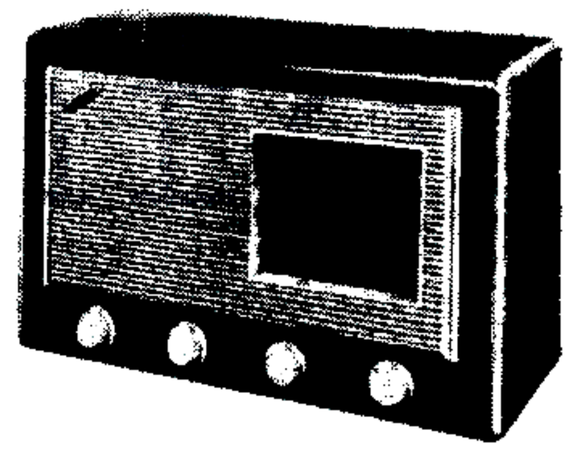
BEETHOVEN
U3038



DESIGNED to operate from A.C. or D.C. mains of 190-250 V, the Beethoven U3038 is a 3-valve (plus rectifier) 3-band superhet whose S.W. range is 15-51.5 m. Most chassis are fitted with end-frame supports to permit the chassis to be stood in any position.

Release date and original price: October, 1947; £17 17*s*. *plus purchase tax.*

CIRCUIT DESCRIPTION

Aerial input, via isolating capacitor **C1**, is inductively coupled by **L1** to single-tuned circuit **L2, C35** on S.W., and capacitatively "bottom" coupled by **C3** to single-tuned circuits **L3, C35** (M.W.) and **L4, C35** (L.W.).

First valve **(V1, Mullard metallized CCH35)** is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L5** (S.W.), **L6** (M.W.) and **L7** (L.W.) are tuned by **C36,** with parallel trimming by **C37** (S.W.), **C38** (M.W.) and **C39** (L.W.) and series tracking by **C10** (S.W.), **C11** (M.W.), and **C12** (L.W.). Reaction coupling from anode, via **C13,** is obtained from the common impedance of the trackers on all bands, with inductive coupling by **L8** on S.W.

Second valve **(V2, Mullard metallized EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings.

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode pentode output valve **(V3, Mullard metallized CBL31).** Audio frequency component in rectified output is developed across load resistor **R12** and passed via A.F. coupling capacitor **C22,** manual volume control **R14,** and grid stopper **R15** to C.G. of pentode section. I.F. filtering by **C18, R11, C19** in diode circuit, and **R15** in **V3** pentode C.G. circuit, and provision for the connection of a gramophone pick-up across **R14,** via isolating capacitors **C23, C24.**

Second diode of **V3,** fed from **V2** anode via **C21,** provides D.C. potential which is developed across **R19** and fed back through a decoupling circuit as G.B. to F.C. and I.F. valves, giving A.V.C. Delay voltage, together with G.B. for pentode section, is obtained from the voltage drop across **R17, R18** in **V3** cathode lead.

When the receiver is operating from A.C. mains, H.T. current is supplied by I.H.C. half-wave rectifying valve **(V4, Mullard CY31)** which, with D.C. mains, behaves as a low resistance.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. Their receiver was operating from A.C. mains of 220 V, using the 210-220 V tapping on the heater ballast resistor, and was tuned to the highest wavelength on the M.W. band, but there was no signal input. Voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection.

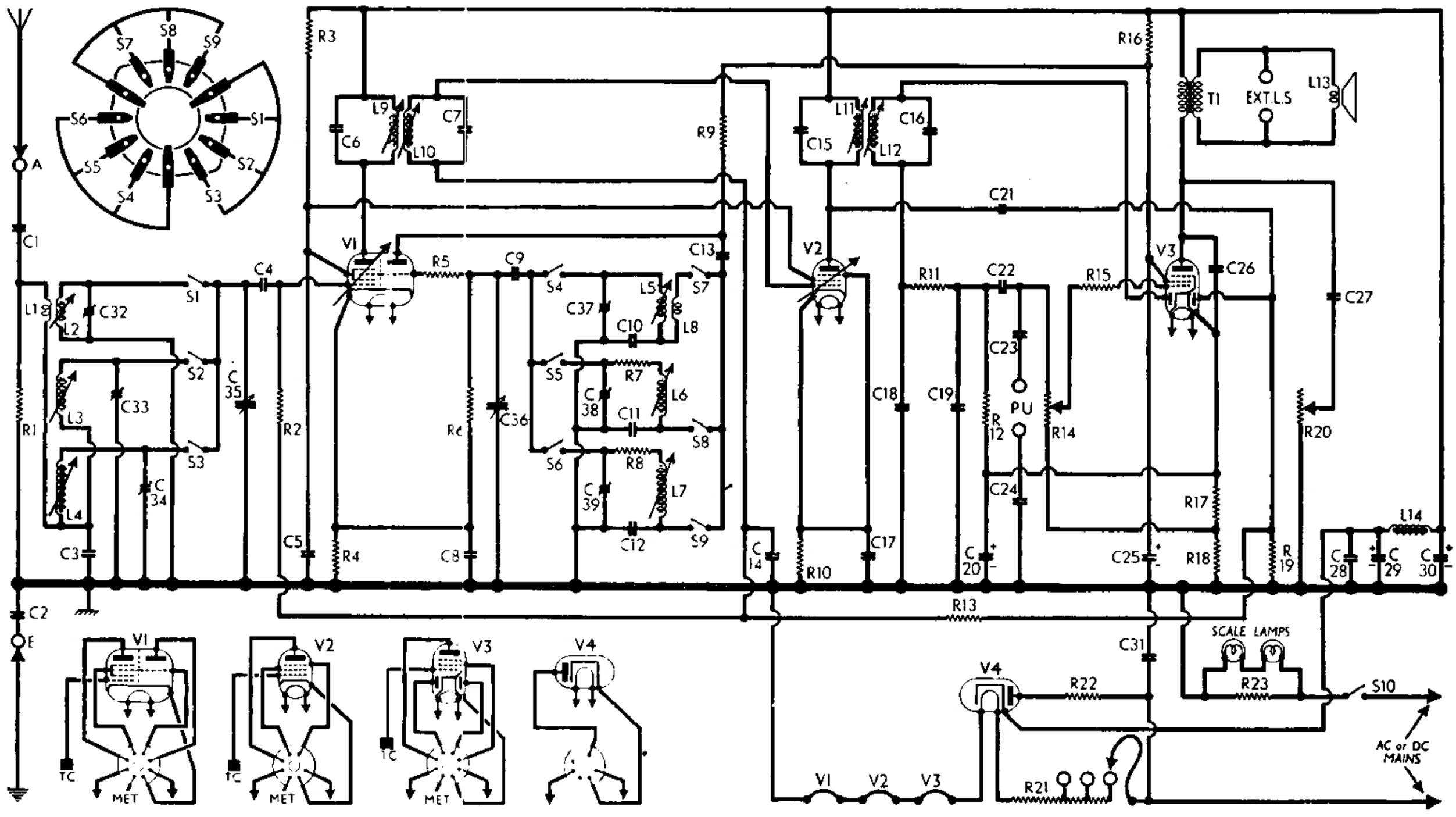
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 CCH35	208	5·0	100	1·6
	Oscillator			
	80	4·0		
V2 EF39	208	6·0	100	1·8
V3 CBL31	195	40·0	180	5·0
V4 CY31†	—	—	—	—

† Cathode to chassis, 225V. D.C.

COMPONENTS AND VALUES

	RESISTORS	Values (ohms)	Location
R1	Aerial Shunt ...	10,000	G3
R2	V1 hex. C.G. ...	1,000,000	B2
R3	S.G.'s H.T. feed ...	33,000	H4
R4	V1 fixed G.B. ...	220	H3
R5	Osc. C.G. stopper...	20	H3
R6	V1 osc. C.G. ...	47,000	H3
R7	Osc. M.W. stabilizer	50	G3
R8	Osc. L.W. stabilizer	180	F3
R9	Osc. H.T. feed ...	20,000	H3
R10	V2 fixed G.B. ...	270	H4
R11	I.F. stopper ...	33,000	F4
R12	Signal diode load...	470,000	F4
R13	A.V.C. decoupling	1,200,000	G4
R14	Volume control ...	1,000,000	F3
R15	V3 C.G. stopper ...	47,000	C2
R16	H.T. feed resistor...	6,800	F4
R17	V3 G.B., and A.V.C. delay resistors...	180	F3
R18		180	E3
R19	A.V.C. diode load...	1,200,000	F4
R20	Tone control ...	50,000	E3
R21	Heater ballast ...	625*	D2
R22	V4 surge limiter ...	100	F4
R23	Scale lamp shunt...	100	D2

* Tapped at 525Ω + 50Ω + 50Ω from V4 heater.



Circuit diagram of the Beethoven U3038 A.C. D.C. superhet, with the waveband switch unit diagram inset at the top left-hand corner.

	CAPACITORS	Values (μF)	Location
C1	Aerial isolator ...	0·1	G3
C2	Earth isolator ...	0·1	G4
C3	Aerial coupling ...	0·002	H3
C4	V1 hex. C.G. ...	0·0001	B2
C5	S.G.'s decoupling...	0·1	H3
C6	1st I.F. transformer tuning	0·0001	A2
C7	1st I.F. transformer tuning	0·0001	A2
C8	V1 cath. by-pass...	0·1	H3
C9	V1 osc. C.G. ...	0·0001	H3
C10	S.W. tracker ...	0·005	F3
C11	M.W. tracker ...	0·000335	G3
C12	L.W. tracker ...	0·00013	G3
C13	Osc. anode coup....	0·01	H3
C14	A.V.C. decoupling	0·1	G4
C15	2nd I.F. trans. tuning	0·0001	B2
C16	2nd I.F. trans. tuning	0·0001	B2
C17	V2 cath. by-pass ...	0·1	H4
C18	I.F. by-pass capacitors	0·00015	F4
C19	I.F. by-pass capacitors	0·00015	F4
C20*	V3 cath. by-pass ...	25·0	F3
C21	A.V.C. coupling ...	0·00001	B2
C22	A.F. coupling ...	0·02	F3
C23	P.U. isolating capacitors	0·01	F3
C24	P.U. isolating capacitors	0·01	G4
C25*	H.T. decoupling ...	4·0	F3
C26	Tone corrector ...	0·002	F4
C27	Tone control ...	0·05	F3
C28	H.T. R.F. by-pass	0·01	E3
C29*	H.T. smoothing capacitors	16·0	D1
C30*	H.T. smoothing capacitors	16·0	D1
C31	Mains R.F. by-pass	0·01	F4
C32‡	Aerial S.W. trim....	0·00003	G3
C33‡	Aerial M.W. trim.	0·00003	G3
C34‡	Aerial L.W. trim....	0·000075	G3
C35†	Aerial tuning ...	0·000442	B2
C36†	Oscillator tuning...	0·000442	B1
C37‡	Osc. S.W. trim. ...	0·00003	G3
C38‡	Osc. M.W. trim. ...	0·00003	G3
C39‡	Osc. L.W. trim. ...	0·000075	G3

* Electrolytic. † Variable. ‡ Pre-set.

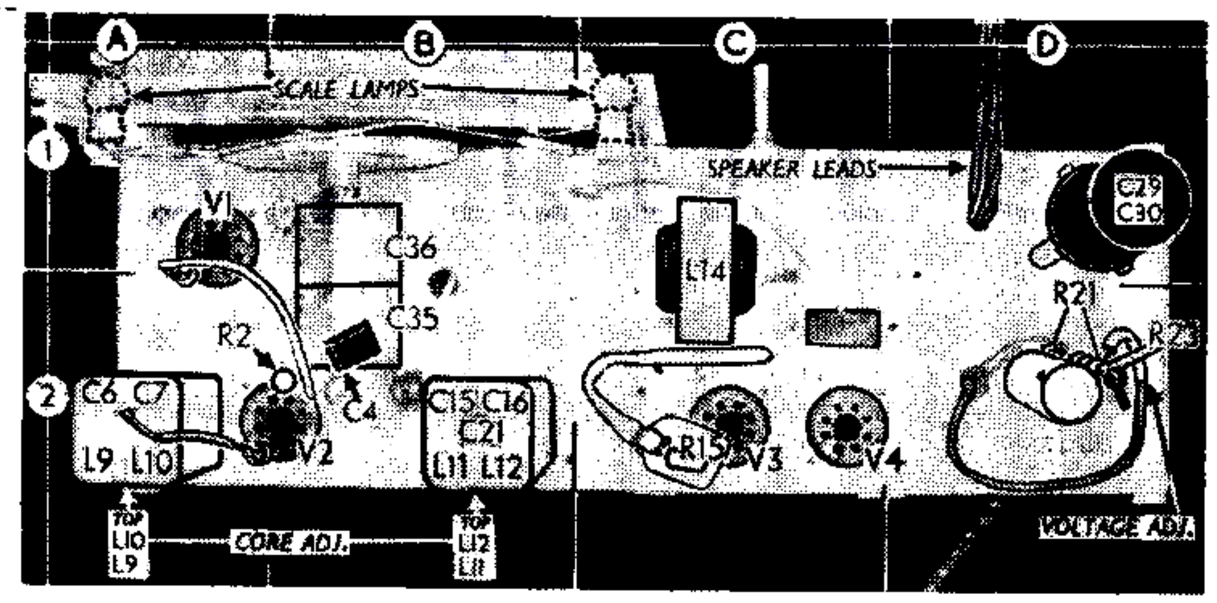
	OTHER COMPONENTS		Approx. Values (ohms)	Location
L1	Aerial S.W. coup.		0·2	G3
L2	Aerial tuning coils		Very low	G3
L3	Aerial tuning coils		2·5	G3
L4	Aerial tuning coils		20·0	G3
L5	Oscillator tuning coils		Very low	G3
L6	Oscillator tuning coils		3·0	G3
L7	Oscillator tuning coils		7·0	F3
L8	Osc. S.W. reaction		0·1	G3
L9	1st I.F. trans.	Pri.	7·0	A2
L10	1st I.F. trans.	Sec.	7·0	A2
L11	2nd I.F. trans.	Pri.	7·0	B2
L12	2nd I.F. trans.	Sec.	5·0	B2
L13	Speech coil ...		2·3	—
L14	H.T. choke ...		230·0	C1
T1	Speaker trans.	Pri. ...	500·0	—
	Speaker trans.	Sec. ...	0·1	—
S1–S9	Waveband switches		—	G3
S10	Mains sw. g'd R14		—	F3

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (two recessed grub screws each) from the front of the cabinet, and the four chassis-retaining screws (with large metal washers) from the underside of the cabinet.

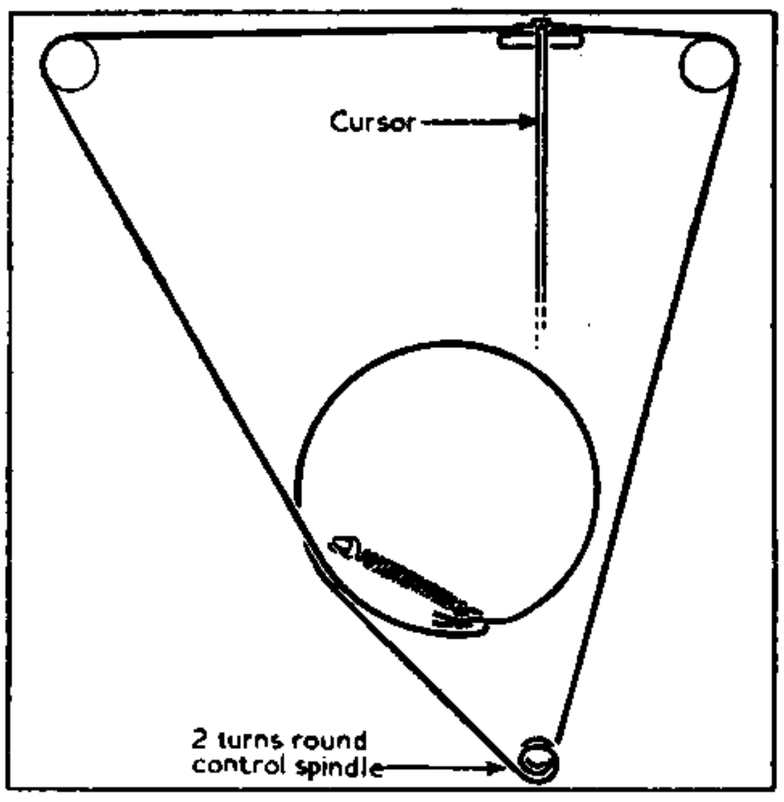
When replacing, the four speaker leads should be reconnected as follows, numbering the tags on the speaker input transformer from left to right when viewed from the rear: 1, yellow; 2, red; 3, black; 4, blue. The transformer should be at the top.

Plan view of the chassis. **R21** is the heater circuit ballast resistor unit, which carries also the scale lamp shunt resistor **R23**.



GENERAL NOTES

Switches.—S1-S9 are the waveband switches, in a 3-position rotary unit beneath the chassis. The unit is indicated in our under-chassis view.



Sketch of the tuning drive system, as seen from the front.

and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram, where it is drawn as seen from the rear of an inverted chassis.

The action of the switches is obvious from the diagram, and no table is given.

Scale Lamps.—These are two Osram M.E.S. types, with small clear spherical bulbs, rated at 6.5 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 2.5Ω) external speaker.

Drive Cord Replacement.—The sketch (col. 2) shows the course taken by the tuning drive cord as seen when viewed from the front of the receiver, neglecting obstructions such as the scale backing-plate and chassis member, with gang at maximum.

Four feet of nylon braided glass cord provides ample length with sufficient to spare for tying off. The sketch is self explanatory, but it is helpful to remove the glass scale panel (four self-tapping screws with moulded spacing collars).

Chassis Divergencies.—R9 is shown in the makers' diagram connected directly to the H.T. positive line, instead of to **V3** screen. Where it is so connected, its value is 33,000Ω. On some chassis, the values of **C22** and **C23** may be transposed. The D.C. resistance of **T1** primary may vary between 350Ω and 500Ω, and **R1** may be reduced from 10,000Ω to 2,000Ω.

CIRCUIT ALIGNMENT

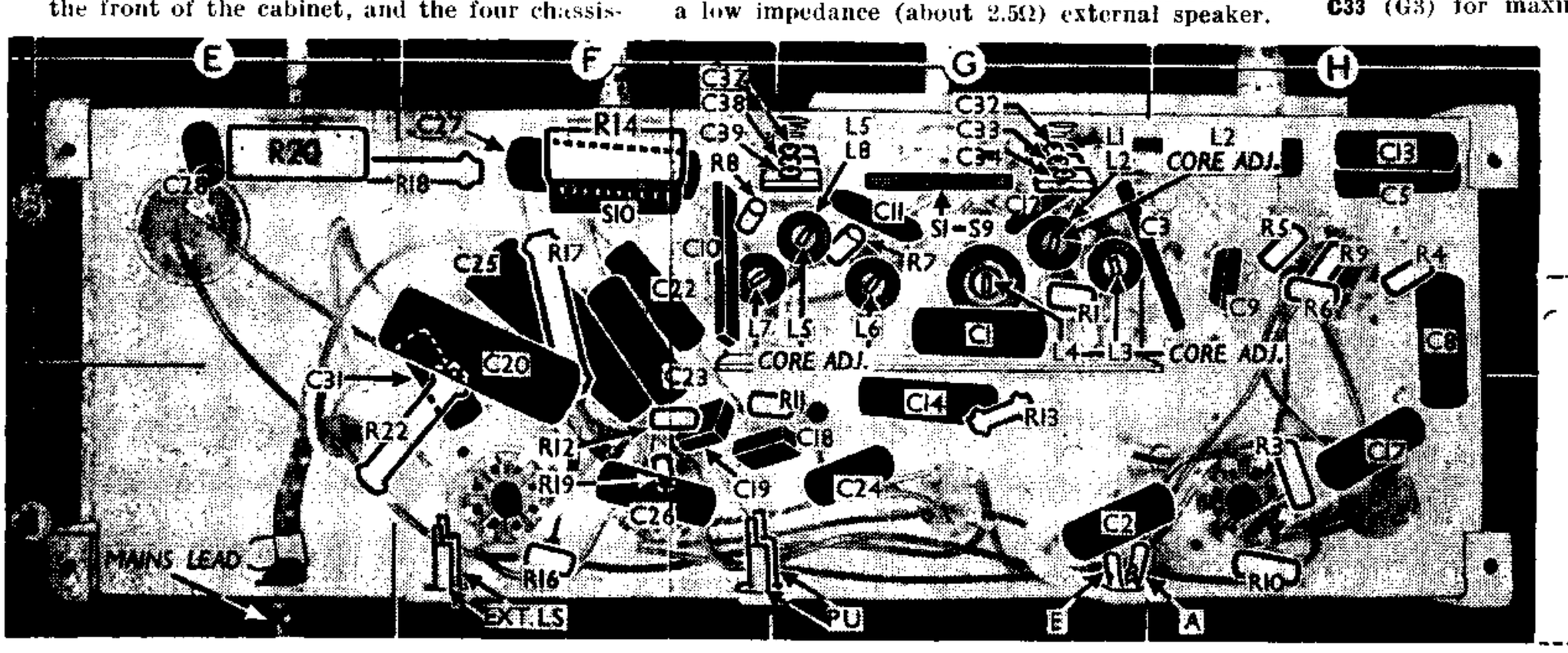
I.F. Stages.—Switch set to M.W., turn volume control to maximum and gang to minimum capacitance, and connect signal generator, via an 0.1 μF capacitor in each lead, to control grid (top cap) of **V1** and **E** socket. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L9, L10, L11** and **L12** (location references A2, B2) for maximum output.

R.F. and Oscillator Stages.—With the gang at maximum capacitance the cursor should coincide with the transparent vertical rectangles at the high wavelength ends of the three scales. It may be adjusted in position by slackening the screw clamping the cursor carriage to the drive cord. Transfer "live" signal generator lead to **A** socket, via a suitable dummy aerial.

L.W.—Switch set to L.W., tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal, and adjust the cores of **L7** (F3) and **L4** (G3) for maximum output. Tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C39** and **C34** (G3) for maximum output. Check calibration at 2,000 m and repeat adjustments if necesssary.

M.W.—Switch set to M.W., tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust the cores of **L6** and **L3** (G3) for maximum output. Tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust **C38** and **C33** (G3) for maximum output.

S.W.—Switch set to S.W., tune to 6 Mc/s on scale, feed in a 6 Mc/s (50 m) signal, and adjust the cores of **L5** and **L2** (G3) for maximum output. Tune to 19 Mc/s on scale, feed in a 19 Mc/s (15.78 m) signal, and adjust **C37** and **C32** (G3) for maximum output.



Under-chassis view. **S1-S9** is the waveband switch unit, which is shown in detail in the diagram inset with the circuit diagram overleaf. The arrow here indicates the direction in which it is viewed.

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