BUSH RADIO

Service Instructions

MODEL VHF.41

FOR A.C. MAINS

INDEX

SPECIFICATION

BASIC DESIGN

The VHF41 is the first receiver produced by the Company to feature a special unit for the reception of F.M.

Waveband Switch in " L " or " M " position

The circuit consists, essentially, of a 5-valve (including rectifier) super-heterodyne employing Mullard valves in the following sequence :—

Frequency-changer ECH81 (V3) ; I.F. Amplifier EF85 (V4) ; Signal/A.G.C. Diode and A.F. Amplifier EABC80 (V5) ; Output EL84 (V6) ; Full-wave Rectifier EZ80 (V7).

Waveband Switch in the " FM " position

The circuit is now re-arranged and, while still employing the above valves, two additional stages (V1 and V2), mounted on a special sub-chassis, are brought into operation. The valve sequence now becomes :—

Wide-band R.F. Amplifier EF80 (V1) ; Oscillator/Frequency-changer EF80 (V2) ; 1st I.F. Amplifier—Heptode part of ECH81 (V3) ; 2nd I.F. Amplifier EF85 (V4) ; Ratio detector—two diodes from EABC80 (V5) ; 1st A.F. Amplifier—triode part of ECH81 (V3) ; 2nd A.F. Amplifier—triode part of EABC80 (V5) ; Output EL84 (V6) ; Full-wave Rectifier EZ80 (V7).

The R.F. stage V1 is fixed-tuned while the oscillator is fitted with variable permeability tuning. Variation is achieved by means of an iron-dust core operated by a cam attached to the normal drive drum. It will be noticed that the frequency-changer valve (V3) is utilized as an I.F. and A.F. amplifier on F.M. Separate I.F. transformers are used for A.M. (I.F. = 470 Kc/s) and F.M. (I.F. = 19·5 Mc/s) and a special slider switch, operated by the Waveband switch, ensures positive changeover. The output stage (V6), which feeds a high flux P.M. elliptical speaker, has a special negative feedback circuit plus tone control to ensure maintenance of the high fidelity of F.M. transmissions.

VALVES

	Heaters
Mullard EF80	6·3V. 0·3A
Mullard ECH81	6·3V. 0·3A
Mullard EF85	6·3V. 0·3A
Mullard EABC80	6·3V. 0·45A
Mullard EL84	6·3V. 0·76A
Mullard EZ80	6·3V. 0·6A

All bases B9A

VOLTAGE RANGE

100–120V., 200–250V.
40–100 c/s

MAINS CONSUMPTION

65 watts.

SCALE LAMPS

2 at 6·5V. 0·3A.

AUDIO OUTPUT

3 watts approx.

WAVEBANDS

Long wave—300 Kc/s to 150 Kc/s (1,000 to 2,000 metres).
Medium wave—1,600 Kc/s to 535 Kc/s (187 to 560 metres).
F.M. band—87·5 Mc/s to 100 Mc/s (3·4 to 3 metres).

INTERMEDIATE FREQUENCIES

A.M.—470 Kc/s.
F.M.—19·5 Mc/s.

CONTROLS (From Left to Right)

Tone—On/Off switch and volume—Tuning—Waverange/Gramophone switch.

GRAMOPHONE PICK-UP

The pick-up sockets are situated on the left-hand side of the receiver (rear view) next to the A.M. aerial and earth sockets.

AERIAL CONNECTIONS

A.M.—Sockets for aerial and earth connections are on a panel at the left-hand side of the receiver (rear view).

F.M.—Earlier receivers are equipped with a plate aerial in the top of the cabinet. This aerial is terminated in a red plug which should be inserted in the upper of the two F.M. band aerial sockets (at left when viewed from rear).

Later models are, however, fitted with an internal dipole aerial terminating in a two-pin plug for insertion into the F.M. band aerial sockets.

In noisy or low-signal areas, an outdoor aerial may be necessary and a separate two-pin plug is supplied for use with 80-ohm twin-wire feeder.

EXTERNAL SPEAKERS

Two sockets, located on a small panel at the top of the cabinet, are provided for a low impedance external speaker. The knurled screw on the panel disconnects the internal speaker when turned anti-clockwise.

A permanent magnet speaker having an impedance of approximately 2·5 ohms should be used for the extension.

CABINET DIMENSIONS

Height 13½ in. Depth 7¾ in. Width 16¼ in.

WEIGHT

19 lb.

CAPACITORS

Ref.	Value mfd.	Value pfd.	Type	D.C. Working Voltage	Tolerance ± %	Part No.	Description
C1	·001	—	M.P.	350	20	AP22248 / AP24116	V1 screen decoupling.
C2	·001	—	M.P.	350	20	AP22248 / AP24116	V1 cathode bypass.
C3	·001	—	M.P.	350	20	AP22248 / AP24116	V1 anode decoupling.
C4	·001	—	M.P.	350	20	AP22248 / AP24116	V1 heater bypass.
C5	—	4·7	S.C.	750	20	AP22252	V1 anode tuning.
C6	—	4·7	S.C.	750	20	AP22252 / AP23258	V2 oscillator tuning.
C7	—	22	S.C.	750	20	AP22253	V2 grid block.
C8	—	4·7	S.C.	750	20	AP22252	V2 oscillator grid capacitor.
C9	·003	—	M.P.	350	20	AP22249 / AP24115	V2 anode decoupling.
C10	—	39	S.M.	350	5	AP22260	I.F.T.1 primary tuning.
C11	·001	—	M.P.	350	20	AP22248 / AP24116	V2 heater decoupling.
C12	—	22	S.M.	350	5	AP20404	I.F.T.1 secondary tuning.
C13	—	800	S.M.	350	10	AP22827	M.W. fixed tuning for L4.
C14	—	600	S.M.	350	10	AP19652	L.W. fixed tuning for L6.
C15	—	85	S.M.	350	2	AP19645	
					9	AP19644	L.W. fixed tuning for L7.
C16	—	100	S.C.	750	20	AP17336	M.W. and L.W. coupling to V3 signal grid.
C17	·02	—	M.P.	150	20	AP22251	V3 cathode bypass (R.F.).
C18	100	—	ELECT.	6	+50–20	AP22258	V3 cathode bypass (A.F.).
C19	·02	—	M.P.	150	20	AP22251	V3 heater decoupling.
C20	·02	—	M.P.	150	20	AP22251	A.F. coupling V3 (oscillator section).
C21	1	—	ELECT.	350	+50–20	AP22254	V3 screen decoupling.
C22	·003	—	M.P.	350	20	AP22249 / AP24115	V3 screen decoupling.
C23	—	56	S.C.	750	20	AP18162	V3 oscillator grid coupling.
C24	—	33	S.M.	350	2	AP19690 / AP17919	L.W. oscillator fixed tuning.
C25	—	240	S.M.	350	2	AP19648 / AP19649	L.W. oscillator fixed tuning.
C26	—	515	S.M.	350	1	AP17175 / AP17207	M.W. oscillator padder.
C27	—	365	S.M.	350	1	AP19650 / AP19651	L.W. oscillator padder.
C28	·001	—	P.T.	500	25	P 3768	V3 oscillator anode feed.
C29	16	—	ELECT.	275	+50–20	AP22256	Audio decoupling to V3 (oscillator section).
C30	·003	—	M.P.	350	20	AP22249 / AP24115	V3 anode decoupling.
C31	·1	—	M.P.	150	25	AP21245	A.G.C. decoupling.
C32	—	110	S.M.	350	2	AP16304 / AP17058	I.F.T.4 primary tuning.
C33	—	39	S.M.	350	5	AP22260	I.F.T.2 primary tuning.
C34	—	110	S.M.	350	2	AP16304 / AP17058	I.F.T.4 secondary tuning.
C35	—	39	S.M.	350	5	AP22260	I.F.T.2 secondary tuning.
C36	·02	—	M.P.	150	20	AP22251	V4 cathode bypass.
C37	·003	—	M.P.	350	20	AP22249 / AP24115	V4 screen decoupling.
C38	·02	—	M.P.	150	20	AP22251	V4 heater decoupling.
C39	—	110	S.M.	350	2	AP16304 / AP17058	I.F.T.5 primary tuning.
C40	·003	—	M.P.	350	20	AP22249 / AP24115	V4 anode decoupling.
C41	—	110	S.M.	350	2	AP16304 / AP17058	I.F.T.5 secondary tuning.
C42	—	47	S.M.	350	5	AP22838	I.F.T.3 secondary tuning.
C43	—	100	M.M.	350	20	P 3775	V5 signal diode reservoir.
C44	·01	—	M.P.	350	20	AP22250 / AP24117	Audio isolating (V5).
C45	·01	—	M.P.	350	20	AP22250 / AP24117	Audio coupling to V5 grid.
C46	—	500	M.M.	350	20	P 3728	De-emphasis circuit.
C47	40	—	ELECT.	350	+50–20	AP22257	Smoothing.
C48	—	220	S.M.	350	1	AP21787	Ratio detector load.
C49	—	220	S.M.	350	1	AP21787	Ratio detector load.
C50	5	—	ELECT.	50	+50–20	AP22255	Ratio detector output stabilizer.
C51	—	270	S.C.	500	20	AP21906	Part of negative feedback circuit.
C52	·01	—	M.P.	350	20	AP22250 / AP24117	A.F. coupling to V6.
C53	·1	—	P.T.	350	25	P 3771	Tone corrector circuit.
C54	50	—	ELECT.	12	+50–20	AP18622	V6 cathode bypass.
C55	·001	—	P.T.	500	25	P 3768	Tone corrector circuit.
C56	20	—	ELECT.	350	+50–20	AP22257	Smoothing (V6).
C57	·0033	—	S.M.	350	5	AP22418	Part of negative feedback circuit.
C58	40	—	ELECT.	350	+50–20	AP22257	Reservoir.
TC1	—	2–8		—	—	AP22241	F.M. oscillator trimmer.
TC2	—	4–40		—	—	AP19637	M.W. aerial and oscillator trimmer.
TC3	—	4–40		—	—		
VC1	—	525		—	—	BP22455	M.W. and L.W. tuning.
VC2	—	525		—	—		

P.T. — Paper Tubular. M.M. — Moulded Mica. S.M. — Silvered Mica.
S.C. — Silvered Ceramic. M.P. — Metallised Paper.

RESISTORS

Reference	Value (ohms)	Rating (watts)	Tolerance ± %	Part No.	Description
R1	15,000	¼	10	P6659	V1 screen dropper.
R2	180	¼	10	P6173	V1 bias.
R3	470	¼	20	P6275	V1 decoupling.
R4	2,200	¼	10	P6449	V1 anode load.
R5	47,000	¼	20	P6779	V2 grid bias.
R6	2,200	¼	10	P6449	V2 anode decoupling.
R7	680,000	¼	20	P7073	V3 grid.
R8	180	¼	10	P6173	V3 cathode bias.
R9	47,000	¼	20	P6779	V3 oscillator grid.
R10	470,000	¼	20	P7031	V3 grid (F.M. only).
R11	22,000	½	10	P6700	V3 screen dropper.
R12	100,000	½	20	P6862	Standby dropper to V1 and V2.
R13	47,000	¼	20	P6779	V3 oscillator decoupling.
R14	10,000	¼	20	P6611	V3 oscillator anode load (F.M. only).
R15	33,000	¼	20	P6737	V3 oscillator anode load.
R16	1,000	¼	20	P6359	V3 amplifier anode decoupling (F.M. only).
R17	56,000	¼	10	P6803	Part of screen potentiometer to V4.
R18	150	¼	10	P6155	Part of cathode bias circuit to V4.
R19	1,200	¼	10	P6383	Part of cathode bias circuit to V4.
R20	1·5 Meg.	¼	20	P7157	A.G.C. filter.
R21	100	¼	20	P6107	Phasing resistor to V5.
R22	100,000	¼	20	P6863	A.G.C. load.
R23	220,000	¼	20	P6947	Audio load.
R24	15 Meg.	¼	33⅓	P14548	V5 grid.
R25	180,000	¼	10	P6929	V5 anode load.
R26	100,000	¼	20	P6863	De-emphasis circuit.
R27	22,000	¼	10	P6701	Ratio detector load.
R28	3,300	¼	20	P6485	V6 grid stopper.
R29	1 Meg.	¼	20	P7115	V6 grid resistor.
R30	220	½	5	P6202	V6 cathode bias.
R31	470,000	¼	5	P7043	Part of negative feedback circuit.
R32	1,000	6	5	AP19726	V6 smoothing.
R33	100,000	½	20	P6862	Part of screen potentiometer to V4.
VR1	500,000	—	—	BP21619	Volume control.
VR2	50,000	—	—	BP21620	Tone control.

COILS, CHOKES AND TRANSFORMERS

Reference	Resistance	Part Number	Description
L1	Less than 0·5	BS22853	F.M. Aerial.
L2	,,	BS22852	F.M. R.F. Anode.
L3	,,	BS22851	F.M. Oscillator.
L4	14	BS22283	M.W. Aerial.
L5	14		
L6	50	BS19711	L.W. Aerial.
L7	20		
L8	5	BS17259	M.W. Oscillator.
L9	1		
L10	5	BS19714	L.W. Oscillator.
I.F.T.1.	P. Less than 0·5	BS22867	F.M. 1st I.F.T.
	S. ,,		
I.F.T.2.	P. ,,	BS22868	F.M. 2nd I.F.T.
	S. ,,		
I.F.T.3.	P. ,,		
	S(1). ,,	CS22856	F.M. 3rd I.F.T. (Discriminator)
	S(2). ,,		
I.F.T,4.	P. 12·5	ES16447	L.W./M.W. 1st I.F.T.
	S. 12·5		
I.F.T.5.	P. 12·5	ES16448	L.W./M.W. 2nd I.F.T.
	S. 12·5		
T1	P. 410		
	S(1). 360	CS22460	Audio Output Transformer.
	S(2). 0·28		
T2	P. 27		
	S(1). Total 280	DS22877	Mains Transformer.
	S(2). 0·1		
CH1	550	CS22858	H.T. line smoothing choke. 12H. with 50 mA.

The cores required for the above coils are as follows :—
L1—AP22298 or AP23944. L2—AP22440. L3—AP22847. L4 to L10 and I.F.T.1 to I.F.T.3—AP17109.

VHF.41 CIRCUIT DIAGRAM

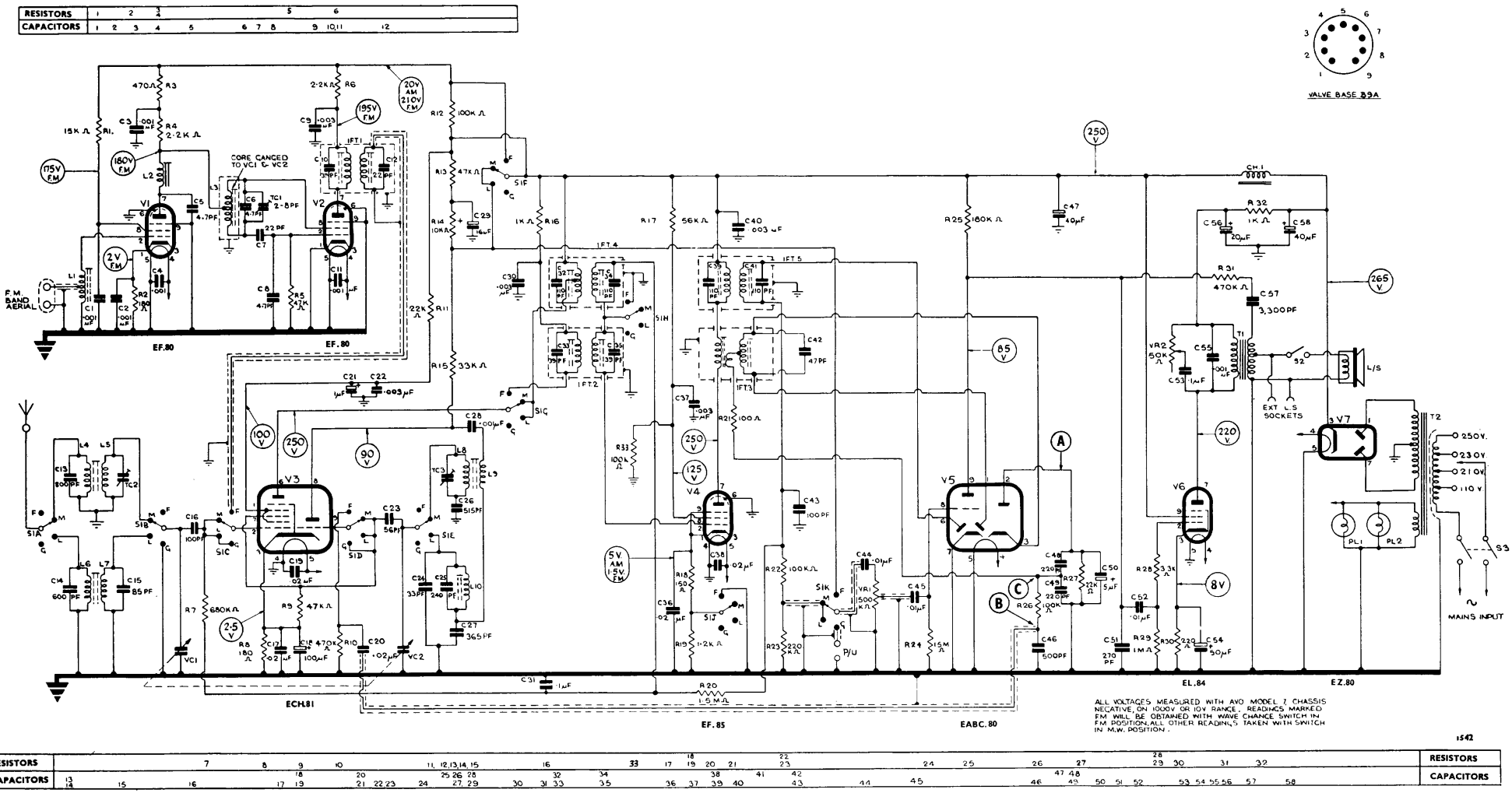

Fig. 1

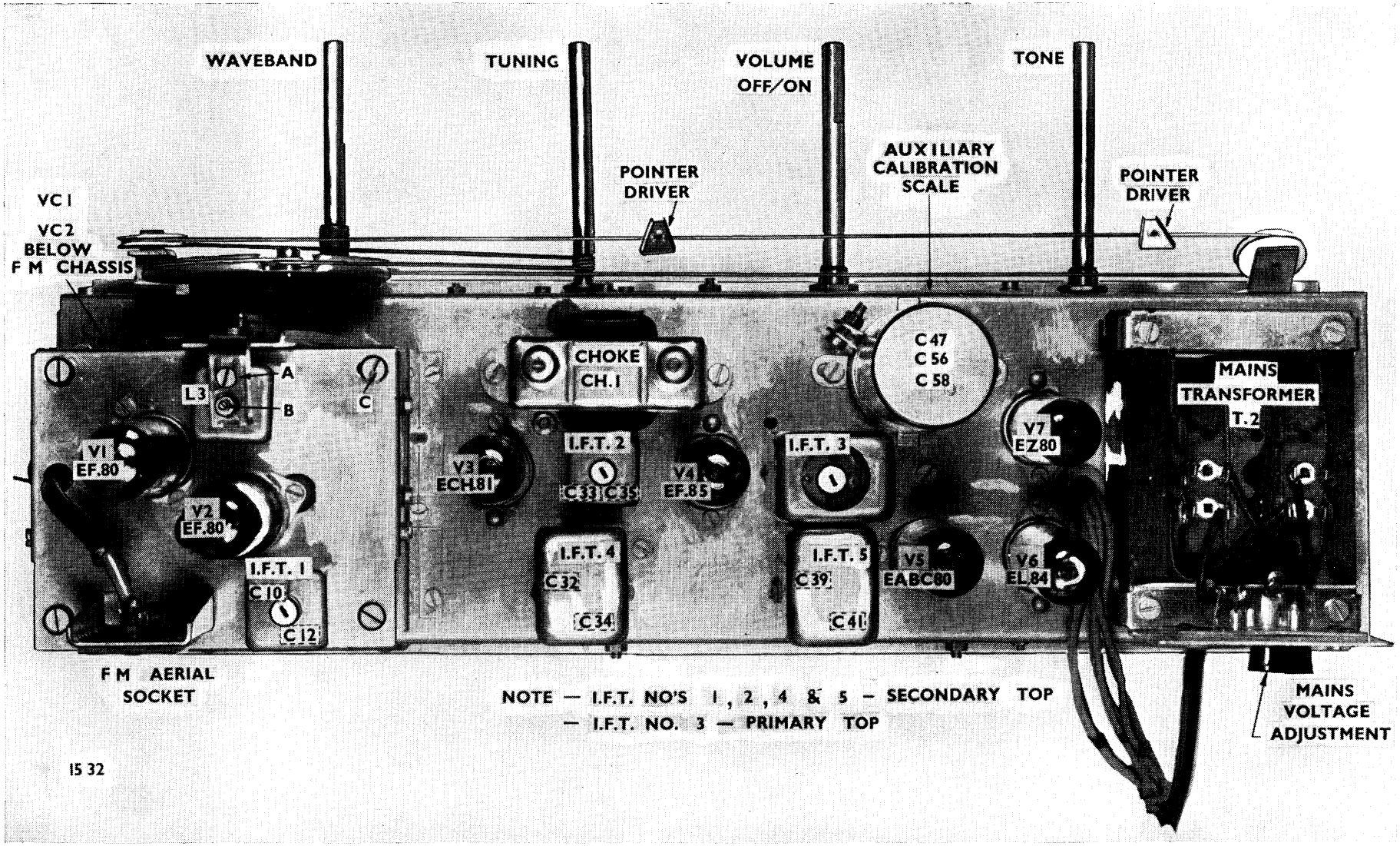

Fig. 2—Top View of Chassis

ALIGNMENT PROCEDURE

(*a*) Remove receiver from cabinet.
(*b*) The receiver and signal generators should be switched on for 15 minutes before commencing alignment.
(*c*) Use the lowest possible input from the signal generators consistent with reasonable output and volume control at maximum.
(*d*) With tuning capacitor set at maximum capacity, a temporary pointer should be clipped on to the drive cord to coincide with the DATUM line on the auxiliary calibration scale at the front of the receiver chassis.
(*e*) Use a non-metallic screwdriver or tube spanner when aligning all cores and trimmers.
(*f*) Where two peaks are found during alignment, select the one nearest to the fully withdrawn position of the core.

A.M. ALIGNMENT

Test Equipment Required

(1) Signal Generator—covering 150 Kc/s to 1,600 Kc/s with a calibration accuracy of ± 1% and modulation 400 c/s, at 30%.
(2) Output Meter—50 to 1,000 mW.
(3) A Dummy Aerial consisting of a 200 pfd. capacitor.

NOTE.—When aligning the R.F. section, the signal generator should be connected to the aerial socket in series with the dummy aerial.

I.F. Alignment (470 Kc/s)

(*a*) Switch the receiver to M.W. Connect generator to pin 2, V4, (generator set to 470 Kc/s, 30% mod. at 400 c/s) and the output meter to the secondary of T1. Disconnect speech coil.
(*b*) Tune Sec. and Pri. of I.F.T.5 (in that order) for maximum output.
(*c*) Transfer signal generator to pin 2, V3, and tune Sec. and Pri. of I.F.T.4 (in that order) for maximum output. Peak each I.F.T. once only.

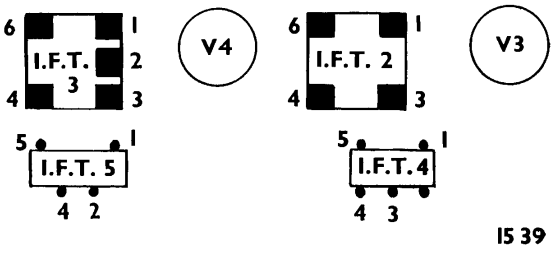

Fig. 3—Underview of I.F. transformers (See note on Fig. 2)

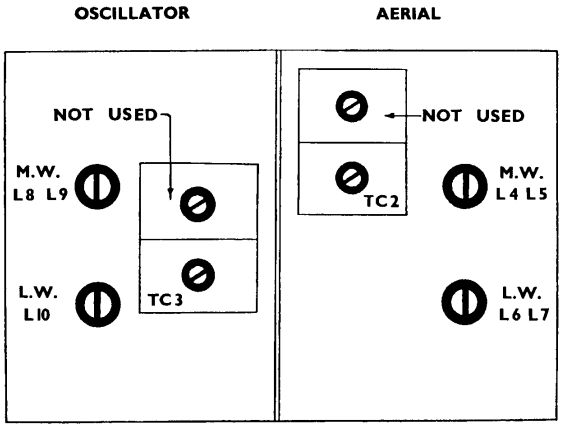

Fig. 4—Core and trimmer location (end view)

R.F. Alignment

(Signal generator to aerial socket):—

Operation	Waverange	Signal Generator Frequency (Kc/s)	Receiver Calibration Mark	Adjust
1	M.W.	600	0·6	Cores of L8/9 (Osc.) and L4/L5 (Aerial) for maximum.
2	M.W.	1,500	1·5	Trimmers TC3 (Osc.) and TC2 (Aerial) for maximum.
3	Repeat operations 1 and 2 and check calibration.			
4	L.W.	214	0·214	Core of L10 (Osc.) and L6/L7 (Aerial) for maximum.
5	Repeat operation 4 and check calibration.			

ALIGNMENT PROCEDURE—(*continued*)

F.M. ALIGNMENT

Test Equipment Required

(1) Signal Generator—covering 19·5 Mc/s (I.F.) and 87·5 to 100 Mc/s (F.M. band).
(2) D.C. Valve-voltmeter or a high-resistance (20,000 ohms per volt) voltmeter.

OR

(1) Frequency-modulated Signal Generator covering the same frequency band as above.
(2) Output meter—50 to 1,000 mW.

NOTE.—These instructions have been arranged in two parts so that alignment may be carried out using either a frequency-modulated test oscillator and an audio output meter or an unmodulated signal generator and a D.C. valve-voltmeter as an output indicator.

I.F. Alignment (19·5 Mc/s)

(Using unmodulated signal generator and valve-voltmeter).

NOTE.—During alignment, an output of 4V. should be maintained on the V–V and it should be connected as indicated in text and circuit diagram.

(*a*) Switch receiver to F.M. band. Connect signal generator to F.M. aerial input sockets (generator set to 19·5 Mc/s unmodulated) and connect V–V between point " A " and chassis (see circuit diagram).
(*b*) Tune Pri. of I.F.T.3 and Pri. and Sec. of I.F.T.2 and I.F.T.1 for maximum output on the V–V.
(*c*) Now connect V–V between point " B " and chassis (see circuit diagram) and tune Sec., I.F.T.3, for maximum on the V–V. Starting from the fully withdrawn position, the core should be screwed in past the dip until the maximum output point is reached.
(*d*) Re-connect V–V to point " A " and retune Pri., I.F.T.3, for maximum. Carefully adjust input from Signal Generator until V–V reads 4 volts.
(*e*) Re-connect V–V to point " B " and adjust Sec., I.F.T.3, for 1·6 volts on the V–V (i.e. 40% of voltage obtained at point " A "). This adjustment should be made by unscrewing the core.

I.F. Alignment (19·5 Mc/s)

(Using frequency-modulated signal generator).

(*a*) Switch receiver to F.M. band. Connect generator to F.M. aerial sockets (set to 19·5 Mc/s modulation 400 c/s deviation ± 22·5 Kc/s). Connect audio output meter across secondary of T1.
(*b*) Tune Sec. and Pri. of I.F.T.3, I.F.T.2 and I.F.T.1 (in that order) for maximum audio output.

R.F. Alignment

(Signal Generator connected to F.M. aerial sockets).

NOTE.—Either method of alignment (i.e. modulated signal with audio output meter or unmodulated signal and valve-voltmeter) may be employed and the following table is common to both. The valve-voltmeter (if used) must be connected between point " A " and chassis.

Operation	Waverange	Signal Generator Frequency (Mc/s)	Receiver Calibration Mark	Adjust
1	F.M.	87·5	87·5	Slacken locking and adjust core of L3 (Osc.) for maximum.
2	F.M.	100	100	Trimmer TC1 (Osc.) for maximum.
3	F.M.	94	94	Core of L2 (R.F.) and L1 (Aerial) for maximum.
4	Repeat operations 1,2 and 3—		check calibration.	

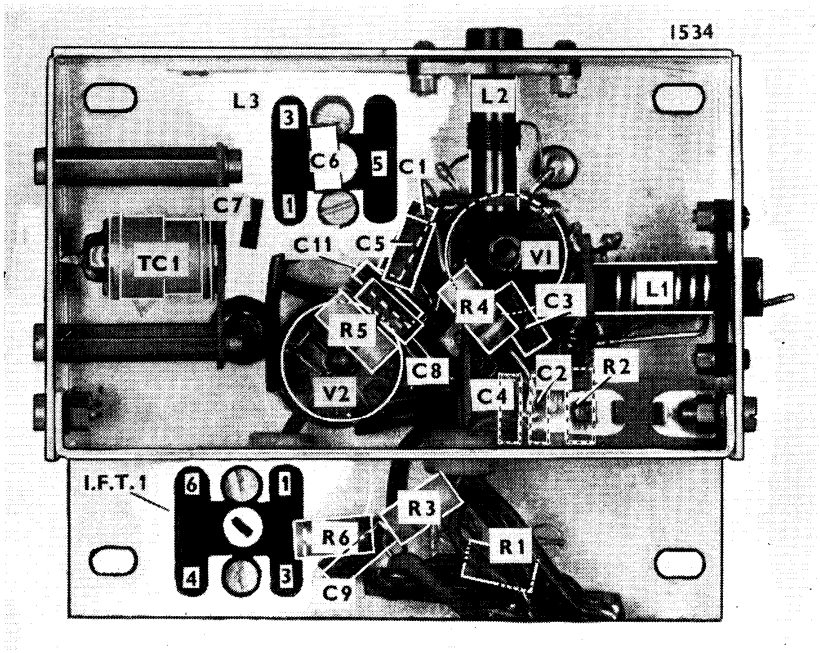

Fig. 5—Underside view of F.M. R.F. sub-chassis

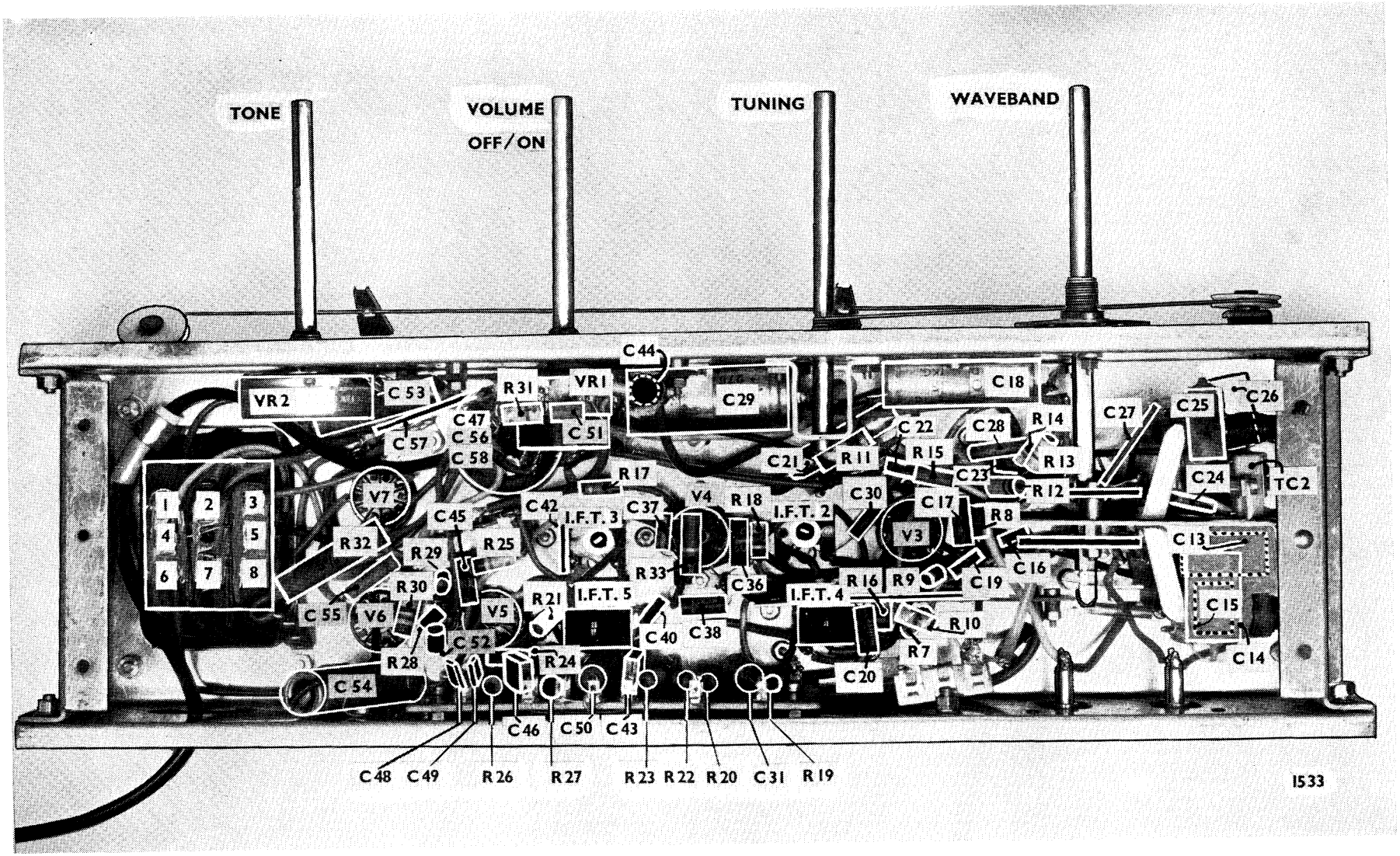

Fig. 6—Underside View of Chassis

VALVE VOLTAGES AND CATHODE CURRENTS

NOTE.—The figures quoted are approximate and variations may occur without impairing the performance of the receiver.

Valve	Anode Volts	Screen Volts	Cathode Current (mA)	Cathode Volts
V1 (EF80)	180 (FM)	175 (FM)	1 (MW), 10 (FM)	2 (FM)
V2 (EF80)	195 (FM)	180 (FM)	1·5 (MW), 15 (FM)	—
V3 (ECH81) ..	Heptode—250 Triode—90	100	15	2·5
V4 (EF85)	250	125	3	5 (MW), 1·5 (FM)
V5 (EABC80) ..	85	—	1·5	—
V6 (EL84)	220	250	36	8
V7 (EZ80)	—	—	65 (MW), 84 (FM)	—

MW—Medium Wave position of Waveband switch.
FM—FM position of Waveband switch.

DISMANTLING

Removing chassis from cabinet

Set the tuning control so that the pointers are approximately in the mid-position on the tuning scale. Lift the pointer drivers off their respective carriages and release the cleat securing the leads to the output transformer. Remove the four control knobs from the front of the receiver and unplug the F.M. aerial.

Unscrew the wooden slats beneath the cabinet to expose the chassis fixing bolts. Remove these and withdraw the chassis from the cabinet ensuring that no undue strain is taken by the output transformer leads.

To gain access to the underside of the F.M. R.F. sub-chassis (See Fig. 5)

(1) Turn the tuning capacitor to minimum.
(2) Above the drive drum and on either side of the slider return spring are two fixing bolts. Remove these and also the screw " A " at the top of the slider.
(3) Carefully lift out the core " B " from L3 ensuring that the setting of the brass nut is unchanged.
(4) Remove the four screws " C " at the corners of the F.M. R.F. unit.
(5) With a little care, the unit may now be lifted in an arc, hinging on the flexible leads at the rear of the sub-chassis.

NOTE.—Re-assembly should present no difficulty if it is remembered that the core " B " must be free to move in the coil L3. The holes for fixing bolts are elongated and the top of the slider is slotted to give maximum latitude for mechanical alignment of the core in the coil.

REPLACING CORD DRIVE

The diagram shows the position of the drive drum with the tuning capacitor fully meshed. The length of glass nylon cord required is 48½ inches after clenching in the anchor.

Hook the cord and anchor to the drive pressure spring and attach the opposite end of the spring to the drive drum. Pass the cord through the opening on the edge of the drive drum, over pulley No. 1 and then over pulley No. 2. Take three turns around the tuning spindle in a clockwise direction and then pass the cord around the drive drum in a clockwise direction. The cord is now passed through the opening on the edge of the drive drum and secured to the other side of the anchor.

PART NUMBERS

Drive Cord Assembly (including Clip, Spring and Cord)	AS23274
Spring, Cord Tension	P1941
Pointer Driver	AP16296
Pointer and Carriage	AS21618
Pointer	AP21603
Pulley	P12416
Spindle Drive	AP23272
Drive Drum and Cam	BS22860

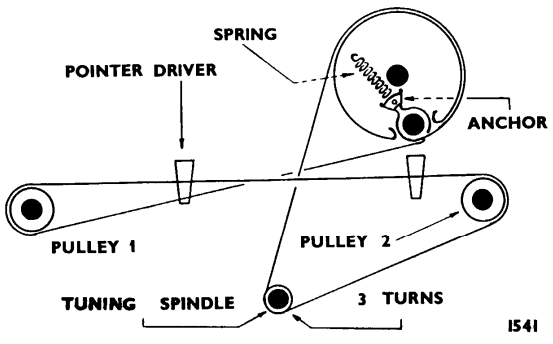

Fig. 7—Assembly of drive cord

REMOVING THE COIL DECK

ELECTRICAL OPERATIONS :—

Aerial Section

1. Remove co-axial connection to Tag No. 1 (S1C).
2. Disconnect R7 from Tag No. 2 (S1C).
3. Disconnect lead from Pin 2, V3.
4. Remove lead from VC1 stator.
5. Remove lead from the aerial socket.
6. Remove earthing wire from the frame of VC1/VC2.
7. Remove connection from the earth socket.

Oscillator Section

1. Remove red lead from Tag No. 1 (S1F).
2. Remove red lead from Tag No. 2 (S1F).
3. Remove red lead from the junction of R13 and R14.
4. Remove screened lead from Tag No. 3 (S1K).
5. Remove R15 from pin 8, V3.
6. Remove screened lead from Tag No. 6 (S1K).

   (NOTE.—this operation may be performed *after* the switch assembly has been unbolted from chassis).
7. Remove the screened lead from the " gram " sockets.
8. Remove C23 from Pin 7, V3.
9. Disconnect lead from VC2 stator.
10. Remove C28 from Pin 8, V3.

NOTE.—Certain of the above connections and components are not duplicated on the new coil deck. These connections must, therefore, be removed from the old unit and replaced on the new one.

MECHANICAL OPERATIONS :—

1. Turn waveband switch to " gram ".
2. Unbolt and remove the slider switch operating lever from the end of the switch operating bar.
3. Remove the slider switch return spring and unscrew the switch locating plate from the front of the chassis.
4. Withdraw the switch operating bar from the coil deck.
5. Unbolt and remove the chassis end plate adjacent to the coil deck. The two screws which hold the coil deck to the top of the chassis may now be removed.

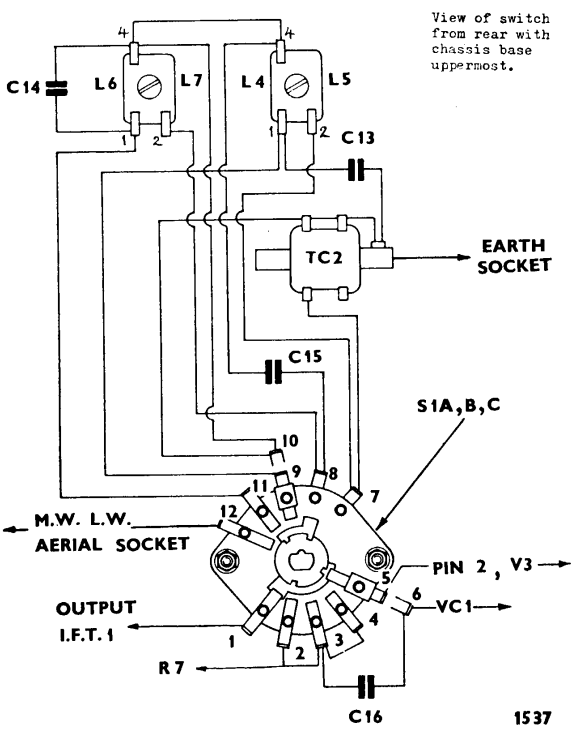

Fig. 8—Coil deck (Aerial Section)

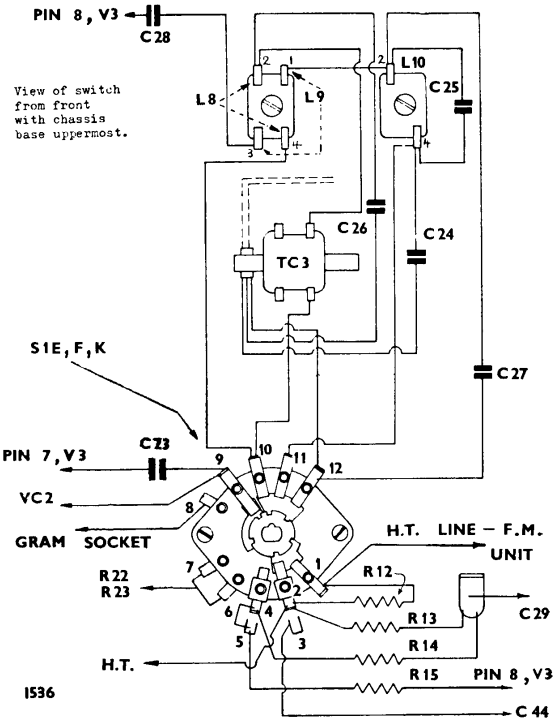

Fig. 9—Coil deck (Oscillator Section)

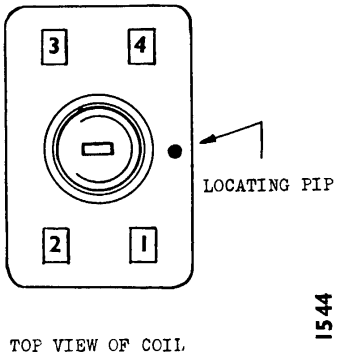

Fig. 10—Key to MW/LW coil connections

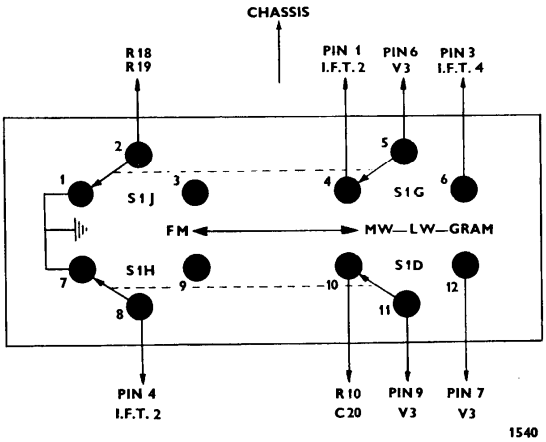

Fig. 11—Connections to F.M. Slider Switch (front view)

CONNECTIONS TO I.F. TRANSFORMERS

External connections are made to tags at the base of each transformer. Tag numbers are shown in Fig. 3 and connections are as follows :—

I.F.T. No.	Part No.	Tag No.	To
1	BS22867	1 3 4 6	Pin 7 of V2. C9 and R6 Co-axial outer. Co-axial inner.
2	BS22868	1 3 4 6	S1G (Tag 4). C30 and R16. S1H (Tag 8) and I.F.T. 4 (Tag 5) Pin 2 of V4.
3	CS22856	1 2 3 4 6	Pin 7 of V4. To R21. I.F.T.5 (Tag 2). Pin 3 of V5. Pin 1 of V5.
4	ES16647	1 3 4 5	To R7, C31 and R20. To S1G (Tag 6). HT + and R16. I.F.T.2 (Tag 4).
5	ES16648	1 2 4 5	C43. I.F.T.3 (Tag 3). HT + and C40. Pin 6 of V5.

NOTE.—Connections to the F.M. slider switch are shown in Fig. 11.

CONNECTIONS TO F.M. OSC. COIL

Coil No.	Part No.	Tag No.	To
L3 (Fig. 5)	BS22851	1 3 5	Pin 8 of V2, TC1 and C6. TC1, C6 and C7. L2.

CONNECTIONS TO MAINS TRANSFORMER
(Part No. DS22877)

The external connections to the mains transformer are made to tags situated on the base of the transformer (see Fig. 6). The connections are as follows :—

Tag No.	To
1	Pin 4 of V6, Pin 4 of V7 and dial lamps.
2	On/Off switch S3.
3	Pin 1 of V7.
4	Chassis.
5	Chassis.
6	Chassis.
7	On/Off switch S3.
8	Pin 7 of V7.

GRAMOPHONE PICK-UP

The waveband switch should be set to the "Gram" position when the receiver is being used for record reproduction. A good quality pick-up of the crystal type is recommended—the ACOS HGP39 is quite suitable. The screened lead from the pick-up should be as short as possible. The inner lead should go to the upper P.U. socket whilst the outer screen goes to the lower one. An input of approximately 150 mVolts is required to fully load the amplifier.

PART NUMBERS

The following part numbers are not shown elsewhere in these Service Instructions. **When ordering replacements please quote :—**

1. Type and Serial Number of receiver.
2. Part Number and Description of item.
3. Quantity required.

Cabinet	EP22456
Cabinet back	EP22290
Clip, Knob	AP16423
Coil deck (complete)	ES22859
Knob, Volume, On/Off Switch	AP20674
Knob, Tone	AP20677
Knob, Tuning	AP20675
Knob, Waveband/Gram.	AP22833
Knob, Skirt (one per knob)	AP21690
Label, calibration	AP22432
Scale, Tuning	DP22820
Slider switch (4-pole)	AP22458
Speaker, P.M., oval	BP18259
Switch wafer, oscillator	AP22435
Switch wafer, aerial	AP22436
Valveholder, B9A	AP22419
Valveholder, B9A, with skirt	AP22755

MODIFICATIONS

1. Early models of the receiver are not equipped with an internal aerial for F.M. reception. Later models are fitted with either a plate aerial in the top of the cabinet (CN5117) or an internal dipole (CN5404).
2. Early models are not fitted with R33 (100 K, Part No. P6862). (CN5140).
3. Capacitor C6 was Part No. AP22252 and is now AP23258. (CN5288).
4. Receivers with Serial Numbers from 4000 to 4701 have an additional resistor of 2·2K ($\frac{1}{4}$ watt $\pm$ 20% ; Part No. P6443) in parallel with R19. (PC1062).
5. Capacitor Part Number changes.
   C1, C2, C3, C4 and C11 were Part No. AP22248 but are now AP24116. C9, C22, C30, C37 and C40 were Part No. AP22249 but are now AP24115. C44, C45 and C52 were Part No. AP22250 but are now AP24117. (CN5481).

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All enquiries to be made to the SERVICE DEPARTMENT

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Telephone: PROspect 8271/4

September, 1955

T.P. 1033

BUSH RADIO

Amendment to Service Instructions for Models VHF.41 and RG.46

Experience has shown that the FM alignment procedure contained within these manuals may not be entirely satisfactory in all cases. It is suggested, therefore, that the following new alignment instructions (for FM only) should be adopted.

ALIGNMENT PROCEDURE (FM)

Test Equipment Required

(1) Signal Generator for 19.5 mc/s. (IF) and 87.5 to 100 mc/s.

(2) Avometer Model 8.
OR

(2) D.C. valve-voltmeter and microammeter with 50μA FSD.

(3) 2 ¼-watt resistors of 47K each, matched.

IF Alignment (19.5 mc/s.)

Switch receiver to VHF band. Inject 19.5 mc/s. unmodulated to pin 2, V3 and turn volume control to minimum. Connect the two matched 47K resistors in series, and then connect them between point "A" (see circuit diagram) and chassis. Connect AVO model 8 (on 10V. DC range) or valve-voltmeter between point "A" and chassis.

During alignment, it is advisable to ensure that the input from the generator is just sufficient to maintain an output of 4V. on the voltmeter. Proceed as follows :—

(*a*) Adjust Pri. and Sec. of IFT2 and Pri. IFT3 for maximum voltage output.

(*b*) Now connect the AVO (on 50 μA range) or microammeter between the junction of the two resistors and point " B ". Adjust Sec. IFT3 to produce zero on the microammeter.

NOTE.—Zero response can only occur when the Sec. IFT3 is in balance. When de-tuned, either positive or negative output will be obtained. The AVO model 8 has a reversing button to allow readings in either direction, but the connections to the microammeter (if used) will need to be changed over as necessary.

(*c*) Re-connect the voltmeter between point "A" and chassis. Re-trim Pri. IFT3 for maximum voltage output.

(*d*) Re-connect microammeter as in (*b*) above, and check Sec. IFT3 for zero response.

NOTE.—It is essential that maximum voltage output coincides with minimum response on the microammeter.

RF Alignment

Transfer signal input to the FM aerial sockets. Re-connect voltmeter between point "A" and chassis and proceed as follows :—

Operation	*Generator (mc/s.)*	*Receiver Calibration Mark*	*Adjust for Maximum*
1	87.5	87.5	Core L3 (Osc.)
2	100	100	Trimmer TC1 (Osc.)
3	94	94	Cores L2 (RF) & L1 (Aerial)
4	Repeat operations—check calibration.		

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TP.1025

January 1956

BUSH RADIO LTD.

Modifications to Bush Service Instructions

Date: June, 1956.

AMENDMENT TO SERVICE INSTRUCTIONS
for
MODELS VHF.41, RG.46, VHF.54 and VHF.55.

Alignment Procedure (FM)

Due to an oversight, no reference was made to the alignment of IFT.1 in the FM Sub-chassis.

The alignment procedure should be followed to the point at which the Signal input is transferred to the FM aerial sockets for 'RF Alignment'. With generator still set to 19.5 mc/s. adjust Pri. and Sec. of IFT. 1 for maximum voltage output. Then proceed with the RF and Oscillator alignment as printed.

TP.1066.

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