"TRADER" SERVICE SHEET

1037

ROBERTS PORTABLES

Covering Models RP4 (Battery only) and RMB (A.C. Mains/Battery)

DESIGNED to operate as an all-dry battery portable, the Roberts RP4 is a 4-valve 3-band superhet with separate frame aerials for M.W. and L.W. bands, with provision for the connection of an external aerial on all bands. The waveband ranges are 19-50 m, 192-570 m and 1,000-2,000 m.

The same receiver becomes a model RMB upon being fitted with an A.C. mains unit, which gives from separate circuits smoothed H.T. and L.T. supplies to the receiver, converting it into an A.C. mains/battery portable. Full details of the differences between these two versions are given overleaf under "Mains/Battery Unit."

Export versions of these two receivers are also covered here, the differences in those models being explained under "Export Models" overleaf. Our work was performed on two Home models.

Release date, both models, September, 1951. Original prices: RP4, £15 8s 9d; RMB, £18 7s 6d, including batteries. Purchase tax extra.

CIRCUIT DESCRIPTION

Tuned frame aerial input on M.W. and L.W. by **L1, C34** (M.W.) and **L2, C34** with loading coil **L5** (L.W.). An external aerial is required for S.W. operation and is coupled via **L3** to single tuned circuit **L4, C34.** Provision is also made for using the external aerial on M.W. and L.W., coupling it via a tap on **L1** (M.W.) or across the common impedance of **L5** (L.W.). First valve **(V1, Mullard DK92)** is a heptode operating as frequency changer with electron coupling.

Oscillator grid coils **L6** (S.W.), **L7** (M.W.) and **L8** (L.W.) are tuned by **C35.** Parallel trimming by **C36** (S.W.), **C37** (M.W.) and **C7, C38** (L.W.); series tracking by **C8** (S.W.), **C9** (M.W.) and **C10** (L.W.). Reaction coupling from oscillator anode by **L9** (S.W.), **L10** (M.W.), **L11** (L.W.).

Second valve **(V2, Mullard DF91)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C3, L12, L13, C4** and **C12, L14, L15, C13.**

Intermediate frequency 472 k/cs

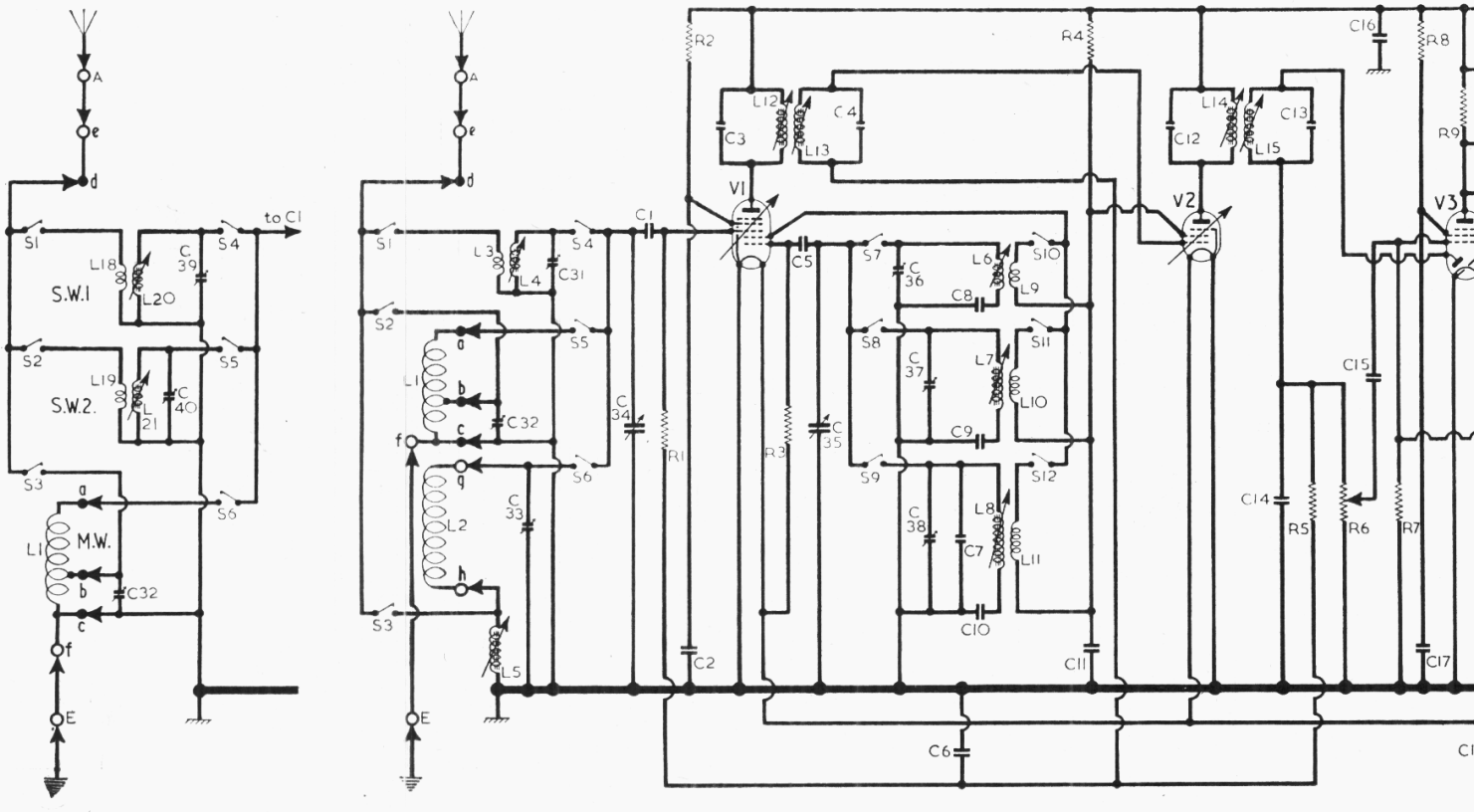
Diode signal detector is part of diode pentode valve **(V3 Mullard DAF91).** Audio frequency component in rectified output is developed across volume control **R6,** which acts as diode load, and passed via **C15** to control grid of pentode section, which operates as A.F. amplifier. I.F. filtering by **C14** in diode circuit, and **C19** in pentode anode circuit.

D.C. potential developed across **R6** is fed back as bias via decoupling circuit **R5, C6** to F.C. and I.F. valves, giving automatic gain control.

Resistance-capacitance coupling by **R9, C22** and **R13** between **V3** pentode anode and control grid of pentode output valve **(V4, Mullard DL94).** Tone correction by **C23** and by negative feed-back via **C20, R11, C21** and **R10,** between **V3** anode and control grid circuits. Grid bias for **V4** is obtained from the voltage developed across **R12** in the H.T. negative lead to chassis. The two sections of **V4** filament are connected in parallel for 1.4 V operation. **C16** and **C24** by-pass the H.T. battery when in use.

For battery operation in model RMB, the power supplies are carried by switches **S17(B), S18(B), S19(B), S20(B), S24(B)** and **S25(B),** which close in that position as indicated by the suffix **(B).** For mains operation **S15(M), S16(M), S21(M), S22(M), S23(M)** and **S26(M)** close. **S13, S14** are the normal "on/off" switches for battery or mains.

For mains operation in model RMB, H.T. current is supplied by half-wave metal rectifier **(MR1, SenTerCel H18-12-1RW).** Smoothing by **R14** and electrolytic capacitors **C27, C28.** L.T. current is supplied by full-wave bridge-connected metal rectifier **(MR2, SenTerCel B35-1-1W).**



Smoothing by choke **L17** and large value electrolytic capacitors **C25, C26.** Mains R.F. filtering by **C29, C30.**

COMPONENTS AND VALUES

	CAPACITORS	Values	Locations
C1	V1 C.G.	100pF	F4
C2	V1 S.G. decoupling	0·1μF	F4
C3	1st I.F. trans.	65pF	B2
C4	tuning	65pF	B2
C5	V1 osc. C.G. ...	100pF	F4
C6	A.G.C decoup. ...	0·05μF	D4
C7	L.W. osc. trim. ...	95pF	F3
C8	S.W. osc. tracker...	0·005μF	E3
C9	M.W. osc. tracker	547pF	F3
C10	L.W. osc. tracker...	150pF	B1
C11	V1, V2 H.T. decoup.	0·05μF	F4
C12	2nd I.F. trans.	65pF	B2
C13	tuning	65pF	B2
C14	I.F. by-pass ...	100pF	D4
C15	A.F. coupling ...	0·002μF	D4
C16	H.T. decoupling...	0·1μF	D4
C17	V3 S.G. decoup. ...	0·1μF	D4
C18*	V4 G.B. by-pass ...	20μF	D4
C19	I.F. by-pass ...	100pF	D3
C20	Neg. feed-back ...	10pF	D3
C21		100pF	D3
C22	A.F. coupling ...	0·01μF	D3
C23	Tone corrector ...	0·002μF	C2
C24*	H.T. decoupling ...	2μF	D4
C25*	L.T. smoothing §	2,500μF	D4
C26*		2,500μF	D4
C27*	H.T. smoothing §	40μF	D4
C28*		40μF	D4
C29	Mains R.F. filtering§	0·01μF	F4
C30		0·01μF	F4
C31‡	S.W. aerial trim. ...	80pF	F3
C32‡	M.W. aerial trim....	40pF	F3
C33‡	L.W. aerial trim.	40pF	F4
C34†	Aerial tuning ...	528pF	E3
C35†	Oscillator tuning...	528pF	E3
C36‡	S.W. osc. trim. ...	40pF	F3
C37‡	M.W. osc. trim. ...	80pF	F3
C38‡	L.W. osc. trim. ...	95pF	F4
C39‡	S.W.1 trim.¶ ...	—	—
C40‡	S.W.2 trim.¶ ...	—	—

*Electrolytic. †Variable. ‡Pre-set. §Model RMB only. ¶Export model only.

The appearance of the Roberts portables, which is the same for all models.

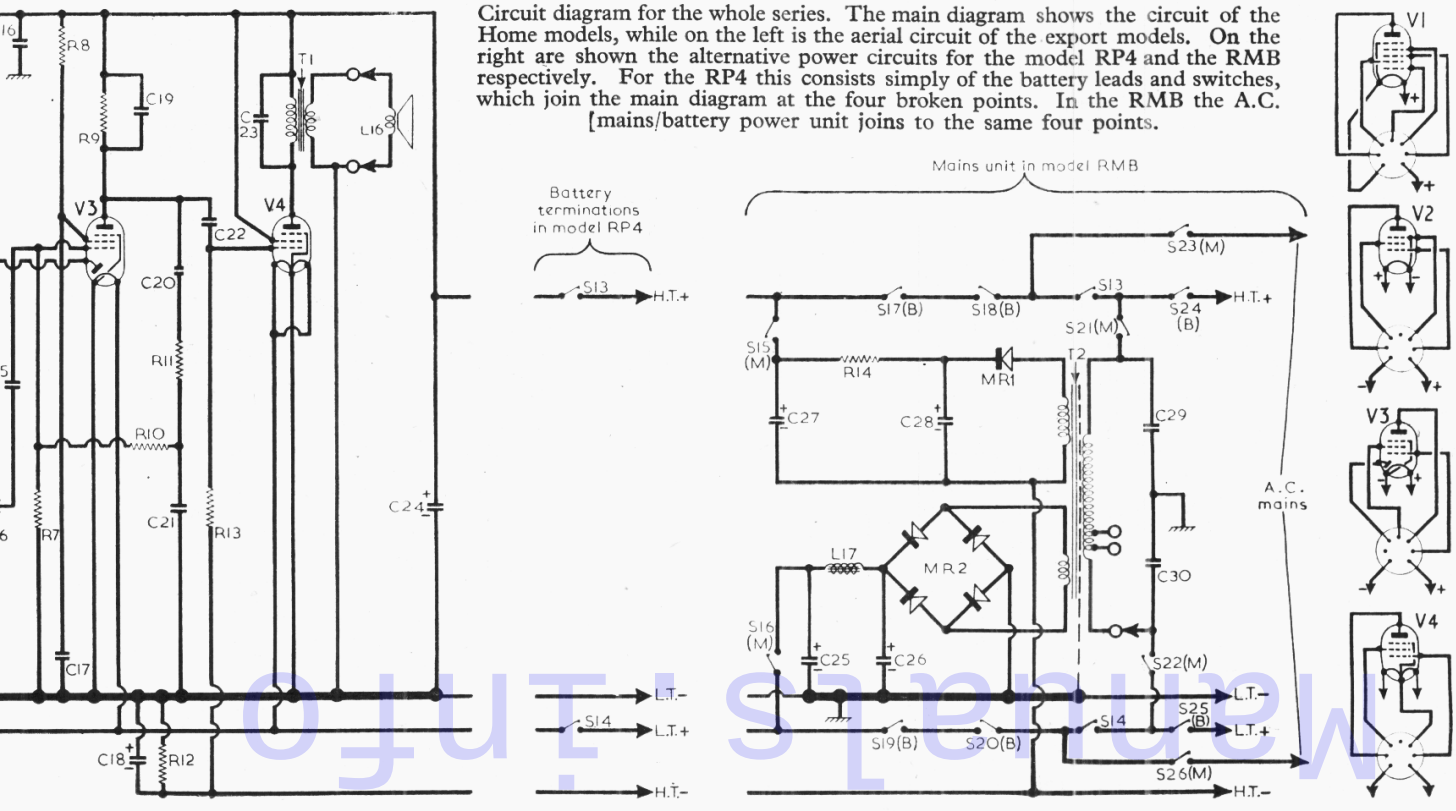
	RESISTORS	Values	Locations
R1	V1 C.G.	2·2MΩ	F4
R2	V1 S.G. feed ...	180kΩ	F3
R3	V1 osc. C.G. ...	27kΩ	F4
R4	H.T. feed	†27kΩ	F3
R5	A.G.C. decoupling	2·2MΩ	D4
R6	Volume control ...	1MΩ	D3
R7	V3 C.G.	4·7MΩ	D3
R8	V3 S.G. feed ...	4·7MΩ	D4
R9	V3 anode load ...	560kΩ	D3
R10	Neg. feed-back ...	2·2MΩ	D4
R11		2·2MΩ	D3
R12	V4 G.B.	390Ω	D3
R13	V4 C.G.	2·2MΩ	D3
R14§	H.T. smoothing ...	1·8kΩ	F4

§Model RMB only. †10kΩ in export models.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	M.W. frame aerial	5·2	B1
L2	L.W. frame aerial	38·0	—
L3	S.W. aerial coil ...	—	F3
L4	S.W. tuning coil...	—	F3
L5	L.W. loading coil	6·0	F4
L6	Oscillator tuning coils	—	A1
L7		7·0	A1
L8		26.5	B1
L9	Oscillator reaction coils	—	A1
L10		1·5	A1
L11		4·5	B1
L12	1st I.F. trans.	Pri. 15·0	B2
L13		Sec. 15·0	B2
L14	2nd I.F. trans.	Pri. 15·0	B2
L15		Sec. 15·0	B2
L16	Speech coil ...	2·5	—
L17	L.T. choke ...	2·7	E4
L18*	Aerial coupling coils	—	—
L19*		—	—
L20*	Aerial tuning coils	—	—
L21*		—	—
T1	O.P. trans.	Pri. 500·0	—
		Sec. 0·5	C2
		Pri, total 219·0	—
T2	Mains trans.	H.T. sec. 118·0	F4
		Fil. sec. 0·3	—
S1-S12	Waveband switches	—	F3
S13-S14	Power sw., g'd R6	—	D3
S15-S26	Mains/battery sw.	—	E4

*Export model only.

If the component numbers given in the accompanying tables are used when ordering replacement parts, dealers are advised to mention the fact on the order, as these numbers may differ from those used in the manufacturers' diagram.



Circuit diagram for the whole series. The main diagram shows the circuit of the Home models, while on the left is the aerial circuit of the export models. On the right are shown the alternative power circuits for the model RP4 and the RMB respectively. For the RP4 this consists simply of the battery leads and switches, which join the main diagram at the four broken points. In the RMB the A.C. mains/battery power unit joins to the same four points.

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VALVE ANALYSIS

Valve voltages and currents given in the table below are derived from the manufacturers' information and were measured when the receiver was operating from a new set of batteries. The voltages in our model RMB when it was operating from 230 V A.C. mains were about 10% higher than the figures quoted in the table.

The A.C. voltage measured from the anode of **MR1** to chassis was 100 V, and the D.C. voltage across **C28** was 116 V. The receiver was tuned to the lowest wavelength end of M.W., and an 0.1 μF capacitor connected between pin 6 of **V1** and chassis.

Voltage readings were measured on the 400 V range of a Model 7 Avometer, chassis being the negative connection.

Valves	Anode		Screen	
	V	mA	V	mA
V1 DK92	85	0·44	44	0·1
	Oscillator			
	28	2·1		
V2 DF91	85	1·4	28	0·22
V3 DAF91	11	0·1	4	0·016
V4 DL94	81	6·5	85	1·5

GENERAL NOTES

Switches.—**S1-S12** are the waveband switches, ganged in a single 3-position rotary unit beneath the chassis. This is indicated at location F3 in our front view of the chassis, where an arrow shows the direction in which it is viewed in the diagram in col. 5, where the unit is shown in detail.

The table below it 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.

S13, S14 are the Q.M.B. on/off switches, ganged with the volume control **R6.**

Mains/Battery Switch

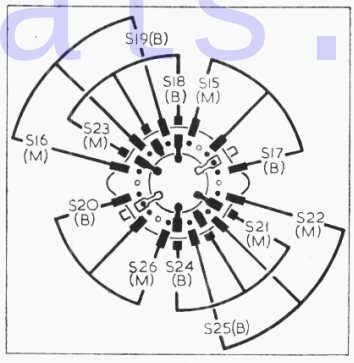


Diagram of the mains/battery changeover switch unit, drawn as seen from the front of the chassis, after removal from the carrying case. The suffixes **(B)** and **(M)** indicate that the switches close on battery and mains respectively.

S15-S26 are the mains/battery changeover switches, ganged in a rotary unit in the power supply unit in the mains/battery version, RMB. The control knob, which faces towards the rear, has only two positions : battery (knob anti-clockwise) and mains, and the switches carry a suffix **(B)** or **(M)** to indicate that they close in the battery or mains position respectively.

This unit is indicated in our front view of the chassis, and it is shown in detail, viewed in the same position, in the diagram above.

Frame Connections.—The M.W. frame aerial winding **L1** is wound on a large frame fitted to the chassis, and is shown in our rear view. The four solder-tags connecting it to chassis are coded **a, b, c, d** here and in the circuit diagram overleaf. The two sub-sockets on the frame, to which the external **A** and **E** sockets are connected, are similarly coded **e** and **f** respectively. The leads to the tags **a, b, c** and **d** are colour-coded yellow, green, black and red respectively.

The L.W. frame aerial is mounted on the sub-baffle in the carrying case, and its connections are effected by two sockets coded **g** and **h.** The plugs for these connections are seen in our front chassis drawing.

Batteries.—The L.T. unit is an Ever Ready "Alldry 1" rated at 1.5 V; the H.T. unit is an Ever Ready "Batrymax" B107 rated at 90 V. Both units are provided with non-reversible connecting sockets, the thicker one in the case of the L.T. unit being the positive. The H.T. plug has three pins, the centre one being blank, for location only. The polarity of the other two is shown in our rear chassis illustration.

Mains/Battery Unit.—The model RMB, which operates from A.C. mains or batteries, employs the same receiver chassis, speaker, frame aerials, carrying case and batteries as the battery model RP4. The battery version is converted into a mains/battery version simply by the addition of the mains unit, which is bolted to the chassis by two screws and nuts, and a rearrangement of the battery and on/off switch leads.

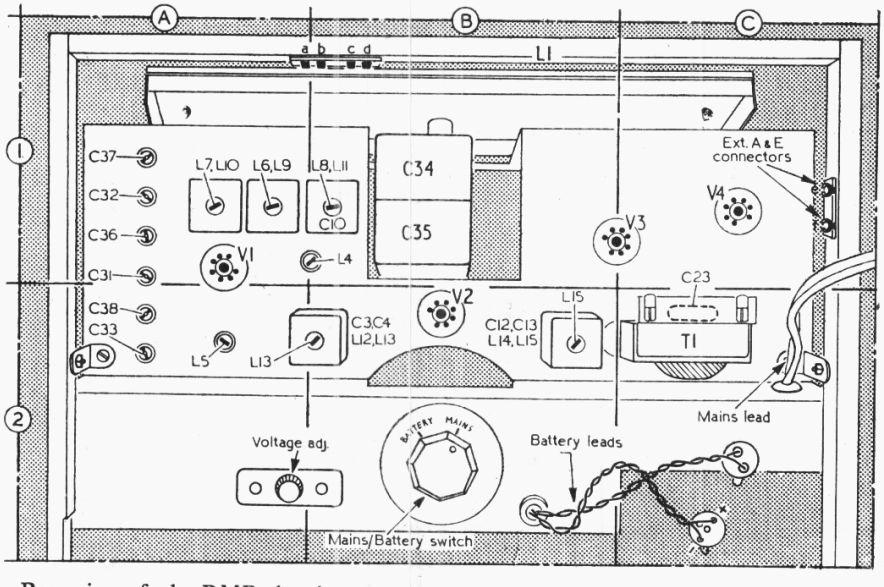
Our chassis illustrations in both cases are of the RMB, but except that the battery leads emerge from an outlet in the mains unit, the RP4 chassis is accurately represented if the mains unit at the bottom is omitted.

Our main circuit diagram represents the receiver as it is in both versions, irrespective of power supplies, while on the right of it are shown the battery terminations for the RP4, whose connections with the main diagram are broken. Beyond them is the diagram of the power unit, with four connections to the main diagram broken, as in the alternative battery-only terminations. Either of these can be read on to the main diagram, although the on/off switches **S13, S14,** which are actually in the main chassis, are shown as parts of the added alternative circuits.

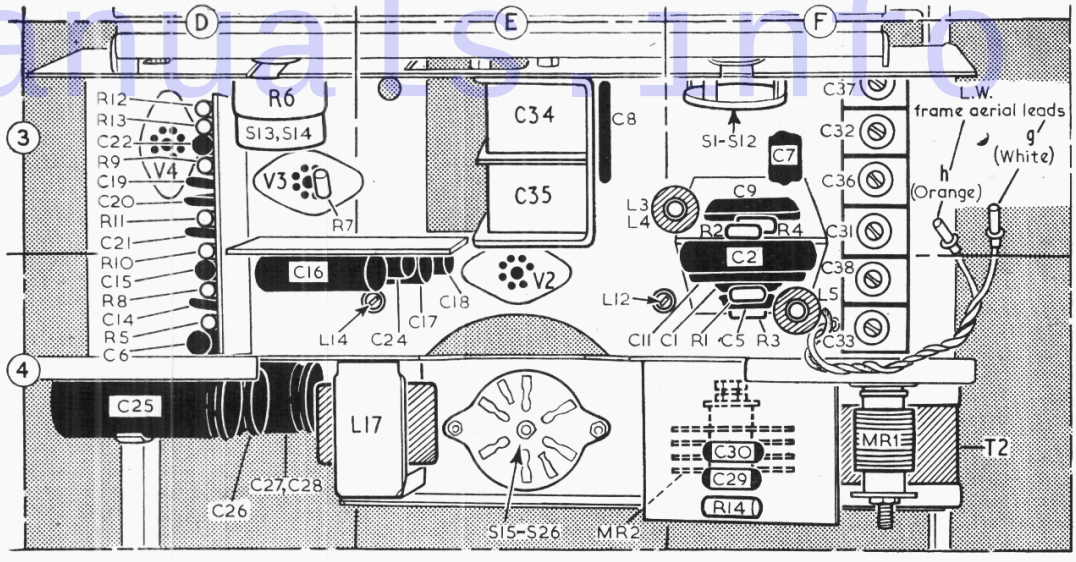
Export Models.—The only difference between the standard Home models and the export versions is in the wavebands covered. The circuit differences are shown on the left of our main circuit diagram, where it will be seen that only one frame aerial is used. This is the M.W. aerial, and it remains exactly as it is in the Home version.

The other two bands are S.W.1 and S.W.2, and these are both of different ranges from the S.W band in the Home version. S.W.2 takes the position in the switching sequence occupied in the Home version by the S.W. band, and its range is 30-70 m; S.W.1 occupies the position of the L.W. band, and its coverage is 10.5-35 m.

The oscillator circuits remain unchanged, but the values of the components are different, while C7 is omitted altogether. One component in the receiver circuit is changed : **R4,** the H.T. feed resistor to **V1** oscillator anode and **V2** screen becomes 10k Ω, and their H.T. readings consequently become 42 V, 3.9 mA and 42 V, 0.52 mA respectively.



Rear view of the RMB chassis, as seen upon opening the door at the rear of the carrying case. In the RP4 the mains unit at the bottom is omitted.



Front view of the RMB chassis, with the mains unit below the main receiver chassis. In the RP4 the mains unit is omitted. Most of the small components are grouped in three assemblies, one of which we show divided to bring both sides into view.

CIRCUIT ALIGNMENT

To gain access to the I.F. core adjustments, the chassis should be removed from the carrying case.

I.F. Stages.—Switch receiver to M.W., turn gang to minimum and volume control to maximum. Connect output of signal generator via a 0.05 μF capacitor in each lead, to control grid (pin 6) of **V1** and chassis, feed in a 472 kc/s (635.6 m) signal and adjust the cores of **L15** (location reference B2), **L14** (E4), **L13** (B2) and **L12** (E4) in that order for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages

Home Model.—Check that with the gang at maximum capacitance the cursor coincides with the high wavelength end of the scales. Couple the signal generator output into the frame aerials by laying the leads close to the receiver.

M.W.—Switch receiver to M.W., tune to 550 m, feed in a 550 m (545.4 k/cs) signal and adjust the core of **L7** (A1) for maximum output. Adjust also inductance of M.W. frame aerial coil **L1** by spacing its turns for maximum output. Tune receiver to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C37** and **C32** (A1) for maximum output.

S.W.—Switch receiver to S.W., tune to 50 m, connect output leads of signal generator via a dummy aerial to **A** and **E** sockets and feed in a 50 m (6 Mc/s) signal. Adjust the cores of **L6** (A1) and **L4** (B1) for maximum output. Tune receiver to 20 m, feed in a 20 m (15 Mc/s) signal and adjust **C36** (A1) and **C31** (A1) for maximum output. Repeat these adjustments.

L.W.—Switch receiver to L.W., disconnect signal generator leads from **A** and **E** sockets and lay them near the carrying case. Tune receiver to "Paris" on L.W. scale, feed in a 1,829 m (164 kc/s) signal and adjust the cores of **L8** (B1) and **L5** (A2) for maximum output. Tune to "Kalundborg" on scale, feed in a 1,224 m (245 kc/s) signal and adjust **C38** (A2) and **C33** (A2) for maximum output. Repeat these adjustments.

Export Model.—With the gang at maximum capacitance the cursor should coincide with the high wavelength ends of the tuning scales.

M.W.—Make the same adjustments as for the Home model.

S.W.2.—Switch receiver control to S.W.2 (which occupies the position in export models of the S.W. band in Home models) and tune to 70 m on scale. Connect signal generator output to **A** and **E** sockets, feed in a 70 m (4.287 Mc/s) signal and adjust the cores of the oscillator and aerial tuning coils for maximum output. Tune to 30 m on scale, feed in a 30 m (10 Mc/s) signal and adjust the oscillator and aerial capacitor trimmers for maximum output.

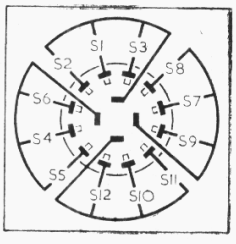


Diagram of the waveband switch unit, drawn as seen from below. Beneath it is the associated switch table.

Switches	L.W.	S.W.	M.W.
S1	—	C	—
S2	—	—	C
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	C	—	—

S.W.1.—Switch receiver to S.W.1, tune to 35 m, feed in a 35 m (8.572 Mc/s) signal and adjust the cores of **L6** and **L20** for maximum output. Tune receiver to 11 m, feed in an 11 m (27.27 Mc/s) signal and adjust **C36** and **C39** for maximum output.

DISMANTLING THE SET

The chassis, speaker and L.W. frame aerial interconnections are made by means of plugs and sockets.

Removing Chassis.—Withdraw the two plugs joining the external **A** and **E** sockets on the back of the carrying case to the sockets on the top right-hand side of the M.W. frame aerial;

withdraw the speaker plugs from their sockets on the output transformer **T1**;

disconnect the two L.W. frame aerial plugs from the sockets on the left-hand bottom corner of the speaker baffle;

remove the plugs from the batteries (if fitted);

in model RMB, release the mains lead held by clamps and two wood screws to back of carrying case;

remove the two 2BA cheesehead bolts, with washers, securing the edges of the chassis to brackets in the carrying case and withdraw chassis, complete with M.W. frame aerial.

When replacing, the white L.W. frame aerial lead goes to the socket nearest the speaker, the black speaker lead goes to the socket on **T1** near **L14, L15,** and the red external aerial lead goes to the upper socket on the M.W. frame aerial.

Removing L.W. Frame and Speaker.—Remove the two 4BA nuts (with washers) at the sides of the speaker and withdraw sub-baffle and frame winding, lower edge first, freeing speaker.

When replacing, speaker speech coil tags should be on the right, when viewed from the rear. The frame aerial sockets should be at the lower left-hand corner.

SERVICE SHEET CORRECTIONS

Owing to an error in the drawing office, one of the components in Service Sheet 1034 was shown in the wrong position in the circuit diagram.

This is the mains R.F. by-pass capacitor C18, which is shown in series with the mains lead to chassis. It should have been shown in the lead between R11 and R14.

Another slip occurs in the valve base diagrams in Service Sheet 1031/T22, where V9 and V11 are shown as having Noval bases, whereas these should, of course, both be octals.

Fortunately neither of these errors is likely to mislead anyone because they are so obvious, but dealers are requested to correct their copies.

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