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"TRADER" SERVICE SHEET

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BUSH SB1 BATTERY SUPERHET

THE Bush SB1 is a 2-band 3-valve (plus Westector second detector) battery superhet.

Release date: 1933.

CIRCUIT DESCRIPTION

Aerial input via volume control **R1, C1** and coupling coils **L1, L2** to inductively coupled band-pass filter. Primary coils **L3** (MW), plus **L4** (LW), are tuned by **C17;** secondaries **L7** (MW), plus **L8** (LW) by **C18;** coupling by coils **L6** (MW), plus **L5** (LW). Image suppression on MW from junction of **C3** and **C4.**

First valve (**V1, Mullard metallised SP2**) is an RF pentode operating as frequency changer with cathode reaction coupling. Anode circuit coils **L11** (MW), plus **L12** (LW), are tuned by **C22.** Parallel trimming by **C30** (MW) and **C23** (LW); series tracking by **C7, C24** (MW) plus **C8, C25** (LW). Reaction from cathode circuit by filament coils **L9, L10.** Coupling from anode via **C20.**

Second valve (**V2, Mullard metallised VP2**) is a variable-mu RF pentode operating as intermediate frequency amplifier with transformer couplings **C20, L13, L14, C21** and **C26, L15, L16, C27.**

Intermediate frequency 123 KC/S.

Audio frequency component in rectified output from **Westector WX6** second detector is developed across load resistance **R8** and passed to CG of pentode output valve (**V3, Mullard PM22A**). Fixed tone correction by **C14** in anode circuit.

The HT battery is a combined HT and 9V GB battery, and GB potential is obtained from drop along **R11** in the negative HT lead (marked GB−) to chassis. The junction of the HT and GB sections (marked HT−), which is actually 9V+, provides the GB tapping for **V2.**

When no carrier signal is present in the aerial circuit, **V3** is considerably overbiased to reduce its anode current, and the IF valve **V2** is biased for maximum sensitivity. As soon as a station is tuned in, the **Westector** applies a positive potential to the grid of **V3,** with the result that the effective negative bias is reduced to the correct amount for normal working. The corresponding increase in anode current through **R11** increases the negative GB applied to **V2** and thus AVC is achieved. Owing to the over-biasing of **V3** between stations QAVC is obtained.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial coupling condenser	0·0005
C2	V1 CG condenser... ...	0·0005
C3	Image suppressor condensers	Very low
C4		0·0005
C5	V1 SG decoupling ...	0·1
C6	V1 anode decoupling ...	0·1
C7	Osc. MW fixed tracker ...	0·0022
C8	Osc. LW fixed tracker ...	0·0011
C9	V2 CG decoupling ...	0·1
C10	V2 SG decoupling ...	0·1
C11	V2 anode decoupling ...	0·1
C12	IF by-pass	0·0001
C13	V3 CG decoupling ...	0·25
C14	Fixed tone corrector ...	0·003
C15	HT circuit reservoir ...	2·0
C16‡	BP pri. LW trimmer ...	—
C17†	Band-pass pri. tuning ...	—
C18†	Band-pass sec. tuning ...	—
C19‡	BP sec. LW trimmer ...	—
C20‡	1st IF trans. pri. tuning...	—
C21‡	1st IF trans. sec. tuning...	—
C22†	Oscillator circuit tuning...	—
C23‡	Osc. circ. LW trimmer ...	—
C24‡	Osc. circ. MW tracker ...	—
C25‡	Osc. circ. LW tracker ...	—
C26‡	2nd IF trans. pri. tuning...	—
C27‡	2nd IF trans. sec. tuning...	—
C28‡	BP pri. MW trimmer ...	—
C29‡	BP sec. MW trimmer ...	—
C30‡	Osc. circ. MW trimmer ...	—

† Variable. ‡ Pre-set.

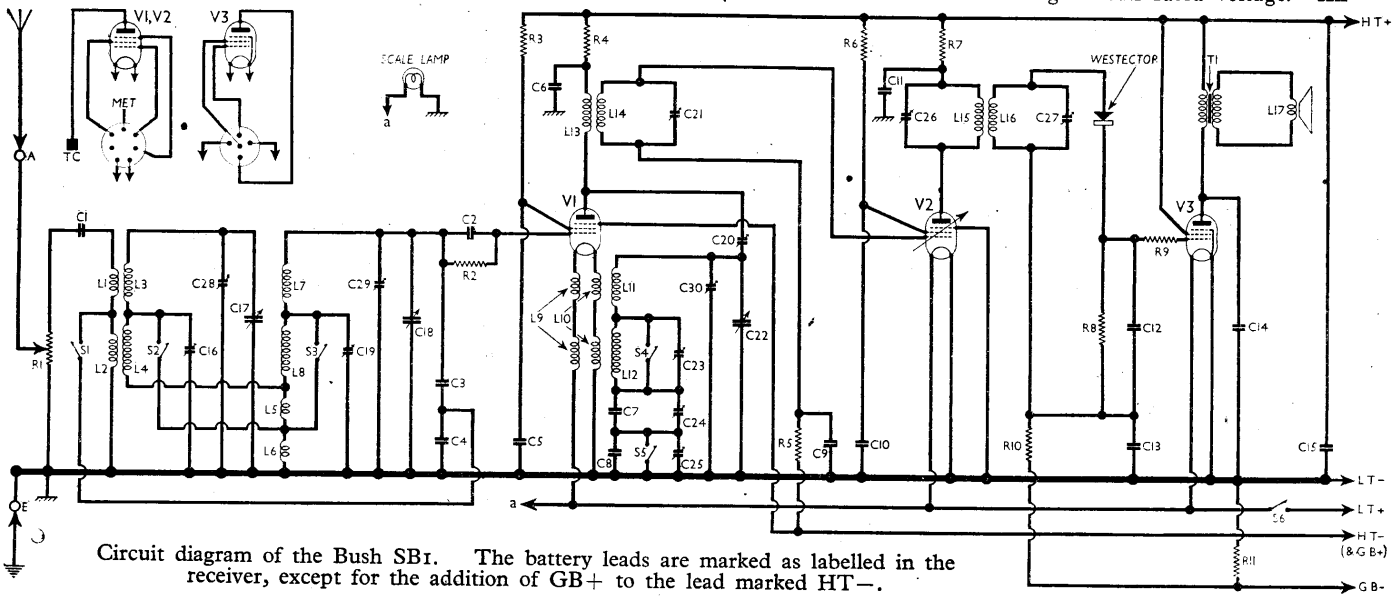
	RESISTANCES	Values (ohms)
R1	Manual volume control...	75,000
R2	V1 CG resistance ...	500,000
R3	V1 SG HT feed	8,000
R4	V1 anode decoupling ...	8,000
R5	V2 CG decoupling ...	2,000,000
R6	V2 SG HT feed	30,000
R7	V2 anode decoupling ...	8,000
R8	Westector load resistance	250,000
R9	IF stopper	150,000
R10	V3 CG decoupling ...	250,000
R11	Auto GB resistance ...	1,500

	OTHER COMPONENTS	Approx. Values (ohms)
L1, L2	Aerial coupling coils ...	3·25
L3, L4	Band-pass primary coils...	14·5
L5, L6	Band-pass coupling coils	3·25
L7, L8	Band-pass secondary coils	14·5
L9, L10	Oscillator reaction coils...	0·1
L11	Osc. circ. MW tuning coil	3·75
L12	Osc. circ. LW tuning coil	9·5
L13, L14	1st IF trans. Pri. ...	70·0
	1st IF trans. Sec. ...	70·0
L15, L16	2nd IF trans. Pri. ...	70·0
	2nd IF trans. Sec. ...	70·0
L17	Speaker speech coil ...	2·0
T1	Speaker input trans. Pri.	600·0
	Speaker input trans. Sec.	0·2
S1-S5	Waveband switches ...	—
S6	LT circuit switch, ganged R1	—

VALVE ANALYSIS

Valve	Anode Volts (V)	Anode Current (mA)	Screen Volts (V)	Screen Current (mA)
V1 SP2	110	1·15	125	0·35
V2 VP2	105	2·43	105	0·63
V3 PM22A	133	0·85	134	0·2

The voltage readings above were taken with a meter having a resistance of 1,000 Ω per V. The HT and GB battery was reading its full rated voltage. All



Circuit diagram of the Bush SB1. The battery leads are marked as labelled in the receiver, except for the addition of GB+ to the lead marked HT−.

voltage readings are made with chassis as negative.

The measurements were made without an aerial connected, i.e., with no signal.

Measurement of the anode and screen currents, particularly of V1, should be made with the meter inserted in circuit at the low RF potential end.

The total no signal current is about 5.6 mA, rising to a steady 9 or 10 mA with the output valve fully loaded.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (set screws);
unsolder speaker leads from the speaker connecting panel;
free speaker leads from clips;
remove the four bolts holding the chassis to bottom of cabinet.

When replacing, connect the speaker leads to the second and fourth tags on the connecting panel, numbering from top to bottom.

Removing Speaker.—Unsolder the leads and remove the four nuts and bolts holding speaker to the front of the cabinet.

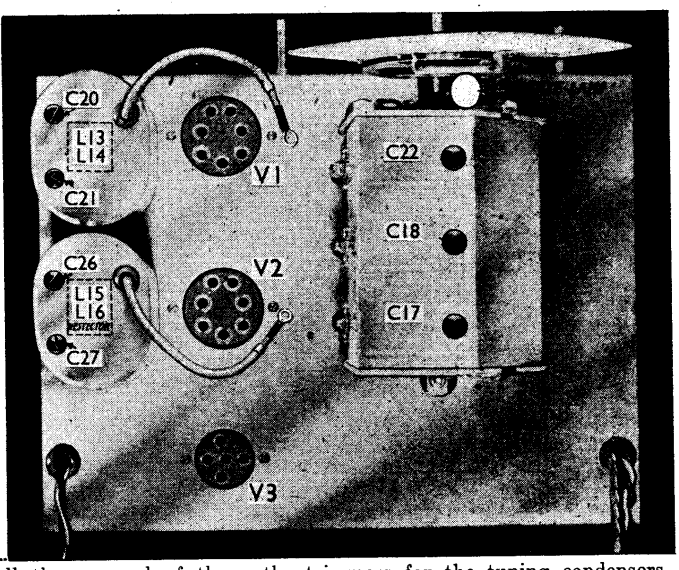
When replacing, the transformer should be on the left.
Connect the leads as indicated above.

GENERAL NOTES

Switches.—The five switches, **S1** to **S5**, perform the wavechange operations, and they are mounted in one unit on a bar attached to a partition passing across the chassis. All the switches are *closed* on MW and *open* on LW.

S6 is the QMB mains switch, ganged with the volume control **R1.**

Coils.—L1-L4; L5-L8; and **L9-L12** are mounted beneath the chassis on the other side of the partition mentioned above. They have metal screens fitted with bayonet catches. The centre one is easily detachable, but removal of the other two involves first of all the removal of the volume control and switch, and the aerial and earth sockets. The wires to these components need not be unsoldered. For any serious work on the coils it will be best to remove the partition carrying them.



Plan view of the chassis. The IF transformer adjustments are indicated. All the remaining trimmers are beneath the chassis. The Westector is housed in the **L15,L16** unit.

The IF transformers **L13, L14** and **L15, L16** are in two screened units with their trimmers on the chassis deck.

The **Westector** is mounted inside the screening can of the **L15, L16** unit.

Condenser C3.—This is a very small fixed condenser formed from a central electrode of 16-gauge wire, covered with insulated sleeving, on which a coil of 20-gauge wire is wound, forming the other electrode.

Condensers C28, C29, C30.—These are the trimmers for the tuning condensers, and are at the base of the band-pass and oscillator coils, inside the screens.

Condensers C5, C6, C9, C10, C11.—These have a capacity of 0.1 μF each, and are contained in a single flat block. The common terminal of each is earthed to the metal case of the block.

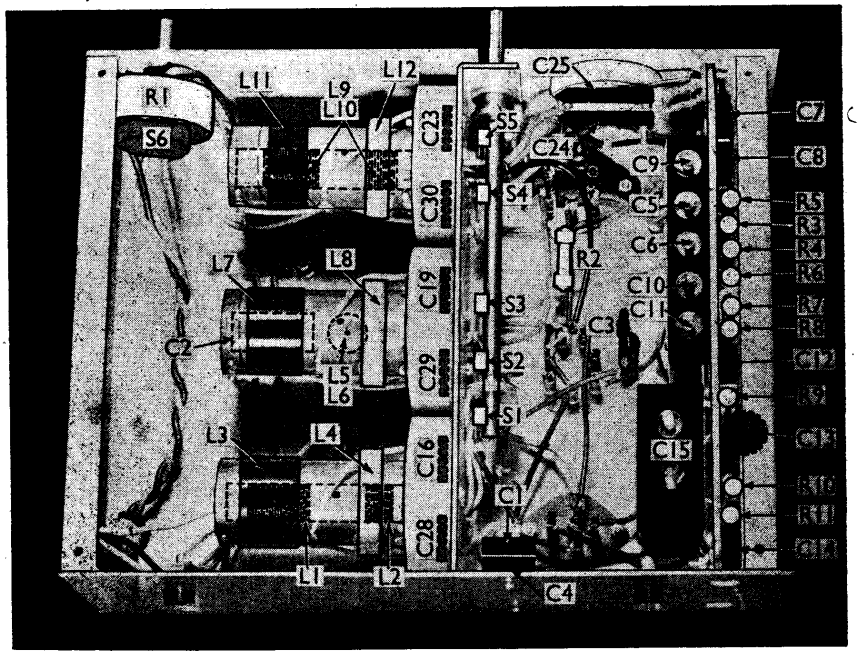
Scale Lamp.—This is an Osram MES type lamp, rated at 3.5V, 0.15A.

Batteries.—LT, Exide LCA3 accumulator cell, 2V, 25AH free acid non-spill. HT, Drydex Yellow Triangle type H1073, 135V + 9V combined HT and GB battery.

HT Battery Leads.—Only three leads are used to connect the HT battery. They are labelled HT+, HT− and GB−. Although the HT− lead is so labelled, and goes to the HT− socket on the battery, it is actually a positive bias tapping. The negative end of the battery, marked GB−, is the HT negative point, and this should be borne in mind when reading the circuit diagram.

Chassis Divergencies.—Where Mazda SP215 valves have been substituted for **V1** and **V2**, the following modifications will be found:

R3 and **R6** become 100,000 O; **R2** becomes 2,000,000 O; a 0.002μF condenser is inserted in series with **C26**, on the HT+ side; the second IF transformer **L15, L16** is replaced with one having a 2 to 1 ratio; the screened lead to **V1** anode (top cap) is replaced by a plain one; and **V1** suppressor grid is returned to the other end of **R5.** In some chassis, without these modifications, **R3** is changed to 30,000 O.



Under-chassis view. The RF and oscillator coil units are seen here with their screening cans removed. The wavechange switch contacts are indicated. The Westector is indicated in the plan view above.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator leads **V1** control grid and chassis, feed in a 123 KC/S (2440 m.) signal, and adjust **C27, C26, C21** and **C20** for maximum output.

RF and Oscillator Stages.—With the gang at minimum, the pointer should coincide with the 200 m. mark on the scale. Connect signal generator leads to **A** and **E** sockets, and turn the volume control to maximum.

MW.—Switch set to MW, tune to 300 m. on scale, feed in a 300 m. (1,000 KC/S) signal, and adjust **C30,** then **C29** and **C28** for maximum output. Feed in a 500 m. (600 KC/S) signal, tune it in, and adjust **C24** for maximum output, while rocking the gang for optimum results. Repeat these adjustments.

LW.—Switch set to LW, tune to 1,500 m. on scale, feed in a 1,500 m. (200 KC/S) signal, and adjust **C23,** then **C19** and **C16,** for maximum output. Feed in a 1,875 m. (160 KC/S) signal, tune it in, and adjust **C25** for maximum output, while rocking the gang for optimum results. Repeat these adjustments. The MW trimmers and tracker should not be touched once the LW alignment has been commenced.

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