"His Master's Voice"

SERVICE MANUAL

for

FIVE-VALVE

DUAL-WAVE A.C. RECEIVER

MANTEL MODEL C13B

(Incorporating Chassis Type C13B)

TECHNICAL SPECIFICATION

POWER SUPPLY:

200 to 250 volts 40 to 50 cycles.

CONSUMPTION:

43 Watts.

FREQUENCY RANGE:

Broadcast: 540 Kc/s to 1600 Kc/s.

Short-Wave: 16.5 Metres to 53 Metres.

I.F. FREQUENCY:

457.5 Kc/s.

VALVE COMPLEMENT:

6J8GA Converter. 6U7G I.F. Amplifier. 6B6G Demod., A.V.C., Audio Amp.
6V6GT Power Amp. 5Y3GT Rectifier.

DIAL LAMPS (2):

6.3 Volts. 0.15 to 0.3 amps.

LOUDSPEAKER:

5-inch Permagnet.
3.7 ohms voice coil impedance at 400 cycles.

DIMENSIONS:

Length	14 inches.
Depth	7 inches.
Height	$9\frac{3}{4}$ inches.

WEIGHT:

Gross	17 lbs.
Nett	$14\frac{1}{2}$ lbs.

CIRCUIT DESCRIPTION

This model comprises a 5-valve mains-operated superheterodyne receiver for broadcast and short-wave reception.

FREQUENCY CHANGER

The aerial, on the broadcast band, is coupled to the signal frequency circuit by means of the iron dust cored aerial transformer L1-L2. For short-wave reception the short-wave aerial transformer L5-L6 is switched into circuit.

A triode heptode V1 is employed as frequency changer. Fixed padding capacitors are used on both bands. A variable padding adjustment is provided on the broadcast band by means of an iron dust tuning bolt in the broadcast oscillator coil L3-L4.

I.F. AMPLIFIER

The converter valve is transformer coupled to a super control pentode V2. This valve is in turn transformer coupled to one diode section of a duo diode triode V3. Both I.F. transformers IFT1 and IFT2 are permeability tuned and have fixed tuning capacitors.

AVC-DEMOD-A.F. AMPLIFIER

The AVC potential for the converter and I.F. amplifier valves, V1 and V2, is obtained from the remaining diode of V3, which is capacity coupled to the primary of the second I.F. transformer IFT2. The action of this diode is delayed by the potential across the back bias resistor R4 in the high tension negative lead.

The demodulated signal across the diode load R6 is applied to the grid of the triode section V3 through the volume control VR1. Bias voltage is provided by the grid leak resistor R7.

Tone control is effected at this stage by means of switch S2, which gives normal and two bass conditions as required, by switching appropriate condensers in the volume control circuit.

Provision is made for the connection of a pick-up by means of two sockets marked "P.U." at the back of the chassis. Insertion of the pick-up plugs automatically suppresses radio reception and converts the demodulator diode filter resistor R5 into a load for the pick-up.

The audio amplifier is resistance capacity coupled to the grid of the beam power valve V4.

OUTPUT STAGE

This stage employs a beam power output tube V4. Negative feedback voltage is taken from the

secondary of the output transformer T2, and fed into the tap of the volume control VR1, through a resistor. This arrangement provides negative feedback over the whole of the audio frequency system. By advancing the volume control setting for higher gain, the feedback factor is reduced. A phasing network comprising a condenser in series with a resistor C29, R16, is connected across the primary of the output transformer.

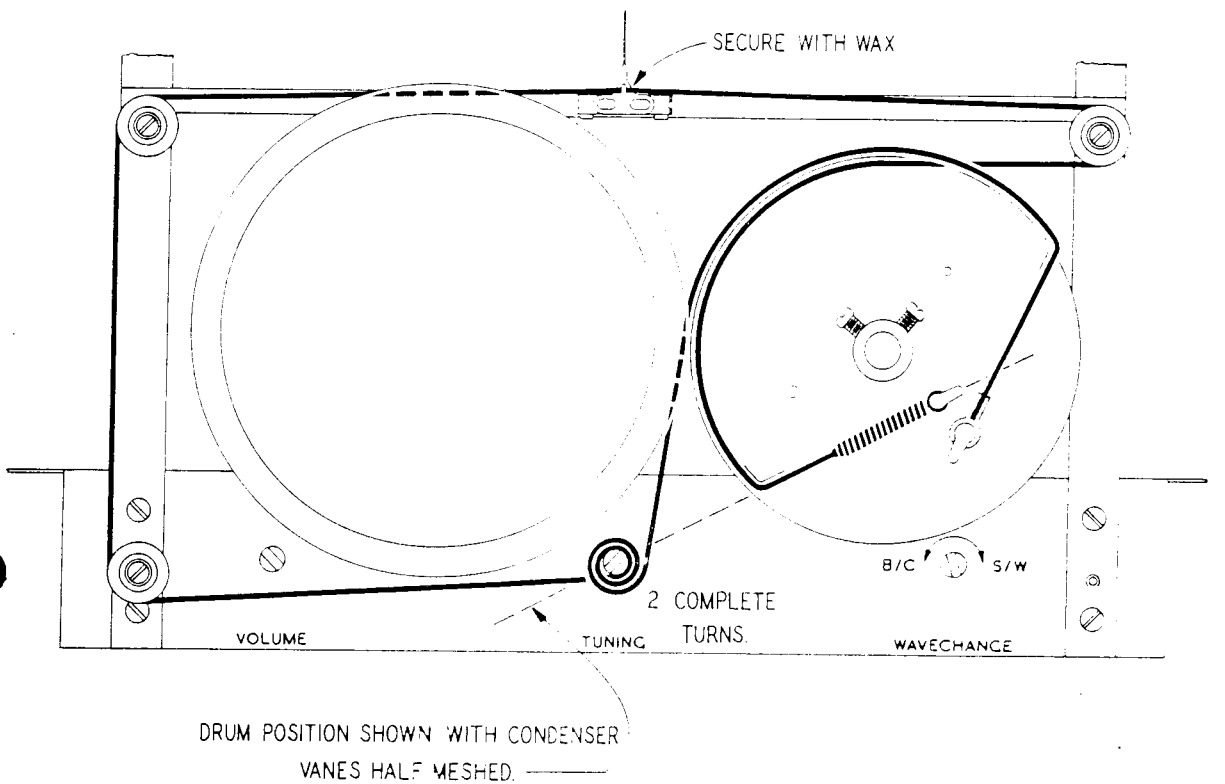
HIGH TENSION SUPPLY

The power supply employs a directly heated type high vacuum rectifier V5. The filter circuit consists of an iron cored choke CK1 and two electrolytic condensers C17 and C24.

DISMANTLING

REMOVAL OF CHASSIS

(1) Disconnect power plug from supply mains.
(2) Remove knobs.
(3) Remove two chassis fixing screws from back of cabinet.
(4) Withdraw chassis from cabinet.



— DIAL CORD ARRANGEMENT —

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 re-aligned. I.F. alignment should always precede R.F. alignment, and even if only one coil has been serviced, the whole of the re-alignment 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

(1) Rotate the volume control fully clockwise, set the wave change switch to "Broadcast" (anti-clockwise) position and fully enmesh the tuning condenser vanes. Connect the output leads of signal generator to the cap of the 6J8GA converter valve, through a 0.1 mF. condenser; do not remove grid lead of the converter valve.

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

(3) Adjust the I.F. transformer trimmer screws for maximum reading on 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 good alignment.

NOTE: If 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 core into the coil until resonance is obtained.

R.F. ALIGNMENT (BROADCAST)

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

(2) Check that when the gang condenser is fully meshed the pointer coincides with the setting line, marked "S," on the extreme left of the dial scale. If necessary, the pointer may be adjusted to this position by softening the wax securing the drive cord to the pointer carrier.

(3) Tune signal generator to 600 Kc/s.

(4) Rotate tuning knob until the pointer is exactly over 600 Kc/s calibration mark (second mark from the left on upper dial scale) and adjust the oscillator padder screw for maximum response.

(5) Rotate tuning knob until the pointer coincides with the 1500 Kc/s calibration mark (second mark from the right on the upper dial scale) and adjust the oscillator trimmer and aerial trimmer in turn for maximum response.

(6) Repeat operations (3) to (5) inclusive for proper alignment.

R.F. ALIGNMENT (SHORT-WAVE)

(1) Set wave change switch to "Short-Wave" (clockwise) position. Remove the 200 mmF. condenser from the output lead of the signal generator and replace with a 400 ohm non-inductive resistor; connect to the aerial terminal as before.

(2) Rotate tuning knob until the pointer coincides with the 17 metres calibration mark.

(3) Tune signal generator to 17 metres (17.65 Mc/s.).

(4) Adjust S-W oscillator trimmer for maximum output. Two settings will be found at which this trimmer will peak; care must be taken that the setting finally selected is that which gives the lower capacity (plunger further out). Failure to select the correct position of the two will cause serious tracking error and loss of sensitivity.

(5) Adjust S-W aerial trimmer for maximum output whilst "rocking" the gang condenser slightly to obtain the true resonance point.

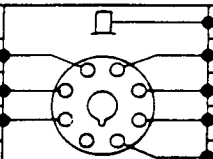
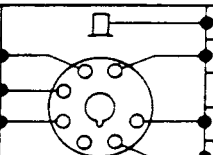
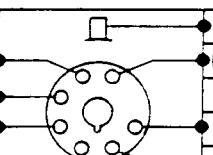
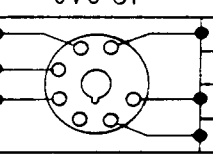
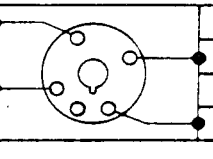
(6) Note that the signal is still tuned in correctly on the dial; if not, readjust S-W oscillator trimmer slightly until dial reads correctly, and repeat operation (5).

ADDITIONAL DATA

Any further service information desired may be obtained by addressing an enquiry to the "Service Department, The Gramophone Co. Ltd., 2 Parramatta Road, Homebush, N.S.W."

— VOLTAGE TABLE —

- VOLTAGES AND CURRENTS ARE WITH THE RECEIVER OPERATING ON AVERAGE MAINS VOLTAGE, AND TUNED TO A POINT OF NO RECEPTION ON THE BROADCAST 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	VALVE BASE LOOKING AT PINS	VALVE ELECTRODE	VOLTS TO CHASSIS	CURRENT MA.	RESISTANCE TO CHASSIS
			V1	6J8-GA	CONVERTER			
					GRID	——	——	3 MEG Ω
87	1·8	INFIN.	SCREEN GRID		OSC. GRID	——	——	50,000Ω
230	1·1	INFIN.	PLATE		OSC. PLATE	130	5	INFIN.
NIL	——	NIL	HEATER		HEATER	6·3 A.C.	450	——
			NO CONN.		CATHODE	NIL	8·1	NIL
			V2	6U7-G	I.F. AMPLIFIER			
					GRID	——	——	3 MEG Ω
87	1·65	INFIN.	SCREEN GRID		SUPPRESSOR	NIL	——	NIL
230	6·6	INFIN.	PLATE					
NIL	——	NIL	HEATER		HEATER	6·3 A.C.	300	——
87	——	INFIN.	NO CONN.		CATHODE	NIL	8·25	NIL
			V3	6B6-G	A.V.C.–DEMODULATOR–AUDIO			
					GRID	——	——	10 MEG Ω
——	——	0·28MEGΩ	DIODE # 2		DIODE # 1	——	——	1 MEG Ω
75	0·45	INFIN.	PLATE					
NIL	——	NIL	HEATER		HEATER	6·3 A.C.	300	——
			NO CONN.		CATHODE	NIL	0·45	NIL
			V4	6V6-GT	OUTPUT			
230	3	INFIN.	SCREEN GRID		GRID	——	——	0·6 MEG Ω
212	44	INFIN.	PLATE					
NIL	——	NIL	HEATER		HEATER	6·3 A.C.	450	——
			NO CONN.		CATHODE	11·5	47	250 Ω
			V5	5Y3-GT	RECTIFIER			
250 A.C.	——	270 Ω	PLATE # 1					
					PLATE # 2	250 A.C.	——	270 Ω
250	2 AMP A.C.	INFIN.	HEATER					
			NO CONN.		HEATER	250	——	INFIN.

REMARKS:-

UNFILTERED H.T. VOLTAGE	=	250	VOLTS
FILTERED H.T. VOLTAGE	=	230	VOLTS
TOTAL H.T. CURRENT	=	63·8	MA.
VOLTAGE ACROSS R4	=	3·5	VOLTS
RECTIFIER HEATER VOLTAGE	=	5	VOLTS

PARTS LIST

RESISTORS

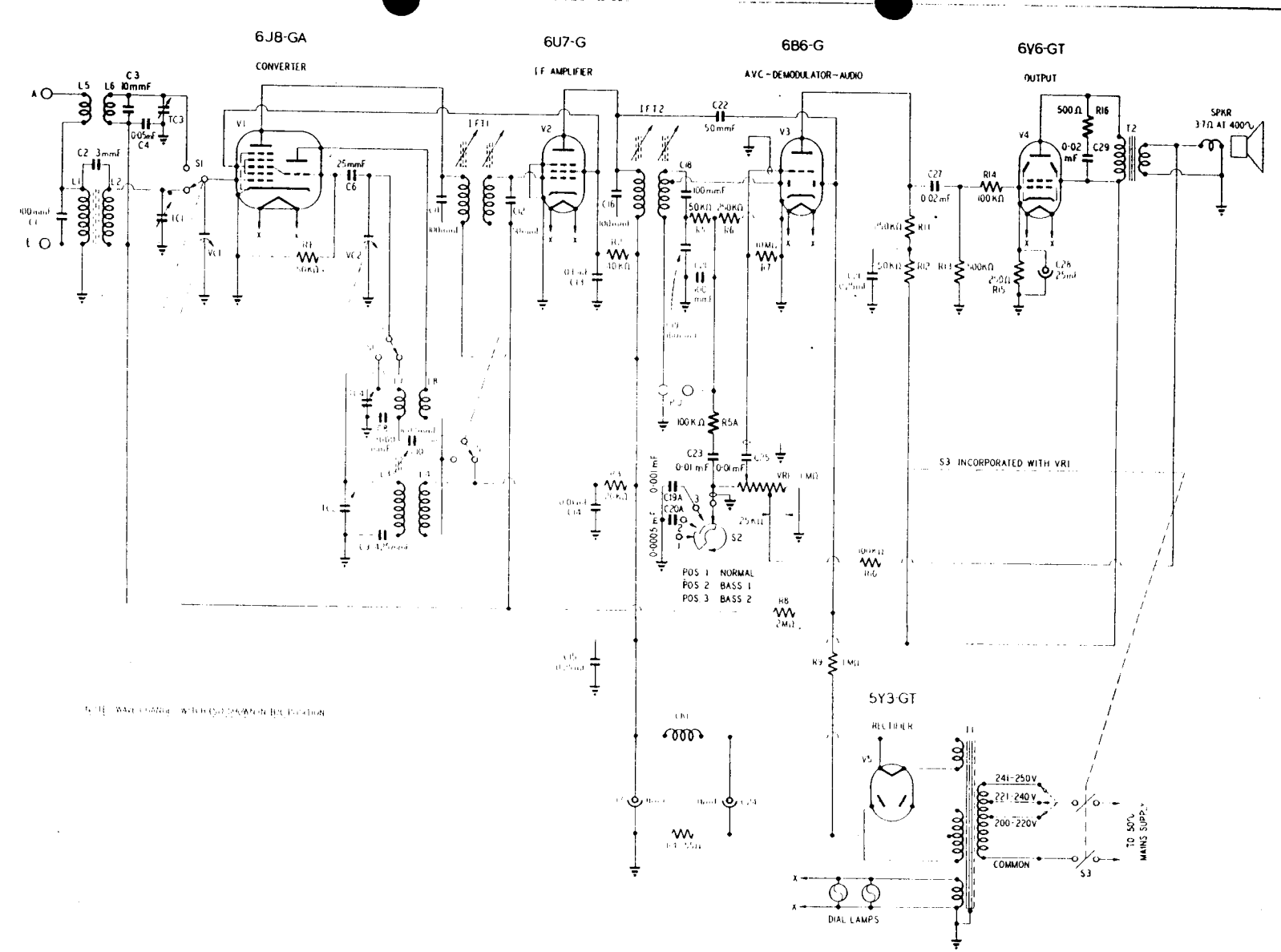
REF.	PART No.	DESCRIPTION
R1	H1X	50,000 ohms $\frac{1}{4}$ watt ± 10%
R2	S3X	40,000 ohms $\frac{1}{4}$ watt ± 10%
R3	V3X	20,000 ohms $\frac{1}{4}$ watt ± 10%
R4	DFW3X	55 ohms 1 watt ± 10%
R5	H2X	50,000 ohms $\frac{1}{2}$ watt ± 10%
R5A	J2X	100,000 ohms $\frac{1}{2}$ watt ± 10%
R6	N1X	250,000 ohms $\frac{1}{4}$ watt ± 10%
R7	AB3X	10 megohms 1 watt ± 10%
R8	AA1X	2 megohms $\frac{1}{4}$ watt ± 10%
R9	P1X	1 megohm $\frac{1}{4}$ watt ± 10%
R10	J1X	100,000 ohms $\frac{1}{4}$ watt ± 10%
R11	N3X	250,000 ohms 1 watt ± 10%
R12	H3X	50,000 ohms 1 watt ± 10%
R13	O1X	500,000 ohms $\frac{1}{4}$ watt ± 10%
R14	J1X	100,000 ohms $\frac{1}{4}$ watt ± 10%
R15	ZW3X	250 ohms 1 watt ± 10%
R16	BW2X	500 ohms $\frac{1}{2}$ watt ± 10%

CONDENSERS

REF.	PART No.	DESCRIPTION
C1	D0243P	100 mmF. ± 10%
C2	D0243BU	3 mmF. ± 0.5 mmF.
C3	D4405C	10 mmF. ± 10%
C4	C0013M	.05 mF. 200V. wkg.
C5	Deleted	
C6	D0243BE	25 mmF. ± 10%
C7	Deleted	
C8	D0243E	3000 mmF. ± 100 mmF.
C9	D0243CW	425 mmF. ± 5 mmF.
C10	D4405A	1000 mmF. ± 10%
C11	D4405W	100 mmF. ± 5%
C12	D4405X	50 mmF. ± 5%
C13	C0013E	.1 mF. 400V. wkg.
C14	C0013N	.01 mF. 600V. wkg.
C15	C0013C	.25 mF. 400V. wkg.
C16	D4405W	100 mmF. ± 5%
C17	C0014CB	16 mF. 525 PV.
C18	D4405W	100 mmF. ± 5%
C19	D0243P	100 mmF. ± 10%
C19A	D0243K	.001 mF. ± 10%
C20	Deleted	
C20A	D0243L	500 mmF. ± 10%
C21	D0243P	100 mmF. ± 10%
C22	D4405F	50 mmF. ± 10%
C23	C0013N	.01 mF. 600V. wkg.
C24	C0014BZ	16 mF. 525 PV.
C25	C0013N	.01 mF. 600V. wkg.
C26	C0013C	.25 mF. 400V. wkg.
C27	C0013I	.02 mF. 400V. wkg.
C28	C0014CC	25 mF. 40 PV.
C29	C0013S	.02 mF. 600V. wkg.

MISCELLANEOUS

REF.	PART No.	DESCRIPTION
VC1-2	D1993 D2297	2 Gang Condenser with Dial Glass or
	D2399 D2401	2 Gang Condenser with Dial Glass
VR1	D2522	1 Megohm Potentiometer tapped at 25,000 ohms incorp. a mains switch
S1	D2268	3-pole 2-position Switch
S2	D2626	Single pole 3 position Switch
IFT.1	D2278	1st I.F. Transformer
IFT.2	D2238	2nd I.F. Transformer
		Dial Lamps. 6.3 V., 0.25 amp. S.C. Lamp
T1	D2279	Mains Transformer
T2	D2236	Output Transformer
CK.1	D2237	H.T. Filter Choke
L1-2	D1614F	B/C Aerial Coil
L3-4	D2275	B/C Osc. oil
L5-6	D2451	S/W Aerial Coil
L7-8	D2452	S/W Osc. Coil
TC.1	D2395	Trimmer Condenser
TC.2	D2395	Trimmer Condenser
TC.3	D2395	Trimmer Condenser
TC.4	D2395	Trimmer Condenser
Spkr.	C0315 or C0391	5in. Speaker
	D2011A	Dial Pointer
	D2416	Dial Cord
	D0873	Cord Spring
	D2009	Control Knob
	D2506	Dial Glass



CIRCUIT DIAGRAM OF MODEL C13B, INCORPORATING CHASSIS TYPE C13B.