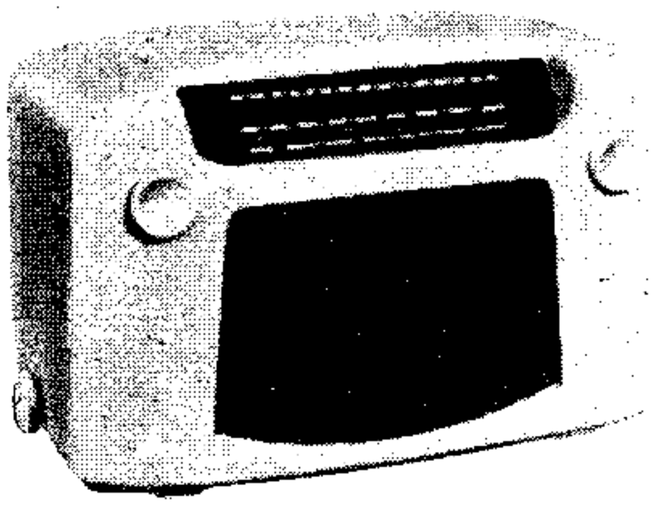
Supplement to Electrical Trader, 21

"TRADER" SERVICE SHEET

1233

KOLSTER-BRANDES

5-valve A.M./F.M. Table Receiver for Operation from



Appearance of the K.-B. MR10.

THE Kolster-Brandes MR10 is a 5-valve (plus metal rectifier) A.M./F.M. table receiver designed to operate from A.C. mains of 200-250V, 50-100 c/s. A ferrite rod aerial is provided for A.M. reception; and a plate aerial for F.M. reception, but provision is also made for the connection of external aerials. **The waveband ranges are: A.M., 187-570m and 1,030-2,100m; F.M., 87-100.5 Mc/s.**

Release date and original price: September 1955, £15 18*s* 5*d*. *Purchase tax extra.*

CIRCUIT DESCRIPTION

A.M. aerial tuning coils **L8** (M.W.) and **L9** (L.W.) are mounted at opposite ends of a length of ferrite rod to form the A.M. internal aerial.

Provision is made for the connection of an external aerial, which is coupled to the tuned circuits by **C12** and the common impedance of **C13.** Aerial tuning is by **C16.**

V2 (Brimar 6BE6) operates as A.M. frequency changer with cathode-coupled oscillator reaction. Oscillator grid coils **L10** (M.W.) and **L11** (L.W.) are tuned by **C17.** Parallel trimming by **C19** (M.W.) and **C20** (L.W.); series tracking by **C18** (M.W. and L.W.). Reaction coupling from cathode via **L12** (M.W.) and via a tapping on **L11** (L.W.).

V3 (Brimar 6BJ6) is a variable-mu R.F. pentode operating as single-valve A.M. intermediate frequency amplifier with tuned transformer couplings **C25, L15, L16, C26** and **C30, L17, L18, C31.**

A.M. intermediate frequenoy 422 kc/s.

Diode section **a** of triple diode triode valve **(V4, Brimar EABC80)** functions as A.M. signal detector, and the audio frequency component in its rectified output is developed across volume control **R18,** which operates as A.M. diode load, switch **S12** closing on M.W. and L.W. I.F. filtering by **C32, R17** and the capacitance of the screened leads. The A.F. signal developed across **R18** is passed via **C38** to grid of triode section **d** of **V4** which operates as A.F. amplifier. Bias for **V4d** is obtained from the "contact" potential developed across the high value grid leak **R19.**

D.C. potential developed across **R17, R18** is fed back as bias to **V2** and **V3,** giving automatic gain control on the A.M. bands.

Provision is made for the connection of a gramophone pickup across the volume control via **S14,** which closes in the gram position of the waveband switch control. Switches **S12** and **S13** open in this position, and **S5** closes, to prevent radio break-through.

Resistance-capacitance coupling by **R20, C39** and **R21** between **V4d** and pentode output valve **(V5, Brimar EL84).** Tone correction in anode circuit by **R23, C44,** and by negative feed-back via **C45, R27, R28** between **T1** secondary winding and **V4d** grid circuit. Variable tone control in **V5** control grid circuit.

H.T. current is supplied by bridge-connected full-wave metal rectifier **(MR1, Westinghouse 18RD2281).** H.T. smoothing by **R24, R25** and electrolytic capacitors **C40, C41, C42.** Residual hum is neutralized by passing H.T. current through section **a** of the output transformer primary winding.

Operation on F.M.

Co-axial 75Ω F.M. aerial input via fixed-tuned transformer **L1, L2** to earthed-grid triode R.F. amplifier, section **a** of **V1 (Brimar 12AT7).**

Section **b** of **V1** is a second triode operating as F.M. oscillator/mixer valve with tuned oscillator anode circuit **L5, C9, C10** and reaction coupling from the grid circuit via **L4.**

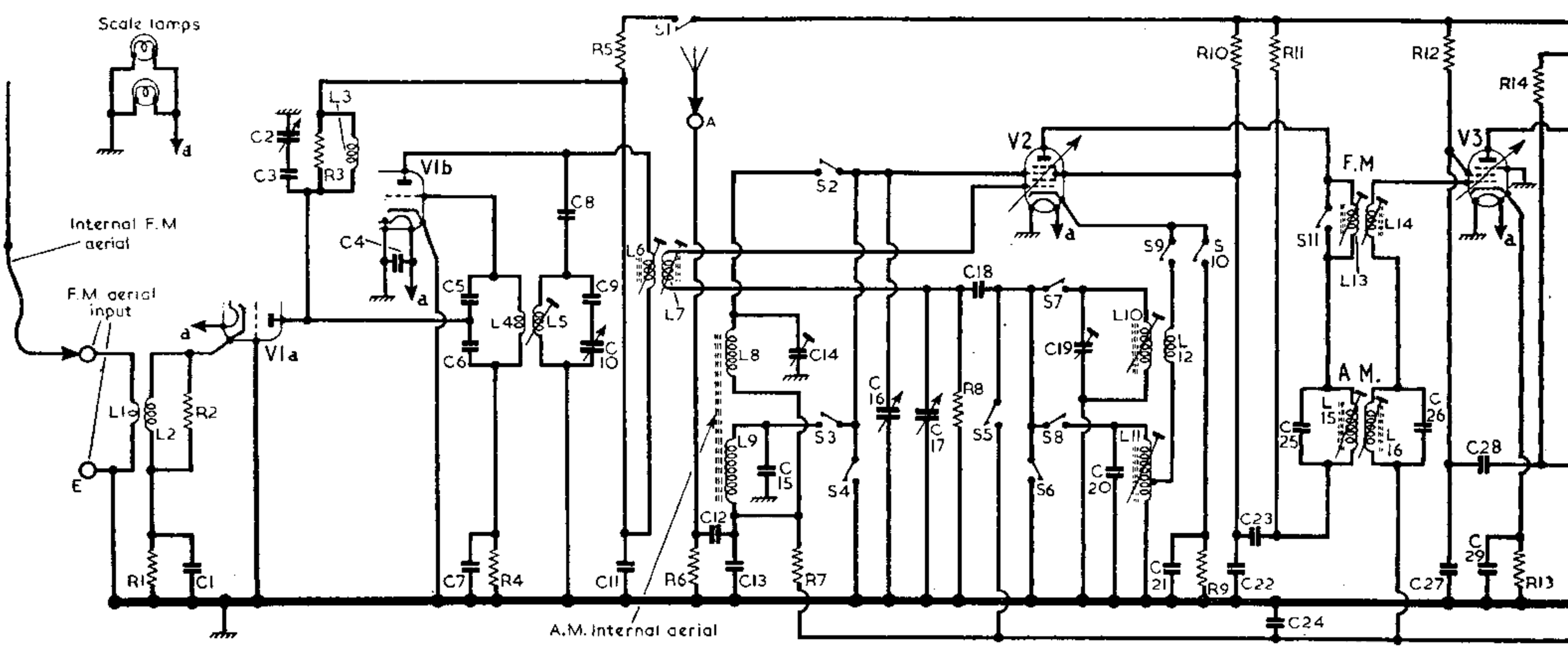
The amplified output from **V1a** is coupled by R.F. tuned circuit **C2, C3, L3** to **V1b** grid circuit via **C5, C6,** which form two arms of a bridge neutralizing circuit to prevent interaction between the R.F. and oscillator circuits and reduce oscillator radiation. Oscillator tuning by **C10** and R.F. tuning by **C2,** which are parts of the tuning gang.

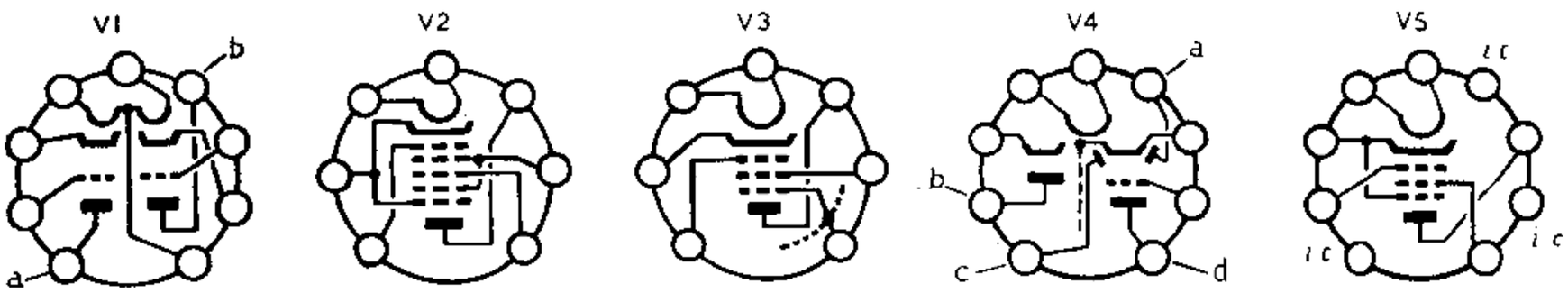
The I.F. signal in **V1b** output is coupled via I.F. transformer **L6, L7** to **V2, L7** being connected directly in series with **V2** oscillator grid circuit. **V2** then functions as 1st F.M. I.F. amplifier, **S6** then being closed.

F.M. intermediate frequency 10.7 Mc/s.

V3 operates as second I.F. amplifier with tuned transformer couplings **L13, L14** and **L19, L20, L21, C34.**

Diode sections **b** and **c** of **V4** operate in a ratio detector circuit, whose A.F. output is developed across **C33** and fed via **C35** to the





Circuit diagram of the K.-B. MR10. asscciated resistors **R2** and **R3,** which the coils. The intermediate frequen the circuit and they are

MR10

m A.C. Mains

volume control circuit. Limiting by "flywheel" effect of D.C. reservoir **C37.**

Feed-back in **V2** is neutralized by **C22, C23,** and in **V3** by **C27, C28,** these capacitors forming part of a bridge circuit with the inter-electrode capacitances of the valves.

VALVE ANALYSIS

Valve voltages and currents in the table below are those measured in our sample receiver when it was operating from A.C. mains of 230 V. Readings for **V1** were taken with the receiver switched to F.M., but the remaining readings were taken with the receiver switched to M.W., and tuned to a point at the high wavelength end of the band where there was no signal pick-up.

Voltages were measured on an Avo Electronic Testmeter, and as this instrument has a high internal resistance, allowance should be made for the current drawn by other types of meter. Chassis was the negative connection.

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 12AT7 a ...	175	6·8	—	—	1·3
V1 12AT7 b ...	175	12·0	—	—	—
V2 6BE6 ...	185	3·0	70	7·0	—
V3 6BJ6 ...	190	9·0	100	3·0	0·7
V4 EABC80 a-c	—	—	—	—	—
V4 EABC80 d	65	0·3	—	—	—
V5 EL84 ...	200	40·0	190	4·0	5·0
MR1 18RD2281	185*	—	—	—	225·0†

*A.C. input, measured across winding **a** on **T2.**
†Measured across **C42.**

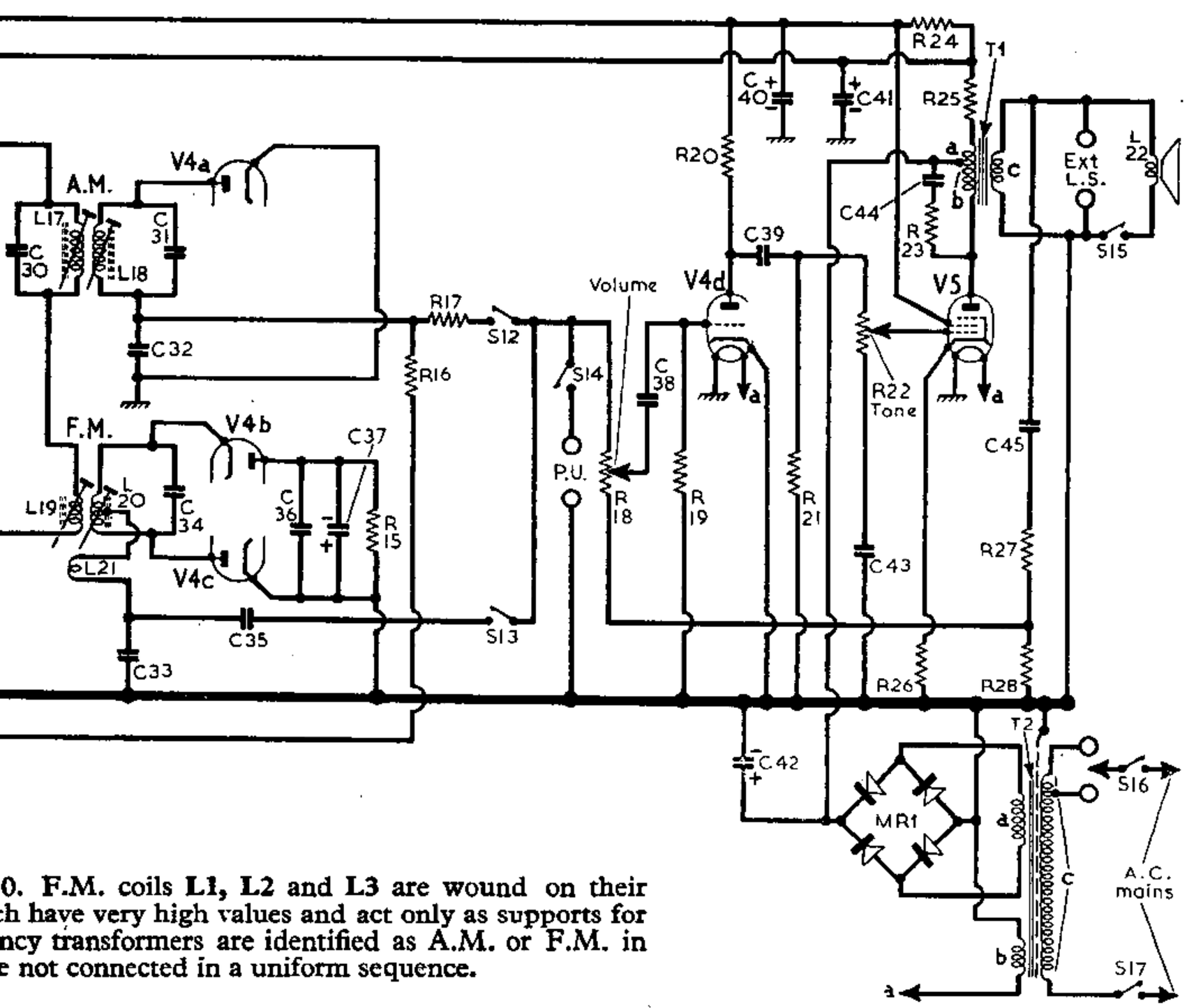
COMPONENT VALUES AND LOCATIONS

CAPACITORS		Values	Locations
C1	V1a cath. by-pass	0·001μF	H3
C2	F.M. R.F. tuning	—	A1
C3	F.M. R.F. tuning	40pF	H3
C4	Heater R.F. by-pass	0·001μF	G3
C5	F.M. coupling, R.F.	20pF	A1
C6	to osc.	10pF	A1
C7	V1b C.G.	5pF	A1
C8	V1b anode coup.	10pF	G3
C9	F.M. osc. tuning ...	33pF	G3
C10	F.M. osc. tuning ...	—	A1
C11	H.T. decoupling	0·001μF	G3
C12	A.M. aerial	470pF	H3
C13	A.M. aerial couplers	0·003μF	H3
C14	M.W. aerial trim.	30pF	A1
C15	L.W. aerial trim.	88pF	B1
C16	A.M. aerial tuning	—	A1
C17	A.M. osc. tuning	—	A1
C18	V2 osc. C.G. ...	410pF	G3
C19	M.W. osc. trim. ...	30pF	A1
C20	L.W. osc. trim. ...	300pF	G2
C21	V2 cath. by-pass	0·003μF	G2
C22	H.T. decoup. and	200pF	F3
C23	V2 neut. ...	0·01μF	F3
C24	A.G.C. decoup. ...	0·04μF	F3
C25	1st A.M. I.F.T.	88pF	B1
C26	tuning	88pF	B1
C27	H.T. decoup. and	0·003μF	F3
C28	V3 neut. ...	0·01μF	E3
C29	V3 cath. by-pass	0·003μF	F3
C30	2nd A.M. I.F.T.	88pF	B1
C31	tuning	88pF	B1
C32	I.F. by-pass ...	300pF	E3
C33	F.M. A.F. load ...	300pF	E3
C34	F.M. I.F.T. tuning	40pF	E3
C35	A.F. coupling ...	0·02μF	F2
C36	I.F. by-pass ...	0·001μF	E3
C37	D.C. reservoir ...	2μF	F2
C38	A.F. coupling ...	0·05μF	E2
C39	A.F. coupling ...	0·02μF	D2
C40	H.T. smoothing ...	10μF	C1
C41	H.T. smoothing ...	20μF	C1
C42	H.T. smoothing ...	30μF	C1
C43	Part tone control	0·003μF	D3
C44	Tone correction ...	0·01μF	D2
C45	Neg. feed-back ...	0·25μF	E2

RESISTORS		Values	Locations
R1	V1a G.B. ...	150Ω	H3
R2	L2 support ...	6·8MΩ	G3
R3	L3 support ...	6·8MΩ	G3
R4	V1 C.G.	22kΩ	A1
R5	V1 H.T. feed ...	220Ω	G3
R6	A.M. aerial shunt	3·3kΩ	H3
R7	A.G.C. decoupling	220kΩ	B1
R8	V2 C.G.	22kΩ	G3
R9	V2 G.B.	150Ω	G2
R10	V2 H.T. feeds	18kΩ	F3
R11	V2 H.T. feeds	2·2kΩ	F3
R12	V3 S.G. feed ...	33kΩ	F3
R13	V3 G.B.	68Ω	F3
R14	H.T. feed	2·2kΩ	E3
R15	D.C. load ...	39kΩ	E3
R16	A.G.C. decoupling	2·2MΩ	F3
R17	I.F. stopper ...	100kΩ	F3
R18	Volume control ...	500kΩ	C1
R19	V4d C.G.	10MΩ	E2
R20	V4d anode load ...	470kΩ	F3
R21	V5 C.G.	680kΩ	D3
R22	Tone control ...	250kΩ	D2
R23	Tone corrector ...	4·7kΩ	E3
R24	H.T. smoothing	1kΩ	D3
R25	H.T. smoothing	820Ω	D3
R26	V5 G.B.	100Ω	E2
R27	Neg. feed-back	2·2kΩ	F2
R28	Neg. feed-back	220Ω	F2

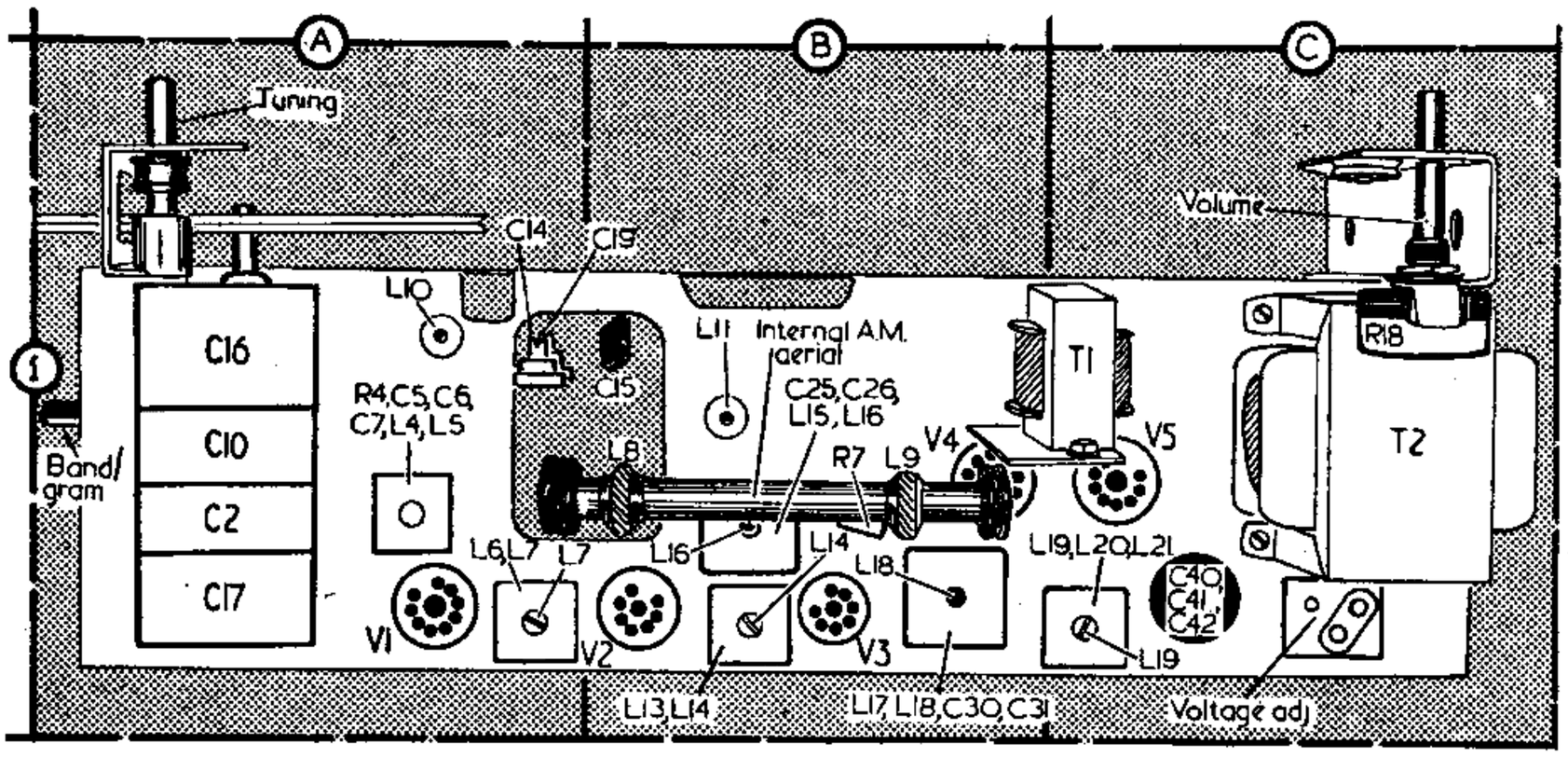
OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	F.M. aerial coupling coils ...	—	G3
L2	F.M. aerial coupling coils ...	—	G3
L3	F.M. R.F. coil ...	—	G3
L4	F.M. oscillator coils	—	A1
L5	F.M. oscillator coils	—	A1
L6	1st F.M. I.F.T. Pri.	1·0	A1
L7	1st F.M. I.F.T. Sec.	1·0	A1
L8	A.M. internal aerial coils	0·5	B1
L9	A.M. internal aerial coils	12·0	B1
L10	A.M. osc. tuning coils	4·0	G2
L11	A.M. osc. tuning coils	5·0	F2
L12	A.M. osc. reaction	0·5	G2
L13	2nd F.M. I.F.T. Pri.	1·5	B1
L14	2nd F.M. I.F.T. Sec.	1·5	B1
L15	1st A.M. I.F.T. Pri.	20·0	B1
L16	1st A.M. I.F.T. Sec.	20·0	B1
L17	2nd A.M. I.F.T. Pri.	20·0	B1
L18	2nd A.M. I.F.T. Sec.	20·0	B1
L19	3rd F.M. I.F.T. Pri.	1·0	C1
L20	3rd F.M. I.F.T. Sec., total	0·5	C1
L21	3rd F.M. I.F.T. Tert.	—	C1
T1	O.P. trans. a	5·0	C1
T1	O.P. trans. b	680·0	C1
T1	O.P. trans. c	—	C1
T2	Mains trans. a	90·0	C1
T2	Mains trans. b	—	C1
T2	Mains trans. c, total	32·0	C1
MR1*	H.T. rectifier 18RD2281	—	E2
S1-S14	Band switches	—	G2
S15	Int. speaker sw. ...	—	D3
S16, S17	Mains sw., g'd R22	—	D2

*Westinghouse contact-cooled metal rectifier.



0. F.M. coils **L1, L2** and **L3** are wound on their ch have very high values and act only as supports for ncy transformers are identified as A.M. or F.M. in e not connected in a uniform sequence.

Dealers are reminded that if the component numbers given in the accompanying tables are used when ordering replacement parts, it is advisable to mention the fact on the order, as these numbers may differ from those used in the manufacturers' circuit diagram.



Plan illustration of the chassis showing the A.M. internal aerial coils **L8, L9** in location B1.

GENERAL NOTES

Switches.—S1-S14 are the waveband/gram switches, ganged in two rotary units beneath the chassis. These units are identified by diamond enclosed numbers 1 and 2 in the underchassis illustration, in which arrows pointing to the units indicate the directions in which they are viewed in the detailed diagrams of the units at the foot of this column. In the associated switch table, which is immediately above the switch diagrams, the switch operations for the four control settings are given, starting with the control fully anti-clockwise. A dash indicates open, and **C**, closed.

Switch Table and Diagrams

Switches	Gram	F.M.	L.W.	M.W.
S1 ...	—	C	—	—
S2 ...	—	—	—	C
S3 ...	—	C	—	—
S4 ...	C	—	—	—
S5 ...	—	C	—	—
S6 ...	—	—	C	—
S7 ...	—	—	C	—
S8 ...	—	—	C	—
S9 ...	—	—	C	—
S10 ...	—	—	C	—
S11 ...	—	—	C	—
S12 ...	—	—	C	—
S13 ...	—	—	C	—
S14 ...	C	—	C	—

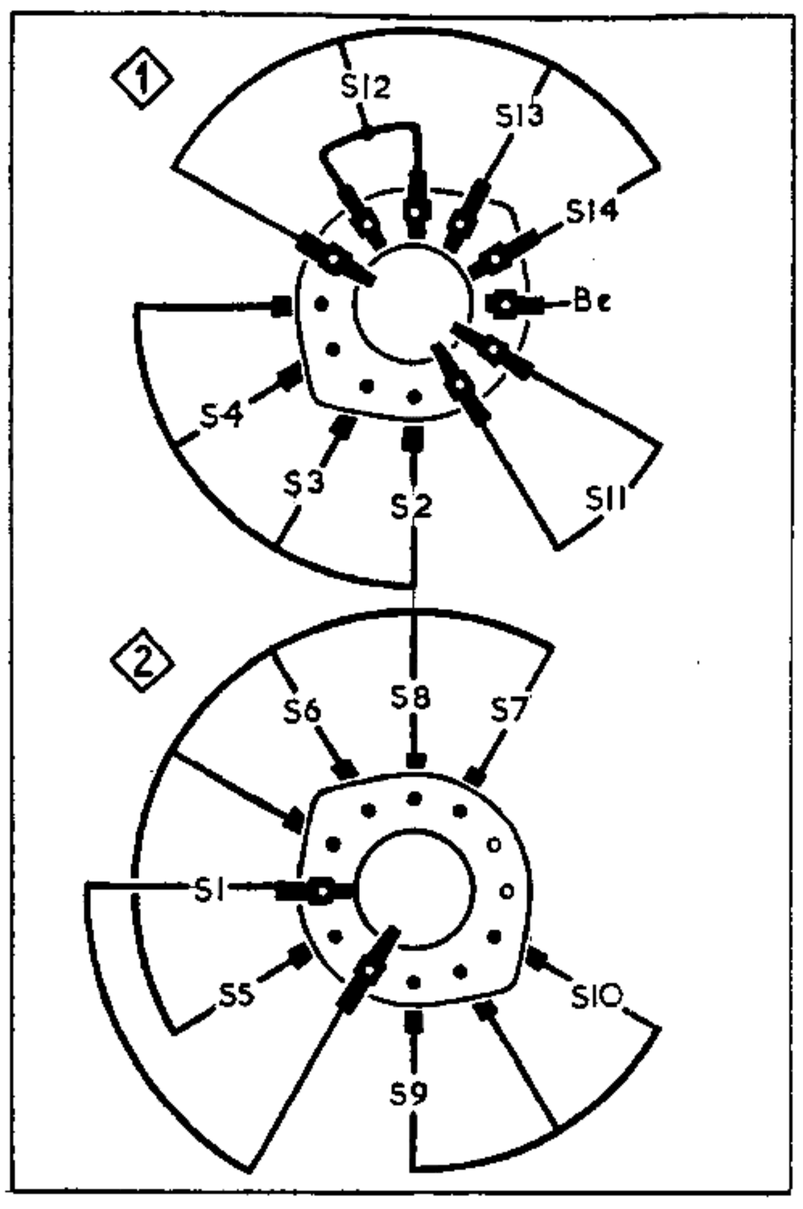


Diagram of the waveband switch units seen from the ends of an inverted chassis as indicated in the underchassis illustration.

Scale Lamps.—These are 6.5V, 0.15A lamps with small spherical bulbs and M.E.S. bases.

Internal and External Aerials.—An internal metal foil aerial is fitted in the cabinet and can be used for F.M. reception by plugging it in the left-hand side (viewed from rear of upright chassis) F.M. aerial socket. An internal ferrite rod aerial **L8, L9** is provided for A.M. reception. Provision is made on both F.M. and A.M. for the connection of an external aerial and earth.

For F.M. reception, an external dipole can be connected between the outer aerial sockets (labelled "F.M. aerial input" in our underchassis illustration). For A.M. reception an external aerial and earth can be connected to the **A** and **E** sockets (centre and right-hand side sockets respectively).

Drive Cord Replacement.—About 60in of nylon braided glass yarn is required for a new drive cord. Turn the gang to minimum capacitance and tie off one end of the drive cord to the uppermost fixing screw on the drive drum bush. Take the cord out through the gap in the drive drum rim and run it anti-clockwise round the drum for a quarter turn, pulling against the gang stop. Run the cord on as indicated in the sketch of the tuning drive system at the foot of columns 2 and 3.

Modification.—F.M. tuning coils **L1, L2** and **L3**, which are wound on 6.8MΩ resistors in the sample receiver on which this *Service Sheet* was prepared, were wound on coil formers in earlier receivers, and **L3** had a dust-iron core adjustment. In these receivers this core should be adjusted in operation 21 in the circuit alignment instructions instead of the end turns of the coil.

CIRCUIT ALIGNMENT

Equipment Required.—A spot-frequency signal generator covering the range of 140 kc/s to 1,700 kc/s. An F.M. signal generator covering the F.M. intermediate frequency of 10.7 Mc/s and the frequency range of 85 Mc/s to 100 Mc/s, with a deviation of at least ± 150 kc/s. An Avometer Model 8, or similar multi-range meter. An oscilloscope.

A.M. I.F. Stages

1.—Switch receiver to M.W., and turn gang to maximum capacitance. Connect output of spot-frequency signal generator, via an 0.1μF capacitor in the "live" lead, to control grid (pin 7) of **V2** and chassis.

2.—Fully unscrew the cores of **L16** (location reference B1) and **L17** (E3).

3.—Feed in a 422 kc/s signal and adjust the cores of **L18** (B1), **L17** (E3), **L15** (F3) and **L16** (B1), in that order, for maximum output. Do not re-adjust cores unless complete procedure is repeated.

A.M. R.F. and Oscillator Stages

4.—Check that with the gang at maximum capacitance, the cursor coincides with datum line "D" on the scale backing plate. As the tuning scale is fixed to the cabinet, reference must be made to calibration marks on the scale backing plate when the chassis is removed from the cabinet for alignment purposes.

5.—Connect spot-frequency signal generator to **A** and **E** sockets via an all-wave dummy aerial. Its output should be progressively reduced to prevent overloading as the sensitivity increases during alignment.

6.—Switch receiver to M.W. and tune to right-hand side "MW" calibration mark on scale backing plate. Feed in a 600 kc/s (500m) signal and adjust the core of **L10** (A1) for maximum output.

7.—Tune receiver to left-hand side "MW" calibration mark on scale backing plate, feed in a 1,400 kc/s (214.3m) signal and adjust **C19** (A1) and **C14** (A1) for maximum output. Repeat these operations whilst rocking the gang for optimum results.

8.—Switch receiver to L.W. and tune to "LW" calibration mark on scale backing plate. Feed in a 225 kc/s (1,333m) signal and adjust the core of **L11** (B1) for maximum output.

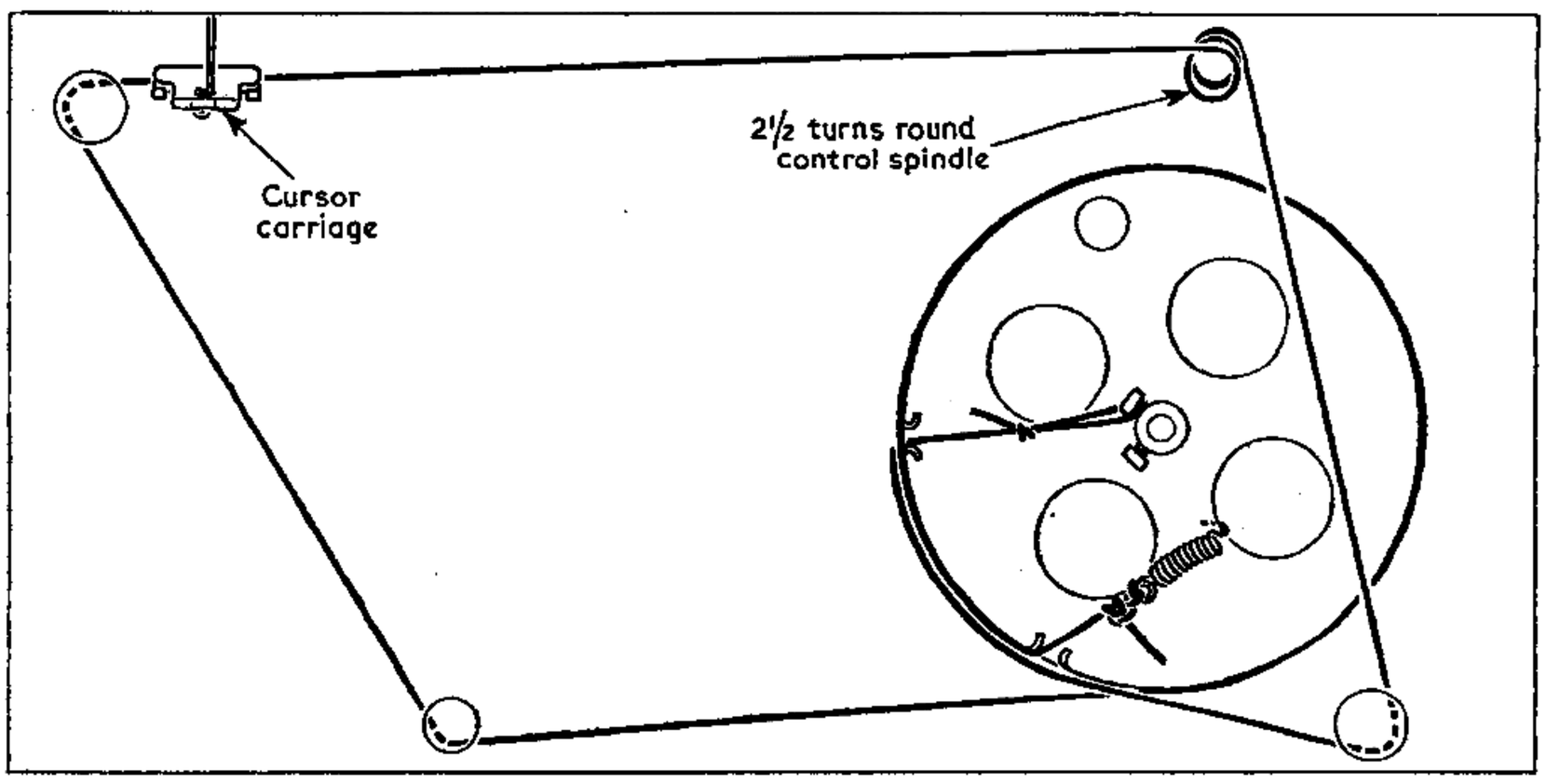
F.M. I.F. Stages

9.—Switch receiver to F.M. Set multi-range meter to 10 V D.C. range and connect it across **C37** (F2), taking the positive lead to chassis. Connect output of F.M. signal generator, via an 0.001μF capacitor in the "live" lead, to control grid (pin 1) of **V3** and chassis.

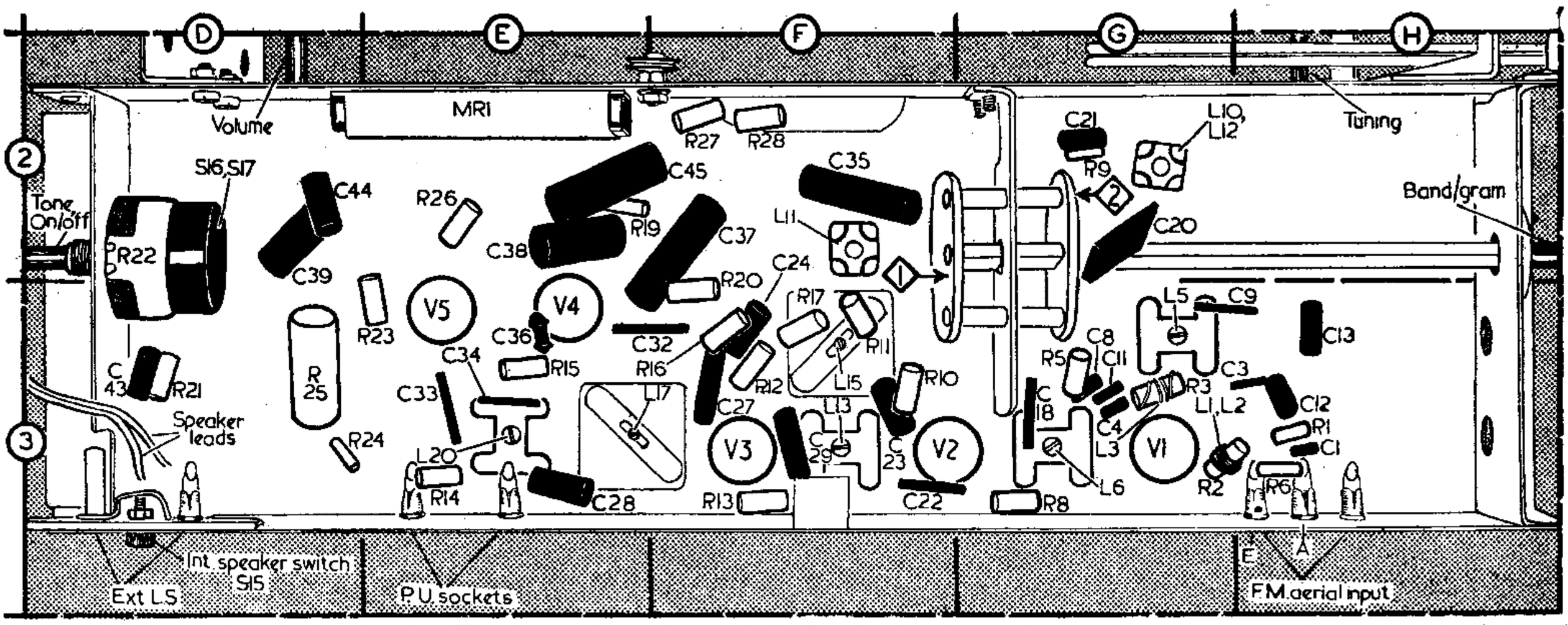
10.—Fully unscrew the cores of **L20** (E3), **L14** (B1) and **L7** (A1).

11.—Feed in an unmodulated 10.7 Mc/s signal and adjust the core of **L19** (C1) for maximum output on the meter.

12.—Transfer "live" F.M. signal generator lead, with 0.001μF capacitor, to anode (pin 1) of **V1a**.



Sketch of the tuning drive system drawn as seen from the front of the chassis with the gang set to minimum capacitance.



Underside illustration of the chassis. The internal speaker switch S15 in location reference D3 is unscrewed to mute the internal speaker. MR1 in location reference E2 is the full-wave H.T. rectifier. It is cooled by contact with the chassis.

13.—Feed in an unmodulated 10.7 Mc/s signal and adjust the output of the F.M. signal generator so that the meter reading does not exced 5 V.

14.—Adjust the cores of **L19** (C1), **L13** (F3), **L14** (B1), **L6** (G3) and **L7** (A1) in that order for maximum output on meter, reducing the input as the circuits come into line to prevent the meter reading exceeding 5 V.

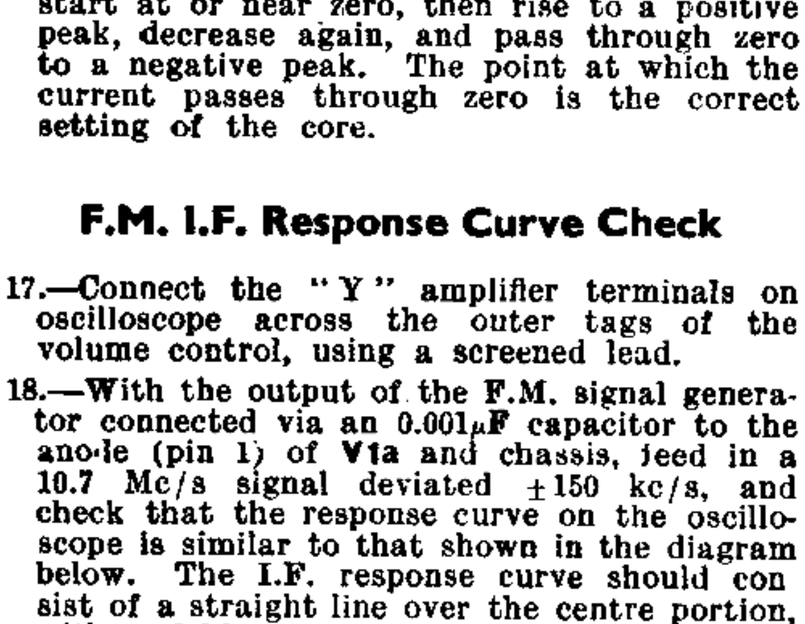
15.—Connect two accurately matched 47kΩ resistors in series across **C37** in place of meter. Set meter to 250μA D.C. range and connect it between the junction of these resistors and the junction of **C33, C35.**

16.—Adjust the core of **L20** (E3) for zero current reading on the meter. This is carried out by screwing the core slowly in from the fully unscrewed position. The current will start at or near zero, then rise to a positive peak, decrease again, and pass through zero to a negative peak. The point at which the current passes through zero is the correct setting of the core.

F.M. I.F. Response Curve Check

17.—Connect the "Y" amplifier terminals on oscilloscope across the outer tags of the volume control, using a screened lead.

18.—With the output of the F.M. signal generator connected via an 0.001μF capacitor to the anode (pin 1) of **V1a** and chassis, feed in a 10.7 Mc/s signal deviated ±150 kc/s, and check that the response curve on the oscilloscope is similar to that shown in the diagram below. The I.F. response curve should consist of a straight line over the centre portion, with a fold over at each end symmetrically placed about the centre intermediate frequency of 10.7 Mc/s. A slight adjustment of the core of **L20** may be necessary to achieve optimum linearity and symmetry of the response curve. Disconnect oscilloscope.



Sketch of the F.M. I.F. response curve referred to in the circuit alignment instructions above.

F.M. R.F. and Oscillator Stages

19.—Tune receiver to "FM" calibration mark on scale backing plate. Transfer output of F.M. signal generator, via a 75Ω co-axial feeder to F.M. aerial sockets. Set Multi-range meter to 10 V D.C. range and connect it across **C37** (F2).

20.—Feed in a 93 Mc/s signal, deviated by ±25 kc/s and adjust the core of **L5** (G3) for maximum output on meter.

21.—Adjust the position of the end turns of **L3** (G3) for maximum output on meter. Alternatively, if the coil is fitted with a core, adjust this for maximum output on meter.

DISMANTLING

Removing Chassis.—Remove two control knobs from front of cabinet, and two knobs from sides of cabinet (pull off);

remove single 4BA chassis securing bolt from rear edge of cabinet base;

remove two 4BA bolts securing front edges of chassis brackets to metal flanges at sides of speaker baffle;

slide chassis rearwards out of cabinet and unsolder speaker leads.

ADDITIONAL NOTES AND MODIFICATIONS

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