



'TRADER' SERVICE SHEETS

BUSH SAC21

SUPERHET FOR A.C. MAINS

H.T. current is supplied by full-wave rectifying valve (V5, Mullard IW3). Smoothing by speaker field winding L20 and electrolytic condensers C19, C20.

FOUR receiving valves and a valve rectifier are employed in the Bush SAC21 superhet, which is constructed to operate on A.C. mains of 200-260 V. It incorporates a 3-position switch which operates as a combined tone and inter-station noise suppressor control.

The circuit consists of an octode frequency changer, a variable-mu pentode I.F. amplifier, a separate double diode, and a pentode output valve. Sockets are fitted for a gramophone pick-up and an extension speaker, and there is a plug and socket device for cutting out the internal speaker.

CIRCUIT DESCRIPTION

Aerial input via coupling coils L1, L2 to inductively-coupled band-pass filter. Primary L3, L4 tuned by C21; secondary L7, L8 tuned by C23; coupling coils L5, L6. Image suppression by coil L9 and condenser C1.

First valve (V1, Mullard, metallised FC4) is an octode operating as frequency changer with electron coupling. Oscillator grid coils L10, L11 tuned by C25; anode reaction coils L12, L13; tracking by specially shaped condenser vanes and condensers C6, C28 (L.W.).

Second valve, a variable-mu H.F. pentode (V2, Mullard metallised VP4); operates as intermediate frequency

amplifier with tuned-primary tuned-secondary transformer couplings L14, L15 and L16, L17.

Intermediate frequency 123 KC/S.

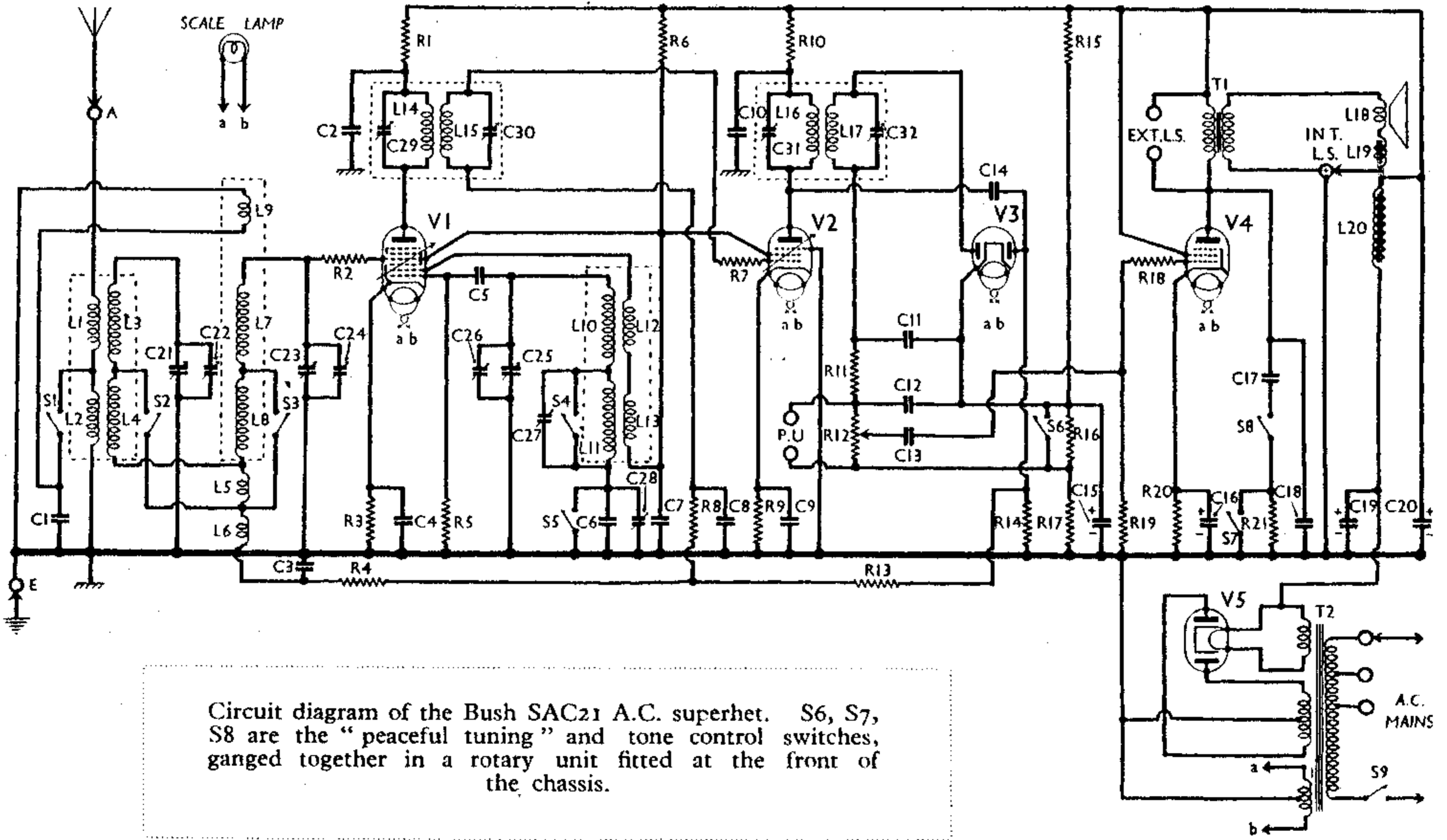
Diode second detector forms part of double diode valve (V3, Mullard metallised 2D4A). Second diode provides D.C. potential which is developed across load resistance R14 and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from potential divider R15, R16, R17 across H.T. supply. The voltage developed across R16 when switch S6 is open is applied as negative bias to the rectifier diode, and thus gives a degree of inter-station noise suppression.

Audio-frequency output from rectifier is developed across manual volume control R12 and passed via coupling condenser C13 and I.F. stopper R18 to control grid of output pentode (V4, Mullard Pen 4VB). Provision for connection of gramophone pick-up across volume control. Tone compensation in anode circuit by R21, C17, C18, which work in conjunction with switches S7, S8. Provision for connection of external high resistance speaker across primary of transformer T1. Plug and socket device enables speech coil circuit of internal speaker to be broken.

COMPONENTS AND VALUES

Condensers	Values (μF)	
C1	Part of image suppression circuit	0.01
C2	V1 anode decoupling	0.1
C3	V1 cont. grid decoupling	0.1
C4	V1 cathode by-pass	0.1
C5	V1 osc. grid condenser	0.0005
C6	Oscillator L.W. tracker	0.001
C7	V1, V2 S.G.'s by-pass; osc. anode decoupling	0.1
C8	V2 cont. grid decoupling	0.1
C9	V2 cathode by-pass	0.1
C10	V2 anode decoupling	0.1
C11	I.F. by-passes	0.0001
C12		
C13	I.F. coupling to V4	0.005
C14	Coupling to V3 A.V.C. diode	0.0001
C15*	V3 cathode by-pass	25.0
C16*	V4 cathode by-pass	25.0
C17	Parts of tone control filter	0.03
C18		
C19*	H.T. smoothing	8.0
C20*		
C21	Band-pass primary tuning	—
C22†	Band-pass primary trimmer	0.00005
C23	Band-pass secondary tuning	—
C24†	Band-pass secondary trimmer	0.00005
C25	Oscillator tuning	—
C26†	Oscillator main trimmer	0.00005
C27†	Oscillator L.W. trimmer	0.000075
C28†	Oscillator L.W. tracker	0.0003
C29†	1st I.F. trans. pri. tuning	0.00015
C30†	1st I.F. trans. sec. tuning	0.00015
C31†	2nd I.F. trans. pri. tuning	0.0003
C32†	2nd I.F. trans. sec. tuning	0.0003

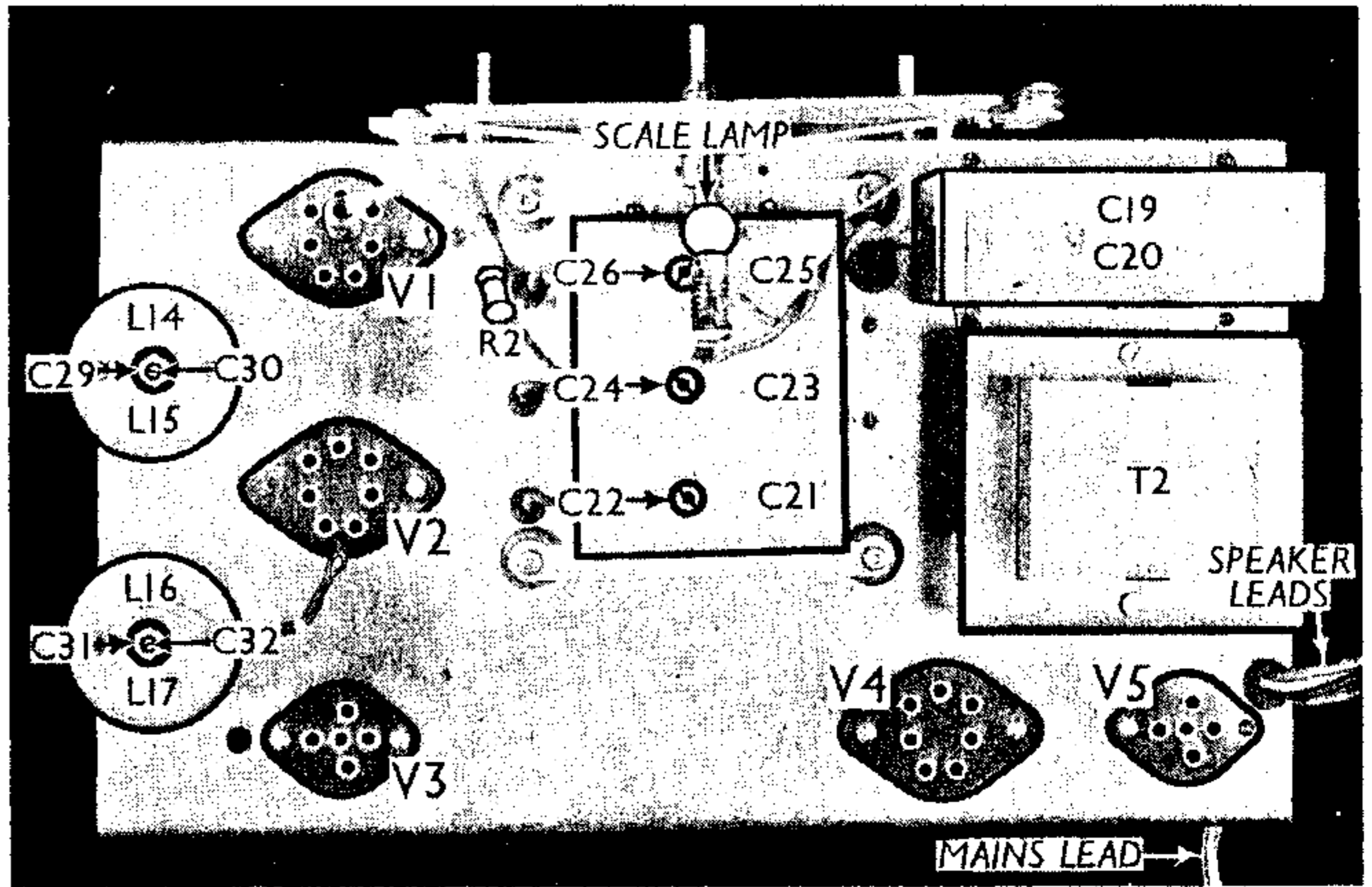
* Electrolytic. † Pre-set.



Circuit diagram of the Bush SAC21 A.C. superhet. S6, S7, S8 are the "peaceful tuning" and tone control switches, ganged together in a rotary unit fitted at the front of the chassis.

Resistances	Values (ohms)
R1	V1 anode decoupling .. 10,000
R2	V1 cont. grid series resistance .. 250
R3	V1 fixed G.B. resistance .. 350
R4	V1 cont. grid decoupling .. 1,000,000
R5	V1 osc. grid resistance .. 30,000
R6	V1 and V2 S.G.'s and osc. anode H.T. feed .. 20,000
R7	V2 cont. grid series resistance .. 250
R8	V2 cont. grid decoupling .. 1,000,000
R9	V2 fixed G.B. resistance .. 250
R10	V2 anode decoupling .. 10,000
R11	I.F. stopper .. 50,000
R12	Manual volume control .. 500,000
R13	A.V.C. circuit decoupling .. 1,000,000
R14	A.V.C. diode load .. 1,000,000
R15	A.V.C. delay voltage potential divider .. 100,000
R16	.. 1,500
R17	.. 10,000
R18	V4 grid I.F. stopper .. 100,000
R19	V4 grid resistance .. 500,000
R20	V4 auto. G.B. resistance .. 150
R21	Part of tone control filter .. 10,000*

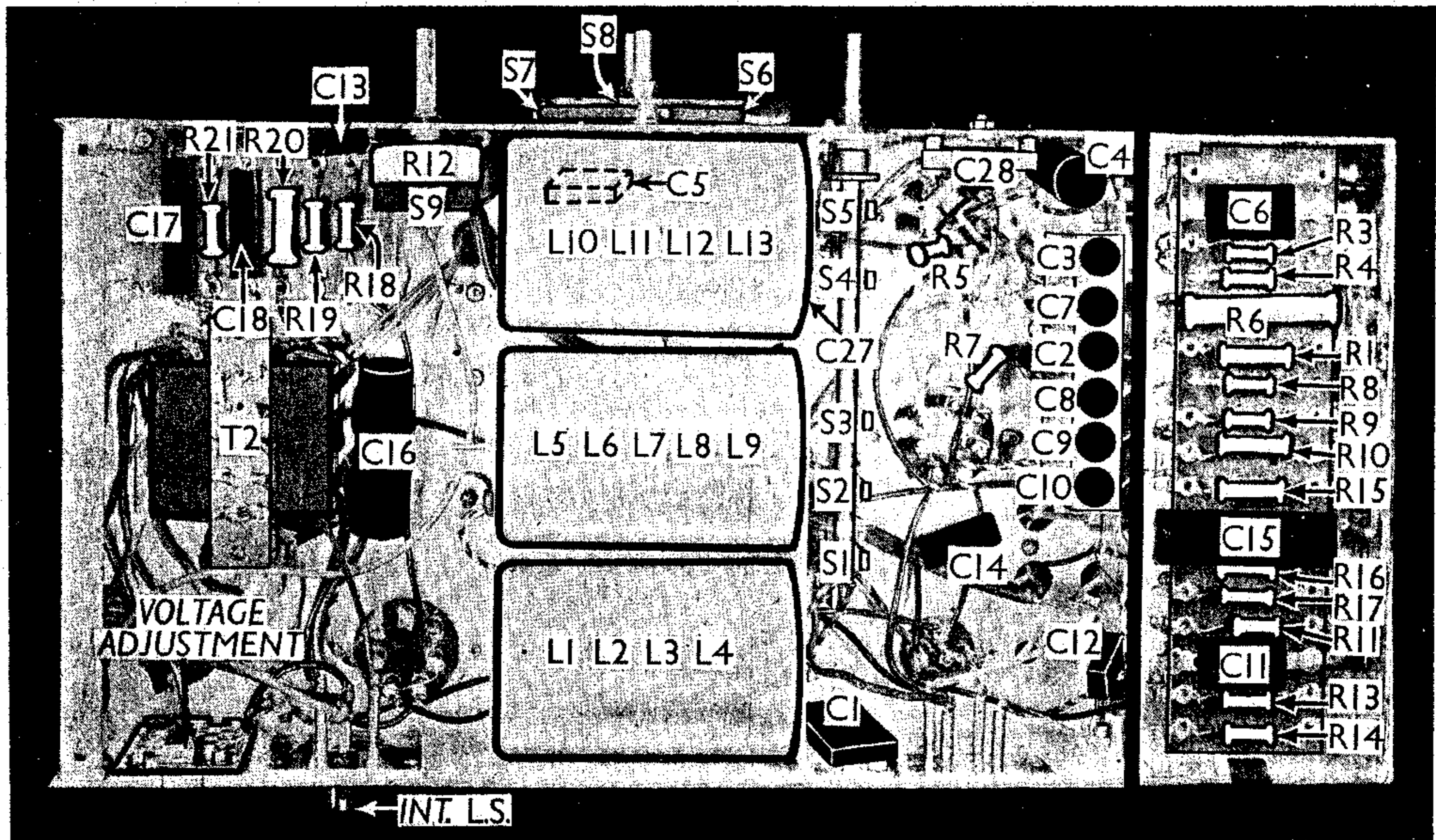
* 20,000 Ω in some early chassis.



Other Components	Values (ohms)
L1	Aerial coupling coils .. 1.5
L2	.. 7.0
L3	Band-pass primary coils .. 3.0
L4	.. 12.0
L5	Band-pass coupling coils .. 3.5
L6	.. 0.5
L7	Band-pass secondary coils .. 3.0
L8	.. 12.0
L9	Image suppression coil .. Very low
L10	Oscillator tuning coils .. 3.5
L11	.. 8.5
L12	Oscillator anode coils .. 3.5
L13	.. 3.5
L14	1st I.F. trans. { Pri. .. 110.0
L15	.. Sec. .. 110.0
L16	2nd I.F. trans. { Pri. .. 60.0
L17	.. Sec. .. 60.0
L18	Speaker speech coil .. 1.75

Other Components (Contd.)	Values (ohms)
L19	Hum neutralising coll. .. 0.2
L20	Speaker field winding .. 2000.0
T1	Speaker input trans. { Pri. .. 600.0
	.. Sec. .. 0.35
	.. Pri. total .. 25.0
T2	Mains trans. { Heater sec. .. 0.05
	.. Rect. heat. sec. .. 0.1
	.. H.T. sec. .. 600.0
S1-S5	Waveband switches ..
S6	Interstation noise suppressor switch ..
S7, S8	Tone control switches ..
S9	Mains switch (ganged R12) ..

DISMANTLING THE SET
 A detachable bottom is fitted to the cabinet, and by removing it (eight round-head wood screws) access can be gained to most of the components under the chassis.
Removing Chassis.—Should it be necessary to remove the chassis from the cabinet, remove the back and the four control knobs (recessed grub screws). Free the speaker leads from the two clips on the side of the cabinet and remove the four chassis fixing bolts (with *(Continued overleaf)*)



Under-chassis view. The strip at the right shows the components on the right-hand side of the paxolin panel. C5 is inside the top screening can. The positions of S6, S7 and S8 are roughly indicated.

BUSH SAC21 (continued)

large metal washers), the heads of which are underneath the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is adequate for normal purposes.

To remove the chassis entirely, unsolder the leads from the speaker terminal panel, when the chassis can be withdrawn. When replacing, the following is the code to follow, numbering the tags from top to bottom:—1 and 2 joined together, red; 3, black; 4, brown; 5, yellow; 6, blue.

Removing Speaker.—To remove the speaker, remove the nuts and washers from the four bolts holding the speaker to the sub-baffle. By tilting it so that the bottom comes out first, it can then be freed.

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured with the receiver operating on A.C. mains of 225 V, with no aerial connected, the volume control at maximum and the tuning condenser at maximum, the wave-change switch being in the L.W. position. The "Peaceful Tuning" switch was in position 1.

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

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 FC4*	220	2.3	80	4.2
V2 VP4	195	4.0	80	1.6
V3 2D4A	—	—	—	—
V4 Pen4VB	210	36.0	240	4.0
V5 1W3	305†	—	—	—

* Osc. anode (G2) 85 V, 2.2 mA.

† Each anode, A.C.

GENERAL NOTES

Switches.—The wavechange switches, **S1-S5**, are in a single unit, seen in the under-chassis view, where they are clearly indicated. They are all *closed* on the M.W. band, and *open* on the L.W. band.

S6, S7 and **S8** are the "peaceful tuning" and tone control switches, ganged in a unit fitted to the front of the chassis. Their positions are indicated roughly in the under-chassis view. In each position of the control knob, only one of the switches opens. In position 1, **S8** opens; position 2, **S7** opens; position 3, **S6** opens.

In case of trouble with these switches, make sure that the paxolin panel carrying them has not warped, causing one or other of the switches to be shorted to chassis.

S9 is the Q.M.B. mains switch, ganged with the volume control **R12**.

Coils.—These are in five screened units. The signal frequency and oscillator units are beneath the chassis. The central one, containing the band-pass coils **L5-L8**, also includes **L9**, the image

suppression coil, the coupling of which is adjustable by means of the nut on the screwed rod projecting through the top of the screen. The oscillator unit also contains the fixed condenser **C5** and the L.W. trimmer **C27**. The latter is adjustable through a hole in the metal partition carrying the coils.

The screens of these units are held by bayonet catches, which are punched at the works to prevent unauthorised removal of the screens. The insertion of a thin screwdriver as a lever will be sufficient to permit the screens to be rotated and pulled off. The oscillator coil screen can only be taken off after the volume control and switch have been temporarily removed from the front of the chassis to provide clearance.

The I.F. coils are on top of the chassis, and the screens are easily removable by undoing the nuts (with washers) on the screws projecting through the tops of the screens. The trimmers are of the dual

type, with hexagonal nuts operating the primary trimmers, and central grub screws operating the secondary trimmers.

Scale Lamp.—This is an Osram M.E.S. type, rated at 6.2 V, 0.3 A.

External Speaker.—This should be of the high resistance type (6,000-8,000 Ω), and should be plugged into the sockets provided at the rear of the chassis. The internal speaker can be silenced by unplugging the plug from the "Int. L.S." socket at the rear of the chassis. This should not be done until the external speaker has been connected up.

Condensers C19, C20.—These are two 8 μ F dry electrolytics in a single unit mounted on top of the chassis. They have a common negative (black) lead, and separate positives (red).

Condenser C28.—This trimmer, at the front of the chassis, is a single unit, though it is fitted with the dual type of adjustment. Actually, it is the hexagonal nut alone which adjusts the condenser.