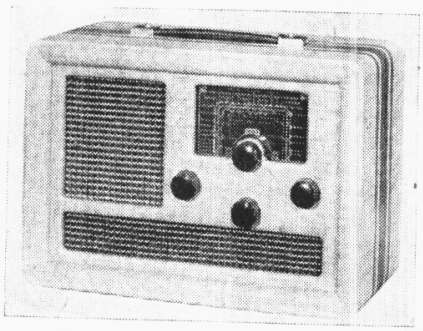
Supplement to The Wireless & Electrical Trader, June 29, 1940

"TRADER" SERVICE SHEET

473

DOUBLE DECCA BM5B

WITH BM5A AND BM5C MODIFICATIONS



THE Double Decca receiver is a transportable 4-valve (plus valve rectifier) 3-band superhet, fitted with frame aerials. The set, by the operation of a switch, will run from its internal dry L/T and H/T battery, or from A.C./D.C. mains.

The original model BM5 (or MB5 in some Decca literature) was considerably different from the models with suffix letters A, B and C, and is not covered by this *Service Sheet*.

Our model was actually a BM5B, and the chief modifications for the A and C models are given at the end of the Sheet. The type number will be found on a label inside the cabinet, but if this is missing, clues to help in identification are given at the end of the Sheet.

Release date: *January*, 1940.

CIRCUIT DESCRIPTION

On MW and LW, tuned frame aerial input **L3** (MW) plus **L4** (LW) tuned by **C28** precedes heptode valve **(V1, Brimar 1A7EG)**, which operates as frequency changer with electron coupling, and is not AVC controlled in the MB5/B model. Provision for connection of external aerial via isolating condenser **C1** and coupling coil **L1**, and earth via isolating condenser **C2**.

On SW, the SW coupling coil **L2** receives its input via **L1** for external or frame aerial operation, and passes it to the SW tuning circuit **L5, C28** and thus to **V1**.

V1 oscillator grid coils **L6** (MW), **L7** (LW) and **L8** (SW) are tuned by **C29**; parallel trimming by **C30** (MW), **C6, C31** (LW) and **C32** (SW); series tracking by **C7** (MW), **C8** (LW), and **C9** (SW). Reaction by anode coils **L9** (MW and LW) and **L10** (SW).

Second valve **(V2, Brimar 1N5EG)** is a variable-mu RF pentode operating as intermediate frequency amplifier with iron-cored, tuned-secondary input and air-cored, tuned-primary, tuned-secondary transformer couplings **L11, L12, C33** and **C34, L13, L14, C35.**

Intermediate frequency 382 KC/S.

Diode second detector is part of single diode triode valve **(V3, Brimar 1H5G).** 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 **C18** and CG resistance **R8** to CG of triode section, which operates as AF amplifier.

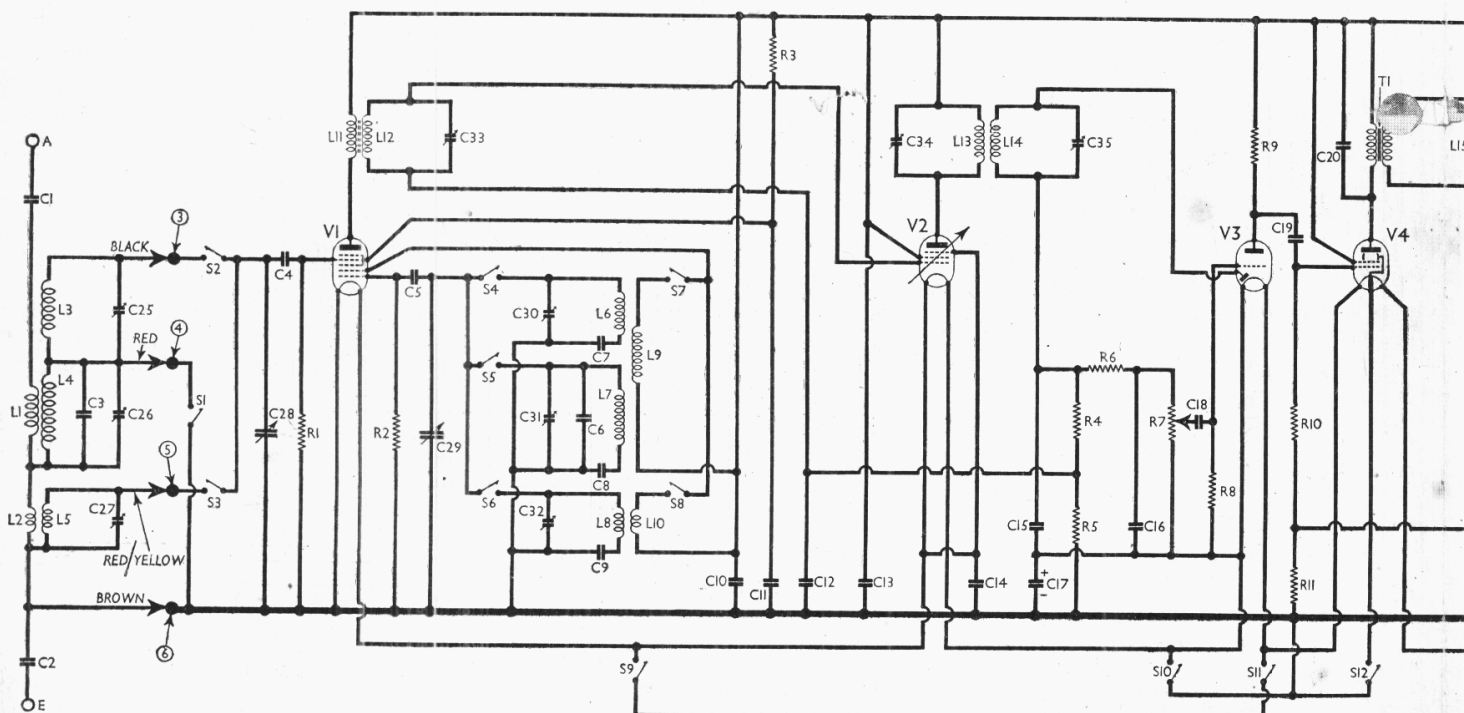
DC potential developed across **R6, R7,** appears also across **R4, R5** and the potential at the junction of **R4** and **R5** is fed back to the grid circuit of **V2** to give automatic volume control.

Resistance-capacity coupling by **R9, C19** and **R10** between **V3** triode and pentode output valve **(V4, Raytheon 3Q5GT).** Fixed tone correction by **C20** in anode circuit.

POWER SUPPLY

The change-over from mains to battery operation or vice-versa is controlled by a manually operated two-position switch unit comprising switches **S9** to **S17.**

When the control knob is turned to the battery position, switches **S9, S10, S11, S12, S13, S15 and S17** all close; **S18** and **S19,** which are ganged with the volume control **R7,** close when the receiver is switched on, whether for mains or battery operation; the combined dry H/T and L/T battery unit is left permanently connected to the receiver via its connecting plug.



Circuit diagram of the Double Decca model BM5B. Mains input modifications for models BM5A and BM5C are overleaf. No as drawn are, from top to bottom, MW, LW and SW. A diagram of the battery plug is inset on th

The HT positive lead is now connected via **S15** and **S18** directly to the HT positive line of the receiver. The HT negative lead is connected directly to the junction of **R10** and **R11**, and the current flowing through **R11** to chassis produces a voltage drop which is used as GB for **V4**.

The LT negative lead is connected via **S17** and **S19** to chassis. The LT positive lead is connected via switches **S9, S11** and **S13** to one end of each of **V1, V2** and **V3** heaters and both ends of **V4** heater, which is twice as long as the former three heaters and is centre-tapped.

The remaining end of **V1** heater is connected directly to chassis, those of **V2** and **V3**, via **S10** to chassis, and the centre-tap of **V4** via **S12** to chassis, so that the first three heaters and the two halves of **V4** heater are all connected in parallel.

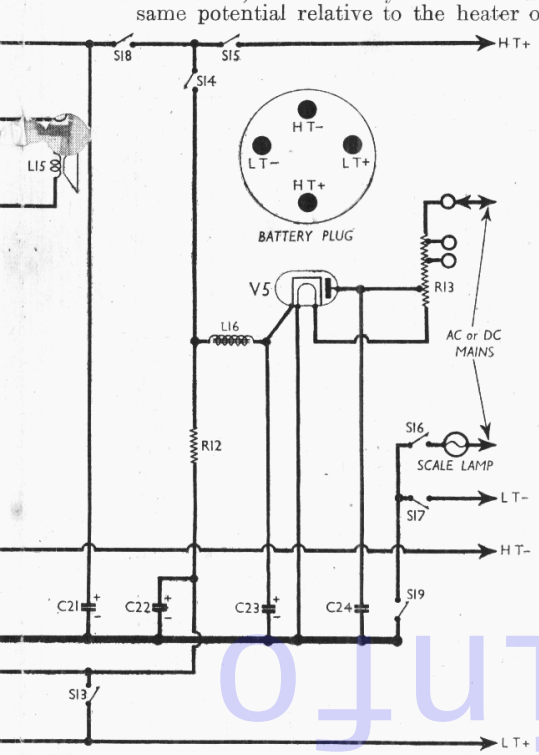
For mains operation, when the change-over control is turned to the mains position the previously mentioned switches, excepting **S18** and **S19**, open, and **S14** and **S16** close.

Under these conditions the mains are connected across **R13** and the heater of the IHC half-wave rectifying valve **(V5, Mullard UY31)** via chassis, **S19, S16** and the scale lamp. **V5** heater warms up, and current flows from the cathode via **L16, R12** and **V1—V4** heaters, which are now connected in series with one another, back to chassis.

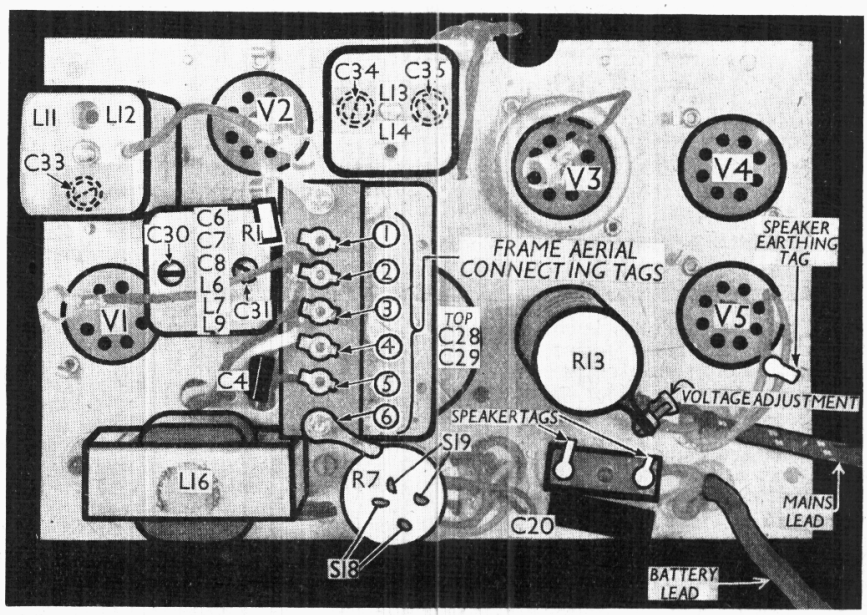
Since **S18** and **S14** are closed, HT current now flows from the junction of **L16** and **R12.**

The low potential ends of the components comprised in the signal diode circuit, and **V3** CG resistance, are connected directly to the negative end of **V3** heater, so that they maintain the same potential relative to the heater on either method of operation. During mains operation, the AC component at this point is maintained at chassis potential via **C17,** while GB for **V4** is obtained by virtue of the fact that its heater is positive with respect to chassis, while its grid circuit is at chassis potential.

Since the scale lamp is included in the mains lead to chassis, it glows only when the receiver is mains operated, and thus serves as an indicator of the source of power.



Note that the wavebands in the circuit on the right.



View of the gang condenser side of the chassis. Note the frame aerial connecting tags. In A and C models **R13** is replaced by a line cord resistance; a voltage adjustment panel is fitted; and a double electrolytic condenser **(C21, C23)** occupies the position of **R13.**

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial isolating condenser	0·001
C2	Earth isolating condenser...	0·01
C3	Aerial LW fixed trimmer ...	0·0001
C4	V1 pentode CG condenser ...	0·0001
C5	V1 osc. CG condenser ...	0·0001
C6	Osc. circ. LW fixed trimmer	0·00022
C7	Osc. circuit MW tracker ...	0·000821
C8	Osc. circuit LW tracker ...	0·0003855
C9	Osc. circuit SW tracker ...	0·005
C10	V1 osc. anode decoupling ...	0·01
C11	V1 SG decoupling	0·01
C12	V2 CG decoupling	0·01
C13	HT circuit RF by-pass ...	0·01
C14	V1, V2 heaters RF by-pass	0·02
C15	IF by-pass condensers ...	0·0001
C16		0·0001
C17*	V3 heater decoupling ...	50·0
C18	AF coupling to V3 triode ...	0·001
C19	V3 triode to V4 AF coupling	0·01
C20	Fixed tone corrector ...	0·001
C21*	HT smoothing condenser ...	32·0
C22*	V1-V4 heaters smoothing ...	50·0
C23*	HT and LT smoothing condenser	16·0
C24	Mains RF by-pass	0·01
C25‡	MW frame aerial trimmer	—
C26‡	LW frame aerial trimmer ...	—
C27‡	Aerial circuit SW trimmer	—
C28†	Aerial circuit tuning ...	—
C29†	Oscillator circuit tuning ...	—
C30‡	Osc. circuit MW trimmer ...	—
C31‡	Osc. circuit LW trimmer ...	—
C32‡	Osc. circuit SW trimmer ...	—
C33‡	1st IF trans. sec. tuning ...	—
C34‡	2nd IF trans. pri. tuning ...	—
C35‡	2nd IF trans. sec. tuning ...	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	V1 pentode CG resistance...	3,300,000
R2	V1 osc. CG resistance ...	250,000
R3	V1 SG HT feed	60,000
R4	AVC feed potential divider resistances	3,300,000
R5		3,300,000
R6	IF stopper	25,000
R7	Manual volume control ...	500,000
R8	V3 triode CG resistance ...	6,800,000
R9	V3 triode anode load ...	1,000,000
R10	V4 CG resistance	2,500,000
R11	V4 (Battery) auto GB ...	400
R12	V1-V4 heater ballast ...	2,000
R13	V5 heater ballast	1,180*

* Tapped at 600 Ω + 400 Ω + 90 Ω + 90 Ω from V5 heater.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Ext. aerial coupling	0·3
L2	Aerial SW coupling coil ...	2·0
L3	Frame aerial windings ...	2·0
L4		4·75
L5	Aerial SW tuning coil ...	Very low
L6	Osc. circuit MW tuning coil	2·4
L7	Osc. circuit LW tuning coil	5·25
L8	Osc. circuit SW tuning coil...	Very low
L9	MW and LW reaction coil ...	6·25
L10	SW reaction coil	0·3
L11	1st IF trans. Pri.	18·5
L12	Sec.	5·5
L13	2nd IF trans. Pri.	13·0
L14	Sec.	13·0
L15	Speaker speech coil	2·5
L16	HT and LT smoothing choke	350·0
T1	Speaker input trans. Pri.	650·0
	Sec.	0·4
S1-S8	Waveband switches	—
S9-S17	Mains / battery change switches	—
S18	HT circuit switch Ganged	—
S19	On/off switch ... R7	

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

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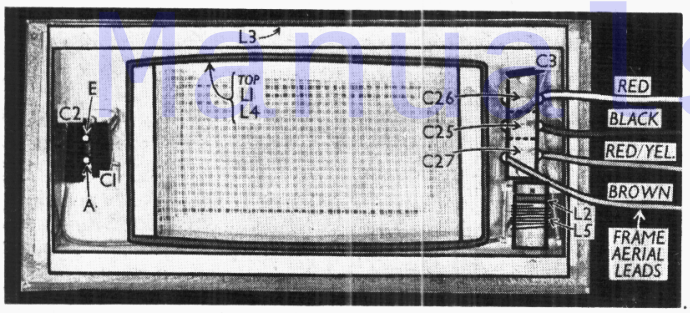


View of the frame aerial assembly on back of the receiver. Note the three trimmers and other components.

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 (two round-head wood screws) on the side of the case;

unsolder from the small connecting panel below the mains resistance the two speaker leads, and from the tag beside **V5** the speaker earthing lead.

Before certain of the components beneath the chassis can be reached, the scale backing plate must be removed by prising up the four press-studs, care being taken that they 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 right-hand tag on the connecting panel;

connect the brown lead to the left-hand tag;

connect the black earthing lead to the chassis tag beside **V5.**

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 and 2, no external connection;

3, black;

4, red;

5, red or blue lead, with yellow tracer.

The brown lead goes to the tag under the bottom fixing nut on the strip.

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 right-hand fixing nut.

The two leads from the input transformer should be connected as indicated above.

VALVE ANALYSIS

Valve voltages and currents given in the tables below are those measured in our receiver when it was operating on (a) a new battery, the HT section of which was reading 96V on load (battery table); (b) AC mains of 236V (mains table) using the second tapping (220-240V) on the mains resistance.

The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum. The frame windings were disconnected so that there should be no signal input.

Voltages were measured on the 400V scale of a model 7 Universal Avometer, chassis being negative.

Battery Operation

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 1A7EG	91	0·25	45	0·8
	Oscillator			
	91	1·0		
V2 1N5EG	91	1·3	91	0·3
V3 1H5G	15	0·03	—	—
V4 3Q5GT	85	8·2	91	0·95

Mains Operation

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 1A7E	91	0·25	45	0·8
	Oscillator			
	91	1·0		
V2 1N5EG	91	1·1	91	0·3
V3 1H5G	15	0·03	—	—
V4 3Q5GT	85	7·0	91	0·8
V5 UY31	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, which is indicated in our illustration of this side. A diagram of the switch unit is in Col. 3, but this is drawn as seen looking from the chassis deck side of the unit. It is rather difficult to see the unit from this side, but by removing the bracket fixing screws, and rotating the bracket slightly, the switching can be checked. The upper table (Col. 3) gives the **S1-S8** switch positions in the three control settings, starting from the fully anti-clockwise position of the switch knob. A dash indicating open, and **C**, closed.

S9-S17 are the mains to battery changeover switches in a double-sided unit mounted on the left-hand bracket on the control panel side of the chassis indicated in our illustration of this side of the chassis. Diagrams of each side of this unit are above, the upper one being the side seen from the control panel side of the chassis, and the lower one the side facing the chassis deck. The lower table (above) gives the switch positions for the two control settings, a dash indicating open, and **C**, closed.

S18 is the HT positive, and **S19** the on-off switch, in a QMB double unit, ganged with the volume control **R7.** The tags of these switches are indicated in our view of the gang condenser side of the chassis.

Coils.—**L1-L3** are the external aerial coupling and frame aerial windings, mounted on the back of the receiver, and shown in a separate illustration. This

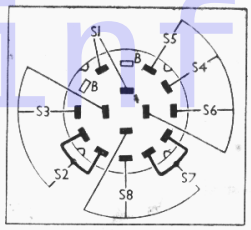
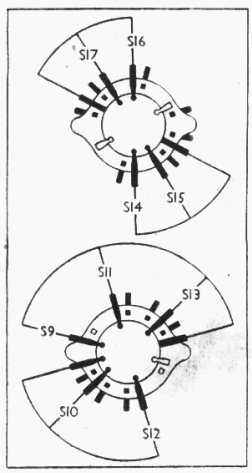


Diagram of the **S1-S8** unit, looking at the side facing the chassis deck.

S1 — S8 Table

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



Diagrams of both sides of the **S9-S17** unit. Above, the side nearest the control panel; below, the side facing the chassis deck.

S9 — S17 Table

Switch	Battery	Mains
S9	C	—
S10	C	—
S11	C	—
S12	C	—
S13	C	—
S14	—	C
S15	C	—
S16	—	C
S17	C	—

also shows the connecting leads colour-coded to agree with the circuit diagram. The **L2, L5 unit**, and condensers **C1, C2, C3, C25, C26, C27,** are also included in this assembly.

L8, L10 are in an unscreened tubular unit on the right of the wavechange switch unit. **L6, L7, L9** and the IF transformers **L11, L12** and **L13, L14** are in three screened units on the gang condenser side of the chassis. Each unit contains its associated trimmers, while the first also contains **C6, C7** and **C8.** The choke **L16** is on the same side of the chassis.

Scale Lamp.—This is an Osram MES type, rated at 8V, 1.6W (0.2A).

Battery.—This is a combined 1.5V LT and 90V 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 is: LT negative, black; LT positive, blue; HT negative, yellow; HT positive, red.

Resistance R13.—In model B this is a tapped vitreous enamelled resistor, mounted on the chassis deck. It has a total resistance of 1,180 O, and is tapped from the chassis end (V5 heater) at 600 O, 1,000 O, 1,090 O, and 1,180 O.

Valve Bases.—The base connections of **V1, V2** and **V3** were given in a table at the end of *Service Sheet* 460 (April 13, 1940). The connections of **V4,** using the normal pin numbering are: 1, blank; 2, filament; 3, anode; 4, screen grid; 5, control grid; 6, no pin; 7, heater; 8, filament centre tap (and beam electrode). The valve has a 2.8V filament. The connections of **V5** are: 1, blank; 2, heater; 3, blank; 4, no pin; 5, anode; 6, no pin; 7, heater; 8, cathode.

Trimmers.—Apart from the three IF trimmers in their respective cans, there are three aerial trimmers in the frame aerial assembly, two in the screened oscillator coil unit, and one by the side of the wavechange switch unit.

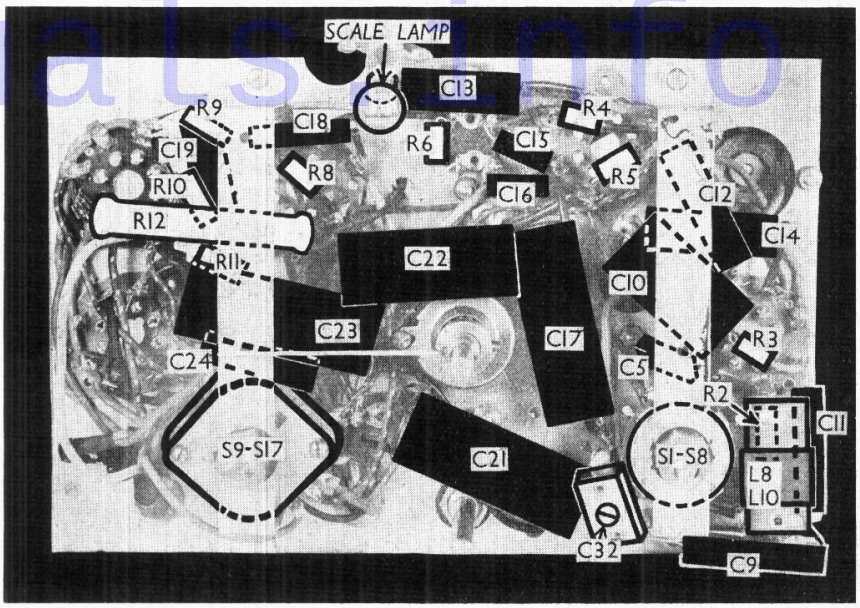
Model BM5B Divergencies.—The following differences were found in our chassis, compared with the makers' BM5B circuit. **R1, R4** and **R5** were all 3.3 megohms (not 3 megohms); **R3** was 60,000 O (not 75,000 O); **R8** was 6.8 megohms (not 10 megohms); **R10** was 2.5 megohms (not 2 megohms); **C14** was 0.02 μF (not 0.1 μF); **C15** and **C16** were returned to filament of **V3,** not to chassis.

CIRCUIT ALIGNMENT

IF Stages.—Remove back of receiver, remove connection to tag 5 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 signal, and adjust **C35, C34** and **C33** for maximum output. Remove signal generator and replace frame lead on tag 5.

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 200m on scale, feed in a 200m. (1,500 KC/S) signal, and adjust **C30,** then **C25,** for maximum output.



View of the switch unit side of the B type chassis. In A and C models **C21 and C23** are in a single block on the other side of the chassis.

LW.—Switch set to LW, tune to 1,200m on scale, feed in a 1,200m (250 KC/S) signal, and adjust **C31,** then **C26,** for maximum output.

SW.—Switch set to SW, tune to 16m on scale, feed in a 16m (18.75 MC/S) signal, and adjust **C32,** then **C27,** for maximum output.

Finally, replace back of set, and adjust **C25, C26** and **C27** accurately for maximum sensitivity on their respective bands.

MODELS BM5 A, B AND C MODIFICATIONS

The differences between the models with suffixes A, B and C are somewhat complicated, but the main divergencies are given below. The early model BM5 (without suffix) is so much different that this Sheet will not cover it.

In the first place, the circuit and details given above refer to the B model, which is identified primarily by the fact that **R13** is a vitreous enamelled resistor, with voltage tappings on it, **V5** is a UY31, and the scale lamp is in series with one mains lead, and has a current rating of 0.2 A.

Model A uses a special line cord resistance in place of the resistor **R13,** and **V5** is a 25Z6, with its two anodes connected together. The scale lamp is in series with **V5** heater and chassis, and has a current rating of 0.3A.

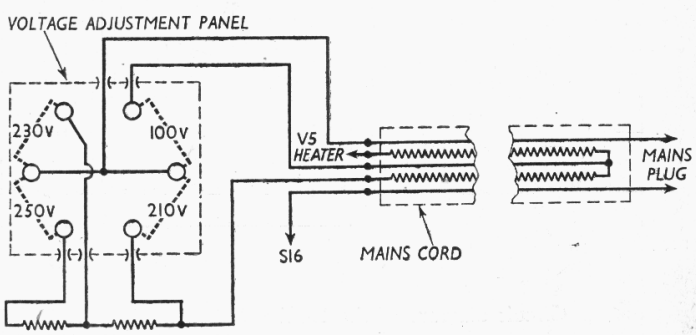
Model C also uses a line cord resistance (but of different value) in place of resistor **R13,** while **V5** is a UY31, and the scale lamp is in series with one mains lead, and has a current rating of 0.2A as in the B model.

In the models using a line cord resistance, the input arrangement and voltage adjustment panel is as shown in a separate diagram on this page. A voltage adjustment panel is fitted on the chassis, and in place of the vitreous resistor, the electrolytics **C21** and **C23** are in a single block on the chassis deck.

To obtain voltage adjustment the two resistors shown beneath the two lower sockets on the panel are used. These have a value of 50 O each in the A model, and 100 O each in the C model. Voltage adjustment is carried out by bridging pairs of sockets on the panel by a small 2-pin fuse plug. The positions of the plug for various voltages are indicated by dotted lines on the panel.

The mains cord resistance, it will be seen, has five leads emerging from the receiver end, and its internal connections are indicated. The resistance is centre tapped, and has a total value of 490 O in the A model, and 1,000 O in the C model.

Modification of the mains input circuit in A and C models, using a line cord resistor. The dotted links show the positions of the fused plug for different voltages.



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