

"TRADER" SERVICE SHEET
868

PILOT SH545

THREE-BAND A.C. SUPERHET

THREE wavebands are covered in the Pilot SH545, the ranges being 13-52 m, 180-565 m, and 900-2,400 m. The receiver is a 4-valve (plus rectifier) superhet designed to operate from A.C. mains of 110-130 V and 200-250 V, 40-100 c/s.

Release date and original price: September, 1947; £22 1s. plus purchase tax.

CIRCUIT DESCRIPTION

Aerial input from socket **A1** is via series capacitor **C1** and coupling coils **L2** (S.W.), **L3** (M.W.) and **L4** (L.W.) to single-tuned circuits **L5**, **C32** (S.W.), **L6**, **C32** (M.W.) and **L7**, **C32** (L.W.). Input attenuation is obtained via socket **A2** and the small wire-wound series capacitor **C2**, and a tuned filter **L1**, **C28** is connected across the aerial coupling circuit to remove interference at the intermediate frequency.

First valve (**V1**, **Brimar 6K8GT**) is a triode-hexode operating as frequency changer with electron coupling. Triode

oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C33**, with parallel trimming by **C10** (S.W.), **C36** (M.W.) and **C37** (L.W.), and series tracking by **C8** (S.W.), **C34** (M.W.) and **C35** (L.W.).

Reaction coupling to grid circuit, via **C11**, by coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.), with additional coupling on S.W. due to the common impedance of **C8** in grid and anode circuits.

Second valve (**V2**, **Brimar 6K7GT**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C4**, **L14**, **L15**, **C5** and **C13**, **L16**, **L17**, **C14** in which the tuning capacitors are fixed and alignment adjustments are carried out by varying the positions of the iron-dust cores.

Intermediate frequency 451 kc/s.

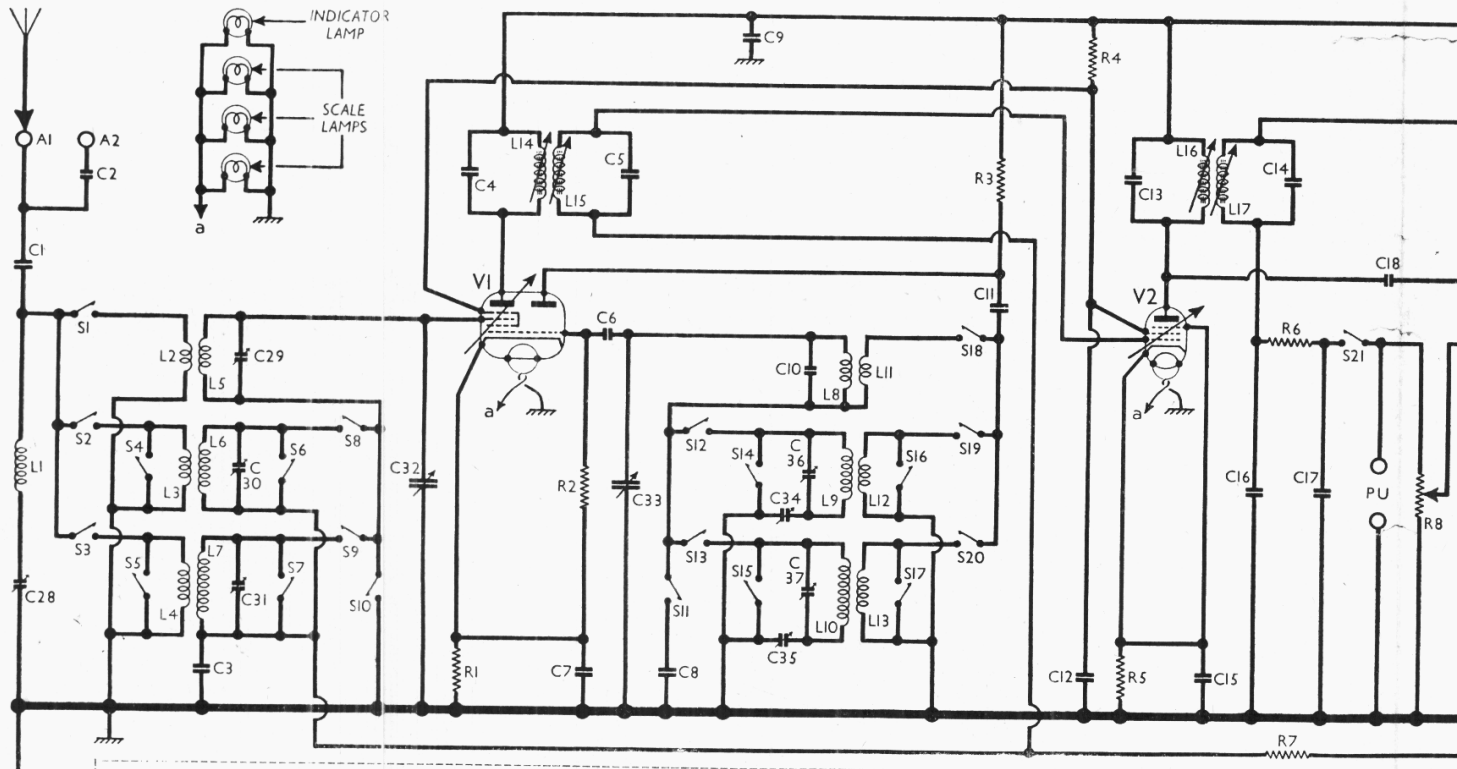
Diode second detector is part of double diode triode valve (**V3**, **Brimar 6Q7GT**). Audio frequency component in rectified output is developed across the manual

volume control **R8**, which is also the diode load resistor, and passed via A.F. coupling capacitor **C19** and C.G. resistor **R9** to grid of triode section, which operates as A.F. amplifier.

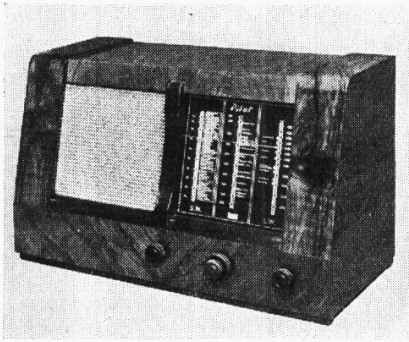
I.F. filtering by **C16**, **R6**, **C17** in diode circuit and **C20** in triode anode circuit, and provision for the connection of a gramophone pick-up across **R8** by means of special sockets with which is associated the radio muting switch **S21**, operated by the pick-up plug.

Second diode of **V3**, fed from **V2** anode via **C18**, provides D.C. potential which is developed across load resistor **R11** and fed back through a decoupling circuit as G.B. to F.C. (except on S.W.) and I.F. valves, giving automatic volume control.

Resistance-capacitance coupling by **R10**, **C22** and **R13** between **V3** triode and beam tetrode output valve (**V4**, **Brimar 6V6G**). Variable tone control in **V3** anode circuit by **C21**, **R12**, and fixed tone correction in **V4** anode circuit by **C23**. Provision for the connection of a low impedance ex-



Circuit diagram of the Pilot SH545 A.C. superhet. **C2** is a very small capacitor for use when receiving very strong signals. **S21** is operated by the special plug used to connect the gramophone pick-up. **S10** and **S11** in the aerial and oscillator circuits close on the S.W. band. Two-stage resistance-capacitance smoothing is used in the H.T. circuit, the output valve anode being fed from the first stage.



speaker leads, which is sufficient for most purposes.
If the speaker leads are unsoldered, the black leads should be connected to the outer tags of the speaker transformer, and the red leads to the inner tags.

Removing Speaker.—Remove chassis as previously described and then detach
(Continued col. 1 overleaf)

COMPONENTS AND VALUES

RESISTORS		Values (ohms)	Locations
R1	V1 fixed G.B. ...	220	K6
R2	V1 osc. C.G. ...	47,000	K6
R3	Osc. H.T. feed ...	22,000	K6
R4	S.G.'s H.T. feed ...	22,000	H8
R5	V2 fixed G.B. ...	220	I8
R6	I.F. stopper ...	47,000	G8
R7	A.V.C. decoupling ...	1,000,000	G8
R8	Volume control ...	500,000	G5
R9	V3 C.G. resistor ...	10,000,000	G8
R10	V3 triode load ...	220,000	F7
R11	A.V.C. diode load ...	1,000,000	G8
R12	Tone control ...	1,000,000	H5
R13	V4 C.G. resistor ...	1,000,000	F8
R14	V4 G.B. resistor ...	270	F8
R15	H.T. smoothing ...	1,000	F7
R16	resistors ...	2,200	F7

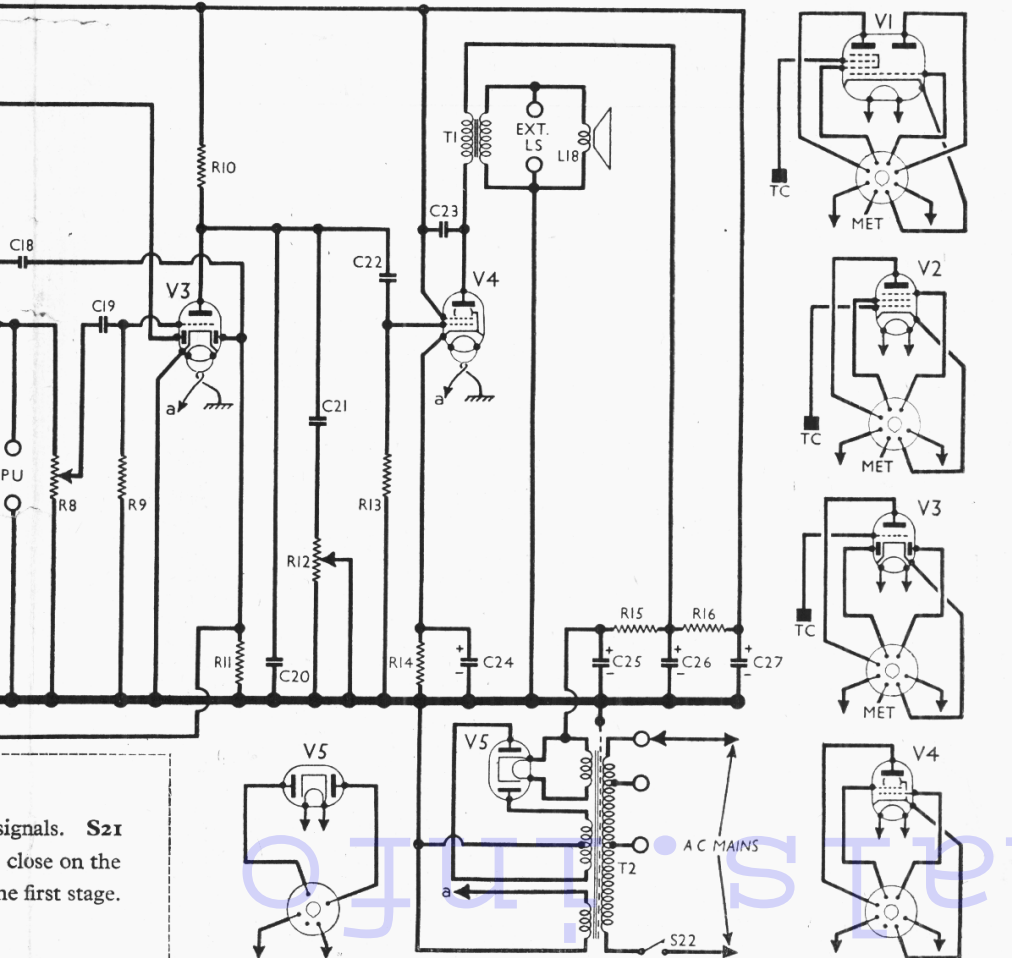
ternal speaker across the secondary winding of the internal speaker transformer **T1**.
H.T. current is supplied by I.H.C. full wave rectifying valve (**V5, Brimar 5Z4G**). Smoothing by resistors **R15, R16** and electrolytic capacitors **C25, C26** and **C27**, and H.T. circuit R.F. filtering by **C9**.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull off) and three felt washers from the front of the cabinet; from the underside of the cabinet remove the four cheese-head screws (with metal washers) securing the chassis, and slide out the chassis to the extent of the

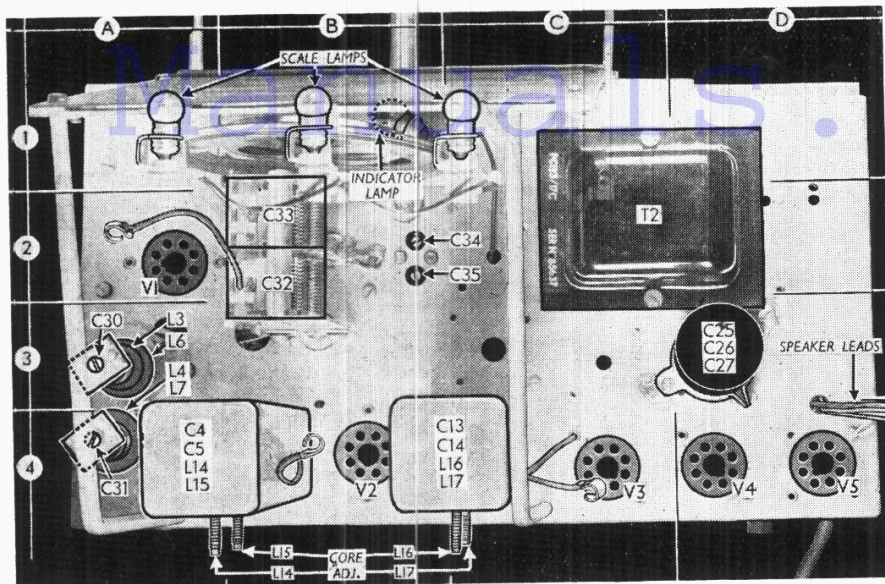
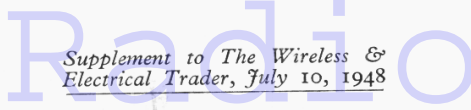
CAPACITORS		Values (μF)	Locations
C1	Aerial series capacitors ...	0-0005	K8
C2	...	0-000003	J8
C3	V1 Hex C.G. decoup.	0-1	J8
C4	1st I.F. trans. former tuning ...	0-00011	A4
C5	...	0-00011	A4
C6	V1 osc. C.G. ...	0-00006	J6
C7	V1 cath. by-pass ...	0-05	K6
C8	S.W. tracker ...	0-006	I6
C9	H.T. R.F. by-pass ...	0-1	H7
C10	Osc. S.W. trim. ...	0-000005	J6
C11	Osc. anode coup. ...	0-0001	K6
C12	S.G.'s decoup. ...	0-1	H7
C13	2nd I.F. trans. former tuning ...	0-00011	B4
C14	...	0-00011	B4
C15	V2 cath. by-pass ...	0-05	I8
C16	I.F. by-passes ...	0-0001	H8
C17	...	0-0001	G8
C18	A.V.C. coupling ...	0-00006	H8
C19	A.F. coupling ...	0-005	G8
C20	I.F. by-pass ...	0-0003	G8
C21	Tone control ...	0-01	F8
C22	A.F. coupling ...	0-05	G8
C23	Tone corrector ...	0-005	E8
C24*	V4 cath. by-pass ...	25-0	F7
C25*	H.T. smoothing capacitors ...	8-0	D3
C26*	...	16-0	D3
C27*	...	16-0	D3
C28‡	I.F. filter tuning ...	0-0002	K8
C29‡	Aerial S.W. trim. ...	0-00001	K7
C30‡	Aerial M.W. trim. ...	0-00003	A3
C31‡	Aerial L.W. trim. ...	0-00005	A4
C32†	Aerial tuning ...	0-000532	B2
C33†	Oscillator tuning ...	0-000532	B2
C34‡	Osc. M.W. track ...	0-0007	I6
C35‡	Osc. L.W. track ...	0-0003	I6
C36‡	Osc. M.W. trim. ...	0-00003	I5
C37‡	Osc. L.W. trim. ...	0-00005	J5

* Electrolytic. † Variable. ‡ Pre-set.



signals. S21 close on the first stage.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	I.F. filter coil ...	8-0	K8
L2	Aerial coupling coils ...	1-8	K7
L3	...	14-0	A3
L4	...	114-0	A4
L5	Aerial tuning coils ...	Very low	K7
L6	...	2-5	A3
L7	...	14-0	A4
L8	Osc. tuning coils ...	Very low	J6
L9	...	3-25	I6
L10	...	12-5	J6
L11	...	0-2	J6
L12	Osc. reaction coils ...	66-0	I6
L13	...	2-3	J6
L14	1st I.F. trans. (Pri.)	7-0	A4
L15	...	7-0	A4
L16	2nd I.F. trans. (Pri.)	7-0	B4
L17	...	7-0	B4
L18	Speech coil ...	2-4	—
T1	Output trans. (Pri.)	230-0	—
	...	0-3	—
	(Pri., total Heat. sec.,	26-5	C2
T2	Mains Rect. heat. trans. sec.,	Very low	C2
	H.T. sec., total	700-0	C2
S1-S20	W/band switches	—	K6
S21	P.U. switch	—	G8
S22	Mains sw., g'd R8	—	G5



Plan view of the chassis. The aerial coils L3, L6 and L4, L7 are normally enclosed in a metal screening box, and V2 and V3 are fitted with close-fitting shields.

Dismantling the Set—continued.

the nuts (with plain and lock washers) of the four clamps securing the speaker to the sub-baffle; remove the clamps and lift out speaker. When replacing, the input transformer should be at the top.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 233 V, using the 230-250 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the M.W. 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 Avometer, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6K8GT	191	0.9	77	3.6
	Oscillator			
V2 6K7GT	99	3.6	77	1.4
	191	5.7		
V3 6Q7GT	62	0.6	—	—
V4 6V6G	225	29.0	191	2.6
V5 5Z4G	250†	—	—	—

† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S20 are the waveband switches, ganged in two rotary units beneath the chassis. These units are indicated in our under-chassis view by numbers in diamonds and arrows, and shown in detail in the diagrams in ecl. 5, where they are drawn as seen when viewed from the rear of an inverted chassis.

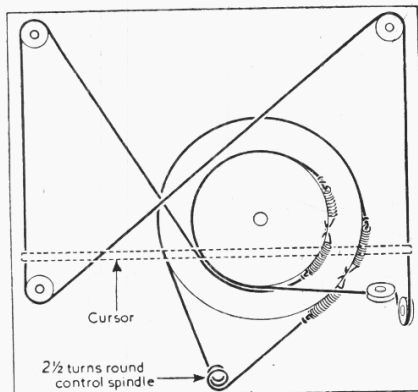
The table (col. 4) gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and C, closed.

S21 is a type of jack switch, associated with the pick-up sockets and operated by the pick-up plug. When the plug is inserted and turned a few degrees anti-clockwise, S21 opens and mutes radio.

S22 is the Q.M.B. mains switch, ganged with the manual volume control R8.

Coils.—The I.F. filter coil L1 is mounted on the rear member beneath the chassis, near the aerial socket. The S.W. aerial circuit coils L2, L5 are beneath the chassis, but the M.W. and L.W. coils L3, L6 and L4, L7 are in two units on the chassis deck, and covered by a metal screening box. The oscillator circuit coils L8-L13 are in three further units beneath the chassis, separated from the S.W. unit by a metal screen.

The I.F. transformers L14, L15 and L16, L17 are in two screened units on the



Sketch showing the tuning drive arrangements, as seen from the front of the chassis.

chassis deck with their fixed tuning capacitors.

Scale and Indicator Lamps.—These are four Osram lamps, rated at 6.5 V, 0.3 A, with M.E.S. bases and small clear spherical bulbs.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low-impedance (about 3-4 Ω) external speaker.

Capacitors C2, C10.—These are two capacitors of very small values, made up by winding one wire over another, the straight wire being covered with sleeving. C10 may be omitted from some chassis.

Capacitors C25, C26, C27.—These are three electrolytics in a single tubular metal unit mounted on the chassis deck. The positive tag of C25 (8 μF) is identified by a red spot, the plain tags being the positive connections of C26 and C27 (16 μF each). The can provides the common negative connection. The unit is rated at 400 V D.C. working.

DRIVE CORD REPLACEMENT

Two drive cords are fitted on this receiver, a short one driving the gang drum from the control spindle, and a longer one driving the cursor from the drum. The drum has two grooves of different diameters, the shorter cord running in the larger diameter groove, and the longer cord running in the smaller diameter groove.

The sketch (col. 2) shows the run of the cords as seen from the front of the chassis, after removing the scale backing plate, when the gang is at maximum. The backing plate is held by three small round-head screws (with lock-washers) in the bottom and top left-hand corners, and a cheese-head screw, which holds the scale assembly to the brace-rod behind it, in the top right-hand corner.

Gang Drive.—Take about 18 inches of cord, tie a spring to one end, turn the gang to maximum, hook spring in hole in the large-diameter drum groove, and take the cord down through the chassis deck, under the control spindle, 2½ times round the spindle, then up again through the chassis deck and over the drum. Tie on the second spring so that both springs open slightly when hooked into position. Both springs hook into the same hole.

Cursor Drive.—Take about four feet of cord, and tie a spring to one end. Turn the gang to maximum, hook the spring into the hole in the small-diameter groove, take the cord downwards, and follow the course indicated in the sketch, finally tying off on to the second spring so that both springs open slightly when hooked into position. Both springs hook into the same hole.

After leaving the bottom left-hand pulley to make the diagonal run to the top right-hand pulley, the cord passes in front of the cranked cross-bar which supports the waveband indicator disc.

Fixing Cursor.—Replace the scale backing plate, with the waveband indicator window at the bottom and the bottom ledge jutting out forward, and turn the gang to maximum. Slip the cursor grips on to the vertical members of the cord at about the position indicated in the sketch, with the silvered lip running

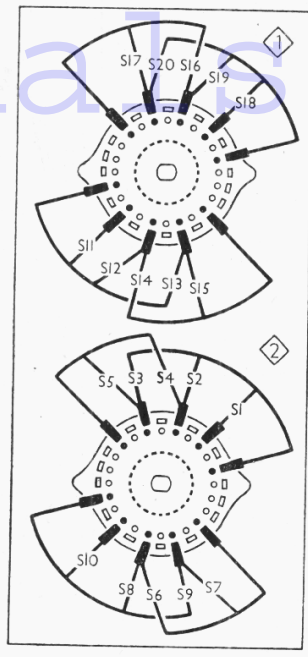
Switch	S.W.	M.W.	L.W.
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	C	—	—
S6	C	C	—
S7	C	—	—
S8	—	C	—
S9	—	C	—
S10	C	—	—
S11	C	—	C
S12	—	C	—
S13	—	—	C
S14	—	C	—
S15	C	C	—
S16	C	—	—
S17	C	C	—
S18	C	—	—
S19	—	C	—
S20	—	—	C

along the upper edge. Then adjust the cursor so that the silver line coincides with the "Set Pointer" calibration marks on the backing plate, and clamp up the grips firmly.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch set to M.W., turn gang to maximum capacitance and volume control to maximum, and connect signal generator, via an 0.1 μF capacitor in the "live" lead, to the control grid (top cap) of V1 and the E socket. Feed in a 451 kc/s (665.1 m) signal, and adjust the cores of L17, L16, L15 and L14 (location references C4, B4, A4) for maximum output, progressively reducing the signal generator input as the circuits are aligned, to avoid A.V.C. action.

R.F. and Oscillator Stages.—Since the calibrated glass scale is mounted in the



Diagrams of the waveband switch units, drawn as seen from the rear of an inverted chassis

cabinet and these adjustments must be carried out with the chassis on the bench, substitute calibration markings are printed and impressed at the sides of the scale backing plate. Reading from top to bottom on the left-hand side of the backing plate, the four horizontally impressed lines, with printed identifications, correspond with the following wavelength settings: 1, 16 m (S.W.) and 220 m (M.W.); 2, 45 m (S.W.); 3, 500 m (M.W.); 4, the

cursor setting line. Similarly, on the right-hand side of the backing plate the horizontal lines correspond to: 1, 1,000 m (L.W.); 2, 2,000 m (L.W.); 3, the cursor setting line.

With the gang at maximum capacitance, the cursor should coincide with the two setting marks. It may be adjusted in position by sliding it up or down the drive cord after opening its clamping tongues slightly. Transfer "live" signal generator lead to A1 socket, via a suitable dummy aerial.

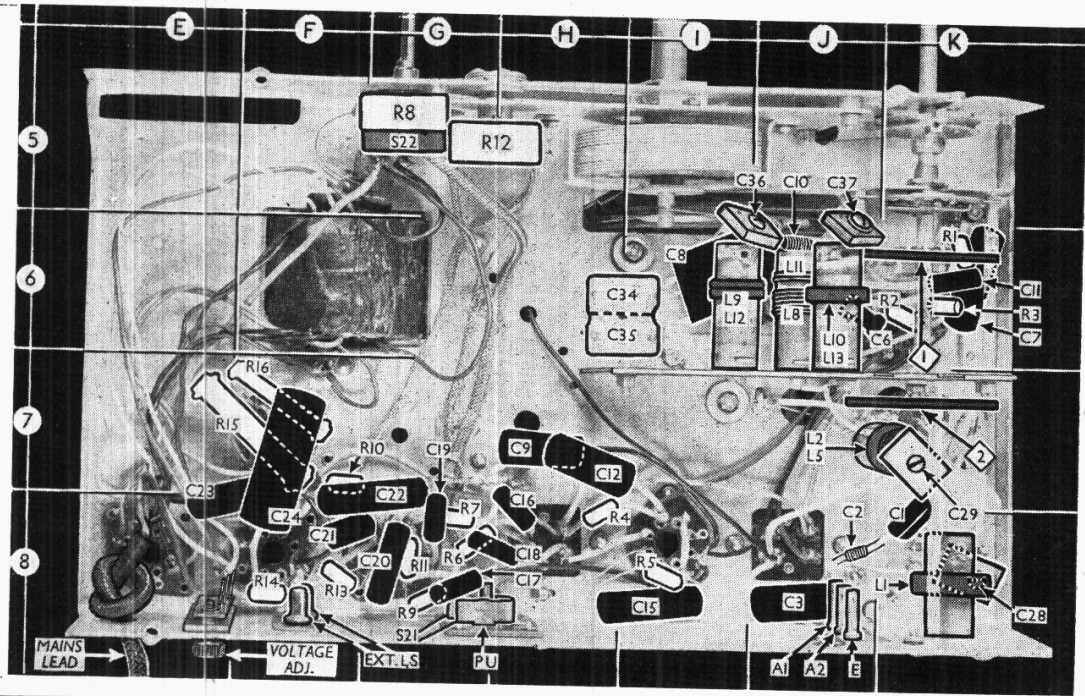
I.F. Filter.—With set still switched to M.W., feed in a strong 451 kc/s signal and adjust C28 (K8) for minimum output.

S.W.—Switch set to S.W., feed in a 15 m (20 Mc/s) signal, tune it in and adjust C29 (K7) for maximum output, while rocking the gang slightly for optimum results. No oscillator trimmer adjustment is provided on this band, but calibration may be checked at the 16 m and 45 m marks on the scale backing plate (first and second lines down the left-hand side).

M.W.—Switch set to M.W., tune to the 220 m calibration mark (top mark on left side of backing plate), feed in a 220 m (1,364 kc/s) signal, and adjust C36 (I5) and C30 (A3) for maximum output. Tune to the 500 m calibration line, feed in a 500 m (600 kc/s) signal, and adjust C34 (B2) for maximum output. Repeat these adjustments until no improvement results.

L.W.—Switch set to L.W., tune to the 1,000 m calibration line (top mark on right-hand side of backing plate), feed in a 1,000 m (300 kc/s) signal, and adjust C37 (J5) and C31 (A4) for maximum output. Tune to the 2,000 m calibration line (second mark on right of backing plate), feed in a 2,000 m (150 kc/s) signal, and adjust C35 (B2) for maximum output. Repeat these adjustments until no improvement results.

Under - chassis view. The waveband switches are indicated by numbers in diamonds with arrows. The tone control R12 is cord-driven from a concentric bush on the tuning drive spindle. S21 is associated with the pick-up sockets.



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