

L8 (L.W.) are tuned by C33. Parallel trimming by C34 (S.W.), C35 (M.W.) and C14, C16 (L.W.); series tracking by C13 (M.W.) and C15 (L.W.), although tracking adjustments are made by iron-dust cores. Reaction coupling is via L9 on S.W. and L10 on M.W., but on L.W. it is via the common impedance of C15.

Second valve (V2, Mullard UBF80) is a variable-mu R.F. pentode with two diodes. The pentode

(Continued in col. 1 overleaf)

### COMPONENTS AND VALUES

CAPACITORS		Values	Locations
C1	} Chassis isolators ...	0.001μF	G4
C2		0.01μF	G4
C3	L.W. aerial shunt ...	600pF	G4
C4	L.W. aerial trim ...	85pF	G4
C5	V1 C.G. ...	100pF	F4
C6	} 1st I.F. trans. ...	110pF	A2
C7		tuning ...	110pF
C8	} P.U. isolators ...	0.005μF	F4
C9		0.01μF	G4
C10	P.U. tone corrector	0.002μF	F4
C11	V1 osc. C.G. ...	56pF	F3
C12	A.G.C. decoupling	0.05μF	F4
C13	M.W. osc. tracker	515pF	G3
C14	L.W. osc. trim. ...	33pF	G3
C15	L.W. osc. tracker	365pF	G3
C16	L.W. osc. trim. ...	240pF	G3
C17	} Oscillator couplers	0.001μF	F3
C18		56pF	G3
C19	S.G. decoupling ...	0.05μF	F3
C20	} 2nd I.F. trans. ...	110pF	B2
C21		tuning ...	110pF
C22	} I.F. by-passes ...	100pF	F4
C23		100pF	E4
C24	A.F. coupling ...	0.002μF	E4
C25	Tone corrector ...	0.01μF	E3
C26*	} V3 cath. by-pass ...	50μF	E3
C27*		50μF	B1
C28*	} H.T. smoothing ...	50μF	B1
C29		0.01μF	B1
C30†	Mains R.F. by-pass	120pF	G4
C31†	S.W. aerial trim. ...	40pF	G4
C32†	M.W. aerial trim. ...	40pF	G4
C33†	Aerial tuning	528pF	A2
C34†	Oscillator tuning ...	528pF	A2
C35†	S.W. osc. trim. ...	120pF	G3
	M.W. osc. trim. ...	40pF	G3

RESISTORS		Values	Locations
R1	Aerial shunt	1MΩ	G4
R2	V1 C.G. ...	680kΩ	F4
R3	V1 G.B. ...	330Ω	G4
R4	P.U. shunt	680kΩ	F4
R5	V1 osc. C.G. ...	47kΩ	G3
R6	Osc. anode feed ...	10kΩ	F3
R7	Osc. stabilizer ...	100Ω	F3
R8	S.G. H.T. feed ...	27kΩ	
R9	A.G.C. decoupling	1.5MΩ	F3
R10	I.F. stopper	47kΩ	F4
R11	} Part A.G.C. delay	20MΩ	F3
R12		bias pot. divider	680kΩ
R13	Diode load	330kΩ	E4
R14	Volume control	500kΩ	D3
R15	V3 C.G. stopper ...	47kΩ	E3
R16	V3 G.B. ...	180Ω	E3
R17	H.T. smoothing ...	1kΩ	E4
R18	V4 surge limiter ...	250Ω	C2
R19	Heater ballast	*1.43kΩ	C2
R20	Scale lamp shunt ...	75Ω	E4

\* Tapped at 1,030Ω + 200Ω + 200Ω from V4 heater.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	} Aerial coupling coils	0.5	G4
L2		50.0	G4
L3	} Aerial tuning coils	—	G4
L4		7.0	G4
L5	} Osc. tuning coils ...	20.0	G4
L6		—	G3
L7	} Osc. reaction coils ...	5.0	G3
L8		5.0	G3
L9	} 1st I.F. trans. {Pri. ...	0.5	G3
L10		1.0	G3
L11	} 2nd I.F. trans. {Sec. ...	12.5	A2
L12		12.5	A2
L13	} 2nd I.F. trans. {Pri., total	12.5	B2
L14		12.5	B2
L15	Speech coil ...	2.3	C2
L16	} Mains R.F. chokes	3.0	C2
L17		3.0	C2
T1	O.P. trans. {Pri. ...	410.0	A1
	{Sec. ...	—	C2
S1-S22	Waveband switches	—	G3
S23	} Mains sw., g'd R14 ...	—	D3
S24		—	D3

DESIGNED for operation from A.C. or D.C. mains of 200-250 V, 40-100 c/s in the case of A.C., the Bush DAC31 is a 3-valve (plus rectifier) 3-band superhet using an 8in speaker in a table cabinet. It is the A.C./D.C. version of the model AC31, which operates from A.C. mains only and is covered separately in *Service Sheet 1066*. Like the AC31, it uses the frequency changer triode as a pick-up pre-amplifier, but the sockets are isolated from the chassis.

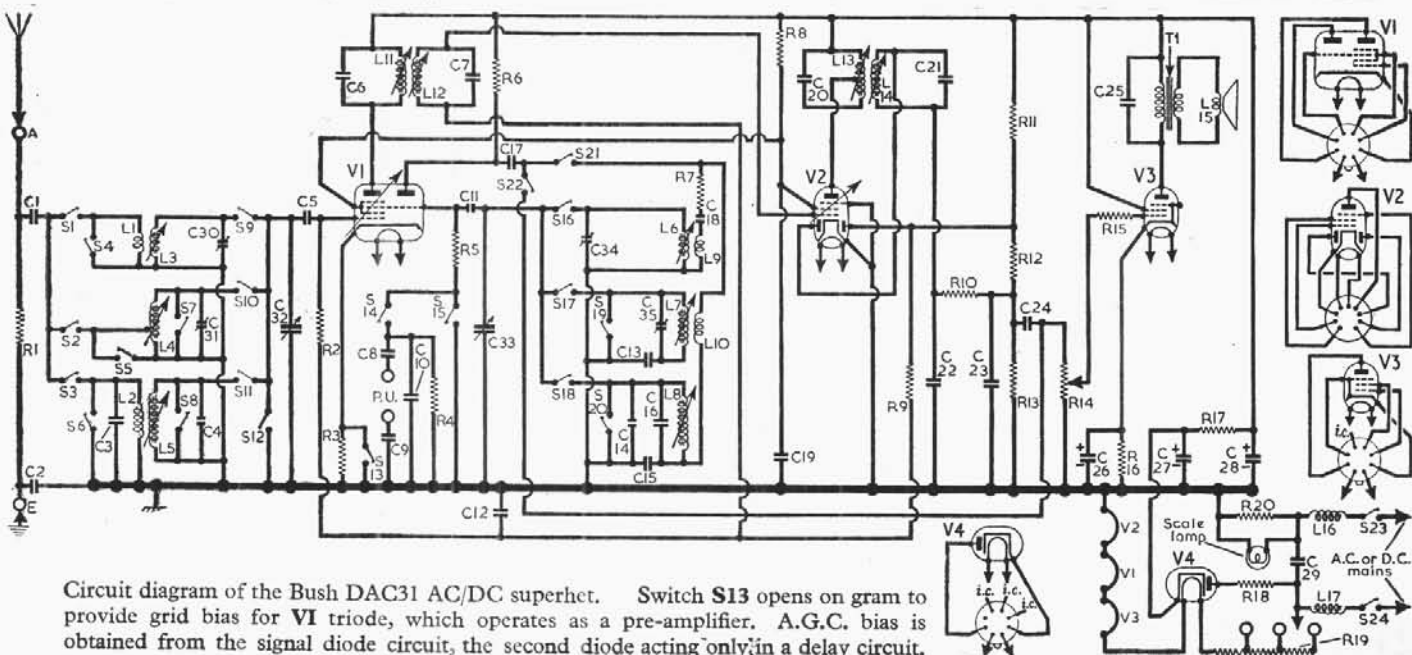
Release date and original price: April 1952, £16 1s 2d. Purchase tax extra.

### CIRCUIT DESCRIPTION

Aerial input via coupling coils L1 (S.W.) and L2 (L.W.) to single-tuned circuits L3, C32 (S.W.), L4, C32 (M.W.) and L5, C32 (L.W.). Aerial coupling on M.W. is via a tapping on the tuning coil L4. A triode hexode valve (V1, Mullard UCH42) operates as frequency changer with internal coupling. C1 and C2 isolate the A and E sockets from the chassis, which is "live" to the mains.

Oscillator grid coils L6 (S.W.), L7 (M.W.) and

\* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Bush DAC31 AC/DC superhet. Switch S13 opens on gram to provide grid bias for V1 triode, which operates as a pre-amplifier. A.G.C. bias is obtained from the signal diode circuit, the second diode acting only in a delay circuit.



**Circuit Description—continued**  
operates as intermediate frequency amplifier with tuned transformer couplings C6, L11, L12, C7 and C20, L13, L14, C21.

**Intermediate frequency 470 kc/s.**  
One of the diodes of V2 operates as a signal detector, and the audio frequency component in the rectified output is developed across load resistor R13. It passes via C24, volume control R14 and grid stopper R15 to control grid of pentode output valve (V3, Mullard U141). I.F. filtering by C22, R10, C23. For operation with a gramophone pick-up, the triode section of V1 acts as an A.F. pre-amplifier. The pick-up input, which is shunted by C10, R4 and isolated from the chassis by C8, C9, is connected via S14 to the triode grid and the amplified output developed across R6 is connected via C17 and S22 to the top of R14 and passed on to the output valve. S13 opens for gram, applying G.B. to V1

The potential developed across R13 is fed back via R12 and decoupling circuits to V1 and V2, giving automatic gain control, but with a delayed action. R11, R12 and R13 form an H.T. potential divider from which a positive potential is applied to the second diode of V2, maintaining it in a conductive condition in the absence of a signal and thus holding the A.G.C. line down to cathode (chassis) potential.

When the signal strength rises sufficiently, the negative D.C. potential developed across R13 neutralizes the positive bias on the diode, and it ceases to conduct. After that, the diode becomes more negative with increased signal strength and carries with it the A.G.C. line, via R9.

H.T. current is supplied by L.H.C. half-wave rectifying valve (V4, Mullard UY41). Smoothing by R17 and electrolytic capacitors C27 and C28. The valve heaters, together with ballast resistor R19, scale lamp with shunt R20 and R.F. chokes L16, L17, are connected in series across the mains input, R18 protects the rectifier, and R20 the scale lamp, from current surges. Mains R.F. filtering by C29, L16 and L17.

### GENERAL NOTES

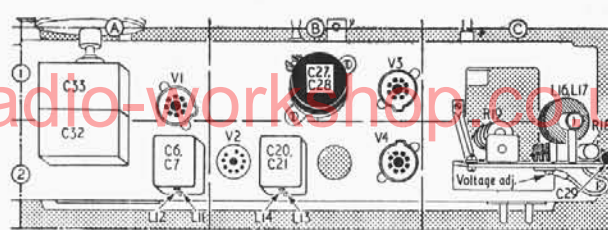
**Switches.**—S1-S22 are the waveband and radiogram change-over switches, gauged in two rotary units beneath the chassis. These are indicated in our underside view of the chassis, and shown in detail in the diagrams inset beside the plan view drawing, where they are viewed in the directions of the arrows in the underside drawing. The table below the diagrams gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and C, closed.

**Scale Lamp.**—This has a large clear spherical bulb and an M.E.S. base, and is rated at 3.5 V, 0.15 A.

**Gram P.U.**—The makers recommend a pick-up of the crystal type, although a magnetic pick-up can be used. They suggest an Acos type GP19. The lower P.U. socket is returned via C9 to chassis.

**Drive Cord Replacement.**—Forty inches of nylon braided glass yarn is required for a new tuning drive cord, this length allowing plenty for tying off. The cord should be run as shown in the accompanying sketch, where it is drawn as seen from the front of the chassis. The pointer coupler can be fitted afterwards, but its position must be adjusted as explained under "Circuit Alignment" with the chassis in the cabinet.

The cord is terminated at both ends in a

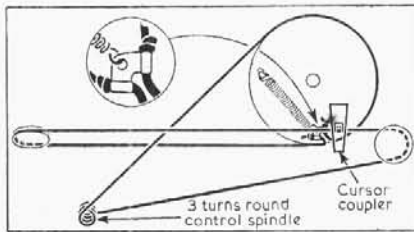


small metal plate, and can be made up in advance and fitted afterwards. The makers give the exact circular length of the cord after clamping its ends in the plate as 36in.

### CIRCUIT ALIGNMENT

Remove chassis from cabinet and stand it in its normal position on the bench. All the I.F. adjustments are then accessible from the rear of the receiver, and the R.F. and oscillator adjustments from one end of it. Before commencing alignment, the receiver and the signal generator should be switched on and allowed to warm up for about ten minutes.

**I.F. Stages.**—Turn gang to maximum capacitance and connect output of signal generator via an 0.01μF capacitor in the "live" lead to anode (pin 6) of V2 and chassis. Switch receiver to M.W., feed in a 470 kc/s (638.8 m) signal, and adjust the cores of L14 (location reference B2)



Sketch of the drive cord system.

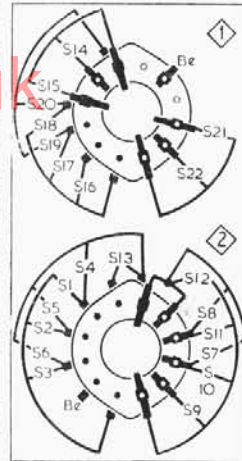
and L13 (B2) for maximum output. Transfer signal generator "live" lead to control grid (pin 6) of V1, and adjust the cores of L12 (A2) and L11 (A2) for maximum output, decreasing the input as the circuits come into line to avoid A.G.C. action.

**R.F. and Oscillator Stages.**—As the tuning scale remains fixed to the cabinet when the chassis is withdrawn, reference is made in the following alignment to the substitute tuning scale fixed to the back of the tuning drive drum. This scale has the trimming and tracking points marked on it in wavelengths, and is read off against the top sloping edge of the thick metal pointer. Check that with the gang at maximum capacitance, the pointer coincides with the datum line on the substitute scale. When the chassis is finally replaced in its cabinet, check that with the gang at maximum capacitance, the cursor coincides with the two dots at the high-wavelength ends of the S.W. and L.W. tuning scales. A dummy aerial, consisting of a 200 pF capacitor, should be connected in series with the "live" signal generator lead for M.W. and L.W., and a 400 Ω non-inductive resistor for S.W. Con-

Above: Plan view of the chassis.

Right: Waveband switch diagrams.

Below: Waveband switch table.



Switch	S.W.	M.W.	L.W.	Gram.
S1	C	—	—	—
S2	—	C	—	—
S3	—	—	C	—
S4	—	C	C	C
S5	—	—	C	C
S6	—	—	—	C
S7	—	—	—	—
S8	C	C	—	—
S9	C	—	—	—
S10	—	C	—	—
S11	—	—	C	—
S12	—	—	—	C
S13	C	C	C	—
S14	—	—	C	C
S15	C	C	C	—
S16	C	—	—	—
S17	—	C	—	—
S18	—	—	C	—
S19	C	C	—	—
S20	—	C	—	—
S21	—	C	—	—
S22	—	—	C	C

nect output of signal generator, via dummy aerial, to A and E sockets.

**L.W.**—Switch receiver to L.W., tune to 1,400 m on substitute scale, feed in a 1,400 m (214 kc/s) signal and adjust the cores of L8 (G3) and L5 (G4) for maximum output. Check calibration over band.

**M.W.**—Switch receiver to M.W., tune to 500 m, feed in a 500 m (600 kc/s) signal and adjust the cores of L7 (G3) and L4 (G4) for maximum output. Tune receiver to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust C35 (G3) and C31 (G4) for maximum output. Repeat these adjustments until no further improvement results.

**S.W.**—Switch receiver to S.W., tune to 30 m, feed in a 30 m (10 Mc/s) signal and adjust the cores of L6 (G3) and L3 (G4) for maximum output. Tune receiver to 15 m, feed in a 15 m (20 Mc/s) signal and adjust C34 (G3) and C30 (G3) for maximum output. Repeat these adjustments until no further improvement results.

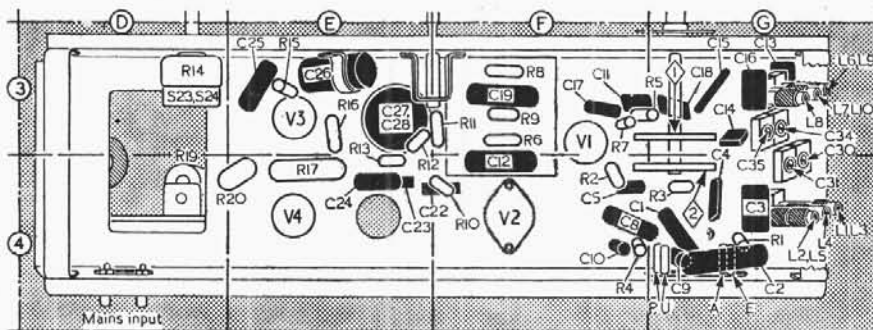
### VALVE ANALYSIS

Valve voltages and currents given in the table below are derived from the makers' service manual. Their receivers were operating from mains of 230 V, 50 c/s, and were switched to the M.W. band, but there was no signal input. H.T. voltages were measured in the 1,000 V range of a Model 7 Avometer, but for V4 cathode voltage the 10 V range was used. Chassis was the negative connection in all cases.

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 UCH42	140	1.5	50	2.1	—
V2 UBF80		100			
		100			
V3 UL41	140	3.4	50	1.2	—
V4 UY41	130	36.0	140	7.0	7.7*
	210†	—	—	—	—

† A.C. reading.

\* Cathode current 55 mA



Underside view of the chassis. 1 and 2 in diamonds indicate the switch units.