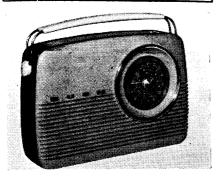
# "TRADER" SERVICE SHEET



Appearance of the Bush MB60.

HE Bush MB60 is a 5-valve 2-band portable receiver housed in a 2-tone cabinet and designed to operate from all-dry batteries or A.C. mains of 110-250 V, 50 c/s. It is fitted with an internal ferrite rod aerial and provision is made for the connection of an external aerial. The waveband ranges are 187-570 m and 1,070-1,900 m.

Release date and original price: June, 1957, £15 17s 6d. Purchase tax extra.

#### CIRCUIT DESCRIPTION

Ferrite rod aerial coils L3 (M.W.) and L2 (L.W.) are tuned by R.F. section of tuning gang C3, and by parallel trimmers C2 (M.W) and C4, C5, C6 (L.W.). Provision is made for the connection of a car aerial via C1, L1. Heptode valve V1 is employed as frequency changer with electron coupling.

Oscillator grid coil L6 is tuned by the oscillator section of the tuning gang C13. Parallel trimming by C14 (M.W.) and C15, C16, C17 (L.W.). Tracking by C18 and the adjustable

## MB60

### 2-band Receiver for Mains/Battery Operation

core of L6. Reaction coupling from oscillator anode via C19, L7.

V2 and V3 are variable-mu R.F. pentodes operating as intermediate frequency amplifiers with tuned transformer couplings L4, L5; L8, L9; and L10, L11.

Intermediate frequency 470 kc/s
Diode signal detector is part of diodepentode valve V4. Audio frequency component in its rectified output is developed across volume control R11, which also operates as

diode load, and is passed via C29 to the control grid of V4 pentode section, which operates as A.F. amplifier. V4 is grid current biased by R12.

The D.C. component developed across potential divider R9, R10 is tapped off and fed back as bias to V1, V2 and V3, giving automatic gain control.

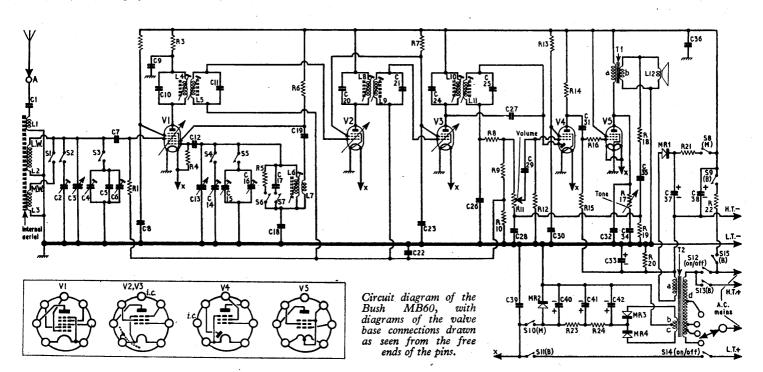
automatic gain control.

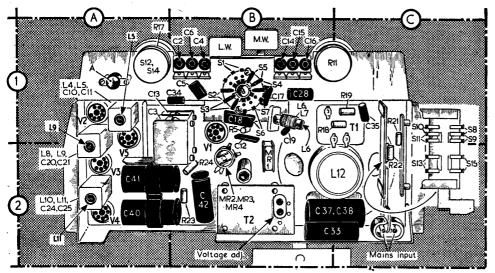
R.-C. coupling by R14, C31 and R15
between V4 pentode and pentode output valve

(Continued overleaf col. 1)

Resisto			L9	16.0	AŽ	C29 0.003μF F4
R1	2·2MΩ	E4	Lio	16.0	A2	C30 0.01 µF F4
R2	100kΩ	E4	Lii	160	A2	C31 0.003µF F4
R3	2·7kΩ	F4	L12	3.0	C2	C32 0.003µF F3
R4	$27k\Omega$	E3				C33 50µF C2
R5	33kΩ	Bi	1			C34 0.01 µF B1
R6	33kΩ	E4	Capacitors			C35 0.04µF C1
R7	$33k\Omega$	F3	Ci	1,800pF	F3	C36 0 1 µF E4
R8	27kΩ	F4	C2	30pF	Bi	C37 50μF B2
R9	$2.7M\Omega$	F4	C3	523pF	Ãī	C38 20µF C2
R10	$2.7M\Omega$	F4	C4	30pF	Bi	C39 0.5μF E3
R11	$500k\Omega$	B1	C5	160pF	B1	C40 3,000μF A2
R12	$10M\Omega$	F4	C6	30pF	B1	C41 3,000μF A2
R13	$2.7M\Omega$	F4	C7	560pF	E4	C42 1,000µF B2
R14	$1M\Omega$	F4	C8	$0.01 \mu F$	E3	1
R15	$1.8M\Omega$	F4	C9	0.04µF	F3	Miscellaneous*
R16	330kΩ	F4	C10	110pF	A1	(0 460.0)
R17	$100$ k $\Omega$	A1 `	C11	110pF	A1	T1 $\begin{cases} a & 460.0 \\ b & 0.2 \end{cases}$ C1
R18	$10$ k $\Omega$	C1	C12	100pF	B1	
R19	1kΩ	C1	C13	523pF	A1	(a 420·0)
R20	$560\Omega$	F4	C14	30pF	B1 .	$T2 \langle b \rangle 0.8 \rangle B2$
R21	$1.8$ k $\Omega$	C1	C15	30pF	B1	16 0.9
R22	$100\Omega$	C2	.C16	30pF	B1	(d 770·0)
R23	$10\Omega$	B2	C17	450pF	B1 -	(pri. total)
R24	$10\Omega$	B2	C18	515pF	B1	MR1 + B2
			C19	$0.01 \mu F$	B1	MR2-MR4 # B2
Coils*			C20	110pF	A2	S1-S7 — B1
L1	. –	E3	C21	110pF	A2	S8-S11 — C1
L2	_	E3	C22	$0.04 \mu F$	F3	S12, S14 — A1
L3		D3	C23	$0.04 \mu F$	F4	S13, S15 — C2
<u>L4</u>	16.0	A1	C24	110pF	A2	11
L5	16.0	A1	C25	110pF	A2	
L6	4.0	B1	C26	68pF	F4	*Approximate D.C. resistance
L7	2.0	B1	C27	3.3pF	F4	in ohms.
L8	1 <b>6</b> ∙0	A2	C28	$0.1 \mu F$	B1	†Westinghouse. 16RC1-1-8-1

‡S.T.C. FSX1634C





As only the edge of the switch unit fitted in locations C1, C2 is Rear view of the chassis. seen, a side view has been added to the right of it to show the contacts.

Circuit Description—continued

via R18, C35, R19, C28, R11 and C29. Tone control by R17, C32 and C34. Bias for V5 is obtained from the voltage drop across R20,

which is in series with the negative H.T. lead and chassis.

For A.C. mains operation, switches S12, S14, S8(M) and S10(M) close. H.T. current is then supplied by half-wave metal rectifier MR1. H.T. smoothing by C37, R21 and C38. Filament current is supplied from full-wave rectifier unit MR2, MR4. Filament wave rectifier unit MR3, MR4: Filament smoothing by C40, C41, C42, R24 and R23. Stabilizing rectifier MR2 limits positive excursions of the filament voltage.

For battery operation, power supplies are carried by switches S12, S14, S9(B), S11(B), S13(B) and S15(B).

#### CIRCUIT ALIGNMENT

Equipment Required.—An accurately calibrated signal generator, modulated 30 per cent at 400c/s; an output meter; a single loop of insulated wire to form a coupling loop; a 0.1 F capacitor; and a non-metallic screwdriver trimming tool.

The receiver and signal generator should be allowed to warm up for at least ten minutes before commencing the alignment procedure.

#### I.F. Stages

1.—Remove chassis from cabinet. Connect output meter across T1 secondary winding. Connect signal generator, via the 0.1µF capacitor, to V2 control grid (pin 6). Set the volume control to maximum and the

The volume control to maximum and the tone control for maximum top response.

—Switch receiver to M.W. and tune it to 300m. Feed in a modulated 470kc/s signal and adjust the cores of L11 (A2), L10 (F4), L9 (A2) and L8 (F4) for maximum output, progressively reducing the signal generator

output as the circuits are brought into line.

3.—Transfer the signal generator to V1 control grid (pin 6). Feed in a modulated 470kc/s signal and adjust the cores of L5 (A1) and L4 (F3) for maximum output. Disconnect signal generator Disconnect signal generator.

#### R.F. and Oscillator Stages

4.—Check that with the tuning gang at maximum capacitance the cursor coincides with the datum line on the tuning scales. Couple the signal generator output to the receiver by means of the single loop of insulated wire placed about three feet from the receiver and with its plane at right angles to the ferrite rod aerial.

-With the receiver switched to M.W., tune

it to 500m. Feed in a 600kc/s signal and adjust the core of L6 (B1) for maximum output.

Tune receiver to 200m. Feed in a 1,500kc/s signal and adjust C14 (B1) and C2 (B1) for maximum output.

-Repeat operations 5 and 6. --Switch receiver to L.W. and tune it to 1,400m. Feed in a 214kc/s signal and adjust C15 (B1), and C16 if necessary; and C4 (B1), and C6 if necessary, for maximum

-The ferrite rod L.W. aerial coil L2 (E3) has been aligned at the factory and should not be moved. Alignment of the M.W. ferrite rod aerial coil L3 (D3) will normally not be necessary. If alignment of L3 is essential, switch the receiver to M.W. and tune it to 500m. Feed in a 600kc/s signal and slide the former of L3 along the ferrite rod for maximum output, then seal the former of L3 to the ferrite rod to prevent it from moving.

#### **GENERAL NOTES**

Switches.-S1-S7 are the press-button operated waveband switches ganged in a single rotary unit and shown in the rear view illustration of the chassis in location refer-

illustration of the chassis in location reference B1. S1, S2, S4 and S6 close on M.W., S3, S5 and S7 close on L.W.

S8-S11, S13 and S15 (location reference C1) are the mains/battery changeover switches ganged in a single slide-type unit operated automatically by the insertion or removal of the mains connector at the rear of the cabinet. Switches with suffix (M) close for mains operation and those with suffix (B) close for battery operation.

suffix (B) close for battery operation.

\$12 and \$14 (location reference A1) are the on/off switches ganged with tone control R17.

Batteries.—Early versions of this receiver employed a combined L.T. and H.T. battery. The battery unit recommended by the manufacturers was an Ever Ready B147, rated at 1.5V (L.T.) and 90V (H.T.). The later versions (serial numbers 12,001 onwards), as in the case of our sample receiver from which this Service Sheet was prepared, use separate L.T. and H.T. batteries, and those recommended are: L.T. two Ever Ready U2 cells, rated at 1.5V each; H.T. Ever Ready B131, rated at 90V.

**Modifications.**—Early versions of this receiver contain the following circuit variations: car aerial coupling coil L1 is omitted; C1 is 5.6pF and is connected between the aerial socket and the junction of C7, L2; S14 is connected in the L.T. negative lead; C39 is  $0.25\mu F$ .

#### **VALVE ANALYSIS**

Valve voltages given in the table below are those derived from the manufacturer's information. They were measured on the 10V and 1,000V ranges of a Model 7 Avometer, chassis being the negative connection in every case.

The receiver was switched to M.W. and was operating from A.C. mains.

H.T. voltage measured at C37 was 105V; filament voltage measured at C40 was 1.3V, V5 bias voltage measured across R20 was -4.9V.

	Valve	Anode (V)	Screen (V)	
VI	DK96 {'mixer		80	70
	losc.		30	· —
V2	DF96		85	60
V3	DF96		85	60
V4	DAF96	!	15	15
V5	DL96		83	85

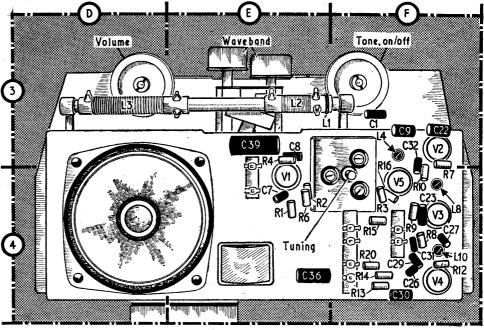


Illustration of the front of the chassis.