR AMERICAN TYPE PORTABLES NORMALLY FITTED WITH BATTERIES.

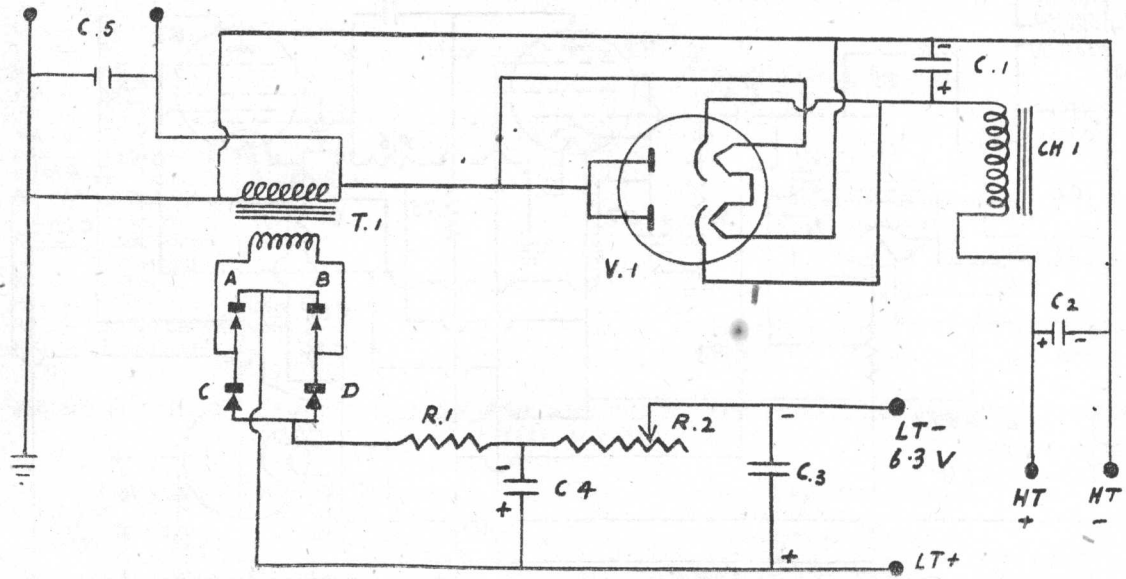
## Table of Values.

C1	—	8 mfd. 150 volt Electrolytic Condenser.	R1	—	7.5 ohm 10 watt Resistance.
C2	—	8 " " " " " "	R2	—	20 ohm Potentiometer.
C3	—	100 mfd. 25 " " " "	V1	—	American type 117Z6 Valve.
C4	—	50 " 25 " " " "	A.B.C.D.	—	Westinghouse Rectifier (plate type).
C5	—	.05 " 500 " Condenser.	T1	—	110 volt to 10 volt Transformer with suitable current carrying capacity.
CH1	—	Midget Type Choke.			

Diagrams of the above sets on following pages.



AC 110 VOLTS INPUT



(12)

## HIGH AMPLIFICATION REGENERATIVE R.F. PRESELECTOR.

V1 — 1852 American Type Valve.	C5 — Same as C4.
C1 — .0005 mfd. Variable Condenser ganged to C2.	R1 — 12,500 ohm Variable Resistance.
C2 — .0005 mfd. " " " " C1.	R2 — 200 ohm $\frac{1}{2}$ watt Resistance.
C3 — .1 mfd. 500 volt Fixed Tubular Condenser.	R3 — 5,000 " $\frac{1}{2}$ " "
C4 — .01 mfd. 500 " " " " "	R4 — 50,000 " $\frac{1}{2}$ " "

### DETAILS OF COILS L1 & L2 TO COVER RANGES FROM 10 METRES TO 550 METRES.

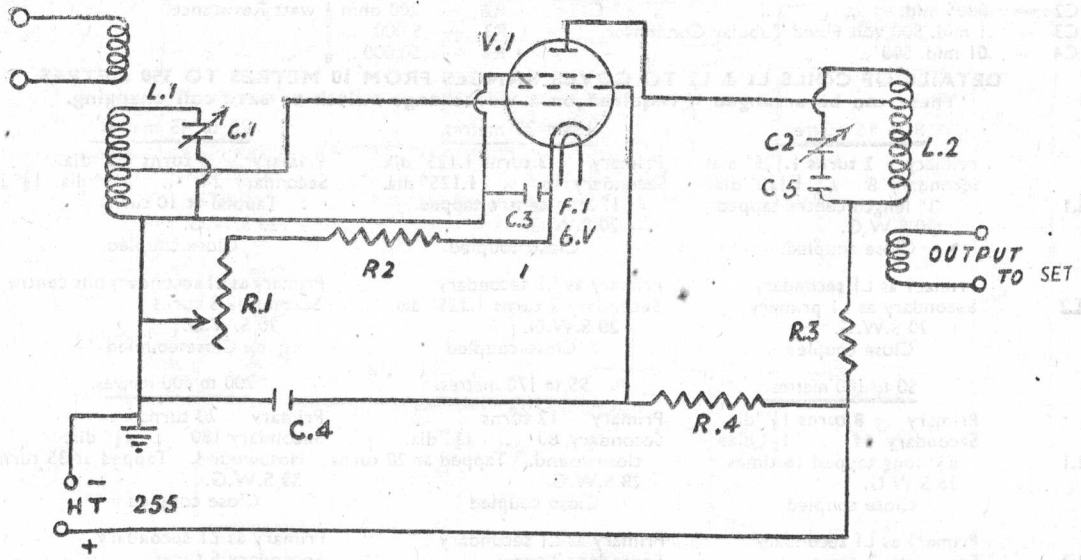
These can be arranged if required on a wavechange switch to save coil changing.

#### 8 to 16 metres.

#### 15 to 30 metres.

#### 28 to 45 metres.

L1	Primary 2 turns 1.125" dia. Secondary 8 " 1.125" dia. 1" length centre tapped 20 S.W.G. Close coupled.	Primary 3 turns 1.125" dia. Secondary 15 " 1.125" dia. 1" long centre tapped 20 S.W.G. Close coupled.	Primary 5 turns 1.5" dia. Secondary 24 " 1.5" dia. $1\frac{1}{2}$ " long. Tapped at 10 turns 20 S.W.G. Close coupled.
L2	Primary as L1 secondary Secondary as L1 primary 20 S.W.G. Close coupled.	Primary as L1 secondary Secondary 2 turns 1.125" dia. 20 S.W.G. Close coupled	Primary as L1 secondary but centre tapped Secondary 3 turns 20 S.W.G. Close coupled
	<u>50 to 100 metres.</u>	<u>95 to 170 metres.</u>	<u>200 to 600 metres.</u>
L1	Primary 8 turns $1\frac{1}{2}$ " dia. Secondary 44 " $1\frac{1}{2}$ " dia. $1\frac{1}{2}$ " long tapped 16 times 26 S.W.G. Close coupled	Primary 12 turns Secondary 80 " $1\frac{1}{2}$ " dia. closewound. Tapped at 20 turns 28 S.W.G. Close coupled	Primary 20 turns Secondary 180 " $1\frac{1}{2}$ " dia. closewound. Tapped at 35 turns 30 S.W.G. Close coupled
L2	Primary as L1 secondary Secondary 3 turns 26 S.W.G. Close coupled	Primary as L1 secondary Secondary 3 turns 26 S.W.G. Close coupled	Primary as L1 secondary Secondary 5 turns 30 S.W.G. Close coupled



## PORTABLE 3 VALVE SUPERHETRODYNE.

R1 — 300 ohm 1 watt Resistor.	C4 — .0001 mfd. Fixed Condenser.
R2 — 50,000 " " "	C5 — .15 " " "
R3 — 500 " " "	C6 — .15 " " "
R4 — 10,000 " " "	C7 — .15 " " "
R5 — 50,000 " " "	C8 — .15 " " "
T1 — 460KC Iron core I.F. Transformer.	C9 — 10 mfd. 25 volt electrolytic Fixed Condenser.
T2 — 460KC " " " "	C10 — .00035 mfd. Fixed Condenser.
T3 — 460KC " " " Beat Oscillator Transformer.	J — Output open circuit Jack for Headphones.
S.W. — Single Pole Single Throw Switch.	V1 — American Type 6K8 Valve.
C1 — .0001 Variable Condenser.	V2 — " " 6K7 "
C2 — .0001 " " "	V3 — " " 6C8 "
C3 — .00003 " " Midget.	

### 160 metre band.

### COIL DETAILS.

- L1 — 72 turns 24 S.W.G. D.S.C. Wire, close wound,  $1\frac{1}{2}$ " dia. Aerial coil 11 turns 24 SW.G. D.S.C. Wire  $\frac{1}{16}$ " from the grid coil.
- L2 — 40 turns 24 S.W.G. D.S.C. Wire,  $1\frac{1}{2}$ " dia., close wound. On this range connect C3 across 39 turns of the grid coil from earth end. Anode coil  $12\frac{1}{2}$  turns 22 S.W.G. D.S.C. wire  $\frac{3}{16}$ " from grid coil.

### 60 metre band.

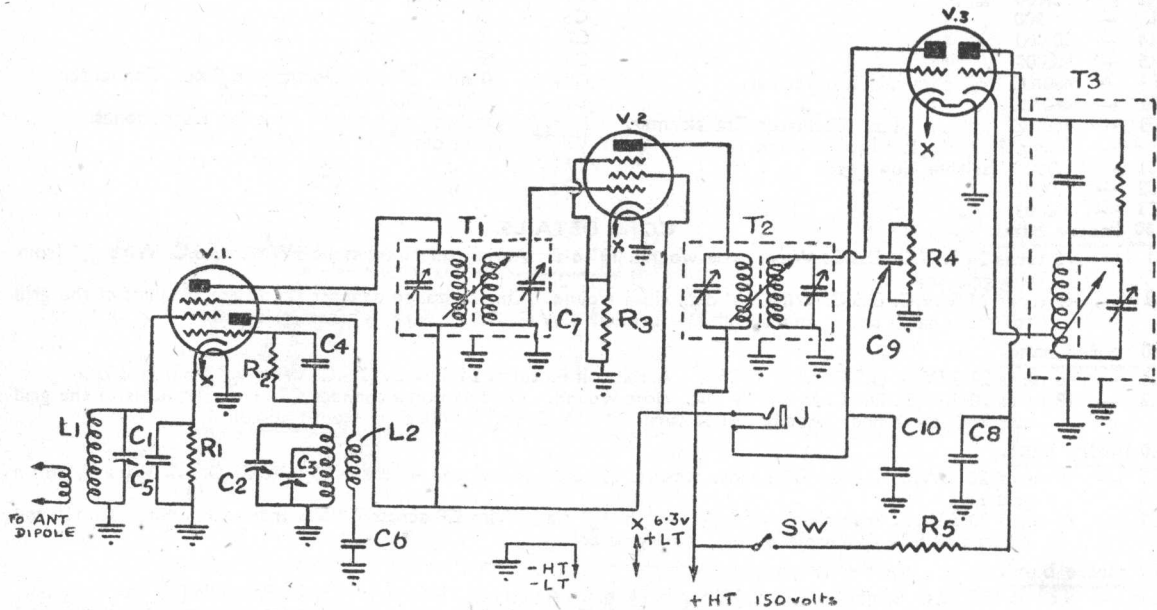
- L1 — 46 turns 22 S.W.G. D.S.C. wire,  $1\frac{1}{2}$ " dia. Aerial coil  $5\frac{1}{2}$  turns 24 S.W.G. D.S.C. Wire  $\frac{1}{16}$ " from grid coil.
- L2 — 18 turns 20 S.W.G. D.S.C. Wire,  $1\frac{1}{2}$ " dia., close wound. On this range connect C3 across 17 turns of the grid coil from earth end. Anode coil  $5\frac{1}{2}$  turns 22 S.W.G. D.S.C. Wire  $\frac{3}{16}$ " from grid coil.

### 40 metre band.

- L1 — 19 turns 20 S.W.G. D.S.C. Wire close wound,  $1\frac{1}{2}$ " dia. Aerial coil  $4\frac{1}{2}$  turns 20 S.W.G. D.S.C. Wire  $\frac{1}{16}$ " from grid coil.
- L2 —  $8\frac{1}{2}$  turns 20 S.W.G. Enamelled Wire,  $\frac{9}{16}$ " length,  $1\frac{1}{2}$ " dia. Wire C3 across 7 turns from earth end. Anode coil 4 turns 20 S.W.G. Enamelled,  $\frac{9}{16}$ " from grid coil.

### 20 metre band.

- L1 — 9 turns 18 S.W.G. Enamelled Wire,  $\frac{1}{2}$ " length,  $1\frac{1}{2}$ " dia. Aerial coil  $3\frac{1}{2}$  turns 18 S.W.G. Enamelled,  $\frac{1}{4}$ " from grid coil.
- L2 — 4 turns 18 S.W.G. Enamelled Wire,  $\frac{5}{16}$ " length,  $1\frac{1}{2}$ " dia. Wire C3 across 3 turns from earth end. Anode coil  $2\frac{1}{2}$  turns 18 S.W.G. Enamelled,  $\frac{1}{8}$ " from grid coil.





(14)

## 5-METRE BAND CRYSTAL CONTROLLED TRANSRECEIVER.

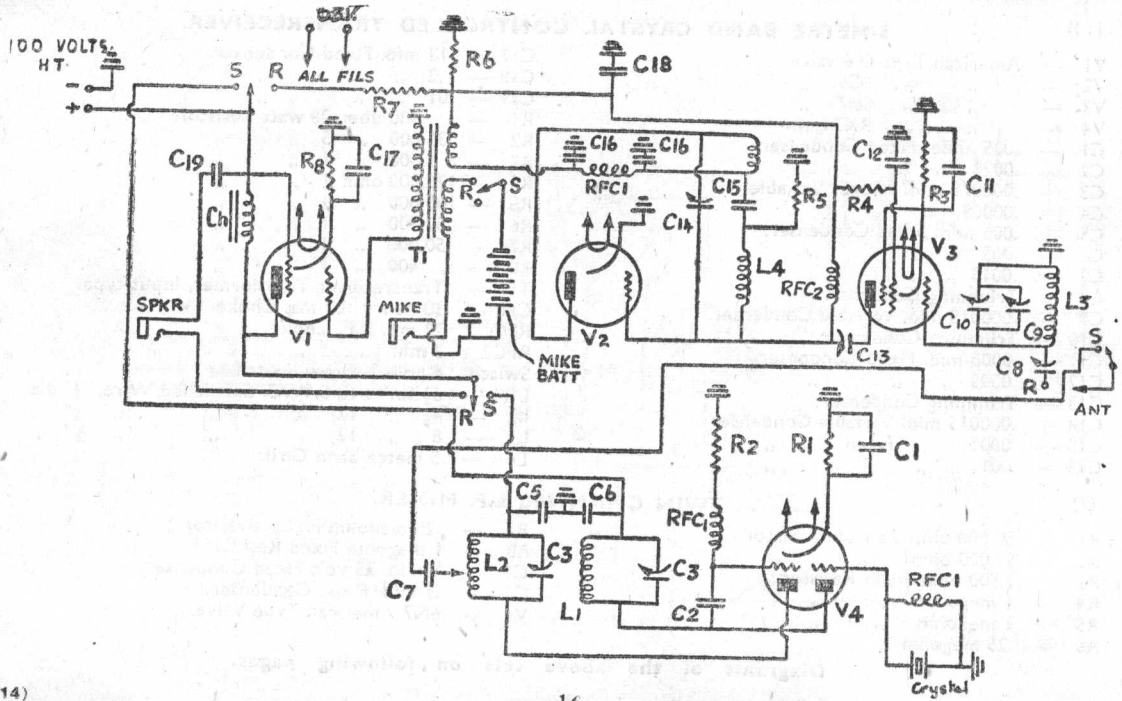
V1 — American Type 6F6 valve.	C17 — 12 mfd. Fixed Condenser.
V2 — " " 6C5 "	C18 — .2 " " "
V3 — " " 6U7 "	C19 — .01 " " "
V4 — " " RK34 "	R1 — 400 ohm 20 watt Resistor.
C1 — .005 mfd. Fixed Condenser.	R2 — 35,000 " 5 " "
C2 — .0025 " " "	R3 — 1,500 " 1 " "
C3 — .000075 mfd. Midget Variable.	R4 — 125,000 ohm 1 " "
C4 — .00003 " " "	R5 — 100,000 " 1 " "
C5 — .005 mfd. Fixed Condenser.	R6 — 52,500 " 1 " "
C6 — .005 " " "	R7 — 50,000 " 1 " "
C7 — .0015 " " "	R8 — 400 " 1 " "
C8 — Trimming Condenser.	T1 — Transreceiver Transformer, Input type.
C9 — .000015 mfd. Variable Condenser.	CH — 30 henry 100 ma. Choke.
C10 — Trimming Condenser.	RFC1 — 22 mh. R.F. Choke.
C11 — .0005 mfd. Fixed Condenser.	RFC2 — 2 mh. " " "
C12 — .0005 " " "	Switch — 4-pole 2-throw Switch.
C13 — Trimming Condenser.	L1 — $6\frac{1}{2}$ turns 12 S.W.G. Enamelled Wire, $\frac{3}{4}$ " dia.
C14 — .000015 mfd. Variable Condenser.	L2 — $4\frac{1}{2}$ " 12 " " " $\frac{3}{4}$ " "
C15 — .0001 " Fixed " "	L3 — 8 " 12 " " " $\frac{4}{8}$ " "
C16 — .001 " " " "	L4 — 5 metre band Coil. " " $\frac{9}{16}$ " "

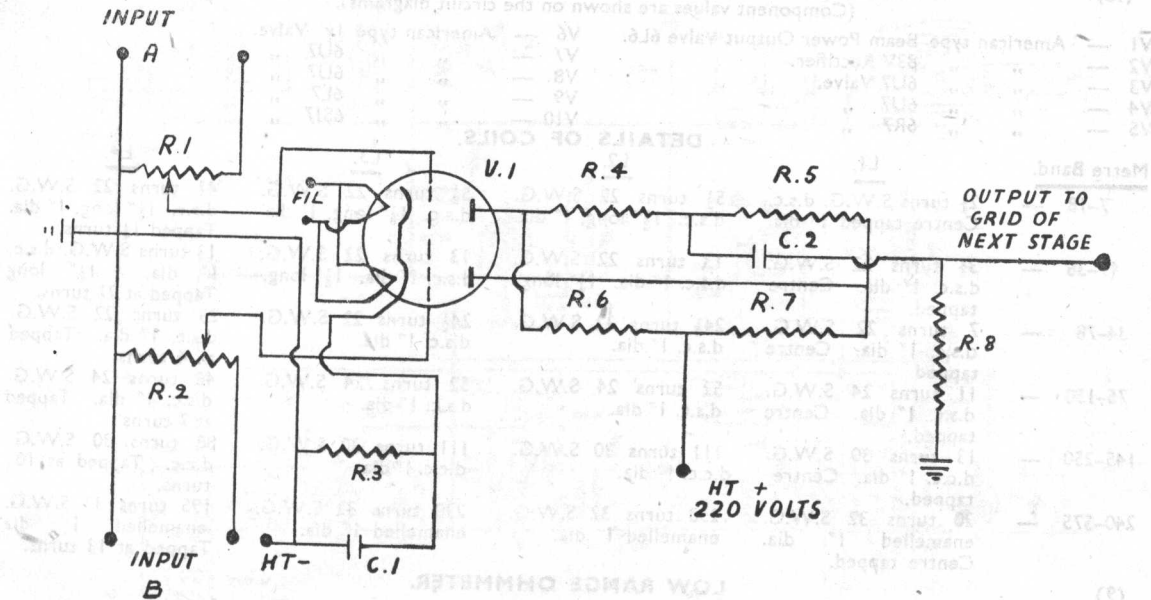
(7)

## TWIN CHANNEL L.F. MIXER.

R1 — 50,000 ohm Variable Resistor.	R7 — .25 megohm Fixed Resistor
R2 — 50,000 ohm " "	R8 — 1 megohm Fixed Resistor.
R3 — 2,500 ohm Fixed Resistor.	C1 — 8 mfd. 25 volt Fixed Condenser.
R4 — 1 megohm " "	C2 — .1 mfd. Fixed Condenser.
R5 — 1 megohm " "	V1 — 6N7 American Type Valve.
R6 — .25 megohm " "	

Diagrams of the above sets on following pages.





(15)

**10-VALVE SUPERSENSITIVE SUPERHETRODYNE RECEIVER.**

(Component values are shown on the circuit diagrams).

V1 —	American type	Beam Power Output Valve	6L6.	V6 —	American type	Iv Valve.
V2 —	"	"	83V Rectifier.	V7 —	"	" 6U7
V3 —	"	"	6U7 Valve.	V8 —	"	" 6U7 "
V4 —	"	"	6U7 "	V9 —	"	" 6L7 "
V5 —	"	"	6R7 "	V10 —	"	" 6SJ7 "

**DETAILS OF COILS.**

<u>Metre Band.</u>	<u>L1.</u>	<u>L2.</u>	<u>L3.</u>	<u>L4.</u>
7-18 —	2½ turns S.W.G. d.s.c. Centre tapped 1" dia.	5½ turns 22 S.W.G. d.s.c. 1½" long, 1" dia.	5½ turns 22 S.W.G. d.s.c. 1½" long, 1" dia.	4¾ turns 22 S.W.G. d.s.c. 1½" long, 1" dia. Tapped 1½ turns.
17-36 —	3½ turns 22 S.W.G. d.s.c. 1" dia. Centre tapped.	13 turns 22 S.W.G. d.s.c. 1" dia. 1½" long.	13 turns 22 S.W.G. d.s.c. 1" dia. 1½" long.	13 turns S.W.G. d.s.c. 1" dia. 1½" long Tapped at 2½ turns.
34-78 —	7 turns 22 S.W.G. d.s.c. 1" dia. Centre tapped	24½ turns 22 S.W.G. d.s.c. 1" dia.	24½ turns 22 S.W.G. d.s.c. 1" dia.	23 turns 22 S.W.G. d.s.c. 1" dia. Tapped at 4 turns.
75-150 —	11 turns 24 S.W.G. d.s.c. 1" dia. Centre tapped.	52 turns 24 S.W.G. d.s.c. 1" dia.	52 turns 24 S.W.G. d.s.c. 1" dia.	46 turns 24 S.W.G. d.s.c. 1" dia. Tapped at 7 turns.
145-250 —	13 turns 30 S.W.G. d.c.c. 1" dia. Centre tapped.	111 turns 30 S.W.G. d.c.c. 1" dia.	111 turns 30 S.W.G. d.c.c. 1" dia.	88 turns 30 S.W.G.. d.c.c. Tapped at 10½ turns.
240-575 —	20 turns 32 S.W.G. enamelled 1" dia. Centre tapped.	230 turns 32 S.W.G. enamelled 1" dia.	230 turns 32 S.W.G. enamelled 1" dia.	195 turns 32 S.W.G. enamelled 1" dia Tapped at 13 turns.

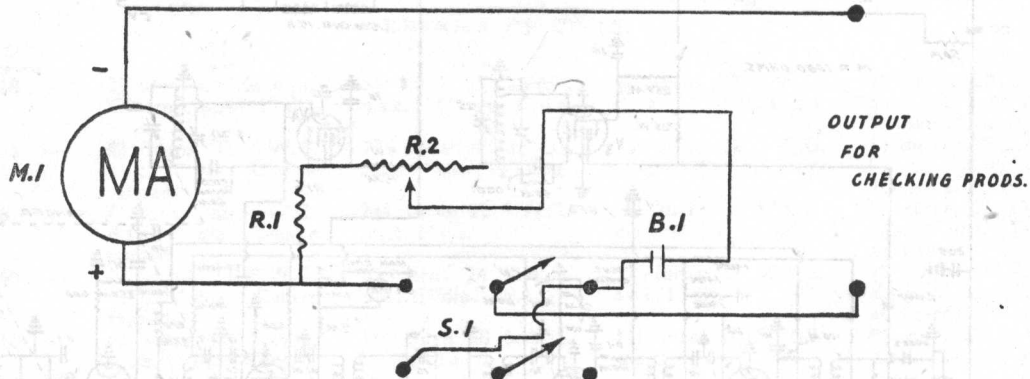
(9)

M1 —	1.5 milliammeter.
R1 —	750 ohm Precision Resistor.
R2 —	500 " " "

**LOW RANGE OHMMETER.**

S1 —	Double Pole Double Throw Switch.
B1 —	1.5 volt Dry Battery.
Calibrate Dial of meter against known Precision Resistors.	





(16) **SUPERSELECTIVE 10 VALVE FULL WAVE BAND COVERAGE SUPERHETRODYNE**

R1 — 450 ohm	1 watt Resistor.	CH1 — 15 henry	100 ma. Choke.	C16 — .02 mfd.	Fixed Condenser.
R2 — 75,000	Variable	CH2 — 15,000 ohm	Speaker Field.	C17 — .15 mfd.	"
R3 — 10,000	1 watt	T1 — 465 kc.	iron core I.F.	C18 — .15 mfd.	"
R4 — 500	"		Transformer.	C19 — .000005	Coupling
R5 — 20,000	"	T2 — 465 kc.	"	C20 — .0001 mfd.	Fixed
R6 — 1,750	"	T3 — 465 kc.	"	C21 — 6 mfd.	Electrolytic
R7 — 40,000	Variable	T4 — 465 kc.	"	C22 — 10 mfd.	"
R8 — 250	1 watt	T5 — 465 kc.	"	C23 — 10 mfd.	"
R9 — 100,000	5	T6 — 465 kc.	"	C24 — 10 mfd.	"
R10 — 1,000	2	T7 — 750 volt, centre tapped,	100 ma.,	C25 — .000015	Variable
R11 — 2,500	Variable		6.3 volt 5 amps., 5 volt. 2 $\frac{1}{2}$	C26 — .00003	"
R12 — 1 megohm	1 watt		amps. Mains Transformer.	C27 — .00015 mfd.	fixed
R13 — 1	"	T8 — Speaker Output Transformer.		C28 — .005 mfd.	"
R14 — 6,000 ohm	"	M — 0-1 D.C. ma.		C29 — .000003	coupling
R15 — 25,000	"	C1 — .000015	Variable Condenser.	C30 — Trimming	"
R16 — 25,000	50 Variable	C2 — .000025	"	C31 — .015 mfd.	Fixed
R17 — 22,500	1 watt	C3 — .005 mfd.	Fixed	C32 — 1 mfd.	"
R18 — 50,000	"	C4 — .02 mfd.	"	C33 — .025 mfd.	"
R19 — 50,000	"	C5 — Trimming	Condenser.	C34 — 1 mfd.	"
R20 — 110,000	"	C6 — .000015	Variable Condenser.	C35 — .0015 mfd.	"
R21 — 600,000	"	C7 — .05 mfd.	Fixed	C36 — .1 mfd.	"
R22 — 1 megohm	"	C8 — .02 mfd.	"	C37 — 10 mfd.	Electrolytic
R23 — 1	"	C9 — .02 mfd.	"	C38 — .025 mfd.	Fixed
R24 — 45,000 ohm	"	C10 — .000005	coupling	C39 — .00015 mfd.	"
R25 — $\frac{1}{2}$ megohm	Vol. Control	C11 — .02 mfd.	Fixed	C40 — .0015 mfd.	"
R26 — 2,000 ohm	1 watt	C12 — .15 mfd.	"	C41 — .015 mfd.	"
R27 — 1,000	"	C13 — .15 mfd.	"	S1 — Mains Switch.	"
R28 — $\frac{1}{4}$ megohm	"	C14 — .025 mfd.	"	S2 — Reception Switch.	"
R29 — 450 ohm	10	C15 — .000005	Coupling		

(16) continued

- S3 — Double - pole Single - throw Switch for Beat Frequency Oscillator and Meter Switch.  
 RFC — 3 mh. 150 ma. Choke.  
 V1 — American type 6U7 Valve.  
 V2 — " " 6U7 "  
 V3 — " " 6J8 "  
 V4 — " " 6U7 "

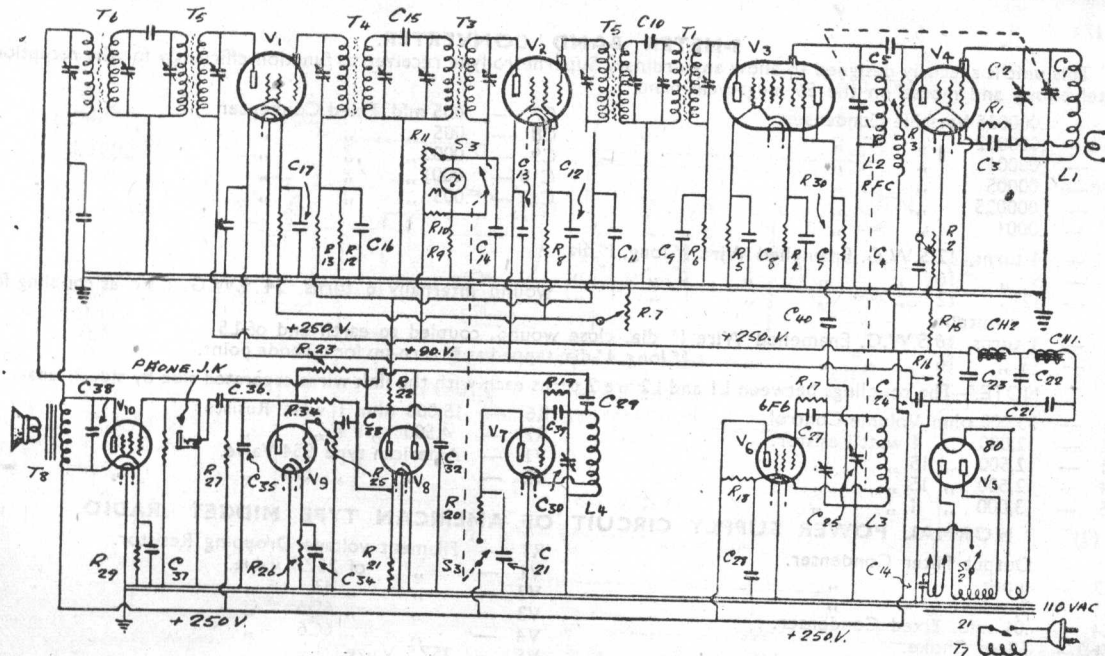
- V5 — American type 83 Rectifier Valve.  
 V6 — " " 6F6 Output "  
 V7 — " " 6C5 Triode "  
 V8 — " " 6H6 Valve.  
 V9 — " " 6C5 Triode Valve.  
 V10 — " " 6F6 Output "

### COIL DETAILS

All Coils 1½" in diameter.

Metre Band.	L1 R.F.	L2 Detector.	L3 Oscillator.
7-18 —	4½ turns, 20 S.W.G. ¾" long. Tapped at ½ turn Aerial Coil 2 turns—24 S.W.G.	4½ turns, 20 S.W.G. ¾" long.	4½ turns, 20 S.W.G. ¾" long.
17-35 —	7 turns, 20 S.W.G. 1" long. Tapped at ¾ turn Shunt Secondary with .00005 mfd. Condenser. Aerial Coil 3 turns—24 S.W.G.	7 turns, 20 S.W.G. 1" long Shunt Secondary with .00005 mfd. Condenser.	7 turns, 20 S.W.G. 1" long. Tapped at 2½ turns Shunt Secondary with .00005 mfd. Condenser.
36-68 —	24 turns, 20 S.W.G. 1" long. Tapped at ¾ turn Aerial Coil 3 turns, 24 S.W.G.	24 turns, 20 S.W.G. 1" long.	22 turns, 24 S.W.G. 1" long. Tapped at 4½ turns.
66-150 —	44 turns, 24 S.W.G. 1¼" long. Tapped at 1½ turns Aerial Coil 4½ turns, 24 S.W.G.	44 turns, 24 S.W.G. 1¼" long.	34 turns, 24 S.W.G. 1" long. Tapped at 6½ turns.
148-240 —	90 turns, 28 S.W.G. 1¼" long. Tapped at 2½ turns Aerial Coil 8 turns, 32 S.W.G.	90 turns, 28 S.W.G. 1¼" long.	70 turns, 28 S.W.G. 1" long. Tapped at 8½ turns.
240-550 —	180 turns, 30 S.W.G. 1½" long. Tapped at 3½ turns Aerial Coil 15 turns, 32 S.W.G.	180 turns, 30 S.W.G. 1½" long.	140 turns, 30 S.W.G. 1" long. Tapped at 11 turns.





(17)

### 5-METER BAND CONVERTER.

This unit is specially designed to allow any ordinary Superhetrodyne receiver to function efficiently for the reception of telephony and morse on the 56 megacycle band.

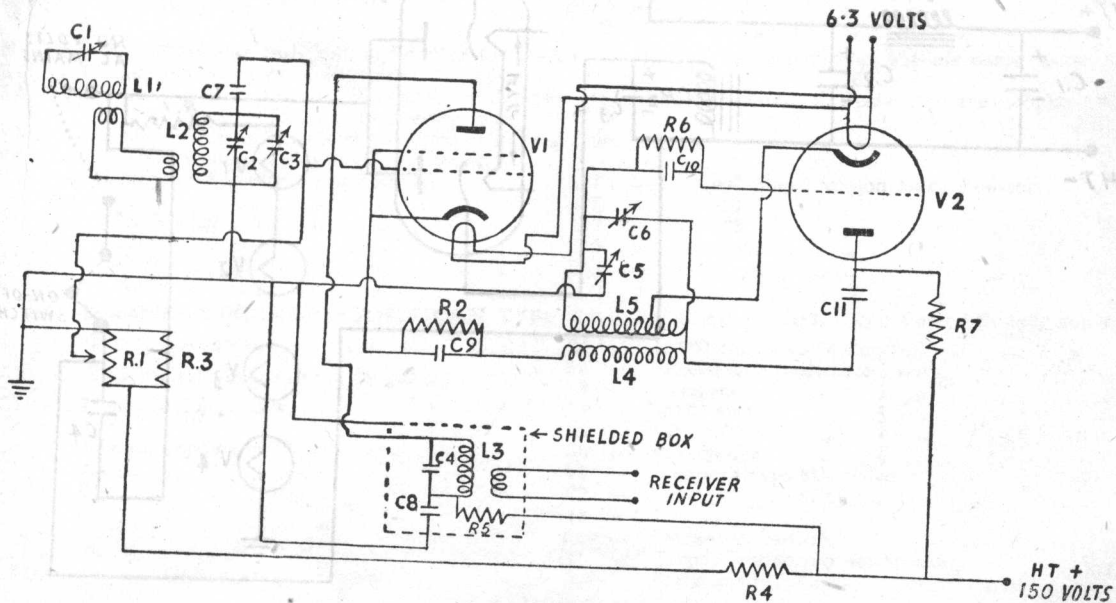
- |   |                                |
|---|--------------------------------|
| C1 — .000025 Variable Condenser.  | C7 — .005 mfd. Fixed Condenser |
| C2 — .000002 " " "  | C8 — .005 " " "                |
| C3 — .00001 " " "   | C9 — .0002 " " "               |
| C4 — .00005 " " "   | C10 — .0001 " " "              |
| C5 — .000025 " " "  | C11 — .005 " " "               |
| C6 — .0001 " " "  |                                |
| L1 — 4 turns, 12 S.W.G. Enamelled Wire $\frac{1}{8}$ " long, 1" dia.  |                                |
| L2 — 5 " 16 " " " $\frac{1}{8}$ " " 1" "  |                                |
| L3 — $12\frac{1}{2}$ " 12 " " " 1" " 1" " wound internally 6 turns, 24 S.W.G. d.s.c. as coupling for output.      |                                |
| L4 — 3 turns, 16 S.W.G. Enamelled Wire 1" dia. close wound, coupled to earth end of L5                            |                                |
| L5 — $1\frac{1}{2}$ " 16 " " " $\frac{5}{8}$ " long, 1" dia. tapped at $\frac{3}{4}$ " turn-up for cathode point. |                                |

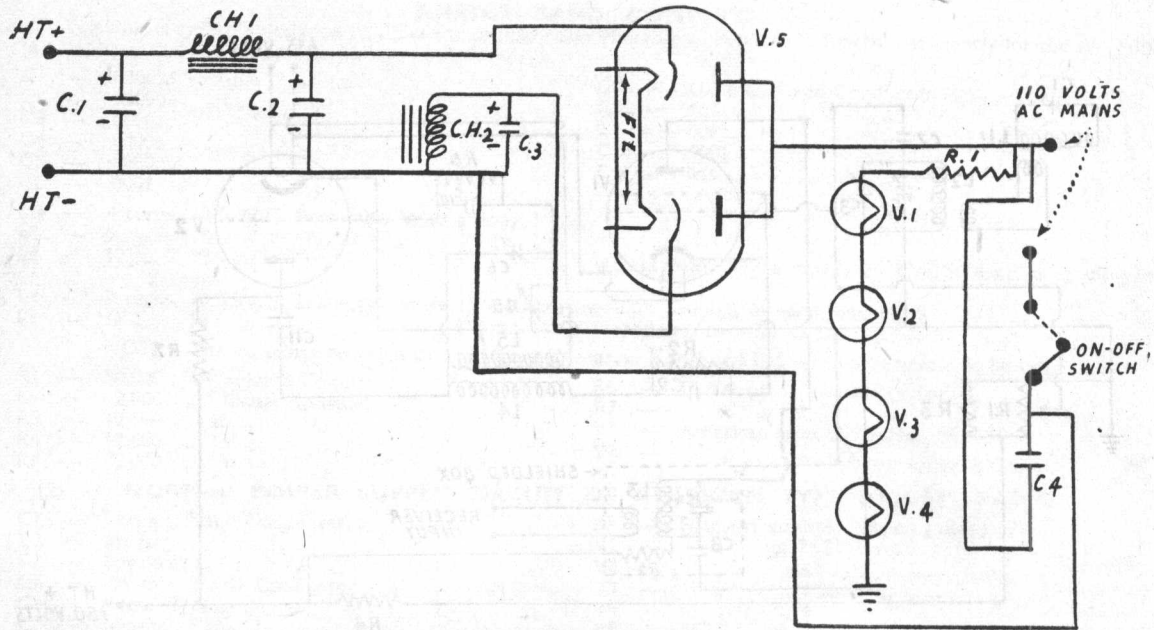
NOTE.—The couplings between L1 and L2 are 2 turns each with the link wires separated side by side  $\frac{5}{8}$ " apart.

- |                                 |                                 |
|---------------------------------|---------------------------------|
| R1 — 50,000 ohm Volume Control. | R6 — 15,000 ohm 1 watt Resistor |
| R2 — 2,000 " 1 watt Resistor.   | R7 — 4,500 " 1 " "              |
| R3 — 12,500 " 15 " "            | V1 — American type 954 Valve.   |
| R4 — 12,500 " 15 " "            | V2 — " " 6J5 "                  |
| R5 — 3,000 " 1 " "              |                                 |

### (2) NORMAL POWER SUPPLY CIRCUIT OF AMERICAN TYPE MIDGET RADIO.

- |                                |  |
|--------------------------------|--|
| C1 — Output Filter Condenser.  | R1 — Filament voltage Dropping Resistor. |
| C2 — Input " "                 | V1 — " of 25Z5 valve.                    |
| C3 — Speaker " "               | V2 — " " 43 "                            |
| C4 — .01 mfd. Fixed Condenser. | V3 — " " 6D6 "                           |
| CH1 — Filter Choke.            | V4 — " " 6C6 "                           |
| CH2 — Speaker Field.           | V5 — 25Z5 Valve.                         |



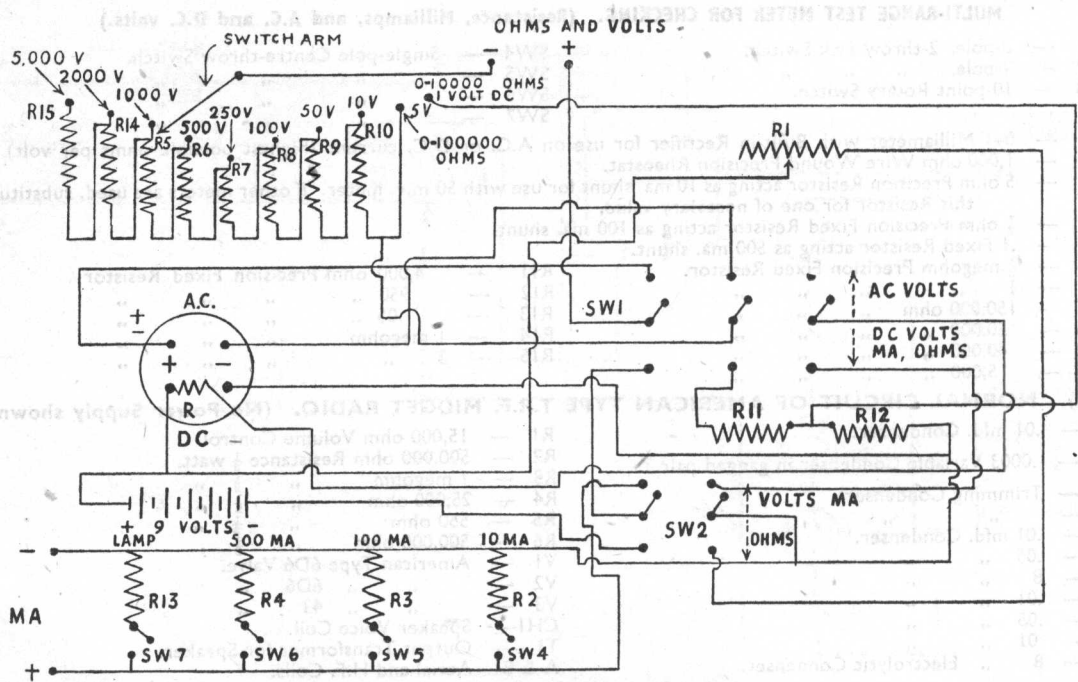


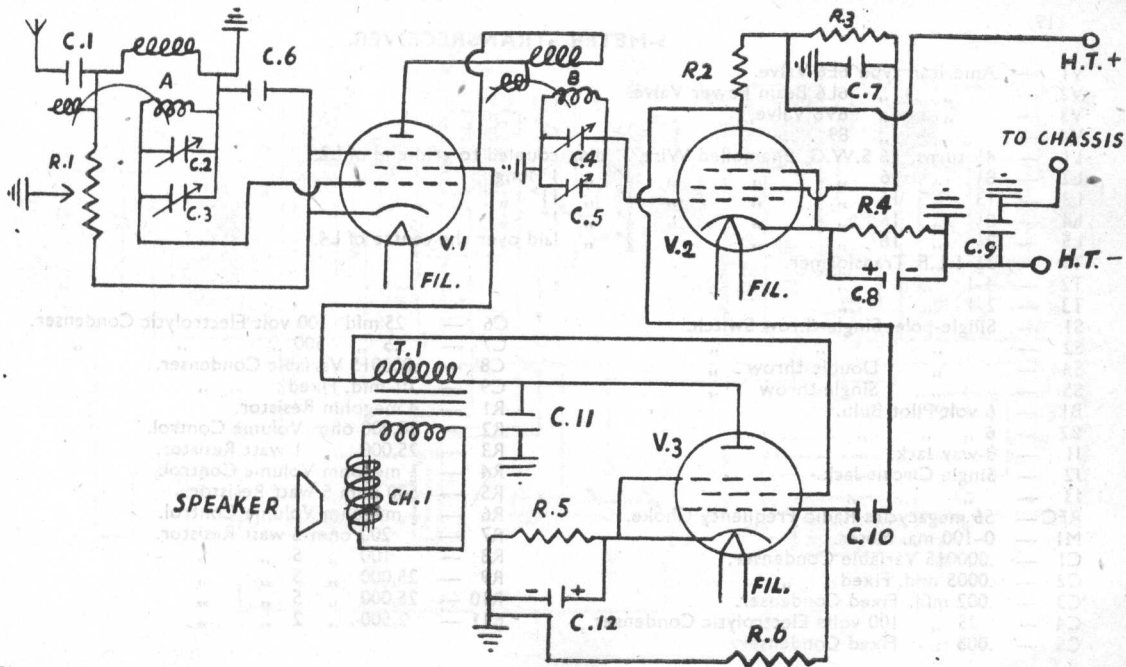
(18) **MULTI-RANGE TEST METER FOR CHECKING. (Resistance, Milliamps, and A.C. and D.C. volts.)**

- |     |   |  |     |   |                                  |
|-----|---|--|-----|---|----------------------------------|
| SW1 | — | 3-pole, 2-throw Jack Switch.   | SW4 | — | Single-pole Centre-throw Switch. |
| SW2 | — | 2-pole, " " "  | SW5 | — | " " "                            |
| SW3 | — | 10-point Rotary Switch.  | SW6 | — | " " "                            |
|     |   |  | SW7 | — | " " "                            |
| M   | — | 0-1 Milliammeter with Built-in Rectifier for use on A.C. or D.C. current (highest possible ohms per volt).   |     |   |                                  |
| R1  | — | 1,000 ohm Wire Wound Precision Rheostat.   |     |   |                                  |
| R2  | — | 5 ohm Precision Resistor acting as 10 ma. shunt for use with 50 m.v. meter. If other meters are used, substitute this Resistor for one of necessary value. |     |   |                                  |
| R3  | — | $\frac{1}{2}$ ohm Precision Fixed Resistor acting as 100 ma. shunt.  |     |   |                                  |
| R4  | — | .1 Fixed Resistor acting as 500 ma. shunt.   |     |   |                                  |
| R5  | — | $\frac{1}{2}$ megohm Precision Fixed Resistor.   |     |   |                                  |
| R6  | — | 150,000 ohm  | "   | " | "                                |
| R7  | — | 50,000   | "   | " | "                                |
| R8  | — | 40,000   | "   | " | "                                |
| R9  | — | 5,000  | "   | " | "                                |
| R10 | — |  |     |   |                                  |
| R11 | — | 4,000 ohm Precision Fixed Resistor   |     |   |                                  |
| R12 | — | 950  | "   | " | "                                |
| R13 | — | .05  | "   | " | "                                |
| R14 | — | 1 megohm   | "   | " | "                                |
| R15 | — | 3  | "   | " | "                                |

(10) **NORMAL CIRCUIT OF AMERICAN TYPE T.R.F. MIDGET RADIO. (No Power Supply shown.)**

- |     |   |  |       |   |  |
|-----|---|--|-------|---|--|
| C1  | — | .01 mfd. Condenser.                      | R1    | — | 15,000 ohm Volume Control.                 |
| C2  | } | .0003 Variable Condenser in ganged pair. | R2    | — | 500,000 ohm Resistance $\frac{1}{2}$ watt. |
| C4  |   |  | R3    | — | 1 megohm " $\frac{1}{2}$ "                 |
| C3  | — | Trimming Condensers.                     | R4    | — | 25,000 ohm " $\frac{1}{2}$ "               |
| C5  | — | " "                                      | R5    | — | 550 ohm " $\frac{1}{2}$ "                  |
| C6  | — | .01 mfd. Condenser.                      | R6    | — | 500,000 ohm " $\frac{1}{2}$ "              |
| C7  | — | .05 " "                                  | V1    | — | American Type 6D6 Valve.                   |
| C8  | — | 8 " "                                    | V2    | — | " " 6D6 "                                  |
| C9  | — | .01 " "                                  | V3    | — | " " 43 "                                   |
| C10 | — | .05 " "                                  | CH1   | — | Speaker Voice Coil.                        |
| C11 | — | .01 " "                                  | T1    | — | Output Transformer for Speaker.            |
| C12 | — | 8 " Electrolytic Condenser.              | A & B | — | Aerial and H.F. Coils.                     |



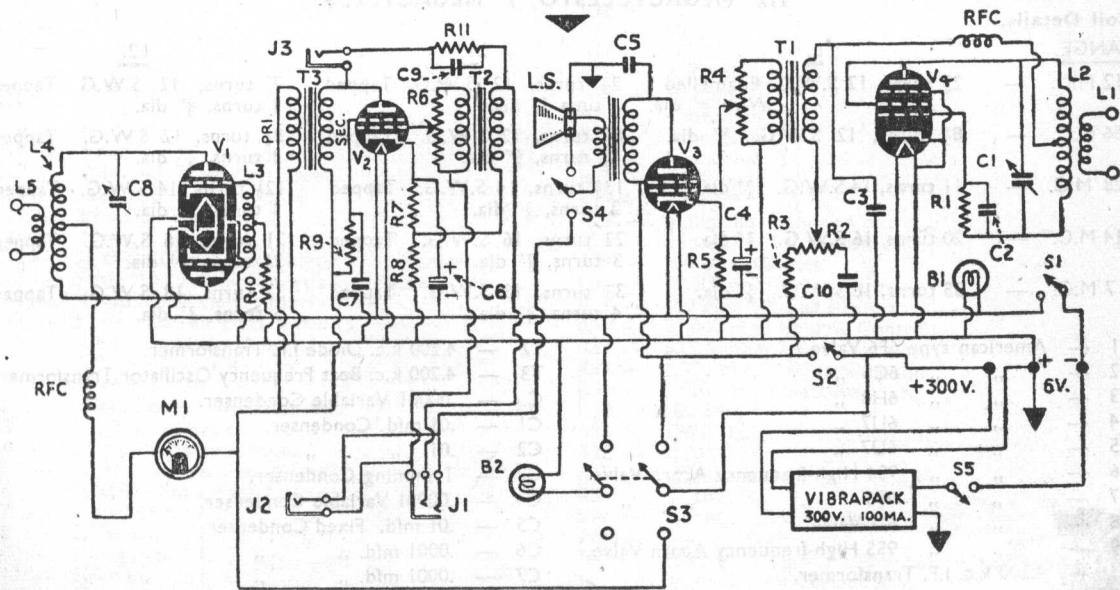


## 5-METER TRANSRECEIVER.

V1	—	American type 6E6 Valve.	
V2	—	" " 6L6 Beam Power Valve.	
V3	—	" " 6V6 Valve.	
V4	—	" " 89 "	
L1	—	4 $\frac{1}{4}$ turns, 16 S.W.G. Enamelled Wire	$\frac{1}{2}$ " dia., coupled to grid end of L2.
L2	—	8 $\frac{3}{8}$ " 16 " " "	$\frac{1}{2}$ " " 1" long.
L3	—	13 " 16 " " "	$\frac{1}{2}$ " " 1 $\frac{1}{4}$ " "
L4	—	8 $\frac{1}{2}$ " 16 " " "	$\frac{1}{2}$ " " 1" "
L5	—	2 $\frac{1}{2}$ " 16 " " "	$\frac{1}{2}$ " " " "
T1	—	3-1 L.F. Transformer.	" " $\frac{1}{4}$ " " laid over the centre of L4.
T2	—	4-1 " "	
T3	—	2-1 " "	
S1	—	Single-pole, Single-throw Switch.	
S2	—	" " " "	
S4	—	" Double-throw " "	
S5	—	" Single-throw " "	
B1	—	6 volt Pilot Bulb.	
B2	—	6 " " "	
J1	—	3-way Jack.	
J2	—	Single Circuit Jack.	
J3	—	" " " "	
RFC	—	56 megacycles Radio Frequency Choke.	
M1	—	0-100 ma. Meter.	
C1	—	.000015 Variable Condenser.	
C2	—	.0005 mfd. Fixed " "	
C3	—	.002 mfd. Fixed Condenser.	
C4	—	25 " 100 volts Electrolytic Condenser.	
C5	—	.005 " Fixed Condenser.	
C6	—	25 mfd. 100 volt Electrolytic Condenser.	
C7	—	.5 " 500 " " "	
C8	—	.000015 Variable Condenser.	
C9	—	.01 mfd. Fixed " "	
R1	—	4 megohm Resistor.	
R2	—	50,000 ohm Volume Control.	
R3	—	25,000 " 1 watt Resistor.	
R4	—	$\frac{1}{2}$ megohm Volume Control.	
R5	—	500 ohm 5 watt Resistor.	
R6	—	$\frac{1}{2}$ megohm Volume Control.	
R7	—	200 ohm 5 watt Resistor.	
R8	—	100 " 5 " "	
R9	—	25,000 " 5 " "	
R10	—	25,000 " 5 " "	
R11	—	2,500 " 2 " "	



VALVE SHORT-WAVE BAND SUPERHETERODYNE FOR RECEPTION FROM  
 1.5 MEGACYCLES TO 15 MEGACYCLES

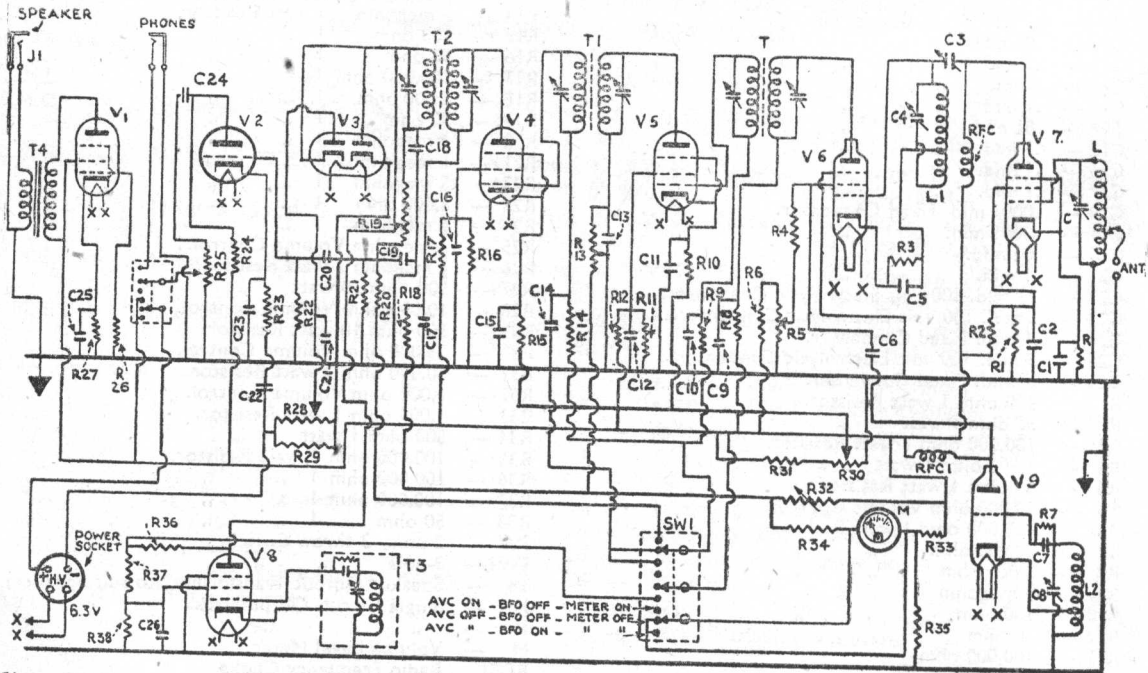


# SHORT-WAVE BAND SUPERHETRODYNE FOR RECEPTION FROM 112 MEGACYCLES TO 7 MEGACYCLES.

## Coil Details.

<u>RANGE.</u>	<u>L.</u>	<u>L1.</u>	<u>L2.</u>
112 M.C. —	2½ turns, 12 S.W.G. Enamelled Wire ⅝" dia.	2½ turns, 12 S.W.G. Tapped ½ turn ⅝" dia.	7 turns, 12 S.W.G. Tapped 3 turns, ⅝" dia.
56 M.C. —	8½ turns, 12 S.W.G. ⅝" dia.	8½ turns, 12 S.W.G. Tapped 1½ turns, ⅝" dia.	8½ turns, 12 S.W.G. Tapped 3 turns, ⅝" dia.
28 M.C. —	11 turns, 14 S.W.G. ¾" dia.	13½ turns, 14 S.W.G. Tapped 2 turns, ¾" dia.	12½ turns, 14 S.W.G. Tapped 3 turns, ¾" dia.
14 M.C. —	20 turns, 16 S.W.G. ¾" dia.	22 turns, 16 S.W.G. Tapped 3 turns, ¾" dia.	21 turns, 16 S.W.G. Tapped 3½ turns, ¾" dia.
7 M.C. —	35 turns, 18 S.W.G. ¾" dia.	33 turns, 18 S.W.G. Tapped 4 turns, ¾" dia.	32 turns, 18 S.W.G. Tapped 5 turns, ¾" dia.
V1 —	American type 6F6 Valve.	T2 —	4,200 k.c. Diode I.F. Transformer.
V2 —	" " 6C5 "	T3 —	4,200 k.c. Beat Frequency Oscillator Transformer.
V3 —	" " 6H6 "	C. —	.00001 Variable Condenser.
V4 —	" " 6U7 "	C1 —	.01 mfd. Condenser.
V5 —	" " 6U7 "	C2 —	.01 " "
V6 —	" " 954 High-frequency Acorn Valve.	C3 —	Trimming Condenser.
V7 —	" " 956 " " "	C4 —	.00001 Variable Condenser.
V8 —	" " 6J7 Valve.	C5 —	.01 mfd. Fixed Condenser.
V9 —	" " 955 High-frequency Acorn Valve.	C6 —	.0001 mfd. " "
T —	4,200 k.c. I.F. Transformer.	C7 —	.0001 mfd. " "
T1 —	4,200 " " "	C8 —	.00001 Variable Condenser.

C9	—	.1 mfd. Fixed Condenser.	R14	—	$\frac{1}{2}$ megohm		1 watt Resistor.
C10	—	.01 mfd. " "	R15	—	300 ohm		" "
C11	—	.1 mfd. " "	R16	—	50 ohm		" "
C12	—	.1 mfd. " "	R17	—	100,000 ohm		" "
C13	—	.1 mfd. " "	R18	—	2,500 ohm		" "
C14	—	.01 mfd. " "	R19	—	50 ohm		" "
C15	—	.1 mfd. " "	R20	—	4 megohm		" "
C16	—	.1 mfd. " "	R21	—	1 megohm		" "
C17	—	.1 mfd. " "	R22	—	5 megohm		" "
C18	—	.0001 mfd. Fixed Condenser.	R23	—	3,000 ohm		" "
C19	—	.0001 mfd. " "	R24	—	$\frac{1}{2}$ megohm		" "
C20	—	.01 mfd. " "	R25	—	$\frac{1}{2}$ megohm		Volume Control.
C21	—	.1 mfd. " "	R26	—	$\frac{1}{2}$ megohm		1 watt Resistor.
C22	—	25 mfd. 100 volt Electrolytic Condenser.	R27	—	500 ohm		10 watt
C23	—	5 mfd. 100 volt Electrolytic Condenser.	R28	—	10,000 ohm		Volume Control.
C24	—	.1 mfd. Fixed Condenser.	R29	—	500 ohm		10 watt Resistor.
C25	—	5 mfd. 100 volt Electrolytic Condenser.	R30	—	25,000 ohm		Volume Control.
C26	—	.1 mfd. Fixed Condenser.	R31	—	50,000 ohm		2 watt Resistor.
R'	—	200 ohm 1 watt Resistor.	R32	—	1,000 ohm		Volume Control.
R1	—	50 ohm 1 watt	R33	—	1,000 ohm		1 watt Resistor.
R2	—	100,000 ohm 1 watt Resistor.	R34	—	500 ohm		1 watt
R3	—	1,500 ohm 1 watt	R35	—	100,000 ohm		1 watt Resistor.
R4	—	50 ohm 1 watt Resistor.	R36	—	100,000 ohm		" "
R5	—	50,000 ohm Volume Control.	R37	—	100,000 ohm		" "
R6	—	100,000 ohm 1 watt Resistor.	R38	—	50 ohm		" "
R7	—	30,000 ohm   " "	SW	—	2-pole, 3-throw Switch.		
R8	—	2,500 ohm   " "	SW1	—	3-pole, " "		
R9	—	$\frac{1}{2}$ megohm   " "	T4	—	Speaker Output Transformer (to suit Speaker).		
R10	—	300 ohm   " "	J	—	Single Circuit Output Jack.		
R11	—	50 ohm   " "	J1	—	" " " "		
R12	—	100,000 ohm   " "	M	—	Volume Level Meter.		
R13	—	2,500 ohm   " "	RFC1	—	Radio Frequency Choke.		



(21) **5-METRE RESISTANCE-COUPLED SUPERHETRODYNE SPECIALLY DESIGNED FOR LONG-DISTANCE PHONE RECEPTION.**

- V1 — American type 6P5 Valve.  
 V2 — " " 6U7 "  
 V3 — " " 6U7 "  
 V4 — " " 6J7 "  
 L1 — 7 turns, 12 S.W.G. Enamelled Wire  $\frac{5}{8}$ " dia.  
 L2 — 10 " 10 S.W.G. " "  $\frac{3}{8}$ " dia.

NOTE.—Separate L1 and L2 on the same former by a distance of  $\frac{3}{16}$  ths. of an inch

RFC — 80 turns, 32 S.W.G. d.s.c. wire  $\frac{5}{16}$ " dia.

C1 — .01 mfd. Fixed Condenser.

C2 — .1 mfd. " "

C3 — .0001 mfd. Fixed Condenser.

C4 — .0001 mfd. " "

C5 — .0001 mfd. " "

C6 — .1 mfd. " "

C7 — .0001 mfd. " "

C8 — 12 mfd. 100 volt Electrolytic Condenser.

C9 — .0001 mfd. Fixed Condenser.

C10 — .00001 Variable Condenser.

C11 — .01 mfd. Fixed Condenser.

C12 — .1 mfd. " "

R1 —  $\frac{1}{2}$  megohm 1 watt Resistor.

R2 — 50,000 ohm 1 watt "

R3 —  $\frac{1}{4}$  megohm 1 watt "

R4 — 50,000 ohm 1 watt Resistor.

R5 —  $\frac{1}{4}$  megohm 1 watt "

R6 — 20,000 ohm 1 watt "

R7 — 1 megohm 1 watt "

R8 —  $\frac{1}{2}$  megohm Volume Control.

R9 — 350 ohm 1 watt Resistor.

R10 — 10,000 ohm Volume Control.

(5)

**ELECTRONIC TYPE INPUT TONE CONTROL FOR P.A. EQUIPMENT.**

R1 — 400,000 ohm resistor.

R2 — 325,000 ohm " "

R3 — 500,000 ohm Variable Resistor for Bass Control.

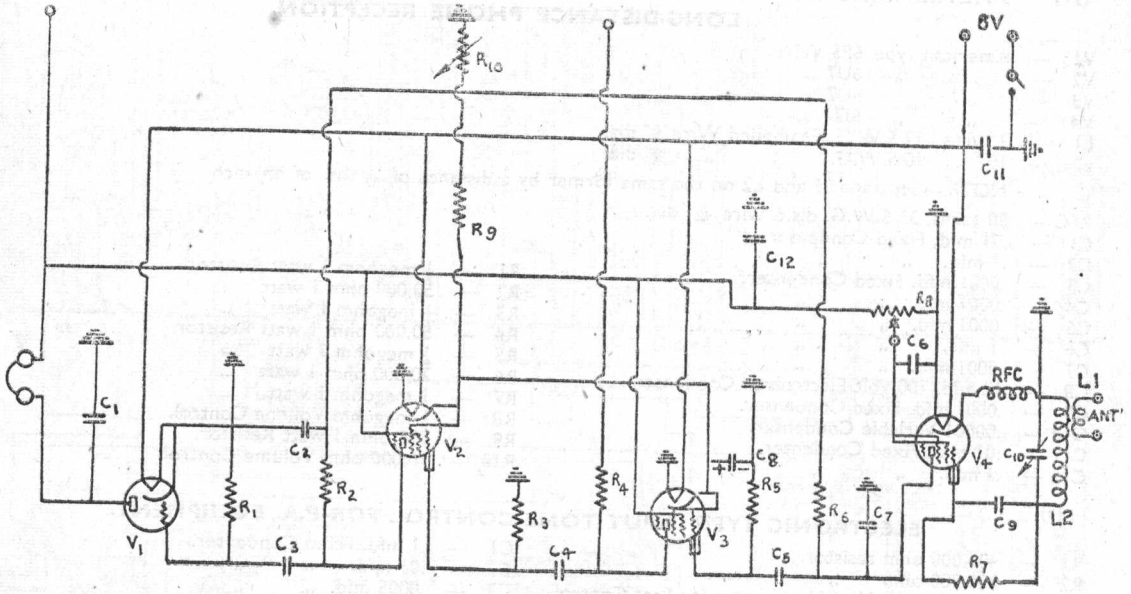
R4 — 500,000 ohm " " " Alto "

C1 — .1 mfd. Fixed Condenser.

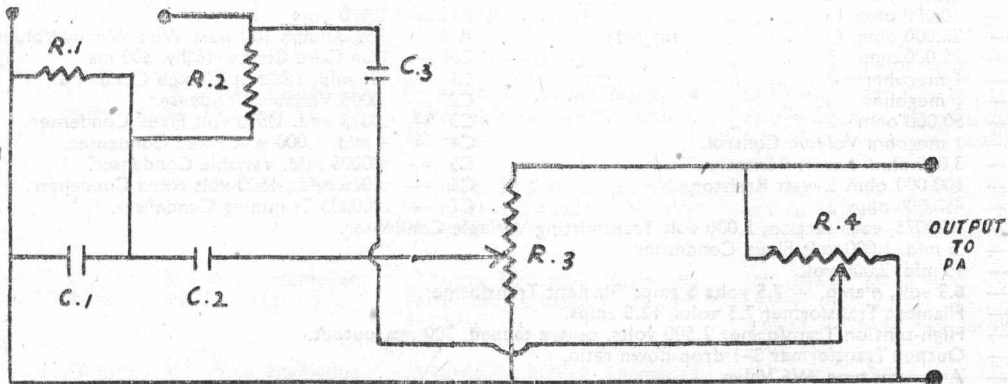
C2 — .01 mfd. " "

C3 — .0005 mfd. " "

+ 50 V. HT. .50 V. HT.



TO  
MICROPHONE  
OR PICKUP



## 50 WATTS OUTPUT GRID MODULATED TRANSMITTER FOR 28, 14, 7, & 3.5 MEGACYCLE BANDS.

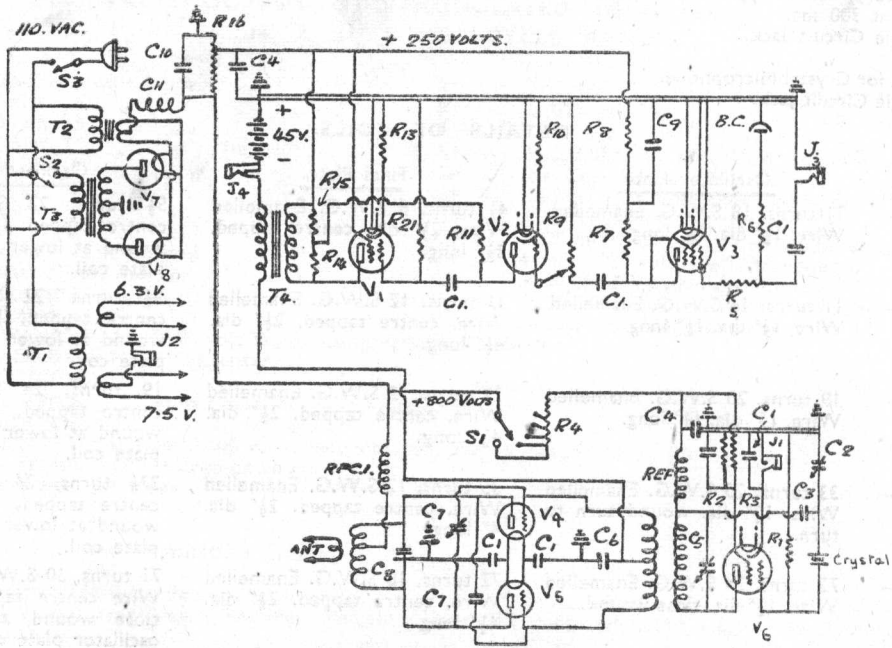
- |  |  |
|--|--|
| <p>R1 — 100,000 ohm 2 watt Resistor.<br/>           R2 — 5,000 ohm 2 " "<br/>           R3 — 10,000 ohm 15 " "<br/>           R4 — 25,000 ohm 75 " " (tapped).<br/>           R5 — 25,000 ohm 2 " "<br/>           R6 — 1 megohm 2 " "<br/>           R7 — <math>\frac{1}{2}</math> megohm 2 " "<br/>           R8 — 50,000 ohm 2 " "<br/>           R9 — 1 megohm Volume Control.<br/>           R10 — 3,000 ohm 1 watt Resistor.<br/>           R11 — 100,000 ohm 2 watt Resistor.<br/>           R12 — 450,000 ohm 2 " "<br/>           C8 — .000075, each section, 5,000 volt Transmitting Variable Condenser.<br/>           C9 — .5 mfd. 1,000 volt Fixed Condenser.<br/>           C10 — 10 mfd. 2,000 volt " "<br/>           T1 — 6.3 volt, 4 amp. + 7.5 volts 5 amp. Filament Transformer.<br/>           T2 — Filament Transformer 2.5 volts, 12.5 amps.<br/>           T3 — High-tension Transformer 2,500 volts, centre tapped, 300 ma. output.<br/>           T4 — Output Transformer 3-1 drop-down ratio.<br/>           V1 — American type 6V6 Valve.<br/>           V2 — " " 76 " "<br/>           V3 — " " 77 " "<br/>           V4 — " " T40 Transmitting Triode.<br/>           V5 — " " T40 " "<br/>           V6 — British type KT66 Beam Power Output Valve.<br/>           V7 — Mercury Vapour type <math>\frac{1}{2}</math>-wave Rectifier, filament current 2.5 amps. delivering output voltage of 15,000 volts at 300 ma.</p> | <p>R13 — 650 ohm 5 watt Resistor.<br/>           R14 — 50,000 ohm 2 " "<br/>           R15 — 5,000 ohm 2 " "<br/>           R16 — 75,000 ohm 100 watt Wire Wound Volume Control.<br/>           CH — Iron Core Choke, 15 hy. 500 ma.<br/>           C1 — .01 mfd. 1,000 volt Fixed Condenser.<br/>           C2 — .0003 Variable Condenser.<br/>           C3 — .0025 mfd. 1,500 volt Fixed Condenser.<br/>           C4 — 4 mfd. 1,000 volt Fixed Condenser.<br/>           C5 — .00005 mfd. Variable Condenser.<br/>           C6 — .0015 mfd., 1500 volt Fixed Condenser.<br/>           C7 — .000005 Trimming Condenser.</p> |
|--|--|



- V8 — Mercury Vapour type  $\frac{1}{2}$ -wave Rectifier, filament current 2.5 amps. delivering output voltage of 15,000 volts at 300 ma.  
 J1 — Single Circuit Jack.  
 J2 — " " "  
 J3 — Jack for Crystal Microphone.  
 J4 — Single Circuit Jack.

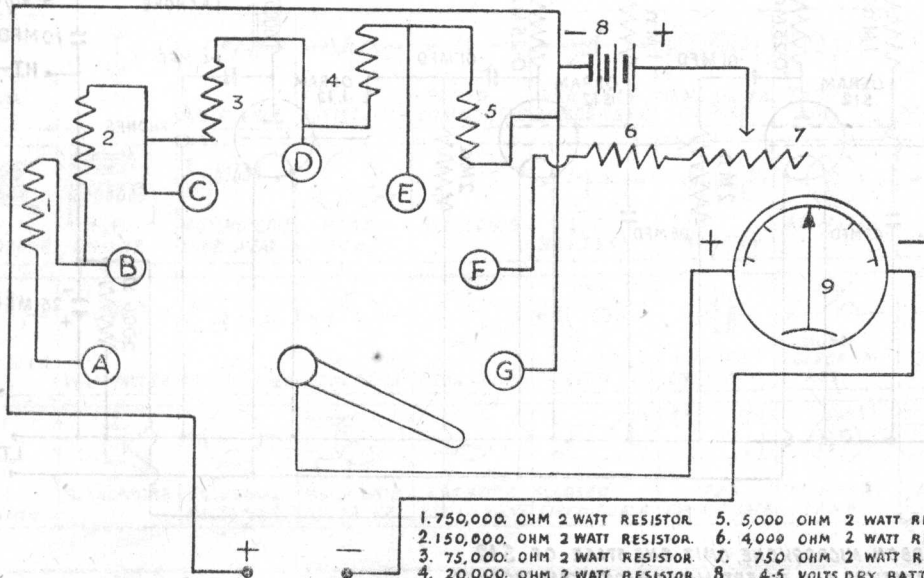
### DETAILS OF COILS.

Meter Range.	Oscillator Plate.	Final Plate.	Oscillator Grid.
10 —	1 $\frac{1}{2}$ turns, 18 S.W.G. Enamelled Wire, 1 $\frac{3}{8}$ " dia. 1 $\frac{3}{8}$ " long.	4 $\frac{1}{2}$ turns, 8 S.W.G. Enamelled Wire, 2 $\frac{1}{2}$ " dia. centre tapped, 3 $\frac{1}{2}$ " long.	5 $\frac{1}{2}$ turns, 22 S.W.G. d.s.c. centre tapped 1 $\frac{3}{8}$ " dia. close wound at lower end oscillator plate coil.
20 —	11 turns, 16 S.W.G. Enamelled Wire, 1 $\frac{3}{8}$ " dia. 1 $\frac{3}{8}$ " long.	11 turns, 12 S.W.G. Enamelled Wire, centre tapped, 2 $\frac{1}{2}$ " dia. 4 $\frac{1}{2}$ " long.	9 $\frac{1}{2}$ turns, 22 S.W.G. d.s.c. centre tapped, 1 $\frac{1}{4}$ " dia. close wound at lower end oscillator plate coil.
40 —	19 turns, 20 S.W.G. Enamelled Wire, 1 $\frac{1}{4}$ " dia. 1 $\frac{3}{8}$ " long.	22 turns, 12 S.W.G. Enamelled Wire, centre tapped, 2 $\frac{1}{2}$ " dia. 4 $\frac{1}{2}$ " long.	19 turns, 24 S.W.G. d.s.c. centre tapped, 1 $\frac{1}{4}$ " dia. close wound at lower end oscillator plate coil.
80 —	33 turns, 20 S.W.G. Enamelled Wire, 1 $\frac{1}{4}$ " dia. wound turn to turn.	35 turns, 12 S.W.G. Enamelled Wire, centre tapped, 2 $\frac{1}{2}$ " dia. 4" long.	37 $\frac{1}{2}$ turns, 24 S.W.G. s.d.c. centre tapped, 1 $\frac{1}{4}$ " dia. close wound at lower end oscillator plate coil.
160 —	72 turns, 24 S.W.G. Enamelled Wire, 1 $\frac{1}{4}$ " dia. close wound.	72 turns, 18 S.W.G. Enamelled Wire, centre tapped, 2 $\frac{1}{2}$ " dia. 4 $\frac{1}{2}$ " long.	71 turns, 30 S.W.G. Enamelled Wire centre tapped, 1 $\frac{1}{4}$ " dia. close wound at lower end oscillator plate coil.



D.C. MULTI-RANGE TESTER. Slide contact set at

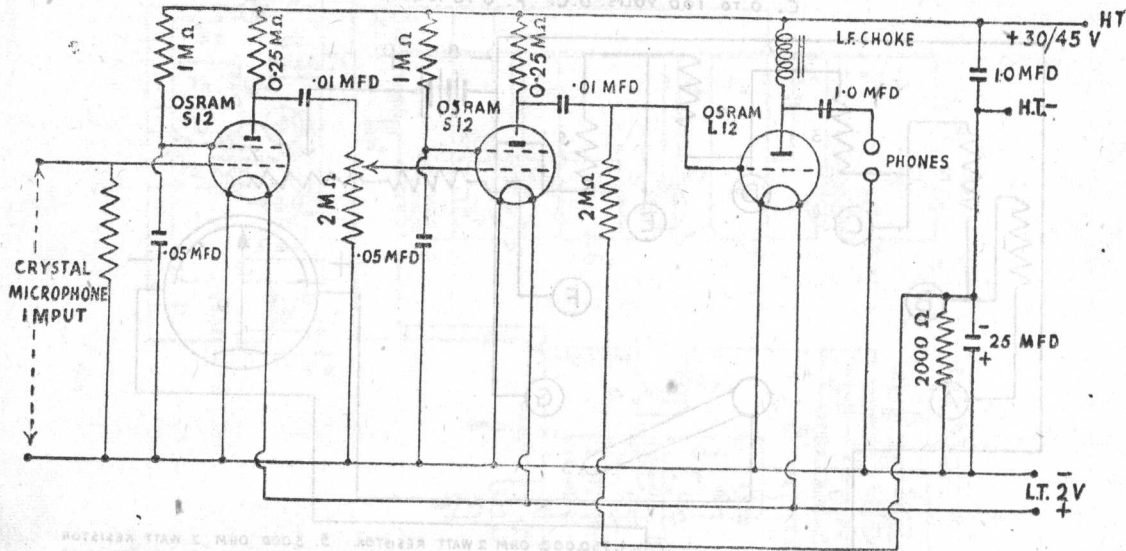
- A. 0 TO 1,000 VOLTS. D.C.    D. 0 TO 25 VOLTS D.C.  
 B. 0 TO 250 VOLTS. D.C.    E. 0 TO 5 VOLTS D.C.    G. 0 TO 1 MILLIAMPERE  
 C. 0 TO 100 VOLTS. D.C.    F. 0 TO 100,000 OHMS



- |                                  |                              |
|----------------------------------|------------------------------|
| 1. 750,000. OHM 2 WATT RESISTOR. | 5. 5,000 OHM 2 WATT RESISTOR |
| 2. 150,000. OHM 2 WATT RESISTOR. | 6. 4,000 OHM 2 WATT RESISTOR |
| 3. 75,000. OHM 2 WATT RESISTOR.  | 7. 750 OHM 2 WATT RESISTOR   |
| 4. 20,000. OHM 2 WATT RESISTOR.  | 8. 4-5 VOLTS DRY BATTERY     |



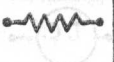



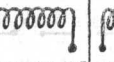
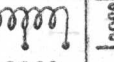
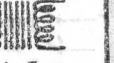


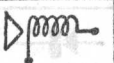


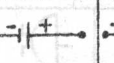
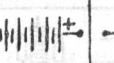


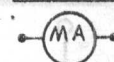
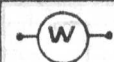
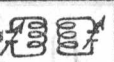
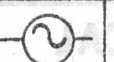

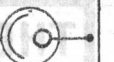

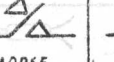

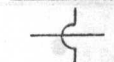




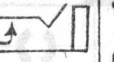
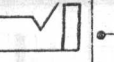
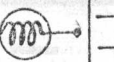

9. 0 TO 1 D.C. MILLIAMMETER

DEAF AID AMPLIFIER CIRCUIT BY COURTESY  
OF OSRAM VALVES

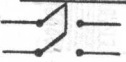
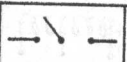
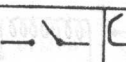

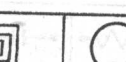
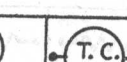
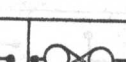
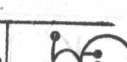




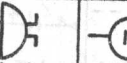
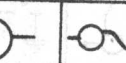
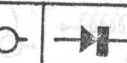
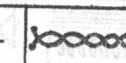
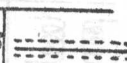

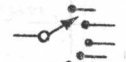
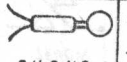
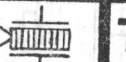
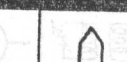
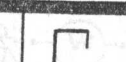

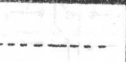
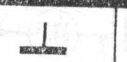

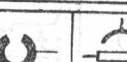
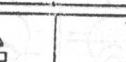



FOR CARBON MICROPHONE, OMIT ONE STAGE OF S12  
AMPLIFICATION, AND INSERT MICROPHONE TRANSFORMER

# THEORETICAL RADIO SYMBOLS

 AERIAL	 EARTH	 RESISTANCE	 VARIABLE RESISTANCE	 FIXED CONDENSER	 VARIABLE CONDENSER	 COIL OR H.F. CHOKE	 TAPPED COIL	 L. F. TRANSFORMER
 H.E. TRANSFORMER	 L. F. CHOKE	 MOVING COIL LOUD SPEAK	 HEAD PHONES	 SHIELDING	 L. T. BATTERY	 H. T. BATTERY	 AMMETER	 VOLTMETER
 MILLIAMMETER	 WATT METER	 I. F. TRANSFORMER	 A. C. GENERATOR	 NEON LAMP	 PHOTO ELECTRIC CELL	 QUARTZ CRYSTAL	 MORSE TELEGRAM KEY	 WIRES JOINED
 WIRES CROSSING	 MICROPHONE	 FULL WAVE RECTIFIER	 MULTI GRID I. H. VALVE	 CATHODE FOR I. H. VALVE	 CLOSED CIRCUIT JACK	 OPEN CIRCUIT JACK	 FILAMENT LAMP	 D. P. D. T. SWITCH

# THEORETICAL RADIO SYMBOLS

 D.P.S.T. SWITCH	 S.P.D.T. SWITCH	 S.P.S.T. SWITCH	 AUTO TRANSFORMER	 FRAME AERIAL	 DIRECTION FINDING LOOP	 T.C. THERMO COUPLE	 FUSE	 RADIO GRAMPHONE PICK UP
 SINGLE-BUTTON CARBON MICROPHONE	 DOUBLE-BUTTON CARBON MICROPHONE	 RIBBON OR VELOCITY MICROPHONE	 A.C. PLUG	 A.C. RECEPTACLE	 FUSE	 RECTIFIER	 TWISTED PAIR	 SHIELDED WIRE
 ROTARY TAP OR BAND SWITCH	 PHONE PLUG	 CRYSTAL MICROPHONE	<b>THEORETICAL VALVE SYMBOLS</b>			 FILAMENT OR HEATER	 CATHODE	 COLD CATHODE
 GRID	 PLATE	 DIODE PLATE				 BEAM FORMING PLATES	 ANODES	 ELECTRON-RAY-TUBE TARGET ANODES

## OHMS LAW

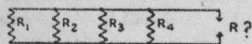
Amperes = Volts  $\div$  Resistance  
 = Watts  $\div$  Volts  
 =  $\sqrt{\text{Watts} \div \text{Resistance}}$

Volts = Resistance  $\times$  Amperes  
 = Watts  $\div$  Amperes  
 =  $\sqrt{\text{Watts} \times \text{Resistance}}$

Watts = (Amperes)<sup>2</sup>  $\times$  Resistance  
 = (Volts)<sup>2</sup>  $\div$  Resistance  
 = Amperes  $\times$  Volts

Resistance = Volts  $\div$  Amperes  
 = (Volts)<sup>2</sup>  $\div$  Watts  
 = Watts  $\div$  (Amperes)<sup>2</sup>

### RESISTANCES IN PARALLEL



$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \text{ETC.}}$$

2 Parallel Resistances  $R = (R_1 \times R_2) \div (R_1 + R_2)$

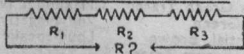
3 Parallel Resistances

$$R = \frac{R_1 \times R_2 \times R_3}{(R_1 \times R_2) + (R_2 \times R_3) + (R_3 \times R_1)}$$

4 Parallel Resistances

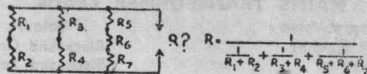
$$R = \frac{R_1 \times R_2 \times R_3 \times R_4}{(R_1 \times R_2 \times R_3) + (R_2 \times R_3 \times R_4) + (R_3 \times R_4 \times R_1) + (R_4 \times R_1 \times R_2)}$$

### RESISTANCES IN SERIES



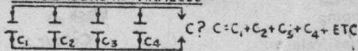
$$R = R_1 + R_2 + R_3 + \text{ETC.}$$

## RESISTANCE-IN-SERIES-PARALLEL



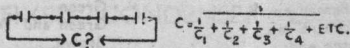
$$R = \frac{1}{\frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4} + \frac{1}{R_5 + R_6 + R_7}}$$

### CONDENSERS IN PARALLEL



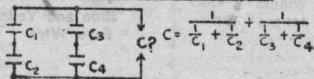
$$C = C_1 + C_2 + C_3 + C_4 + \text{ETC}$$

### CONDENSERS IN SERIES



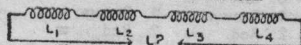
$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \frac{1}{C_4} + \text{ETC.}}$$

### CONDENSERS IN SERIES-PARALLEL



$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} + \frac{1}{\frac{1}{C_3} + \frac{1}{C_4}}$$

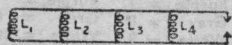
## INDUCTANCES IN SERIES



Where there is no mutual inductance

$$L = L_1 + L_2 + L_3 + L_4 + \text{ETC.}$$

## INDUCTANCES IN PARALLEL



$$L = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \frac{1}{L_4} + \text{ETC.}}$$

## MAINS TRANSFORMER LEADS.

Primary Value :	Colour :
10 volt tapping	Black and Green
210 volt "	Black and Yellow
230 volt "	Black and Red
250 volt "	Black and Brown
Zero tapping	Black.
Secondaries Value :	Colour :
High tension ends	Red
" " centre tap	Red and Yellow
Rectifier heater ends	Green
" " centre tap	Green and Yellow
Valve heater ends	Brown
" " centre tap	Brown and Yellow
Additional L.T. windings	Blue
" " centre tap	Blue and Yellow
Earthing Lead	Bare Wire

## METER CONVERSIONS.

To Extend Range of a Milliammeter

$$\text{Shunt resistance } R_S = \frac{R_M}{n-1}$$

To Extend Range of a Voltmeter

$$\text{Series resistance } R_T = R_M \times (n-1)$$

To use a Milliammeter as a Voltmeter

$$\text{Series resistance } R_T = \frac{E}{I_M} - R_M$$

Where  $n$  = factor by which it is desired to multiply the range of meter,  $R_M$  = resistance of meter,  $E$  = required voltage reading, and  $I_M$  = reading of current meter at full scale deflection.

## FIXED CONDENSERS.

### COLOUR CODE FOR CAPACITY IN mmf.

First Dot.	Second Dot.	Third Dot.
Black = 0	Black = 0	Black = 0
Brown = 1	Brown = 1	Brown = 00
Red = 2	Red = 2	Red = 000
Orange = 3	Orange = 3	Orange = 0000
Yellow = 4	Yellow = 4	Yellow = 00000
Green = 5	Green = 5	Green = 000000
Blue = 6	Blue = 6	Blue = 0000000
Purple = 7	Purple = 7	Purple = 00000000
Grey = 8	Grey = 8	Grey = 000000000
White = 9	White = 9	White = 0000000000

Example :—1st dot Green, 2nd dot Red, and 3rd dot Brown - = 570 mmf. capacity.

### BRITISH COLOUR CODE FOR BATTERY CORDS.

Colour.	Purpose.
Red	Highest Positive Voltage.
Maroon and Red	2nd Positive Voltage.
Maroon	3rd Positive Voltage.
Black with Red Tracer	Negative H.T.
Yellow	Positive L.T. Voltage.
Black with Yellow Tracer	Negative L.T. Voltage.
Green	Positive Bias Voltage.
Black with Green Tracer	Maximum Negative Bias.
Black and Green	2nd Negative Bias.
High Potential, Brown	Loud-speaker Connections.
Black with Brown Tracer	



## BRITISH COLOUR CODES.

### RESISTANCES.

The colour of the body represents the first figure of the resistance value, and the colour of the tip or end band the second figure. The colour of the spot on the centre band denotes the number of cyphers that follow the first two figures.

Colour	Figure	Colour	Figure
Black ...	0	Green ...	5
Brown ...	1	Blue ...	6
Red ...	2	Violet ...	7
Orange ...	3	Grey ...	8
Yellow ...	4	White ...	9



Example :- Orange body, Violet Tip and Green spot  
= 3,700,000 ohms. resistance.

### WANDER PLUGS.

Value :	Colour :
Highest + H.T.	Red
2nd highest + H.T.	Yellow
3rd highest + H.T.	Green
4th highest + H.T.	Blue
L.T. Positive	Pink
Negative (L.T.-, H.T.-, G.B.+)	Black
Highest G.B. -	Brown
2nd highest G.B. -	Grey
3rd highest G.B. -	White

Any additional battery lead is Violet, and any centre tap is White.

### FUSES.

Value :	Colour :	Value :	Colour :
60mA	Black	1 Amp	Dark Blue
100mA	Grey	1.5 Amp	Light Blue
150mA	Red	2 Amp	Purple
250mA	Brown	3 Amp	White
500mA	Yellow	5 Amp	Black & White
750mA	Green		

### FIXED CONDENSER LEADS.

Value :	Colour :
Highest Capacity +	Red
2nd highest Capacity +	Yellow
3rd .. .. +	Green
4th .. .. +	Blue
5th .. .. +	Violet
Principal Negative Lead	Black
2nd Negative ..	Brown
3rd .. ..	Grey
Centre lead of Voltage doubler Condensers	White

When 2 capacities are of the same value, the one of the higher voltage rating has the higher colour in the table.

Common Positive junctions are marked +  
 " Negative " " " -  
 Series connections are marked ±  
 Unconnected sections are marked &

Examples :-

- 8 + 8 = Two 8uF condensers with common positive lead
- 8 - 8 = " " " " " " " " negative lead
- 8 ± 8 = A series voltage doubler connection
- 8 & 8 = Two isolated 8 u F condensers.

## U.S.A. COLOUR CODE FOR

### A.F. Transformers :

Blue — plate (finish) lead of primary.

Red — B + lead (this applies whether the primary is plain or centre-tapped).

Brown — plate (start) lead on centre-tapped primaries. (Blue may be used for this lead if polarity is not important).

Green — grid (finish) lead to secondary.

Black — grid return (this applies whether the secondary is plain or centre-tapped).

Yellow — grid (start) lead on centre-tapped secondaries. (Green may be used for this lead if polarity is not important).

NOTE:—These markings apply also to line-to-grid, and tube-to-line transformers.

### Loudspeaker Voice Coils :

Green — finish.

Black — start.

### Field Coils :

Black and Red — start.

Yellow and Red — finish.

Slate and Red — tap (if any).

### Power Transformers :

- Primary Leads.....Black  
If tapped :  
Common.....Black  
Tap.....Black and Yellow Striped  
Finish.....Black and Red Striped
- High-Voltage Plate Winding.....Red  
Centre-Tap.....Red and Yellow Striped
- Rectifier Fil. Winding.....Yellow  
Centre-Tap.....Yellow and Blue Striped
- Fil. Winding No. 1.....Green  
Centre-Tap.....Green and Yellow Striped
- Fil. Winding No. 2.....Brown  
Centre-Tap.....Brown and Yellow Striped
- Fil. Winding No. 3.....Slate  
Centre-Tap.....Slate and Yellow Striped

## BRITISH MOVING COIL SPEAKER. COLOUR CODE.

Colour.	Purpose.
Green (outer lead)	Output Transformer—Primary ends of winding.
Brown (inner end)	.. .. Primary ends of windings.
Red	.. .. Primary centre tap.
Maroon	.. .. Secondary end—inside.
White	.. .. outside.
Yellow	Field Winding—Outside end.
Black	.. .. Inside end.

## U.S.A. COLOUR CODE FOR RADIO COMPONENTS.

Condenser voltage ratings are indicated by a supplementary dot or band as follows:—

Brown .....	100 volts	Violet .....	700 volts
Red .....	200 volts	Grey .....	800 volts
Orange .....	300 volts	White .....	900 volts
Yellow .....	400 volts	Gold.....	1000 volts
Green .....	500 volts	Silver .....	2000 volts
Blue .....	600 volts	None .....	500 volts

In some instances condensers are identified by a second (lower) row of three dots or a series of three narrow colour bands to the right of the wide capacitance bands. In these cases the first colour of the second row or series indicates the number of ciphers following the capacitance digits, the second colour indicates tolerance and the third voltage rating.

### I.F. Transformers :

Blue — plate lead.

Red — B + lead.

Green — grid (or diode) lead.

Black — grid (or diode) return.

NOTE:—If the secondary of the i.f.t. is centre-tapped, the second diode plate lead is green-and-black striped, and black is used for the centre-tap lead.

### Resistors and Condensers :

An auxiliary colour code has been established covering the tolerances of resistors and condensers and the voltage ratings of condensers. Tolerances are indicated by the following colours, which appear as a fourth dot or band:—

Brown .....	1%	Violet .....	7%
Red .....	2%	Grey .....	8%
Orange .....	3%	White .....	9%
Yellow .....	4%	Gold .....	5%*
Green .....	5%	Silver.....	10%*
Blue .....	6%	None.....	20%*

\*Commonly used on resistors.

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