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BUSH BAC31

All-dry Battery Portable

R11, which acts as diode load, and is passed via C17 to control grid of pentode section. I.F. filtering by C15, R9, C16 and C21.

Resistance-capacitance coupling via R14, C22 and R17 between V3 and pentode output valve (V4, Mullard DL94). Tone correction in anode circuit by C23. Grid bias voltage for V4 is developed across R17 in the H.T. negative lead.

The receiver, which is designed primarily for operation from all-dry batteries, may be powered from an A.C. mains supply by means of a separate add-on mains unit. When in use this mains unit is bolted into the cabinet beneath the main receiver chassis, H.T. and L.T. connections between the two being made by means of the 4-pin plugs and sockets A, B, C and D. Details of the plug and socket connections are given under

(Continued col. 1 overleaf)

COMPONENTS AND VALUES

RESISTORS		Values	Locations
R1	V1 C.G. ...	2.2MΩ	G3
R2	V1 S.G. feed ...	180kΩ	F3
R3	V1 osc. C.G. ...	47kΩ	G4
R4	Fl. H.T. by-pass...	150Ω	G4
R5	Osc. H.T. feed ...	33kΩ	F3
R6	V2 C.G. ...	4.7MΩ	F3
R7	V2 S.G. feed ...	56kΩ	F3
R8	Fl. H.T. by-pass...	220Ω	F4
R9	I.F. stopper ...	47kΩ	E4
R10	A.G.C. decoupling	2.2MΩ	F3
R11	Volume control ...	600kΩ	E3
R12	V3 C.G. ...	4.7MΩ	E3
R13	Fl. H.T. by-pass...	180Ω	E3
R14	V3 anode load ...	470kΩ	E4
R15	V3 S.G. feed ...	2.2MΩ	D4
R16	V4 C.G. ...	1MΩ	D3
R17	V4 G.B. ...	150Ω	D3
R18	Fl. H.T. by-pass...	470Ω	D3
R19	H.T. smoothing ...	2.7kΩ	F4
R20	Fl. smoothing	1.5kΩ	D4
R21		700Ω	D4

CAPACITORS		Values	Locations
C1	L.W. aerial trim. ...	140pF	G3
C2	V1 C.G. ...	100pF	G3
C3	V1 S.G. decoup. ...	0.05μF	F4
C4	1st I.F. trans. tun. {	110pF	A1
C5		110pF	A1
C6	V1 osc. C.G. ...	80pF	G3
C7	Osc. tracker ...	605pF	F3
C8	L.W. osc. trim. ...	515pF	F3
C9	Osc. anode decoup. ...	0.05μF	F3
C10	V2 C.G. ...	0.01μF	F3
C11	V2 S.G. decoup. ...	0.05μF	F3
C12	2nd I.F. trans. tun. {	110pF	B1
C13		110pF	B1
C14	A.G.C. decoupling	0.05μF	E3
C15	I.F. by-passes ... {	500pF	E3
C16		100pF	E4
C17	A.F. coupling ...	500pF	E3
C18	H.T. by-pass ...	0.5μF	B1
C19	Filament by-pass...	0.05μF	E3
C20	V3 S.G. decoup. ...	0.05μF	D4
C21	L.F. by-pass ...	100pF	E4
C22	A.F. coupling ...	0.005μF	R1
C23	Tone corrector ...	0.001μF	—
C24	V4 G.B. by-pass ...	50μF	B1
C25	Filament by-pass	200μF	D3
C26	H.T. smoothing ... {	32μF	A2
C27		32μF	A2
C28		25μF	D4
C29	L.W. aerial trim. ...	40pF	G3
C30	Aerial tuning ...	528pF	F3
C31	Oscillator tuning ...	528pF	F3
C32	L.W. osc. trim. ...	40pF	G3
C33	M.W. osc. trim. ...	40pF	G3
C34	M.W. aerial trimmer	40pF	G3

* Electrolytic. † Variable. ‡ Pre-set.

THE Bush BAC31 is a 4-valve all-dry battery portable superhet covering 187-560 m and 1,071-1,898 m.

A separate mains unit is designed for use with the BAC31 which enables it to operate from 200-250 V A.C. mains of 40-100 c/s.

Release date, August 1953. Original prices: BAC31, £13 4s 4d, plus purchase tax and batteries; Mains Unit, £3.

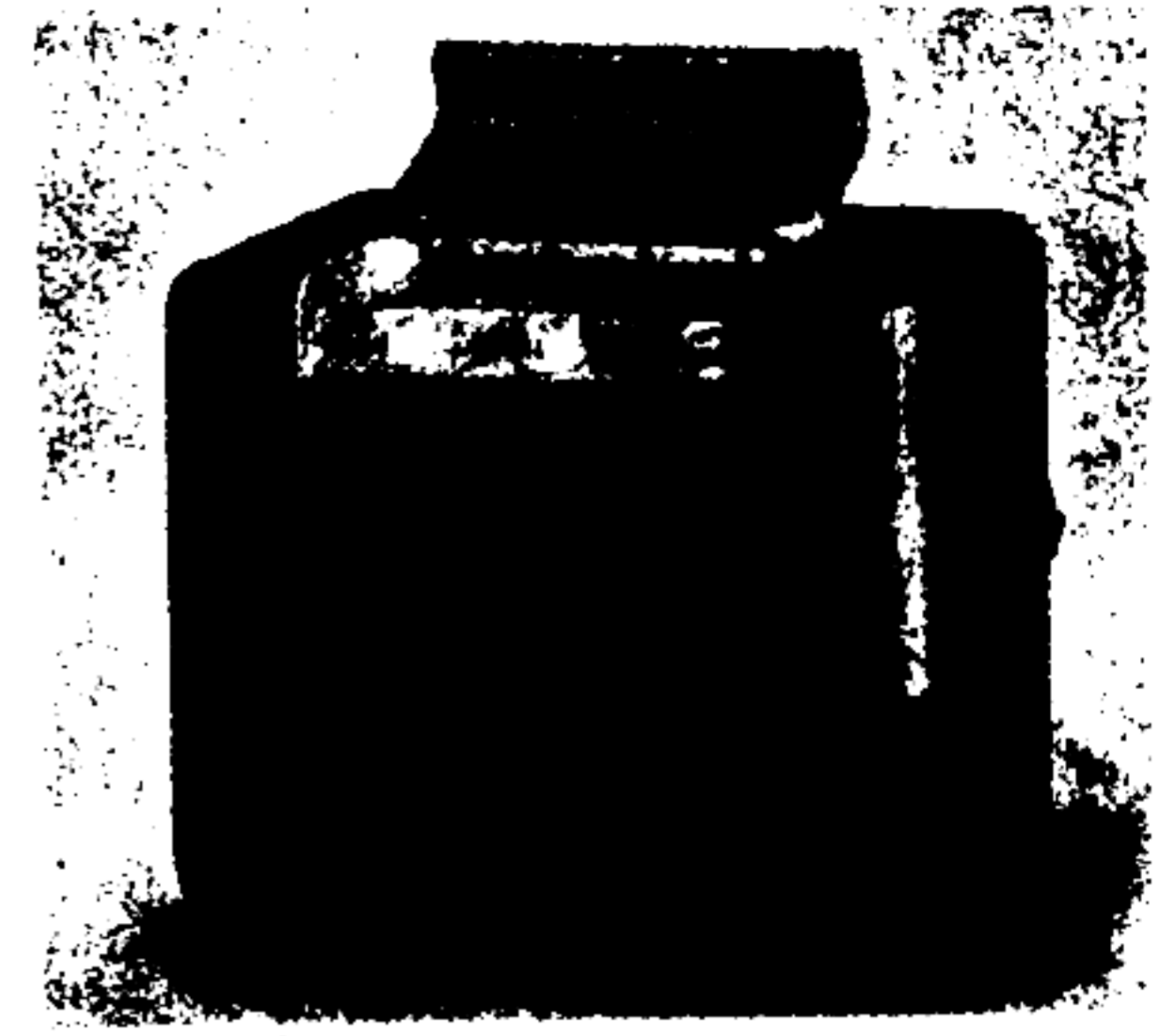
CIRCUIT DESCRIPTION

Tuned frame aerial input by L1, C30 (M.W.) and L1, L2, C30 (L.W.) to heptode valve (V1, Mullard DK92), which operates as frequency changer with electron coupling. When the receiver is operated in conjunction with the specially designed mains unit (see end of "Circuit Description") the extra chassis surface involved acts as a short-circuit turn on the frame aerials, reducing their inductance. This effect is particularly marked on L.W., and to offset it a L.W. loading coil L3 is inserted in series with the frame aerials. This coil is only brought into operation where a mains unit is fitted, and is otherwise short-circuited as indicated in the circuit diagram.

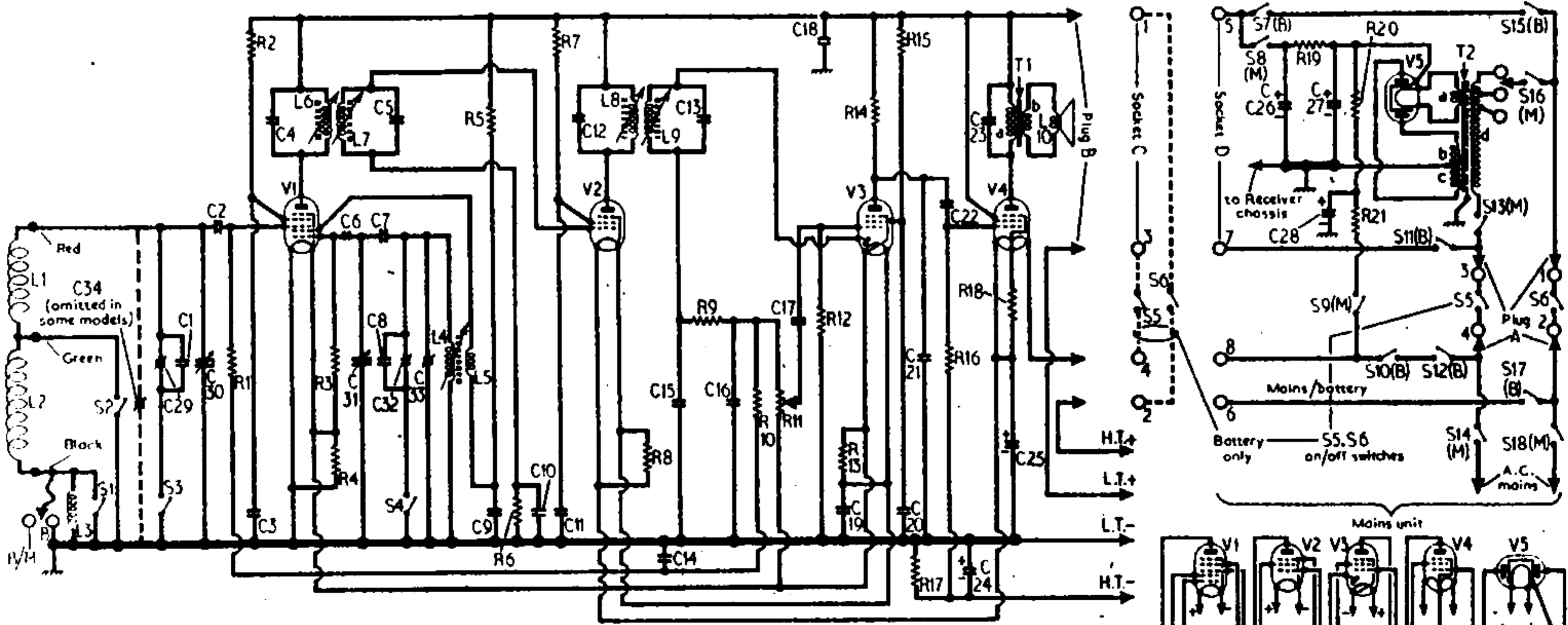
Second valve (V2, Mullard DF91) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings C4, L6, L7, C5 and C12, L8, L9, C13.

Intermediate frequency 470 kc/s.

Diode signal detector is part of diode pentode valve (V3, Mullard DAF91). Audio frequency component in rectified output is developed across volume control



Appearance of the Bush BAC31



Circuit diagram of the Bush BAC31. On/off switches S5, S6 are either connected directly to the receiver, as shown by the socket C connections 1, 2, 3, 4 in broken line, or directly to the mains unit, shown on the extreme right.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	M.W. frame aerial	2.0	—
L2	L.W. frame aerial...	7.5	—
L3	L.W. loading coil...	3.8	F3
L4	Osc. tuning coil ...	1.5	F3
L5	Osc. reaction coil...	2.0	F3
L6	1st I.F. trans. { Pri.	11.0	A1
L7		Sec.	11.0
L8	2nd I.F. trans. { Pri.	11.0	B1
L9		Sec.	11.0
L10	Speech coil	2.5	—
T1	O.P. trans. { a ...	540.0	—
T2	Mains trans. { a ...	300.0	A2
		300.0	
		280.0	
S1-S4	Waveband switches	—	F3
S5, S6	Power sw., g'd R11	—	R8
S7(B)-S18(M)	Mains/battery switches ...	—	E4

Circuit Description—continued

"Mains Unit" in "General Notes." Mains/battery change-over switches S7(B), S10(B), S11(B), S12(B) and S17(B) close for battery operation as indicated by the suffix (B). Switches S8(M), S9(M), S13(M), S14(M), S16(M) and S18(M) close for mains operation.

For mains operation H.T. current is supplied by full-wave H.T. rectifying valve (V5, Mullard EZ41). Smoothing by R19 and capacitors C26, C27.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' information. Readings for V1-V4 were measured on a receiver operating from new batteries. Those obtained when it was operating from the mains unit were about 10 per cent lower. Readings for V5 were measured on a mains unit that was operating from A.C. mains of 230 V, the voltage adjustment being set to the 220-230 V tapping.

Voltages were measured on the 10 V and 400 V ranges of a Model 7 Avometer, chassis being the negative connection. The negative bias measured across R17 was 1.8 V, when the receiver was operating from batteries.

Valve	Anode		Screen	
	V	mA	V	mA
V1 DK92	90	1.3	62	0.2
	Oscillator { 42 1.9 }			
V2 DF91	90	1.2	62	0.4
V3 DAF91	42	0.12	22	0.02
V4 DL94	85	4.2	90	0.8
V5 EZ41	125*	—	—	—

* A.C., each anode. Cathode voltage, 108V.

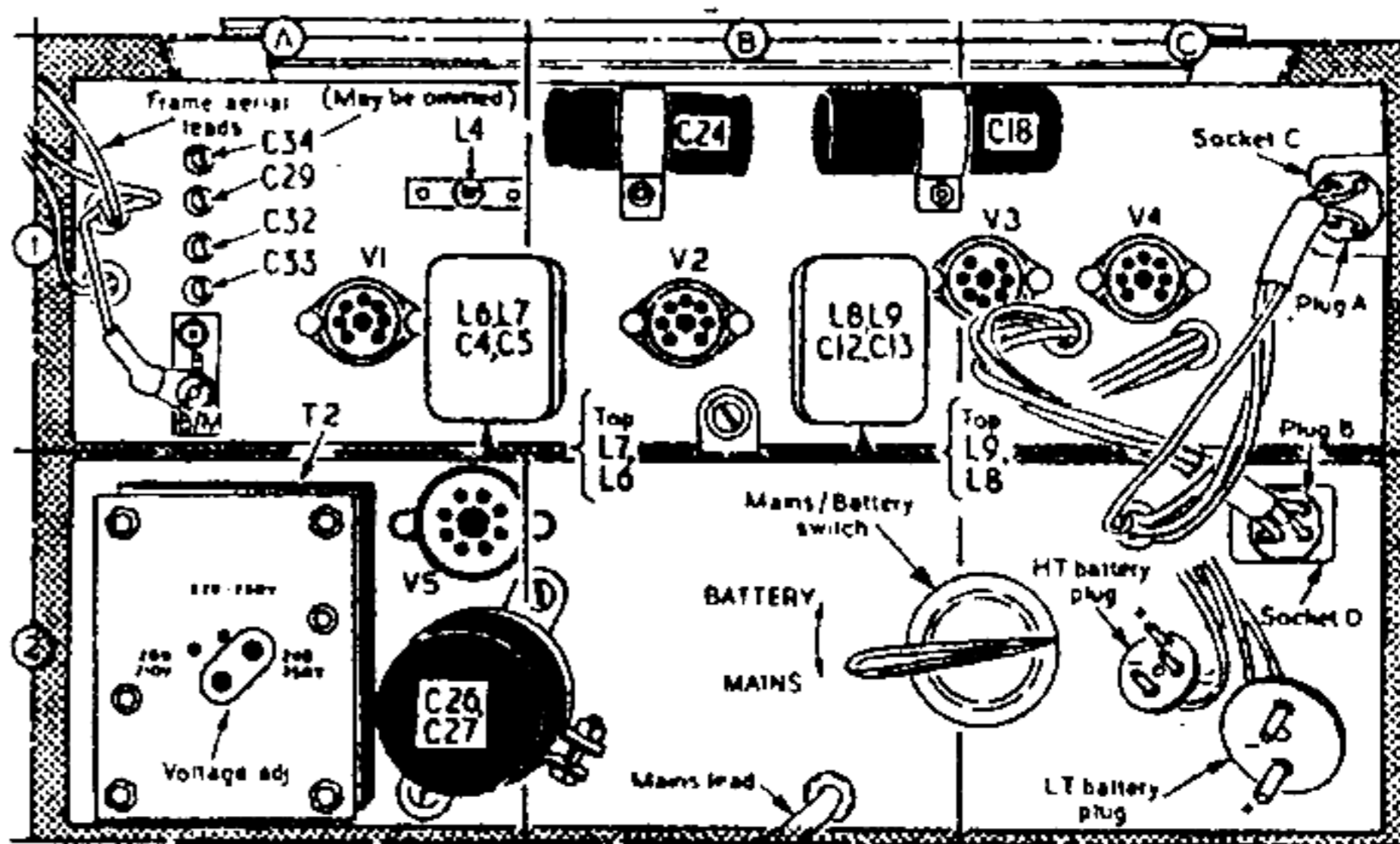
GENERAL NOTES

Switches.—S1-S4 are the waveband switches, ganged in a single rotary unit beneath the chassis. The unit is shown in detail in our front view of the chassis, switches S1 and S2 closing for M.W. operation, and S3, S4 for L.W. operation.

S5, S6 are the Q.M.B. on/off switches ganged with the volume control R11. The switch connections terminate in a 4-pin socket (labelled "C" in the chassis picture and circuit diagram) which allows it to be used as a battery on/off switch when the receiver is operated from batteries only, or as a power on/off switch when the receiver is operated in conjunction with the mains unit.

S7(B)-S18(M) are the mains/battery change-over switches, ganged in a single rotary unit under the chassis. The unit is

Rear view of the BAC31 chassis (top) with the mains unit chassis attached (below). Trimmer C34 in location A1, is omitted in some receivers.



indicated in the front view of the chassis and shown in detail in the diagram below. The (M) switches close for mains operation (control fully anti-clockwise) and the (B) switches for battery operation.

Mains Unit.—When in use this unit is secured to the carrying case by means of two 2BA screws and is anchored to the receiver chassis by means of a third 2BA screw. The receiver plug, labelled B in the rear chassis illustration and in the circuit diagram, is inserted in socket D

on the mains unit. The mains unit plug A is inserted in the receiver socket C, and the lead from the loading coil L3 is anchored under terminal B/M (location reference A1). If the mains unit is subsequently removed, the receiver plug B should be inserted in socket C, and the loading coil lead should be anchored under the "B" terminal.

Batteries.—Those recommended by the manufacturers are, L.T., Ever Ready AD31, rated at 7.5V; H.T., Ever Ready Batrymax B107, rated at 90V.

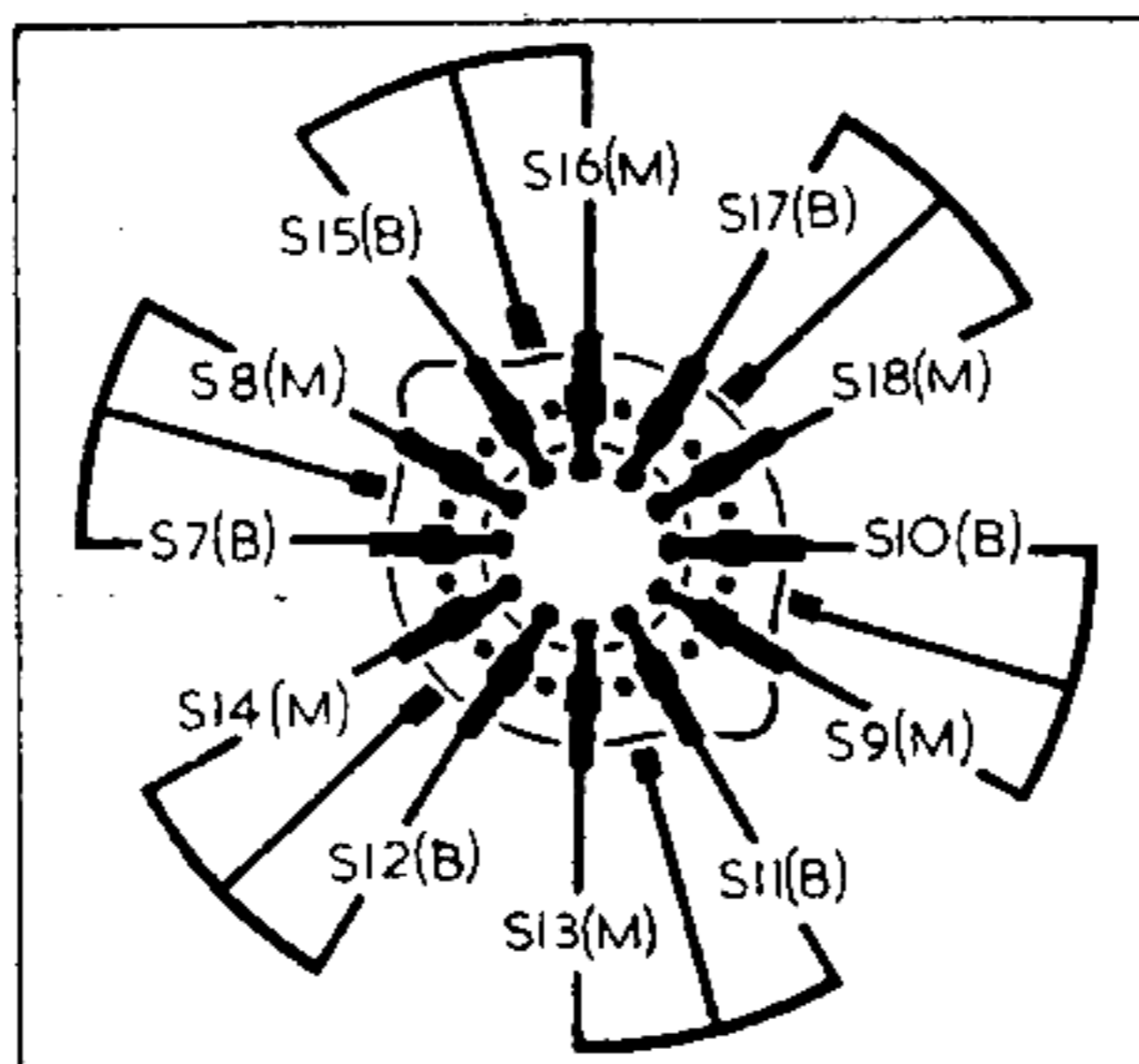
CIRCUIT ALIGNMENT

I.F. Stages.—Connect output of signal generator to junction of L1, C2 (red frame aerial lead) and to chassis. Switch receiver to M.W. and turn gang to minimum capacitance. Feed in a 470 kc/s (638.3 m) signal and adjust the cores of L9 (location reference B1), L8 (B1), L7 (A1) and L6 (A1) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—With the chassis in position in the carrying case and the gang at maximum capacitance, check that the cursor coincides with the high wavelength ends of the tuning scales. Connect output of signal generator to a loop consisting of three turns of wire of 8in diameter and place the loop parallel to and about 3-4ft from the frame aerials.

M.W.—Switch receiver to M.W., tune to 500 m, feed in a 500 m (600 kc/s) signal and adjust the core of L4 (A1) for maximum output. Tune receiver to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust C33 (A1) and C34 (A1), where fitted, for maximum output. Repeat these adjustments until no further improvement results.

L.W.—Switch receiver to L.W., tune to 1,402 m, feed in a 1,402 m (214 kc/s) signal and adjust C32 (A1) and C29 (A1) for maximum output. Repeat these adjustments.



Above: Mains/battery switches, as viewed in chassis illustration below.

Below: Front view of the BAC31 chassis with the mains unit attached.

