

"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 17s 2d. 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	—
V3a UCH81	80	72	—
V3b UCH81	92	—	1.0
V4 UF89	145	70	1.0
V5c UABC80	158	70	1.0
V6 UL84	142	81	—
V7 UY85	158	88	—
	55	—	—
	58	—	—
	188	104	6.9
	193	112	7.4
	200 ²	—	206.0
	229 ²	—	213.0

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

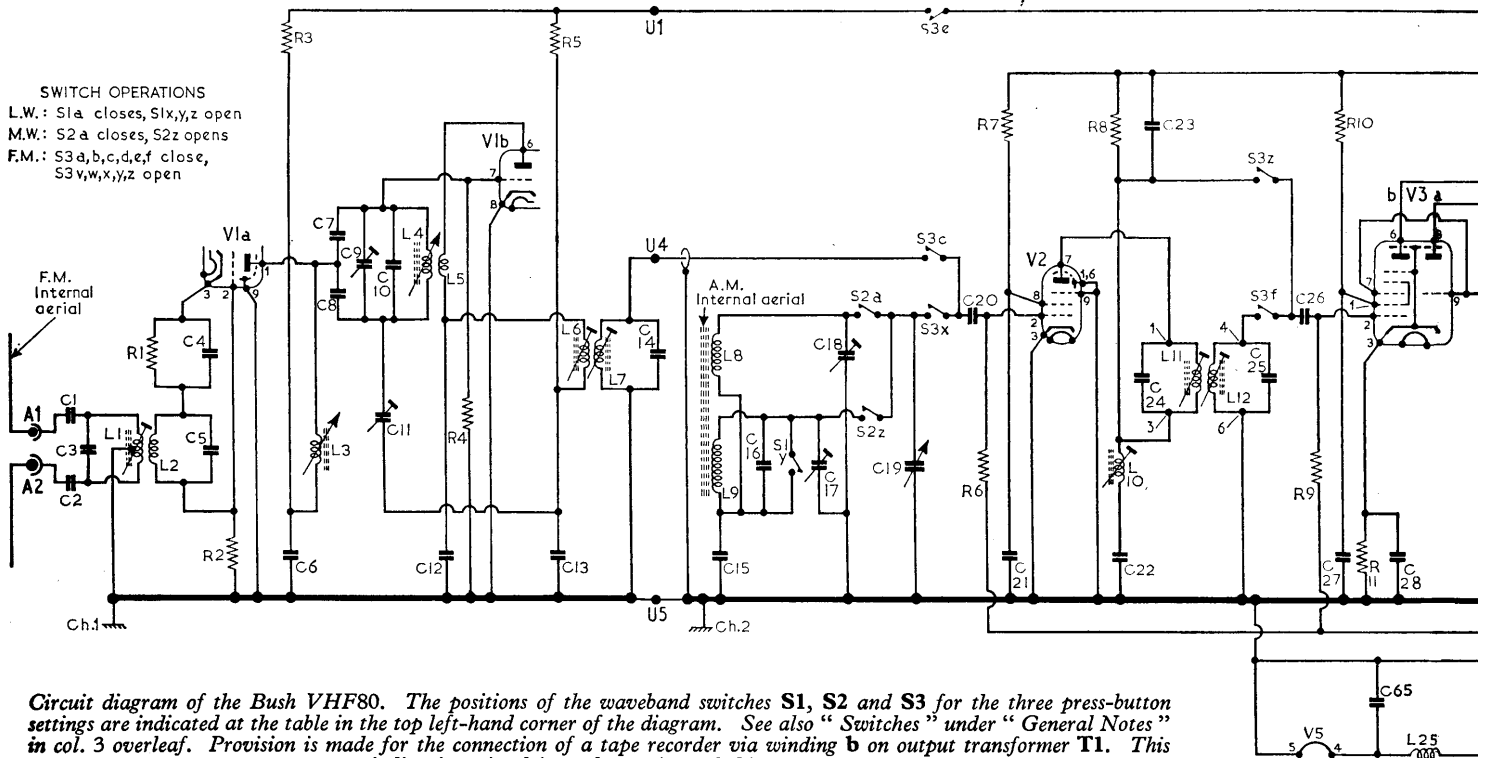
Intermediate frequency at 10.7 Mc/s is extracted at V1b anode circuit by the I.F. transformer L6, L7 and passed via S3c and C20 to pentode first I.F. amplifier V2, and then via L11, L12 and S3f, C26 to

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.

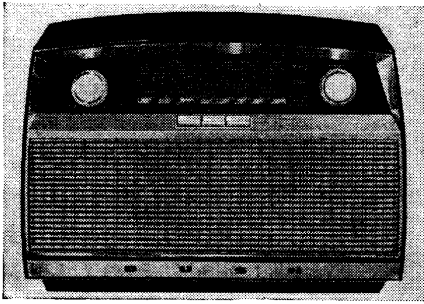
On A.M., input from ferrite rod aerial, which is tuned by C19, is coupled via S3x and C20 to control grid of V2, whose anode circuit is untuned on A.M. and is resistance-capacitance coupled by R8, S3z and C26 to the heptode section of V3. Series-tuned circuit L10, C22 rejects unwanted signals at the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



SWITCH OPERATIONS
L.W.: S1a closes, S1x,y,z open
M.W.: S2a closes, S2z opens
F.M.: S3a,b,c,d,e,f close,
S3v,w,x,y,z open

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

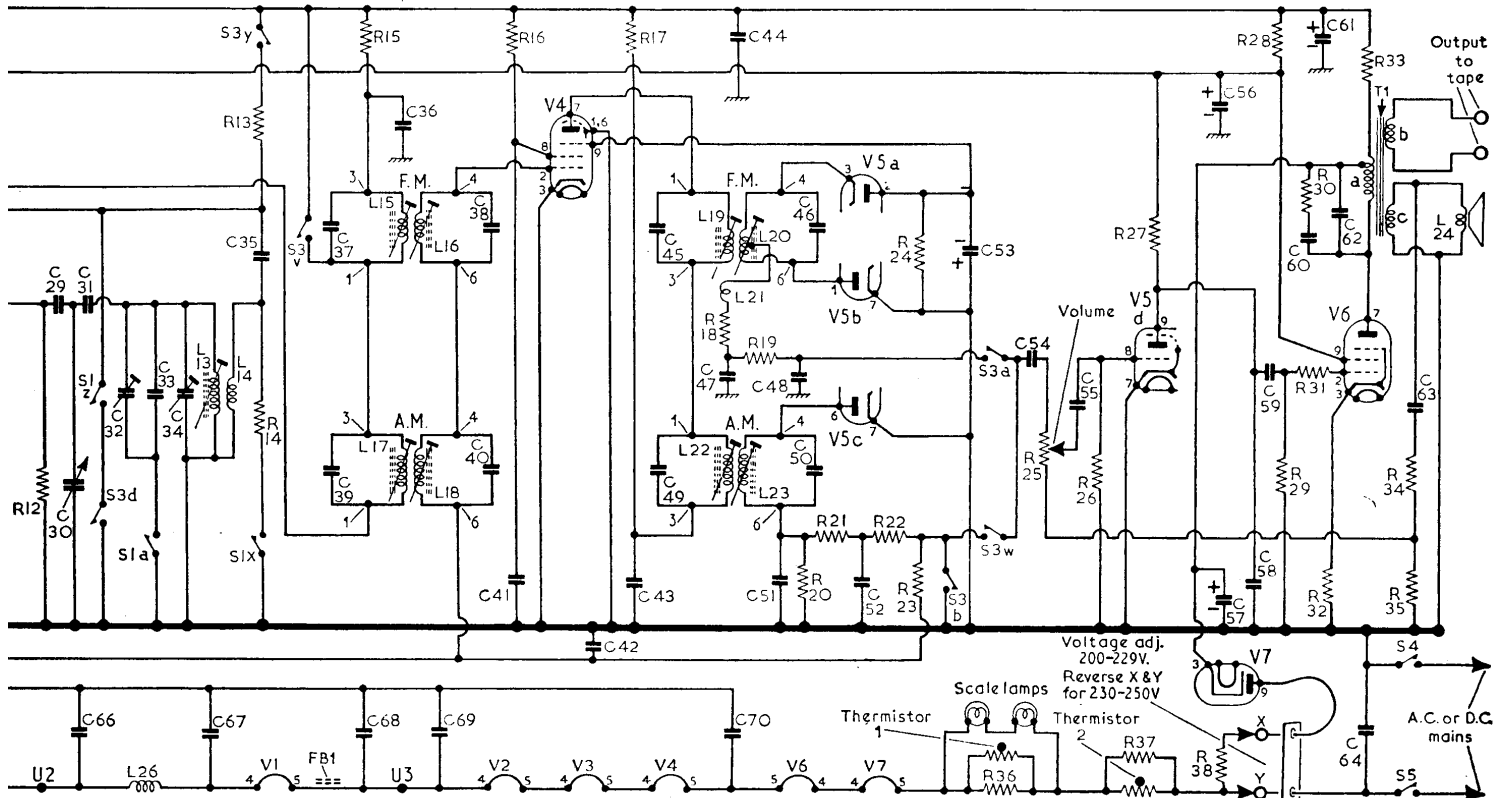
Coils

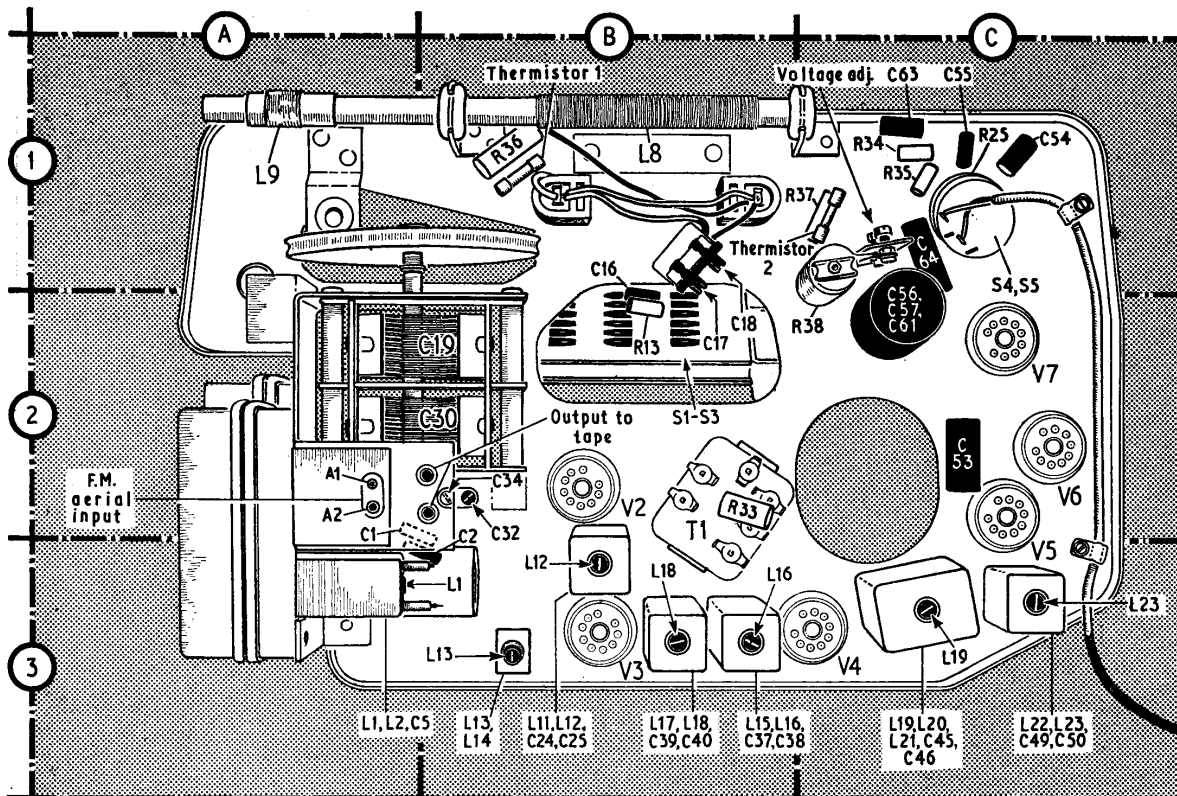
L1	—	A3
L2	—	A3
L3	—	G7
L4	—	G7
L5	—	G7
L6	—	F6
L7	—	F6
L8	—	B1
L9	—	A1
L10	18.0	F6
L11	—	B3
L12	—	B3
L13	1.5	B3
L14	4.8	B3
L15	—	B3
L16	—	B3
L17	14.0	B3
L18	14.0	B3
L19	—	C3
L20	—	C3
L21	—	C3
L22	14.0	C3
L23	14.0	C3
L24	3.0	C1
L25	—	D6
L26	—	G7

Miscellaneous

T1	{ a 600.0 b — 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 0-50 μ A microammeter; two matched 47k Ω resistors; a 1k Ω resistor for use as a damping shunt; a 0.1 μ F 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 0.1 μ F 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) $\frac{1}{4}$ in inside the coil former; L19 (C3) $\frac{1}{4}$ in inside the former; and L20 (D6) $\frac{1}{4}$ in inside the former.

- 2.—Switch the receiver to F.M. and set the volume control to minimum. Connect the two matched 47k Ω 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 0.1 μ F 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 0-50 μ A microammeter between the junction of R18, R19 (E6) and the junction of the two 47k Ω 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 1k Ω 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

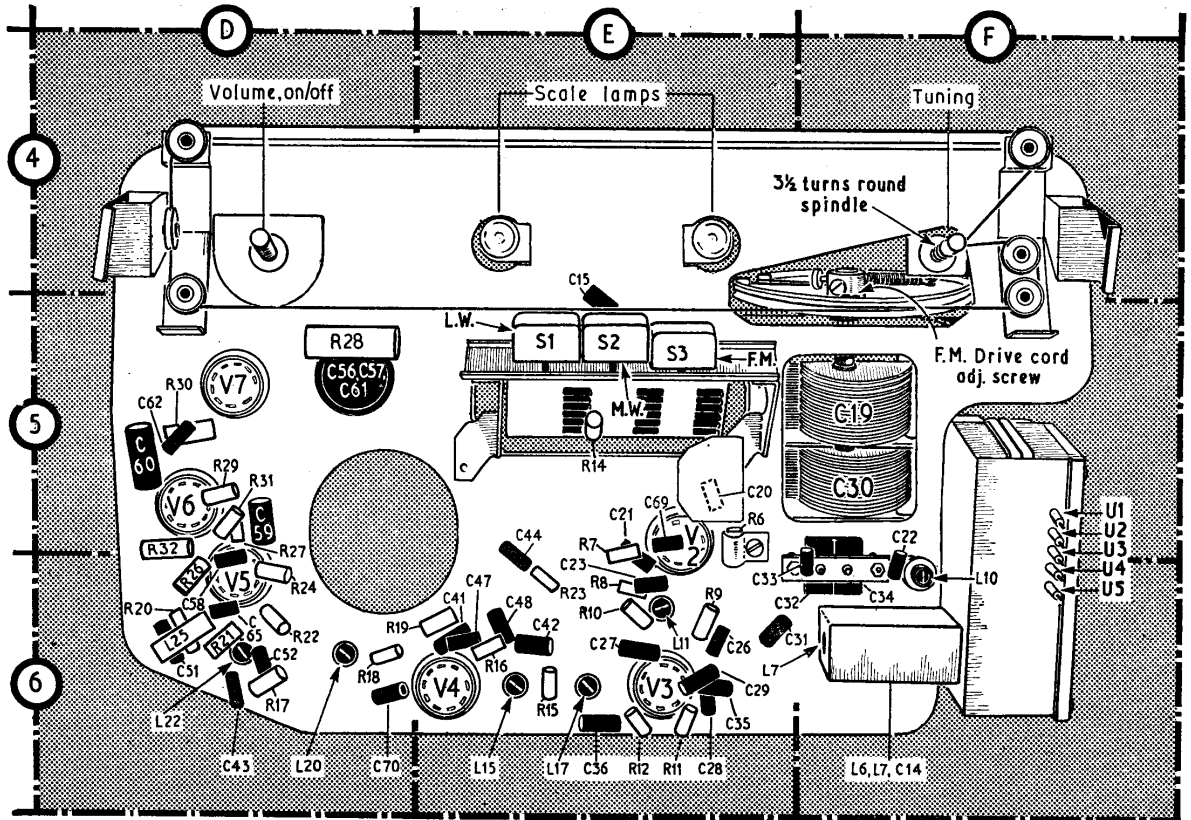
Switches.—Waveband switching is performed by a 3-position press-button unit, whose switch contacts are indicated in the diagram cols. 4, 5, on each side of the unit. The action of the switches is indicated by their suffixes. All the S1 switches are operated by the L.W. button, S2 switches by the M.W. 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 cheese-head 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 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 through the free end of the spring. Pass the cord through the slot in the drum and $\frac{1}{2}$ turn anti-clockwise round the drum. Then run the cord as indicated in the front view of the chassis. Finally, pass the cord $\frac{1}{2}$ 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."

