

# PILOT 85 Series

Covering Models 754, 85A & 85U

**H**OUSED in a plastic cabinet, the Pilot 85A is a 4-valve (plus rectifier) 3-band transportable superhet, designed to operate from A.C. mains of 200-250 V, 40-100 c/s. The waveband ranges are 16-50 m, 185-550 m, 1,200-2,000 m.

Model 85U is an A.C./D.C. version of model 85A, on which this *Service Sheet* is based, and is covered as explained under "General Notes" by a separate section of circuit diagram to the right of the main diagram.

Model 754 is a 4-band version of model 85A, its R.F., oscillator and I.F. circuits being re-drawn to the left of the main circuit diagram. Further notes on this model appear under "General Notes" overleaf.

Release date, all models, September 1953. Original prices: 85A, £11 5s 10d; 85U, £15 1s 8d; 754, £18 5s 3d.

## CIRCUIT DESCRIPTION

Tuned frame aerial input on M.W. by L2, loading coil L5 and C35, and on L.W. by L1, L2, loading coil L5 and C35. For S.W. reception an external aerial is neces-

sary and is coupled via L3 to single-tuned circuit L4, C35. An external aerial may also be used on M.W. and L.W., when it is connected either to the junction of L2, L5 (M.W.) or to the junction of L1, L2 (L.W.) by switches S2, S3.

Model 754 has four waveband ranges comprising S.W.1, S.W.2, M.W. and L.W. No frame aeriels are fitted and the external aerial is fed via aerial coupling coils to the single-tuned grid circuits.

First valve (V1, Brimar 12AH8) is a triode heptode valve operating as frequency changer with internal coupling. Oscillator grid coils L6 (S.W.), L7 (M.W.) and L8 (L.W.) are tuned by C36. Parallel trimming by C37 (S.W.), C38 (M.W.) and C9, C39 (L.W.); series tracking by C10 (M.W.) and C11 (L.W.). Reaction coupling from anode circuit by L9 (S.W.), L10 (M.W.) and L11 (L.W.). The oscillator circuit in model 754, but for the addition of a second S.W. band, is similar.

Second valve (V2, Brimar 12BA6) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings C4, L12, L13, C5 and C14, L14, L15, C15.

Diode signal detector is part of double diode triode valve (V3, Brimar 12AT6). Audio frequency component in rectified output is developed across volume control R8, which acts as diode load, and is passed via C22 to grid of triode section.

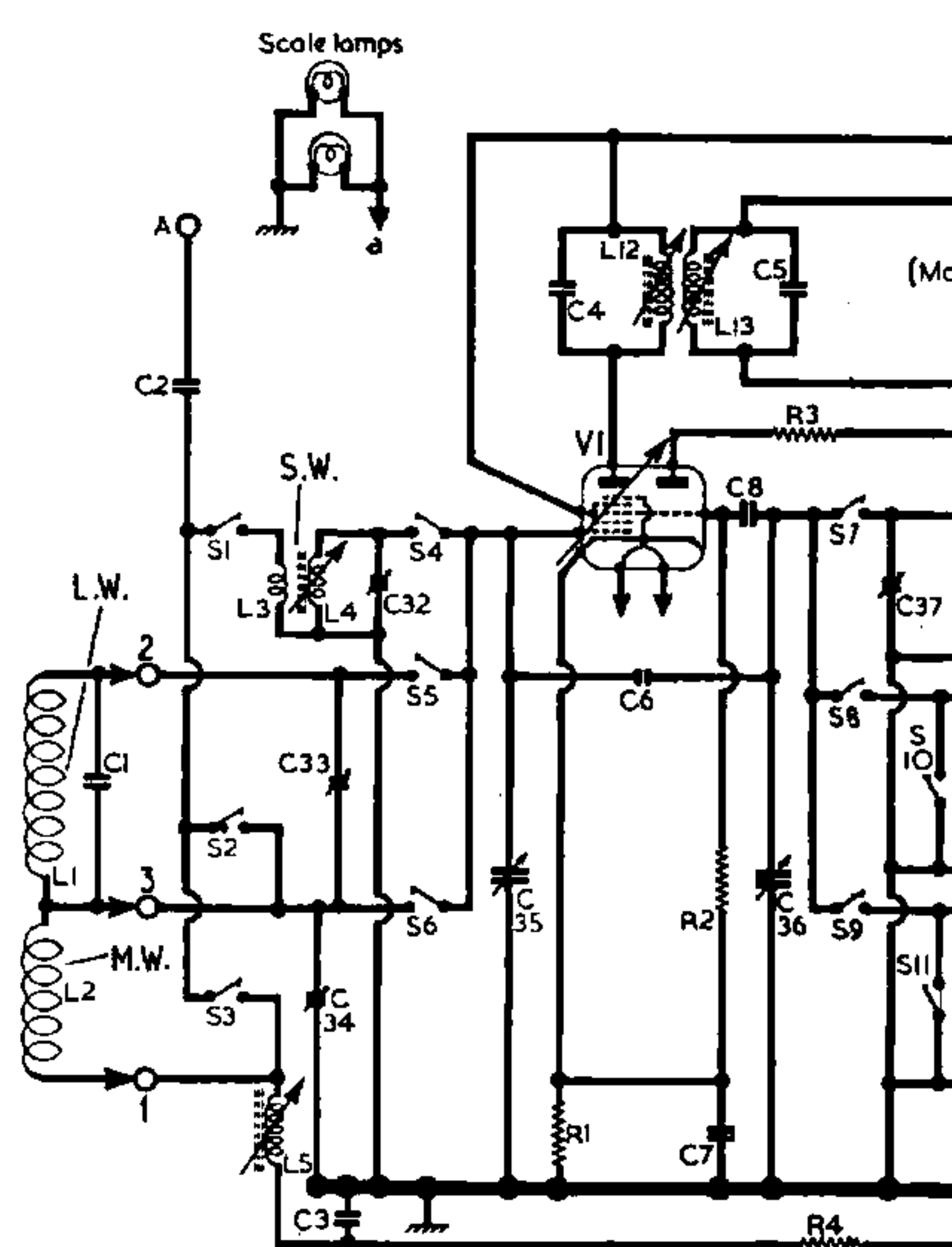
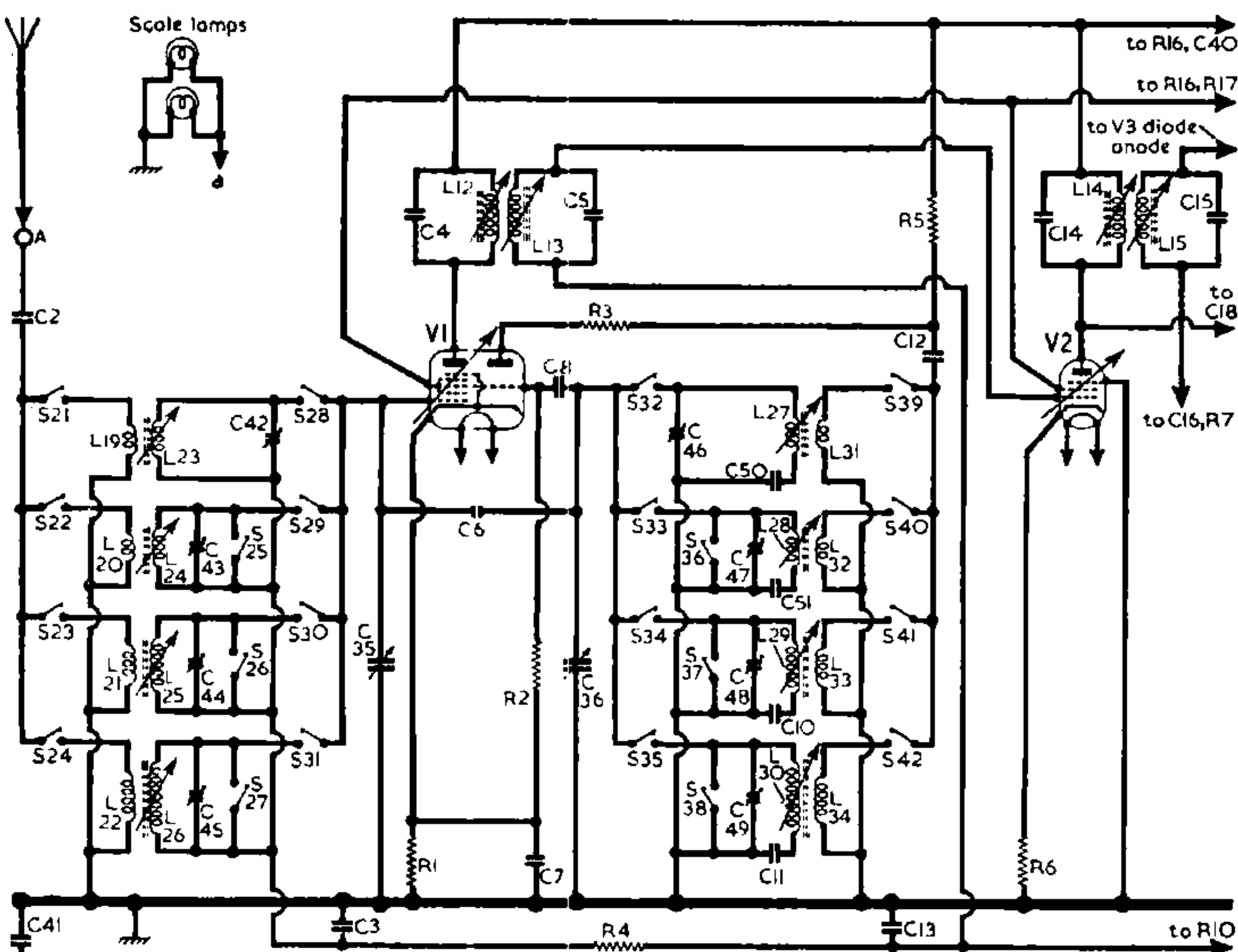
### Intermediate frequency 471 kc/s.

Second diode of V3 is fed via C18 from V2 anode, and the resulting D.C. potential developed across load resistor R11 is fed back as bias to V1 and V2, giving automatic gain control.

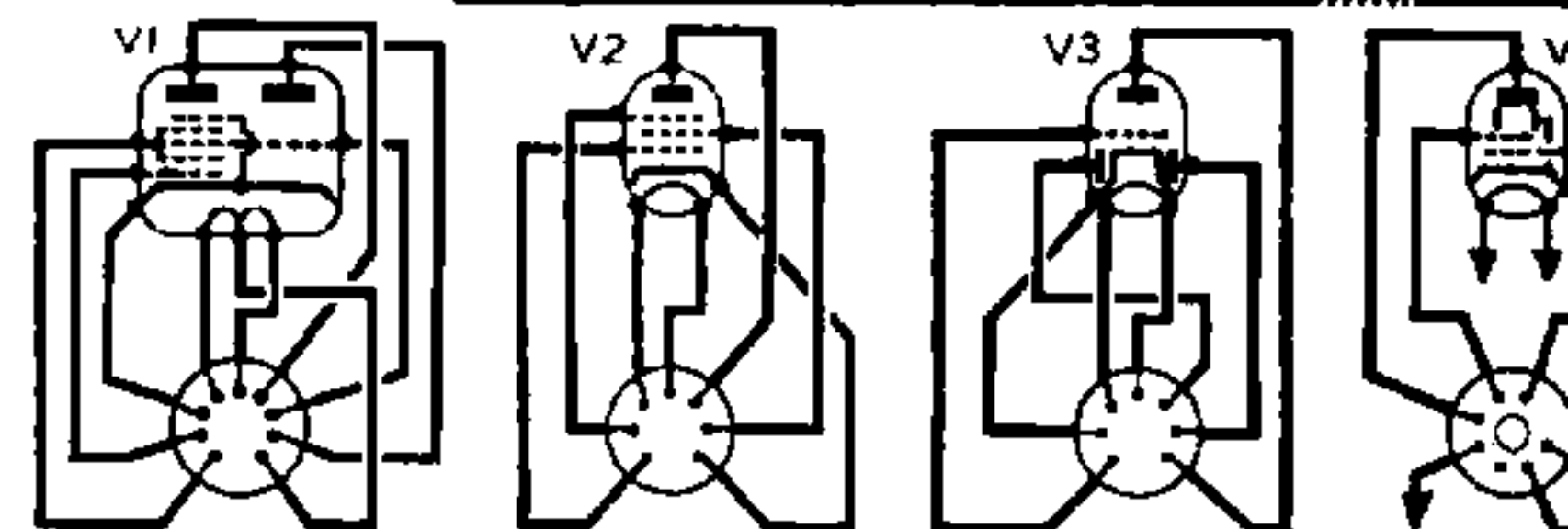
Resistance-capacitance coupling by R12, C24, R13 and R14 between V3 and pentode output valve (V4, Brimar 35L6). Fixed tone correction by negative feedback via R15 between the anodes of V4 and V3. Tone control R14 is part of the negative feedback chain C25, R13, R14 between the anode and control grid circuits of V4.

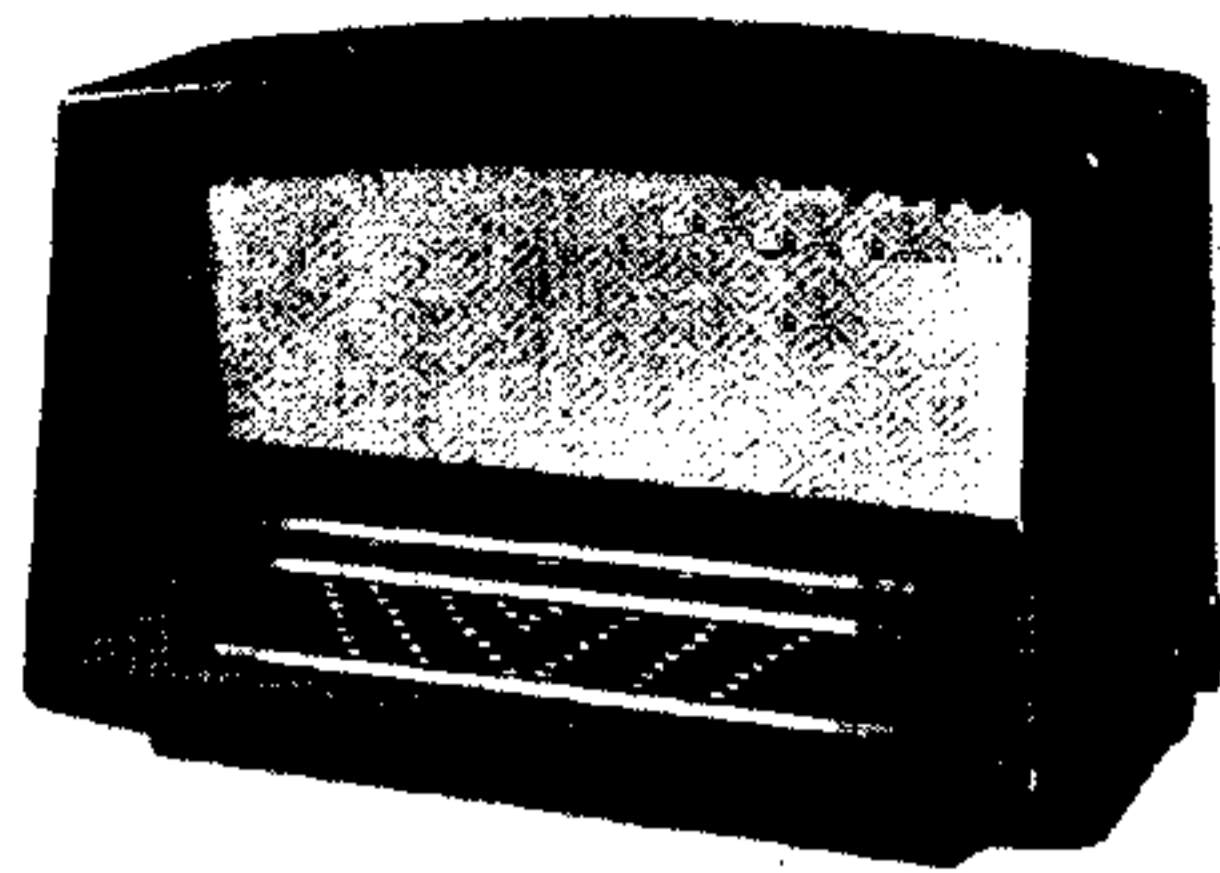
H.T. current in models 85A and 754 is supplied by I.H.C. half-wave rectifying valve (V5, Brimar 35Z4). Smoothing by R16, R20 and electrolytic capacitors C27, C29, C30. The valve filaments are connected in series across a section of the primary winding of mains transformer

(Continued col. 1 overleaf)



Circuit diagram of the Pilot 85 series, a 3-band A.C. transportable table receiver. The A.C./D.C. version, model 85U, is covered by the separate circuit section on the extreme right of the main diagram, where the sound output and mains input stages have been re-drawn. Above, on left of the main diagram, are shown the aerial, oscillator and I.F. stages of model 754, which is otherwise mainly like the 85A, although a few further details are given under "General Notes" overleaf.





Appearance of models 85A, 85U.

RESISTORS	Values	Locations
R1	V1 G.B. ...	220Ω F2
R2	V1 osc. C.G. ...	47kΩ F2
R3	V1 osc. stabilizer...	100Ω F2
R4	A.G.C. decoupling	100kΩ G2
R5	Osc. anode feed ...	27kΩ F3
R6	V2 G.B. ...	88Ω E2
R7	I.F. stopper ...	47kΩ E2
R8	Volume control ...	500kΩ D2
R9	V3 C.G. ...	10MΩ E2
R10	A.G.C. decoupling	1MΩ F2
R11	A.G.C. diode load...	1MΩ E2
R12	V3 anode load ...	470kΩ E2
R13	Part tone control...	220kΩ E3
R14	Tone control ...	500kΩ D3
R15	Neg. feed-back ...	1.5MΩ E3
R16*	H.T. potential divider ...	4.7kΩ D2
R17		15kΩ E2
R18	V4 C.G. stopper ...	4.7kΩ E3
R19	V4 G.B. ...	180Ω E3
R20	H.T. smoothing ...	1kΩ D3
R21	V5 surge limiter ...	100Ω D3
R22	Brimistor CZ2 ...	—
R23		740Ω —
R24	Heater ballast ...	100Ω —

\* 6.8kΩ in Model 754.

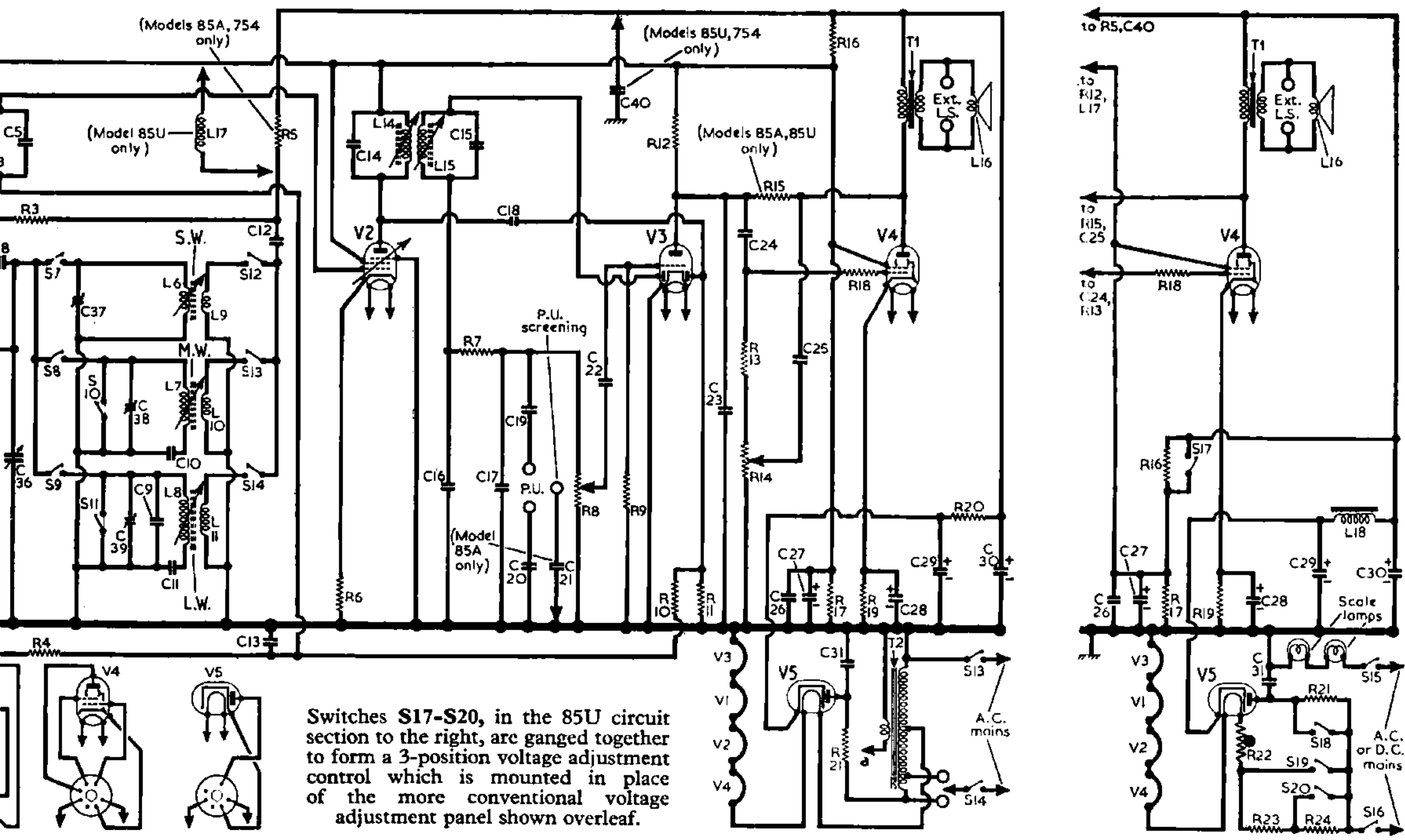
CAPACITORS	Values	Locations
C1	L.W. aerial trim...	20pF A1
C2	Aerial series ...	500pF G2
C3	A.G.C. decoupling	0.1μF G2
C4	I.F. transformer	150pF B1
C5	tuning ...	150pF B1
C6	Osc. neutralizer ...	— A1
C7	V1 cath. by-pass ...	0.02μF F2
C8	V1 osc. C.G. ...	100pF F2
C9	L.W. osc. trim. ...	220pF F2
C10	M.W. osc. tracker...	520pF F3
C11	L.W. osc. tracker...	225pF F3
C12	Osc. anode coupling	100pF G2
C13	A.G.C. decoupling	0.1μF F2
C14	I.F. transformer	150pF B1
C15	tuning ...	150pF B1
C16	I.F. by-passes ...	110pF E2
C17		110pF E2
C18	A.G.C. coupling ...	20pF E2
C19		0.02μF E3
C20		0.02μF F3
C21		0.02μF F3
C22	A.F. coupling ...	0.001μF E2
C23	I.F. by-pass ...	300pF E2
C24	A.F. coupling ...	0.04μF E2
C25	Part tone control...	500pF E3
C26	H.T. by-pass ...	0.1μF D2
C27*	H.T. smoothing ...	8μF C1
C28*	V4 cathode by-pass	50μF E3
C29*		32μF C1
C30*	H.T. smoothing ...	32μF C1
C31	Mains R.F. by-pass	0.05μF D3
C32†	S.W. aerial trim ...	60pF A1
C33†	L.W. aerial trim ...	60pF A1
C34†	M.W. aerial trim ...	60pF A1
C35†	Aerial tuning ...	532pF A1
C36†	Oscillator tuning ...	532pF A1
C37†	S.W. osc. trim. ...	60pF A1
C38†	M.W. osc. trim. ...	60pF A1
C39†	L.W. osc. trim. ...	60pF A1
C40	H.T. decoupling ...	0.1μF —
C41	Chassis isolator ...	0.002μF —
C42†	S.W.1 aerial trim...	60pF —
C43†	S.W.2 aerial trim...	60pF —
C44†	M.W. aerial trim...	60pF —
C45†	L.W. aerial trim...	60pF —
C46†	S.W.1 aerial trim...	60pF —
C47†	S.W.2 aerial trim...	60pF —

(continued next col.)

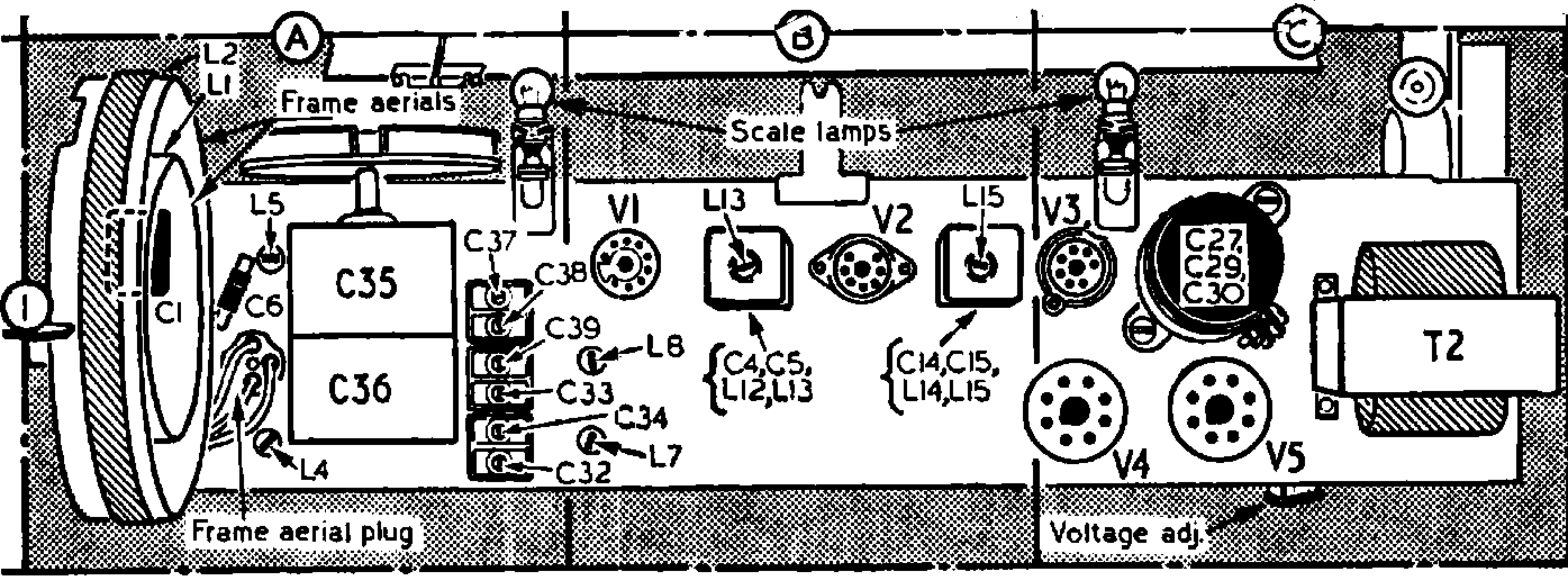
CAPACITORS (continued)	Values	Locations
C49†	L.W. aerial trim...	60pF —
C50	S.W.1 osc. tracker	0.005μF —
C51	S.W.2 osc. tracker	0.0026μF —

\* Electrolytic. † Variable. ‡ Pre-set.  
§ "Swing" value, minimum to maximum.  
¶ Very low capacitance, formed by twisted wires

OTHER COMPONENTS	Approx. Values (ohms)	Locations
I1	L.W. frame aerial	18.0 A1
I2	M.W. frame aerial	2.0 A1
I3	S.W. aerial coupling	— G3
I4	S.W. aerial tuning	— G3
I5	Loading coil ...	1.0 G2
I6		— F3
I7	Oscillator tuning coils ...	3.0 F3
I8		7.5 F3
I9		— F3
I10	Oscillator reaction coils ...	1.5 F3
I11		2.0 F3
I12	1st I.F. trans. { Pri.	7.0 B1
I13	{ Sec.	7.0 B1
I14	2nd I.F. trans. { Pri.	7.0 B1
I15	{ Sec.	7.0 B1
I16	Speech coil ...	2.5 —
I17	Osc. anode choke ...	25.0 —
I18	Smoothing choke...	150.0 —
I19	R.F. and oscillator coils (S.S.M.L.), Model 754	— —
T1	O.P. trans. { Pri.	340.0 —
	{ Sec.	— —
T2	Mains trans. { total	76.0 C1
	{ Pri.	1.0 —
	{ Sec.	— —
S1-S14	Waveband switches	— G3
S15		— —
S16	Mains sw., g'd R14	— D3
S17		— —
S20	Voltage adj. sw. ...	— —
S21-S42	Waveband switches	— —







Plan view of the 85A chassis. The frame aeriels L1, L2 shown in location reference A1 are normally mounted in the cabinet, chassis connections being made by a 3-pin plug and socket, but they are shown here for the purpose of identification.

**Circuit Description—continued.**

T2, which acts as an auto-transformer. An isolated secondary winding is provided on T2 for the scale lamps.  
H.T. current in model 85U is supplied by I.H.C. half-wave rectifying valve (V5, Brimar 35Z4). Smoothing by R16, choke L18 and electrolytic capacitors C27, C29, C30. Valve heaters, together with scale lamps, thermistor R22 and ballast resistors R23, R24, are connected in series across the mains input. Voltage adjustment is by means of a three-position switch unit S17-S20.

**GENERAL NOTES**

**Switches.**—S1-S14 are the waveband switches in models 85A and 85U, and are ganged in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis illustration and shown in detail in the diagram in column 2 where

**Switch Table, Models 85A & 85U**

Switch	S.W.	M.W.	L.W.
S21	—	—	—
S22	—	—	—
S23	—	—	—
S24	—	—	—
S25	—	—	—
S26	—	—	—
S27	—	—	—
S28	—	—	—
S29	—	—	—
S30	—	—	—
S31	—	—	—
S32	—	—	—
S33	—	—	—
S34	—	—	—
S35	—	—	—
S36	—	—	—
S37	—	—	—
S38	—	—	—
S39	—	—	—
S40	—	—	—
S41	—	—	—
S42	—	—	—

it is drawn as seen from the volume control end of an inverted chassis. The associated table (above) shows the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and C closed.

S15, S16 are the Q.M.B. mains switches, ganged with the tone control R14.  
S17-S20 are the voltage adjustment

switches in model 85U, and are ganged in a single rotary unit which takes the place of the voltage adjustment panel in our plan view of the chassis. In the 110 V position of the switch S17, S18 and S19 close, and S20 opens; in the 200-225 V position S20 closes and S17, S18, S19 open; in the 225-250 V position all switches open.

S21-S42 are the waveband switches in model 754, and are ganged in two rotary units beneath the chassis deck in place of the single rotary unit shown in our under chassis illustration. The switch table in column 3 gives the switch operations for the four control settings, a dash indicating open, and C closed.

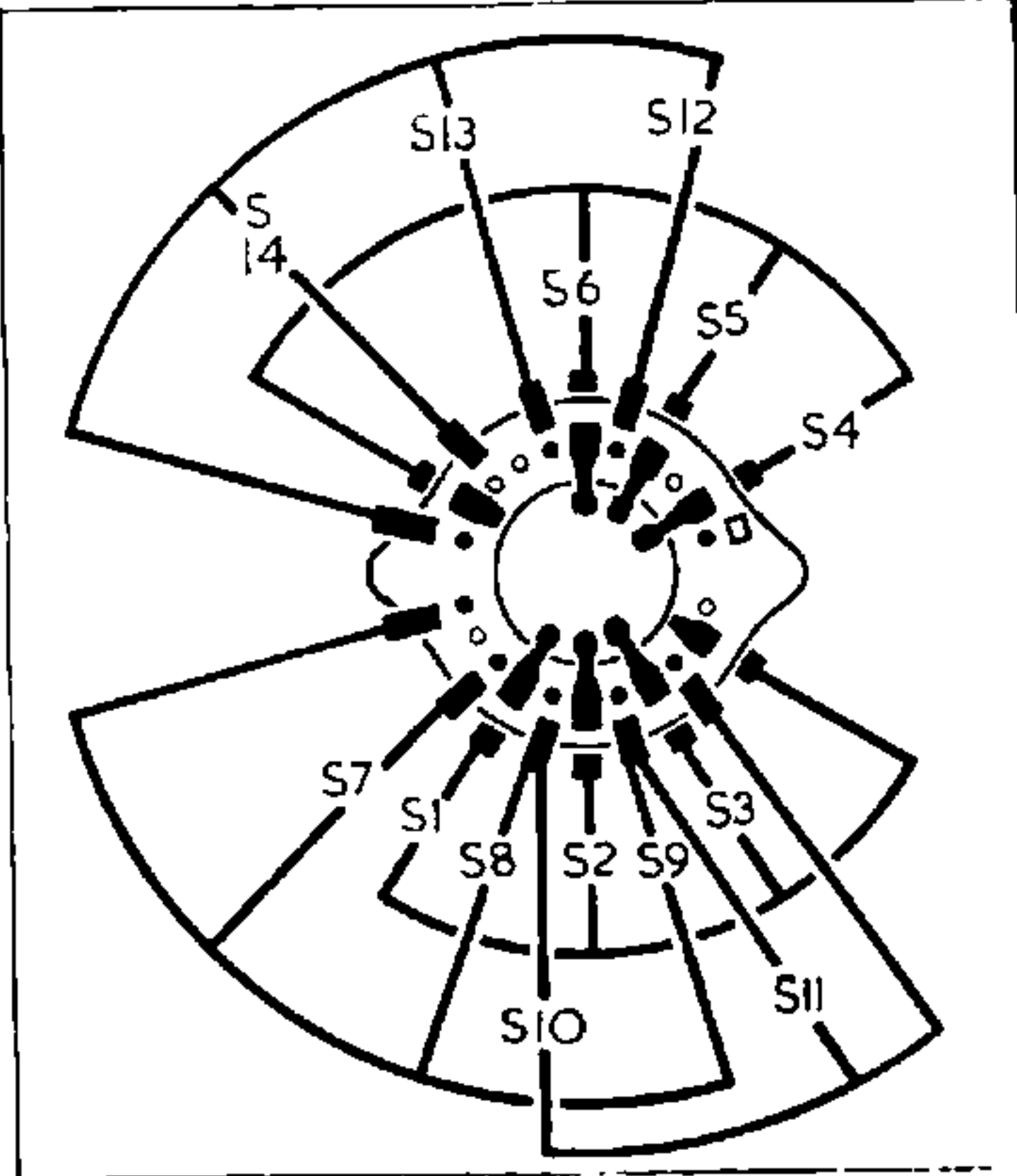


Diagram of the waveband switch unit for the 85A and 85U, drawn as seen from the volume control end of an inverted chassis.

**Model 85U.**—This is an A.C./D.C. version of the model 85A on which this Service Sheet was based. It differs from the 85A mainly in the power input stage,

and this section has been re-drawn to the right of the main circuit diagram overleaf.

The receiver is designed to operate from A.C. or D.C. mains of 110 V and 200-250 V, 40-100 c/s in the case of A.C. Apart from other small differences, which are indicated in the main circuit diagram and in the valve voltage table, the remaining information applies equally to both receivers.

**Model 754.**—This is a 4-band version of model 85A, an extra S.W. band covering the range 50-180 m being added. No frame aeriels are fitted to this model and the full H.T. voltage is applied to the anodes of V1 and V2. The complete R.F., oscillator and I.F. section of this receiver has been re-drawn to the left of the main circuit diagram. The remainder of the 754 circuit, except where otherwise indicated, is the same as that for the 85A.

**Scale Lamps.**—These are 6.5 V, 0.3 A lamps with small clear spherical bulbs and M.E.S. bases.

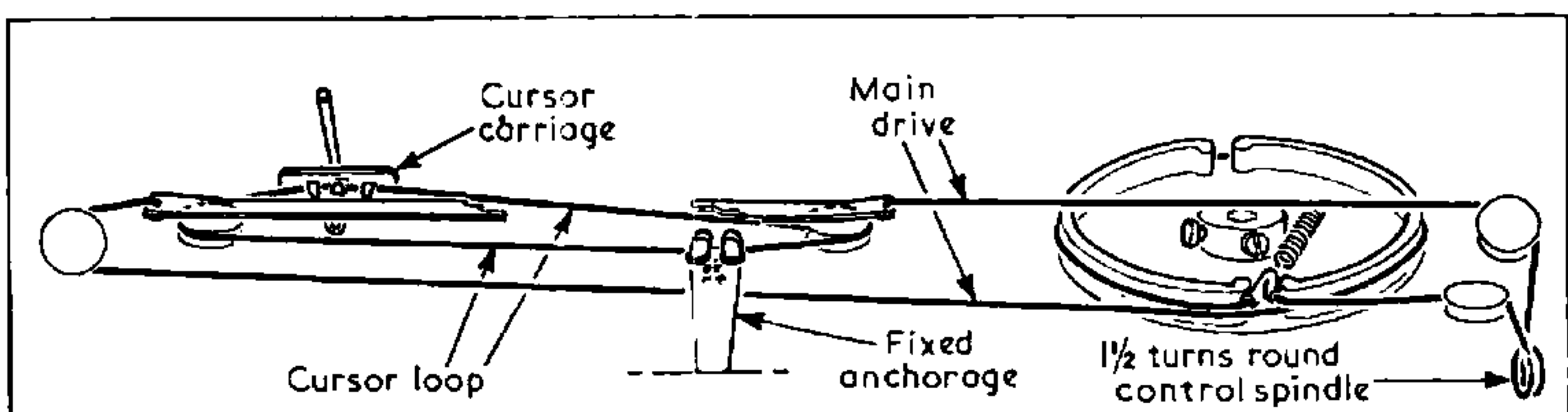
**DISMANTLING**

**Removing Chassis.**—Remove four control knobs from sides of cabinet (pull-off); unsolder four leads from speech coil and output transformer tags on speaker; remove two 2BA nuts (with washers) from rear lower edges of chassis; release two 2BA captive bolts securing lower front edges of chassis to cabinet, and withdraw chassis.

When replacing, the brown and black speaker leads should go to the speech coil tags, and the red and blue leads to the tags on the output transformer.

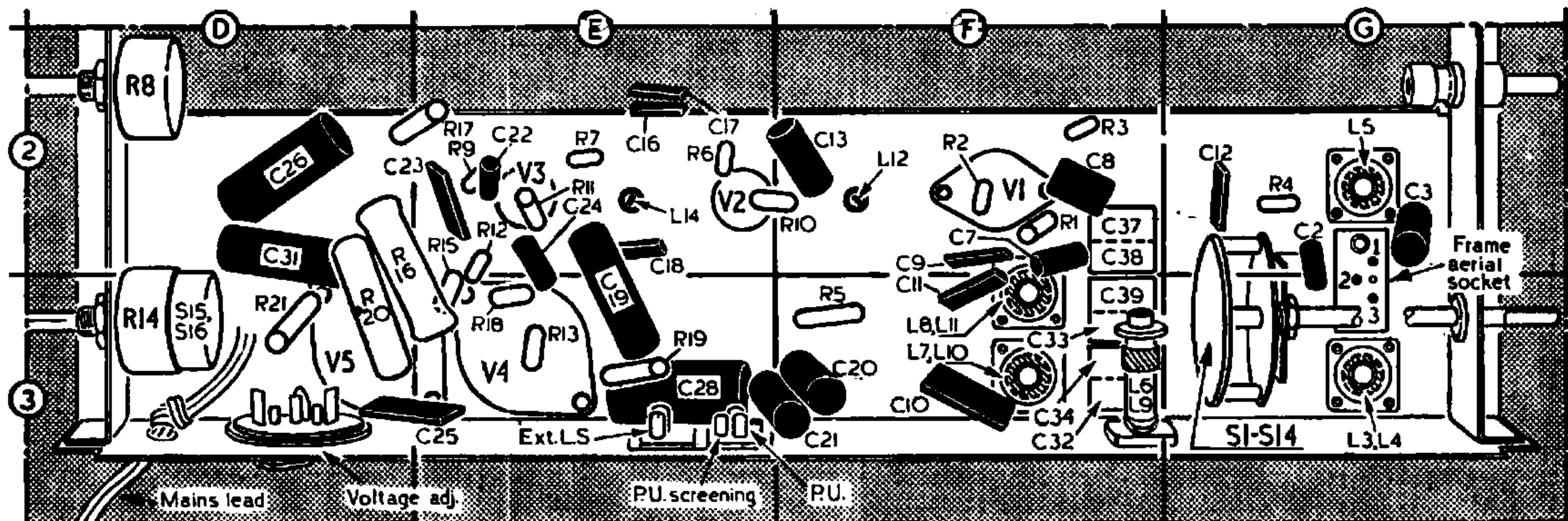
**Switch Table, Model 754**

Switch	S.W.1	S.W.2	M.W.	L.W.
S21	—	—	—	—
S22	—	—	—	—
S23	—	—	—	—
S24	—	—	—	—
S25	—	—	—	—
S26	—	—	—	—
S27	—	—	—	—
S28	—	—	—	—
S29	—	—	—	—
S30	—	—	—	—
S31	—	—	—	—
S32	—	—	—	—
S33	—	—	—	—
S34	—	—	—	—
S35	—	—	—	—
S36	—	—	—	—
S37	—	—	—	—
S38	—	—	—	—
S39	—	—	—	—
S40	—	—	—	—
S41	—	—	—	—
S42	—	—	—	—



Drive cord as seen from beneath the chassis with the gang at minimum capacitance.





Under-chassis view of the 85A. In the 754 a two-wafer 4-position switch unit is fitted in place of the single-wafer unit S1-S14 in location G3. The core adjustment for L6 (F3) is reached from the rear of the chassis.

**VALVE ANALYSIS**

Valve voltages and currents given in the table below are those derived from the manufacturers' information and were measured on a model 85A receiver when it was operating from 225 V A.C. mains, the voltage adjustment being set to the 200-225 V tapping. Readings taken on a model 85U and a model 754, except where otherwise indicated in the table, were approximately the same.

Voltages were measured with an electronic meter, and as these instruments have a high internal resistance, allowance should be made for the current drawn by other types of meter. Chassis was the negative connection. The voltage measured across C30 was 190 V.

Valve	Anode		Screen		Cath.
	V	mA	V	mA	
V1 12AH8	90V Oscillator	2.0	90	3.0	2.0
V2 12BA6	85V	4.0	90	3.0	0.7
V3 12AT6	90V	7.5	90	3.0	0.7
V4 35L6 ...	50	0.1	90	3.0	5.0
V5 35Z4 ...	180	26.0	90	3.0	5.0
	240*	—	—	—	240.0†

\* A.C. reading. † Cathode current, 49 mA.  
§ 90V in Model 85U. ¶ 185V in Model 754.

**DRIVE CORD REPLACEMENT**

The tuning drive system is unusual in that there is a two-to-one step-up drive on the cursor section, devised by means of an anchored loop to which the cursor is attached. Altogether, about 4½ feet of nylon-braided glass yarn is required, and it should be divided into two lengths of 3ft and 1½ft.

First, with the shorter length, make the cursor loop. The ends of this loop should be passed through a metal collet and knotted together, the loop, when stretched out flat measuring 7½in overall. Attach the loop to the fixed anchorage behind the scale backing plate, as shown in the sketch at foot of cols. 1 and 2, and positioning the loop round the two pulleys on the "floating" pulley plate, attach the cursor to the uppermost run of the loop.

Thread half an inch of Systoflex sleeving on the longer length of drive cord, and attach one end of the cord to one end of the "floating" pulley plate. Run

the cord as indicated in the sketch, finally tying of the cord to the other end of the pulley plate. The Systoflex on the cord should be positioned over the gap in drive drum rim and the tension spring should be anchored to it.

**CIRCUIT ALIGNMENT**

Although all the R.F. and oscillator adjustments are accessible with the chassis in its cabinet, the chassis must be withdrawn when making the I.F. adjustments.

**I.F. Stages.**—Switch receiver to M.W. and turn gang to maximum capacitance. Connect signal generator output, via an 0.1 µF capacitor in each lead, to control grid (pin 2) of V1 and chassis. Feed in a 471 kc/s (637 m) signal and adjust the cores of L15 (location reference B1), L14 (E2), L13 (B1) and L12 (F2) for maximum output. Repeat these adjustments until no further improvement results.

**R.F. and Oscillator Stages.**—Transfer signal generator leads to A and E sockets. Replace chassis in cabinet and check that with the gang at maximum capacitance the cursor coincides with the 100 mark on the 0-100 tuning log scale.

**Models 85A, 85U.**

**S.W.**—Switch receiver to S.W., tune to 17.65 m, feed in a 17.65 m (17 Mc/s) signal and adjust C37 (A1) and C32 (A1) for maximum output. Tune receiver to 46.16 m, feed in a 46.16 m (6.5 Mc/s) signal and adjust the cores of L6 (F3) and L4 (A1) for maximum output. Repeat these adjustments until no further improvement results.

**M.W.**—Switch receiver to M.W., tune to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust C38 (A1) and C34 (A1) for maximum output. Tune receiver to 500 m, feed in a 500 m (600 kc/s) signal and adjust the cores of L7 (B1) and L5 (A1) for maximum output. Repeat these adjustments until no further improvement results.

**L.W.**—Switch receiver to L.W., tune to 1,200 m, feed in a 1,200 m (250 kc/s) signal and adjust C39 (A1) and C33 (A1) for maximum output. Tune receiver to 1,667 m, feed in a 1,667 m (180 kc/s) signal and adjust the core of L8 (B1) for

maximum output. Repeat these adjustments until no further improvement results.

**Model 754.**

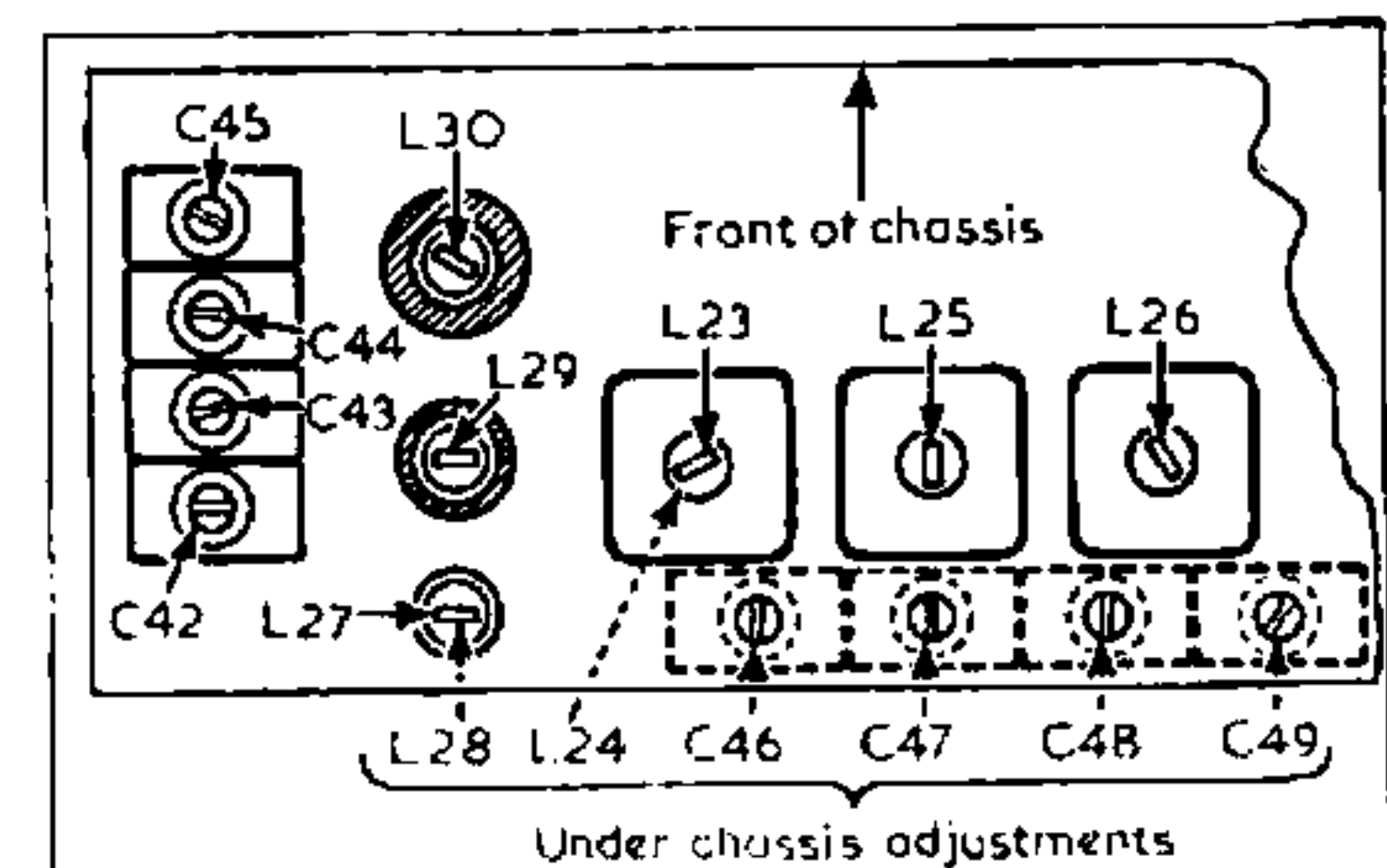
The positions of the core and trimmer adjustments used in the following alignment instructions are shown in a separate sketch at the foot of this column.

**S.W.1.**—Switch receiver to S.W.1, tune to 20 m, feed in a 20 m (15 Mc/s) signal and adjust C46 and C42 for maximum output. Tune receiver to 50 m, feed in a 50 m (6 Mc/s) signal and adjust the cores of L27 and L23 for maximum output. Repeat these adjustments until no further improvement results.

**S.W.2.**—Switch receiver to S.W.2, tune to 60 m, feed in a 60 m (5 Mc/s) signal and adjust C47 and C43 for maximum output. Tune receiver to 180 m, feed in a 180 m (1,667 kc/s) signal and adjust the cores of L28 and L24 for maximum output. Repeat these adjustments until no further improvement results.

**M.W.**—Switch receiver to M.W., tune to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust C48 and C44 for maximum output. Tune receiver to 500 m, feed in a 500 m (600 kc/s) signal and adjust the cores of L29 and L25 for maximum output. Repeat these adjustments until no further improvement results.

**L.W.**—Switch receiver to L.W., tune to 1,304 m, feed in a 1,304 m (230 kc/s) signal and adjust C49 and C45 for maximum output. Tune receiver to 1,800 m, feed in a 1,800 m (166.7 kc/s) signal and adjust the cores of L30 and L26 for maximum output. Repeat these adjustments until no further improvement results.



Model 754 trimmer and core positions.