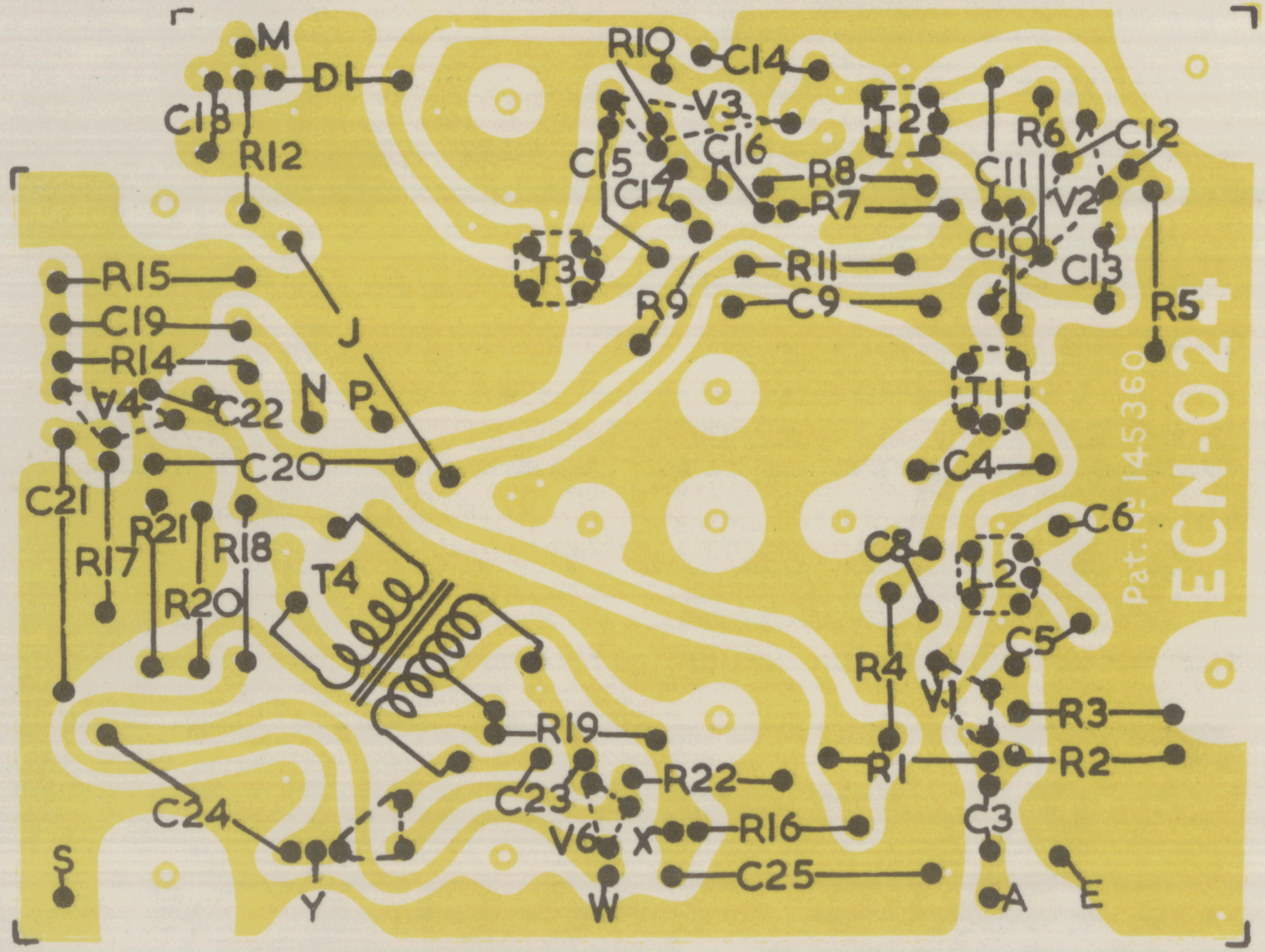
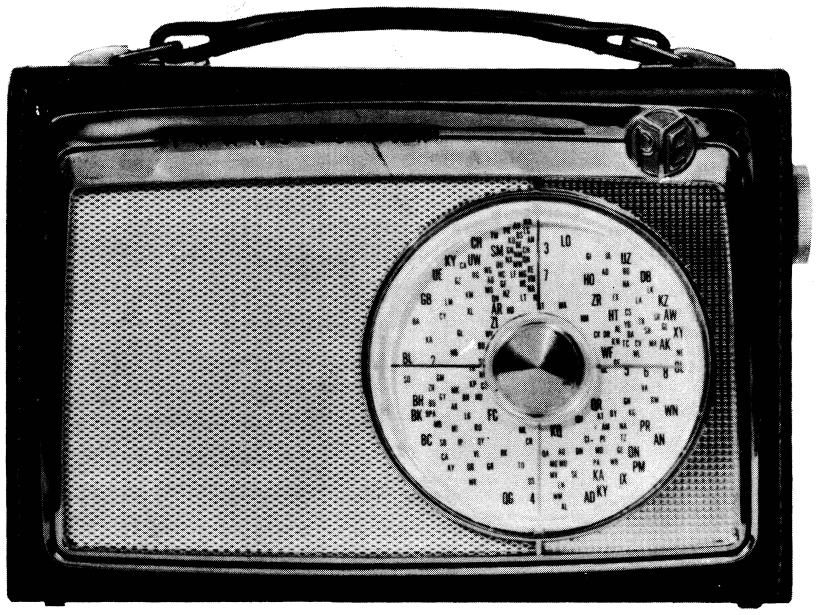
PRINTED CIRCUIT BOARD



DO NOT USE:- AN IRON OVER 60W - EXCESS SOLDER - UNDUE PRESSURE. REPLACE COMPONENTS BY - WITHDRAWING SOLDER FROM THE CRIMPED LEADS WHILE LIFTING THE LEAD FROM THE FOIL BY THE INSERTION OF A KNIFE EDGE. CUT OFF THE CRIMPED SECTION AND WITHDRAW COMPONENT. OR-CUT OUT COMPONENT, UNSOLDER REMAINING TERMINATIONS AND PUSH THROUGH. REPAIR FOIL BREAKS BY:- FLOWING SOLDER, OR SOLDERING TINNED COPPER WIRE ACROSS. REPLACE DAMAGED SECTIONS WITH A JUMPER OF WIRE.

RADIO SERVICE DATA



CHASSIS MODEL NO. R21-1A

DESCRIPTION

A leather covered, portable receiver with a 6 volt battery powered superheterodyne circuit containing 6 transistors and a diode.

SPECIFICATIONS

Tuning Range	1615-535 Kc/s
Intermediate Frequency	455 Kc/s
Batteries	Four 1.5 volts batteries. (No. 935 Eveready)
Transistors and Diode.	A.W.V. Kit or equivalent as per service notes.
Speaker	Rola 4C Magnavox 4T

SUMMARY OF OPERATION

The aerial coil L1 is tuned to match the base impedance of V1 by C1 and C2. The oscillator coil L2 is tuned by C6 and C7.

V1 oscillates due to feedback between emitter and collector via L2. Initially, the base of V1 is biased negative with respect to the emitter by R1 and R2. The amplitude of oscillation builds up over part of the cycle until it reaches the point where the emitter is driven negative with respect to base and the stage is cut-off. Rectification of the oscillator voltage thus takes place at the emitter where C5 charges in opposition to the original bias and stabilisation of the amplitude of oscillation is obtained.

Mixing of signal and local oscillator frequencies occur at the base-emitter junction of V1. After amplification, the required difference frequency is selected by T1 which also provides the correct matching between V1 collector and V2 base.

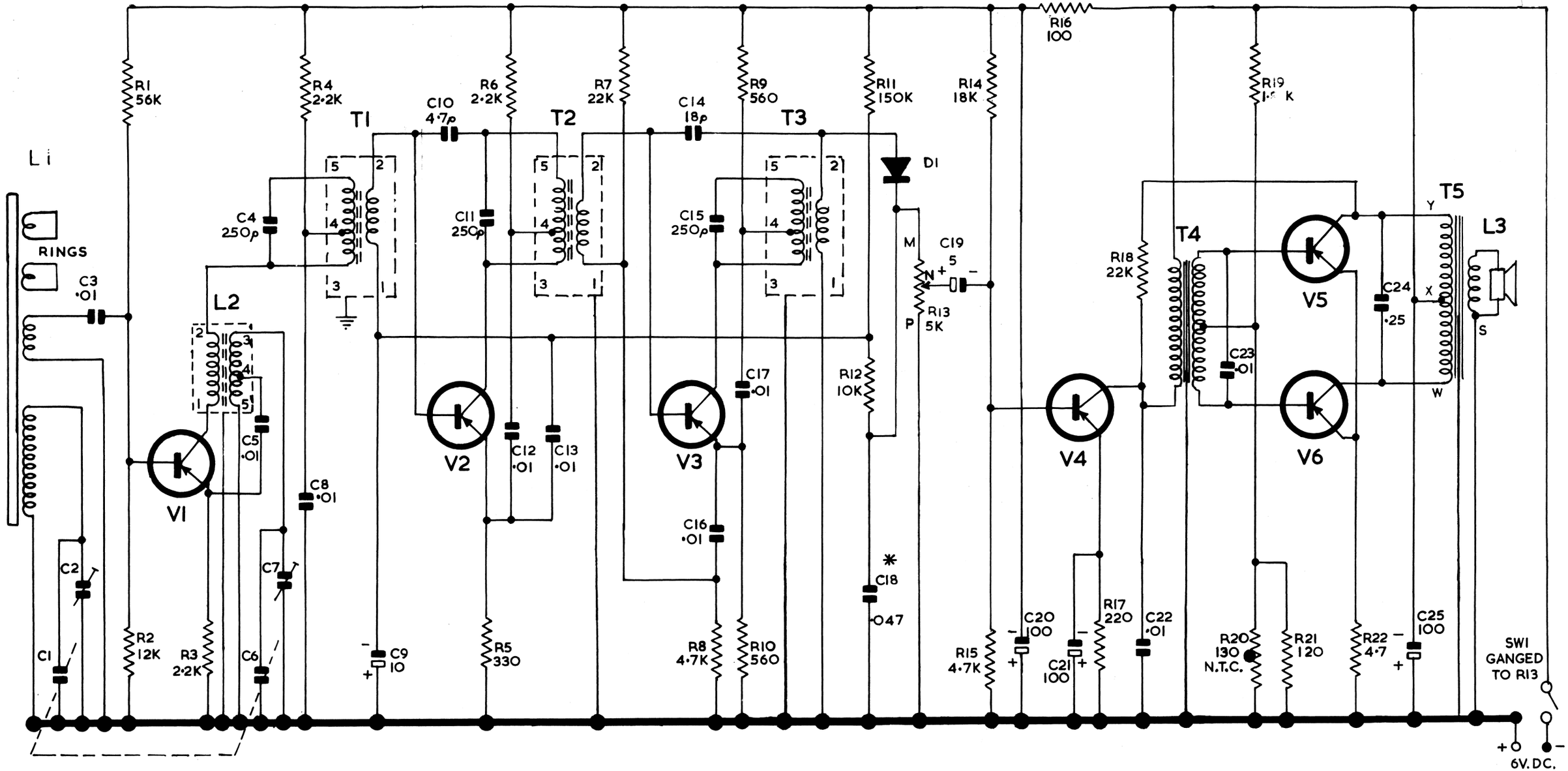
After further amplification by V2 and V3, the I.F. signal is fed to the diode detector D1. The required audio voltage is developed across volume control R13 which also serves as the diode load. Neutralisation of the I.F. amplifiers is provided by the neutralising capacitors C10 and C14. C18 serves as an I.F. bypass and C9 & R12 as an audio filter in the A.G.C. line.

With the receiver tuned-in to a station, the rectified carrier voltage developed across R13 causes the diode side of the control to become positive with respect to the earthed side, thus reducing the bias of V2 and controlling the gain.

After amplification by V4 the audio signal is fed to the output stages V5 and V6, via the push-pull driver transformer T4. Bias for V4 is obtained from the potential divider R14 & R15. C22 acts as an additional I.F. filter. C23 restricts the ringing which may occur in transformer T4.

The output stages, which operate in class B, are driven in the conducting direction by the negative half-cycle of the signal. The potential divider formed by R19 & R21 provides forward bias thus establishing the quiescent collector current of each stage at about 1-5 mA. R20, the N.T.C., is connected across R21 so as to stabilise this bias for changes in temperature. At full output, the peak current in each stage rises to 100 mA, while the average battery current at the normal listening level will be 25-35 mA. C24 restricts the distortion which arises due to the class B operation of the output stages. Distortion is further reduced by feedback from V5 collector to V4 collector via R18.

Stabilisation of the D.C. operating conditions of all stages, is achieved by the use of emitter resistances.


L1
RINGS
C3 ·01
L2
C4 250p
C5 ·01
C8 ·01
C2
C1
C7
C6
V1
R1 56K
R2 12K
R3 2·2K
R4 2·2K
T1
C10 4·7p
R6 2·2K
T2
C11 250p
C12 ·01
C13 ·01
V2
R5 330
C9 10
R7 22K
C14 18p
T3
C15 250p
C16 ·01
C17 ·01
V3
R8 4·7K
R9 560
R10 560
R11 150K
D1
R12 10K
C18 ·047
M
N
P
R13 5K
C19 5
R14 18K
R15 4·7K
C20 100
V4
R16 100
R17 220
C21 100
C22 ·01
R18 22K
T4
C23 ·01
R19 1·5K
V5
V6
T5
Y
X
W
S
C24 ·25
L3
R20 130 N.T.C.
R21 120
R22 4·7
C25 100
SW1 GANGED TO R13
+
-
6V. DC.

TRANSISTOR VOLTAGES E.T.C.

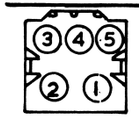
CODE	TYPES		BASE EMIT.		COLLECTOR	
	FUNCTION	A.W.V.	VOLTS	VOLTS	VOLTS	M.A.
V1	MIX.-OSC.	2N412 – 2N 219	-0·85	-0·80	-5·0	0·40
V2	IST I.F. AMP.	2N410 – 2N 218	-0·30	-0·20	-4·5	0·50
V3	2ND I.F. AMP	2N410 – 2N 218	-0·90	-0·70	-5·0	1·0
V4	A.F. DRIVER	2N408	-1·0	-0·85	-5·5	4·0
V5	P.P. OUTPUT	2N217	-0·2	-0·15	-5·95	2·0
V6	P.P. OUTPUT	2N217	-0·2	-0·15	-5·95	2·0

BASE AND EMITTER VOLTAGES TO BE WITHIN ±15 % OF THOSE GIVEN WHEN INPUT VOLTAGE IS 6 VOLTS.

MEASUREMENTS TAKEN WITH AN AVO-METER MODEL 8 - 20,000 OHMS PER VOLT - NO SIGNAL INPUT - GANG FULLY MESHED. ALL MEASUREMENTS TAKEN TO CHASSIS.

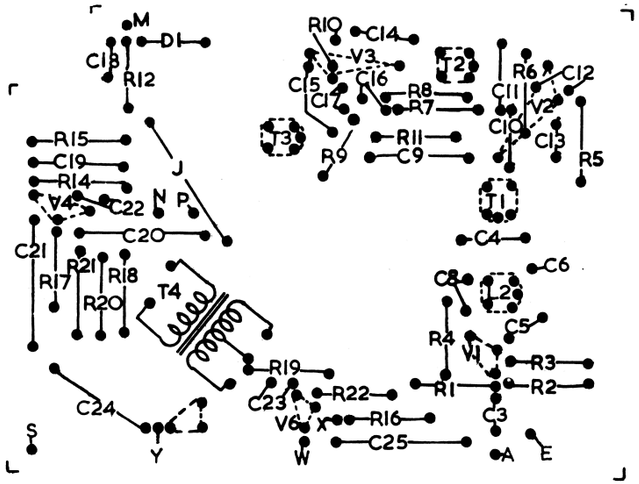
DO NOT MAKE CONTINUITY TESTS WITH TRANSISTORS IN CIRCUIT. USE A HEAT SINK, IE. A PAIR OF PLIERS, BETWEEN THE TRANSISTOR AND IRON WHEN SOLDERING A REPLACEMENT.
TRANSISTORS MAY BE PERMANENTLY DAMAGED IF THE POLARITY OF THE BATTERIES IS REVERSED.
DO NOT INTERCHANGE THE TRANSISTOR TYPES. DO NOT USE A TRANSISTOR AS A REPLACEMENT UNLESS IT IS IDENTICAL, OR HAS BEEN SPECIFIED AS A DIRECT EQUIVALENT, TO THE ORIGINAL.

I.F. TRANSFORMER CONNECTIONS



COLOUR DOT:- T1 & T2 - WHITE.
T3 - BLACK.
L2 - TAN.

PRINTED CIRCUIT BOARD



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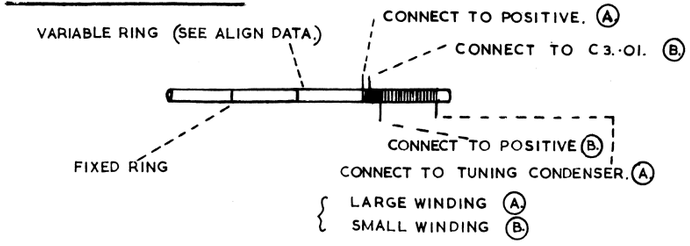
MISCELLANEOUS

SPECIFICATION	PART Nº
PRINTED BOARD ASSEMBLY Nº	EAF-176
KNOB ASSEMBLY	EAH-218
DIAL KNOB	EAH-267
DIAL SCALE	ECP-014
BATTERY CASE	ECE-267
BATTERIES (FOUR) 1·5 VOLT	(EVEREADY) 935

FERRITE ROD AERIAL



MAXIMUM POWER OUTPUT:- 250 MW.

R21-1A

RESISTORS

CODE Nº	VALUE (OHMS)	+%/−%	WATTS	PART Nº
R1	56K	10	1/2	EBJ-083
R2	12K	10	1/2	EBJ-047
R3	2·2K	10	1/2	EBJ-037
R4	2·2K	10	1/2	EBJ-037
R5	330	10	1/2	EBJ-066
R6	2·2K	10	1/2	EBJ-037
R7	22K	10	1/2	EBJ-017
R8	4·7K	10	1/2	EBJ-106
R9	560	10	1/2	EBJ-045
R10	560	10	1/2	EBJ-045
R11	150K	10	1/2	EBJ-095
R12	10K	10	1/2	EBJ-034
R13	5K	POT-VOLUME		EBL-092
R14	18K	10	1/2	EBJ-051
R15	4·7K	10	1/2	EBJ-106
R16	100	10	1/2	EBJ-055
R17	220	10	1/2	EBJ-033
R18	22K	20	1/2	EBJ-044
R19	68K	5	1/2	EBJ-152
R20	130 AT 25°C	N.T.C.		EBK-054
R21	120	5	1/2	EBJ-147
R22	4·7	10	1/2	EBK-043

CAPACITORS

CODE Nº	VALUE (FARADS)	+%/−%	D.C. W.V.	PART Nº
C1	8-200p		GANG (AERIAL)	EBG-408
C2	20p MAX		TRIMMER ON	EBG-408
C3	·01μ	+80-20	33	EBE-503
C4	250p	5	500	EBD-046
C5	·01μ	+80-20	33	EBE-503
C6	6·9-90p		GANG (OSC)	EBG-408
C7	20p MAX		TRIMMER ON	EBG-408
C8	·01μ	+80-20	33	EBE-503
C9	10μ	+100-20	6	EBA-073
C10	4·7p	0·5p	500	EBE-034
C11	250p	5	500	EBD-046
C12	·01μ	+80-20	33	EBE-503
C13	·01μ	+80-20	33	EBE-503
C14	18p	10	500	EBE-023
C15	250p	5	500	EBD-046
C16	·01μ	+80-20	33	EBE-503
C17	·01μ	+80-20	33	EBE-503
C18 *	·047μ	20	33	EBE-506
C19	5μ	+100-20	6	EBA-079
C20	100μ	+100-20	6	EBA-075
C21	100μ	+100-20	6	EBA-075
C22	·01μ	20	33	EBE-504
C23	·01μ	20	33	EBE-504
C24	·25μ	20	100	EBA-435
C25	100μ	+100-20	6	EBA-075
C18 *	·04μ	20	200	EBB-017 (ALT.)

INDUCTANCES

CODE Nº	SPECIFICATION	PART Nº
L1	COIL - AERIAL ASSEMBLY.	EAJ-008
L2	COIL - OSCILLATOR.	EAC-283
L3	COIL - SPEAKER	EBR-036

TRANSFORMERS

CODE Nº	SPECIFICATION	PART Nº
T1	TRANSFORMER - 1ST I.F.	EAB-364
T2	TRANSFORMER - 2ND I F	EAB-364
T3	TRANSFORMER - 3RD I F	EAB-365
T4	TRANSFORMER - DRIVER	EAB-062
T5	TRANSFORMER - SOUND OUTPUT	EAB-080

SERVICING

THE REMOVAL OF THE PRINTED BOARD from the chassis cannot be effected until the dial, volume control knob, battery tube and aerial assembly have been removed. When this has been done, the six holding screws can be removed and the board can be lifted away from the chassis.

REMOVAL AND REPLACEMENT OF THE DIAL

REMOVE:- Rotate the dial until the orange pointer line is horizontal. Insert a screwdriver under each side of the dial and lever the dial evenly away from the cabinet until the stopper at the rear of the dial is clear of the slot (approx. $\frac{1}{8}$") Detatch the dial by pulling it gently and at the same time rotating it in a clockwise direction.

REPLACEMENT:- Fully unmesh the gang. Position the dial on the shaft so that the stopper is located on the left hand side and the orange pointer line is horizontal. Press the dial carefully into position and rotate it clockwise as far as it will go. The pointer is now correctly set in its position.

TO REMOVE THE VOLUME CONTROL KNOB:- Pull from the spindle.

REMOVE THE BATTERY TUBE by detatching, complete with batteries from the receiver.

REMOVAL AND REPLACEMENT OF THE AERIAL ASSY.

REMOVE by lifting the left hand rubber mounting grommet on the end of the ferrite rod out of the retaining slot, easing the rod out of the right hand grommet.

REPLACE by reversing the above process.

SPEAKER REPLACEMENT

In the event of a speaker replacement it will be necessary to first remove the printed board (see THE REMOVAL OF THE PRINTED BOARD) as well as the output transformer mounted above the speaker. The speaker can then be removed by unscrewing the four holding nuts and lifting it away from the chassis.

ALIGNMENT DATA

Alignment should not be necessary unless repairs have been made to the tuned circuit. When alignment is necessary follow the procedure outlined below. Use an output meter and with the volume control set to maximum, regulate the output of the signal generator so that the output of the receiver is kept as low as possible, e.g. 10 mW. In this way A.G.C. action and overloading will be avoided.

BROADCASTING ALIGNMENT

a. To inject a signal into the receiver ferrite rod aerial, connect to the active terminal of the signal generator attenuator approx 2 ft. of aerial wire, then fashion the wire to a vertical position.

b. Place receiver so that the ferrite rod aerial is uppermost and horizontal and so that volume control end of the case is nearest to the 2 ft. of vertical aerial wire. A distance of not less than 1 ft. is to be between the 2 ft. of vertical aerial wire and the end of the receiver. For the alternative radiation loop method of alignment refer to fig. 3 Service Data Model R.15-2B

ALIGNMENT TABLE

	Input Frequency	Apply signal:-	Set receiver dial to:-	Adjust in order for maximum output.
1.	455 Kc/s	Between chassis and junction of L1 & C3	Extreme low frequency end	T3-T2-T1, repeat for maximum output.
2.	1600 Kc/s	To vertical wire	2AN	Oscillator Trimmer C7 (On gang, nearest T1).
3.	1500 Kc/s	As in 2.	3AK Victoria	Trimmer C7 (osc.) then Trimmer C2 (aerial, on gang) repeat if necessary.
4.	600 Kc/s	As in 2.	4AT Queensland	Adjust L2, if necessary, then ring on ferrite rod nearest L1 (aerial).
5.	Repeat 2, 3 & 4 until alignment is correct.		Seal ring and all other adjustments after alignment with wax.	