"TRADER" SERVICE SHEET

1419

BUSH VHF70

A.M./F.M. Table Receiver

THE Bush VHF70 is a 3-band A.M./F.M. table receiver housed in a plastics cabinet and designed to operate from A.C. or D.C. mains of 200-250V, 40-100 c/s in the case of A.C. Total mains consumption is 45W. Maximum audio output is 2W. It is fitted with internal A.M. and F.M. aerials. Provision is made for the connection of an external F.M. aerial, but no external A.M. aerial sockets are provided. The band ranges are 187-560m (M.W.); 1,050-1,935m (L.W.); and 87.5-100 Mc/s (F.M.).

Release date and original price: September 1958, £15 17*s* 6*d*. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Tuned ferrite rod aerial circuits **L8, C16** and **C17** (M.W.); **L9, C14, C15** and **C17** (L.W.) precede triode-heptode frequency changer **V2.**

Oscillator grid coil **L10** is tuned by **C21, C22** and **C25** (M.W.) and by **C21, C22, C23** and **C24** (L.W.). Reaction coupling from oscillator anode via **C26, L11.**

I.F. amplifier valves **V3** and **V4** are coupled via A.M. switches **S12, S13, S16, S17;** and tuned A.M. transformers **L14, L15; L18, L19;** and **L23, L24** to diode section **c** of triple-diode-triode valve **V5,** which operates as A.M. detector.

Intermediate frequency 470kc/s

The audio frequency component in the rectified output of **V5c,** developed across load resistor **R24,** is passed via A.M. switches **S20, S21,** volume control **R25** and A.F. coupling capacitor **C56** to triode section **V5d,** which operates as a grid current biased A.F. amplifier. I.F. filtering by **R21, C52.**

The D.C. component of the rectified signal developed across **R24** is fed back as A.G.C. bias to **V2b, V3** and **V4.**

Resistance-capacitance coupling via **R28, C61** and **R30** between **V5d** anode and pentode output valve **V6.** Negative feedback tone correction between **V6** cathode and **V5d** grid circuit via **C62, R29** and **R25, R26.** Tone correction in **V6** anode circuit by **R33, C63** and **C64.**

H.T. current is supplied by half-wave rectifying valve **V7.** Smoothing by **C57,** winding **a** on output transformer **T1, R34** and **C58.**

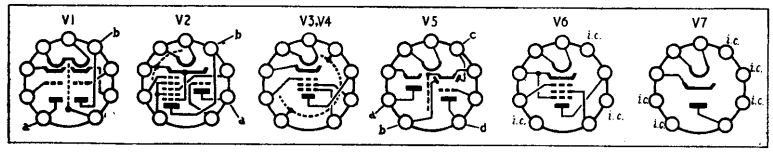
OPERATION ON F.M.

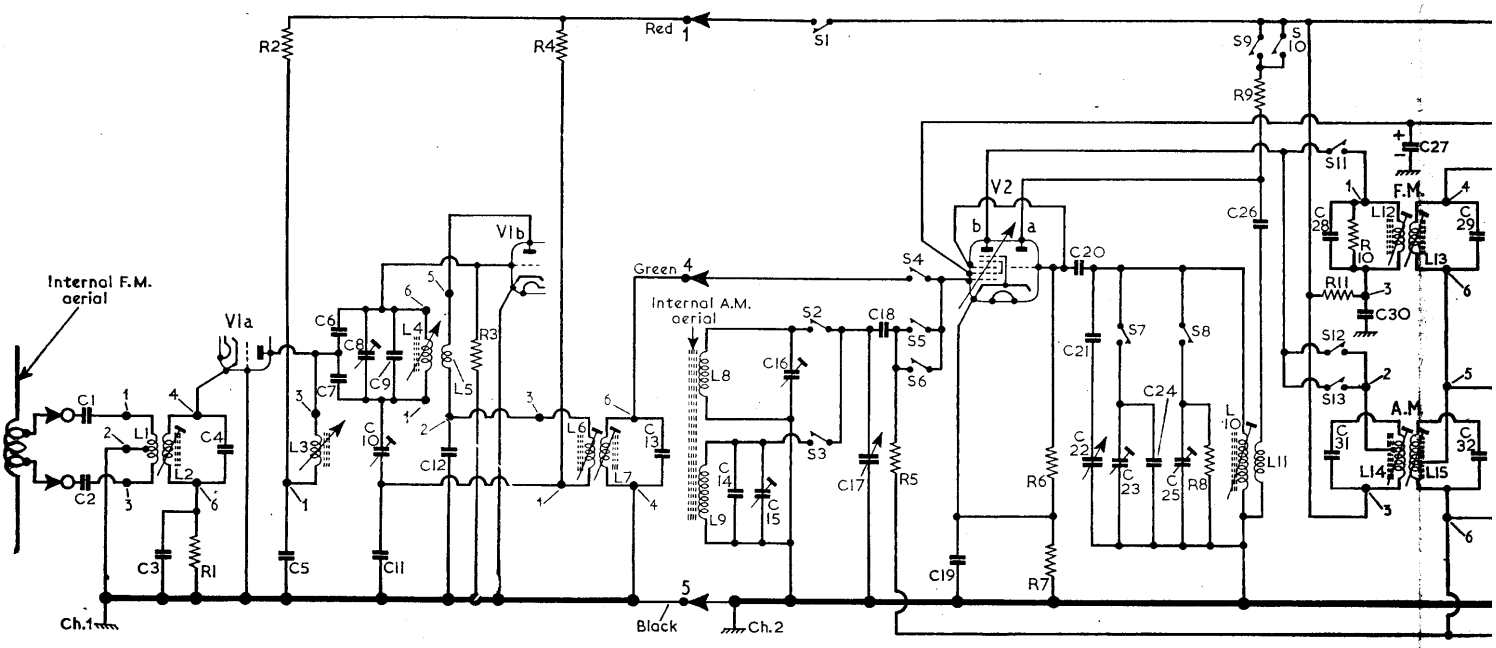
80Ω balanced aerial input is coupled via **L1, L2** to the earthed-grid R.F. amplifier valve **V1a,** which together with self-oscillating frequency changer **V1b** operates in a conventional tuner circuit. Tuning is by means of the variable cores of **L3** and **L4.**

S9 and **S10** are open circuit on F.M., thus muting the A.M. local oscillator **V2a.** Heptode section **V2b** now operates with **V3** and **V4** in a 3-stage F.M. I.F. amplifier circuit with tuned transformer couplings **L6, L7; L12, L13; L16, L17;** and discriminator transformer **L20, L21** and **L22,** via F.M. switches **S4, S11** and **S15.**

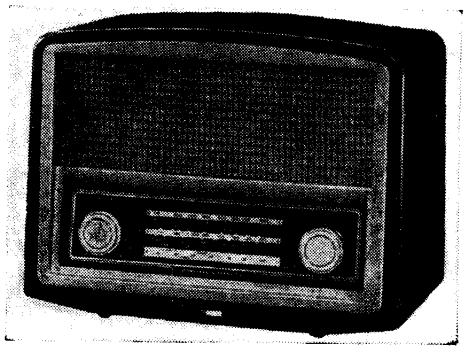
F.M. Intermediate frequency 10.7Mc/s

Diode sections **a** and **b** of **V5** operate in a conventional ratio detector circuit whose A.F. output is developed across





Circuit diagram of the Bush VHF70, and above it the valve base diagrams drawn as seen when viewed from the free ends of the pins. The numbers sho the circuit diagram correspond with those marked on the bases of the coil formers.



Appearance of the Bush VHF70.

the capacitative load **C48** and passed via **C55** and **S19** to the volume control circuit.

Limiting is by the flywheel action of the D.C. reservoir circuit **C54, R23,** and in addition by **C44, R22** in the control grid circuit of **V4.**

CIRCUIT ALIGNMENT

Equipment Required.—A signal generator covering the A.M. alignment frequencies of 200-1,500kc/s and the F.M. alignment frequencies of 10.7Mc/s and 87.5-100Mc/s; an A.C. voltmeter for use

(*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 manufacturers' service manual.

Resistors

R1	150Ω	J5
R2	2·2kΩ	J5
R3	100kΩ	J5
R4	6·8kΩ	J5
R5	680kΩ	H3
R6	47kΩ	H4
R7	150Ω	H4
R8	33kΩ	H4
R9	18kΩ	H4
R10	22kΩ	C1
R11	1kΩ	G4
R12	18kΩ	H4
R13	150Ω	G4
R14	22kΩ	B1
R15	1kΩ	G4
R16	2·2MΩ	G3
R17	39kΩ	F4
R18	150Ω	F4
R19	1kΩ	F4
R20	100Ω	F4
R21	47kΩ	F4
R22	2·2MΩ	G3
R23	22kΩ	F3
R24	180kΩ	G3
R25	500kΩ	A2
R26	1kΩ	F3
R27	15MΩ	E4
R28	220kΩ	E4
R29	4·7kΩ	F3
R30	1MΩ	E4
R31	15kΩ	E3
R32	4·7kΩ	E4
R33	10kΩ	‡
R34	1kΩ	A2
R35	220Ω	E4
R36	30Ω	F3
R37	160Ω	A2
R38	200Ω	A2
R39	200Ω	A2

Capacitors

C1	470pF	D1
C2	470pF	D1
C3	560pF	J5
C4	10pF	D1
C5	560pF	J5
C6	22pF	J5
C7	22pF	J5
C8	15pF	J5
C9	5·6pF	J5
C10	15pF	J5
C11	47pF	J5
C12	10pF	J5
C13	47pF	D1
C14	140pF	H3
C15	80pF	H3
C16	40pF	H3
C17	528pF	C1
C18	560pF	H3
C19	0·02μF	H4
C20	47pF	H4
C21	515pF	H3
C22	528pF	C1
C23	80pF	G3
C24	150pF	H4
C25	40pF	G3
C26	0·003μF	H4
C27	1μF	H4
C28	47pF	C1
C29	47pF	C1
C30	0·002μF	G4
C31	110pF	C1
C32	110pF	C1
C33	0·01μF	G4
C34	0·04μF	G4
C35	0·02μF	G4
C36	47pF	B1
C37	47pF	B1
C38	0·002μF	G4
C39	110pF	C1
C40	110pF	C1
C41	0·002μF	F3
C42	0·01μF	F4
C43	0·02μF	F4
C44	0·04μF	F4
C45	0·01μF	F4
C46	10pF	B1
C47	47pF	B1
C48	470pF	F4
C49	110pF	B1
C50	110pF	B1
C51	100pF	F4
C52	100pF	F3
C53	470pF	F3
C54	5μF	F3
C55	0·04μF	F3
C56	0·01μF	E4
C57	50μF	B2
C58	50μF	B2
C59	2μF	E4
C60	2,200pF	E4
C61	0·01μF	E4
C62	0·1μF	E3
C63	0·01μF	‡
C64	0·01μF	‡
C65	0·05μF	A1
C66	0·01μF	E4
C67	560pF	J5
C68	560pF	J5
C69	560pF	J5
C70	0·002μF	G4

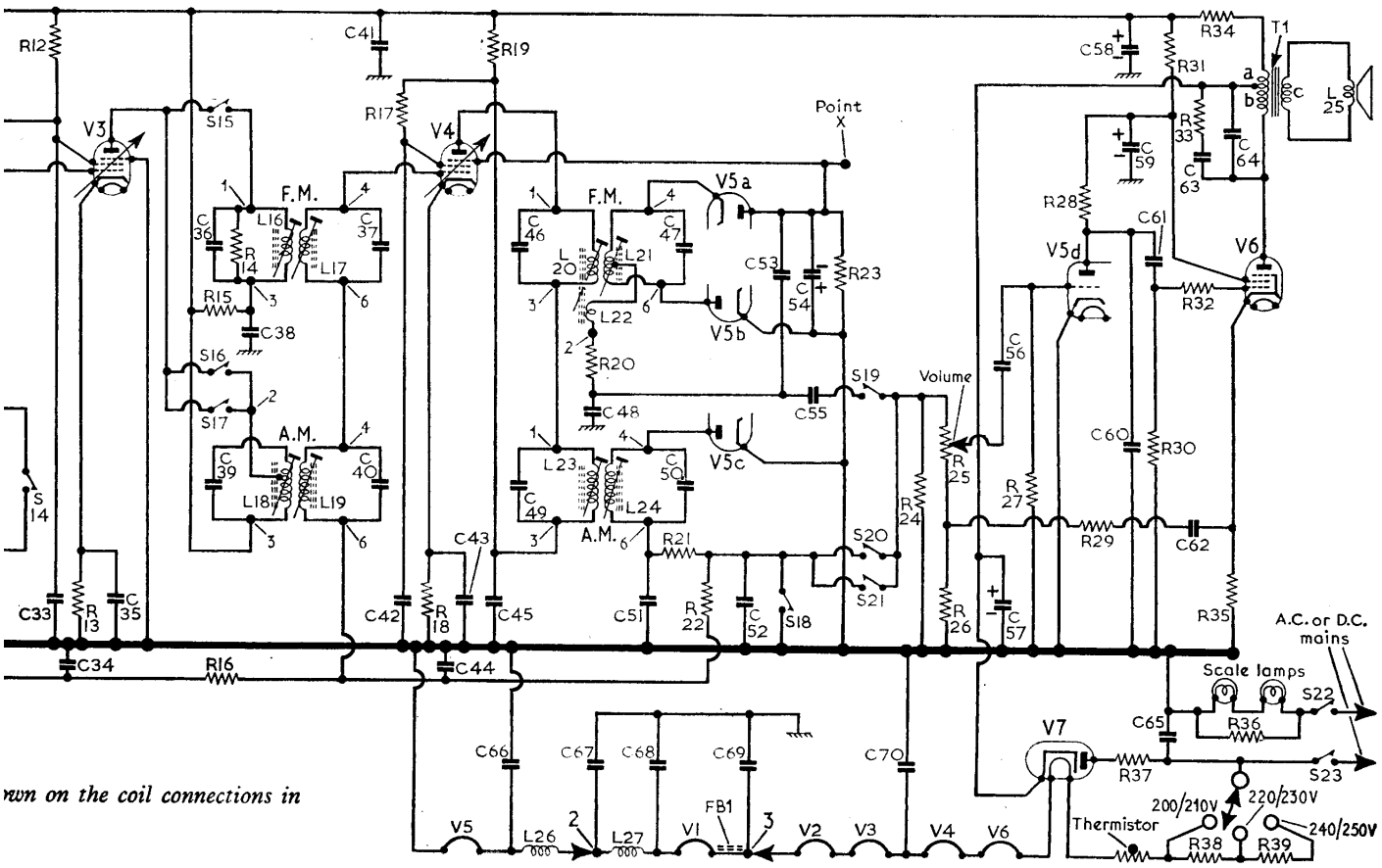
Coils*

L1	—	D1
L2	—	D1
L3	—	J5
L4	—	J5
L5	—	J5
L6	—	D1
L7	—	D1
L8	0·5	B2
L9	14·0	C2
L10	—	D2
L11	—	D2
L12	—	C1
L13	—	C1
L14	14·0	C1
L15	14·0	C1
L16	—	B1
L17	—	B1
L18	14·0	C1
L19	14·0	C1
L20	—	B1
L21	—	B1
L22	—	B1
L23	14·0	B1
L24	14·0	B1
L25	2·5	—
L26	—	G3
L27	—	J5

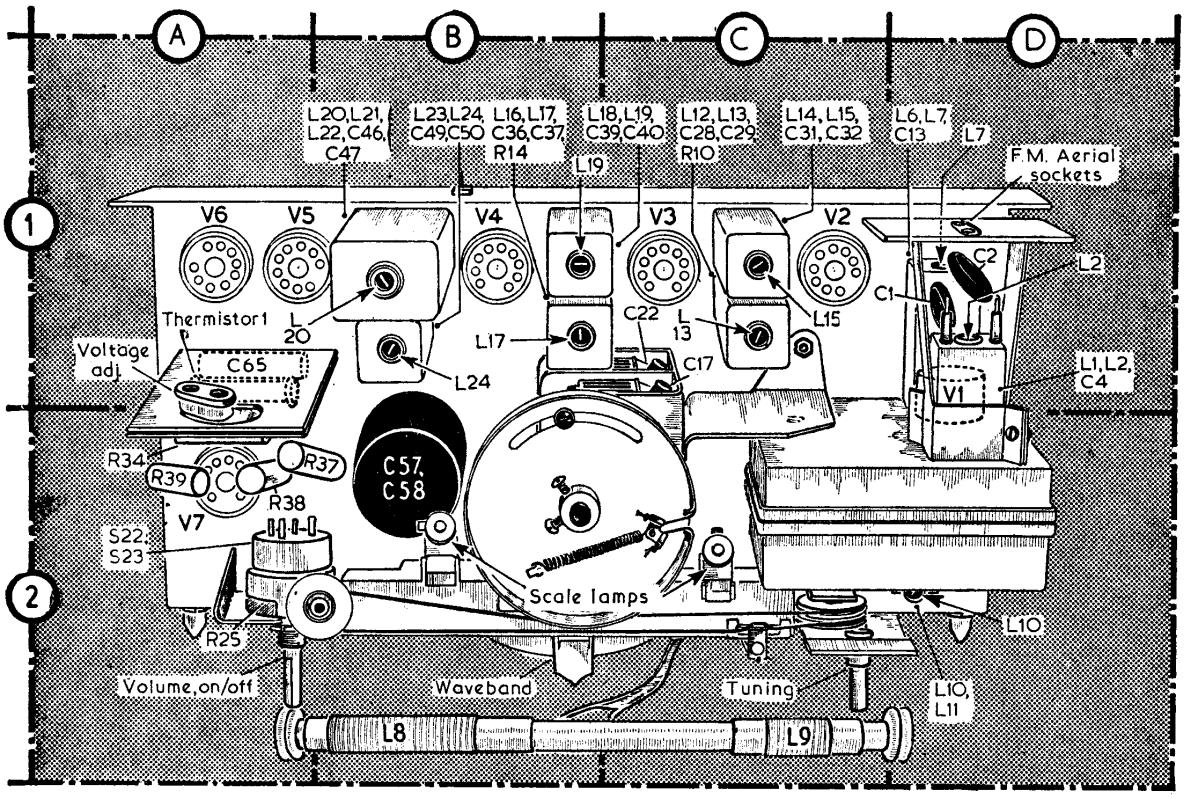
Other Components*

T1 a	5·5	‡
T1 b	600·0	‡
T1 c	0·46	‡
Therm. 1	CZ1	A1
FB1	†	J5
S2—S6	—	H3
S1, S7—S10, S13		H4
S11, S12, S14—S17		G4
S18—S21	—	G3
S22, S23	—	A2

*Approximate D.C. resistance in ohms.
† Ferrite bead.
‡ Mounted on speaker baffle*



wn on the coil connections in



Plan view of the chassis. The ferrite rod aerial coils **L8** *and* **L9** *are mounted, together with the output transformer* **T1,** *on the speaker baffle inside the cabinet.*

Circuit Alignment—*continued*

as audio output meter; a Model 8 Avometer or a D.C. valve voltmeter for use as D.C. output meter; an 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.

As the tuning scale remains fixed to the cabinet when the chassis is removed for alignment purposes, calibration marks are punched on the cursor carriage rail. These calibration marks are identified with their corresponding frequencies in the sketch shown in col. 4. Check that with the gang at maximum capacitance the cursor coincides with the datum point on the cursor carriage scale.

The chassis should be connected to the mains via an isolating transformer. Where this is not available, ensure that the chassis is connected to the neutral side of the mains. No earth connection, either direct or through earthed equipment, should be made to the receiver. Connect the signal generator to the appropriate points in the circuit via a 0.1μF isolating capacitor in its live output lead.

A.M. Alignment

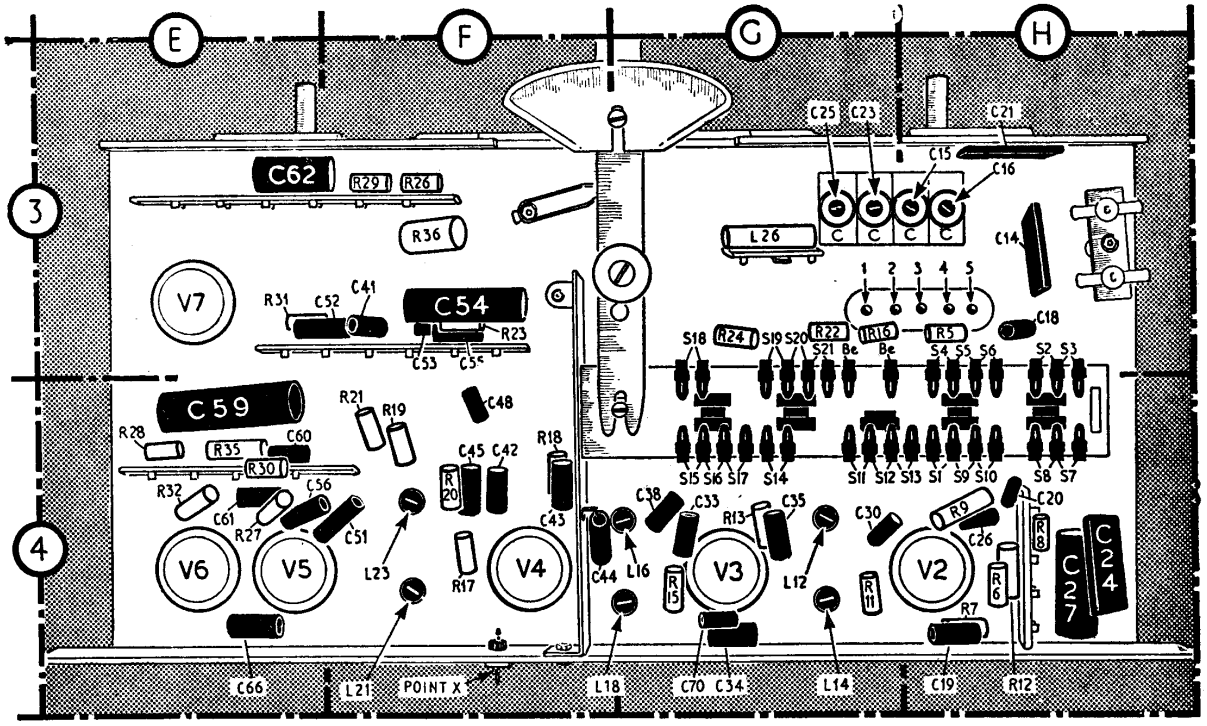
1.—Connect the audio output meter across **L25.** Connect the signal generator output between chassis and **V4** control grid (pin 2).
2.—Feed in a modulated 470kc/s signal and adjust the cores of **L23** (F4) and **L24** (B1) for maximum output.
3.—Transfer the signal generator to **V2b** control grid (pin 2). Feed in a modulated 470kc/s signal and adjust the cores of **L19** (B1), **L18** (G4), **L15** (C1) and **L14** (G4) for maximum output.
4.—Transfer the signal generator to the junction of **C17, C18** (H3). With the receiver switched to M.W., tune it to 500m. Feed in a modulated 600kc/s signal and adjust the core of **L10** (D2) for maximum output.
5.—Tune the receiver to 200m. Feed in a modulated 1,500kc/s signal and adjust **C25** (G3) for maximum output.
6.—Loosely couple the signal generator to **L8** (B2). With the receiver still tuned to 200m, feed in a 1,500kc/s signal and adjust **C16** (H3) for maximum output.
7.—Repeat operations 4, 5 and 6.
8.—Reconnect signal generator to the junction of **C17, C18.** Switch the receiver to L.W. and tune it to 1,400m. Feed in a modulated 214kc/s signal and adjust **C23** (G3) for maximum output.
9.—Loosely couple the signal generator output to **L9** (C2). With the receiver still tuned to 1,400m, feed in a 214kc/s signal and adjust **C15** (H3) for maximum output. Disconnect signal generator and audio output meter.

F.M. Alignment

1.—Switch the receiver to F.M. Connect the two 47kΩ resistors in series between chassis and point X (location reference F4). Connect the Model 8 Avometer (10V range) or D.C. valve voltmeter between chassis and point X, positive terminal to chassis.
2.—Connect signal generator output, via the 0.1μF capacitor in its live lead, between chassis and **V2b** control grid (pin 2).
3.—For the following operations, feed in an unmodulated 10.7Mc/s signal and adjust the output of the signal generator to maintain a 4V reading on the D.C. output meter. The correct tuning peak for the iron-dust tuning cores is the first peak obtained from the adjusting end of the coil former, excepting **L20** which is set to the second peak in.
4.—Adjust the core of **L20** (B1) for maximum reading on the D.C. output meter.
5.—Connect the 0-50μA microammeter between the junction of **R20, C48** (F4). Adjust **L21** (F4) for a zero reading on the microammeter; this will occur midway between a positive and negative-going peak.
6.—Connect the 1kΩ damping resistor across **L17** (B1) and adjust **L16** (G4) for maximum D.C. output.
7.—Connect the damping resistor across **L16** and adjust **L17** for maximum D.C. output.
8.—Connect the damping resistor across **L13** (C1) and adjust **L12** (G4) for maximum D.C. output.
9.—Connect the damping resistor across **L12** and adjust **L13** for maximum D.C. output.
10.—Repeat operations 4 and 5.
11.—Transfer the signal generator to the F.M. aerial sockets. Adjust **L7** (D1) and **L6** (J5) for maximum D.C. output.
12.—Tune the receiver to 87.5Mc/s on the auxiliary tuning scale. Feed in an unmodulated 87.5Mc/s signal and adjust the cores of **L3, L4** by means of the screw on the gang drum (location reference B2), which should be slackened off and moved along its curved slot until a position giving a maximum reading on the D.C. output meter is obtained. Tighten the locking screw.
13.—Tune the receiver to 94Mc/s. Feed in an unmodulated 94Mc/s signal and adjust the core of **L2** (D1) for maximum D.C. output. **C8** and **C10** are accurately aligned at the factory with special equipment. No instructions are therefore given for adjusting these trimmers.

GENERAL NOTES

Switches.—S1-S21 are the A.M. waveband and A.M./F.M. changeover switches ganged in a single slide-type unit beneath the chassis. This unit is shown in the under chassis illustration (location



Underside view of the chassis. The band switch contacts are identified in location references G4, H4, and their operation is described under "General Notes" in cols. 3 and 4. Point X in location reference F4 is used for the connection of an output meter during F.M. alignment.

references G4, H4) where the individual switch contacts are identified. **S2, S5, S8, S9, S12, S16** and **S20** close on M.W.; **S3, S6, S7, S10, S13, S17** and **S21** close on L.W.; **S1, S4, S11, S14, S15, S18** and **S19** close for F.M. operation.

Gang Drive Cord.—About 30in of nylon-braided glass yarn is required for a new drive cord. One end of the cord should be tied to its anchoring clip attached to the spring in the drive drum.

Then, with the tuning gang turned to maximum capacitance, the cord should be passed through the opening in the drive drum, and then run as indicated in the sketch of the tuning drive system below.

F.M. Drive Cord.—Should a breakage occur in any section of the F.M. drive cord, or should one of the tuning cores break, the manufacturers recommend that the complete drive cord and core assembly (Part Number CS24888) be replaced. Access to the drive and tuning cores is obtained by removing the front cover of the F.M. tuner unit (seven 6BA nuts and bolts).

The screw on the drive drum which adjusts the position of the cores of **L3** and **L4** should be removed. Then the gang drive cord and the drive drum should be removed.

The new drive cord and core assembly should then be threaded through the formers of **L3** and **L4**, and with the gang turned to minimum capacitance the cord should be run as indicated in the front illustration of the tuner unit (cols. 5, 6). Then adjust the cores of **L3** and **L4** as described in operation 12 under "Circuit Alignment" (col. 3).

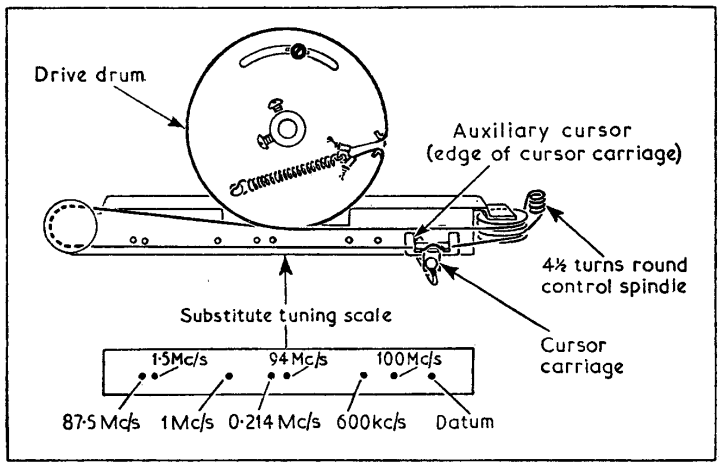
Scale Lamps.—These are two 3.5V, 0.15A lamps with clear spherical bulbs and M.E.S. bases.

VALVE ANALYSIS

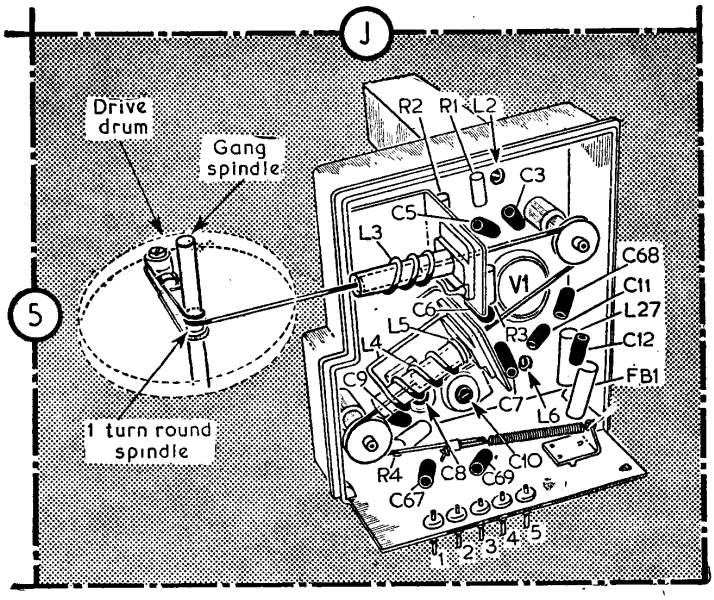
Valve voltages given in the table below are those derived from the manufacturers' information. They were measured on the 10V and 1,000V ranges of a Model 7 Avometer, chassis being the negative connection in every case. Except where otherwise indicated, the receiver was switched to F.M.

Valve		Anode (V)	Screen (V)	Cath. (V)
V1 UCC85	a	155	—	1·3
	b	140	—	—
V2 UCH81	a	90[1]	—	1·5
	b	165	70	1·5
V3 UF89	..	165	70	1·3
V4 UF89	..	165	75	1·4
V5d UABC80	..	60	—	—
V6 UL84	..	185	135	10.5
V7 UY85	..	*	—	220·0

[1]*Receiver switched to M.W.*
**No reading quoted.*



Above: *Sketch of the tuning drive system, drawn as seen with the gang at maximum capacitance, with below it, a diagram in which the calibration points seen on the cursor carriage are identified.*



Right: *Front view of the F.M. tuner unit.*

Printed in England by Cornwall Press Ltd., Paris Garden, London, S.E.1.