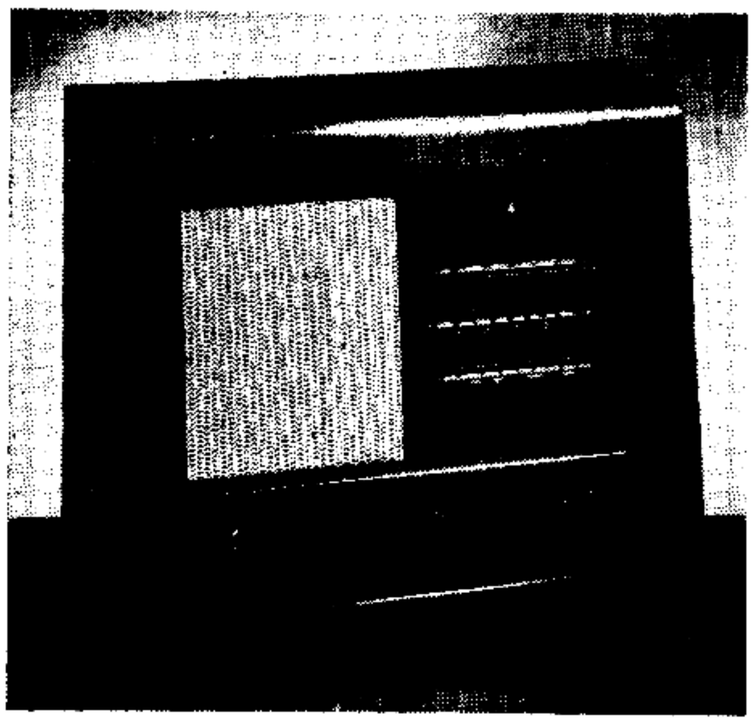
*Supplement to Wireless & Electrical Trader, November 8, 1952*





# BUSH DAC31



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 **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

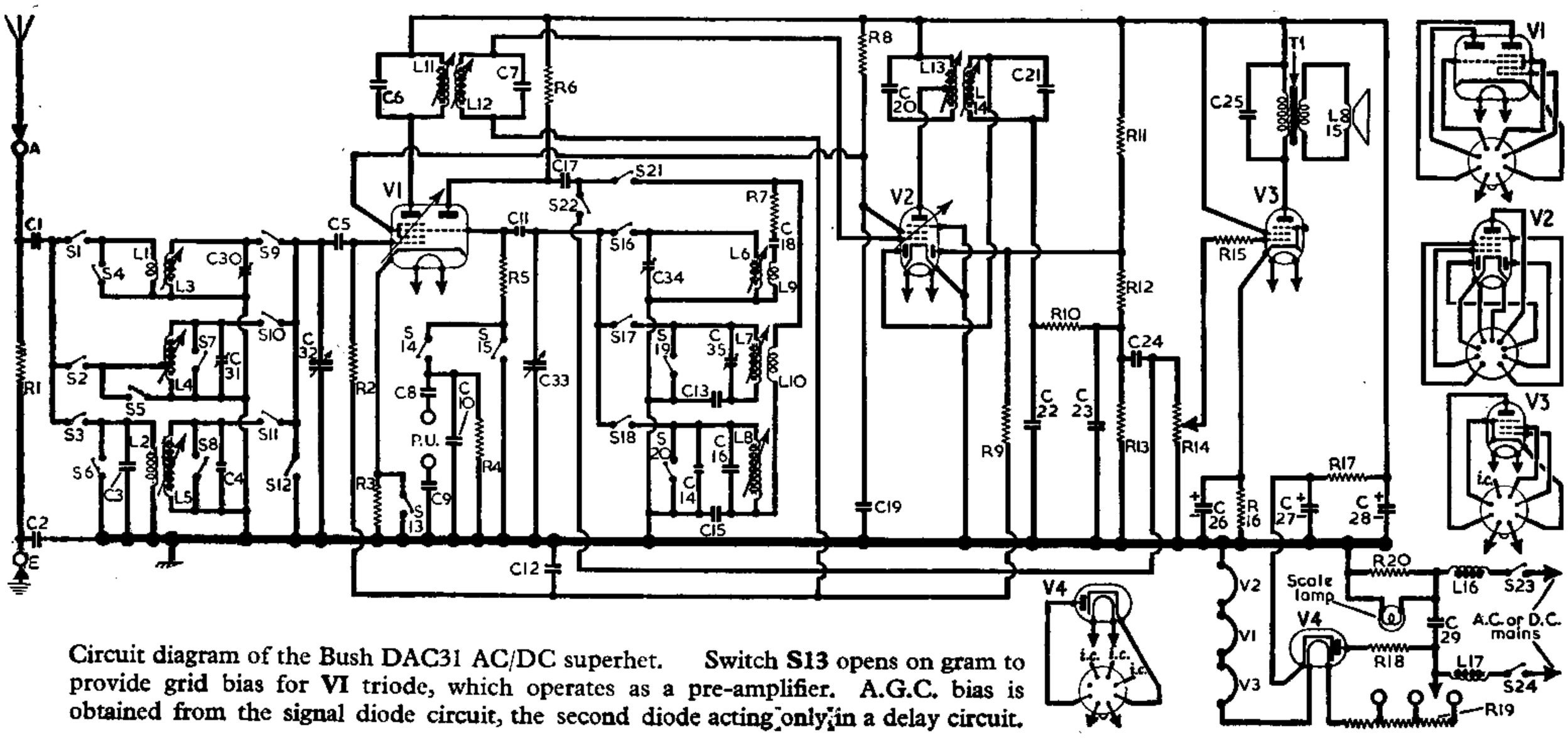
| | CAPACITORS | Values | Locations |
|---|---|---|---|
| C1, C2 | Chassis isolators | 0·001μF, 0·01μF | G4 |
| C3 | L.W. aerial shunt | 600pF | G4 |
| C4 | L.W. aerial trim. | 85pF | G4 |
| C5 | V1 C.G. | 100pF | F4 |
| C6, C7 | 1st I.F. trans. tuning | 110pF, 110pF | A2 |
| C8, C9 | P.U. isolators | 0·005μF, 0·01μF | F4, 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, C18 | Oscillator couplers | 0·001μF, 56pF | F3, G3 |
| C19 | S.G. decoupling | 0·05μF | F3 |
| C20, C21 | 2nd I.F. trans. tuning | 110pF, 110pF | B2 |
| C22, C23 | I.F. by-passes | 100pF, 100pF | F4, E4 |
| C24 | A.F. coupling | 0·002μF | E4 |
| C25 | Tone corrector | 0·01μF | E3 |
| C26* | V3 cath. by-pass | 50μF | E3 |
| C27*, C28* | H.T. smoothing | 50μF, 50μF | B1 |
| C29 | Mains R.F. by-pass | 0·01μF | C2 |
| C30‡ | S.W. aerial trim. | 120pF | G4 |
| C31‡ | M.W. aerial trim. | 40pF | G4 |
| C32† | Aerial tuning | 528pF | A2 |
| C33†‡ | Oscillator tuning | 528pF | A1 |
| C34‡ | S.W. osc. trim. | 120pF | G3 |
| C35‡ | 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, R12 | Part A.G.C. delay / bias pot. divider | 20MΩ / 680kΩ | F3 / E3 |
| 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, L2 | Aerial coupling coils | 0·5, 50·0 | G4 |
| L3, L4, L5 | Aerial tuning coils | —, 7·0, 20·0 | G4 |
| L6, L7, L8 | Osc. tuning coils | —, 5·0, 5·0 | G3 |
| L9, L10 | Osc. reaction coils | 0·5, 1·0 | G3 |
| L11, L12 | 1st I.F. trans. Pri., Sec. | 12·5, 12·5 | A2 |
| L13, L14 | 2nd I.F. trans. Pri., total, Sec. | 12·5 | B2 |
| L15 | Speech coil | 2·3 | — |
| L16, L17 | Mains R.F. chokes | 3·0, 3·0 | C2 |
| T1 | O.P. trans. Pri., Sec. | 410·0, — | — |
| S1-S22 | Waveband switches | — | G3 |
| S23, S24 | Mains sw., g'd R14 | — | D3 |

* 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 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 UL41).** 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 A.F. 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 I.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

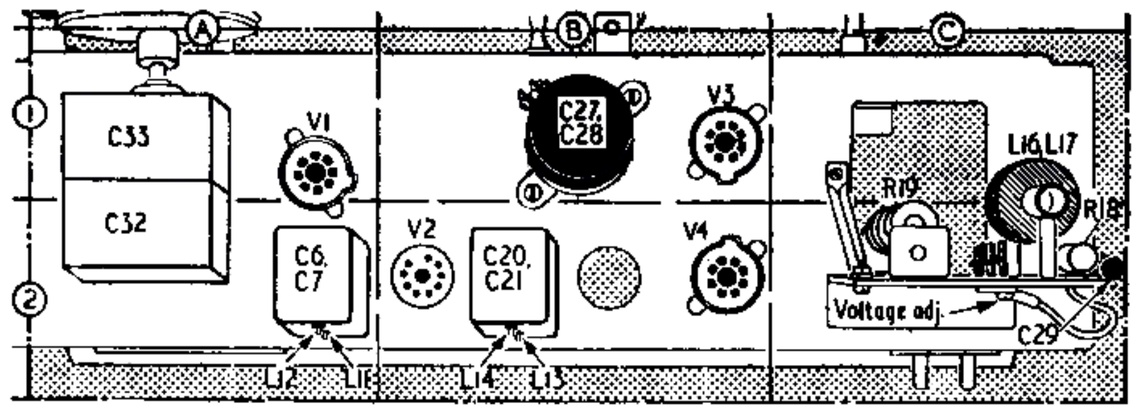
**Switches.—S1-S22** are the waveband and radiogram change-over switches, ganged in two rotary units beneath the chassis. These are indicated in our underside view of the chassis, and shown in detail in the diagrams inset beside the plan view drawing, where they are viewed in the directions of the arrows 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.

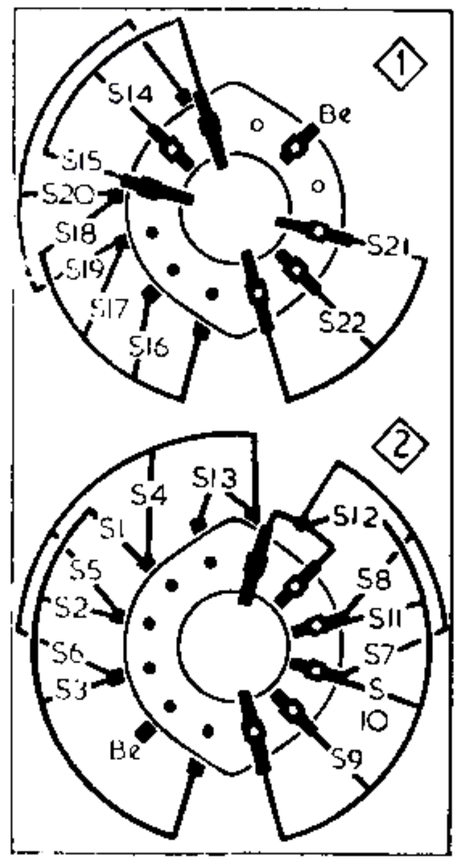
The cord is terminated at both ends in a small metal plate, and can be made up in advance and fitted afterwards. The makers give the exact circular length of the cord after clamping its ends in the plate as 36⅝in.




*Above:* Plan view of the chassis.

*Right:* Waveband switch diagrams.

*Below:* Waveband switch table.

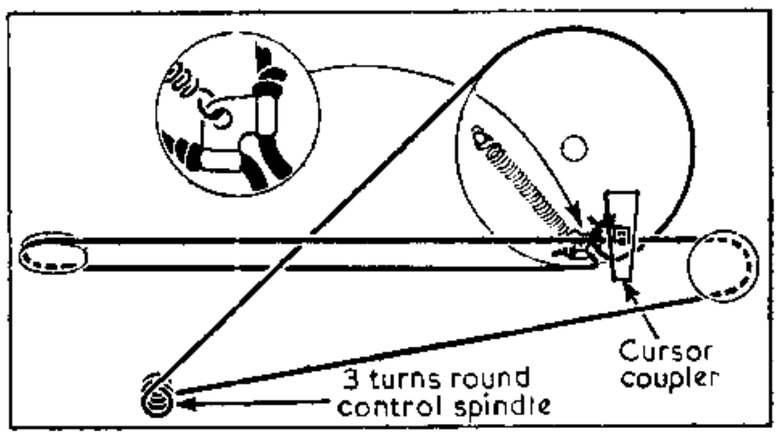



| Switch | S.W. | M.W. | L.W. | Gram. |
|---|---|---|---|---|
| S1 | C | — | — | — |
| S2 | — | C | — | — |
| S3 | — | — | C | — |
| S4 | — | C | C | C |
| S5 | — | — | C | C |
| S6 | — | — | — | C |
| S7 | C | — | — | — |
| S8 | C | C | — | — |
| S9 | C | — | — | — |
| S10 | — | C | — | — |
| S11 |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

## 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) 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.




Sketch of the drive cord system.

**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. Connect 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.

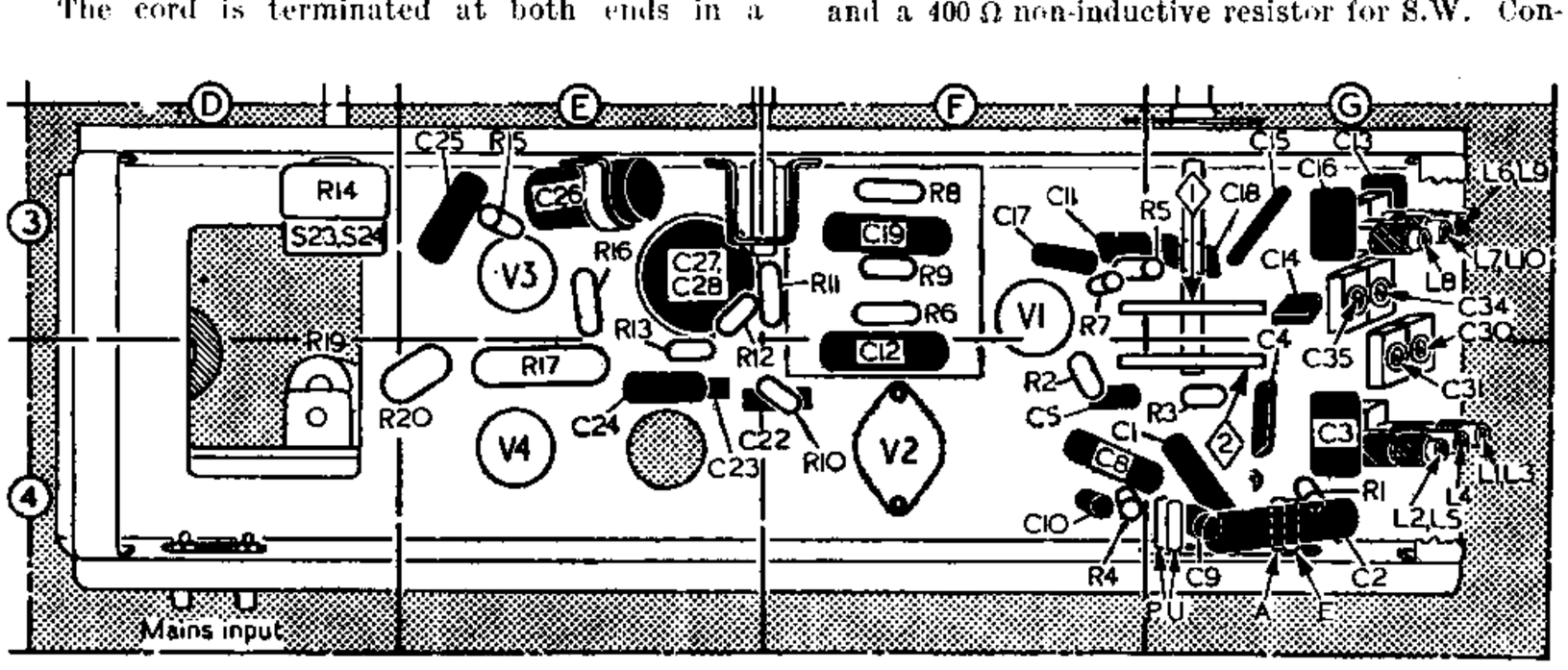
**S.W.**—Switch receiver to S.W., tune to 30 m, feed in a 30 m (10 Mc/s) signal and adjust the cores of **L6** (G3) and **L3** (G4) for maximum output. Tune receiver to 15 m, feed in a 15 m (20 Mc/s) signal and adjust **C34** (G3) and **C30** (G3) for maximum output. Repeat these adjustments until no 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 / Oscillator / 100 | 1·5 / — / 3·8 | 50 | 2·1 | — |
| V2 | UBF80 | 140 | 3·4 | 50 | 1·2 | — |
| V3 | UL41 | 130 | 36·0 | 140 | 7·0 | 7·7 |
| V4 | UY41 | 210† | — | — | — | * |

† A.C. reading. * Cathode current 55 mA




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

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