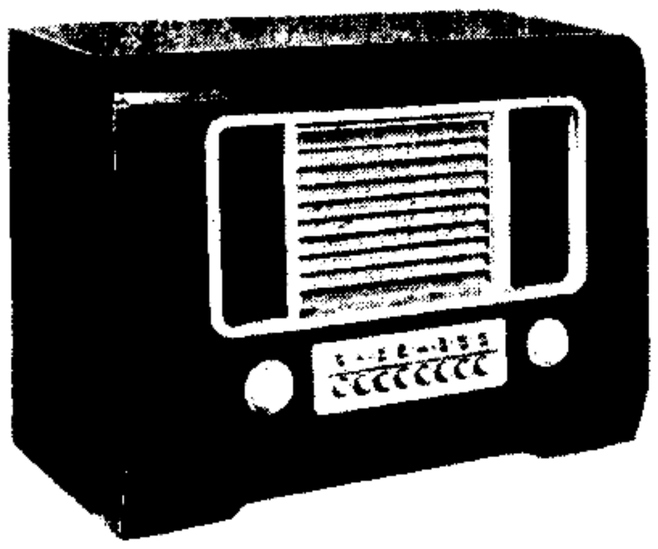
Supplement to The Wireless & Electrical Trader, November 13, 1948

"TRADER" SERVICE SHEET

886

H.M.V. 1407

Press-button Battery Superhet



The appearance of the H.M.V. 1407 battery superhet. The knob on the side belongs to the tone control.

PRESS-BUTTON tuning for five stations and press-button waveband switching is provided on the H.M.V. 1407, a 4-valve, 3-band battery superhet. The waveband ranges are 16.8-51.7 m, 192-575 m and 850-2,000 m.

Release date and original price: March, 1948; £26 5s, including batteries, plus purchase tax.

CIRCUIT DESCRIPTION

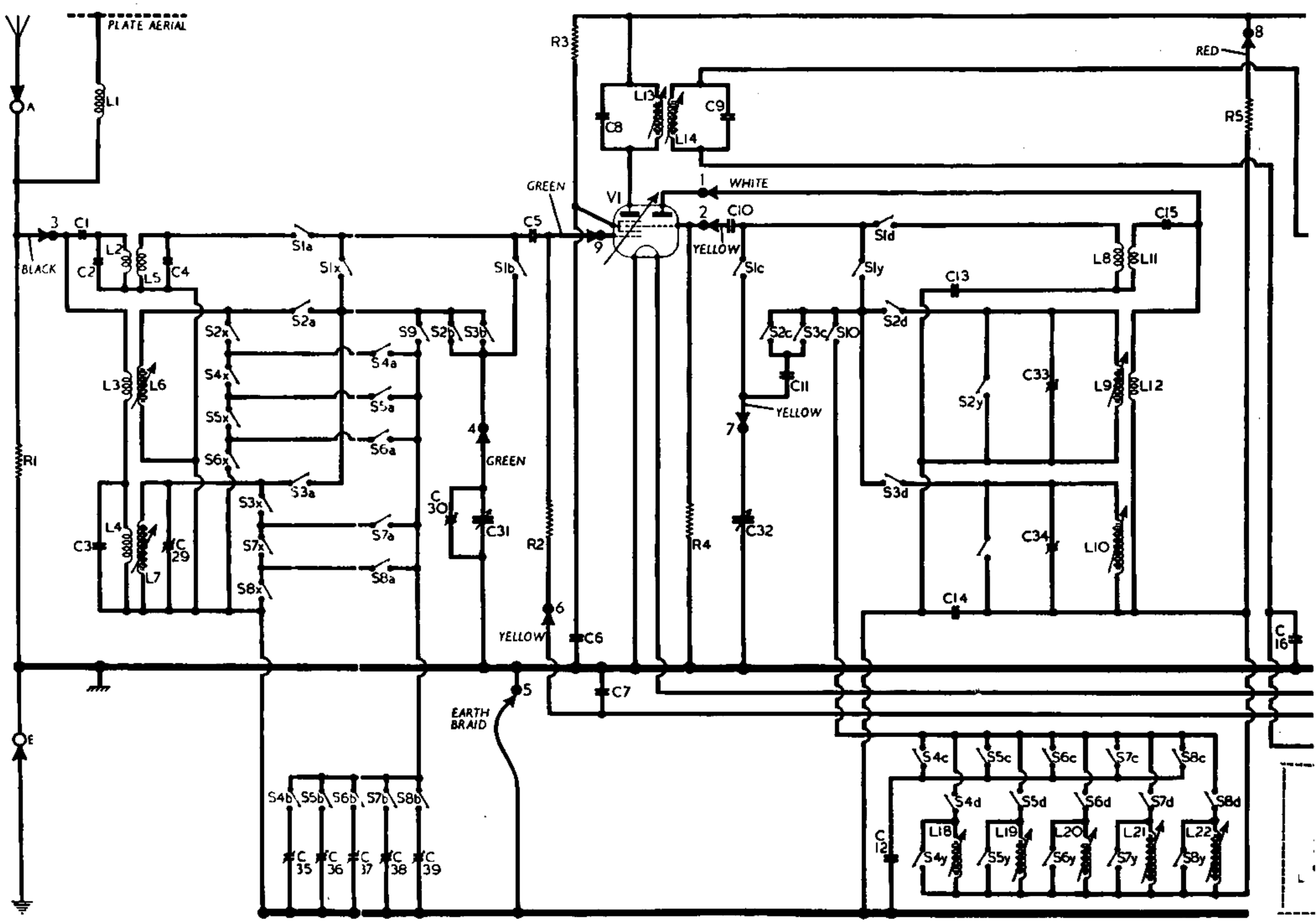
External aerial input is via coupling coils **L2** (S.W.), **L3** (M.W.) and **L4** (L.W.) to **L5** (S.W.), **L6** (M.W.) and **L7** (L.W.), tuned manually by **C31 via S1a, b** (S.W.), **S1x, S2a, b** (M.W.) and **S1x, S3a, b** (L.W.). For automatic tuning, **C31** is replaced by pre-set trimmer type capacitors **C35, C36, C37** (M.W.) and **C38, C39** (L.W.), selection being achieved by switches **S4a, b, x** to **S8a, b, x.**

The press-button switches are coded with suffix letters to indicate their functions, and they are arranged in groups. Two groups are controlled by each button, one belonging to the aerial circuit and the other to the oscillator circuit.

All the switches in the two groups belonging to a given press-button bear the same number, the individual switches in each group being identified by the suffix letter. If the suffix is **a, b, c** or **d,** the switch closes when its button is pressed; if the suffix is **x** or **y,** the switch opens. When a button is released (by pressing another button), its **a, b, c, d** switches open and its **x** and **y** switches close. When the manual tuning system is in operation the automatic tuning switches are disconnected, via master switches **S9, S10.**

First valve **(V1, Marconi metallized X24M)** is a triode-hexode operating as frequency changer with internal coupling. For manual operation triode oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C32,** via **S1c, d** to **S1y, S3c, d.** Parallel trimming by **C33** (M.W.) and **C34** (L.W.), and series tracking by **C13** (S.W.), **C11** (M.W.) and **C14** (L.W.). Mixed reaction coupling from anode, via **C15, L11** and the common impedance of **C13** on S.W., inductive reaction coupling by **L12** on **M.W.,** and capacitative coupling across **C14** on L.W.

For automatic tuning all the foregoing circuits are disconnected and replaced, via **S1y**



and **S10**, by one of the iron-dust cored pre-set coils **L18** to **L22**, which are tuned by fixed capacitors **C12, C14** in series, selection being determined by switches **S4c, d, y** to **S8c, d, y**, as explained previously.

Second valve **(V2, Marconi metallized Z21M)** is an R.F. tetrode operating as I.F. amplifier with tuned transformer couplings.

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Marconi metallized HD24M).** Audio frequency component in rectified output is developed across manual volume control **R9**, which is the diode load resistor, and passed via **C21** and **R10** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C20, R7** in diode circuit and **C23** in triode anode circuit.

Second diode of **V3**, fed from **V2** anode via **C22**, provides D.C. potential which is developed across load resistors **R14, R15**, tapped off, and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic gain control. Delay voltage, together with fixed G.B. for **V1, V2** and **V4** is obtained from the drop across **R19** in the H.T. negative lead to chassis.

Resistance-capacitance coupling by **R11, C24** and **R16**, between V3 triode and beam tetrode output valve **(V4, Marconi KT2).** Fixed tone correction by **C27** in anode circuit, and variable tone control by **C28, R18.** Provision for the connection of a low impedance external speaker across **T1** secondary winding, via **S11.** Resistor **R17** is included in series with the H.T.+ lead to reduce the H.T. battery consumption, and is short-circuited by **S13** when the battery economiser switch is in the "off" position.

COMPONENTS AND VALUES

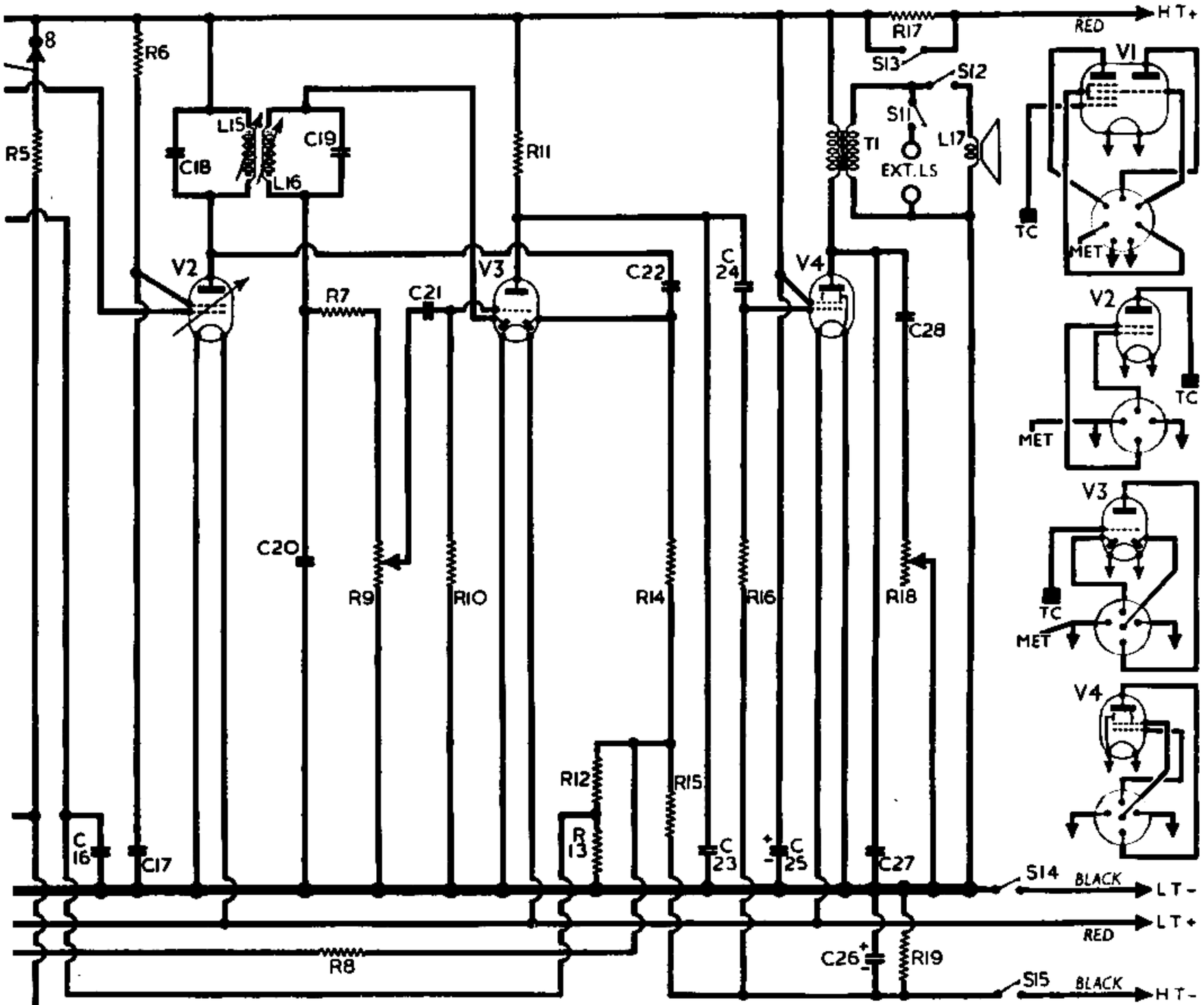
If the component numbers given in the following tables are used when ordering replacement parts, dealers are advised to mention the fact on the order, as these numbers may differ from those used in the manufacturers' diagram.

	RESISTORS	Values (ohms)	Locations
R1	Aerial shunt ...	10,000	J6
R2	V1 hex. C.G. ...	470,000	H4
R3	V1 S.G. feed ...	47,000	J5
R4	V1 osc. C.G. ...	100,000	J5
R5	Osc. anode load ...	10,000	L8
R6	V2 S.G. feed ...	68,000	J6
R7	I.F. stopper ...	220,000	H5
R8	A.G.C. decoupling	220,000	H5
R9	Volume control ...	500,000	E3
R10	V3 triode C.G. ...	2,200,000	E3
R11	V3 triode load ...	150,000	H5
R12	A.G.C. potential divider resistors	1,000,000	H5
R13		220,000	H5
R14	A.G.C. diode load resistors ...	220,000	H6
R15		1,000,000	H5
R16	V4 C.G. resistor ...	330,000	G5
R17	H.T. economiser ...	10,000	H6
R18	Tone control ...	200,000	E4
R19	G.B. resistor ...	360	E3

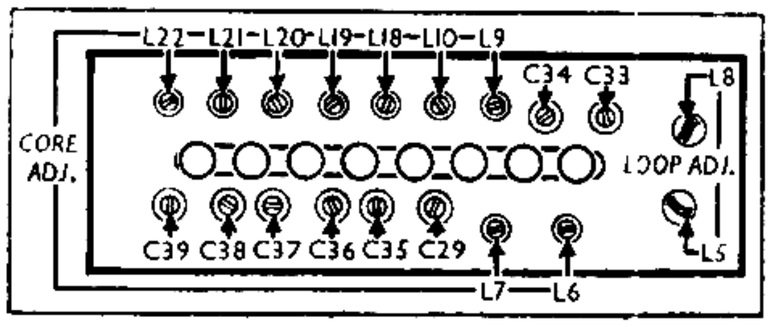
	CAPACITORS	Values (μF)	Locations
C1	Aerial S.W. series	0·00005	J4
C2	Aerial S.W. shunt	0·000005	J4
C3	Aerial L.W. shunt	0·0005	G4
C4	Aerial S.W. trim....	0·000005	J3
C5	V1 hex. C.G. ...	0·0001	J4
C6	V1 S.G. decoupling	0·047	J5
C7	V1 A.G.C. decoup.	0·047	H5
C8	1st I.F. transformer tuning	0·0001	A2
C9		0·0001	A2
C10	V1 osc. C.G. ...	0·00005	L8
C11	Osc. M.W. tracker	0·0005	L8
C12	Osc. auto-tuning	0·00023	M8
C13	Osc. S.W. tracker	0·005	L7
C14	Osc. L.W. tracker	0·00035	M8
C15	Osc. anode coup.	0·00005	L7
C16	V2 C.G. decoup. ...	0·047	K5
C17	V2 S.G. decoup. ...	0·047	J5
C18	2nd I.F. transformer tuning	0·0001	B2
C19		0·0001	B2
C20	I.F. by-pass ...	0·0001	H5
C21	A.F. coupling ...	0·047	E4
C22	A.G.C. coupling ...	0·0001	H6
C23	I.F. by-pass ...	0·00023	G5
C24	A.F. coupling ...	0·047	G5
C25*	H.T. reservoir ...	8·0	H6
C26*	G.B. by-pass ...	50,0	F5
C27	Tone corrector ...	0·001	G5
C28	Part tone control...	0·01	E5
C29‡	Aerial L.W. trim...	0·000135	G3
C30‡	Aerial M.W. trim...	—	K4
C31†	Aerial tuning ...	—	K4
C32†	Oscillator tuning	—	K4
C33‡	Osc. M.W. trim. ...	0·000045	L7
C34‡	Osc. L.W. trim. ...	0·000135	L7
C35‡	Aerial circuit press-button tuning trimmers ...	0·000135	G3
C36‡		0·00045	G3
C37‡		0·00045	F3
C38‡		0·00045	F3
C39‡		0·00045	F3

* Electrolytic † Variable ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Aerial choke ...	4.5	K6
L2	Aerial coup. coils ...	0.6	J3
L3		24·0	H3
L4		60·0	H3
L5	Aerial tuning coils	0·1	J3
L6		5·5	H3
L7		20·0	H3
L8	Osc. tuning coils ...	0·1	L7
L9		3·0	L7
L10		8·5	M7
L11	Osc. reaction coils	0·6	L7
L12		1·5	L7
L13	1st I.F. trans. Pri.	7·0	A2
L14	1st I.F. trans. Sec.	7·0	A2
L15	2nd I.F. trans. Pri.	7·0	B2
L16	2nd I.F. trans. Sec.	7·0	B2
L17	Speech coil ...	3.5	—
L18	Osc. press-button tuning coils ...	2·0	M7
L19		4·5	M7
L20		4·5	M7
L21		10·4	M7
L22		10·4	M7
T1	Output trans. Pri.	1,200·0	C1
	Output trans. Sec.	0·1	C1
S1a, b to S3a,b,x	Aerial circuit wave-band switches	—	—
S4a, b to S8a,b,x	Aerial circ. press-button tuning switches ...	—	—
S1c, d to S3c,d,y	Osc. circuit wave-band switches ...	—	—
S4c,d to S8c,d,y	Osc. circuit press-button tuning switches ...	—	—
S9	Press-button tun. master switches	—	G4
S10		—	M8
S11	Speaker switches ...	—	G6
S12		—	G6
S13	Economiser switch	—	J6
S14	L.T. circ. switch ...	—	E3
S15	H.T. circ. switch	—	E3



Circuit diagram of the H.M.V. 1407 battery superhet. The sections of the tuning circuits shown beneath the chassis line are associated solely with the pre-set station press-buttons. Fixed grid bias potentials for **V1** and **V2** are obtained from the potential divider formed by the A.G.C. diode load resistors **R13, R12, R15** which are connected in series across the G.B. resistor **R19.**



Drawing of the tuning assembly panel as seen from the front of the receiver after removing the moulded escutcheon. The pre-set tuning adjustments are on the left, and the manual tuning adjustments are on the right.

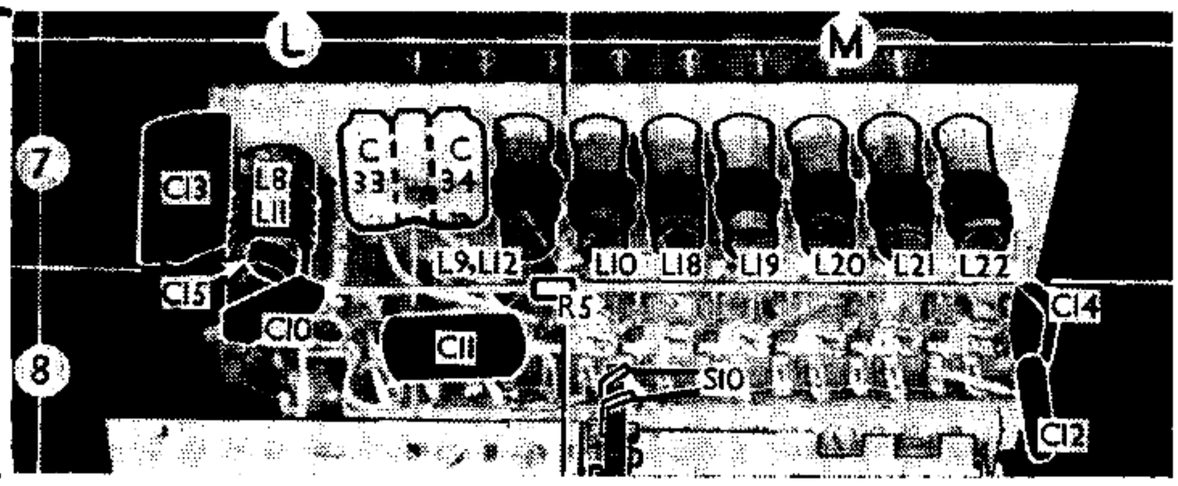
VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. With the economy switch closed and the receiver operating from a new H.T. battery they give the total H.T. current as 11.5 mA. Voltages were measured with a meter having an internal resistance of 500 ohms-per-volt.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X24M	115	0·95	60	1·05
	Oscillator			
	85	2.4		
V2 Z21M	115	1·1	60	0·28
V3 HD24M	33	0·4	—	—
V4 KT2	110	4.0	115	1·0

GENERAL NOTES

Switches.—The press-button switches are numbered **S1 to S8,** with suffix letters **a, b, c, d, x, y,** as explained under "Circuit Description" overleaf. **The S1** switches are controlled by the S.W. manual button, the **S2** switches by the M.W. manual button, and the **S3** group by the L.W. manual button. **S4, S5** and **S6** groups are controlled by the three M.W. pre-set station buttons, and **S7** and **S8** by the two L.W. pre-set buttons. Both sides of the press-button switch unit are shown in detail in the diagrams in cols. 2 and 3.



Upper side of the tuning assembly, which faces the underside of the chassis deck, as seen from the rear. **S9** is on the lower end of the appended switch unit carrying **S10.**

S9 and **S10** form a separate unit mounted on the rear of the press-button unit, as seen in our photograph at the head of cols. 2, 3. They both open automatically when any waveband button is pressed, and close when any station button is pressed.

S11, S12 are the speaker switches, in a three-position unit which permits either the internal or external speaker to be operated separately or both to operate together. Its connecting tags are identified in our under-chassis photograph, where the unit has been artificially tilted so as to show them.

S13 is the battery economy switch, indicated on the rear chassis member. It closes to short-circuit **R17** when its knob is turned clockwise. **S14, S15** are the battery circuit switches in a toggle unit whose "dolly" is operated by a lever on the spindle of the volume control **R9.**

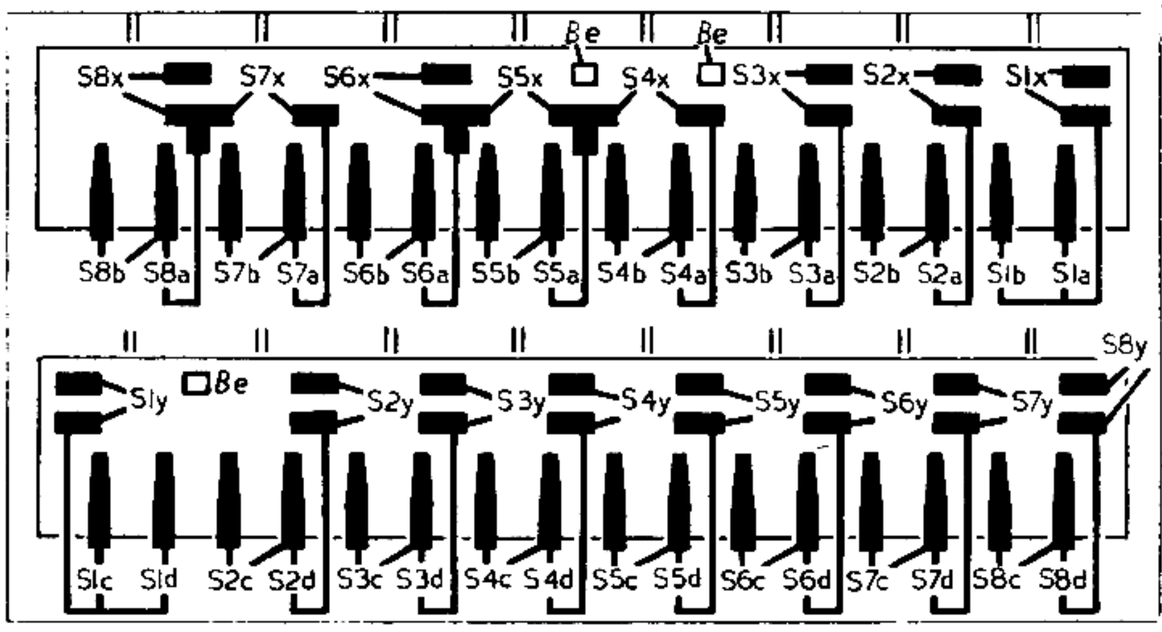
External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 5Ω) external speaker. Either or both speakers can then be operated, according to the setting of the speaker circuit switch unit **S11, S12.**

Batteries and Leads.—A thin pair of black and red leads with wander-plugs are provided for the H.T. battery, and a thicker pair with spade tags for the accumulator.

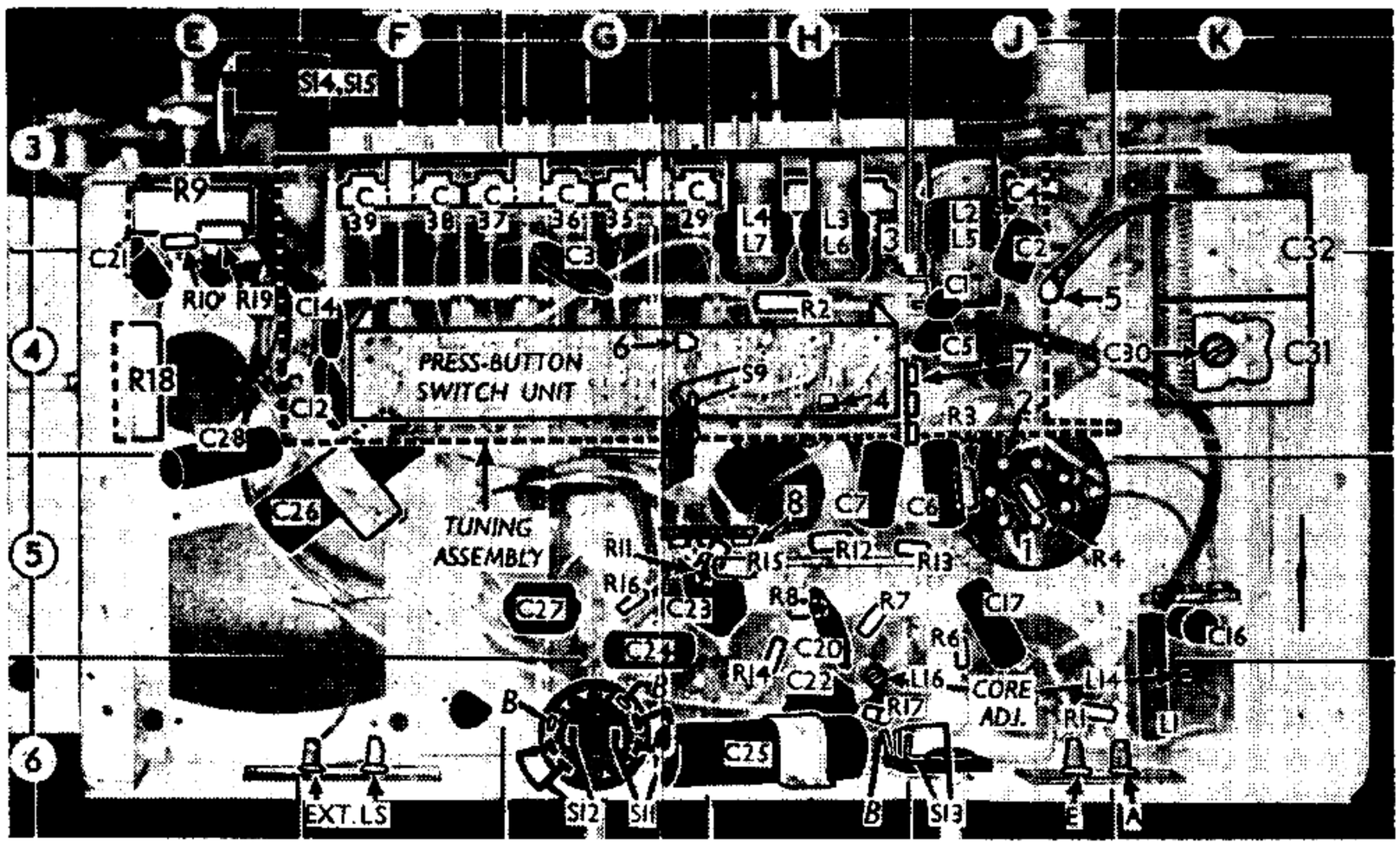
The accumulator is a 2v cell type GFAG. The H.T. battery is a Marconiphone type B498, 120 V overall. The positive plug goes to the +114 V socket, and the negative plug to the —6v socket. An alternative battery suggested by the makers is No. B600.

Chassis Divergencies.—The plate aerial loading coil **L1,** which is covered with plastic sleeving, may be 2.3Ω in early versions instead of 4.5Ω as in our sample.

Generally, with the exception of a few early chassis, the S.W. aerial fixed trimmer **C4** is omitted.



Diagrams of the two sides of the press-button switch unit. The upper diagram is actually the underside of the unit, as seen in our under-chassis view; the lower one is the side seen in the photograph above.



Under-chassis view. The press-button switch unit is indicated here, but it is shown in detail in the diagrams in cols. 2 and 3 above, where both sides are drawn. A photograph of the upper side of the tuning assembly appears at the top of cols. 2 and 3. Interconnecting points between this assembly and the main chassis, referred to in "Dismantling The Set," are indicated here by numbers **1** to **8.** No. **9** is on the top cap connector to **V1.** The speaker switch unit **S11, S12** has been tilted artificially to show its face.

DRIVE WIRE REPLACEMENT

When replacing the drive, it is important that only the correct type of wire be used for the tuning drive wire replacement. This can be obtained from E.M.I. Sales and Service, Ltd., Sheraton Works, Hayes, Middlesex. The overall length is about 88 ins.

Make a ⅛ in. diameter loop at one end of the wire (which will solder quite easily), pass it through the groove slot in the drum and hook it on to the anchor pin as shown in the sketch (col. 4), where the gang is at maximum.

Take the wire ¾ of a turn clockwise round the drum, then follow the course shown in the sketch, finishing off with another loop like the first, twisting the wire and soldering. The loop is then passed through the second groove slot and hooked on to the spring, which is in turn hooked to the anchor peg. The length of the wire should be such that the coils of the spring open slightly.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator via an 0.05 μF capacitor in the "live" lead, to control grid (top cap) of **V2** and the **E** socket. Press the S.W. button, turn the gang to maximum capacitance and the volume control to maximum, feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L16** and **L15** (location references H6, B2) for maximum output, damping **L15** with a 33,000 Ω resistor while adjusting **L16** and vice versa.

Transfer "live" signal generator lead to control grid (top cap) of **V1,** leaving existing connector in position, and adjust the cores of **L14** (K6) and **L13** (A2) for maximum output, damping the associated winding in each case, as previously explained.

R.F. and Oscillator Stages.—The locations of all adjustments (except **C30**) in the following operations are indicated in our sketch of the tuning assembly front panel (col. 1). Since the calibrated glass scales are mounted on the cabinet and the alignment adjustments are carried out with the chassis on the bench, a substitute scale is fixed on the front chassis member. This is divided into inches and sixteenths of an inch, and linear measurements on this scale correspond to frequencies given in the alignment instructions, which are read against the left-hand edge of a red tab attached to the horizontal section of the drive wire.

With the gang at maximum capacitance the left-hand edge of the red tab should coincide with the 5½ in mark on the scale. If any adjustment is necessary, slacken the two screws securing the scale and slide it horizontally to correct the error. Tighten the fixing screws and connect "live" signal generator lead to **A** socket, via a suitable dummy aerial.

M.W.—Press M.W. button, set tab to $\frac{5}{32}$ in, feed in a 210 m (1,427 kc/s) signal, and adjust **C33** and **C30** (K4) for maximum output. Set tab to 4½ in, feed in a 510 m (588 kc/s) signal, and adjust the cores of **L9** and **L6** for maximum output. Repeat these adjustments.

L.W.—Press L.W. button, set tab to 1⅛ in, feed in a 1,000 m (300 kc/s) signal, and adjust **C34** and **C29** for maximum output. Set tab to $4\frac{13}{32}$ in, feed in a 1,850 m (162 kc/s) signal, and adjust the cores of **L10** and **L7** for maximum output. Repeat these adjustments.

S.W.—Press the S.W. button and use S.W. dummy aerial. Set tab to 5⅛ in, feed in a 50 m (6.0 Mc/s) signal and adjust the positions of the internal loops in **L8** and **L5** for maximum output.

Finally, replace the chassis in the cabinet and turn the gang to maximum capacitance. The two cursors should be positioned so that they coincide with the horizontal lines at the tops of the scales and then clamped to the drive wires. Check the calibration on known stations at approximately mid-scale positions and adjust the cursors as necessary. On M.W. and L.W. it may be necessary to set the cursor to give the best compromise on both wavebands.

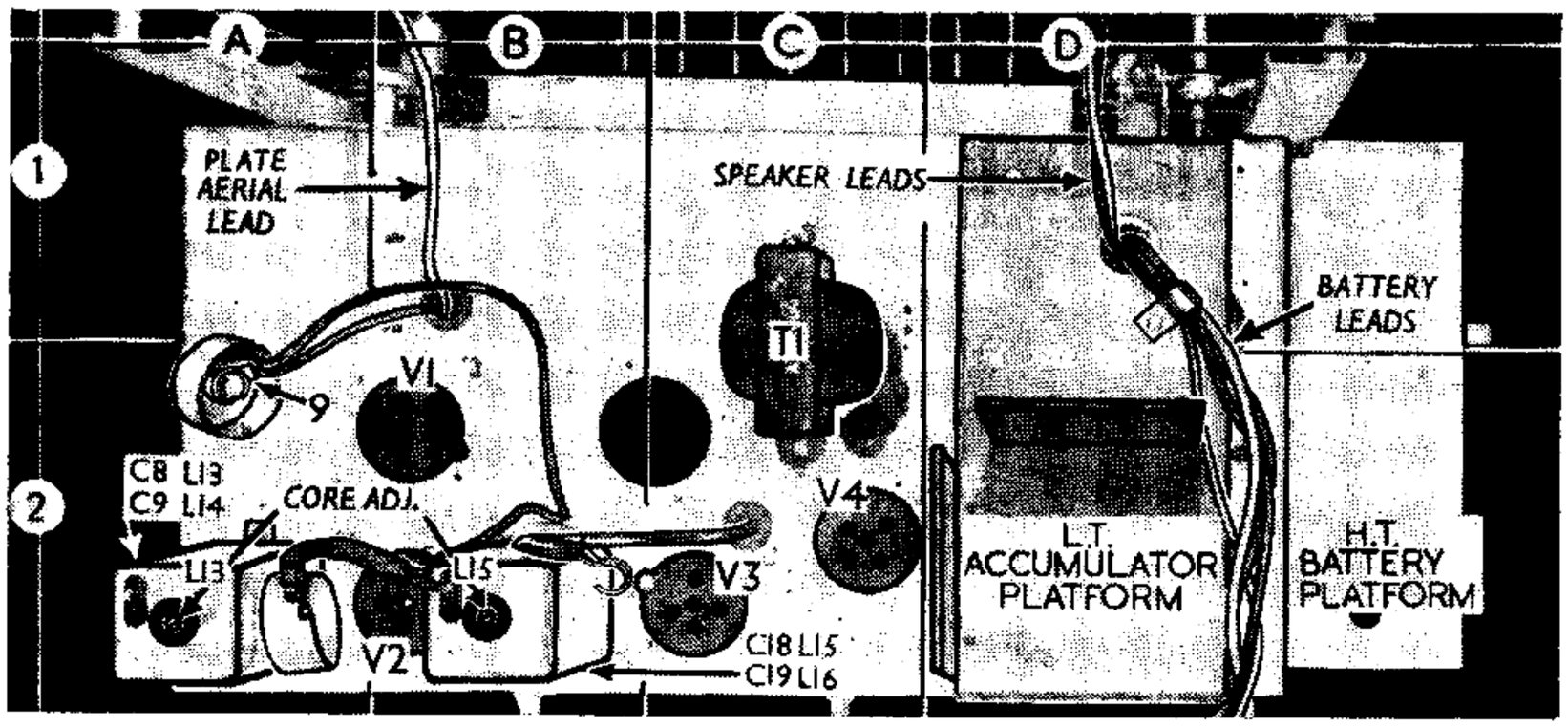
Press-button Setting

The press-button circuits should be reset after alignment. The process is simple, but should be carried out at the customer's address on actual stations if possible. The adjustment range of each oscillator coil core is shown on an associated label exposed when the escutcheon is lifted off the cabinet (press fit). Adjust the upper (oscillator) coil core first to the required station, and then peak the lower (aerial) trimmer.

DISMANTLING THE SET

Almost unimpeded access to the chassis underside may be obtained upon removal of the bottom cover (three round-head wood screws).

Removing Chassis.—Remove the two front control knobs (taking care not to lose their fixing screws) and the side control knob (pull off);



Plan view of the chassis, showing the battery platforms. **V2** top cap, it should be noted, is the anode connection.

detach the plate aerial lead (one round-head wood screw and washer);

loosen each of the scale cursor clamping screws and lift out the associated drive wire;

loosen the speaker lead cleat on the sub-baffle, lift out the leads, and remove the four hexagon-head chassis retaining screws (with spring and claw washers) from the underside of the cabinet.

To free the chassis entirely, unsolder the two speaker leads at tags on the speaker connecting panel.

When replacing, resolder the yellow speaker lead to the tag marked + on the speaker connecting panel, and the black lead to the tag marked —, which is also joined to the right-hand scale backing plate.

Removing Speaker.—Remove the four round-head bolts (with washers) securing the speaker to the sub-baffle.

When replacing, the connecting panel should be at the top, and if the leads have been unsoldered they should be reconnected as previously described.

Removing Tuning Assembly.—Unsolder from the underside of the chassis, at points indicated in our circuit diagram and under-chassis view by the numbers **1** to **8** (location references J5, J4, H4, G4, H5), the eight leads connecting the assembly;

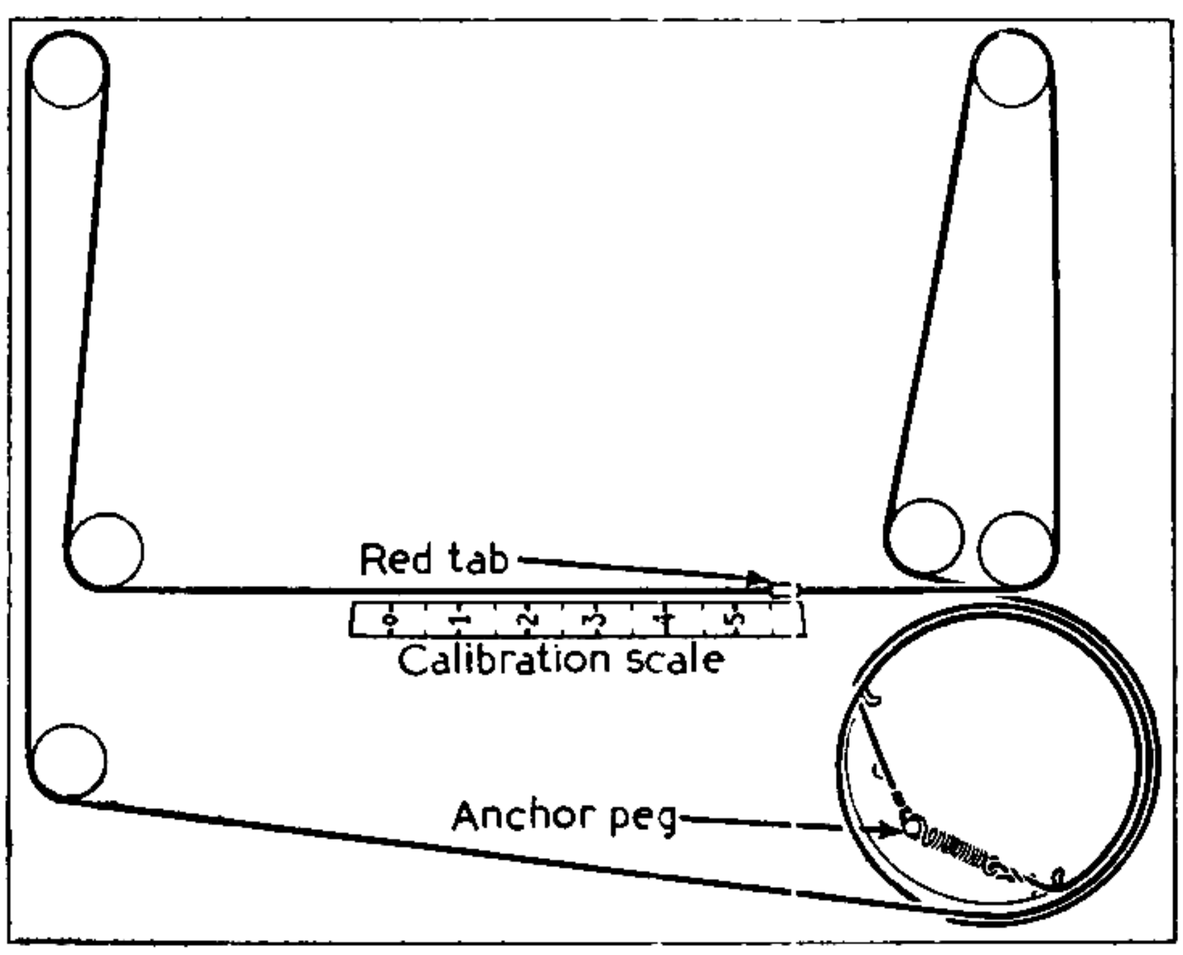
remove **V1** top cap connector and unsolder the green plastic covered lead, number **9** (A2), and draw the lead back into the chassis through the grommet provided;

remove the two self-threading screws securing the toggle switch mounting bracket and the four screws securing the tuning assembly and substitute scale to the front chassis member;

lift out the assembly, taking care not to foul the cursor drive wire.

When replacing, the eight leads should be re-soldered to the numbered points indicated in our under-chassis picture as follows: 1, white lead from **L12**; 2, yellow lead from **C10**; 3, black screened aerial lead; 4, green lead from **C31**; 5, metal braided lead from tuning assembly; 6, yellow lead from **C7, R8**; 7, yellow lead from **C11**; 8, red lead from **R5**.

The long green lead from **C5, R2** on the press-button switch should be threaded back, through the grommet provided, to the chassis deck where **V1** top-cap connector (9) may be reconnected to it.



Sketch showing the tuning scale drive system, drawn as seen from the front of the chassis when the gang is at maximum. The cable consists of a special stranded steel wire. The position of the calibration scale is indicated.

Printed in England by The Cornwall Press Ltd., Paris Garden, London, S.E.1

*