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For Trade Use Only

"HIS MASTER'S VOICE"

RADIO SERVICE MANUAL

for

SIX - VALVE

A.C. MAINS - OPERATED MEDIUM - WAVE AND BANDSPREAD SHORT - WAVE CHASSIS

TYPE A2

•

THE GRAMOPHONE COMPANY LIMITED

(Incorporated in England)

2 PARRAMATTA ROAD, HOMEBUSH, N.S.W.

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PART No. 682-5031

TECHNICAL SPECIFICATION

POWER SUPPLY:
200 to 250 volts at 40 to 50 c.p.s.

CONSUMPTION:
52 watts.

TUNING RANGE:
S.W.1: 18.40 — 14.20 Mc/s. (16.30 — 21.13 metres).
S.W.2: 12.10 — 9.40 Mc/s. (24.79 — 31.92 metres).
S.W.3: 7.50 — 5.90 Mc/s. (40.00 — 50.85 metres).
M.W.: 1600 — 540 Kc/s.

INTERMEDIATE FREQUENCY:
457.5 Kc/s.

VALVE COMPLEMENT:

6AN7	......	Frequency Changer
6N8	......	I.F. Amp.-Demod.-A.V.C.
12AX7	......	A.F. Amp.—Phase Splitter
6M5	......	Power
6M5	......	Power
6V4	......	Rectifier

DIAL AND PILOT LAMPS:
6.3 volt, 0.3 amp. (Minature screw-cap base).

OUTPUT IMPEDANCE:
15 ohms at 400 c.p.s.

CIRCUIT DESCRIPTION

This chassis type is a 6-valve A.C. mains-operated medium-wave and bandspread short-wave superheterodyne receiver, in which provision for the attachment of record playing equipment has been made.

FREQUENCY CHANGER

A triode - hexode, V1, is employed as the frequency changer.

On the medium-wave band the aerial is coupled through a high-gain transformer, L2-L3, to the hexode grid. An acceptor circuit, tuned to the intermediate frequency, is connected across the earth and aerial terminals. The triode section of V1 on the medium-wave band is used as a shunt fed plate tuned oscillator; tracking is obtained by means of a fixed padding capacitor in conjunction with an adjustable iron-dust tuning bolt in oscillator coil L7-L8. With the wave-change switch set to "Gram." position the hexode signal grid is grounded to chassis, at R.F. potentials, through capacitor C4.

On the short-wave bands, a transformer, L4-L5, having a tapped secondary, is used to couple the aerial to the frequency changer grid. The signal frequency section of the variable ganged capacitor, VC1, is padded on all short-wave bands by means of capacitors C5, C6 and C7 to obtain bandspread tuning. Circuit trimming adjustments are carried out by means of the iron-dust tuning bolt in L4-L5 and trimmer capacitor TC2.

The short-wave oscillator employs a tapped coil, L6, in a Colpitt's arrangement; bandspread tuning is obtained on all short-wave bands by the use of padding capacitors C12, C13 and C14, in conjunction with the oscillator section, VC2, of the variable ganged capacitor. Circuit trimming adjustments are made by means of the iron-dust tuning bolt in L6 and trimmer capacity TC4. The oscillator circuit tracks on the high frequency side of the signal frequency.

I.F. AMPLIFIER-DEMOD.-A.V.C.

The frequency changer is transformer-coupled to a duo-diode-pentode valve, V2, the output of which is coupled by means of a second transformer to the demodulator diode, where the signal is demodulated and appears across resistor R8

The I.F. transformers employed have fixed tuning capacitors and are permeability tuned.

Neutralisation of this stage is effected by capacitor C20. The plate circuit of this amplifier is capacity-coupled to the remaining diode to provide A.V.C. Full A.V.C. voltage is applied to the frequency changer and I.F. amplifier standing bias for these stages and A.V.C. diode delay voltage is supplied from the back-bias resistor, R17, in the high tension negative circuit.

A.F. AMPLIFIER

The demodulated signal, or pick-up input, is coupled to the volume control in grid circuit of the first half of the twin triode, V3. The signal is then resistance-capacitance coupled to the phase splitter, second half of V3.

POWER AMPLIFIER

The output of the phase splitter, taken across R18 and R20 is then applied to the signal grids of the push-pull Power Amplifier valves, V4 and V5. The Power Valves are then transformer coupled to the loudspeaker. Portion of the voltage appearing across the secondary of the output transformer is applied to the cathode of the A.F. Amplifier, first half V3, to provide negative feedback.

HIGH TENSION SUPPLY

The power supply employs an indirectly-heated full-wave recifier, V6. Unfiltered high tension voltage from the cathode of the rectifier supplies the plate circuit of the power amplifier; the remaining H.T. circuits of the receiver are fed through a resistance-capacitance filter. Voltage drop across the back-bias Resistor, R17, in the high tension negative circuit supplies standing grid bias to the frequency changer, V1, and the I.F. Amplifier, V2. A double-pole mains switch incorporated with the tone control is used to connect the mains supply to the receiver and mains outlet socket.

RECEIVER ALIGNMENT PROCEDURE

In any case where a component replacement has been made in either the tuned I.F. or R.F. circuits of a receiver, all circuits must be realigned. I.F. alignment should always precede R.F. alignment, and even if only one coil has been serviced, the whole of the realignment should be done in the order given. An output meter should always be connected across the voice coil terminals of the speaker to indicate when the circuits are tuned to resonance.

In carrying out the following operations, it is important that the input to the receiver from the signal generator should be kept low and progressively reduced as the circuits are brought into line, so that the output meter reading does not exceed about 1 volt.

I.F. ALIGNMENT

Set receiver controls as follows:

Volume Control: Maximum.
Tone Control: Maximum Clockwise.
Wave-Change: Medium-Wave.
Tuning Control: Capacitor plates fully enmeshed.

(1) Connect the output of the signal generator through a 0.1 mF. capacitor to the stator plates of the front section of the ganged capacitor.

(2) Tune the signal generator to exactly 457.5 kc/s.

(3) Adjust the I.F. transformer trimmer screws for maximum reading on the output meter, commencing with the second I.F. transformer and following with the first.

(4) Continue this alignment on each transformer in turn until no greater output can be obtained. It is necessary to repeat this procedure twice to ensure correct alignment.

Note: If the trimmer screws are screwed too far in, it may be possible to obtain a false peak due to coupling effects between the iron cores. Start alignment of each individual transformer by first screwing its core well out, and then advancing the core into the coil until resonance is obtained.

R.F. ALIGNMENT (Medium-Wave)

(1) With the controls set as for I.F. alignment, connect the signal generator output leads in series with a 200 pF. capacitor to the aerial and earth terminals of the receiver.

(2) Check that, when the ganged capacitor is fully closed, the pointer coincides with the setting marks at the extreme left-hand side of the dial scale.

(3) Tune the signal generator and receiver to 600 kc/s. (The 600 kc/s calibration mark will be found above 7ZL on the dial scale).

(4) Whilst "rocking" the tuning control, adjust the medium-wave oscillator tuning bolt for maximum responce.

(5) Tune the signal generator to 1500 kc/s.

(6) Adjust the tuning control until the pointer coincides with the 1500 kc/s calibration mark (near 7DY).

(7) Adjust the oscillator and aerial trimmer capacitors in that order for maximum response.

(8) Repeat operations (3) to (7) inclusive until correct alignment is obtained.

R.F. ALIGNMENT (Short-Wave)

(1) Set the wave-change switch to S.W.2. Replace the 200 pF. capacitor between the signal generator and receiver with a 400 ohm non-inductive resistor.

(2) Tune the signal generator to 10 Mc/s.

(3) Adjust receiver tuning control so that the pointer coincides with 10 Mc/s calibration.

(4) Adjust S.W. oscillator and aerial tuning bolts in that order for maximum output.

(5) Tune the signal generator to 12 Mc/s.

(6) Adjust tuning control so that the pointer coincides with 12 Mc/s calibration.

(7) Adjust S.W. oscillator and aerial trimmer capacitors in that order for maximum output.

(8) Repeat operations (2) to (7) inclusive, until correct calibration is achieved at both 10 Mc/s and 12 Mc/s points.

(9) Switch the wave-change switch to S.W.1.

(10) Tune signal generator and receiver to 15 Mc/s.

(11) Adjust the inductance of the S.W. aerial circuit for resonance.

In this operation, the tuning bolt in the coil should not be touched. The adjustment is made by altering the position of the wire connected to the first tap (nearest the coil base) of the S.W. aerial coil. A convenient method of doing this is to take a $\frac{1}{4}$in. diameter plastic rod and file a small slot across one end; engage the wire in the slotted rod, and alter its position relative to the coil winding; a position will be found where resonance is obtained as indicated by maximum deflection on the output meter.

This completes the short-wave alignment for all bands.

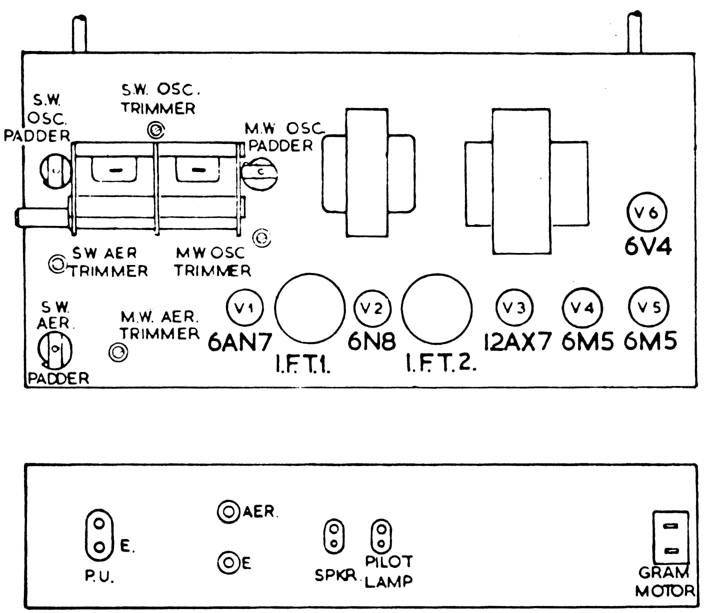
CAUTION

When refitting the chassis into a cabinet, care should be taken not to disturb the wiring of the short-wave circuits; otherwise,they will be thrown out of alignment.

ADDITIONAL DATA

Any further service information may be obtained by addressing an enquiry to "The Service Division, E.M.I. (Aust.) Limited, 575-577 Parramatta Road, Leichhardt" (telephone LM1491).

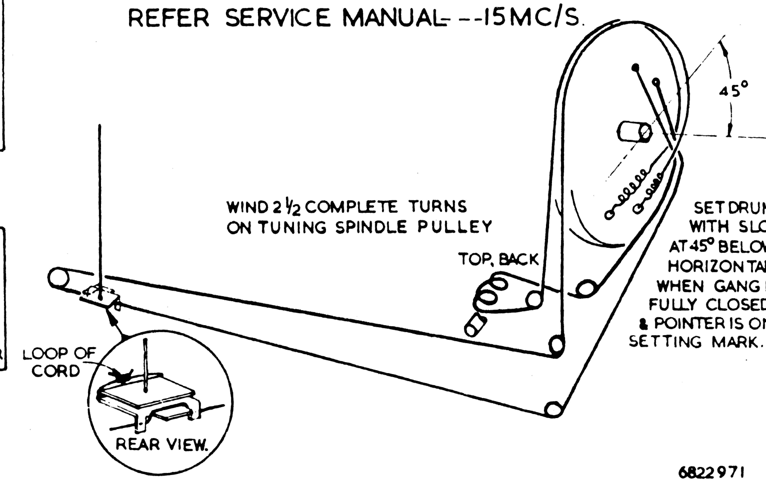
During the course of production of this chassis the Company reserves the right, without notice, to make any modifications or improvements in design which may be necessary to meet prevailing conditions.



ALIGNMENT DETAILS

I.F. 457·5 KC/S.

	M.W.	S.W. BAND 2
OSC. PADDER	600 KC/S	10 MC/S.
OSC. TRIMMER	1500 KC/S	12 MC/S.
AER. PADDER		10 MC/S.
AER. TRIMMER	1500 KC/S.	12 MC/S.
REFER SERVICE MANUAL		15 MC/S.



PARTS LIST

RESISTORS

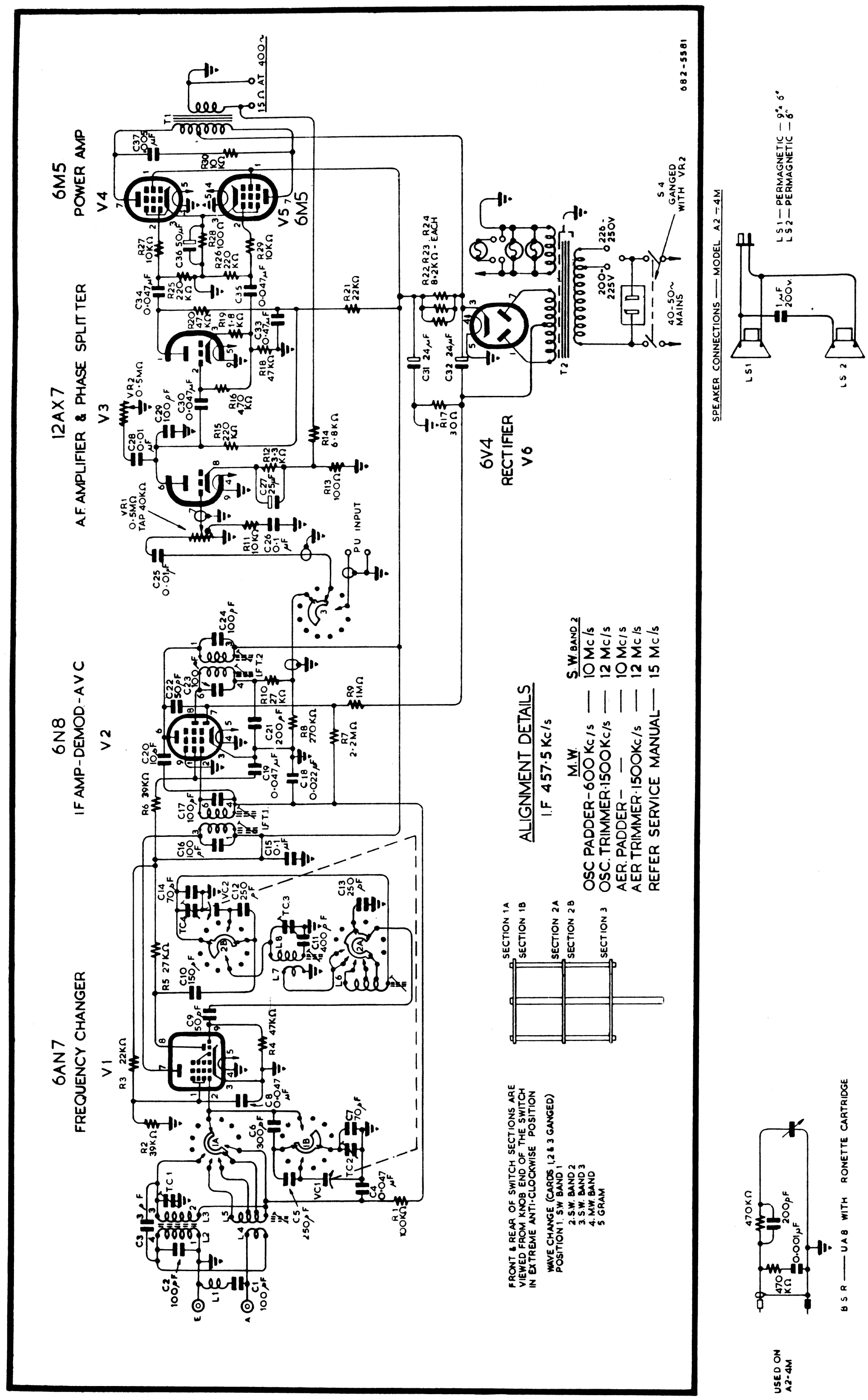
REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
R1	7400142	100,000 ohms ± 10% $\frac{1}{2}$ Watt	R16	7400182	470,000 ohms ± 10% $\frac{1}{2}$ Watt
R2	7400232	39,000 ohms ± 10% $\frac{1}{2}$ Watt	R17	7460011	30 ohms ± 10% $\frac{1}{2}$ Watt
R3	7420052	22,000 ohms ± 10% 1 Watt	R18	7420282	47,000 ohms ± 5% 1 Watt
R4	7400122	47,000 ohms ± 10% $\frac{1}{2}$ Watt	R19	7400302	1,800 ohms ± 10% $\frac{1}{2}$ Watt
R5	7420062	27,000 ohms ± 10% 1 Watt	R20	7420282	47,000 ohms ± 5% 1 Watt
R6	7400232	39,000 ohms ± 10% $\frac{1}{2}$ Watt	R21	7420052	22,000 ohms ± 10% 1 Watt
R7	7400202	2.2 Megohms ± 10% $\frac{1}{2}$ Watt	R22	7420272	8,200 ohms ± 10% 1 Watt
R8	7420142	270,000 ohms ± 10% 1 Watt	R23	7420272	8,200 ohms ± 10% 1 Watt
R9	7400192	1 Megohm ± 10% $\frac{1}{2}$ Watt	R24	7420272	8,200 ohms ± 10% 1 Watt
R10	7400112	27,000 ohms ± 10% $\frac{1}{2}$ Watt	R25	7400192	220,000 ohms ± 10% $\frac{1}{2}$ Watt
R11	7400082	10,000 ohms ± 10% $\frac{1}{2}$ Watt	R26	7400192	220,000 ohms ± 10% $\frac{1}{2}$ Watt
R12	7400052	3,300 ohms ± 10% $\frac{1}{2}$ Watt	R27	7400082	10,000 ohms ± 10% $\frac{1}{2}$ Watt
R13	7460041	100 ohms ± 10% $\frac{1}{2}$ Watt	R28	7460041	100 ohms ± 10% $\frac{1}{2}$ Watt
R14	7420532	6,800 ohms ± 10% 1 Watt	R29	7400082	10,000 ohms ± 10% $\frac{1}{2}$ Watt
R15	7420132	220,000 ohms ± 10% 1 Watt	R30	7420031	10,000 ohms ± 10% 1 Watt

CAPACITORS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
C1	2750041	100 pF ± 5%	C20	2730011	10 pF ± 10%
C2	2730051	100 pF ± 10%	C21	2730071	200 pF ± 10%
C3	2730001	3 pF ± 1 pF	C22	2730041	50 pF ± 10%
C4	2791081	.047 mF ± 20% 200V.	C23	2750041	100 pF ± 5%
C5	2730271	250 pF ± 1%	C24	2750041	100 pF ± 5%
C6	2730281	300 pF ± 1%	C25	2792121	.01 mF ± 20% 600V.
C7	2730261	70 pF ± 5%	C26	2791121	.1 mF ± 20% 200V.
C8	2791701	.047 mF ± 20% 400V.	C27	2690221	25 mf 40 P.V.
C9	2730041	50 pF ± 10%	C28	2792121	.01 mF ± 20% 600V.
C10	2730061	150 pF ± 10%	C29	2730051	100 pF ± 10%
C11	2730091	400 pF ± 1%	C30	2791701	.047 mF ± 20% 400V.
C12	2730271	250 pF ± 1%	C31	2690111	24 mF 350 P.V.
C13	2730271	250 pF ± 1%	C32	2690111	24 mF 350 P.V.
C14	2730261	70 pF ± 5%	C33	2791821	.47 mF. ± 20% 400V.
C15	2791741	.1 mF ± 20% 400V.	C34	2791701	.047 mF ± 20% 400V.
C16	2750041	100 pF ± 5%	C35	2791701	.047 mF ± 20% 400V.
C17	2750041	100 pF ± 5%	C36	2690171	50 mF 40 P.V.
C18	2792161	.022 mF ± 20% 600V.	C37	2730731	5,000 pF ± 10%
C19	2791701	.047 mF ± 20% 400V.			

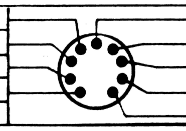
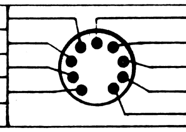
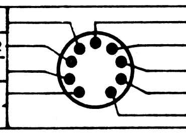
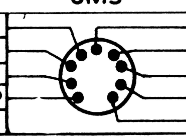
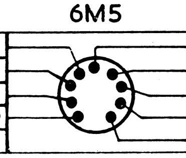
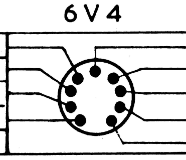
MISCELLANEOUS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
L1	2590004	Coil, I.F. Filter	S1A, 1B 2A, 2B S3	8550003	Switch, Wave-Change
L2-L3	2530103	Coil, M/W Aerial	V1	9320151	Valve, 6AN7
L4-L5	2530112	Coil, S/W Aerial	V2	9320201	Valve, 6N8
L6	2570092	Coil, S /W Oscillator	V3	9320401	Valve, 12AX7
L7-L8	2570086	Coil, M/W Oscillator	V4-V5	9320291	Valve, 6M5
VC1- VC2	2810022	Capacitor, 2-gang, Variable	V6	9320351	Valve, 6V4
TC1-2 TC3-4	2810051	Capacitor Trimmer		9320291	Lamp, 6.3 volt, 0.3 to 0.32 amp., M.E.S.
IFT1- IFT2	9060063	Transformer I.F. (1st and 2nd)		7940571	Scale, Dial
T1	9050151	Transformer Output		2970011	Cord, Dial Drive (5ft. 10in.)
T2	9040044	Transformer Mains		3810073	Drum
VR1	6770391	Volume Control, .5 megohms tapped at 40,000 ohms, potentiometer		6710341	Pointer Assembly
VR2/S4	6770012	Tone Control, .5 megohms potentiometer with switch		8400191	Spring, Drive Drum
				8400261	Spring, Drive Pointer


6AN7
FREQUENCY CHANGER
V1
6N8
I.F AMP-DEMOD-AVC
V2
12AX7
A.F. AMPLIFIER & PHASE SPLITTER
V3
6M5
POWER AMP
V4
V5
6M5
6V4
RECTIFIER
V6
ALIGNMENT DETAILS
I.F 457·5 Kc/s
M.W.
S.W. BAND 2
OSC PADDER-600 Kc/s — 10 Mc/s
OSC. TRIMMER-1500Kc/s — 12 Mc/s
AER. PADDER- — — 10 Mc/s
AER TRIMMER-1500Kc/s — 12 Mc/s
REFER SERVICE MANUAL— 15 Mc/s
FRONT & REAR OF SWITCH SECTIONS ARE VIEWED FROM KNOB END OF THE SWITCH IN EXTREME ANTI-CLOCKWISE POSITION
WAVE CHANGE (CARDS 1,2 & 3 GANGED)
POSITION 1. SW BAND 1
2. S.W. BAND 2
3. S.W. BAND 3
4. M.W. BAND
5 GRAM
SECTION 1A
SECTION 1B
SECTION 2A
SECTION 2B
SECTION 3
PU INPUT
40-50~ MAINS
S 4 GANGED WITH VR2
15Ω AT 400~
682-5581
SPEAKER CONNECTIONS — MODEL A2-4M
LS1 — PERMAGNETIC — 9"x 6"
LS2 — PERMAGNETIC — 6"
USED ON A2-4M
BSR — UA8 WITH RONETTE CARTRIDGE

VOLTAGE TABLE

- VOLTAGES AND CURRENTS ARE WITH THE RECEIVER OPERATING ON AVERAGE MAINS VOLTAGE AND TUNED TO A POINT OF NO RECEPTION ON THE MEDIUM WAVE BAND.
- VOLTAGE READINGS TAKEN WITH METER RESISTANCE OF 500 OHMS PER VOLT

VOLTS TO CHASSIS	CURRENT mA.	RESISTANCE TO CHASSIS	VALVE ELECTRODE	BOTTOM VIEW OF VALVE SOCKET	VALVE ELECTRODE	VOLTS TO CHASSIS	CURRENT mA.	RESISTANCE TO CHASSIS
			V1	6AN7	FREQUENCY CHANGER			
—	—	0	HEATER		HEATER	6·3 A.C.	230 A.C.	—
0	10·5	0	CATHODE		INTERNAL CON	—	—	—
—	—	3·3 MΩ	GRID		PLATE	182	4·6	61 KΩ
85	2·5	39 KΩ	SCREEN GRID		OSC. PLATE	85	3·4	88 KΩ
					OSC. GRID	—	—	47 KΩ
			V2	6N8	I.F. AMPLIFIER-DEMODULATOR-A.V.C.			
—	—	0	HEATER		HEATER	6·3A.C.	300A.C.	—
0	8·4	0	CATHODE		PLATE	182	6·4	61 KΩ
—	—	3·2 MΩ	GRID		A.V.C. DIODE	—	—	1 MΩ
90	2·2	100 KΩ	SCREEN GRID		DEMOD. DIODE	—	—	2 97KΩ
					SUPP. GRID	—	—	0
			V3	12AX7	T1 1ST A.F. T2 PHASE SPLITTER			
6·3 A.C.	300A.C.	—	HEATER		HEATER	6·3A.C.	300 A.C.	—
25 V	0·5	48·8 KΩ	CATHODE-T2		PLATE-T1	60	0·25	303 KΩ
—	—	517 KΩ	GRID-T2		GRID-T1	—	—	0-500KΩ
114	0·5	130 KΩ	PLATE- T2		CATHODE-T1	0·75	0·25	3·3 KΩ
					HEATER-C.T.	—	—	—
			V4	6M5	POWER AMPLIFIER			
—	—	0	HEATER		HEATER	6·3A.C.	710A.C.	—
5·4	24·9	100 Ω	CATHODE		—	—	—	—
—	—	230KΩ	GRID		PLATE	252	22·0	64KΩ
182	2·9	61 KΩ	SCREEN GRID		—	—	—	—
					—	—	—	—
			V5	6M5	POWER AMPLIFIER			
6·3AC.	710AC.	—	HEATER		HEATER	—	—	0
5·4	24·9	100Ω	CATHODE		—	—	—	—
—	—	230KΩ	GRID		PLATE	252	22·0	64 KΩ
182	2·9	61KΩ	SCREEN GRID		—	—	—	—
					—	—	—	—
			V6	6V4	RECTIFIER			
6·3A.C.	600A.C.	—	HEATER		HEATER	—	—	0
255	70	64 KΩ	CATHODE		—	—	—	—
—	—	—	—		PLATE 2	247 A.C.	—	175Ω
247 A.C.	—	175 Ω	PLATE 1		—	—	—	—
					—	—	—	—

REMARKS :-

BIAS VOLTAGES :
CONVERTER/ I.F. AMP. — 2·2 VOLTS.

682-3071