

BUSH SB3

4-VALVE BATTERY SUPERHET

THE Bush SB3 battery superhet receiver has an octode frequency changer, a variable-mu pentode I.F. amplifier, a double diode and a pentode output valve. An interesting point is that the double diode is of the indirectly heated cathode type.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1, L2** to inductively-coupled band-pass filter. Primary **L3, L4** tuned by **C15**; secondary **L6, L7** tuned by **C18**; coupling coils **L8, L9**. Image suppression by coil **L5** and condenser **C1**. Local-distant switch **S1** shunts aerial-earth circuit with resistance **R1** in "local" position, thus reducing sensitivity of receiver.

First valve (**V1, Mullard metallised FC2**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L10, L11** tuned by **C20**; tracking by shaped condenser vanes and condensers **C5, C23** (L.W.); oscillator anode reaction coils **L12, L13**.

Second valve, a variable-mu H.F. pentode (**V2, Mullard metallised VP2**), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L14, L15** and **L16, L17**.

Intermediate frequency 123 KC/S.

Diode second detector forms part of separate I.H.C. double diode valve (**V3, Mullard metallised 2D2**). Second diode,

fed from **V2** anode by **C9**, provides D.C. potential which is developed across **R10** and fed back as G.B. to F.C. and I.F. valves, giving automatic volume control.

Audio-frequency output from rectifier diode is developed across manual volume control **R8** and passed via **C11** to C.G. of output pentode (**V4, Mullard PM22D**). Tone correction in anode circuit by fixed condenser **C13**. Provision for connection of gramophone pick-up across volume control and for external high-impedance speaker across primary of internal speaker transformer **T1**. Plug and socket device enables internal speaker speech coil circuit to be broken.

G.B. for **V4** is obtained automatically from voltage drop along **R12** in common H.T. negative line.

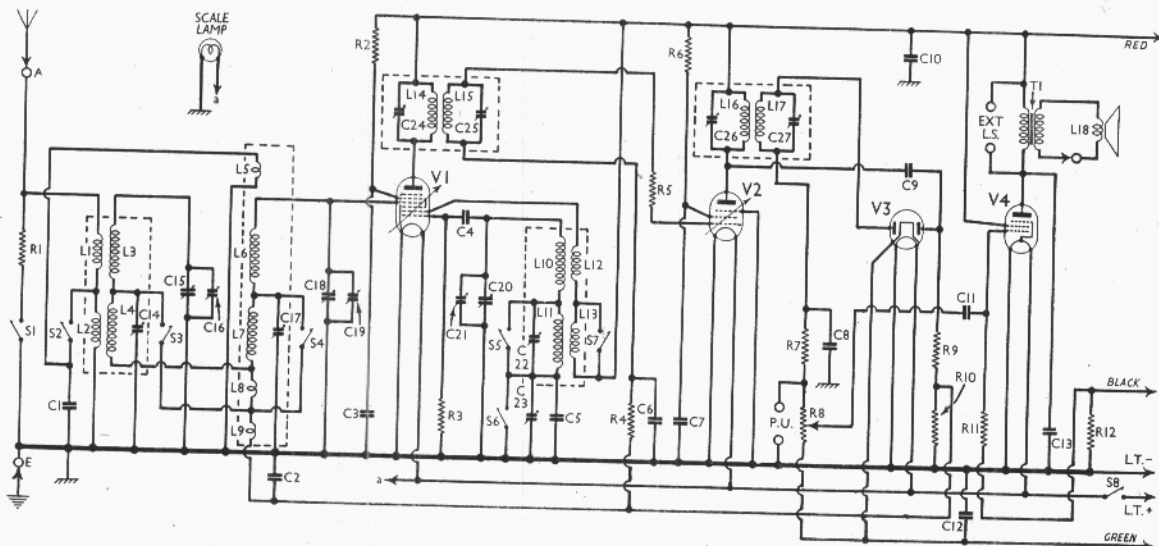
COMPONENTS AND VALUES

Resistances		Values (ohms)
R1	Aerial-earth shunt	50
R2	V1 S.G.'s H.T. feed	100,000
R3	V1 oscillator C.G. resistance	70,000
R4	V2 C.G. decoupling	1,000,000
R5	V2 C.G. circuit stabiliser	5,000
R6	V2 S.G. H.T. feed	10,000
R7	I.F. stopper	500,000
R8	Signal diode load; vol. control	500,000
R9	A.V.C. diode load	1,000,000
R10		100,000
R11	V4 C.G. resistance	1,000,000
R12	Auto G.B. resistance	300

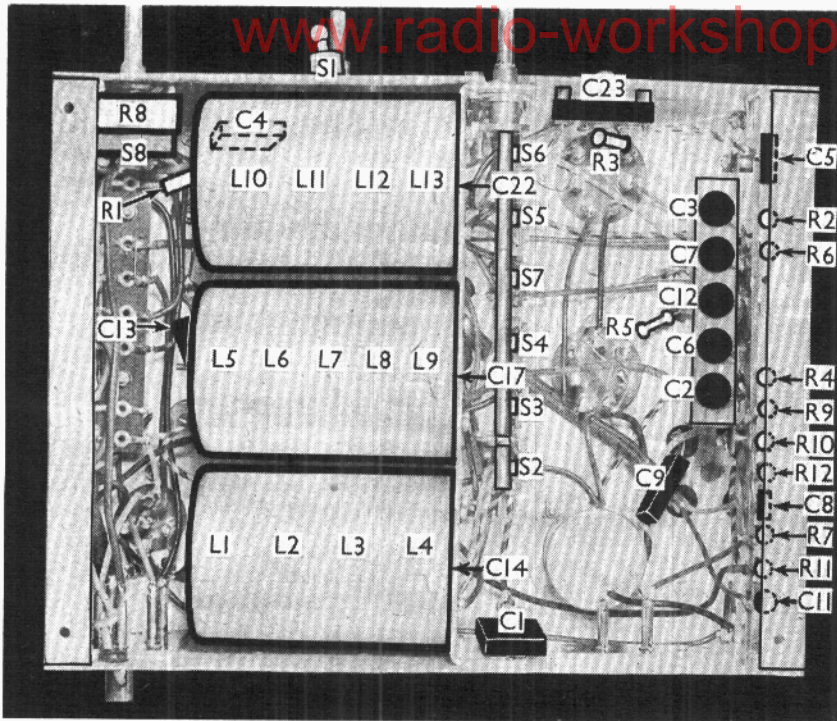
Condensers		Values (μ F)
C1	Part of image suppression circuit	0.01
C2	V1 pentode C.G. decoupling	0.1
C3	V1 S.G.'s by-pass	0.1
C4	V1 oscillator C.G. condenser	0.0005
C5	Oscillator L.W. tracker, fixed	0.0011
C6	V2 C.G. decoupling	0.1
C7	V2 S.G. by-pass	0.1
C8	I.F. by-pass	0.0001
C9	Coupling to V3 A.V.C. diode	0.0001
C10	H.T. reservoir	2.0
C11	L.F. coupling to V4	0.01
C12	A.V.C. delay voltage circuit by-pass	0.1
C13	Tone corrector	0.003
C14†	Band-pass pri. L.W. trimmer	—
C15†	Band-pass primary tuning	—
C16†	Band-pass pri. main trimmer	—
C17†	Band-pass sec. L.W. trimmer	—
C18†	Band-pass secondary tuning	—
C19†	Band-pass sec. main trimmer	—
C20†	Oscillator tuning	—
C21†	Oscillator main trimmer	—
C22†	Oscillator L.W. trimmer	—
C23†	Oscillator L.W. tracker	—
C24†	1st I.F. trans. pri. tuning	—
C25†	1st I.F. trans. sec. tuning	—
C26†	2nd I.F. trans. pri. tuning	—
C27†	2nd I.F. trans. sec. tuning	—

† Variable. ‡ Pre-set.

Other Components		Approx. Values (ohms)
L1	Aerial coupling coils	1.3
L2		6.0
L3	Band-pass primary coils	3.2
L4		13.0



Circuit diagram of the Bush SB3 battery superhet. Note the arrangement of the battery leads and the bias resistor R12.



Under-chassis view. C4 is inside the L10-L13 unit. C14, C17 and C22 are adjustable through holes in the partition carrying the coil units.

Other Components (contd.)		Approx. Values (ohms)
L5	Image suppression coil	0.05
L6	Band-pass secondary coils	3.2
L7		13.0
L8	Band-pass coupling coils	3.5
L9		0.5
L10	Oscillator tuning coils	3.5
L11		8.5
L12	Oscillator reaction coils	2.2
L13		2.5
L14	1st I.F. trans. (Pri.)	110.0
L15	(Sec.)	110.0
L16	2nd I.F. trans. (Pri.)	110.0
L17	(Sec.)	110.0
L18	Speaker speech coil	2.0
T1	Speaker input trans. (Pri.)	800.0
	(Sec.)	0.3
S1	Local-distant switch	—
S2-S7	Waveband switches	—
S8	L.T. switch, ganged R8	—

DISMANTLING THE SET

Removing Chassis.—Remove the back and the batteries, and then the three control knobs (recessed grub screws) and the four chassis fixing bolts (with washers). Next free the battery and speaker leads from the cleats holding them to the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is adequate for normal purposes.

To free the chassis entirely, unsolder the leads from the speaker terminal panel. The tags on this panel are numbered and when replacing the leads, they should be connected as follow: 1, red; 2, green; 3, black; 4, yellow.

Removing Speaker.—To remove the speaker, the nuts and washers should be removed from the four bolts with ornamental heads, which hold the speaker

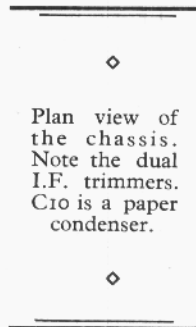
to the front of the cabinet. When replacing, see that the transformer is at the bottom.

VALVE ANALYSIS

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 FC2*	133	0.7	54	0.8
V2 VP2	133	2.4	120	0.7
V3 2D2	—	—	—	—
V4 PM22D	130	4.9	133	0.9

* Osc. anode (G2) 133V, 0.9 mA.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating from a new 120 V H.T. and 9 V G.B. battery. Both the volume and sensitivity controls were at maximum and the receiver was



Plan view of the chassis. Note the dual I.F. trimmers. C10 is a paper condenser.

tuned to the lowest wavelength on the medium band, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

GENERAL NOTES

Switches.—S1 is the Q.M.B. "local-distant" switch located at the front of the chassis. This is closed when the knob is to the left ("local").

S2-S7 are the waveband switches ganged in a single unit beneath the chassis. They are all closed on the M.W. band and open on the L.W. band. Incidentally, S5 and S7 in our chassis are transposed in relation to their positions in the makers' service instructions. We show the positions as we found them.

S8 is the Q.M.B. L.T. switch, ganged with the volume control R8.

Coils.—All the coils, except the I.F. units, are in three screened units beneath the chassis. The screens have bayonet fittings, but in each case there is an obstacle in the way of their removal. Note that the L10-L13 unit also contains C4. In the middle unit L5 is held to the inside of the screen, and one connection of it goes to the screen.

The I.F. units, L14, L15 and L16, L17 are in two screens on the chassis deck, each with a dual concentric type of trimmer unit, of which the nut adjusts the primary and the central screw the secondary.

Scale Lamp.—This is an Osram M.E.S. type, rated at 3.5 V, 0.15 A.

External Speaker.—Two sockets at the rear of the chassis are provided for a high resistance type (20,000 Ohm). A plug and socket device disconnects the speech coil of the internal speaker if desired.

Battery Leads and Voltages.—Black rubber lead, spade tag, L.T.—; Brown rubber lead, spade tag, L.T.+2 V; Black braided lead, GB—9 V tapping; Green braided lead, H.T.+4.5 V tapping; Red braided lead, H.T.+ tapping (max.).

Batteries.—L.T., Exide CZH2 celluloid cased 2 V cell. H.T. and G.B., Drydex 129 V H.T.+9 V G.B.

