'TRADER' SERVICE SHEET

291

BUSH SB44

2-BAND BATTERY SUPERHET

THE Bush SB44 is a 4-valve battery 2-band superhet with an octode frequency changer, a variable-mu pentode I.F. amplifier, a double-diode triode and a pentode output valve. Provision is made for a gramophone pick-up and an extension speaker, and there is a plug and socket arrangement for cutting out the internal speaker. No batteries are supplied with the receiver.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1, L2** to inductively coupled band-pass filter. Primary coils **L3, L4** are tuned by **C16**; secondaries **L8, L9** by **C18**; coupling by coils **L5, L6**. **R1** across aerial circuit introduces damping when local-distant switch **S1** is closed to reduce sensitivity when receiving local transmissions.

First valve (**V1, Mullard metallised FC2**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L10** (M.W.) and **L11** (L.W.) are tuned by **C20**; parallel trimming by **C21** (M.W.) and **C22** (L.W.); tracking by specially shaped vanes of **C20** and, on L.W. only, series trackers **C5, C23**. Reaction by coils **L12** (M.W.) and **L13** (L.W.).

Second valve (**V2, Mullard metallised VP2**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C24, L14, L15, C25**, and **C26, L16, L17, C27**.

Intermediate frequency 123 KC/S.

Diode second detector is part of double diode triode valve (**V3, Mullard metallised TDD2A**). Audio frequency component in rectified output is developed across load resistance **R8**, which also operates as manual volume control, and passed via A.F. coupling condenser **C11**, C.G. resistance **R10** and grid stopper **R9** to C.G. of triode section, which operates as A.F. amplifier.

Second diode of **V3**, fed from **V2** anode via **C8**, provides D.C. potential which is developed across load resistance **R13** and passed back through decoupling circuit as G.B. to F.C. and I.F. valves, giving automatic volume control.

Resistance-capacity coupling by **R12, C13** and **R15** via grid stopper **R17**, between **V3** triode and pentode output valve (**V4, Mullard PM22A**). Fixed tone correction in anode circuit by **C14**. Provision for connection of high impedance external speaker across primary of internal speaker input transformer **T1**. Internal speaker may be muted by removing plug from socket at rear of chassis which breaks the speech coil circuit.

G.B. potentials for **V3** triode and **V4** are obtained automatically from drop along **R18, R19** in H.T. negative lead to chassis.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the four control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the cleat holding them to the sub-baffle, when the chassis can be withdrawn to the extent of the leads, which is sufficient for normal purposes.

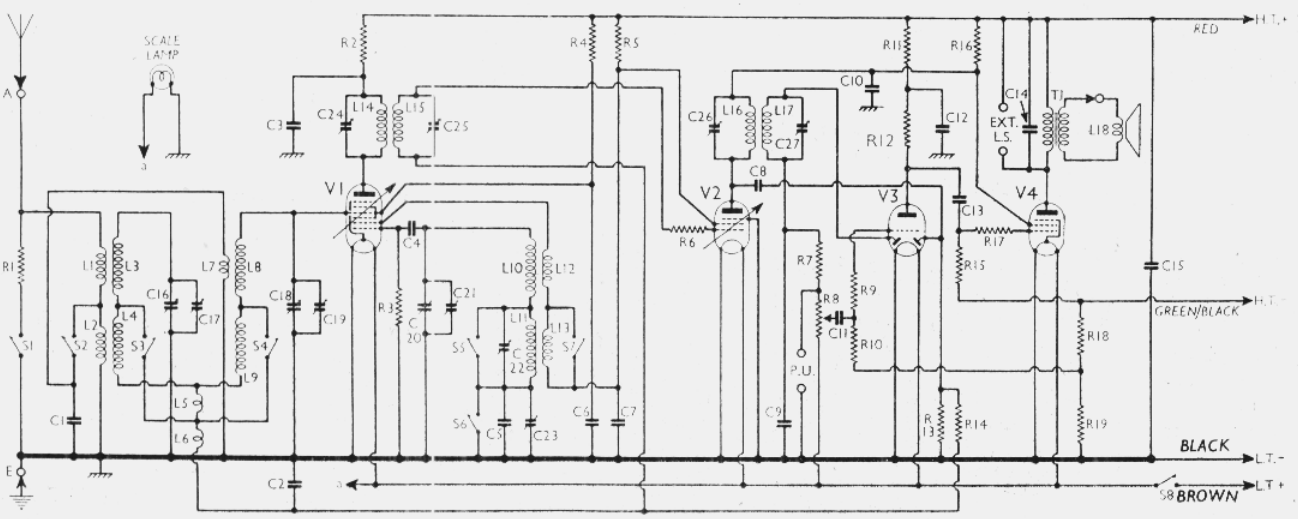
If it is desired to free the chassis entirely, unsolder the speaker leads, and *when replacing* connect them as follows, numbering the tags from left to right:—1, red; 2, black, 3, no external connection; 4, green; 5, yellow.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts and washers from the four screws holding it to the sub-baffle. *When replacing*, see that the transformer is at the bottom and connect the leads as above.

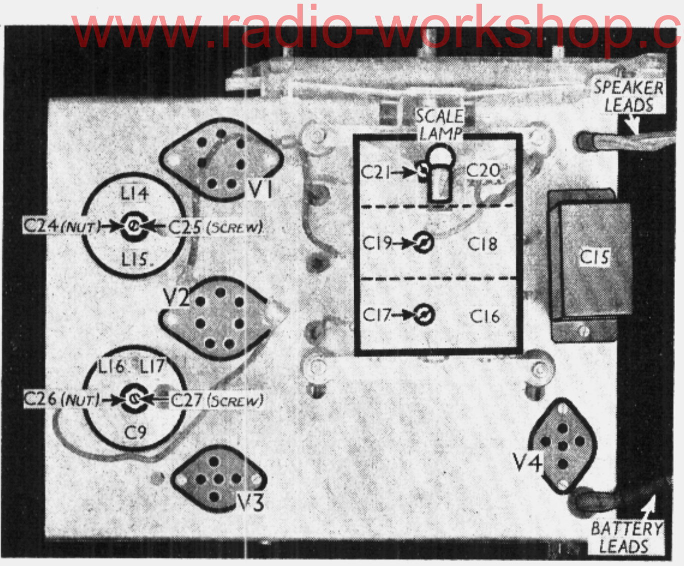
COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Part of image suppression circuit	0·01
C2	A.V.C. line decoupling	0·1
C3	V1 pentode anode decoupling..	0·1
C4	V1 osc. C.G. condenser.. ..	0·0005
C5	Osc. circuit L.W. fixed tracker	0·0011
C6	V1 S.G. decoupling	0·1
C7	V1 osc. anode and V2 S.G. decoupling	0·1
C8	Coupling to V3 A.V.C. diode ..	0·00005
C9	I.F. by-pass	0·0001
C10	V2 anode and V4 S.G. decoupling	0·1
C11	A.F. coupling to V3 triode ..	0·01
C12	V3 triode anode decoupling ..	0·1
C13	V3 triode to V4 A.F. coupling	0·03
C14	Fixed tone corrector	0·003
C15	H.T. circuit reservoir	2·0
C16†	Band-pass primary tuning ..	—
C17‡	Band-pass pri. M.W. trimmer..	—
C18†	Band-pass secondary tuning ..	—
C19‡	Band-pass sec. M.W. trimmer..	—
C20†	Oscillator circuit tuning ..	—
C21‡	Osc. circuit M.W. trimmer ..	—
C22‡	Osc. circuit L.W. trimmer ..	0·00004
C23‡	Osc. circuit L.W. tracker ..	0·00025
C24‡	1st I.F. trans. pri. tuning ..	0·00012
C25‡	1st I.F. trans. sec. tuning ..	0·00012
C26‡	2nd I.F. trans. pri. tuning ..	0·00025
C27‡	2nd I.F. trans. sec. tuning ..	0·00025

† Variable. ‡ Pre-set.



Circuit diagram of the Bush SB44 2-band battery superhet. **S1** is the local-distant switch.



Plan view of the chassis. The I.F. transformers have dual trimmers for adjustment. **C9** is inside the second unit.

	RESISTANCES	Values (ohms)
R1	Aerial circuit sensitivity shunt	50
R2	V1 pentode anode H.T. feed ..	10,000
R3	V1 osc. C.G. resistance ..	30,000
R4	V1 S.G. H.T. feed	100,000
R5	V1 osc. anode and V2 S.G. H.T. feed	10,000
R6	V2 C.G. anti-parasitic resistance	10,000
R7	I.F. stopper	50,000
R8	V3 signal diode load and manual volume control	500,000
R9	V3 triode grid stopper ..	500,000
R10	V3 triode C.G. resistance ..	5,000,000
R11	V3 triode anode decoupling ..	10,000
R12	V3 triode anode load	10,000
R13	V3 A.V.C. diode load	1,000,000
R14	A.V.C. line decoupling ..	1,000,000
R15	V4 C.G. resistance	500,000
R16	V2 anode and V4 S.G. H.T. feed	10,000
R17	V4 grid stopper	100,000
R18	} Automatic G.B. resistances {	150
R19		250

	OTHER COMPONENTS	Approx. Values (ohms)
L1	} Aerial coupling coils {	1·2
L2		6·5
L3	} Band-pass primary coils {	3·0
L4		13·0
L5	} Band-pass coupling coils {	3·5
L6		0·5
L7	Image suppression coil ..	0·05
L8	} Band-pass secondary coils {	3·0
L9		13·0
L10	Osc. circuit M.W. tuning coil	3·5
L11	Osc. circuit L.W. tuning coil	8·5
L12	Oscillator M.W. reaction coil..	2·2
L13	Oscillator L.W. reaction coil..	2·5
L14	} 1st I.F. trans. { Pri.	107·0
L15	Sec.	107·0
L16	} 2nd I.F. trans. { Pri.	66·0
L17	Sec.	66·0
L18	Speaker speech coil	1·7
T1	Speaker input trans. { Pri. ..	600·0
	Sec. ..	0·2
S1	Local-distant switch	—
S2-S7	Waveband switches	—
S8	L.T. circuit switch, ganged R8	—

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating with an H.T. battery reading 144 V, on load. The receiver was tuned to the lowest wavelength on the medium band and both the volume control and local-distant switch were at maximum (the latter in position 1), but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC2 ..	{ 130 Oscill 117	0·2 ator 1·4 }	43	0·9
V2 VP2 ..	110	1·6	117	0·4
V3 TDD2A	114	0·8	—	—
V4 PM22A	137	4·0	110	0·6

GENERAL NOTES

Switches.—**S1** is the local-distant switch, located at the front of the chassis, and having a knob marked 1 and 2. In position 1, **S1** is open (" distant "), and in position 2 it is closed, switching **R1** into circuit for local reception.

S2-S7 are the waveband switches, ganged in a single unit beneath the chassis. They are individually indicated in our under-chassis view, and are all closed on M.W. and open on L.W.

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

Coils.—All the coils, except the I.F. transformers, are in three screened units beneath the chassis. Note that the **L10-L13** unit also contains the condenser **C4**. In the centre unit **L7** is arranged for variable coupling to **L8, L9** by a screwed rod and nut projecting through the top of the can. One of its connections goes to the screen.

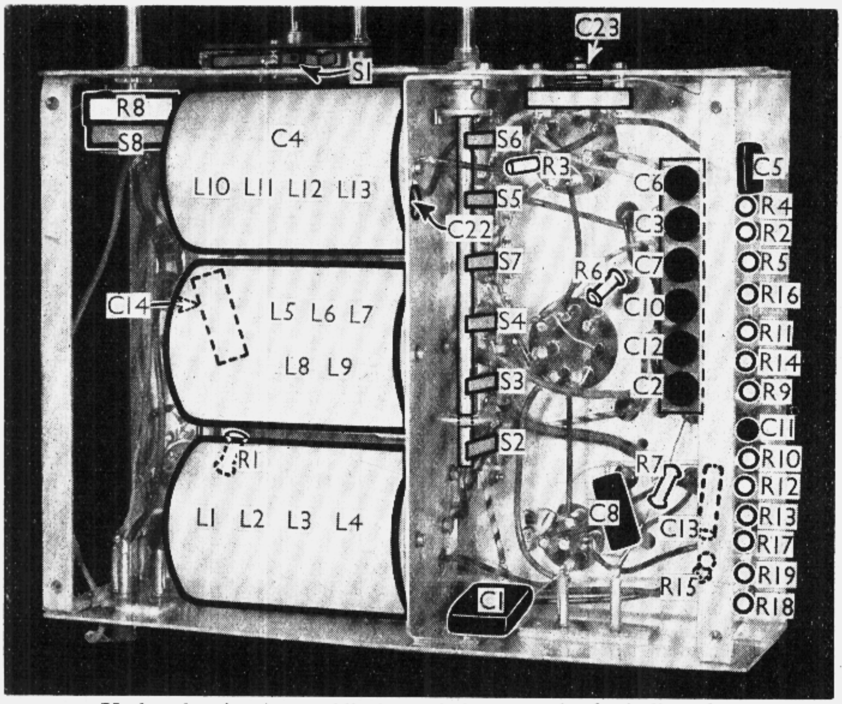
The I.F. transformers **L14, L15** and **L16, L17** are in two screened units on the chassis deck, each having a dual concentric type of trimmer unit, of which the nut adjusts the primary and the central screw the secondary. The second unit also contains **C9.**

Scale Lamp.—This is an Osram M.E.S. type, rated at 3·5 V, 0·15 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a high resistance (16,000O) external speaker. A plug and socket device disconnects the speech coil of the internal speaker, if desired.

Condenser Block.—Six 0·1 μF paper condensers are contained in a flat metal-cased unit beneath the chassis. The case forms one common connection for each condenser, the other connections being brought out to tags. The condensers are identified in our under-chassis view.

Continued overleaf



Under-chassis view. All the switches are clearly indicated.

MAINTENANCE PROBLEMS

Hints Contributed by Service Engineers

Omission in Wiring

ONE of our salesmen recently installed a Philips 785AX receiver with converter on D.C. mains. When he returned he complained that there was a lot of electrical interference on both wavebands. As I knew the district was fairly free in that respect I went out to investigate and found that the interference was coming from the converter itself.

I removed the back of the set and pushed the valves down in their sockets, and as I moved the output pentode I found that, with it pressed to one side, the interference ceased and reception was quite clear. On removing the cabinet bottom and noting what happened when the valve was moved I saw that interference ceased when either side of the heater wiring was earthed to chassis.

I measured from heater winding to chassis with the resistance range of the Avo, and found it was infinity, although the makers' service chart showed the centre tap connected to chassis.

On checking over the wiring from the mains transformer I found that there was no connection at all to the centre tap on the transformer and never had been. I connected up to chassis with an odd length of wire and everything was O.K.

This is one of the very few occasions when I have found anything slip by the Philips testers. — F. A. BEDWARD, WORTHING.

No L.W. Signals on Cossor 238

PASSING through phases of similar troubles in servicing, a number of Cossor 238 receivers have been returned with an identical complaint, that of no L.W. reception.

Initially the fault was suspected to be coil trouble and in order to eliminate one section, the H.T. voltage on the first valve, a 210VPT, was checked, the H.T. to the anode of the valve being fed through the coil. On the M.W. range it was satisfactory, but with the wavechange switch in the L.W. position no anode volts were obtainable.

As the wavechange switch short circuits the L.W. section of the coil it was assumed that the L.W. portion had an open circuit. Removing the coil for examination, this proved to be the case, a break being found in the winding exactly where the wire is looped through the coil former, corrosion having taken place. Extending the wire, the winding was reconnected, the coil replaced in the chassis, and the receiver then functioned normally.

It is interesting to note that on all subsequent 238 models received for service, the fault and position of the break was identical. A rapid test for this fault is to check the anode volts of the 210 VPT on M.W. and L.W. If O.K. on M.W. but not on L.W., then the coil with the anode lead to the 210 VPT can definitely be removed for further examination.—L. LACEY, DORKING.

Change in Resistor Value

A PYE CR/AC came into our service department with the complaint that the set was very poor in quality and only local stations were receivable. It may be added here that this set had not developed this fault suddenly but had been getting gradually worse for months.

Starting with valve tests, it was found that many of the voltages and currents were abnormal but we could not immediately trace these variations to any specific point. Happening to test one of the resistances it was noted that its value was about 50 per cent. higher than it should have been. As replacement of this one resistance did not improve matters, we started testing *all* the resistances, and no fewer than *ten* of these were found to have incorrect values. On completely replacing all resistances the set worked perfectly, our customer stating that it worked better than when he first purchased it.

We might add that these resistances were of a waxed type made by Pye Radio, and since this CR AC job we have found the same trouble in other models.—D. RENNISON, BRADFORD.

Disruption of Paper Condensers

WE were recently checking up a Lissen 8110 Universal which was to be returned to stock after being out for demonstration purposes. It was put on test, and after being switched on gave a satisfactory performance for a few minutes. Then came an explosion in the shape of a loud "bang" from the interior. At the same time there was a flicker on the light supply which seemed to indicate a short across the mains.

The receiver, however, after a momentary pause, continued to work satisfactorily. It was then switched off for examination, and the first thing found was that pieces of 10 A fuse wire had been placed at the back of the fuses which at some previous time had blown. An internal search revealed quite a lot of small pieces of pitch, and the fault narrowed down to a short-circuited R.F. by-pass tubular paper condenser across the mains.

The short-circuit caused sufficient heat for internal expansion, and a good proportion of the pitch was blown out from the condenser, thus accounting for the "bang." The disruption of the condenser at the same time caused the short-circuit to break, probably through the running of the insulating material, it being noted that when removed the condenser showed a capacity reading on the bridge.

A new condenser and fuses were fitted to put matters right.

* * *

THESE Lissen 8110 receivers, when used in this locality, which is distant from most transmitters, often show distortion on most of the distant Regionals and others.

The circuit is of the Q.A.V.C. type, and a study of the circuit diagram showed the "muting" to be obtained by placing a delay voltage on the signal diode, thus giving rise to only partial rectification on weak signals, with consequent distortion.

In all cases the delay voltage has been removed and the diode placed at cathode potential, with greatly improved results, both as regards sensitivity and quality.—W. W. SMITH, HAVERFORDWEST.

BUSH SB 44—*Continued*

Trimmer C22.—This is adjusted through a hole beneath the case of the **L10-L13** unit.

Tracker C23.—This is adjusted from the front of the chassis, a hexagonal nut forming the adjustment. The central screw is not used.

Chassis Divergencies.—**C13** is 0·03 μF in our chassis, but is given as 0·3 μF in the makers' component table. **R3** is 30,000 O in our chassis, not 50,000 O. **C14** is connected between anode of **V4** and H.T. positive line, not chassis.

Batteries.—L.T., 2 V L.T. cell; H.T., 144 V dry H.T. battery, such as Drydex type S54. No intermediate tappings are necessary. G.B. is automatic.

Battery Leads and Voltages.—Black lead, spade tag, L.T. negative; brown lead, spade tag, L.T. positive 2 V; green/black lead and plug, H.T. negative; red lead and plug, H.T. positive 144 V.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator to control grid (top cap) of **V1** and chassis. Turn gang to maximum and switch to M.W. Feed in a 123 KC/S signal and adjust **C27** (screw), **C26** (nut), **C25** (screw) and **C24** (nut) in turn for maximum output.

R.F. and Oscillator Stages.—With gang at maximum, pointer should read 550 m. on the scale. Connect signal generator to **A** and **E** sockets.

M.W.—Switch to M.W., feed in a 300 m. (1,000 KC/S) signal, tune to 300 m. on scale, and adjust **C21, C19** and **C17,** in that order, for maximum output.

Feed in a 500 m. (600 KC/S) signal, tune to 500 m. on scale, and check settings of **C19** and **C17.** No M.W. tracker is used (apart from the shaped condenser vanes).

L.W.—Switch to L.W., feed in a 1,200 m. (250 KC/S) signal, tune to 1,200 m. on scale, and adjust **C22** for maximum output. Feed in an 1,800 m. (167 KC/S) signal, tune it in, and adjust **C23** for maximum output, while rocking the gang for optimum results. Check at 1,500 m.