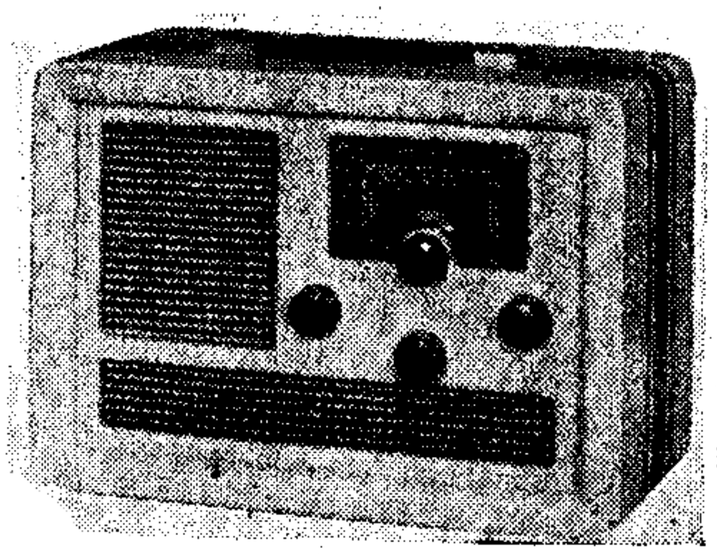
Supplement to The Wireless & Electrical Trader, February 14, 1942

DOUBLE DECCA MB5

(Original Version without Suffix Letter)



THIS version of the Double Decca receiver, the original MB5, is not to be confused, from the point of view of service work, with the subsequent versions MB5A, B and C, which were covered in our *Service Sheet* 473. It is distinguishable from the later versions by the absence of a suffix letter after the model number, by the presence of both a vitreous enamelled voltage adjustment resistance (R17) *and* a line cord (R16), and by the different arrangement of the valve holders.

The receiver is a transportable 4-valve (plus rectifier) 3-band superhet fitted with frame aerials. It is designed to operate from a self-contained all-dry combined HT and LT battery unit or from AC or DC mains, the change-over being effected by a manually operated control.

Release date: February, 1939.

CIRCUIT DESCRIPTION

Tuned frame aerial input on MW and LW by **L4** (MW) plus **L5** (LW) and **C26** to heptode valve **(V1, Brimar 1A7GT),** which operates as frequency changer with electron coupling. Provision for connection of an external aerial and an earth via isolating condensers **C1, C2** and coupling coil **L2** on both bands.

On SW, the signal is picked up either from the external aerial or the MW and LW frame windings by the SW coupling coil **L1** and fed to single tuned circuit **L3, C26,** and then applied to **V1.**

V1 oscillator grid coils **L6** (SW), **L7** (MW) and **L8** (LW) are tuned by **C27.** Parallel trimming by **C6, C28** (MW) and **C7, C29** (LW); series tracking by fixed condensers **C8** (SW), **C9** (MW) and **C10** (LW). Reaction from anode by coils **L9** (SW) and **L10** (MW and LW).

Second valve **(V2, Brimar 1N5GT)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned transformer couplings **L11, L12, C30** and **C31, L13, L14, C32.**

Intermediate frequency 382 KC/S.

Diode second detector is part of single diode triode valve **(V3, Brimar 1H5GT).** Audio frequency component in rectified output is developed across manual volume control **R7,** which also operates as load resistance, and passed via AF coupling condenser **C15** and CG resistance **R8** to CG of triode section, which operates as AF amplifier. IF filtering by **C14, R6** in diode circuit, and **C16.**

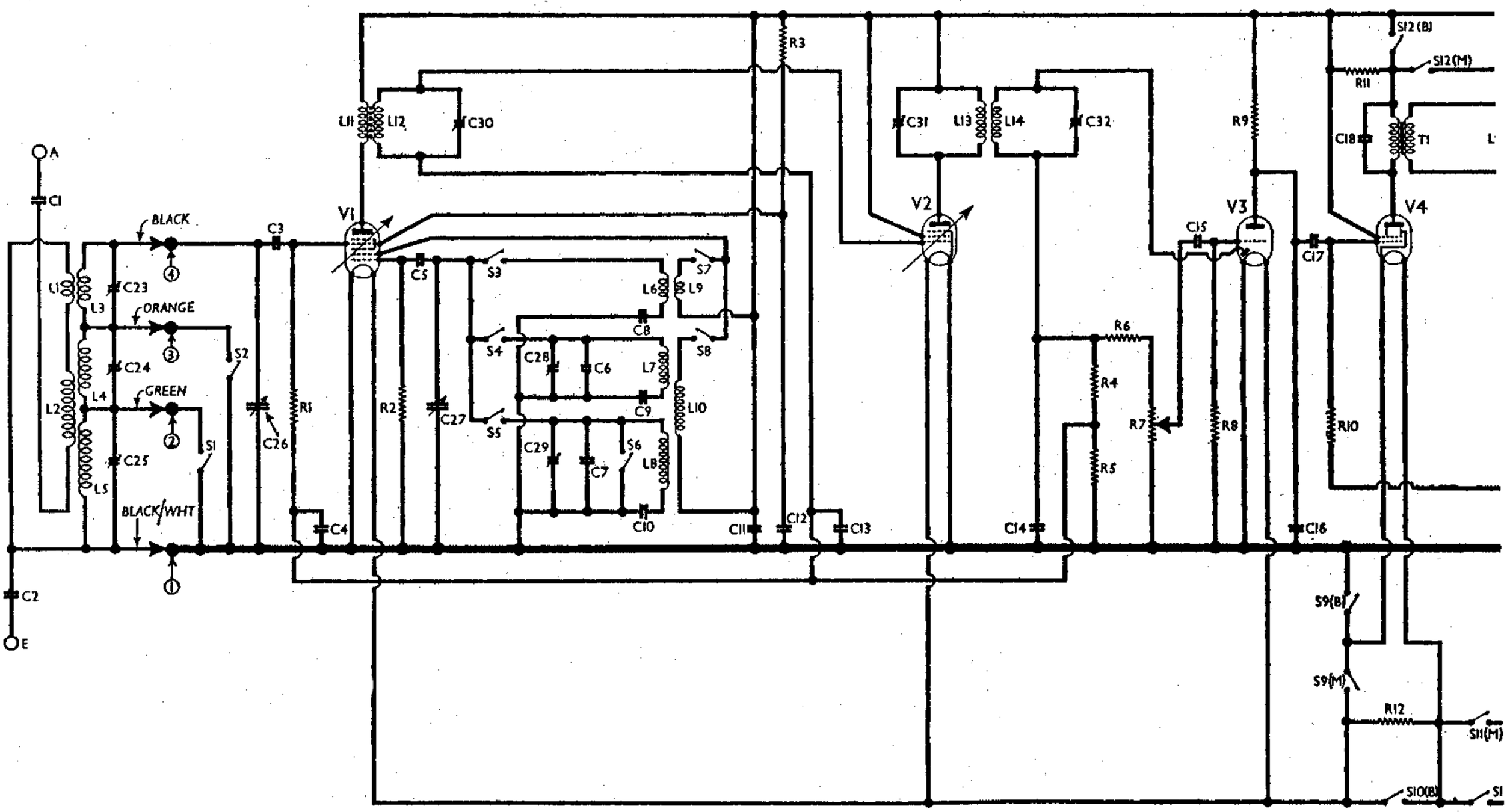
DC potential developed across **R6, R7** appears also across the resistances **R4, R5,** which form a potential divider across them. The potential at the junction of **R4** and **R5** is tapped off and fed back as GB to FC and IF valves, giving automatic volume control; decoupling is effected by condensers **C4, C13,** and **R4.**

Resistance-capacity coupling by **R9, C17** and **R10** between **V3** triode and tetrode or pentode output valve **(V4, Brimar 1Q5GT** or **1C5GT).** Fixed tone correction by **C18** in anode circuit.

POWER SUPPLIES

This receiver is designed to operate from AC or DC mains or its own self-contained combined HT and LT dry battery unit. The foregoing description relates only to the receiving circuits, and is the same irrespective of whether the source of power is mains or battery. Following is a description of the power supply circuits and the method of changing over from one source to the other.

The change-over is accomplished by a manually operated rotary switch unit comprising switches **S9** to **S14,** which, with the exception of **S10,** have been numbered off in pairs, in which one switch of each pair closes when the other opens. The



single elements of each pair are marked with a lettered suffix to indicate when the switch closes. Thus : in the case of the pair marked **S9,** that element marked **S9(B)** closes when the control is turned to the battery position, whereas the second element, marked **S9(M),** closes when the control is turned to "Mains," while **S9(B)** opens.

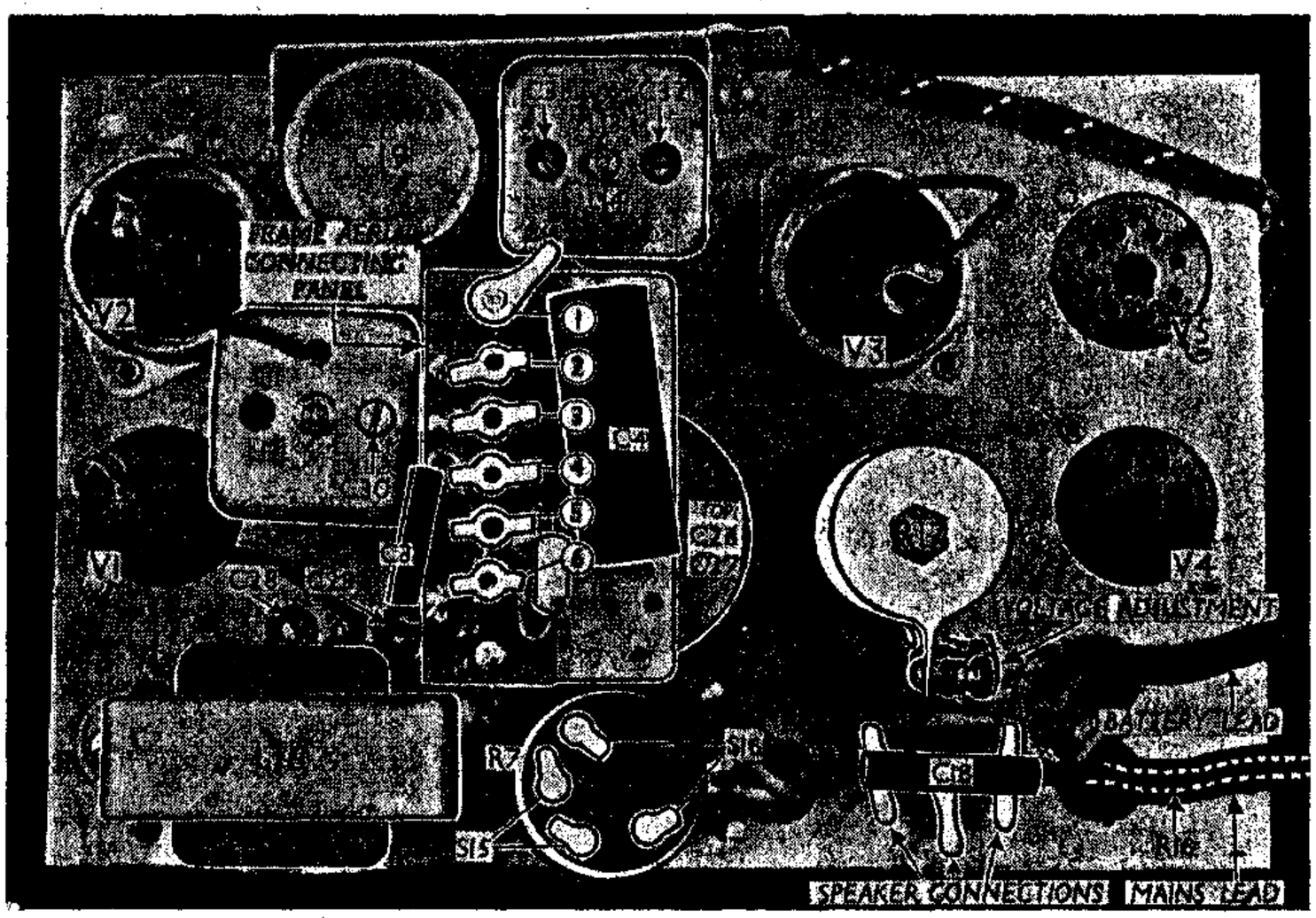
The "Master" switches **S15, S16** are marked normally. They are ordinary QMB switches, ganged together and with **R7,** and they are used to switch the receiver on or off, controlling mains and battery circuits.

HT Circuit.—When the receiver is switched on, **S15** is closed, and if the power control is turned to the battery position, the HT positive socket of the HT battery is connected via **S14(B), S15** and **S13(B)** to the HT positive line; **V4** anode circuit is connected to the HT positive line via **S12(B).**

The HT negative socket of the battery is connected directly to **R14,** through which it is returned via **R15** to chassis. The passage of HT current through these resistances provides a voltage drop which is applied to **V4** control grid circuit as grid bias.

If the power control is now turned to the mains position, the **(M)** switches close and the **(B)** switches open. **R17, R16** (the line cord resistance), **V5** heater and the indicator lamp are all connected in series directly across the mains input circuit, and **V5** heater begins to warm up.

The cathode is connected via the HT smoothing choke **L16** and **S12(M)** to **V4** anode circuit, and to the rest of the receiver, including **V4** screen, via the smoothing resistance **R11** and the HT positive line, and when HT current begins to flow, the receiver, which stopped working when the control was turned to mains, commences to work again.



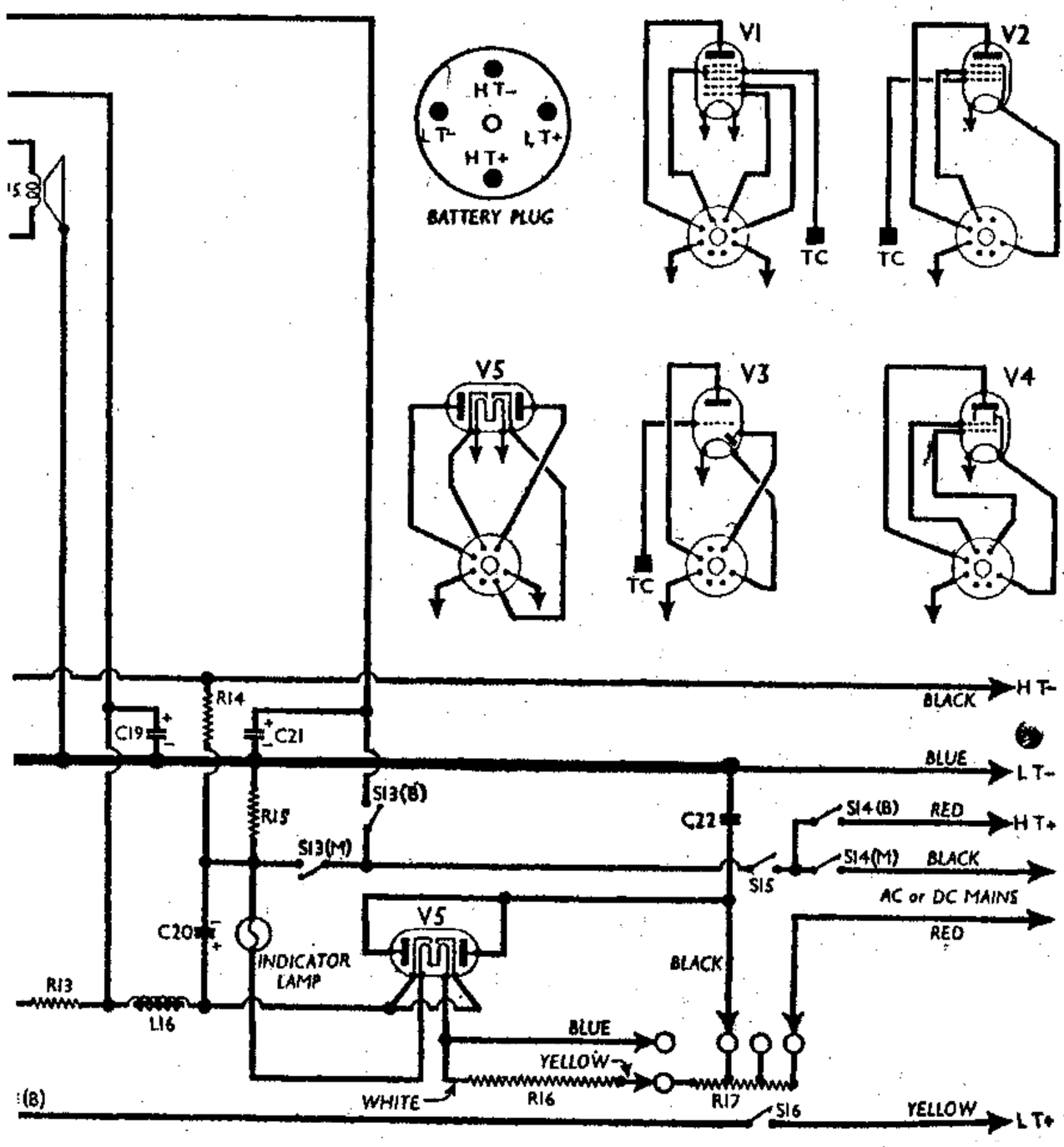
View of the rear or gang condenser side of the chassis. **R16** is in the mains lead.

Smoothing is effected by **L16** and **R11** in conjunction with electrolytic condensers **C19, C20** and **C21,** the last one acting as HT reservoir condenser on battery operation. The indicator lamp performs the dual function of illuminating the scale and indicating that the receiver is on mains.

LT Circuit.—When the receiver is switched on, **S16** closes, and if the power control is in the battery position, the LT positive socket of the battery is connected via **S16, S11(B)** and **S10(B)** to the positive side of **V1-V4** filaments. **V1-V3** filaments are returned directly to chassis, and **V4** filament returns there via **S9(B).** This completes the circuit, as LT negative is connected directly to chassis.

When the change-over is made to mains operation, **S11(B)** opens and disconnects the LT battery. **S9(B)** and **S10(B)** also open, and the LT supply is tapped off the smoothed HT line and taken via **R13 S11(M)** and **R12,** with **V4** filament in parallel with it via **S9(M),** to **V1-V3** filaments, which remain connected in parallel with one another. The filament current is then returned via chassis and **R15,** recombining with the HT current, back to the mains via **S13(M), S15** and **S14(M),** the voltage drop across **R15** being applied via **R14** and **R10** as GB to **V4** control grid. Additional GB is available to **V4** by virtue of the fact that its filament is about 2 V positive with respect to chassis.

The total filament current of **V1-V3** is 0.15 A, and as **V4** filament, which is in series with them, is rated at 0.1 A, **R12** by-passes the surplus 0.05 A.



Circuit diagram of the Double Decca MB5 AC/DC/Battery superhet. The frame aerial connections are numbered and colour coded, and the numbers agree with those in the chassis view above. The mains/battery change-over switches are numbered **S9(B)** and **S9(M)** to **S14(B)** and **S14(M).** The **(B)** indicates that the switch closes for battery operation, and the **(M)** that it closes for mains. **V1-V3** heaters are always in parallel with one another, but **V4** is in parallel with them on battery, and in series with them on mains. **R11** is part of the HT smoothing circuit, and is short-circuited on battery by **S12(B).**

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode CG resistance	500,000
R2	V1 osc. CG resistance ...	250,000
R3	V1 SG HT feed	75,000
R4	AVC feed potential divider resistances	10,000,000
R5		3,000,000
R6	IF stopper	25,000
R7	Manual volume control; V3 diode load resistance	500,000
R8	V3 CG resistance... ...	10,000,000
R9	V3 triode anode load ...	1,000,000
R10	V4 CG resistance... ...	2,000,000
R11	HT smoothing resistance (on mains)	3,000
R12	V4 filament shunt (on mains)	30
R13	Filament circuit ballast ...	700
R14	V4 automatic GB resistances	400*
R15		22†
R16	V5 heater ballast (line cord)	620
R17	Mains voltage adjustment resistance, total ...	315‡

* Value if V4 is 1Q5GT; 800 Ω for 1C5GT.
† Value if V4 is 1Q5GT; 43 Ω for 1C5GT.
‡ Tapped at 80 Ω + 135 Ω + 100 Ω from R16

	CONDENSERS	Values (μF)
C1	External aerial isolator ...	0·001
C2	Earth isolator	0·01
C3	V1 pentode CG condenser	0·0001
C4	V1 pentode CG decoupling	0·1
C5	V1 osc. CG condenser ...	0·0001
C6	Osc. circ. MW fixed trimmer	0·00003
C7.	Osc. circ. LW fixed trimmer	0·0002
C8	Osc. circ. SW tracker ...	0·005
C9	Osc. circ. MW tracker ...	0·000821
C10	Osc. circ. LW tracker ...	0·0003855
C11	HT circuit RF by-pass ...	0·01
C12	V1 SG decoupling ...	0·1
C13	V2 CG decoupling ...	0·02
C14	IF by-pass	0·0001
C15	AF coupling to V3 triode...	0·001
C16	IF by-pass	0·0001
C17	V3 triode to V4 coupling...	0·01
C18	Fixed tone corrector ...	0·001
C19*	HT smoothing condensers	100·0
C20*		16·0
C21*		8·0
C22	Mains RF by-pass	0·01
C23‡	SW aerial circuit trimmer	—
C24‡	Frame aerial MW trimmer	—
C25‡	Frame aerial LW trimmer	—
C26†	Frame aerial circuit tuning	—
C27†	Oscillator circuit tuning...	—
C28‡	Osc. circ. MW trimmer ...	—
C29‡	Osc. circ. LW trimmer ...	—
C30‡	1st IF trans. sec. tuning...	—
C31‡	2nd IF trans. pri. tuning...	—
C32‡	2nd IF trans. sec. tuning...	—

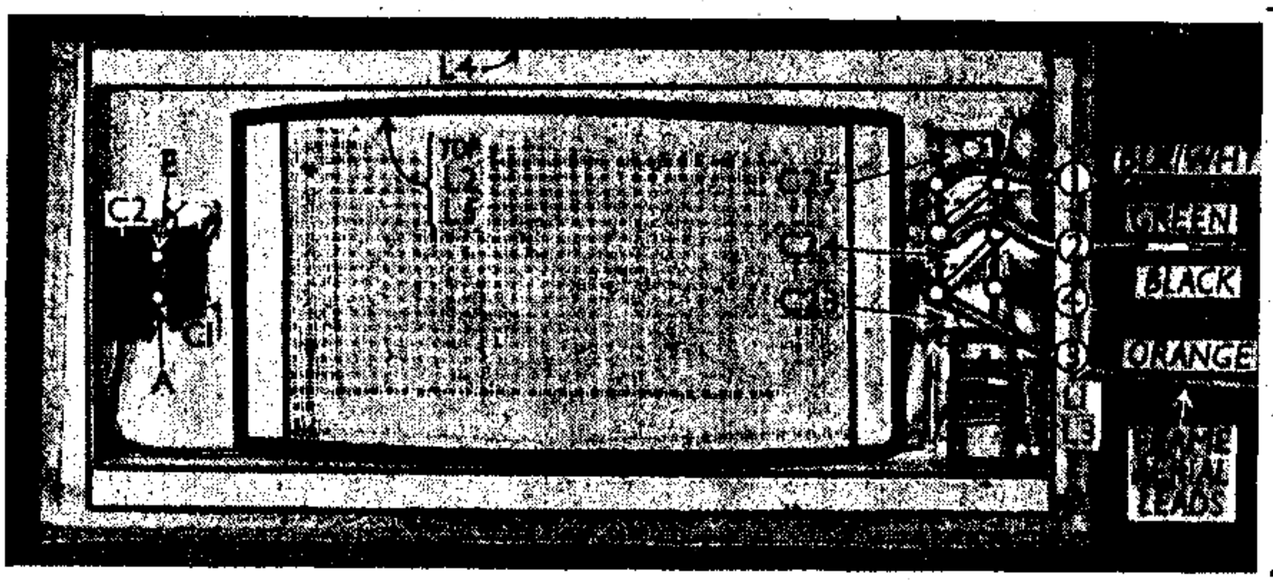
* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Ext. aerial SW coupling coil	2·0
L2	Ext. aerial coupling coil	0·6
L3	Aerial SW tuning coil...	Very low
L4	Tuned frame aerial ...	2·0
L5	MW and LW windings	4·75
L6	Osc. circ. SW tuning ...	Very low
L7	Osc. circ. MW tuning...	2·25
L8	Osc. circ. LW tuning ...	5·25
L9	Oscillator SW reaction	0·35
L10	Osc. MW and LW reaction	5·0
L11	1st IF trans. Pri. ...	19·0
L12	Sec. ...	6·0
L13	2nd IF trans Pri. ...	9·0
L14	Sec. ...	9·0
L15	Speaker speech coil ...	2·7
L16	HT smoothing choke ...	150·0
T1	Speaker input trans. Pri.	650·0
	Sec.	0·4
S1-S8	Waveband switches ...	—
S9 (M, B) to S14(M, B)	Mains/battery change-over switches ...	—
S15	HT and mains circuit switch ganged	—
S16	LT circuit switch ganged	

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws);
remove the two large flat hexagon nuts (with lock-washers) sunk into the front of the case behind the left-hand and right-hand control knobs;
remove the back cover (four round-head wood screws in the corners of the unhinged portion) on which are mounted the frame windings;
unsolder from the vertical connecting strip on the gang assembly the four leads connecting the frame assembly to the chassis;
remove the two countersunk-head wood screws holding the upper edge of the chassis to the mounting blocks at the top of the case, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.
To free the chassis entirely, free the mains lead from the cleat (round-head wood screw) on the side of the case;
unsolder from the small connecting panel below the mains resistance the two speaker leads and the speaker earthing lead.
Before certain of the components beneath the chassis can be reached, the scale backing plate must be removed by removing two press-studs and two self-tapping screws, taking care that the press-studs do not fly off and become lost.
When replacing, refit the scale backing plate with its dull side outwards.
Connect the green speaker lead to the left-hand tag on the connecting panel;
connect the brown lead to the right-hand tag;
connect the black earthing lead to the centre tag.
The frame aerial leads should be connected as follows, numbering the tags on the vertical connecting strip on the chassis from top to bottom;
1 (under fixing nut), black/white;
2, green;
3, orange;
4, black;
5 and 6, no external connection.
Do not forget to replace the felt washers, one going on each control spindle between the knob and the cabinet.

Removing Speaker.—Unsolder the two connecting leads from the panel on the chassis;
remove the three nuts (with lock-washers) holding the speaker to the sub-baffle.
When replacing, the transformer should point towards the bottom right-hand corner of the case, and the tag of the black earthing lead from chassis should be fitted under the lower left-hand fixing nut.
The two leads from the input transformer should be connected as indicated above.



View of the frame aerial assembly on back of the receiver. Note the three trimmers and other components.

VALVE ANALYSIS

Valve voltages and currents given in the table below are approximate. They represent values to be expected in an average chassis, whether operated from battery or mains, when the voltage adjustment has been properly set. When making measurements, **C26** should be short-circuited and a high resistance meter, with its negative lead connected to chassis, should be used. There will, of course, be no voltage reading at **V5** cathode on battery operation.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 1A7GT	90	0·25	40	0·8
	Oscillator			
	90	1·0		
V2 1N5GT	90	1·1	90	0·3
V3 1H5GT	15	0·03	—	—
V4 1Q5GT	86	7·0	90	0·8
V5 25Z6GT	112†	—	—	—

† Cathode to chassis, DC.

GENERAL NOTES

Switches.—S1-S8 are the waveband switches, in a rotary unit mounted on the right-hand bracket on the control panel side of the chassis. This is indicated in our illustration in cols. 5 and 6. A diagram of the unit is seen below, but this is drawn as seen looking from the chassis deck side of the switch unit. It is rather difficult to see the switch unit from this side, but by removing the bracket fixing screws, and rotating the bracket slightly, the switching can be checked. The table gives the **S1-S8** switch positions in the three control settings, starting from the fully anti-clockwise position of the switch knob. A dash indicates open, and **C**, closed.

Switch Table and Diagram
(*Waveband Unit*)

Switch	SW	MW	LW
S1	—	C	—
S2	C	—	—
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	—	C	—
S7	C	—	—
S8	—	C	C

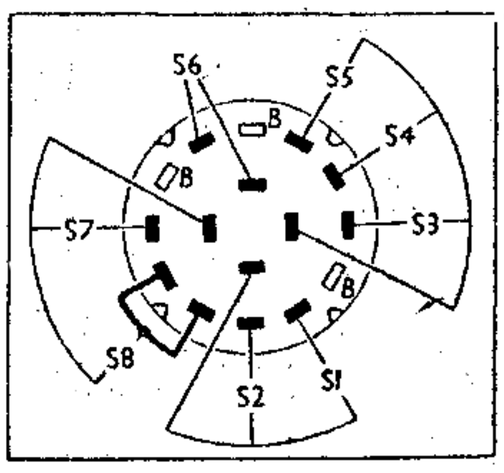


Diagram of the **S1 - S8** unit, looking at the side facing the chassis deck. The table is above.

S9 (B) and **(M)** to **S14 (B)** and **(M)** are the mains to battery change-over switches in a double-sided unit mounted on the left-hand bracket on the control panel side of the chassis.

The diagram of this unit appears in col. 4, drawn as seen when viewed directly as shown in our illustration of the control panel side of the chassis.

The action of these switches is clearly indicated in the circuit diagram, where

an **(M)** indicates that the switch *closes* for mains operation, while a **(B)** indicates that it *closes* for battery operation.

S15, S16 are the master switches, controlling the mains, HT and LT supplies to the receiver. They are of the QMB type, and are ganged with the manual volume control **R7.**

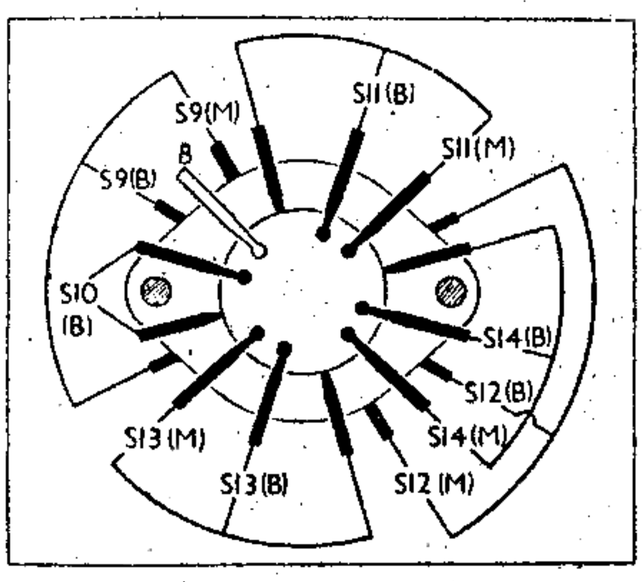


Diagram of the mains/battery change-over switch unit, as seen when viewed from the rear.

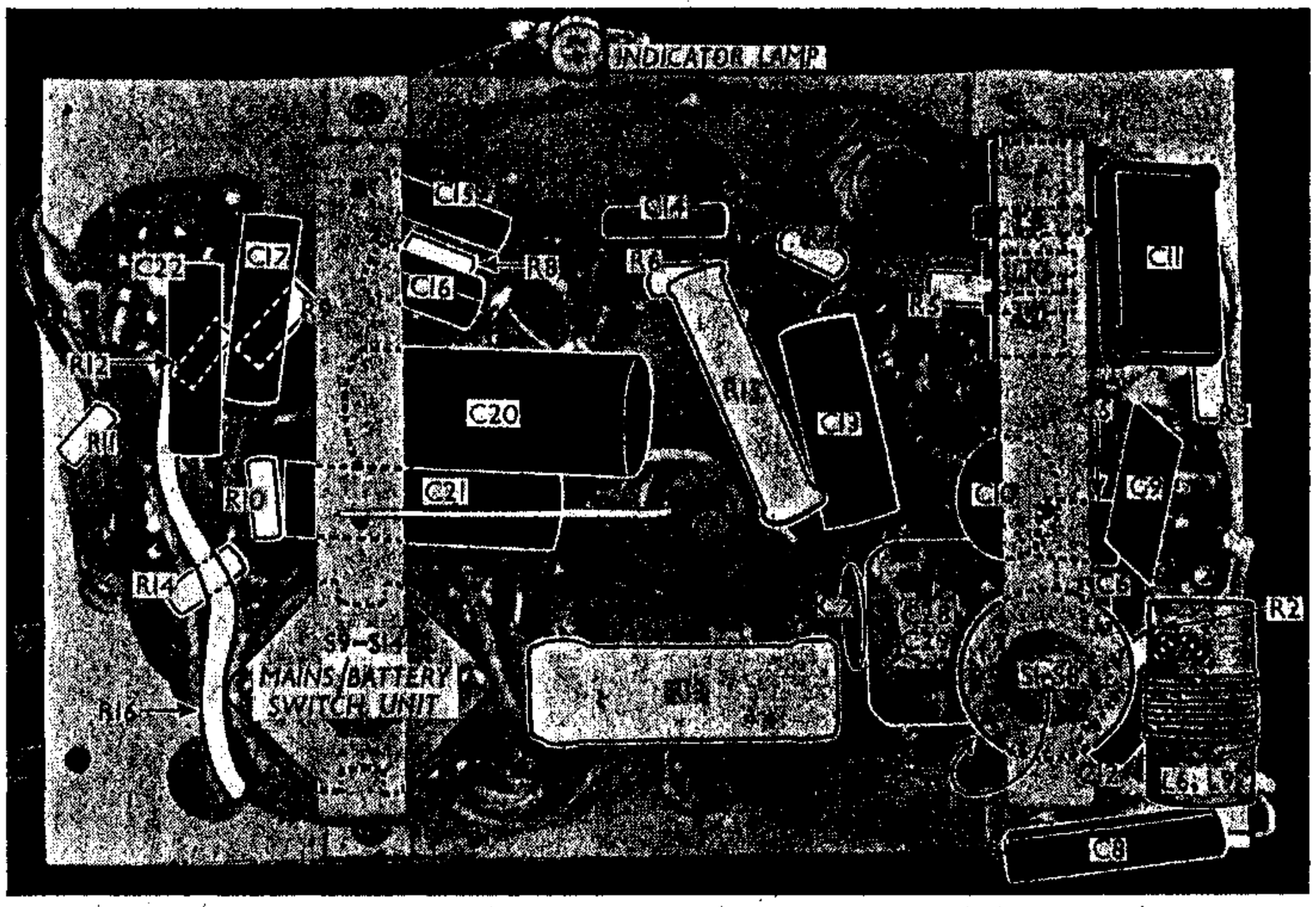
Indicator Lamp.—This is an Osram MES type, with a small spherical bulb, rated at 6.5 V, 0.3 A. It is connected in series with the heater of **V5,** and lights as a signal that the receiver is operating from the mains.

R16.—This is the line cord ballast resistance for **V5** heater, and is located in the mains lead to the receiver. Since the pair of mains conductors is taken directly to the chassis without contact with **R16,** and **R16** is in the mains lead, two further conductors emerge from the chassis end of the mains lead, so that four leads in all emerge from the cable at the chassis end, while only two enter it from the mains end. The colours of the leads are indicated in the circuit diagram, while in the sketch below, the physical arrangement of the leads is shown. The colour coding is given here to agree with the circuit diagram.

R17.—This is the mains voltage adjustment resistance in a vitreous enamelled unit mounted perpendicularly on the gang side of the chassis deck. It has four tappings brought out to lugs spaced along its length, while a fifth lug, the end one, farthest from the chassis deck, is unconnected with the resistance element, and merely provides a convenient anchor for one of the voltage adjustments leads when the latter is out of use.

Voltage Adjustment.—A complicated system of adjustable leads and tappings on **R17** permits fairly critical adjustments to be made for AC mains of 200-260 V, DC mains of 190-250 V and AC or DC mains of 110-120 V.

A table showing the various combinations is pasted on the inside of the flap at the bottom of the back cover, but as



View of the chassis from the front or control spindle side. The two switch units are indicated.

the adjustment would be difficult to carry out if the table were missing or illegible, the table is repeated below.

The lead colours in the table agree with those given in the circuit diagram, while the tapping numbers are those of the lugs on **R17,** starting with the top (blank) lug as No. 1, and finishing with No. 5 at the bottom, nearest the chassis deck.

Voltage Adjustment Table

Mains	Tapping				
AC	1	2	3	4	5
200-220	Blue	—	Black	Red and yellow	—
220-240	Blue	Black	—	Red and yellow	—
240-260	Blue	Black	—	Red	Yellow
DC	1	2	3	4	5
190-210	Blue	Black	—	Red and yellow	—
210-230	Blue	Black	—	Red	Yellow
230-250	Blue	Black	—	Yellow	Red
AC/DC	1	2	3	4	5
110-120	Yellow	Blue	—	Black and red	—

V4 Alternatives.—Two alternative output valves, 1Q5GT and 1C5GT, are specified by the makers for use in this receiver, but they are not directly replaceable. In our chassis, **V4** was a tetrode, 1Q5GT; but if the alternative pentode, 1C5GT is used, the values of the GB resistances **R14** and **R15** become 800 O and 43 O respectively, instead of 400 O and 22 O as in our chassis.

Chassis Divergency.—In our chassis, **C9** was 821 $\mu\mu$F (0.000821 μF), but in the makers' diagram it is given as 221 $\mu\mu$F (0.000221 μF).

Battery.—This is a combined 1.5 V LT and 90 V HT dry battery (Ever Ready All-Dry No. 3). It is fitted with a built-in socket for connections, the battery lead from the receiver terminating in a 4-pin plug to fit. A diagram of the plug, looking at the free ends of the pins, is inset in the circuit diagram.

The colour coding of the connections to the plug in our chassis was : LT negative, blue; LT positive, yellow; HT negative, black; HT positive, red.

CIRCUIT ALIGNMENT

IF Stages.—Remove back of receiver, remove connection to tag 4 on frame aerial connection strip, and connect signal generator to this tag and the **E** socket. Switch set to SW, feed in a 382 KC/S (785.5 m) signal, and adjust **C32, C31** and **C30** for maximum output. Disconnect signal generator and replace frame lead on tag 4.

RF and Oscillator Stages.—With gang at maximum, pointer should be horizontal. Connect signal generator to external **A** and **E** sockets.

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust **C28,** then **C24,** for maximum output.

LW.—Switch set to LW, tune to 1,200 m on scale, feed in a 1,200 m (250 KC/S) signal, and adjust **C29,** then **C25,** for maximum output.

SW.—Switch set to SW, tune to 16 m on scale, feed in a 16 m (18.75 MC/S) signal, and adjust **C23** for maximum output.

Finally, replace back of set and adjust **C23, C24** and **C25** accurately for maximum sensitivity on their respective bands.

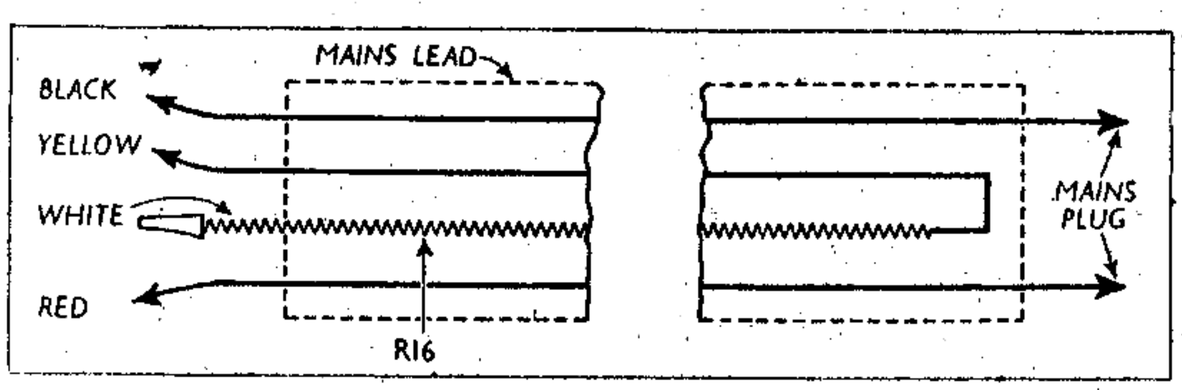


Diagram showing the arrangement of the line cord, giving the colour coding of the leads at the chassis end.

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