"TRADER" SERVICE SHEET

1474

BUSH VHF80

A.M./F.M. Table Receiver for A.C. or D.C. Mains Operation

THE Bush VHF80 is a 6-valve (plus rectifier) 3-band A.M./F.M. receiver housed in a two-tone plastics cabinet and designed for use on A.C. or D.C. mains of 200-250V (40-100 c/s A.C.). Power consumption is 45W. It is fitted with internal A.M. and F.M. aerials, and a socket is provided for the connection of an external F.M. aerial. The tuning ranges are 187-560m (M.W.), 1,050-1,935m (L.W.) and 87.5-100Mc/s (F.M.).

Release date and original price: February 1960, £15 17*s* 2*d*. *Purchase tax extra.*

Valve Table

Valve		Anode (V)	Screen (V)	Cath. (V)
V1a UCC85	†	152[1]	—	0·9
V1b UCC85	†	152[1]	—	—
V2 UF89	†	75	68	—
	*	80	72	—
V3a UCH81	*	92	—	1·0
V3b UCH81	†	145	70	1·0
	*	158	70	1·0
V4 UF89	†	142	81	—
	*	158	88	—
V5c UABC80	†	55	—	—
	*	58	—	—
V6 UL84	†	188	104	6·9
	*	193	112	7·4
V7 UY85	†	200[2]	—	206·0
	*	229[2]	—	213·0

†*Receiver on F.M.* **Receiver on A.M.*
[1]*Measured at junction of R3, R5.* [2]*A.C. reading.*

VALVE ANALYSIS

Valve voltages given in the table (col. 1) are those derived from the manufacturers' service manual. They were measured on the 10V and 1,000V ranges of a model 8 Avometer, chassis being the negative connection in every case.

CIRCUIT DESCRIPTION

Balanced aerial input on F.M. via **C1, C2** and **L1, L2** to earthed grid triode R.F. amplifier **V1a**. Tuned-anode coupling by **L3** and associated capacitances to triode self-oscillating mixer valve **V1b,** which operates as frequency changer, via centre-point oscillator tuning circuit at the junction of **C7** and **C8**.

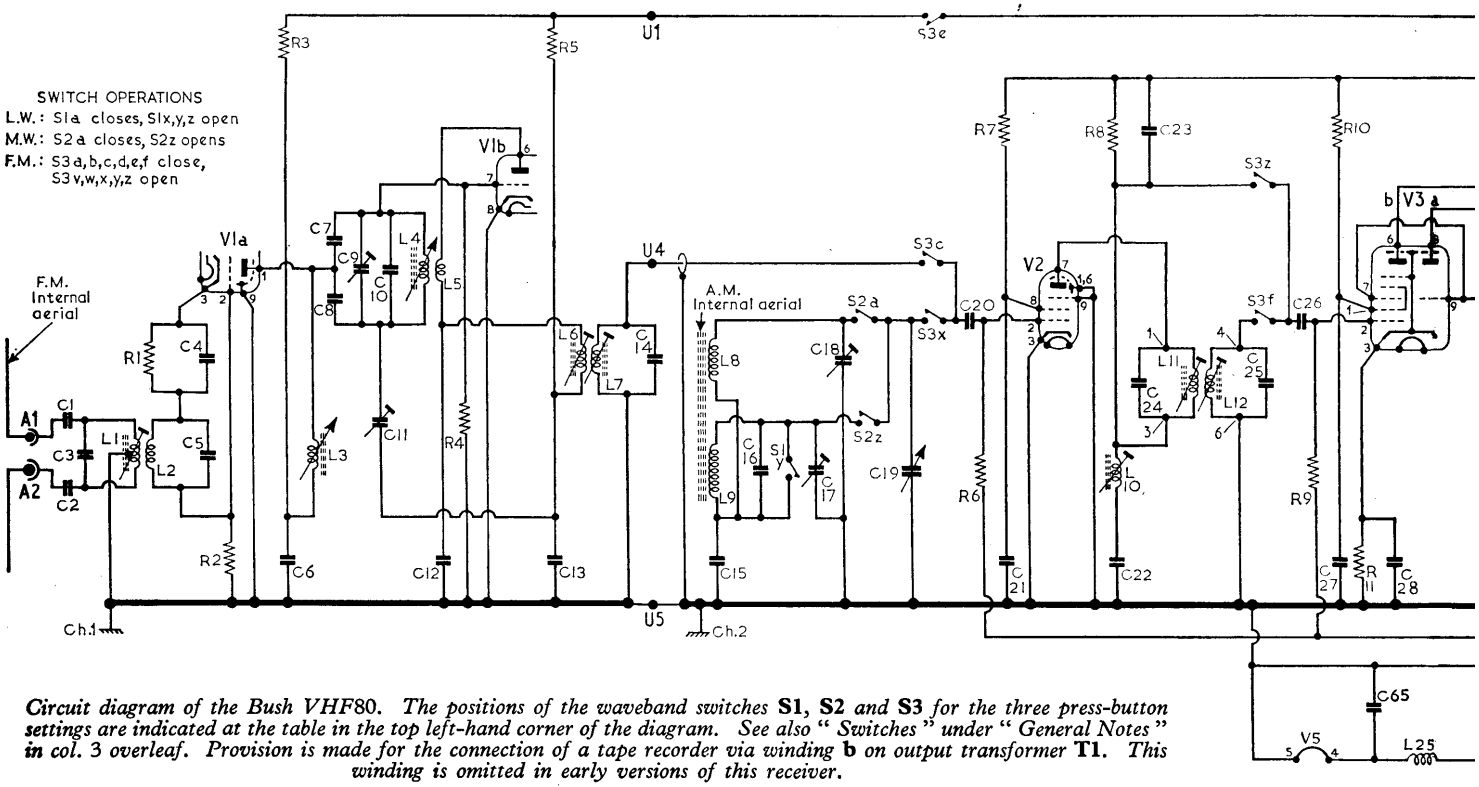
Oscillator voltage of tuned circuit **L4, C9,** etc., should be zero at the junction of **C7, C8** if the bridge circuit is properly balanced, preventing oscillator voltages from reaching **V1** and leaking through to the aerial circuit. Bridge circuit balancing is adjusted by **C11** in association with **C10** and the cores of **L3** and **L4,** but these are set accurately at the works and should not require readjustment. Stability is achieved by decoupling grid and anode circuits via **C13.**

Intermediate frequency at 10.7 Mc/s is extracted at **V1b** anode circuit by the I.F. transformer **L6, L7** and passed via **S3c** and **C20** to pentode first I.F. amplifier **V2,** and then via **L11, L12** and **S3f, C26** to heptode section **b** of **V3,** which operates as second I.F. amplifier, which is coupled in turn via **L15, L16** to pentode third I.F. amplifier **V4,** and thus to discriminator circuit comprising **L19, L20** and **V5a, V5b.**

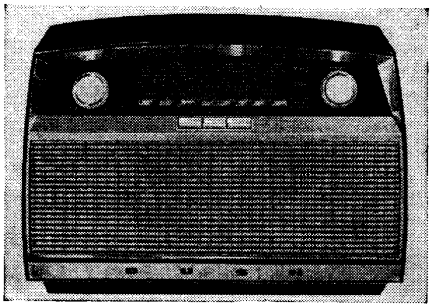
Audio frequency output from discriminator is developed across **C47** and passed via de-emphasis network **R19, C48** and **S3a, C54** to volume control and thus to triode section of **V5,** which operates as A.F. amplifier, with resistance capacitance coupling to pentode output valve **V6.** Negative feed-back by **C63, R34, R35** from speech coil circuit to **V5d** grid circuit. Provision for special coupling to take recorder by a separate winding on output transformer **T1.**

On A.M., input from ferrite rod aerial, which is tuned by **C19,** is coupled via **S3x** and **C20** to control grid of **V2,** whose anode circuit is untuned on A.M. and is resistance-capacitance coupled by **R8, S3z** and **C26** to the heptode section of **V3.** Series-tuned circuit **L10, C22** rejects unwanted signals at the A.M. **intermediate frequency of 470kc/s.**

V3 operates as A.M. frequency changer, its triode section (a) acting as oscillator with grid circuit tuning by **L13, C34** (M.W.) and **C32, C33** (L.W.), in association with **C30.** Reaction coupling from anode by **L14. V4** operates as A.M. and I.F. amplifier with tuned-transformer coupling **L17, L18** and **L22, L23.** Diode A.M. detector is section **c** of **V5,** and its output is passed via **S3w** to the volume control after which the circuit of the A.F. amplifier is the same as has already been described for F.M. reception.



Circuit diagram of the Bush VHF80. The positions of the waveband switches **S1, S2** *and* **S3** *for the three press-button settings are indicated at the table in the top left-hand corner of the diagram. See also "Switches" under "General Notes" in col. 3 overleaf. Provision is made for the connection of a tape recorder via winding* **b** *on output transformer* **T1.** *This winding is omitted in early versions of this receiver.*



Appearance of the Bush VHF80.

On A.M., the D.C. component developed across the detector load resistor **R20** is fed back to **V2, V3** heptode and **V4** as A.G.C. bias. On F.M., **S3b** closes, and **C42, R23,** which on A.M. provide A.G.C. decoupling, constitute a grid leak network that bias up **V4** should the special amplitude rise high enough to cause grid current to flow.

V4 thus acts as a limiter, and the D.C. potential developed across **R23** is applied also to **V2** and **V3b** as A.G.C. bias. The limiting action is complemented by suppressor grid bias in **V4** derived from the discriminator D.C. load circuit **R24, C53.**

CIRCUIT ALIGNMENT

Equipment Required.—An amplitude modulated signal generator covering the A.M. alignment frequencies 200-1,500kc/s and the F.M. alignment frequencies 10.7Mc/s and 87.5-100Mc/s; an audio output meter to match a 3Ω impedance; a Model 8 Avometer

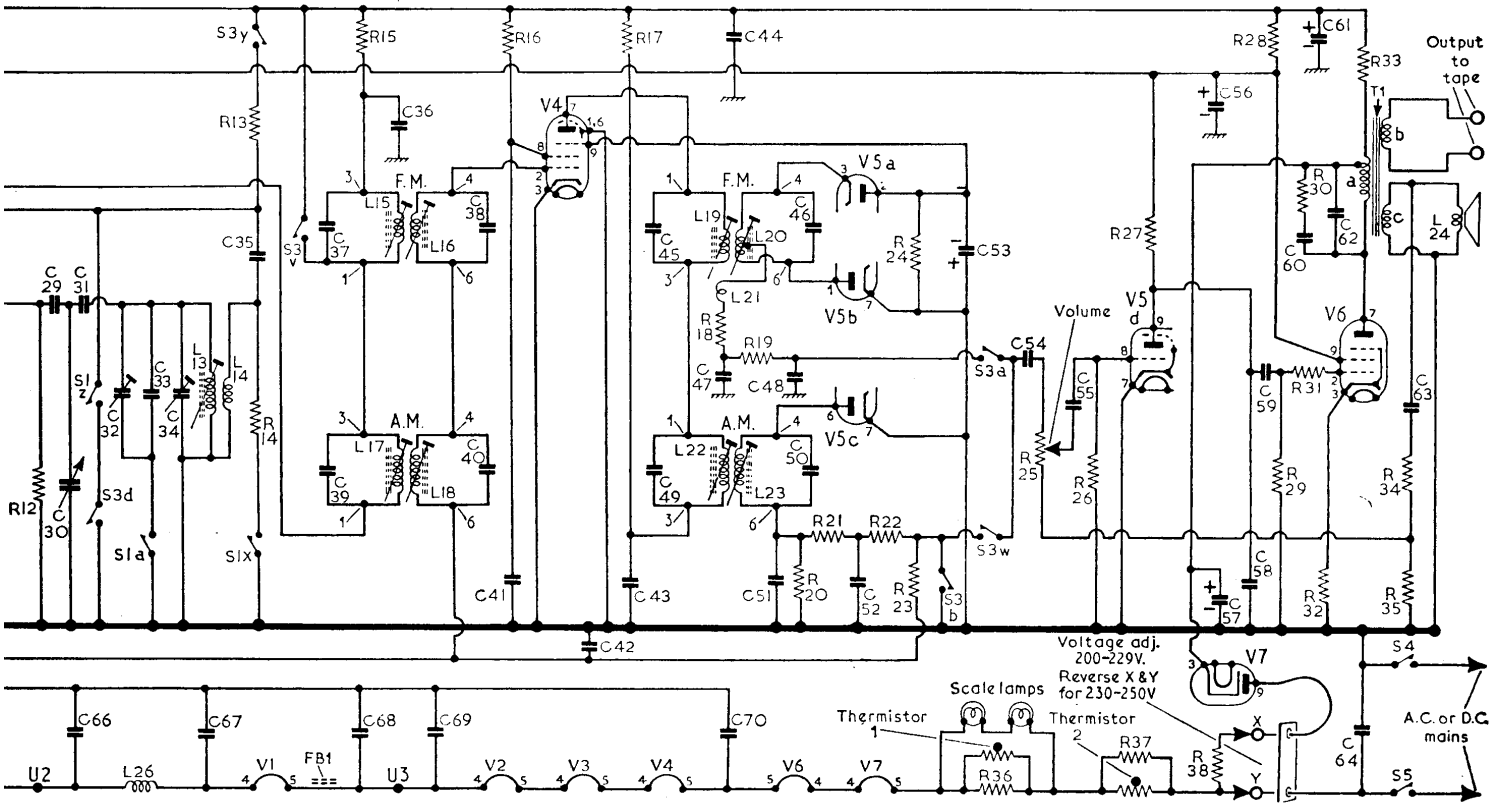
(*Continued overleaf col. 1*)

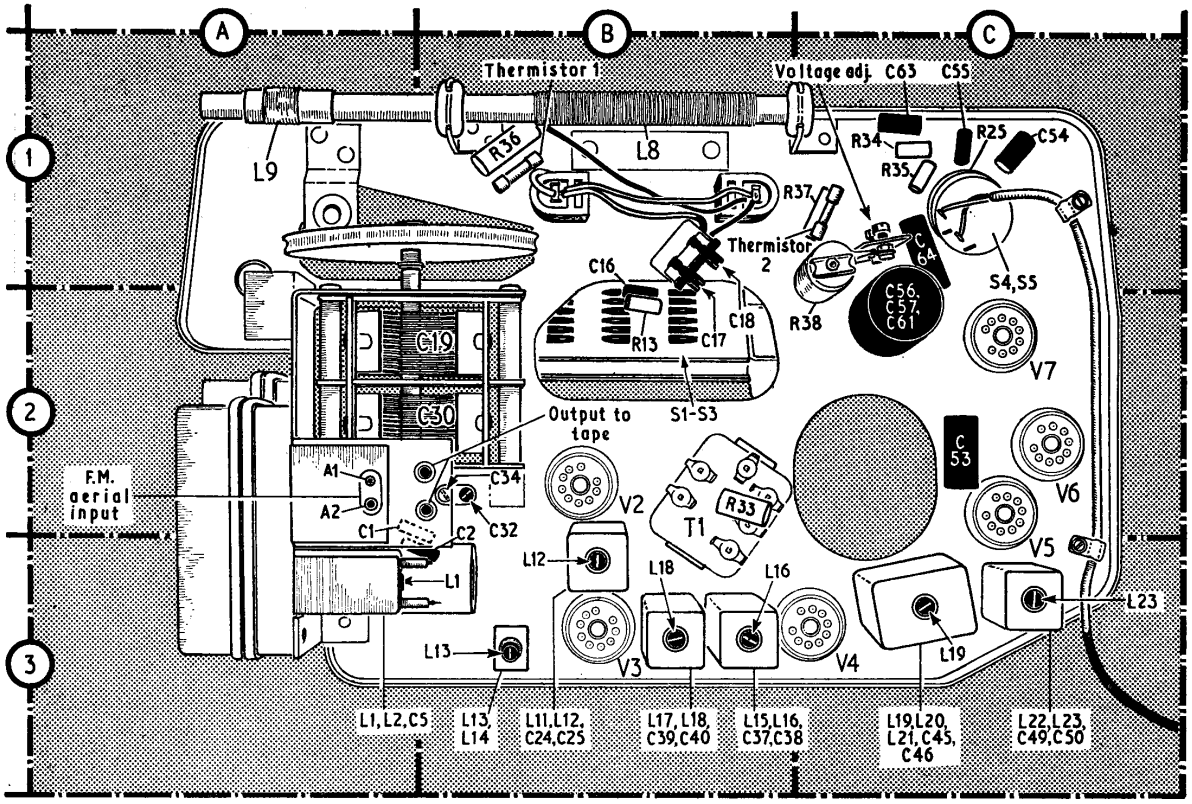
If the component numbers in these tables are used when ordering spare parts, dealers are requested to mention the fact on the order, as these numbers may differ from those used in the manufacturer's service manual.

COMPONENT VALUES AND LOCATIONS

Resistors		
R1	82Ω	G7
R2	27Ω	G7
R3	2·2kΩ	G7
R4	100kΩ	G7
R5	6·8kΩ	G7
R6	680kΩ	E5
R7	10kΩ	E5
R8	2·2kΩ	E6
R9	680kΩ	E6
R10	10kΩ	E6
R11	10Ω	E6
R12	47kΩ	E6
R13	15kΩ	B2
R14	2·2kΩ	E5
R15	1kΩ	E6
R16	22kΩ	E6
R17	1kΩ	D6
R18	100Ω	D6
R19	22kΩ	E6
R20	330kΩ	D6
R21	100kΩ	D6
R22	47kΩ	D6
R23	2·2MΩ	E6
R24	22kΩ	D6
R25	1MΩ	C1
R26	6·8MΩ	D6
R27	180kΩ	D5
R28	5·6kΩ	D5
R29	1MΩ	D5
R30	10kΩ	D5
R31	47kΩ	D5
R32	220Ω	D5
R33	1·2kΩ	B2
R34	8·2kΩ	C1
R35	1·5kΩ	C1
R36	680Ω	B1
R37	2·7kΩ	C1
R38	150Ω	C1
Capacitors		
C1	470pF	A2
C2	470pF	B3
C3	15pF	G7
C4	560pF	G7
C5	10pF	A3
C6	560pF	G7
C7	22pF	G7
C8	22pF	G7
C9	15pF	G7
C10	5·6pF	G7
C11	15pF	G7
C12	10pF	G7
C13	47pF	G7
C14	47pF	F6
C15	7,500pF	E4
C16	120pF	B2
C17	30pF	B1
C18	30pF	B1
C19	—	B2
C20	270pF	E5
C21	4,700pF	E5
C22	47pF	F5
C23	33pF	E6
C24	47pF	B3
C25	47pF	B3
C26	270pF	E6
C27	4,700pF	E6
C28	4,700pF	E6
C29	100pF	E6
C30	—	B2
C31	515pF	E6
C32	40pF	F6
C33	450pF	F6
C34	40pF	F6
C35	0·001μF	E6
C36	4,700pF	E6
C37	47pF	B3
C38	47pF	B3
C39	150pF	B3
C40	150pF	B3
C41	4,700pF	E6
C42	0·04μF	E6
C43	4,700pF	D6
C44	0·01μF	E5
C45	10pF	C3
C46	47pF	C3
C47	560pF	E6
C48	2,200pF	E6
C49	150pF	C3
C50	150pF	C3
C51	100pF	D6
C52	100pF	D6
C53	5μF	C2
C54	0·01μF	C1
C55	0·003μF	C1
C56	20μF	C2
C57	40μF	C2
C58	270pF	D6
C59	0·01μF	D5
C60	0·01μF	D5
C61	40μF	C2
C62	0·003μF	D5
C63	0·04μF	C1
C64	0·02μF	C1
C65	2,200pF	D6
C66	560pF	G7
C67	560pF	G7
C68	560pF	G7
C69	2,200pF	E5
C70	2,200pF	D6
Coils		
L1	—	A3
L2	—	A3
L3	—	G7
L4	—	G7
L5	—	G7
L6	—	F6
L7	—	F6
L8	—	B1
L9	—	A1
L10	18·0	F6
L11	—	B3
L12	—	B3
L13	1·5	B3
L14	4·8	B3
L15	—	B3
L16	—	B3
L17	14·0	B3
L18	14·0	B3
L19	—	C3
L20	—	C3
L21	—	C3
L22	14·0	C3
L23	14·0	C3
L24	3·0	—
L25	—	D6
L26	—	G7
Miscellaneous		
T1 a	600·0	B2
T1 b	—	B2
T1 c	—	B2
Thermistor 1. V1010		B1
Thermistor 2. V1010		C1
FB1	—	G7
S1-S3	—	E5
S4, S5	—	C1

**Approximate D.C. resistance in ohms.*





Rear view of the vertically mounted chassis. The pull-off-type scale lamp holders are seen just below **L8** *on the ferrite rod.* **V1** *is mounted on the F.M. tuning unit, just behind* **L1, L2** *coil can in this view.*

Circuit Alignment—*continued*

or D.C. valve voltmeter for use as a D.C. output meter; a 0-50μA microammeter; two matched 47kΩ resistors; a 1kΩ resistor for use as a damping shunt; a 0.1μF capacitor; and a non-metallic screwdriver-type trimming tool.

A.M. Alignment

1.—Remove the chassis from the cabinet as described under "Dismantling" in columns 5 and 6. Connect the audio output meter across **T1** secondary winding, and the signal generator output between chassis and **V4** control grid (pin 2) via the 0.1μF capacitor. Allow the generator and receiver to warm up for about 15 minutes before commencing the following operations. Each time an adjustment is made, reduce the generator output to maintain the audio output at 50mW.

2.—Switch the receiver to M.W. and tune it to 300m. Turn the volume control to maximum. Feed in a modulated 470kc/s signal and adjust the cores of **L22** (D6) and **L23** (C3) for maximum output.

3.—Transfer the generator output to **V3** control grid (pin 2). Feed in a 470kc/s signal and adjust **L17** (E6) and **L18** (B3) for maximum output.

4.—Transfer the generator output to **V2** control grid (pin 2). Feed in a 470kc/s signal and adjust **L10** (F6) for *minimum* output.

5.—Loosely couple the signal generator to the receiver via a loop of insulated wire placed about 3 feet from the receiver. Check that with the tuning gang at maximum capacitance the cursor coincides with the dots at the right-hand ends of the tuning scale apertures.

6.—Tune the receiver to 500m. Feed in a modulated 600kc/s signal and adjust **L13** (B3) for maximum output.

7.—Tune the receiver to 200m. Feed in a 1,500kc/s signal and adjust **C34** (B2) and **C18** (B1) for maximum output.

8.—Repeat operations 6 and 7.

9.—Switch the receiver to L.W. and tune it to 1,400m. Feed in a 214kc/s signal and adjust **C32** (B2) and **C17** (B1) for maximum output.

F.M. Alignment

1.—Before commencing the F.M. alignment procedure position the I.F. tuning cores as follows: **L11** (E6), **L12** (B3), **L15** (E6) and **L16** (B3) $\frac{1}{8}$in inside the coil former; **L19** (C3) $\frac{3}{4}$in inside the former; and **L20** (D6) $\frac{3}{8}$in inside the former.

2.—Switch the receiver to F.M. and set the volume control to minimum. Connect the two matched 47kΩ resistors in series across **C53** (C2). Connect the Model 8 Avometer, switched to its 10V D.C. range, across **C53**, with positive meter terminal to chassis. Connect the signal generator output between chassis and **V3** control grid (pin 2) via the 0.1μF capacitor in its live output lead.

3.—For the following operations feed in an unmodulated 10.7Mc/s signal and adjust the generator output to maintain a 4V reading on the D.C. output meter. The correct tuning peak for the iron-dust cores is the first peak obtained from the adjusting end of the coil former, excepting **L19** which is set to the second peak in.

4.—Adjust **L19** (C3) for maximum reading on the D.C. output meter.

5.—Connect the 0-50μA microammeter between the junction of **R18, R19** (E6) and the junction of the two 47kΩ resistors. Adjust **L20** (D6) for a zero reading on the microammeter. This will occur mid-way between a positive and a negative peak.

6.—Connect the 1kΩ damping resistor across **L16** and adjust **L15** (E6) for maximum D.C. output.

7.—Connect the damping resistor across **L15** and adjust **L16** (B3) for maximum D.C. output. Remove the damping resistor.

8.—Transfer the signal generator to **V2** control grid (pin 2). Connect the damping resistor across **L12** and adjust **L11** (E6) for maximum D.C. output.

9.—Connect the damping resistor across **L11** and adjust **L12** (B3) for maximum D.C. output.

10.—Repeat operations 4 and 5.

11.—Transfer the signal generator to the F.M. aerial sockets. Connect the damping resistor across **L6** and adjust **L7** (F6) for maximum D.C. output.

12.—Tune the receiver to 87.5Mc/s. This coincides with the Third programme calibration mark on the M.W. tuning scale. Feed in an unmodulated 87.5Mc/s signal and adjust the cores of **L3** and **L4** (G7) for maximum output. This may be done by slackening the locking screw on the tuning drive drum and moving it along its curved slot. Then retighten the locking screw.

13.—Tune the receiver to 94Mc/s. Feed in a 94Mc/s signal and adjust the core of **L1** (A3) for maximum D.C. output. **C9** and **C11** are accurately aligned at the factory and should not be disturbed.

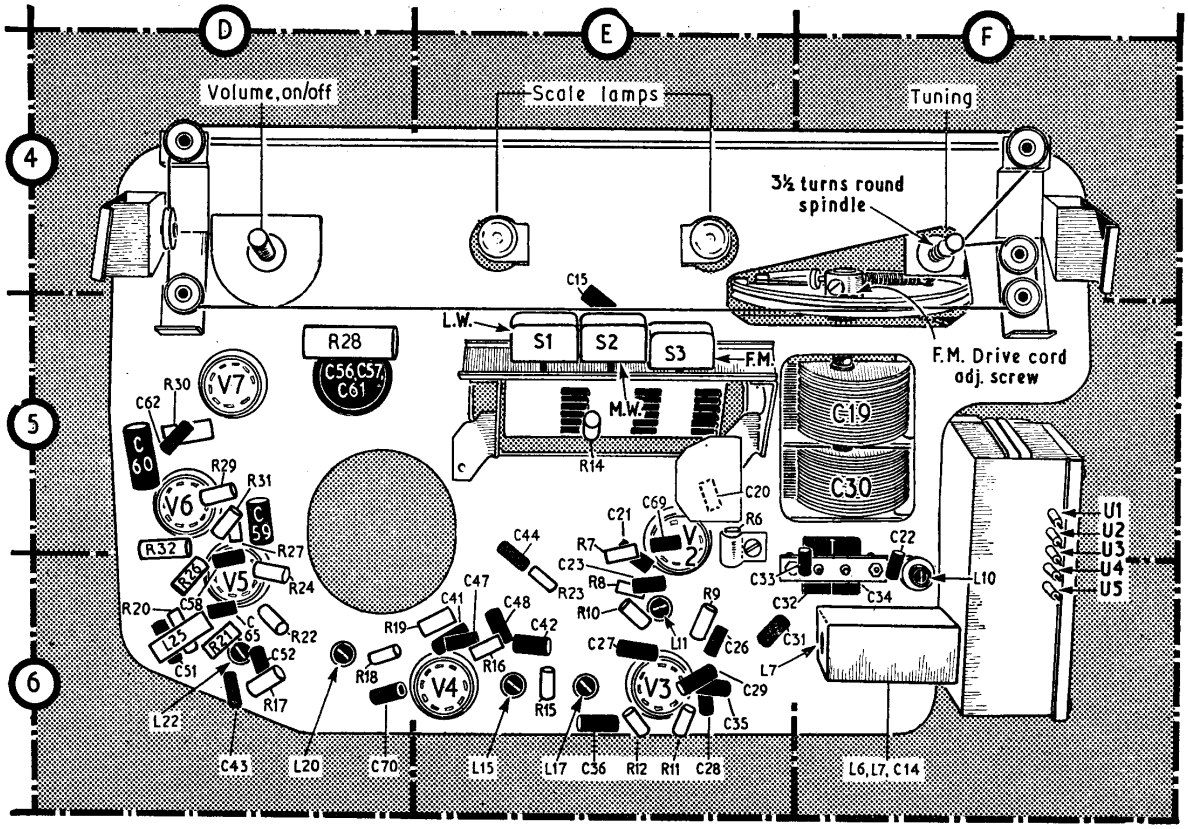
GENERAL NOTES

Switches.—Waveband switching is performed by a 3-position press-button unit, whose switch contacts are indicated in the diagram cols. 4, 5, on each side of the unit. The action of the switches is indicated by their suffixes. All the **S1** switches are operated by the L.W. button, **S2** switches by the M.W. button, and **S3** switches by the F.M. button.

If when its button is pressed a switch closes, its suffix letter is **a, b, c, d, e** or **f**; if it opens, its suffix letter is **v, w, x, y** or **z**. Thus **S2a** closes when the M.W. button is pressed, and **S2z** opens. **S3c** closes when the F.M. button is pressed, and **S3x** opens. **S1y** opens when its button is pressed, and **S1a** (in the oscillator circuit) closes.

These actions are reversed, however, when the button is released, so that when the L.W. or the F.M. button is depressed, for instance, the M.W. button is released, and its **a, b** buttons open, while its **y, z** buttons close. Thus the L.W. aerial coil **L9** is switched into circuit by the release of the M.W. button, because **S2z** then closes; but if the F.M. button is depressed to release the M.W. button, the set will receive F.M. programmes, not L.W., because **S3x** opens.

Cursor Drive Cord.—About 47 inches of nylon-braided glass yarn is required for a new cursor and main tuning drive. To replace the cord, first remove the chassis from the cabinet as described under "Dismantling" in col. 5. Then remove the control knobs, which are secured by 4BA cheesehead screws. Slacken the retaining clamps at each end of the tuning scale by loosening their Phillips head fixing screws (alternatively 6BA nuts) which are accessible from the rear of the chassis, and remove the scale.



Front view of the chassis. Details of the press-button waveband switch unit **S1-S3** *are shown in the diagrams at the foot of this page. The brackets at the top corners of the chassis retain the tuning scale; this has been removed in order to show details of the tuning drive cord system.*

Turn the gang to minimum and anchor the tension spring to the lug on the drive drum. Tie one end of the cord to the free end of the spring. Pass the cord through the slot in the drum and ⅓ turn anti-clockwise round the drum. Then run the cord as indicated in the front view of the chassis. Finally, pass the cord ⅔ turn anti-clockwise round the drum and tie it to the spring.

Reassemble tuning scale and adjust the cursor so that with the gang at maximum capacitance it coincides with the dots at the right-hand ends of the tuning scale apertures.

F.M. Drive Cord.—Should a breakage occur in any section of the F.M. drive cord, the manufacturers recommend that the complete drive cord and core assembly (Part No. CS62885) be replaced.

To replace the drive cord assembly, remove the front cover of the F.M. unit (seven 6BA screws) and set the tuning gang to minimum capacitance. Remove the screw and washer from the curved slot in the drive drum. Unhook the cord from the tension spring and the boss on the pivoted adjuster. Thread the new cord and core assembly through the formers of **L3, L4** and **L5** and run the cord as indicated in the front view illustration of the tuner unit (col. 6).

After reassembling, check that with the tuning gang at maximum capacitance the cursor coincides with the dots at the right-hand ends of the tuning scale apertures. Then adjust the cores of **L3, L4** and **L5** as described in operation 12 under "F.M. Alignment" (col. 3).

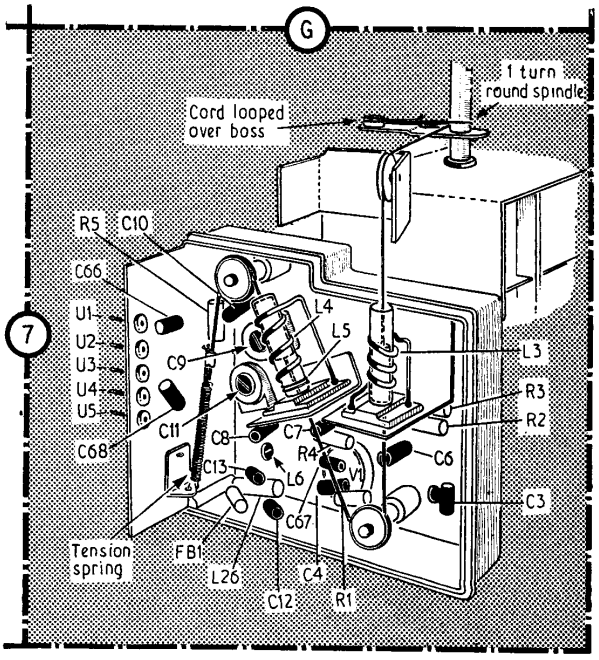
Scale Lamps.—These are two 6.3V, 0.1A lamps with clear spherical bulbs and M.E.S. bases.

DISMANTLING

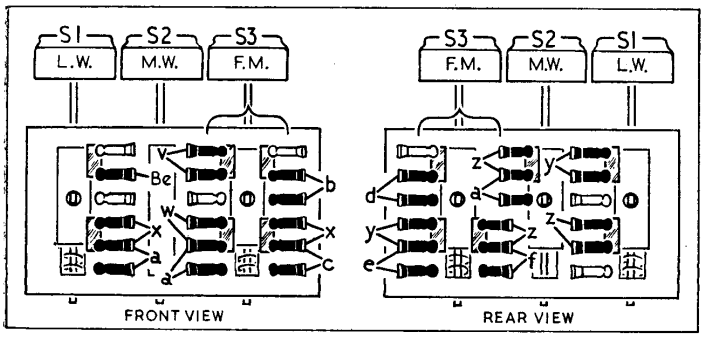
Removing Chassis.—Remove the back cover (four screws and washers);
remove five 4BA chassis fixing screws and washers, two from the lower edge of the chassis, one from each side, and one just above **V1**;
withdraw the chassis, tilting it slightly to clear the retaining brackets at the top of the cabinet.

Tuner Unit.—Access to the inside of the tuner unit may be gained by removing the screening cover which is secured by seven 6BA screws and nuts. To completely remove the unit from the chassis, proceed as follows:
unsolder five leads from terminals **U1-U5** on the tuner (location references F5, F6);
remove the screw and washer from the curved slot on the tuning drive drum;
remove the F.M. drive cord from the boss on the pivoted adjuster;
remove the two screws which fix the tuner and aerial panel to the tuning gang mounting bracket.

Right: *A view of the F.M. tuning unit with the screening cover removed.*



Below: *Diagrams showing details of waveband switches. See also "General Notes."*



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