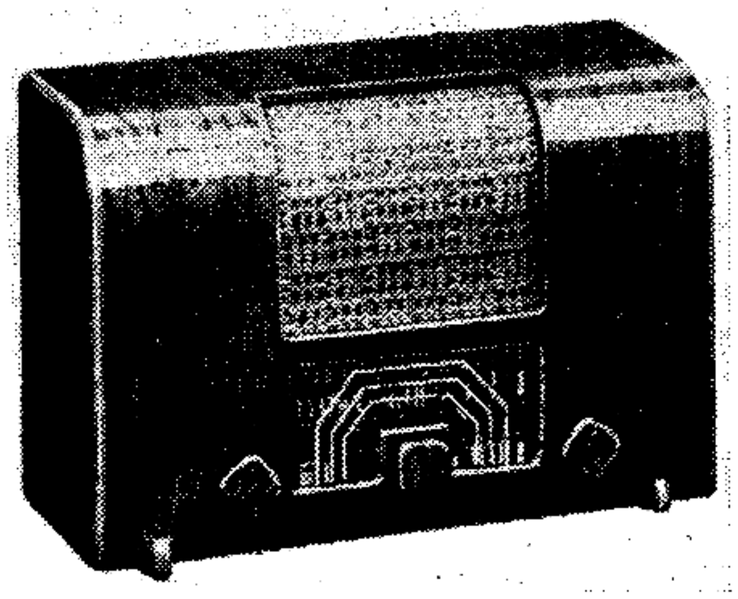
BELMONT 650

AC/DC MIDGET SUPERHET



THE Belmont 650 is a 4-valve (plus rectifier) 3-band midget superhet, designed for use with AC or DC mains of 200-260 V, 40-100 C/S in the case of AC. The SW range is 16-55 m.

Release date : *April*, 1938.

CIRCUIT DESCRIPTION

Aerial input via **C1, C2,** which form a potential divider, and coil **L3** to single tuned circuits **L4, C23** (SW), **L5, C23** (MW) and **L6, C23** (LW) which precede heptode frequency changer valve **(V1, 6A8G).** Oscillator grid coils **L7** (SW), **L8** (MW) and **L9** (LW) are tuned by **C24.** Parallel trimming by **C27** (SW), **C25** (MW) and **C26** (LW); series tracking by **C5** (SW), **C28** (MW) and **C29** (LW). Reaction by **L10** (SW) and common impedance of trackers **C28** (MW) and **C29** (LW).

Second valve **(V2, 6U7G)** is a variable-mu RF pentode operating as IF amplifier with tuned-primary, tuned-secondary transformer couplings.

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve **(V3, 6Q7G),** in which the diodes are strapped together. Audio frequency output is developed across load resistance **R11** and passed via **C11** and manual volume control **R10** to CG of triode section.

DC potential across **R11** is fed back as GB to FC and IF valves, giving AVC.

Resistance-capacity coupling by **R13, C14, R14** between **V3** triode and pentode output valve **(V4, 25A6G).** Fixed tone correction by **C15,** and provision for connection of high impedance external speaker, in anode circuit.

When operating with AC mains, HT current is supplied by rectifying valve operating as half-wave rectifier **(V5, 25Z6G)** which, with DC mains, behaves as a low resistance. Smoothing by speaker field **L16** and electrolytic condensers **C17, C18.**

Valve heaters, together with scale lamps, and ballast resistances **R17, R18, R19,** are connected in series across mains input.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with AC mains of 237 V.

The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a Model 7 Universal Avometer, chassis being negative.

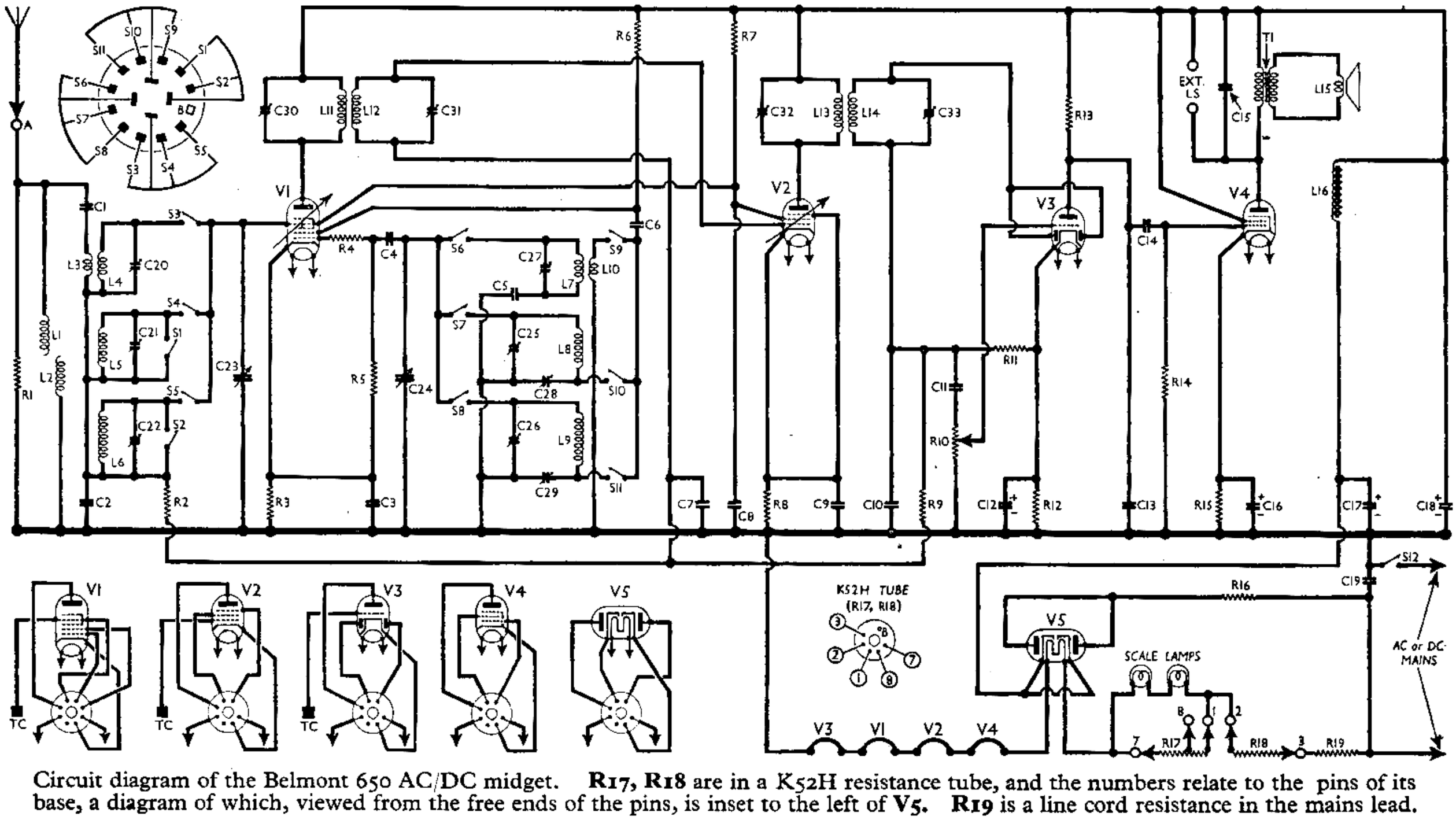
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A8G	143	2·4	60	3·0
	Oscillator			
	103	3·5		
V2 6U7G	143	4.3	60	1·0
V3 6Q7G	27	0·2	—	—
V4 25A6G	126	41.0	143	9·2
V5 25Z6G	259†	—	—	—

† Cathode to chassis, DC.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt ...	25,000
R2	V1 tetrode CG decoupling	500,000
R3	V1 fixed GB resistance ...	500
R4	V1 osc. CG stabiliser ...	150
R5	V1 osc. CG resistance ...	50,000
R6	V1 osc. anode HT feed ...	10,000
R7	V1, V2 SG's HT feed ...	25,000
R8	V2 fixed GB resistance ...	500
R9	AVC line decoupling ...	500,000
R10	Manual volume control ...	500,000
R11	V3 diode load resistance	500,000
R12	V3 triode GB	10,000
R13	V3 triode anode load ...	500,000
R14	V4 CG resistance... ...	500,000
R15	V4 GB resistance... ...	500
R16	V5 anode surge limiter ...	50
R17	Scale lamps shunt ...	20†
R18	Heater circuit ballast ...	135†
R19	Line cord resistance ...	360

† In K52H tube; measured cold.



Circuit diagram of the Belmont 650 AC/DC midget. **R17, R18** are in a K52H resistance tube, and the numbers relate to the pins of its base, a diagram of which, viewed from the free ends of the pins, is inset to the left of **V5.** **R19** is a line cord resistance in the mains lead.

CONDENSERS		Values (μF)
C1, C2	Aerial coupling potential divider	0·0025, 0·0024
C3	V1 cathode by-pass	0·1
C4	V1 osc. CG condenser	0·00012
C5	Osc. circ. SW tracker	0·0014
C6	V1 anode coupling	0·0025
C7	V2 CG decoupling	0·05
C8	V1, V2 SG's decoupling	0·1
C9	V2 cathode by-pass	0·1
C10	IF by-pass	0·00025
C11	AF coupling to V3 triode	0·01
C12*	V3 cathode by-pass	5·0
C13	IF by-pass	0·0006
C14	V3 triode to V4 coupling	0·01
C15	Fixed tone corrector	0·01
C16*	V4 cathode by-pass	5·0
C17*, C18*	HT smoothing condensers	10·0, 8·0
C19	Mains RF by-pass	0·1
C20‡	Aerial circ. SW trimmer	—
C21‡	Aerial circ. MW trimmer	—
C22‡	Aerial circ. LW trimmer	—
C23†	Aerial circuit tuning	—
C24†	Oscillator circuit tuning	—
C25‡	Osc. circ. MW trimmer	—
C26‡	Osc. circ. LW trimmer	—
C27‡	Osc. circ. SW trimmer	—
C28‡	Osc. circ. MW tracker	—
C29‡	Osc. circ. LW tracker	—
C30‡	1st IF trans. pri. tuning	—
C31‡	1st IF trans. sec. tuning	—
C32‡	2nd IF trans. pri. tuning	—
C33‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1, L2	Aerial circuit shunt coils	—
L3	Aerial SW coupling coil	0·25
L4	Aerial SW tuning coil	Very low
L5	Aerial MW tuning coil	4·5
L6	Aerial LW tuning coil	14·5
L7	Osc. SW tuning coil	Very low
L8	Osc. MW tuning coil	8·0
L9	Osc. LW tuning coil	1·5
L10	Osc. SW reaction coil	0·25
L11	1st IF trans. Pri.	3·0
L12	1st IF trans. Sec.	3·0
L13	2nd IF trans. Pri.	16·5
L14	2nd IF trans. Sec.	15·0
L15	Speaker speech coil	3·0
L16	Speaker field coil	1,500·0
T1	Speaker input trans. Pri.	300.0
	Speaker input trans. Sec.	0·8
S1–S11	Waveband switches	—
S12	Mains switch, ganged R10	—

GENERAL NOTES

Switches.—S1-S11 are the waveband switches, in a single rotary unit beneath the chassis. A diagram of the unit, as seen when viewed from the rear of the underside of the chassis, appears in the top left-hand corner of the circuit diagram, while the table (next col.) gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C,** closed.

S12 is the QMB mains switch, ganged with the volume control **R10.**

Switch Table

Switch	SW	MW	LW
S1	—	—	C
S2	—	C	—
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C

Coils.—All the RF and oscillator coils **L3-L10** are mounted in a separable unit at one end of the chassis, and can be detached from the chassis if the six wires connecting it to the chassis proper are unsoldered, and four fixing screws are removed. **L1, L2** are mounted on the rear member, near the aerial socket.

Scale Lamps.—These are two Tre Vita MES types, with tubular bulbs, rated at 6 V, 0.15 A. They are shunted across resistance **R17,** which forms part of the K52H resistance tube.

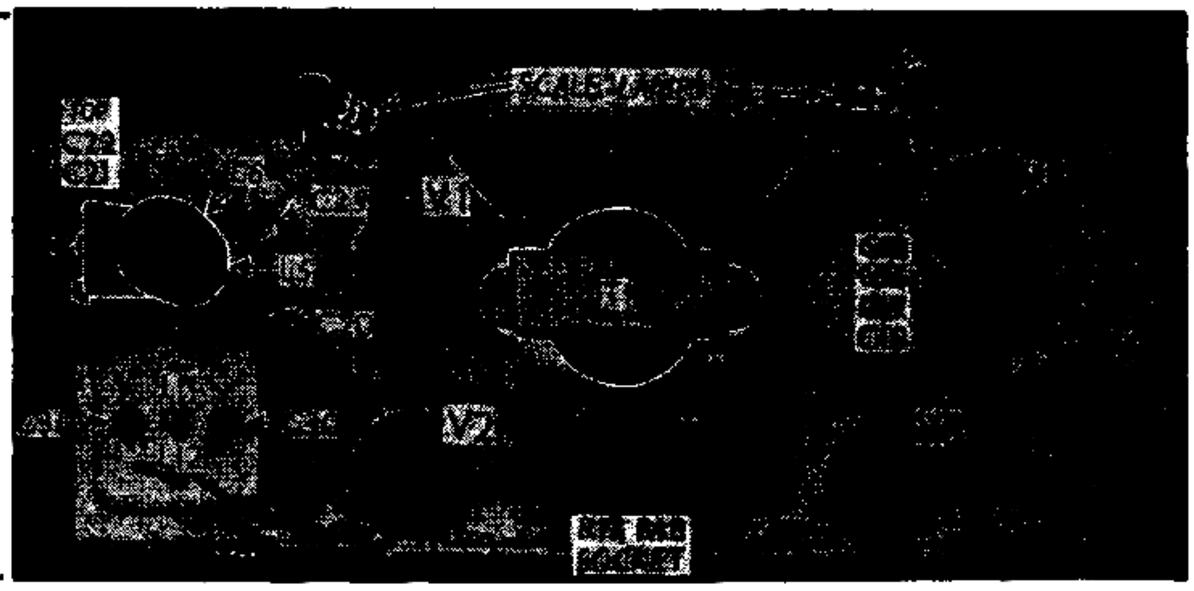
K52H Tube.—This is a metal cased resistance tube, mounted on a universal octal valve base, a diagram of which, viewed from the free ends of the pins, is inset just above the heater chain in the circuit diagram. The whole unit operates as part of the heater circuit ballast resistance, the remainder being the line cord, and the scale lamps are shunted across part of it. This part **(R17)** is connected internally to pins 1, 8 and 7 of the base; the rest **(R18)** is connected between pins 2 and 3. Pins 1 and 2 are unconnected in the tube, but are connected together on the socket. Pin 6 is blank.

R19.—This is the line cord, connected in series with the K52H tube. It drops half the applied mains voltage, and forms part of the heater circuit ballast. The resistance element is wound round the black insulated mains lead conductor, and is insulated by asbestos, which is also wound round the conductor, and is terminated at the receiver end of the mains lead by a blue lead which emerges from the mains lead.

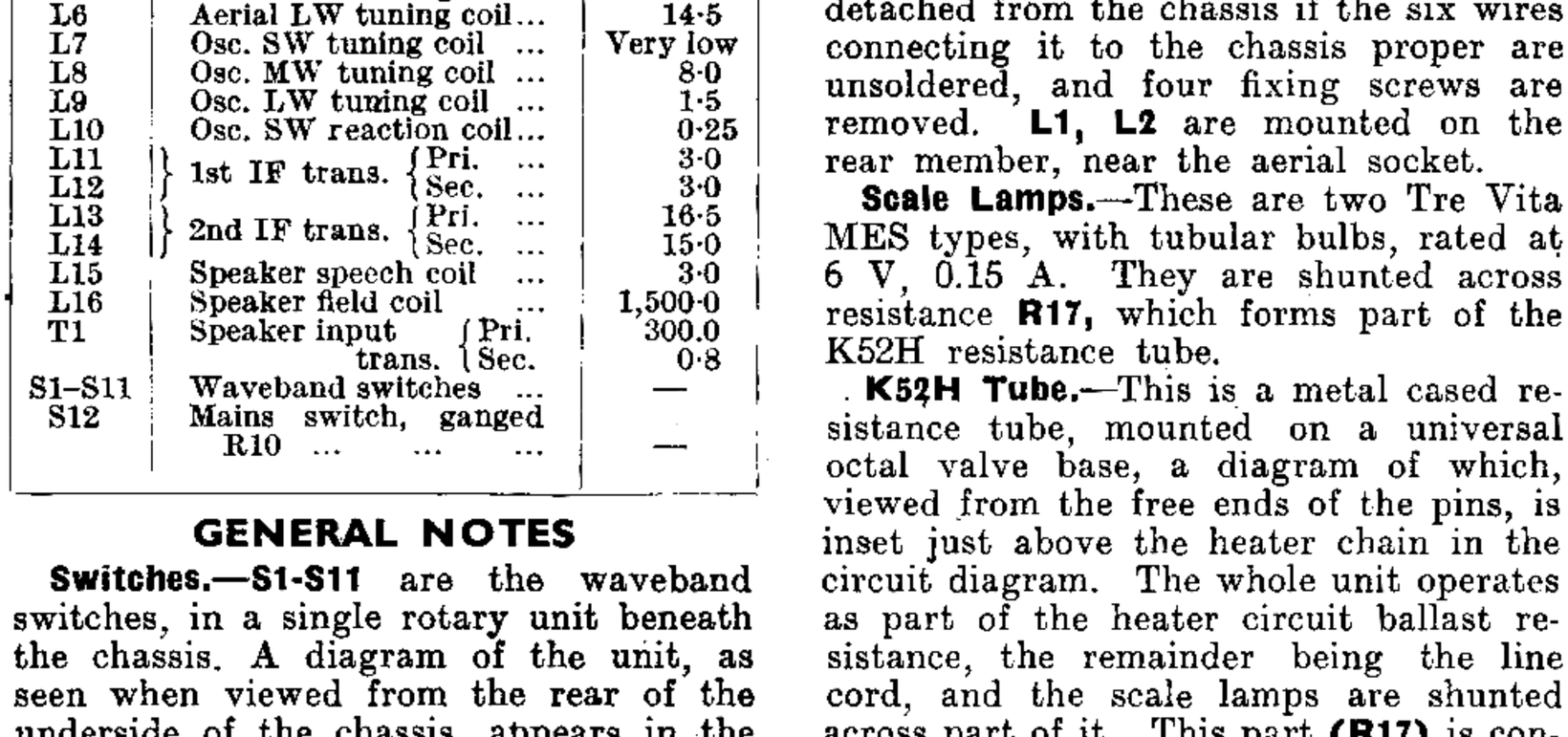
C12, C16, C17, C18.—These are four dry electrolytics in a single cardboard tubular container. The red lead is the positive of **C17** (10 μF), the yellow is the positive of **C18** (8 μF), and the two green leads the positives of **C12** and **C16** (both 5 μF). **C17** and **C18** are rated at 250 V working, and their common negative lead is black; **C12** and **C16** are rated at 50 V working, and their common negative lead is brown.

A. and E. Sockets.—Our chassis was fitted with a panel on which these were mounted, each being identified by engraved lettering. The earth socket was, however, not connected to the circuit.

External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (4,000-5,000 O) external speaker, whose leads would be "live" to the mains. A low impedance type (4-8 O) could be connected to the speech coil tags on **T1** secondary.



Plan view of the chassis. The K52H holder is indicated, and marked "**R17, R18** socket." **T1** is mounted on the speaker magnet.



Under-chassis view. **R19** is the line cord, located in the mains lead.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW, turn the volume control to maximum, and the gang to minimum. Connect signal generator leads to control grid (top cap) of **V2** and, via a 0.1 μF condenser, chassis. Feed in a 465 KC/S (645.16 m.) signal, and adjust **C32** and **C33** for maximum output. Transfer signal generator lead to control grid (top cap) of **V1,** and adjust **C30** and **C31** for maximum output.

RF and Oscillator Stages.—Transfer "live" signal generator lead to aerial socket, via a suitable dummy aerial. With the gang at either end of its travel, the pointer should be horizontal.

SW.—Switch set to SW, tune to 19 m. on scale, feed in a 19 m (15.8 MC/S) signal, and adjust **C27** for maximum output, using the peak involving the lesser trimmer capacity. Tune to 20 m on scale, feed in a 20 m (15 MC/S) signal, and adjust **C20** for maximum output. Check calibration at 50 m and 43 m (6 MC/S and 7 MC/S).

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust **C25** for maximum output. Tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust **C21** for maximum output. Feed in 500 m (600 KC/S) signal, tune it in, and adjust **C28** for maximum output, while rocking the gang for optimum results. Repeat until no further improvement results.

LW.—Switch set to LW, tune to 1,090 m on scale, feed in 1,090 m (275 KC/S) signal, and adjust **C26, C22** for maximum output. Feed in a 1,710 m (175 KC/S) signal, tune it in, and adjust **C29** for maximum output, while rocking the gang for optimum results.

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