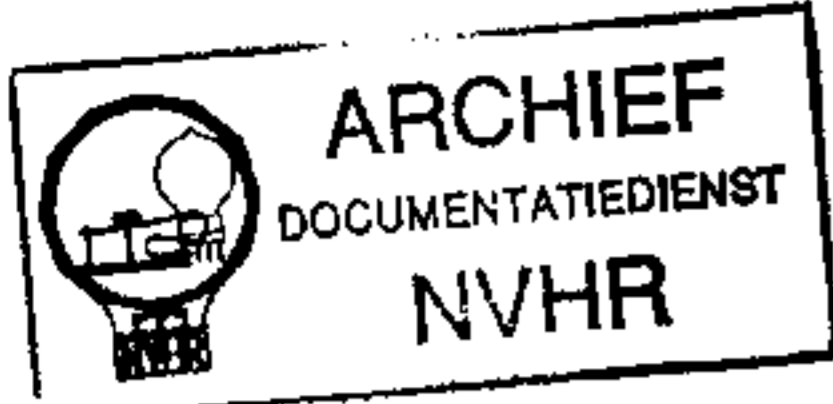


Ned. Ver. v. Historie v/d Radio

BUSH SB3

4-VALVE BATTERY SUPERHET



REVISED ISSUE OF
SERVICE SHEET No. 107



The Bush SB3

THE Bush SB3 is a 4-valve, 2-band battery superhet, using an indirectly heated double diode second detector. There is provision for use with a gramophone pick-up and an external speaker.

Release date and original price: 1936; £10 10s. complete with batteries.

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 resistor 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 (LW); oscillator anode reaction coils L12, L13.

Second valve, a variable-mu RF 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 IHC double diode valve (V3, Mullard metallised 2D2). Second diode, fed from V2 anode by C9, provides DC potential which is developed across R10 and fed back as GB to FC and IF valves, giving automatic volume control.

Audio-frequency output from rectifier diode is developed across manual volume control R8 and passed via C11 to CG 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.

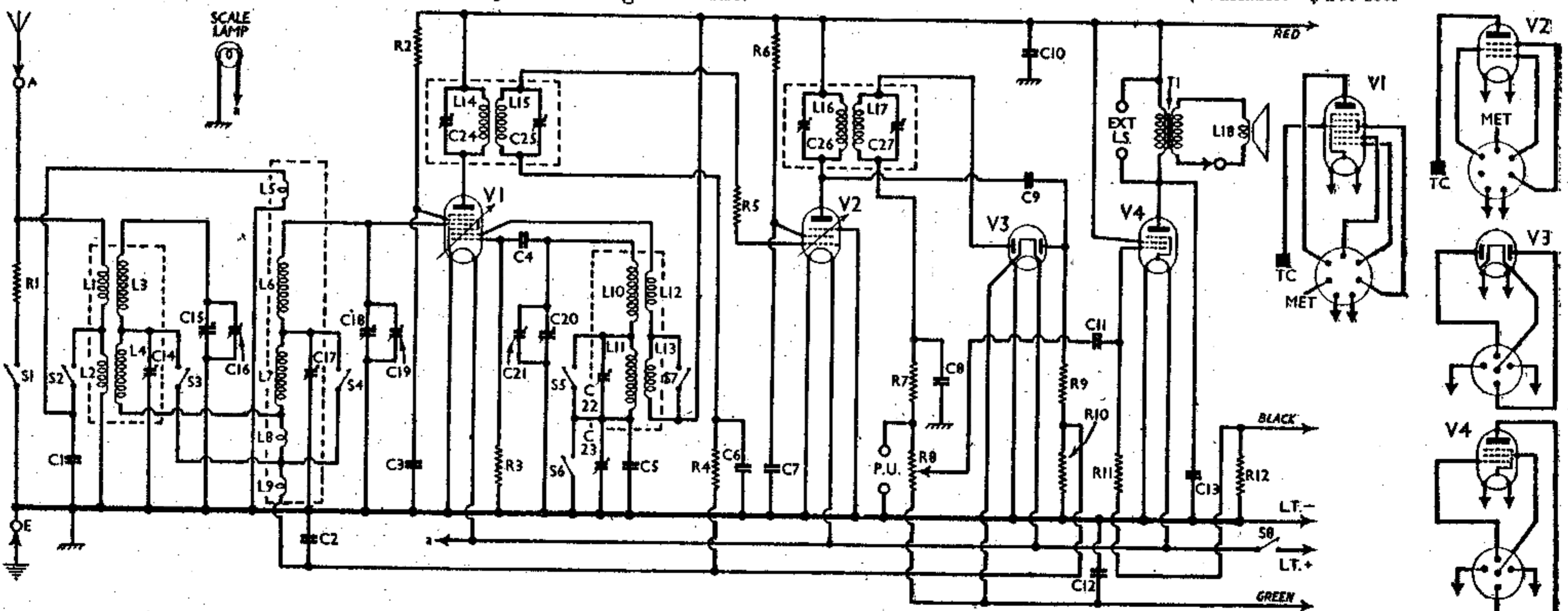
GB for V4 is obtained automatically from voltage drop along R12 in common HT negative line.

COMPONENTS AND VALUES

RESISTORS		Values (ohms)
R1	Aerial-earth shunt	50
R2	V1 SG HT feed	100,000
R3	V1 osc. CG resistor	70,000
R4	V2 CG decoupling	1,000,000
R5	V2 grid stopper	5,000
R6	V2 SG HT feed	10,000
R7	IF stopper	50,000
R8	Signal diode load; manual volume control	500,000
R9	AVC diode load resistors	1,000,000
R10		100,000
R11	V4 CG resistor	1,000,000
R12	Auto GB resistor	300

CONDENSERS		Values (μF)
C1	Image suppressor	0.01
C2	V1 pent. CG decoupling	0.1
C3	V1 SG by-pass	0.1
C4	V1 osc. CG condenser	0.0005
C5	Osc. LW tracker	0.0011
C6	V2 CG decoupling	0.1
C7	V2 SG by-pass	0.1
C8	IF by pass	0.0001
C9	Coupling to V3 AVC diode	0.0001
C10	HT reservoir	2.0
C11	AF coupling to V4	0.01
C12	AVC delay by-pass	0.1
C13	Fixed tone corrector	0.003
C14†	B-P pri. LW trimmer	—
C15†	Band-pass pri. tuning	—
C16†	B-P pri. MW trimmer	—
C17†	B-P sec. LW trimmer	—
C18†	Band-pass sec. tuning	—
C19†	B-P sec. MW trimmer	—
C20†	Oscillator tuning	—
C21†	Oscillator MW trimmer	—
C22†	Oscillator LW trimmer	—
C23†	Oscillator LW tracker	—
C24†	1st IF trans. pri. tuning	—
C25†	1st IF trans. sec. tuning	—
C26†	2nd IF trans. pri. tuning	—
C27†	2nd IF trans. sec. tuning	—

† Variable. ‡ Pre-set.



Circuit diagram of the Bush SB3 battery superhet. V3 is a separate double diode valve with an indirectly heated cathode to which a small positive bias potential is applied to delay AVC action. Negative bias is automatically developed across R12. Valve base connection diagrams are on the right.

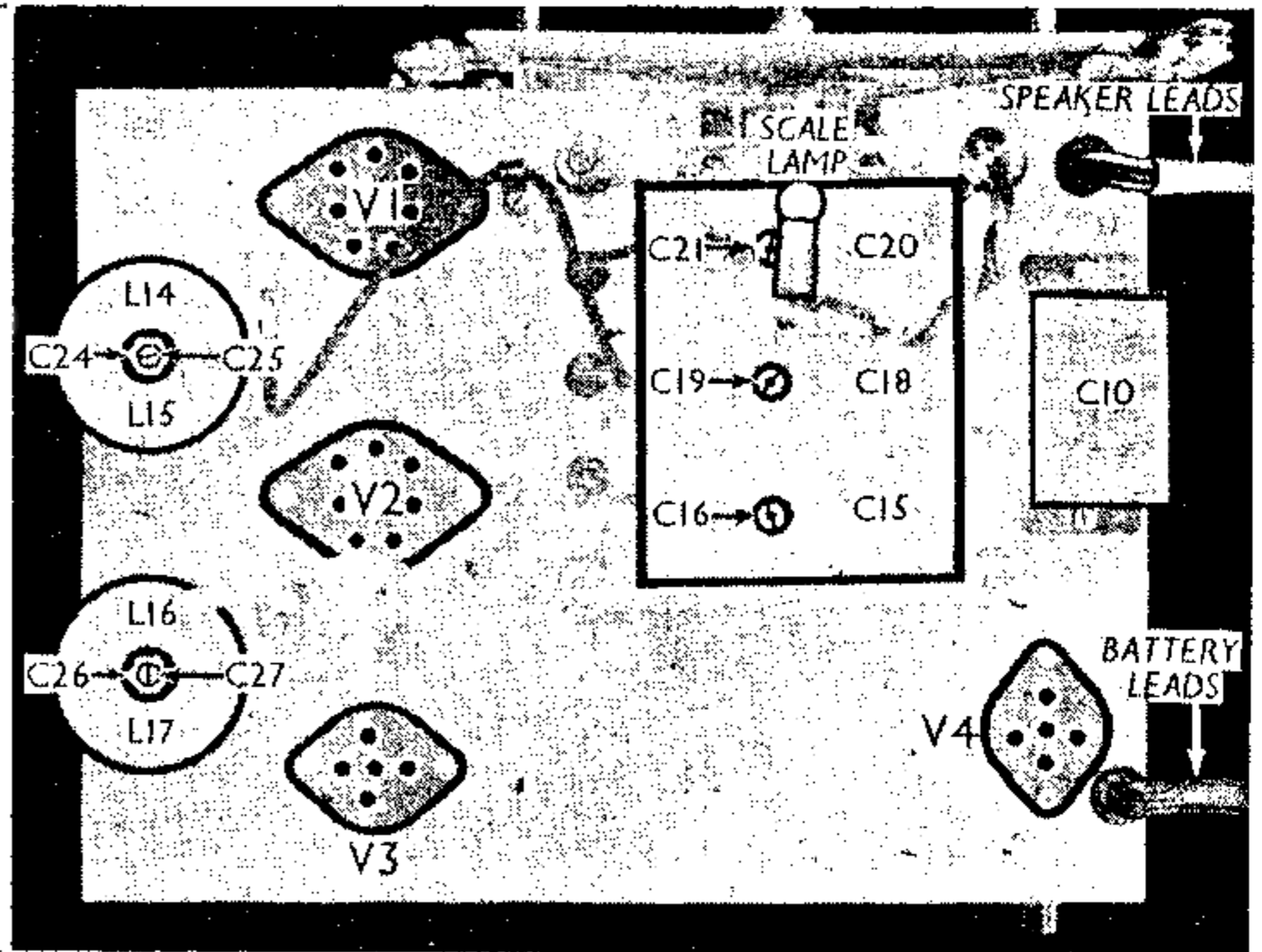
OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coils ...	1.3
L2		6.0
L3		3.2
L4		13.0
L5	Image suppression coil ...	0.05
L6		3.2
L7	Band-pass secondary coils	13.0
L8		3.5
L9	Band-pass coupling coils	0.5
L10		3.5
L11	Oscillator tuning coils ...	8.5
L12		2.2
L13	Oscillator reaction coils ...	2.5
L14		110.0
L15	1st IF trans. { Pri. ...	110.0
L16		110.0
L17	2nd IF trans { Pri. ...	110.0
L18		110.0
T1	Speaker input trans. { Pri. ...	800.0
S1		0.3
S2-S7	Waveband switches ...	—
S8	LT switch, ganged R8 ...	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from a new 129 V HT and 9 V GB battery. Both the volume and sensitivity controls were at maximum and the receiver was 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.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6C2	133	0.7	54	0.8
	Oscillator			
V2 VP2	133	0.9	120	0.7
V3 2D2	133	2.4		
V4 PM22D	130	4.9	133	0.9

Plan view of the chassis. The IF trimmers are concentric, the primaries being adjusted by the nuts, and the secondaries by the screws. C10 is a paper condenser.



DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub screws); free the battery and speaker leads from the cleats holding them to the cabinet; remove the four bolts (with washers) holding chassis to bottom of cabinet. The chassis may now be withdrawn to the extent of the speaker leads; or it may be removed entirely if these are unsoldered from the speaker terminal panel. *When replacing*, the leads should be connected as follows, using the numbers marked on the panel: 1, red; 2, green; 3, black; 4, yellow.

Removing Speaker.—Remove the nuts and washers from the ornamental headed bolts holding the speaker to the front of the cabinet. *When replacing*, the transformer goes at the bottom, and the leads should be connected as described above.

GENERAL NOTES

Switches.—S1 is the QMB "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 MW band and open on the LW 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 QMB LT switch, ganged with the volume control R8.

Coils.—All the coils, except the IF 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 IF 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 MES 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 Ω). A plug and socket device disconnects the speech coil of the internal speaker if desired.

Battery Leads and Voltages.—Black rubber lead, spade tag, LT-; brown rubber lead, spade tag, LT+ 2 V; black braided lead, GB- 9 V tapping; green braided lead, HT+ 4.5 V tapping; red braided lead, HT+ tapping (max.).

Batteries.—LT, Exide CZH2 celluloid cased 2 V cell. HT and GB, Drydex 129 V HT+ 9 V GB.

CIRCUIT ALIGNMENT

In order to prevent AVC action during alignment, the green (AVC delay) battery plug may be temporarily inserted in a socket several volts more positive than its usual position. Turn the volume control to maximum.

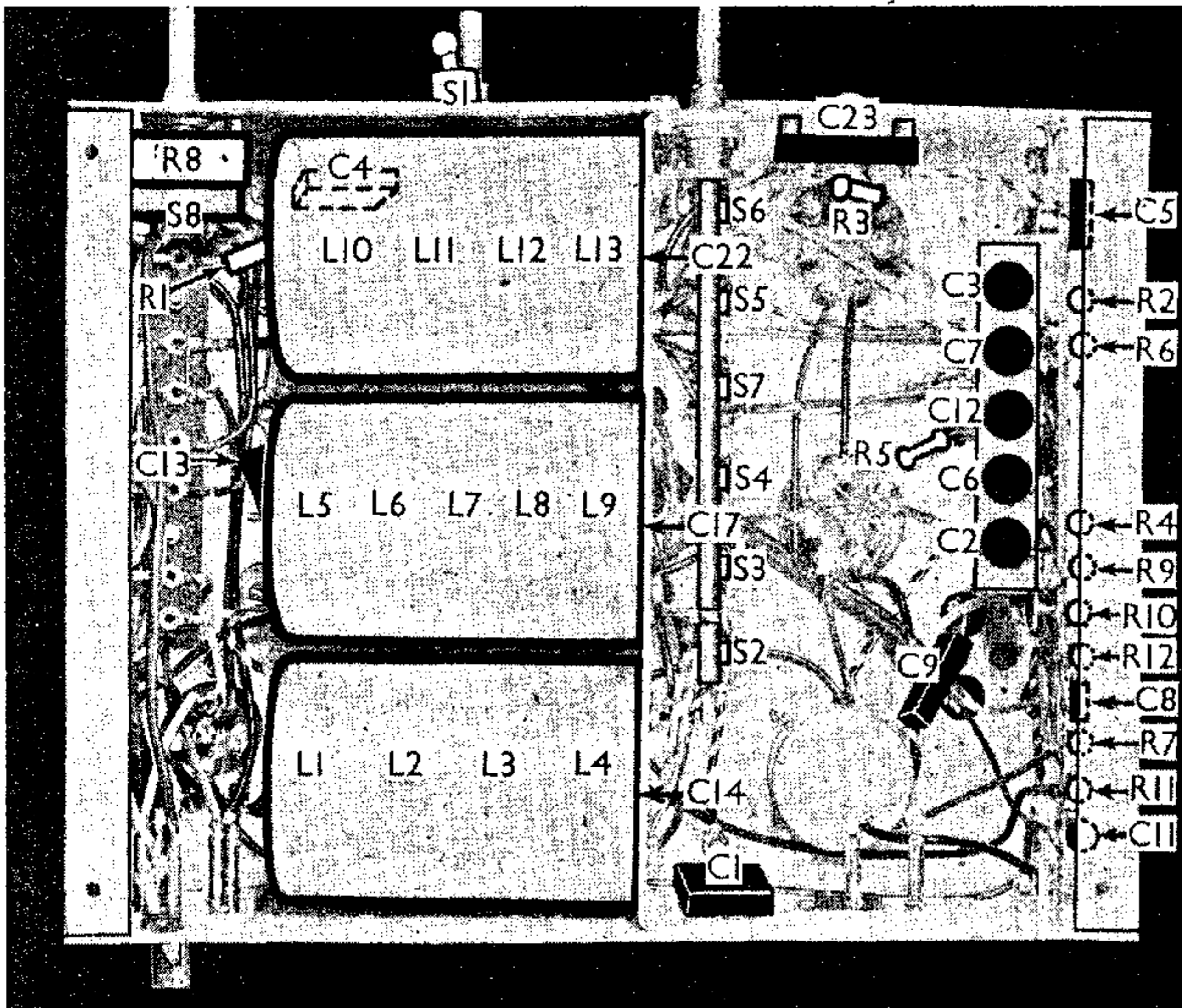
IF Stages.—Connect signal generator leads to control grid (top cap) of V1, via a 0.1 μF condenser, and chassis, feed in a 123 kc/s (2,439 m) signal, and adjust C27, C26, C25 and C24 for maximum output.

RF and Oscillator Stages.—Transfer signal generator leads, via a suitable dummy aerial, to A and E sockets.

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust C21, then C16, for maximum output. Check calibration at 300 m (1,000 kc/s) and 500 m (600 kc/s).

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust C22, then C14, for maximum output. Feed in a 1,800 m (166.5 kc/s) signal, tune it in; and adjust C23 while rocking the gang for optimum results.

Image Suppressor.—Switch set to MW, feed in a strong 300 m (1,000 kc/s) signal, tune in the image at 1,000-246 kc/s (just below 400 m on scale), then adjust L5 (screw at top of L5-L9 can) for minimum output.



Under-chassis view. The three-coil units are mounted horizontally, each with a trimmer on its base, reached through the screen. The image rejector adjustment can be seen at the top of the centre unit.