Private and Confidential ***For Trade Use Only***

"His Master's Voice"

SERVICE MANUAL

for

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

TYPE 41

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THE GRAMOPHONE COMPANY LIMITED
(*Incorporated in England*)
HOMEBUSH - - - - N.S.W.

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PART No. 6822421

TECHNICAL SPECIFICATION

POWER SUPPLY:
200 to 250 volts at 40 to 50 c.p.s.
(Receiver only).

CONSUMPTION:
42 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.
6N8 ..... A.F. Amp.
6M5 ..... Power
6V4 ..... Rectifier.

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

TONE CONTROL:
Four Positions—
(1) Bass and Treble Cut
(2) Normal
(3) Treble Cut
(4) Treble Cut.

CIRCUIT DESCRIPTION

This model incorporates a 5-valve A.C. mains-operated medium-wave and bandspread short-wave superheterodyne receiver.

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 aerial and earth 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 R14 in the high tension negative circuit.

A.F. AMPLIFIER

The demodulated signal, or pick-up output, is coupled to the volume control in the grid circuit of this pentode amplifier, V3, through the tone control circuits, which comprise series and/or shunt connected capacitors.

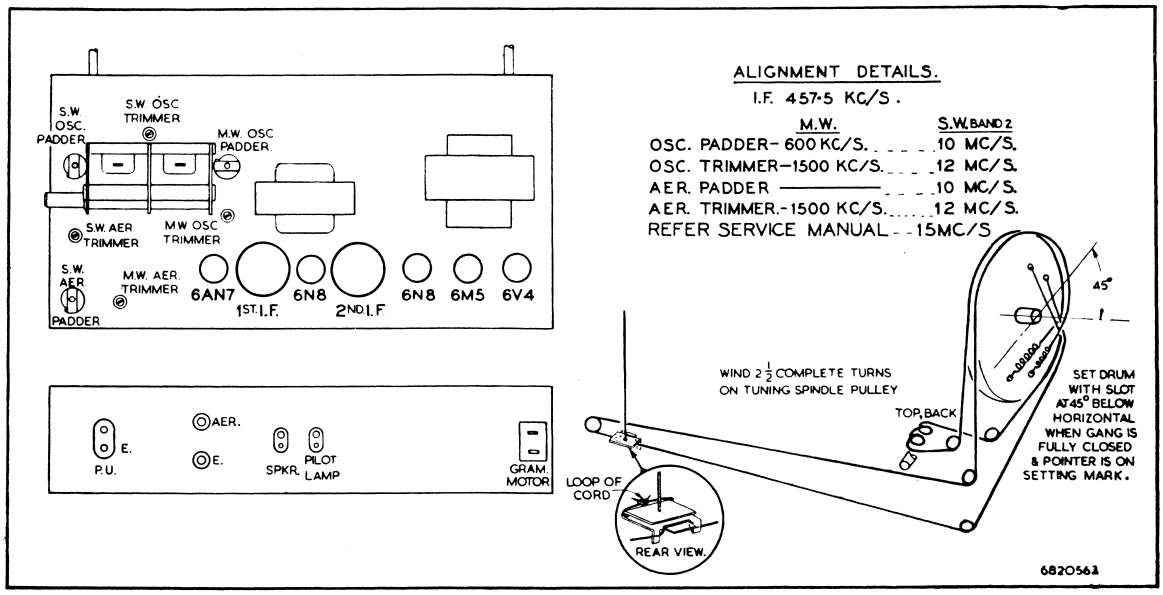
A weighted volume control is employed to compensate for aural deficiencies at low volume levels. This is accomplished by introducing a degree of bass boost at low settings of the volume control.

POWER AMPLIFIER

The output of the preceding stage is resistance - capacitance coupled to the pentode power valve, V4, which is, in turn, coupled to the speaker through a step-down transformer. Voltage developed across the secondary of this transformer is injected back into the screen grid circuit of the A.F. amplifier to provide inverse feedback.

HIGH TENSION SUPPLY

The power supply employs an indirectly-heated full-wave rectifier, V5. Unfiltered high tension voltage from the cathode of the rectifier supplies the plate circuit of the power amplifier; the remaining high tension circuits of the receiver are fed through a resistance-capacitance filter. Voltage drop across back-bias resistors R14 and R15 in the high tension negative circuit supplies grid bias voltage to the power amplifier. A double-pole mains switch incorporated with the volume control is used to control 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: Normal.
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 response.

(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 operation (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 the 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.) Pty. Limited, 575-577 Parramatta Rd., Leichhardt (telephone LM1491).

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

PARTS LIST

RESISTORS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
R1	7400142	100,000 ohms ± 10% ½ watt	R12	7420252	10,000 ohms ± 10% 1 watt
R2	7400232	39,000 ohms ± 10% ½ watt	R13	7420252	10,000 ohms ± 10% 1 watt
R3	7420052	22,000 ohms ± 10% 1 watt	R14	7460022	39 ohms ± 10% ½ watt
R4	7400122	47,000 ohms ± 10% ½ watt	R15	7460022	39 ohms ± 10% ½ watt
R5	7420062	27,000 ohms ± 10% 1 watt	R16	7400082	10,000 ohms ± 10% ½ watt
R6	7400232	39,000 ohms ± 10% ½ watt	R17	7400022	1,000 ohms ± 10% ½ watt
R7	7400202	2.2 megohms ± 10% ½ watt	R18	7420182	680,000 ohms ± 10% 1 watt
R8	7420142	270,000 ohms ± 10% 1 watt	R19	7420132	220,000 ohms ± 10% 1 watt
R9	7400192	1 megohm ± 10% ½ watt	R20	7400112	27,000 ohms ± 10% ½ watt
R10	7400112	27,000 ohms ± 10% ½ watt	R21	7400182	470,000 ohms ± 10% ½ watt
R11	7420252	10,000 ohms ± 10% 1 watt			

CAPACITORS

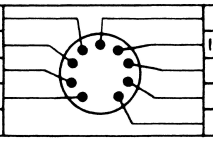
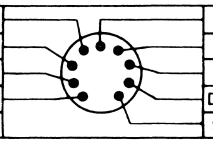
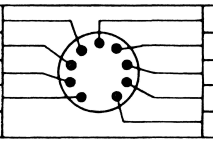
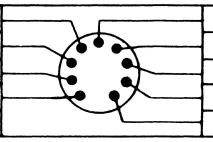
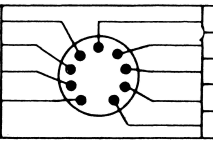
REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
C1	2750041	100 pF. ± 5%	C18	2790101	.02 mF. ± 20% 600V.
C2	2730051	100 pF. ± 10%	C19	2790131	.05 mF. ± 20% 400V.
C3	2730001	3 pF. ± 1 pF.	C20	2730011	10 pF. ± 10%
C4	2790121	.05 mF. ± 20% 200V.	C21	2730071	200 pF. ± 10%
C5	2730271	250 pF. ± 1%	C22	2730041	50 pF. ± 10%
C6	2730281	300 pF. ± 1%	C23	2750041	100 pF. ± 5%
C7	2730261	70 pF. ± 5%	C24	2750041	100 pF. ± 5%
C8	2790131	.05 mF. ± 20% 400V.	C25	2690111	24 mF. 350 P.V.
C9	2730041	50 pF. ± 10%	C26	2730131	500 pF. ± 10%
C10	2730061	150 pF. ± 10%	C27	2790071	.01 mF. ± 20% 600V.
C11	2730091	400 pF. ± 1%	C28	2730141	800 pF. ± 10%
C12	2730271	250 pF. ± 1%	C29	2730171	.002 mF. ± 10%
C13	2730271	250 pF. ± 1%	C30	2690111	24 mF. 350 P.V.
C14	2730261	70 pF. ± 5%	C31	2790151	.1 mF. ± 20% 200V.
C15	2790161	.1 mF. ± 20% 400V.	C32	2790131	.05 mF. ± 20% 400V.
C16	2750041	100 pF. ± 5%	C33	2690211	8 mF. 350 P.V.
C17	2750041	100 pF. ± 5%	C34	2790161	0.1 mfd. ± 20% 400V.

MISCELLANEOUS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
L2-L3	2530101	Coil M/W Aerial	S4	8550013	Switch Tone Control
L4-L5	2530112	Coil S/W Aerial	V1	9320151	Valve 6AN7
L6	2570092	Coil S/W Oscillator	V2-V3	9320201	Valve 6N8
L7-L8	2570084	Coil M/W Oscillator	V4	9320291	Valve 6M5
L1	2590002	Coil I.F. Filter	V5	9320351	Valve 6V4
VC1-VC2	2810021	Capacitor 2-Gang Variable		9320391	Lamp, 6.3 Volt, 0.3 amp.
TC1-TC2	2810051	Capacitor Trimmer		7940322	Scale Dial Glass
TC3-TC4	2810051	Capacitor Trimmer		2970011	Cord Dial Drive (5' 6" length)
IFT1	9060024	Transformer—1st I.F.		3810072	Drum-Dial
IFT2	9060024	Transformer—2nd I.F.		6710262	Pointer-Dial
T1	9040004	Transformer Power		8400191	Spring (Drum to Pointer)
T2	9050011	Transformer Output		8400261	Spring (Drive Spindle to Drum)
VR1	6770061	Volume Control, ½ megohm tapped 40K ohms with switch		8370034	Drive Spindle
S1A, S1B, S2A, S2B, S3	8550003	Switch Wave-Change			

VOLTAGE TABLE

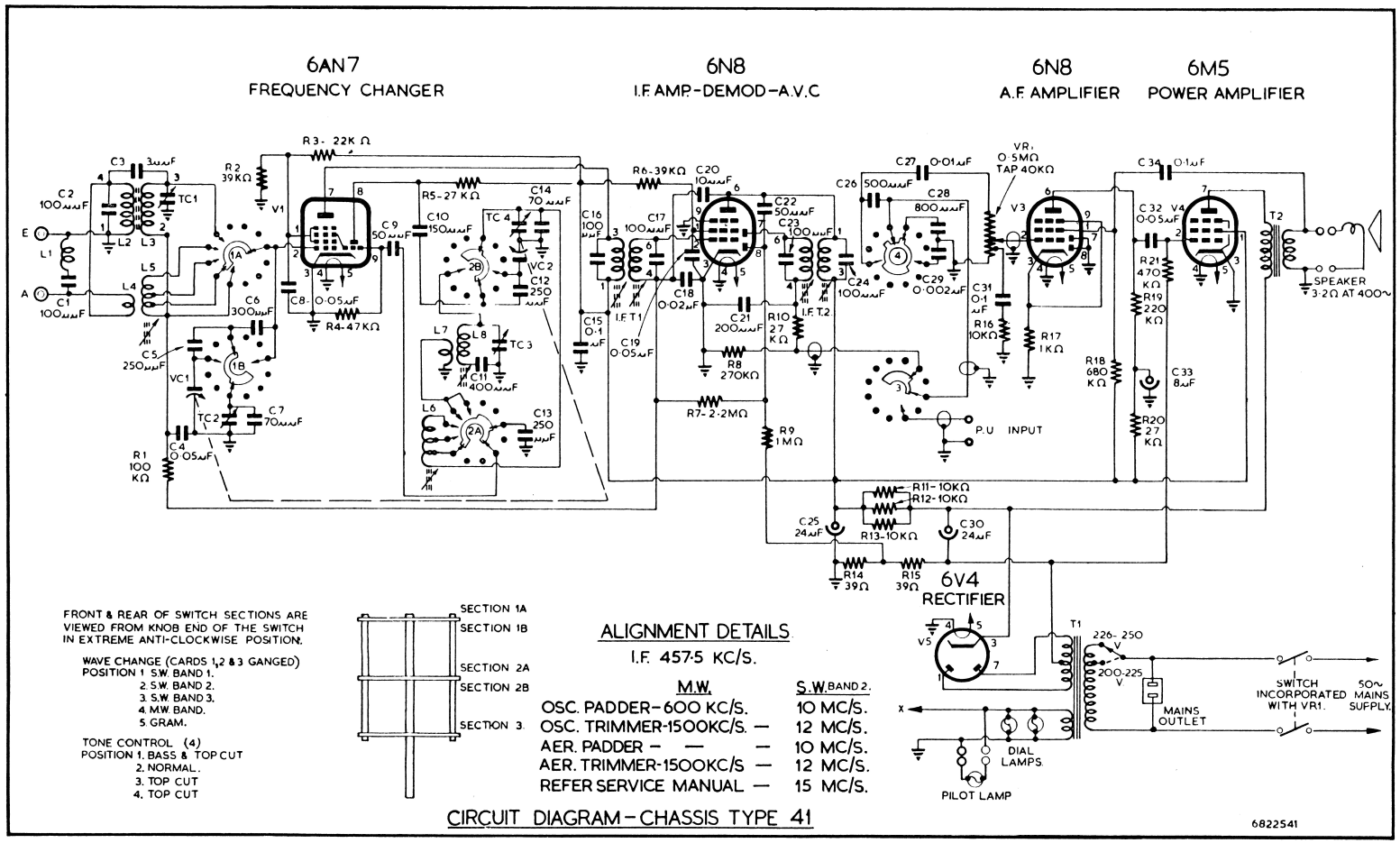
- VOLTAGES AND CURRENTS ARE WITH THE RECEIVER OPERATING ON AVERAGE MAINS VOLTAGE AND TUNED TO A POINT OF NO RECEPTION ON THE MEDIUM WAVE BAND.
- VOLTAGE READINGS TAKEN WITH METER RESISTANCE OF 1,000 OHMS PER VOLT.
- VOLTAGE AND CURRENT READINGS WITHIN ± 15 %.
- RESISTANCE READINGS ARE APPROXIMATE.

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	9·1	0	CATHODE		INTERNAL CON.	———	———	———
———	———	3·1 MΩ	GRIDE		PLATE	178	3·2	50 KΩ
72	2·5	30 KΩ	SCREEN GRID		OSC. PLATE	85	3·4	75 KΩ
					OSC. GRID	———	———	50 KΩ
			V2	6N8	I.F. AMPLIFIER-DEMODULATOR-A.V.C.			
———	———	0	HEATER		HEATER	6·3A.C.	300A.C.	———
0	7·7	0	CATHODE		PLATE	178	5·5	50 KΩ
———	———	3·0MΩ	GRID		A.V.C. DIODE	———	———	1 MΩ
90	2·2	90 KΩ	SCREEN GRID		DEMOD. DIODE	———	———	275KΩ
					SUPP. GRID	———	———	0
			V3	6N8	A.F. AMPLIFIER			
———	———	0	HEATER		HEATER	6·3A.C.	300A.C.	———
0·75	0·8	1K Ω	CATHODE		PLATE	19	0·6	250KΩ
———	———	0 – 500KΩ	GRID		DIODE	———	———	0
14	0·24	750KΩ	SCREEN GRID		DIODE	———	———	0
					SUPP. GRID	0·75	———	1K Ω
			V4	6M5	POWER AMPLIFIER			
———	———	0	HEATER		HEATER	6·3A.C.	710A.C.	———
0	35·2	0	CATHODE		———	———	———	———
———	———	500K Ω	GRID		PLATE	238	31	54K Ω
178	4·2	50K Ω	SCREEN GRID		———	———	———	———
					———	———	———	———
			V5	6V4	RECTIFIER			
———	———	0	HEATER		HEATER	6·3A.C.	600	———
250	55	54K Ω	CATHODE		———	———	———	———
———	———	———	———		PLATE 2	257A.C.	———	500 Ω
257A.C.	———	470 Ω	PLATE 1		———	———	———	———
					———	———	———	———

REMARKS :–

BIAS VOLTAGES :
CONVERTER / I.F. AMP. ___ 2·2 VOLTS.
POWER AMPLIFIER _____ 4·4 VOLTS.

6821122



CIRCUIT DIAGRAM – CHASSIS TYPE 41

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