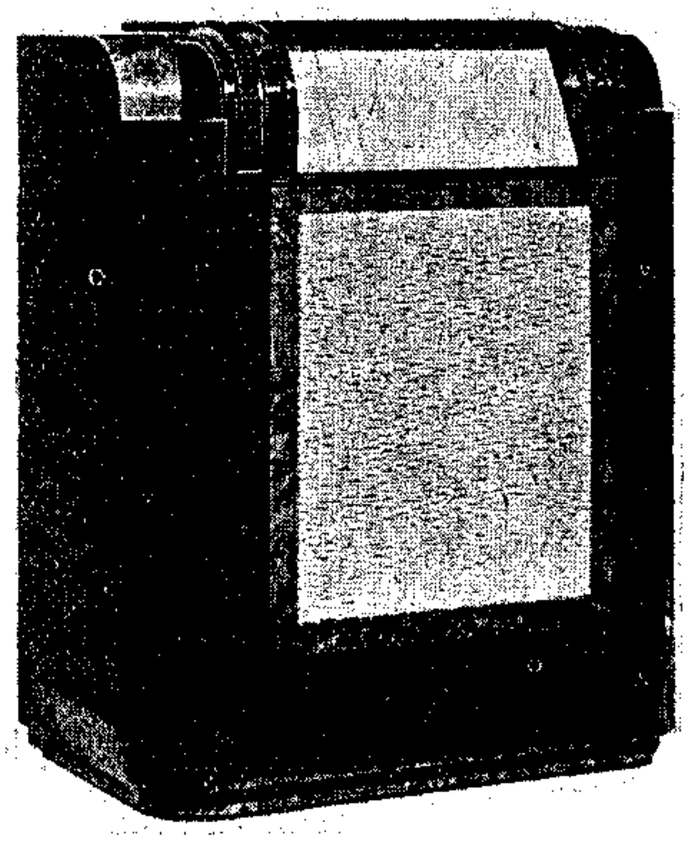
EKCO UAW88

4-BAND AC/DC SUPERHET



SPIN-WHEEL tuning, provision for connecting a dipole aerial and a special waveband for the reception of the sound channel accompanying television transmissions (for use only in districts within a few miles radius of the transmitting station) are salient features in the Ekco UAW88, a 4-valve (plus rectifier) 4-band superhet designed for AC or DC mains of 200-250 V, 40-100 c/s in the case of AC.

The set is housed in a plastic cabinet of which two alternative finishes are available : walnut and black and ivory. The SW range is 16-50 m.

Release date, 1937.

Original prices : in walnut finish cabinet, £13 13s.; black and ivory, £14 0s. 6d.

CIRCUIT DESCRIPTION

Aerial input, from socket **A1,** is via isolating condenser **C1,** then on MW via coupling condenser **C5** and tapping on **L3** and on LW via coupling coil **L2,** to inductively coupled band-pass filter. Primary coils **L3, L4** are tuned by **C37;** secondary coils **L9, L10** by **C43.** Coupling is effected by mutual inductance of primary and secondary windings. On LW, aerial circuit is shunted by IF filter **L1** and **C3.** Image suppression by **C42.**

On television sound, referred to as "TS", and SW bands, input is via **S1** and coupling coil **L5** (TS) or **S2** and **L6** (SW) to single-tuned circuits **L7, C43** (TS) or **L8, C43** (SW). If an ordinary aerial is used, it should be connected to socket **A1.** If a dipole is used, its leads go to the socket **A1** and the unmarked socket **(A2** in our circuit diagram) immediately below. Socket **"E"** should be connected to earth in either case.

Tuned circuits are connected via selector switches **S10** (TS), **S11** (SW), **S12** (MW) and **S13** (LW) to CG of first valve **(V1, Mullard metallised TH21C),** a triode-hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L11** (TS and SW), **L12** (MW) and **L13** (LW) are tuned by **C45;** parallel trimming by **C46** (SW), **C47** (MW) and **C13, C48** (LW); series tracking by **C11** (fixed—MW), **C12** (fixed—LW) and adjustable iron-dust cores in both cases. Reaction by coils **L14** (TS and SW), **L15** (MW) and **L16** (LW).

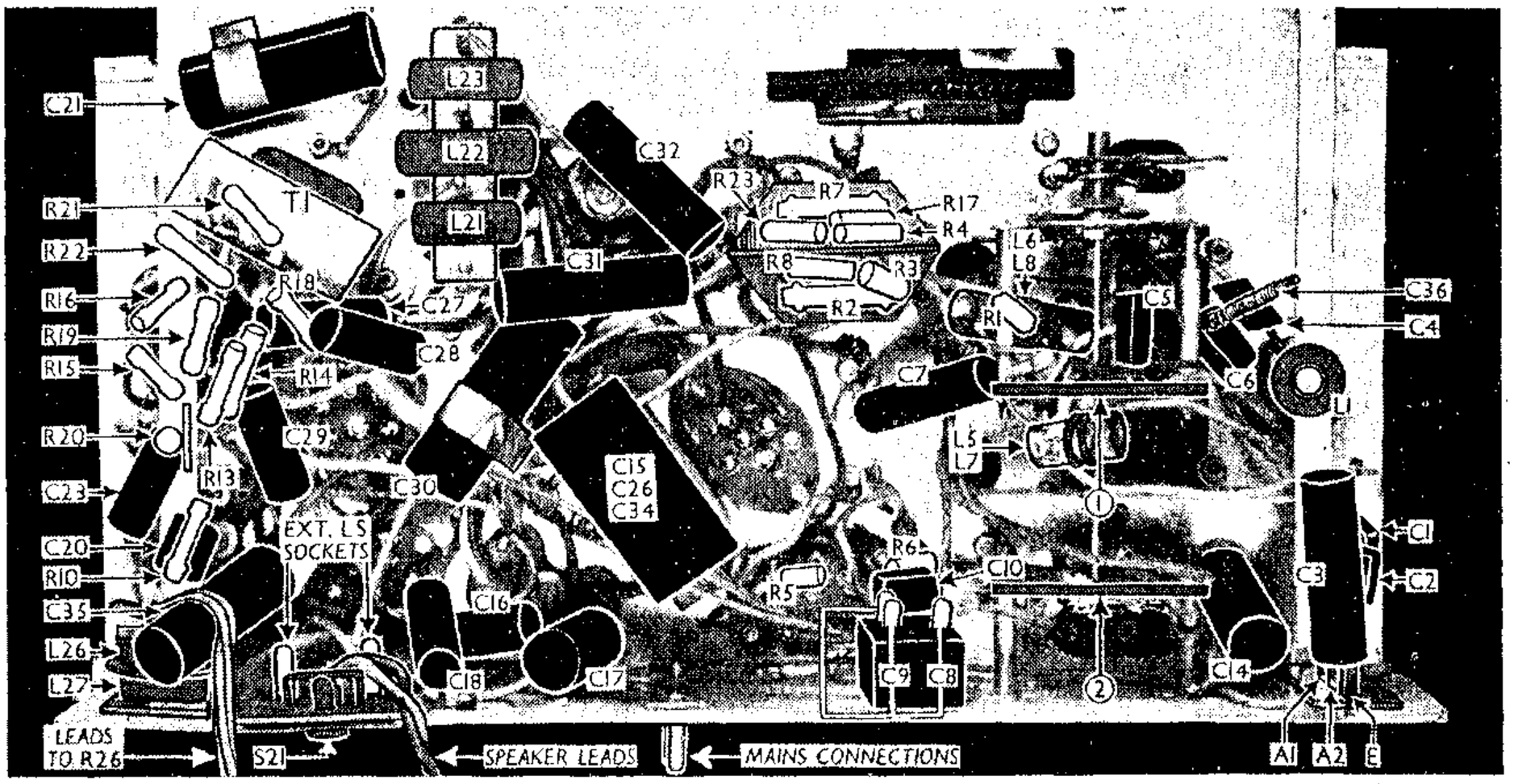
No separate oscillator circuit is provided for the television sound band, a harmonic of the SW band serving the purpose.

Second valve **(V2, Ekco metallised VPU1** or **Mullard VP13C)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C49, L17, L18, C50** and **C51, L19, L20, C52.**

Intermediate frequency 126.5 kc/s.

Diode second detector is part of double diode triode valve **(V3, Ekco metallised DTU1** or **Mullard TDD13C).** Audio frequency component in rectified output is developed across load resistor **R10** and passed via AF coupling condenser **C23** and manual volume control **R11** to CG of

Circuit diagram of the Ekco UAW88 AC/DC superhet. **L5, L7** are the Television Sound aerial coils. In the oscillator circuit, the SW operating harmonically. The extreme right-hand end-section of **R26** acts as a surge limiter for **V5**



Under-chassis view. The waveband switch units are indicated by numbers **1** and **2** to agree with the detailed diagrams in col. 2 overleaf, the arrows indicating the direction in which they are viewed. **R26** is not mounted on the chassis, but the leads to it are indicated here.

triode section, which operates as AF amplifier.

IF filtering by **R9, C19** and **C20.** High-note compensation by **C24,** connected between **C23** and triode CG. Variable tone control by RC filter **C25, R12** between CG and chassis.

Second diode of **V3,** fed from **V2** anode via **C22,** provides DC potential which is developed across load resistor **R16** and fed back through decoupling circuits as GB to FC and IF valves on all bands, giving automatic volume control.

Since **R16** is returned to **V3** cathode, no delay is imposed on the commencement of AVC action, but a positive bias, derived from the drop along **R17,** will be applied via the AVC line to **V1** and **V2,** off-setting partly the negative bias obtained from their cathode resistors. Otherwise, **R17** provides GB for the triode section of **V3.**

Resistance-capacity coupling by **R14** in triode anode circuit and, in series between anode and chassis, **C27, R18, R19** and **R20,** between **V3** triode and pentode output valve **(V4, Mullard Pen36C).** At this stage gain and tone control modifications and a negative feed-back system are introduced. The feed-back voltages are developed across a separate secondary winding on the output transformer **T1** and fed via **R21** to the coupling resistor **R22** which is inserted in the control grid lead to **V4,** so that the voltages are fed back from the anode circuit to the grid circuit.

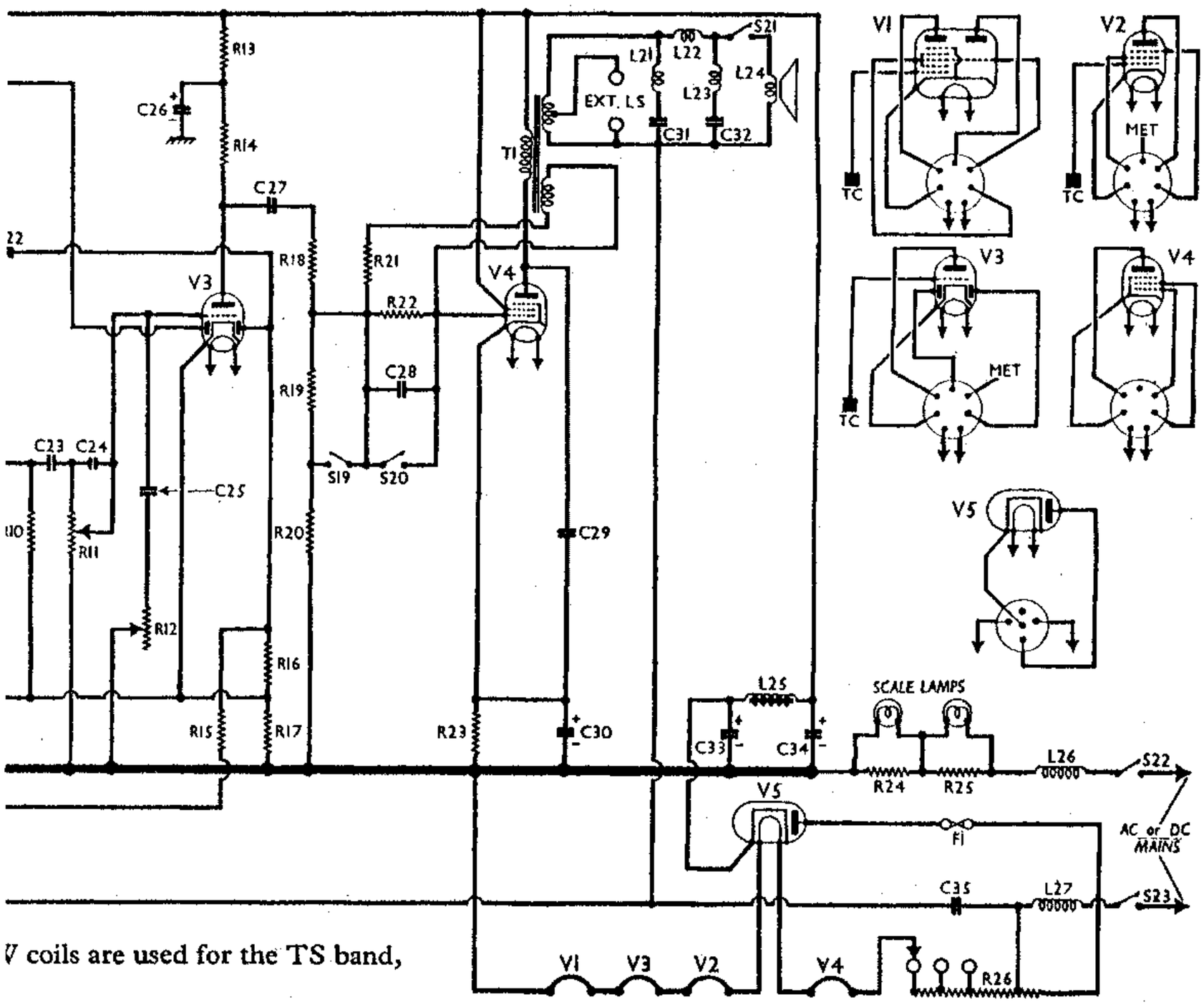
Tone and gain modifications are effected by **S19** and **S20,** which form part of the waveband switch group. **S20** closes on the SW band, eliminating the negative feed-back action, and **S19** closes on the TS band, short-circuiting **R19** and reducing the coupling efficiency between **V3** and **V4. R21** acts as a buffer, preventing the feed-back secondary winding from becoming short-circuited when **S20** closes for SW operation.

Fixed tone correction by **C29** in **V4** anode circuit. A special filter circuit comprising **L21, L22, L23** and **C31, C32** is introduced between the normal secondary winding of **T1** and the speech coil to suppress whistles and other interference above 8,000 c/s. The speech coil of the internal speaker has an impedance of 30 Ω, which is higher than usual, but the speech coil secondary of **T1** is tapped to make provision for the use of the normal external speaker of about 4 Ω impedance. The switch **S21** permits the internal speaker to be muted, and as one side of the circuit is returned directly to the **E** socket, the external speaker is safe to handle if a good earth connection is made to **E.**

When the receiver is operating from AC mains, HT current is supplied by IHC half-wave rectifying valve **(V5, Mullard UR1C)** which acts merely as a low resistance path on DC mains. Smoothing is effected by iron-cored choke **L25** and electrolytic condensers **C33** and **C34.**

Valve heaters, together with adjustable ballast resistor **R26** and scale lamps (with their shunt resistors **R24, R25),** are connected in series across the mains input, the scale lamps going in the negative lead between the mains and chassis so that while the switching surge does not overload them unduly, the heater current through them is augmented by the anode current when the valve heaters warm up.

Fuse **F1** in the anode lead to **V5** protects the valve in a case of electrolytic breakdown or similar short-circuit, while a section at one end of **R26** which is also included in **V5** anode lead protects the valve against current surges.



V coils are used for the TS band,

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Mains isolating condensers	0·001
C2	Mains isolating condensers	0·001
C3	Mains isolating condensers	0·1
C4	Aerial IF filter tuning ...	0·00015
C5	Aerial MW coupling ...	0·001
C6	Aerial capacity swamp ...	0·001
C7	V1 hept. CG decoupling ...	0·04
C8	V1 SG decoupling ...	0·1
C9	V1 cathode by-pass ...	0·1
C10	V1 osc. CG condenser ...	0·00005
C11	Osc. circuit MW tracker ...	0·002
C12	Osc. circuit LW tracker ...	0·0008
C13	Osc. LW fixed trimmer ...	0·00005
C14	V1 osc. anode decoupling	0·1
C15*	V1 osc. anode decoupling	2·0
C16	V2 CG decoupling ...	0·04
C17	HT circuit RF by-pass ...	0·1
C18	V2 cathode by-pass ...	0·1
C19	IF by-pass condensers ...	0·0002
C20	IF by-pass condensers ...	0·0002
C21*	V3 cathode by-pass ...	50·0
C22	Coupling to V3 AVC diode	0·000015
C23	AF coupling to V3 triode	0·01
C24	High-note compensator ...	0·00006
C25	Part of tone control ...	0·004
C26*	V3 triode anode decoupling	2.0
C27	AF coupling to V4 ...	0·01
C28	Feed-back coupling ...	0·03
C29	Fixed tone corrector ...	0·004
C30*	V4 cathode by-pass ...	50·0
C31	Whistle filter tuning condensers ...	0·2
C32	Whistle filter tuning condensers ...	0·2
C33*	HT smoothing condensers	8·0
C34*	HT smoothing condensers	24·0
C35	Mains RF by-pass ...	0·1
C36‡	B-P pri. LW trimmer ...	—
C37‡	Band-pass pri. tuning ...	—
C38‡	B-P pri. MW trimmer ...	—
C39‡	Aerial SW trimmer ...	—
C40‡	B-P sec. MW trimmer ...	—
C41‡	B-P sec. LW trimmer ...	—
C42‡	Image suppressor ...	—
C43‡	TS, SW and B-P tuning ...	—
C44‡	Aerial TS trimmer ...	—
C45‡	Oscillator circuit tuning ...	—
C46‡	Osc. circuit SW trimmer	—
C47‡	Osc. circuit MW trimmer	—
C48‡	Osc. circuit LW trimmer	—
C49‡	1st IF trans. pri. tuning ...	—
C50‡	1st IF trans. sec. tuning ...	—
C51‡	2nd IF trans. pri. tuning ...	—
C52‡	2nd IF trans. sec. tuning ...	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	V1 hept. CG decoupling ...	250,000
R2	V1 SG potential divider ...	15,000
R3	V1 SG potential divider ...	30,000
R4	V1 fixed GB resistor ...	250
R5	V1 osc. CG resistor ...	25,000
R6	V1 osc. anode stabiliser ...	200
R7	V1 osc. anode HT feed ...	5,000
R8	V2 fixed GB resistor ...	400
R9	IF stopper	250,000
R10	V3 signal diode load ...	250,000
R11	Manual volume control ...	1,000,000
R12	Variable tone control ...	1,500,000
R13	V3 triode anode decoupling	15,000
R14	V3 triode anode load ...	50,000
R15	AVC line decoupling ...	1,000,000
R16	V3 AVC diode load ...	750,000
R17	V3 triode GB resistor ...	2,000
R18	V4 CG resistors	32,000
R19	V4 CG resistors	250,000
R20	V4 CG resistors	25,000
R21	Feed-back coupling resistors	5,000
R22	Feed-back coupling resistors	20,000
R23	V4 GB resistor	160
R24	Scale lamp shunts ...	50
R25	Scale lamp shunts ...	50
R26	Heater circuit ballast ...	645†

† Tapped at 100Ω (+ 100 Ω + 400 Ω + 45 Ω from V4 heater end.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF filter coil ...	40·0
L2	Aerial LW coupling coil ...	40·0
L3	Band-pass primary coils ...	2·5
L4	Band-pass primary coils ...	30·0
L5	Aerial TS coupling coil ...	Very low
L6	Aerial SW coupling coil ...	0·4
L7	Aerial TS tuning coil ...	Very low
L8	Aerial SW tuning coil ...	0·05
L9	Band-pass secondary coils	2·5
L10	Band-pass secondary coils	27·0
L11	Oscillator TS and SW tuning coil	0·05
L12	Oscillator MW tuning coil	3·0
L13	Oscillator LW tuning coil	9·0
L14	Oscillator TS and SW reaction	0·4
L15	Oscillator MW reaction ...	0·6
L16	Oscillator LW reaction ...	2·0
L17	1st IF trans. Pri. ...	80·0
L18	1st IF trans. Sec. ...	80·0
L19	2nd IF trans. Pri. ...	80·0
L20	2nd IF trans. Sec. ...	80·0
L21	Parts of whistle filter ...	2·5
L22	Parts of whistle filter ...	5·5
L23	Parts of whistle filter ...	2·5
L24	Speaker speech coil ...	24·0
L25	HT smoothing choke ...	360·0
L26	Mains RF filter coils ...	2·0
L27	Mains RF filter coils ...	2·0
T1	Output trans. Pri.	320·0
T1	Output trans. Normal sec. ...	4·0
T1	Output trans. Feed-back sec.	28·0
S1-S20	Waveband switches ...	—
S21	Interval speaker switch ...	—
S22S23	Mains switches, ganged R11	—
F1	V5 anode fuse, 0·5A ...	—

VALVE ANALYSIS

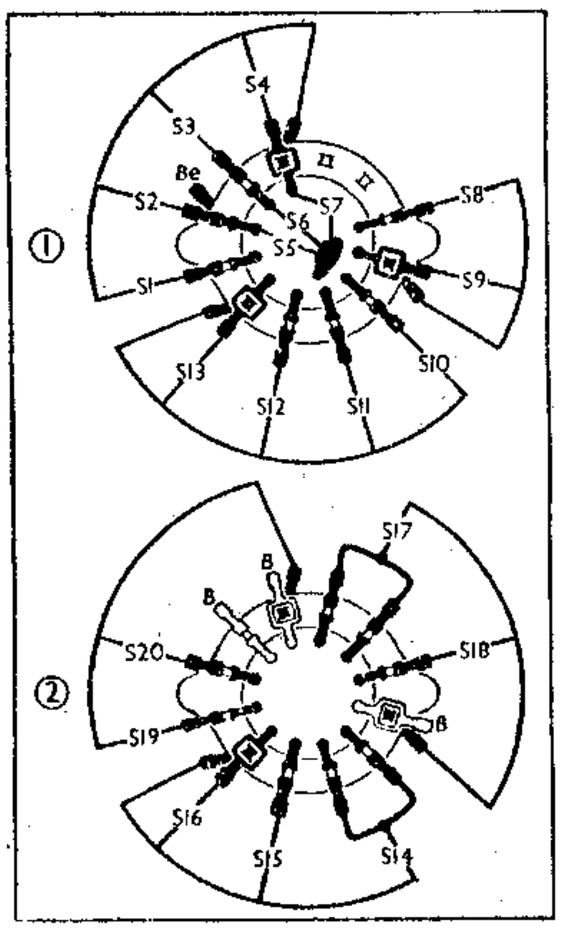
Valve voltages and currents given in the table below are those quoted in the makers' manual. They represent conditions in an average receiver when it is operating from mains of 230 V, with the voltage adjustment properly set, with the receiver tuned to 200 m, but with no signal input.

Voltages were measured with a 1,000 ohms-per-volt meter whose negative lead was connected to chassis.

If **V2** should become unstable when measurements are being made of its anode current, it can be stabilised by connecting a non-inductive condenser of about 0.1 μF from grid (top cap) to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH21C	175	3·5	65	4·8
	Oscillator			
	135	6·7		
V2 VPU1	175	6·7	175	2·8
V3 DTU1	80	1·2	—	—
V4 Pen36C	160	39·0	175	5·8
V5 UR1C	200†	—	—	—

† Cathode to Chassis, D.C.



Diagrams of the two waveband switch units, as seen from the rear of the underside of the chassis. ***B*** indicates a blank tag, and ***Be*** a bearer.

DISMANTLING THE SET

Removing Speaker.—The speaker must be removed before it is possible to remove the chassis.

Unsolder from the terminal panel on the speaker the leads connecting it to chassis;

Slacken the nuts holding the four clamps to the speaker rim, and lift out the speaker.

When replacing, the terminal panel should point towards the bottom left-hand corner of the cabinet.

There are only two connecting leads to the speaker, and it is immaterial which way round they are connected to the tags on the speaker.

Removing Chassis.—Remove the speaker as explained above;

remove the two screws (with lock-washers) holding the scale assembly brackets to the top of the cabinet;

remove the four screws (with lock-washers) holding the front and rear of the chassis to the cabinet;

remove the four screws (with lock-washers) holding the vertical supports to the base of the cabinet;

remove the two clamps (nuts and lock-washers) holding the front of the chassis to the sub-baffle.

If the rear is tilted upwards, the chassis may now be withdrawn.

When replacing, several packing pieces (rectangular press-board washers) may be required between the bottoms of the vertical supports and the base of the cabinet to level the chassis squarely and impose an even strain on the plastic cabinet.

Finally, do not omit to re-wax the heads of the screws in the base of the cabinet.

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, where they are identified by numbers and circles, with arrows to show the direction in

Switch Table

Switch	LW	MW	SW	TS
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
S15	—	C	—	—
S16	C	—	—	—
S17	—	—	C	C
S18	—	C	—	—
S19	—	—	—	C
S20	—	—	C	—

which they are viewed in the diagrams in col. 2, where they are shown in detail. The table (col. 3) gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control spindle when viewed from its free end (control drum lever in bottom position). A dash indicates open, and **C**, closed.

S21 is the internal speaker switch, which is mounted at the rear of the chassis near the external speaker sockets, and controlled by a small milled knob. When this is unscrewed, the internal speaker speech coil circuit is broken, thus muting the speaker.

S22, S23 are the QMB mains switches, ganged with the volume control **R10.**

Coils.—L1 is mounted beneath the chassis, and has an adjustable iron core, reached through a hole in the chassis deck. **L2, L3, L4, L9, L10** and **L11-L16** are in two screened units on the chassis deck. The first of these units contains four trimmers reached through holes in the top of the can. The second contains two trimmers (reached through holes in the top of the can) and the three fixed condensers **C11, C12, C13,** while the cores of **L12** and **L13** are adjustable through holes in one side of the can, their positions being indicated approximately in our plan view. **L5, L7** and **L6, L8** are on small tubular formers, supported directly on their switch units beneath the chassis.

L17, L18 and **L19, L20** are the IF transformers in two further screened units on the chassis deck. They contain their associated trimmers, while the second also includes **R9, C19** and **C22.**

The whistle filter coils **L21-L23** are on a single former beneath the chassis, and are unscreened.

L25 is the HT smoothing choke, mounted near the centre of the chassis deck, while the mains RF filter coils **L26, L27** are wound in a single assembly mounted at one end of the rear chassis member. Fuse **F1** is mounted on **L25.**

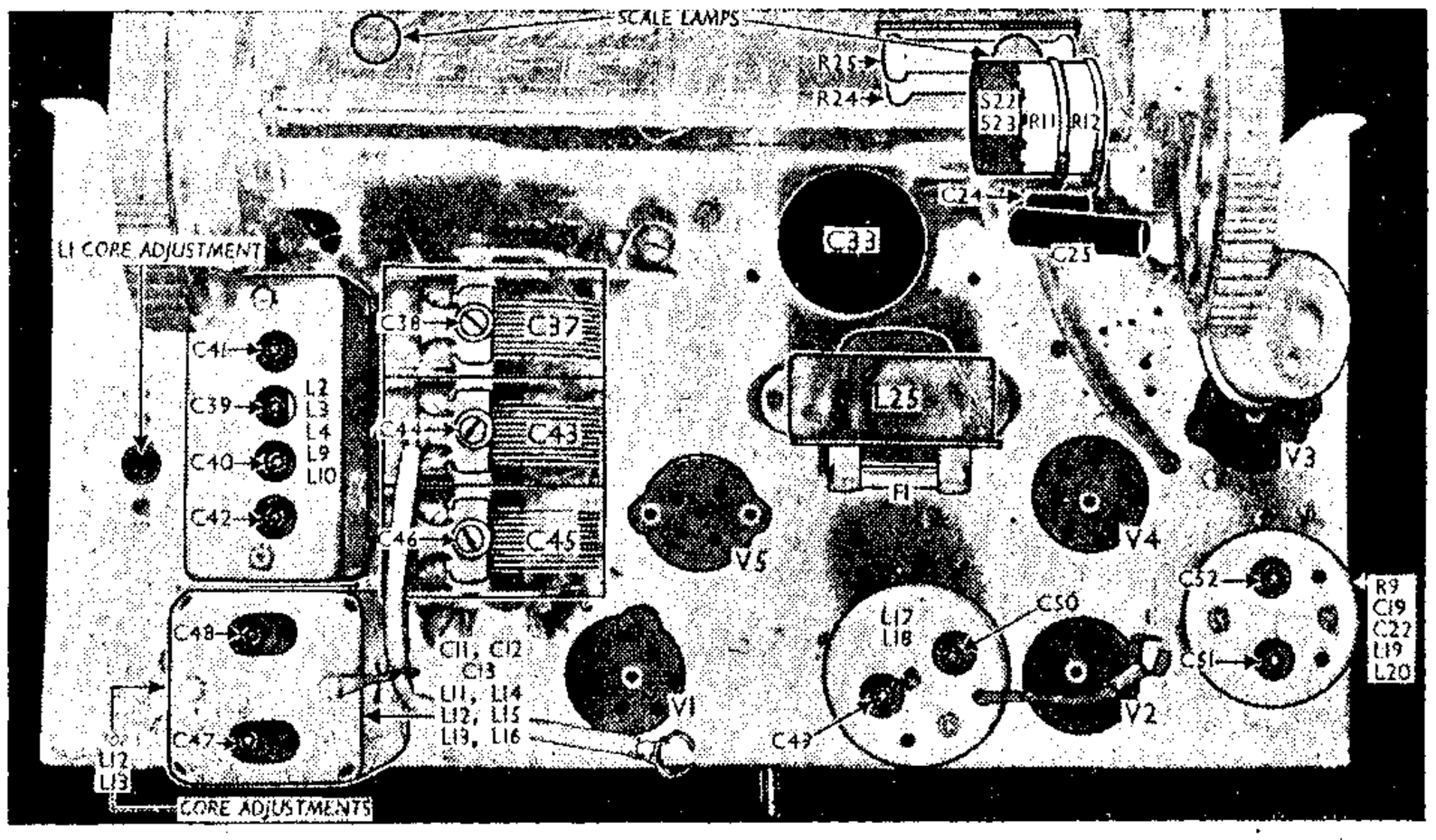
Scale Lamps.—These are two Osram MES types, rated at 6.2 V, 0.3 A. They are shunted by resistors **R24, R25** which are mounted on an insulating panel fitted to the chassis deck beneath the scale assembly.

The lamps may be reached for replacement purposes by removing the three small cheese-head screws, at the top of the inside of the cabinet, which hold the moulded escutcheon in place, removing the escutcheon and lifting the hinged scale panel from the bottom.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (4 Ω) external speaker. The internal speaker can be muted by unscrewing **S21.**

Condensers C15, C26, C34.—These are three dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The yellow leads are the positives of **C15** and **C26** (both of 2 μF condensers), and the red lead is the positive of **C34** (24 μF).

Condensers C8, C9.—These are two 0.1 μF paper condensers in a metal-cased unit at the inside of the rear of the chassis. The tag nearest the chassis deck is common to both condensers. The other



Plan view of the chassis. All the pre-set coil and condenser adjustments are indicated with the exception of C36, which is beneath the chassis.

connection of each goes to one of the two tags as shown in the under-chassis view.

Condensers C13, C36.—These are small condensers formed of wires spiralled over insulated wires. **C13** is inside the oscillator coil unit, while **C36** is beneath the chassis near the switch units. The latter is adjustable by sliding the spiralled winding over the straight wire.

Chassis Divergencies.—In our chassis, **V2** CG decoupling condenser **C16** was returned to **V2** cathode as shown in our circuit diagram, but in the makers' diagram it is shown returned to chassis.

It may also be found in some chassis that the variable tone control components **C25, R12** are reversed, **C25** going to chassis, and that **S21** is connected in the earthed lead to the speech coil **L24,** instead of going between **L22** and **L24,** as they are shown that way in the makers' diagram. This will not affect the operation of the receiver, but it may lead to trouble when making tests if the alternatives are not expected.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to **E** socket, and via a 0.02 μF condenser to grid (top cap) of **V1,** leaving existing cap in position. Switch set to LW, turn gang to maximum, volume control to maximum, and tone control to "Normal." Feed in a 126.5 kc/s (2,372 m) signal, and adjust **C49, C50, C51** and **C52** for maximum output.

RF and Oscillator Stages.—See that cursor line covers the 550 m mark when gang is at maximum. Volume control should be at maximum during alignment. Connect signal generator via a suitable dummy aerial to **A** and **E** sockets. When adjusting the cores of **L1, L12** and **L13,** the trimmer tool used must be made entirely of insulating material.

TS.—Connect signal generator to **A1** and **E** sockets, and feed in an 18 Mc/s (16.66 m) signal. Switch set to SW, and tune of 18 Mc/s on scale. Fully unscrew **C46,** then screw it in slowly. Two peaks will be obtained, of which the first reached is correct. Adjust to this accurately.

Feed in a 20.75 Mc/s (14.3 m) signal (its second harmonic being 41.5 Mc/s), at full generator output. Then switch to TS and adjust **C44** for maximum output.

SW.—Switch to SW, feed in a 15 Mc/s (20 m) signal, tune to 15 Mc/s on scale, and adjust **C39** for maximum output.

MW.—Switch set to MW, tune to 200 m on scale, and feed in a 200 m (1,500 kc/s) signal. Fully unscrew **C47** and then screw it in slowly, adjusting accurately to the first peak reached. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust **C40** and **C38** for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust iron core of **L12** for maximum output, while rocking the gang for optimum results. Repeat the adjustments at 200, 250 and 500 m until a small adjustment at one end of the scale does not affect the calibration at the other end.

LW.—Switch set to LW, tune to 1,100 m on scale, feed in a 1,100 m (272.5 kc/s) signal, and adjust **C48, C41** and **C36** for maximum output. **C36** is adjusted by sliding the spiralled wire on the insulating sleeve over the straight wire.

Tune to 1,700 m. on scale, feed in a 1,700 m (176.5 kc/s) signal, and adjust core of **L13** for maximum output, while rocking the gang for optimum results.

IF Filter. — Leaving set tuned to 1,700 m, feed in a 126.5 kc/s signal at full generator output, and adjust core of **L1** for **minimum** output. Reduce generator output, and adjust to 272.5 kc/s. Tune to 1,100 m on scale, and repeat LW alignment as above.

Image Rejector.—Switch set to MW, feed in a 1,000 kc/s (300 m) signal at full generator output. Tune receiver to image of generator frequency (about 400 m) and adjust **C42** for **minimum** output.

Tune to 250 m, feed in a 1,200 kc/s signal, and readjust **C40** for maximum output.

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