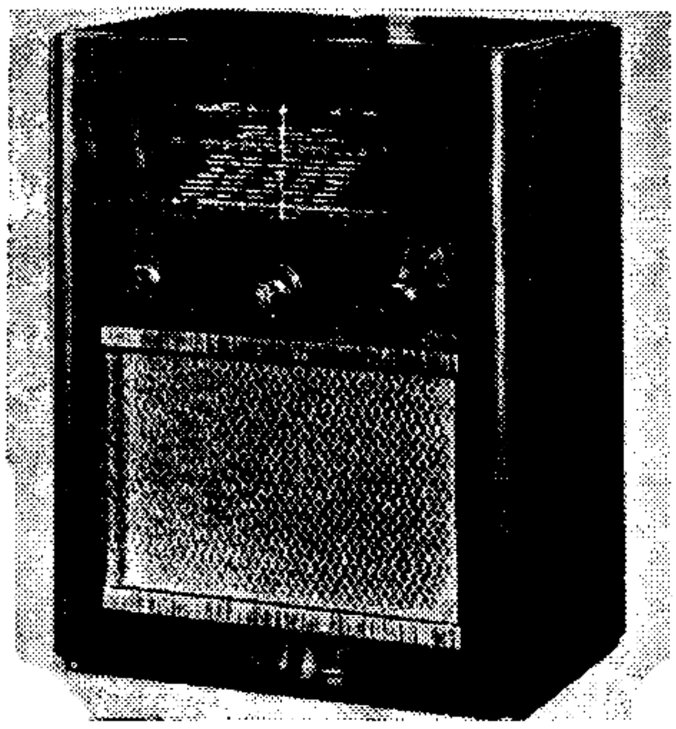
COSSOR 77

71B, 62B, 63, 64B, 66 & 66A



The Cossor model 77 receiver.

THE Cossor model 77 receiver is a 4-valve (plus rectifier) 3-band AC superhet. The chassis is divided into two units : the main receiver chassis and the power and output unit.

The points of interconnection between the two units are shown in the circuit diagram, where they are indicated by circles and arrows separating the two sections.

There is provision for both a gramophone pick-up and a high impedance external speaker; a rejector circuit in series with the aerial lead is tuned to the intermediate frequency; and variable tone control is provided.

The short-wave range is 16-52 metres, and the receiver is suitable for mains of 200-250 V, 40-100 C/S.

Two console models 62B and 63, table model 71B, and radio-gramophone models 64B, 66 and 66A (with auto-changer), all employ a chassis which is similar with the exception of modifications described at the end of "General Notes."

Release dates: 62*B*, 64*B*, 71*B*, *January*, 1940; 77, *July*, 1940; 63, *August*, 1940; 66, 66*A*, *September*, 1940.

CIRCUIT DESCRIPTION

Aerial input is via intermediate frequency rejector circuit **L1, C2,** aerial series condenser **C1** and coupling coils **L2** (SW), **L3** (MW) and **L4** (LW) to single tuned circuits **L5, C33** (SW), **L6, C33** (MW) and **L7, C33** (LW). IF rejector tuning is effected by adjusting the variable iron core of **L1.**

First valve **(V1, Cossor metallised 41STH)** is a triode hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L8** (SW), **L9** (MW) and **L10** (LW) are tuned by **C34;** parallel trimming by **C35** (SW), **C36**

SPEAKER PLUG

POWER & OUTPUT PLUG

Circuit diagram of the Cossor 77 AC 3-band superhet. Except for the modifications described at the end of "General Notes," the chassis of the console models 62B and 63, the radiograms 64B and 66, the auto-radiogram 66A and the table model 71B are similar. A separate power unit is employed, and the connections between this and the main chassis and the speaker are indicated. Diagrams of the connecting plugs are inset beneath the circuit diagram.

(MW) and **C10, C37** (LW); series tracking by **C11** (MW) and **C12, C38** (LW). There is no tracking condenser on the SW band.

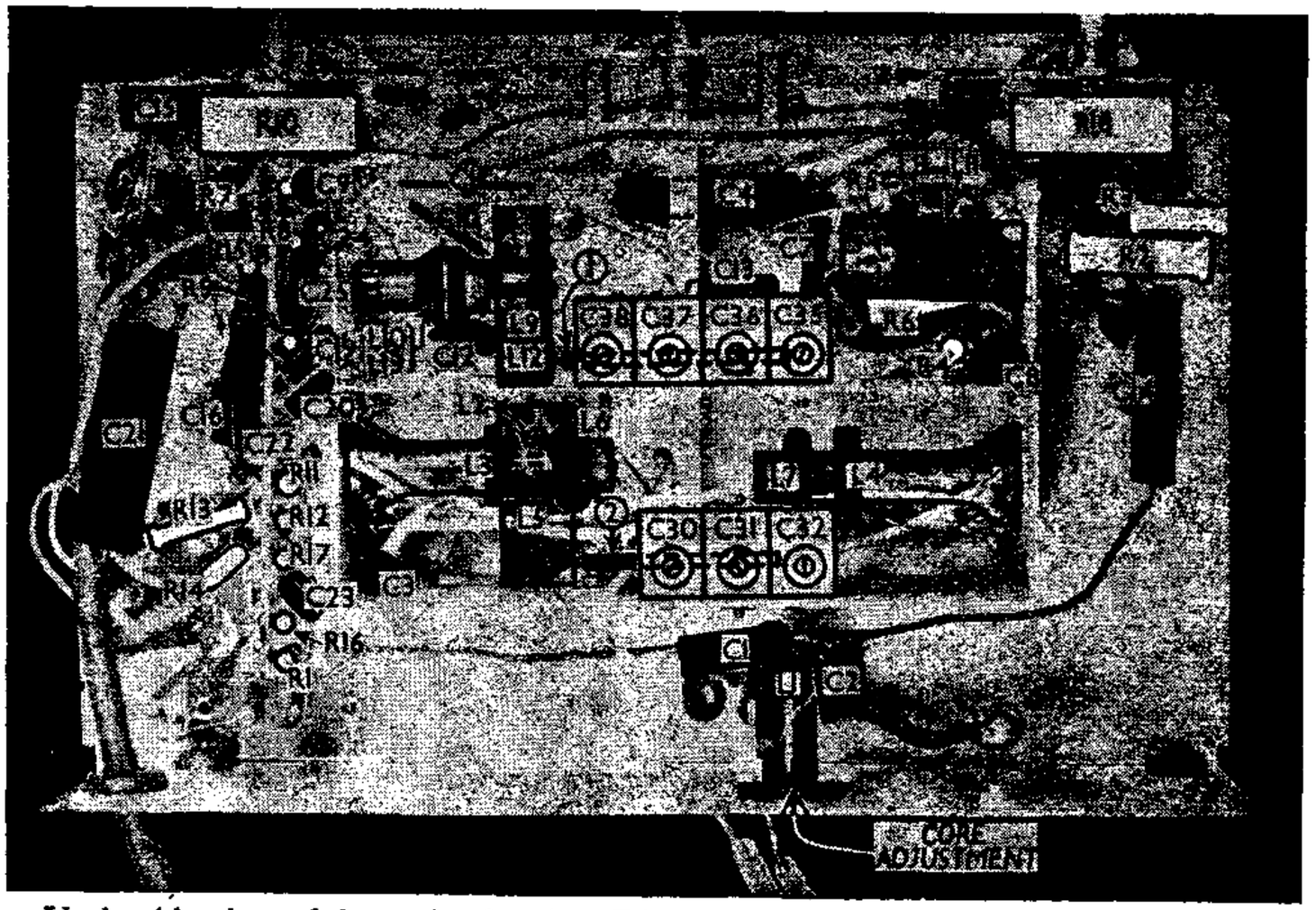
Reaction is applied from anode via coupling condenser **C13** and coils **L11** (SW), **L12** (MW) and **L13** (LW).

Second valve **(V2, Cossor metallised MVSPenB)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C5, L14, L15, C6** and **C17, L16, L17, C18.** The tuning condensers are fixed, and alignment adjustments are effected by varying the positions of the iron cores.

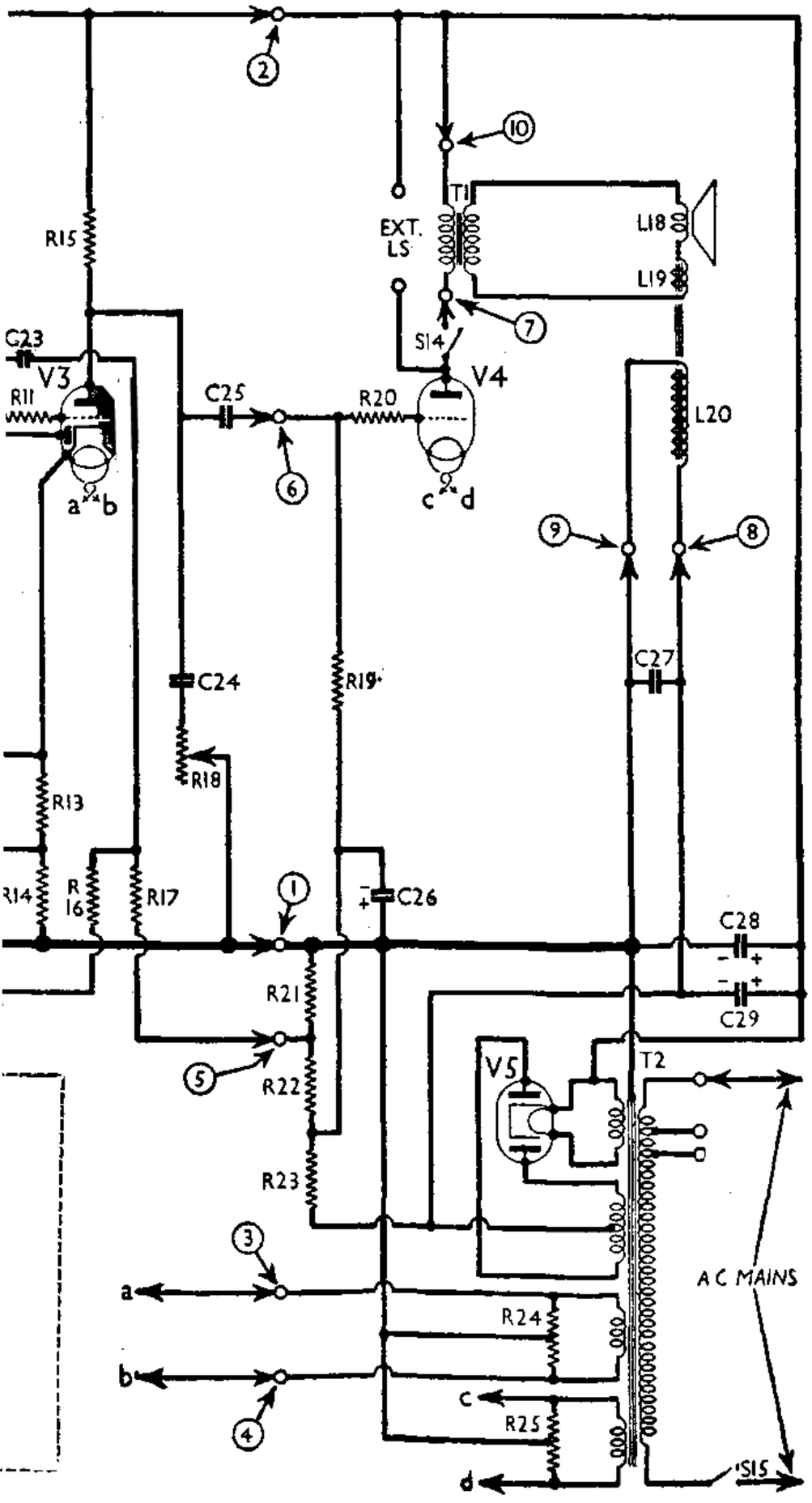
Intermediate frequency 465KC/S.

Diode second detector is part of double-diode triode valve **(V3, Cossor metallised DDT).** Audio frequency component in rectified output is developed across manual volume control **R10,** which also operates as load resistance, and passed via AF coupling condenser **C22,** CG resistance **R12** and grid stopper **R11** to CG of triode section, which operates as AF amplifier.

IF filtering by **C19, R9** and **C20.** Provision for connection of gramophone pick-up by sockets across **R10, C21.** Variable tone control by **C24** and **R18,**



Underside view of the main chassis. Diagrams of the two switch units appear in column 6 overleaf.



which are connected in series between **V3** triode anode and chassis.

Second diode of **V3,** fed from tapping on **L16** via **C23,** provides DC potential which is developed across load resistance **R17** and fed back through decoupling circuits as GB to FC (except on SW band) and IF valves, giving automatic volume control. Delay voltage, together with GB for triode section, is obtained from drop along resistances **R13** and **R14** which form a potential divider in cathode lead to chassis.

Resistance-capacity coupling by **R15, C25** and **R19,** via grid stopper **R20,** between **V3** triode and directly-heated cathode triode output valve **(V4, Cossor 2P).** It should be borne in mind that this valve has a two-volt filament, which is energised from a special two-volt heater secondary on the mains transformer **T2.** Across this heater circuit is connected a centre-tapped wire-wound resistance **R25** for purposes of earthing the filament and applying GB.

Sockets are provided on the power and output chassis for a high impedance external speaker. They are connected to **V4** anode and HT positive respectively, and on one of them switch **S14** is so fitted that, if the connecting plug is partly inserted into them, both speakers are in circuit, while if the plug is pushed right home, **S14** opens automatically; the primary of the internal speaker input transformer **T1** is thus disconnected from **V4** anode, and the internal speaker is muted. It will be noted that HT current in the anode circuit must then flow via the external speaker circuit.

HT current is supplied by IHC full-wave rectifying valve **(V5, Cossor 43 IU).** Smoothing is effected by speaker field **L20** (which is connected in the HT negative lead to chassis) and dry electrolytic condensers **C28** and **C29.** HT circuit RF filtering by **C9.**

Fixed GB potential for **V1** (in addition to that developed across **R4**) and **V2,** and GB for **V4,** are obtained from the junctions of **R21, R22** and **R23** which form a potential divider across **L20** in the negative HT lead. The voltage developed across **R21** will, of course, form part of the AVC delay potential in addition to that which is developed across **R13** and **R14.**

DISMANTLING THE SET

Removing Chassis.—The receiver comprises two chassis units: the main chassis and the power and output unit; both are independently mounted.

To remove the main chassis, remove the four control knobs (recessed grub screws) from the front of the cabinet;

loosen the two round-head wood screws holding the metal clamps to the top of the scale assembly inside the cabinet;

withdraw from the side of the power and output unit the plug connecting it to chassis;

remove the metal batten supporting the rear of the chassis (one cheesehead screw and washer at each end), taking the weight of the chassis with one hand while removing the screws with the other.

When replacing, see that the chassis supporting pegs inside the front of the cabinet, and those on the batten at the rear, are located in the grommets provided for them on the chassis.

Removing Power and Output Unit.—Withdraw the connecting plug from the side of the unit, and another plug from the panel on the speaker transformer;

remove the fixing nut holding the toggle switch to the cupped escutcheon on the side of the cabinet (this is best done by first loosening the stop nut inside the cabinet);

remove the four cheese-head fixing screws (with large metal and rubber washers) holding the unit to the bottom of the cabinet.

When replacing, note that two large rubber washers are fitted to each fixing bolt, one going either side of the bottom of the cabinet.

Removing Speaker.—Withdraw the con-

necting plug from the speaker transformer;
remove the four cheese-head screws (with washers and lock-washers) holding the speaker to the sub-baffle.
When replacing, the transformer should be at the bottom.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 hexode CG decoupling	500,000
R2	V1 SG HT feed potential divider resistances ...	20,000
R3		30,000
R4	Part V1 fixed GB resistance	130
R5	V1 osc. CG resistance ...	40,000
R6	V1 osc. anode HT feed ...	30,000
R7	V2 SG HT feed	120,000
R8	V2 anode HT feed ...	5,000
R9	IF stopper	50,000
R10	Manual volume control; V3 signal diode load ...	500,000
R11	V3 triode grid stopper ...	120,000
R12	V3 triode CG resistance...	1,500,000
R13	V3 triode GB; AVC delay resistances	750
R14		1,000
R15	V3 triode anode load ...	60,000
R16	AVC line decoupling ...	3,000,000
R17	V3 AVC diode load ...	1,500,000
R18	Variable tone control ...	250,000
R19	V4 CG resistance... ...	500,000
R20	V4 grid stopper	150,000
R21	V1, V2 fixed GB and V4 GB potential divider resistances	7,000
R22		75,000
R23		170,000
R24	V1-V3 heater circuit pot., total	25*
R25	V4 heater circuit pot., total	25*

* Centre-tapped.

	CONDENSERS	Values (μF)
C1	Aerial series condenser ...	0·0005
C2	Aerial IF rejector tuning	0·000225
C3	V1 hexode CG decoupling	0·05
C4	V1 SG decoupling ...	0·05
C5	1st IF transformer fixed tuning condensers ...	0·000225
C6		0·000225
C7	V1 osc. CG condenser ...	0·0001
C8	V1 cathode by-pass ...	0·1
C9	HT circuit RF by-pass ...	0·1
C10	Osc. circuit LW fixed trimmer...	0·00005
C11	Osc. circuit MW tracker...	0·000638
C12	Osc. circuit LW fixed tracker	0·00014
C13	V1 osc. anode coupling ...	0·0005
C14	V2 CG decoupling ...	0·05
C15	V2 SG decoupling ...	0·05
C16	V2 anode decoupling ...	0·1
C17	2nd IF transformer fixed tuning condensers ...	0·00006
C18		0·000075
C19	IF by-pass condensers ...	0·00005
C20		0·00005
C21*	V3 cathode by-pass ...	50·0
C22	AF coupling to V3 triode	0·005
C23	Coupling to V3 AVC diode	0·00005
C24	Part of variable tone control	0·01
C25	V3 triode to V4 AF coupling	0·01
C26*	V4 CG decoupling ...	10·0
C27	Speaker field shunt ...	0·05
C28*	HT smoothing condensers	8·0
C29*		8·0
C30‡	Aerial circuit SW trimmer	—
C31‡	Aerial circuit MW trimmer	—
C32‡	Aerial circuit LW trimmer	—
C33†	Aerial circuit tuning ...	—
C34†	Oscillator circuit tuning...	—
C35‡	Osc. circuit SW trimmer	—
C36‡	Osc. circuit MW trimmer	—
C37‡	Osc. circuit LW trimmer	—
C38‡	Osc. circuit LW tracker...	—

* Electrolytic. † Variable ‡ Pre-set

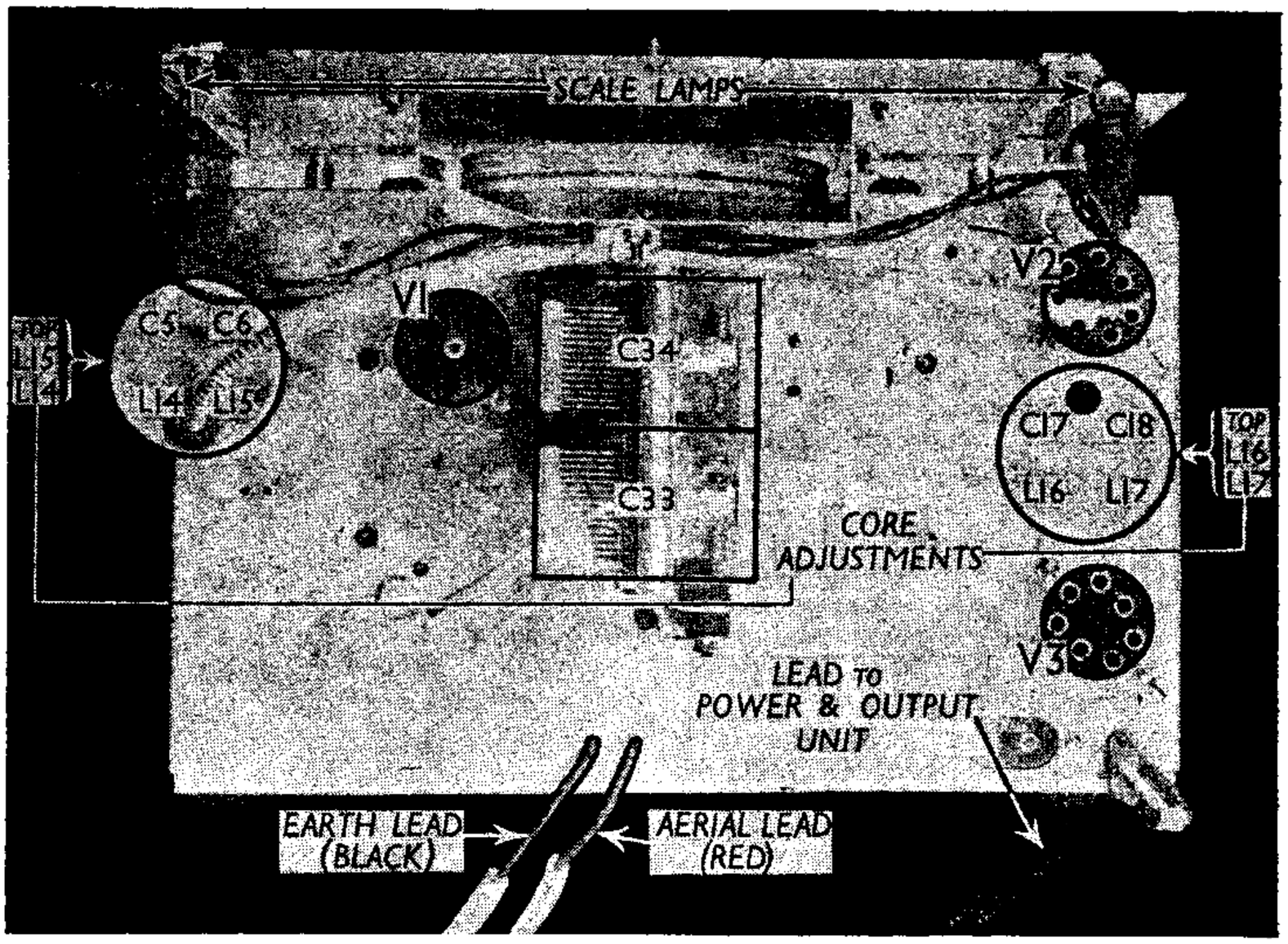
VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating on mains of 225 V, using the 220 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the MW 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 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 41STH	273	1·8	100	4·5
	Oscillator			
	103	6·5		
V2 MVS Pen B	238	4·9	112	1·2
V3 DDT	119	2·1	—	—
V4 2P	265	45·2	—	—
V5 43IU	305†	—	—	—

† Each anode, AC.



Plan view of the main chassis. The positions of the IF transformer coil core adjustments are approximately indicated.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF rejector coil ...	4·0
L2	Aerial SW coupling coil...	0·5
L3	Aerial MW coupling coil...	25·0
L4	Aerial LW coupling coil...	150·0
L5	Aerial SW tuning coil ...	Very low
L6	Aerial MW tuning coil ...	2·0
L7	Aerial LW tuning coil ...	15·0
L8	Osc. circuit SW tuning coil	Very low
L9	Osc. circuit MW tuning coil	5·6
L10	Osc. circuit LW tuning coil	13·0
L11	Oscillator SW reaction ...	0·1
L12	Oscillator MW reaction ...	2·4
L13	Oscillator LW reaction ...	6·0
L14	1st IF trans. Pri. ...	4·0
L15	1st IF trans. Sec. ...	4·0
L16	2nd IF trans. Pri., total	18·0
L17	2nd IF trans. Sec., total	18·0
L18	Speaker speech coil ...	2·0
L19	Hum neutralising coil ...	0·15
L20	Speaker field coil... ...	1,000·0
T1	Speaker input trans. Pri. ...	170·0
	Speaker input trans. Sec. ...	0·15
T2	Mains trans. Pri., total ...	27·0
	Mains trans. V1-V3 heat. sec.	0·1
	Mains trans. V4 heater sec. ...	0·1
	Mains trans. Rect. heat. sec.	0·2
	Mains trans. HT sec., total...	240·0
S1-S13	Waveband switches ...	—
S14	Speaker switch	—
S15	Mains switch	—

GENERAL NOTES

Switches.—S1-S13 are the waveband switches, in two ganged rotary units beneath the chassis. These are indicated in our under-chassis view, and are shown in detail in the diagrams in col. 6, where they are drawn as seen looking from the underside of the chassis in the direction indicated by the arrows.

The table (col. 6) gives the switch positions for the three control settings, starting from fully anti-clockwise. **A** dash indicates *open*, and **C** *closed*.

S14 is the internal speaker muting switch, associated with one of the Ext. LS sockets, in the power and output unit. When the external speaker connecting plug is fully inserted in the sockets, **S14** opens and breaks the connection between **T1** primary winding and the anode of the output valve, thus muting the internal speaker.

S15 is the QMB mains switch, mounted in a cupped escutcheon on the side of the cabinet and wired to the power and output chassis.

Coils.—L1 is the intermediate frequency rejector coil, mounted on the rear member of the chassis, and shown in our under-chassis view with its fixed tuning condenser. It has an adjustable iron-dust core, reached through a hole in the chassis, through which the moulded former protrudes.

The aerial and oscillator coils **L2, L5; L3, L6; L4, L7** and **L8, L11; L9, L12; L10, L13** are in six unscreened tubular units, mounted in two screened compartments beneath the chassis.

The IF transformers **L14, L15** and **L16, L17** are in two screened units on the chassis deck with their associated fixed tuning condensers. The screw core adjustments of the variable iron-dust cores are reached through holes in the sides of the cans; their positions are indicated approximately in our plan chassis view.

Pre-set Condensers.—All the aerial

trimmers and the oscillator trimmers and trackers are mounted in the screened compartments with their coils beneath the chassis; they are shown in our underchassis view.

Scale Lamps.—These are two Osram MES type lamps, rated at 6.5 V, 0.3 A. They have small bulbs.

External Speaker.—Two sockets are provided on the power and output chassis for connection of a high impedance (3,000 O) external speaker. **S14** is associated with one of these sockets for muting the internal speaker.

Condensers C28, C29.—These are two 8 μF (450 V working) dry electrolytic condensers in a cardboard container, mounted beneath the power and output chassis. The red lead is the positive of **C28,** whose negative (black) lead is connected to chassis. The yellow lead is the positive of **C29,** its negative lead being blue.

Inter-Chassis Connections.—The connections between the two chassis are by a 6-way cable, with a 6-pin plug and socket. The connections are numbered 1 to 6, and indicated by arrows in the circuit diagram, while inset beneath it is a diagram of the plug, looking at the free ends of the pins. The colour-coding of the connections to the plug is: 1, black; 2, red/black; 3 and 4, grey; 5, blue; 6, red.

A small 4-pin plug and socket at the end of a 4-way lead provide the connections between the power and output unit and the speaker. These connections are numbered 7 to 10 in the circuit diagram, and a diagram of the plug, looking at the free ends of the pins, is inset below it. The colour-coding of the plug connections is: 7, red; 8, blue; 9, black; 10, yellow.

Resistances R24, R25.—These are two wire-wound 25 O centre-tapped fixed potentiometers, situated beneath the power and output unit.

Valve V4.—This is a 2 V Cossor 2P directly-heated triode, which derives its heater supply from a separate secondary winding (c, d) of the mains transformer **T2.**

Chassis Divergencies.—Small divergencies may occur in the values of some of the resistances as compared with those given in our tables. **R7** and **R11** were both 120,000 O in our chassis, whereas they are given as 100,000 O in the makers' diagram. Similarly, **R12** was 1,500,000 O as against 2,000,000 O; **R15** was 60,000 O as against 50,000 O; **R17** was 1,500,000 O as against 1,000,000 O; and **R20** was 150,000 as against 100,000 O. Also **R15** may be 30,000 O in early chassis.

The makers' diagram shows **R18** with its ends connected between **C24** and chassis, and the slider connected to the **C24** end, short-circuiting the portion of the resistance not in use.

CONSOLE MODIFICATIONS

The console models 62B and 63 employ a similar arrangement of chassis to that in the 77 table model, except that in the model 63, **C28** and **C29** are both 16 μF instead of 8 μF, and **C27** is omitted.

RADIOGRAM MODIFICATIONS

Similar modifications to those applying to the console models occur, with others, in the radiogram models 64B, 66 and 66A.

C28 and **C29** are both 16 μF, and **C27** is omitted, in all three models. In addition, they are equipped with a three-position switch, two positions of which are radio and gramophone, while the third operates the mains switch. In the fully anti-clockwise position of the control knob, the receiver is switched off; in the middle position, the receiver operates on radio; in the fully clockwise position, the pick-up is switched into circuit and radio is muted.

The switch is of the rotary disc type, with the mains switch **S15** mounted beneath it. The whole assembly is mounted on a metal bracket fitted to the chassis just in front of the tuning control, and its spindle passes through a hole on the control panel in the cabinet.

The pick-up connections are taken to the same points as shown in our circuit diagram, but the high-potential side goes via a pair of the switch contacts. Another pair of switch contacts is interposed between **R6** and the HT positive line, and they open to mute radio when the control is turned to the gramophone position.

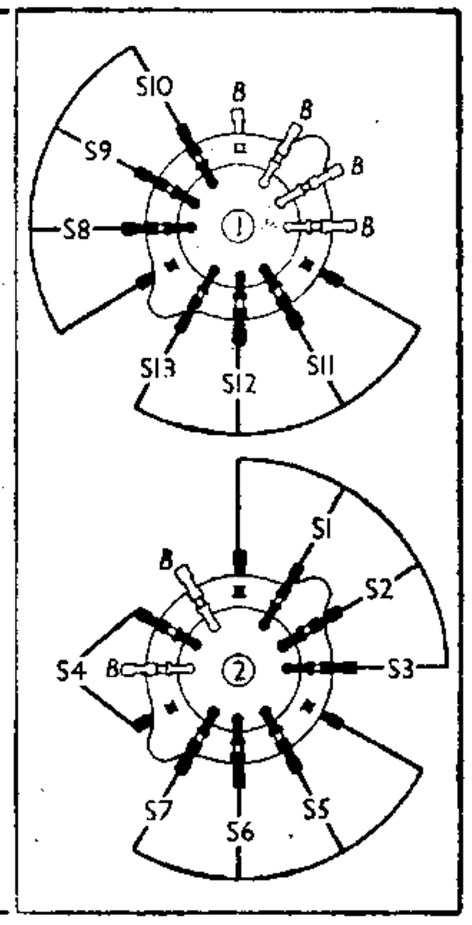
The power and output is mounted on the floor of the cabinet, and a long lead is run from it to the mains switch at the top of the cabinet.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator via a 0.1 μF condenser to control grid (top cap) of **V2** and chassis, feed in a 465 KC/S (645.2 m) signal, and adjust the cores of **L16** and **L17,** softening the wax by the application of a warm screwdriver. Transfer signal generator to top cap of **V1,** and similarly adjust cores of **L14, L15.** The existing lead to each top cap should be left in position, and the response curve of the IF stages should be symmetrical, with a perceptible flat top when viewed on an oscilloscope.

IF Rejector.—Connect signal generator to **A** and **E** leads, tune to top of MW band, feed in a strong 465 KC/S signal, and adjust core of **L1** for *minimum* output.

RF and Oscillator Stages.—With gang at maximum, pointer should cover the short horizontal lines at the extreme right-hand ends of the scales. Connect signal generator to **A** and **E** leads, via a suitable dummy aerial.



Diagrams of the two switch units, as seen when viewed from the front of the underside of the chassis. The table appears below.

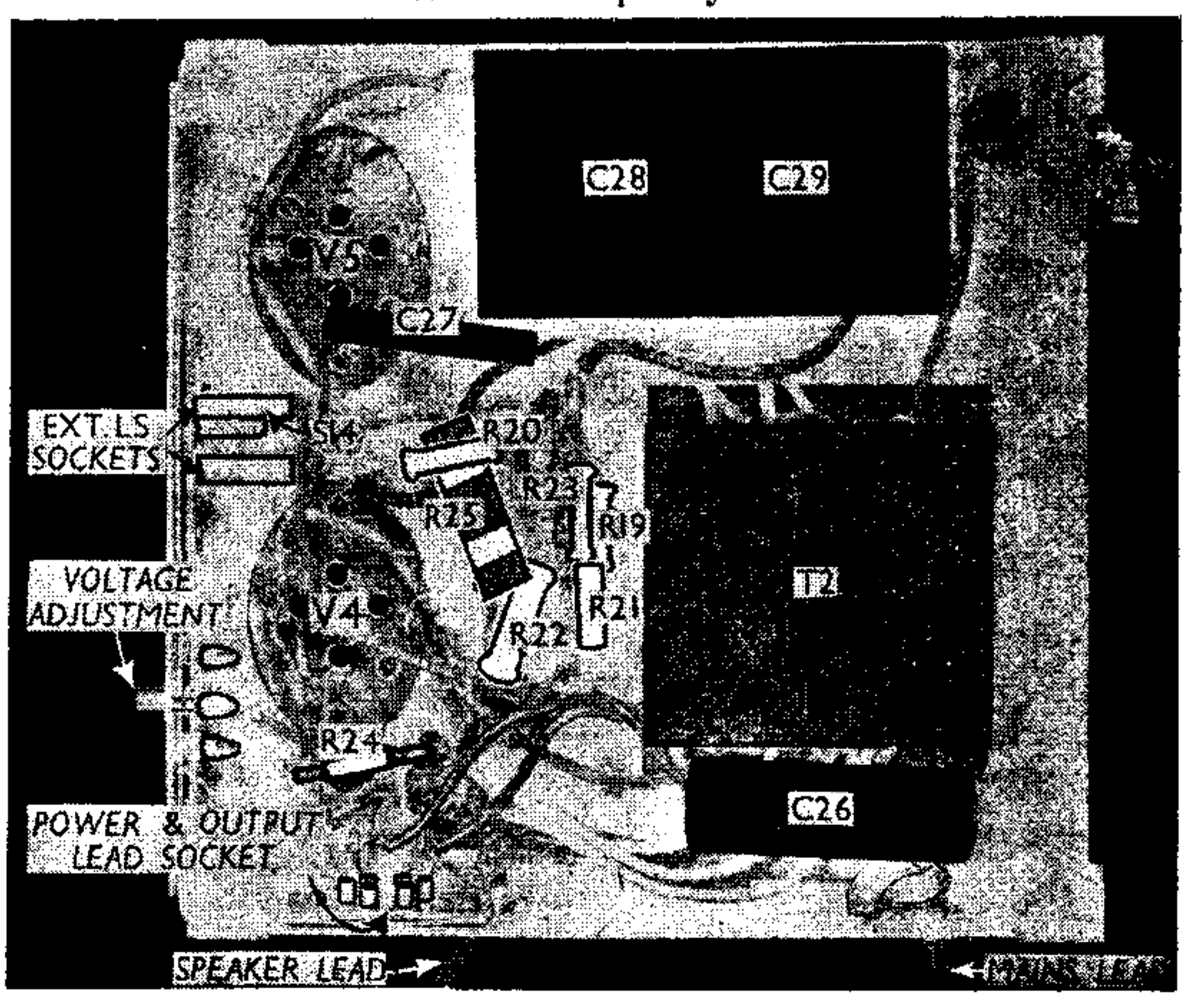
Switch Table

Switch	SW	MW	LW
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

LW.—Switch set to LW, and tune to 1,200 m on scale. Feed in a 1,200 m (250 KC/S) signal, and adjust **C37,** then **C32,** for maximum output. Feed in a 1,875 m (160 KC/S) signal, tune it in, and adjust **C38** for maximum output, while rocking the gang for optimum results. Repeat the LW adjustments.

MW.—Switch set to MW, and tune to 214 m on scale. Feed in a 214 m (1,400 KC/S) signal, and adjust **C36,** then **C31,** for maximum output. Tracking is fixed.

SW.—Switch set to SW, tune to 18 MC/S on scale, and feed in an 18 MC/S (16.67 m) signal. Adjust **C35,** then **C30** for maximum output. **C35** must be adjusted to the peak involving the smaller trimmer capacity.



Underside view of the power and output unit. The mains switch **S15,** which is fitted on the side of the cabinet, is attached to the unit by a pair of flexible leads. The speaker plug (pins 7-10) is attached to the speaker lead; the socket is on the speaker transformer.

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