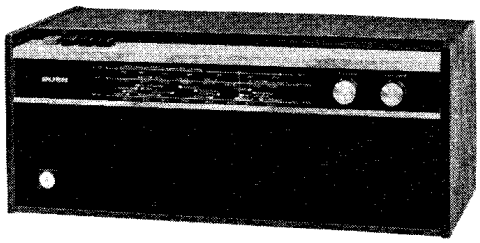
BUSH | MURPHY

SERVICE INFORMATION

BUSH MODEL VHF101
MURPHY MODEL A857
A.M.-F.M. TRANSISTORISED RADIO RECEIVERS



VHF101

SPECIFICATION

GENERAL

The VHF101 and the A857 are mains operated fully transistorised table model AM–FM radio receivers, covering the LW, MW and the VHF wavebands. They are designed for operation on a.c. mains supplies between 200–240 volts at 40–100 Hz.

Both the models are electrically similar with each receiver incorporating ten transistors, three crystal diodes and utilising silicon diodes as a power supply rectifier. An internal ferrite rod is provided for the LW and MW bands, and a folded dipole for the VHF band. A connector is provided enabling the use of an external aerial on the VHF bands only.

PRESENTATION

Common features for both models

Both models are housed in a wooden cabinet with four small moulded plastic feet. On the front of the cabinet is the moulded plastic loudspeaker grille with horizontal slots which extends to the full width of the cabinet. Above the grille is the full-width tuning scale finished in clear plastic with aluminium trim. Projecting from the right-hand side of this scale are the Tuning and Volume control knobs. On top of the cabinet is a brush finish aluminium panel, to the left-hand side of which are located the four push-buttons selecting OFF–LW–MW and VHF. The tape socket and the external VHF aerial connectors are located at the rear of the cabinet.

CABINET DIMENSIONS

Height: $7\frac{7}{8}$ inches (20 cm)
Width: $18\frac{1}{2}$ inches (47 cm)
Depth: $6\frac{1}{4}$ inches (15·9 cm)
Weight: $9\frac{3}{4}$ lb (4·4 kg)

These are the overall dimensions including feet and the projection of control knobs.

CONTROLS

Top Left: Four push-button switches selecting OFF–LW–MW and VHF.
Front Right: Tuning control and Volume control.

WAVEBANDS

LW Band: 1070 to 1900 metres (280 kHz–158 kHz)
MW Band: 187 to 570 metres (1605 kHz–525 kHz)
VHF Band: 88 MHz to 108 MHz

INTERMEDIATE FREQUENCIES

LW and MW Bands: 470 kHz, oscillator high with respect to signal.
VHF Band: 10·7 MHz, oscillator low with respect to signal.

AERIALS

An internal ferrite rod aerial serves the LW and MW bands and a folded dipole aerial serves the VHF band. At the rear of the cabinet a connector is provided for the use of an external VHF aerial.

MAINS SUPPLY

200 volts to 240 volts a.c., 40 Hz to 100 Hz.

PILOT LAMPS

Two 8 volts 1·2 watts for illumination of the tuning scale.

POWER CONSUMPTION

20 watts.

LOUDSPEAKER

6 × 4 inches (15 × 10 cm) elliptical. Impedance 10 ohms. Flux density 8000 lines per square centimetre.

AUDIO OUTPUT

2 watts.

AUTOMATIC GAIN CONTROL

One controlled stage on the LW and MW bands only.

TAPE SOCKET

A 5-pin DIN type socket is provided at the rear of the receiver for recording purposes.

MAINTENANCE

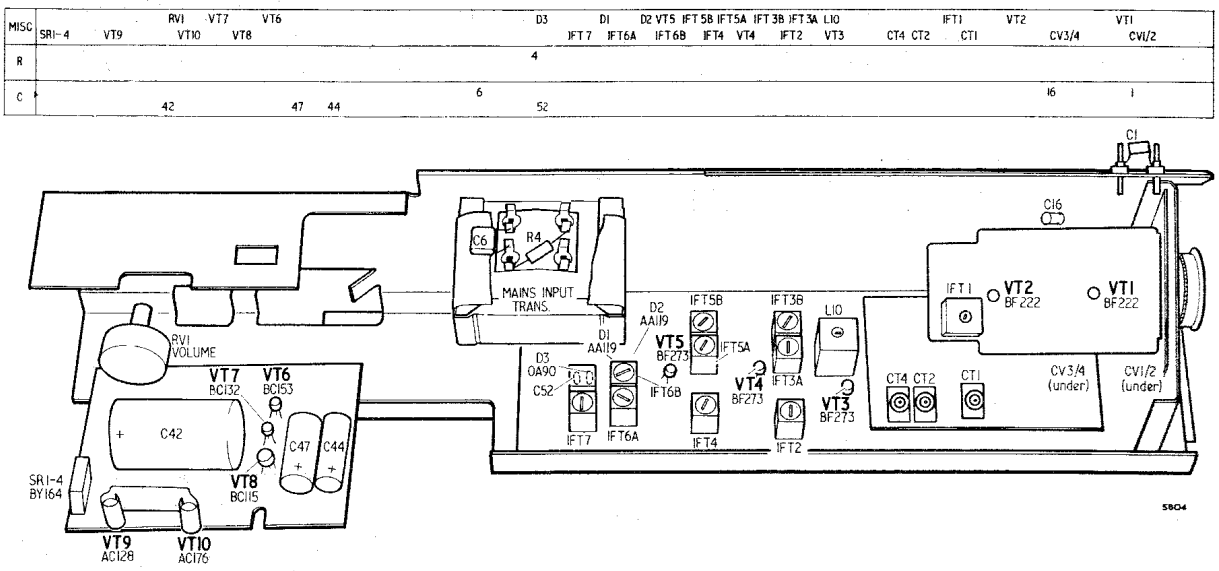


Fig. 1 Rear view of chassis

DISMANTLING

REMOVAL OF CHASSIS

1 Disconnect the mains supply and remove the cabinet back.
2 Pull off the Tuning and Volume control knobs.
3 Place the cabinet face downwards.
4 Disconnect the pilot lamp sockets from the mains transformer and the loudspeaker sockets.
5 Release the mains lead clamped to the cabinet base and remove the two 4BA nuts (on some models, a fixing screw is used in place of one nut) securing the chassis to the underside of the top of the cabinet.
6 Lift the chassis out of the cabinet to the extent of the ferrite aerial leads.
7 For a complete removal of the chassis, disconnect the tape socket leads from the audio unit A784 (see Fig. 6b). Disengage the ferrite rod aerial from its mounting bracket and disconnect the internal VHF aerial leads.
8 For reassembly reverse the above procedure.

ALIGNMENT PROCEDURE

PRELIMINARY NOTES

1 Equipment required:
(*a*) A suitable signal generator to cover 158 kHz to 1605 kHz, 10·7 kHz, and 88 MHz to 108 MHz with provision for a.m. and f.m. modulated and unmodulated signals as required.
(*b*) A power output meter with ranges to cover 0–2·5 watts to match 10 ohms impedance.
(*c*) An Avometer Model 8, or both a d.c. valve voltmeter (0–2·5 watts) and a microammeter (5–0–5 μA).
(*d*) Dummy aerial (a loop of insulated wire).
(*e*) 0·1 μF isolating capacitor.
(*f*) A matched pair of 50k ohms resistors (see Fig. 2).
(*g*) Suitable trimming tools for adjusting the iron dust cores and r.f. trimmers.
2 Set the volume control to maximum unless otherwise stated.
3 Disconnect the loudspeaker and connect the power output meter in its place.
4 The signal generator should be switched on about 15 minutes before commencing the alignment.

I.F. ALIGNMENT

A.M. CIRCUITS

Note: The output of the receiver should be maintained at a level of 50 mW by reducing the i.f. input signal as necessary.
1 Switch the receiver to the Medium waveband and set the tuning pointer to approximately 1000 kHz (300 metres).
2 Set the signal generator to 470 kHz a.m. modulated 30% 400 Hz. Inject the signal via a 0·1 μF capacitor between L7/R1 (tag 'D') and chassis (tag 'A') on the ferrite rod aerial.
3 Align IFT7, IFT5 secondary, IFT5 primary, IFT3 secondary and IFT3 primary in that order for maximum audio output. Align each IFT once only.

F.M. CIRCUITS

Notes: (*a*) Connect the d.c. output and balance meters and the two 50k ohms resistors into circuit as shown in Fig. 2.
(*b*) Signal input level should be maintained to produce an output of 1 volt d.c. on the d.c. voltmeter connected across C49.
(*c*) In some receivers a magnetic screen is fitted over the IFT6 to reduce hum. This should be lifted off for alignment purposes.

1 Switch the receiver to the VHF waveband and set the tuning pointer to approximately 94 MHz. Set the volume control to minimum.
2 Set the signal generator to 10·7 MHz, unmodulated. Inject the output to TP3 (see Fig. 3), ensuring not to short circuit the output leads of the generator to the centre pin of the tuner unit as it may cause damage to VT3.
3 Adjust the pre-set control RV2 to mid-way position and align IFT6 primary for maximum d.c. output and IFT6 secondary for zero on the balance meter (microammeter).
4 Align the cores of IFT4 and IFT2 in that order for maximum d.c. output. Re-align IFT6 primary for maximum d.c. output and then IFT6 secondary for zero on the balance meter.
5 Transfer the i.f. signal to the VHF aerial connector, then with a suitable input level, adjust the secondary and primary cores of IFT1 for maximum on the d.c. voltmeter.
6 Switch to frequency modulation 30% at 400 Hz. Adjust the signal input so as to maintain a level of 1 volt d.c. on the voltmeter. Set the volume control for an output of 500 mW on the power output meter. Switch to amplitude modulation 30% at 400 Hz and adjust RV2 for minimum output on the output meter. Readjust IFT6 secondary for zero on the balance meter and RV2 for minimum output on the output meter.

R.F. ALIGNMENT

A.M. CIRCUITS

Notes: (*a*) The signal generator should be coupled to the receiver by a loop of insulated wire placed about 3 feet from the receiver and with its plane at right-angles to the ferrite rod aerial. Ensure that the tuning pointer is in line with the datum points (see Fig. 7) at the low frequency end of the scale when the tuning capacitor is fully meshed.
(*b*) Set the volume control to maximum. Ensure that the signal output of the receiver is maintained at a level of 50 mW by reducing the input signal as necessary. Follow the procedure below:

Operation	Waveband	Signal Generator Frequency (mod. 30% 400 Hz)	Tuning Pointer Setting	Adjust for Maximum Output
1	MW	600 kHz	500 metres	L10
2	MW	1500 kHz	200 metres	CT2
Repeat operation 1 and 2 until tracking is correct.				
3	MW	600 kHz	500 metres	L6, L7
4	MW	1500 kHz	200 metres	CT1
Repeat operation 3 and 4 until tracking is correct.				
5	LW	214 kHz	1400 metres	CT4
6	LW	214 kHz	1400 metres	L8, L9
Repeat operation 5 and 6 until tracking is correct.				

F.M. CIRCUITS

Notes: (*a*) Before calibrating the VHF waveband ensure that the screening cover of the VHF unit is securely in position. Check that the tuning pointer is in line with the datum points (see Fig. 7) at the low frequency end of the scale when tuning capacitor is fully meshed.
(*b*) Switch the receiver to the VHF waveband and connect the signal generator to the external VHF aerial connector. The d.c. output meter and the balance meter should be connected for f.m. i.f. alignment.

Calibration

Set the tuning pointer to 94 MHz and inject an unmodulated signal of 94 MHz. Adjust CT5 (osc.) and CT3 (r.f.) for maximum output on the d.c. output meter.

Note: The cores of L3 and L5 are adjusted during production and should not require further adjustment. If they have been disturbed, they may be re-set in accordance with the following procedure:

Operation	Signal Generator Frequency (Unmodulated)	Tuning Pointer Setting	Adjust for Maximum d.c. Output
1	87·5 MHz	87·5 MHz	L5 (osc.)
2	100 MHz	100 MHz	CT5 (osc.)
3	87·5 MHz	87·5 MHz	L3 (r.f.)
4	100 MHz	100 MHz	CT3 (r.f.)

Repeat operations 1 to 4 until no further adjustment is required then check calibration at 94 MHz and adjust CT5 and CT3 if necessary.

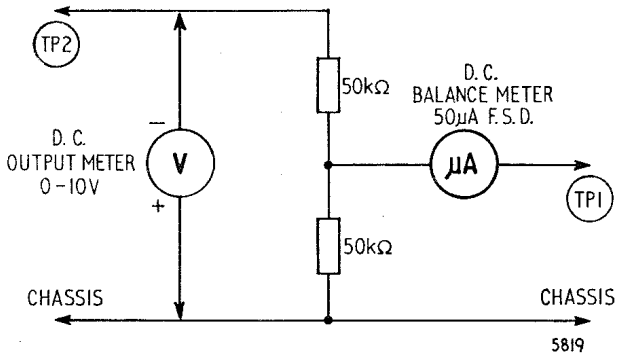
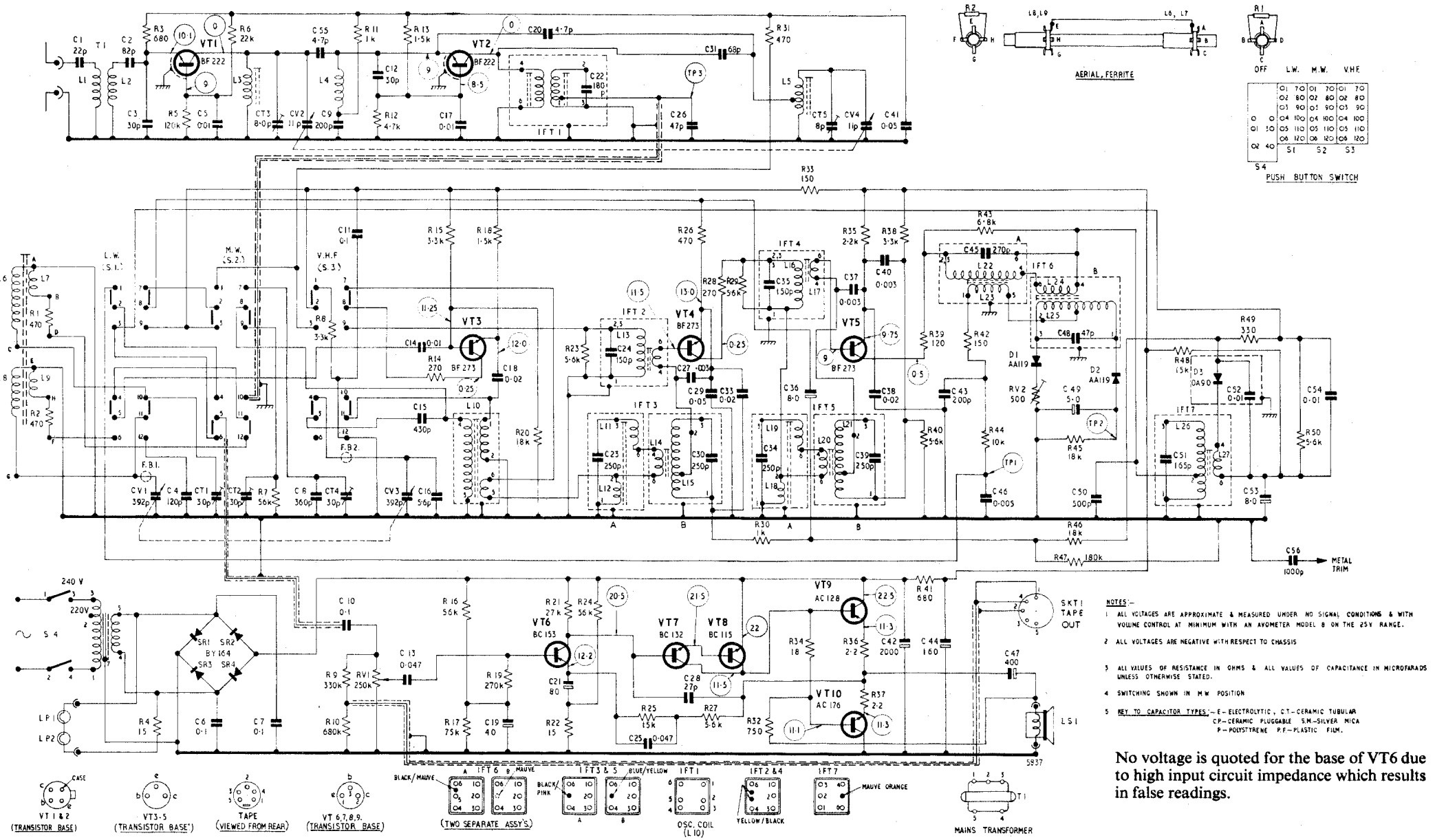


Fig. 2 Meter connections for F.M. alignment



NOTES:-

1 ALL VOLTAGES ARE APPROXIMATE & MEASURED UNDER NO SIGNAL CONDITIONS & WITH VOLUME CONTROL AT MINIMUM WITH AN AVOMETER MODEL 8 ON THE 25V RANGE.

2 ALL VOLTAGES ARE NEGATIVE WITH RESPECT TO CHASSIS

3 ALL VALUES OF RESISTANCE IN OHMS & ALL VALUES OF CAPACITANCE IN MICROFARADS UNLESS OTHERWISE STATED.

4 SWITCHING SHOWN IN M.W. POSITION

5 KEY TO CAPACITOR TYPES:- E-ELECTROLYTIC, CT-CERAMIC TUBULAR CP-CERAMIC PLUGGABLE S.M.-SILVER MICA P-POLYSTYRENE P.F.-PLASTIC FILM.

No voltage is quoted for the base of VT6 due to high input circuit impedance which results in false readings.

Fig. 3 Circuit diagram

MISC	IFT1	VT2	L4 L5	CT5	VT1 L3	CT3	L1/2
R	31	13 12		11	6 3	5	
C	26 41	17 12 31 20		9 55	5	2 3	

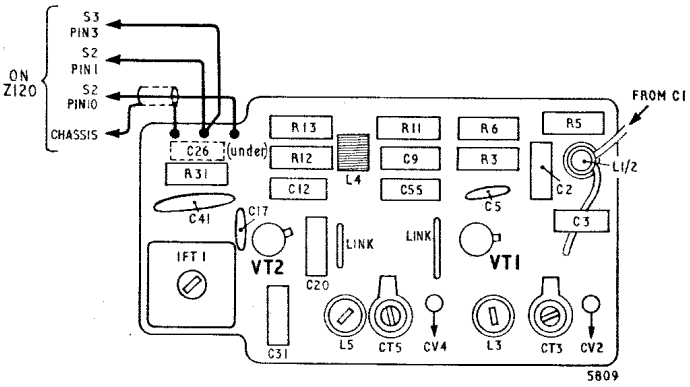


Fig. 4a V.H.F. unit (A778) component layout

MISC	IFT1	VT2	L5 L4	CT5	L3 VT1	CT3 L2
R	31	12 13		11	3 6	5
C	41 17 26	31 20 12		55 9	5	2 3

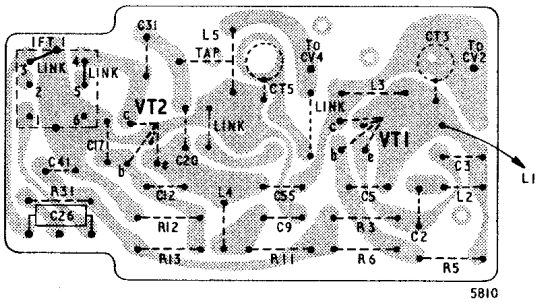


Fig. 4b V.H.F. unit (A778) printed side

MISC	D3 IFT7	RV2 D1 D2 IFT6A	IFT6B VT5 IFT5A IFT5B IFT4	IFT3A VT4 IFT3B IFT2	L10 VT3	CT4	CT2	CT1	FB2	FB1
R	46 44 49 50 48	47 42	45 40 43 38 35	30 39 29 28 33 26 23	18 20 15 14		7	8		
C	53 54	52 46 43 50	49 40 37 38	36 33 27 29	18 15 11	8		4 14		

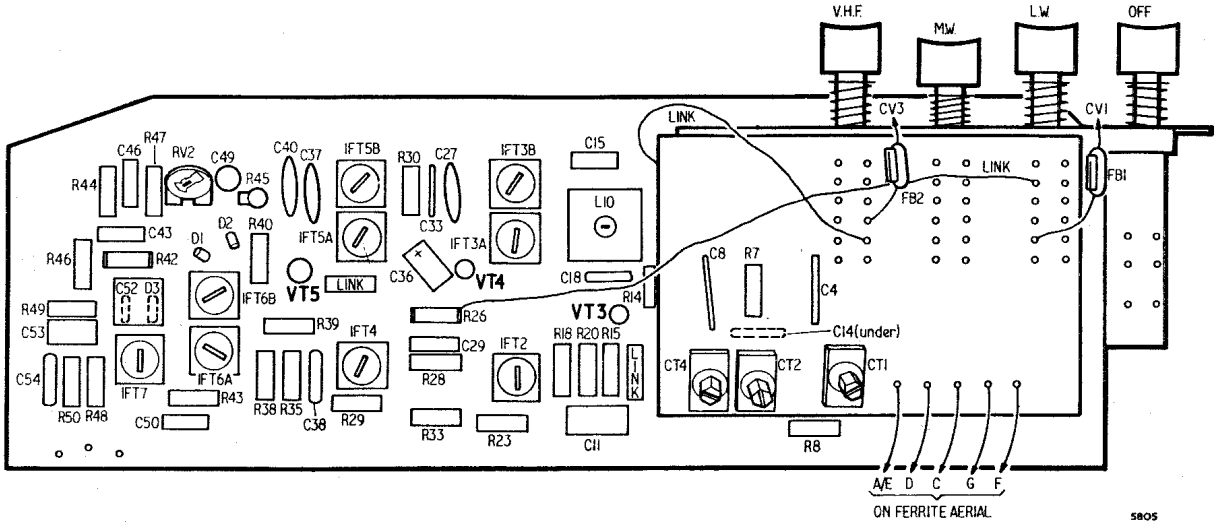


Fig. 5a I.F.-R.F. panel (Z120) – component layout

MISC	S1	S2	S3	L10 VT3	IFT3B IFT3A IFT2	VT4	IFT5B IFT5A IFT4	VT5 IFT6B IFT6A	D2	RV2 D1 D3 IFT7
R			8	14 15 20	18 23	26 30 28 33	29	39 40 45 35 38	42 47 43	44 46 49 48 50
C			14	15 18 11		27 33 29 36		37 40 49 38	50	46 43 52 53 54

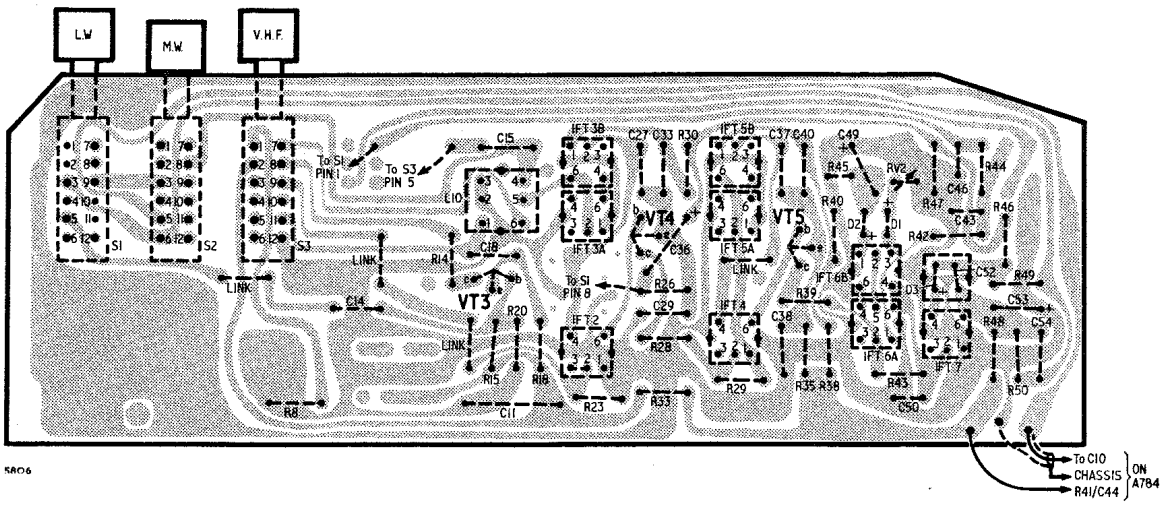


Fig. 5b I.F.-R.F. panel (Z120) – printed side

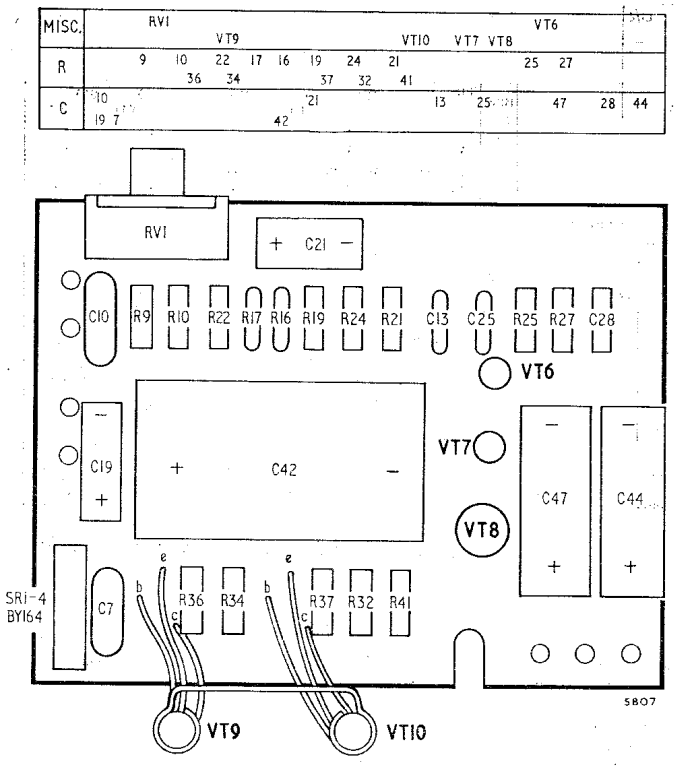


Fig. 6a Audio unit (A784) component layout

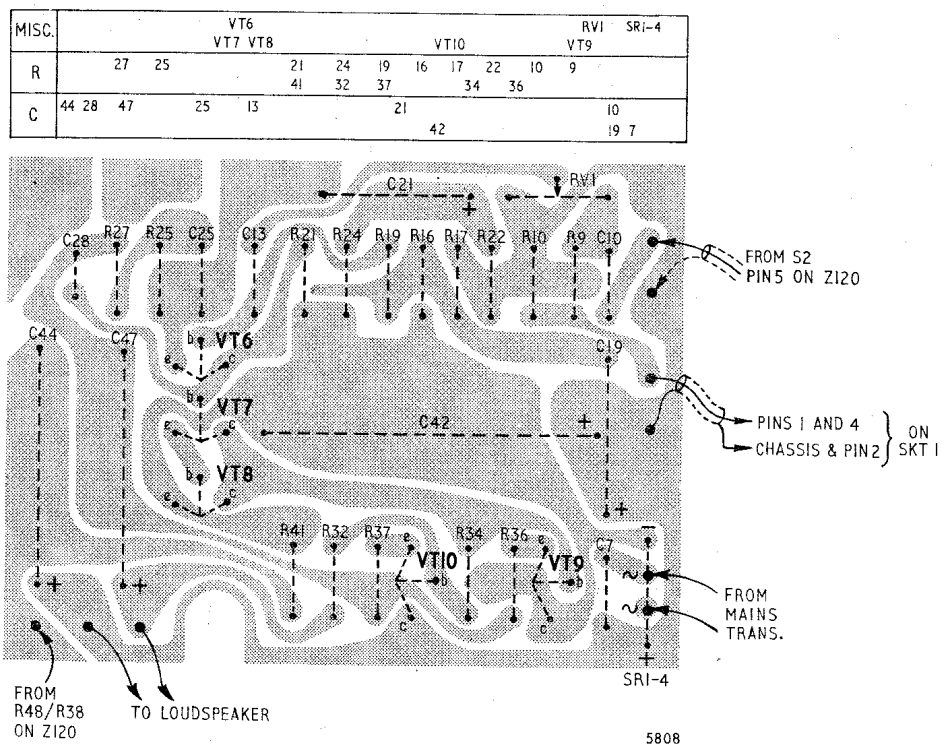


Fig. 6b Audio unit (A784) printed side

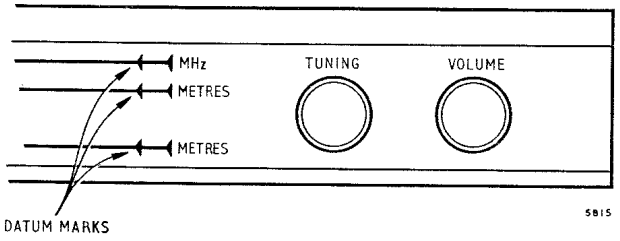


Fig. 7 Tuning scale showing datum marks

REPLACEMENT OF TUNING DRIVE CORD

To replace the drive cord, first remove the receiver chassis as described in the Dismantling Procedure. Fit the cord as shown in Fig. 8.

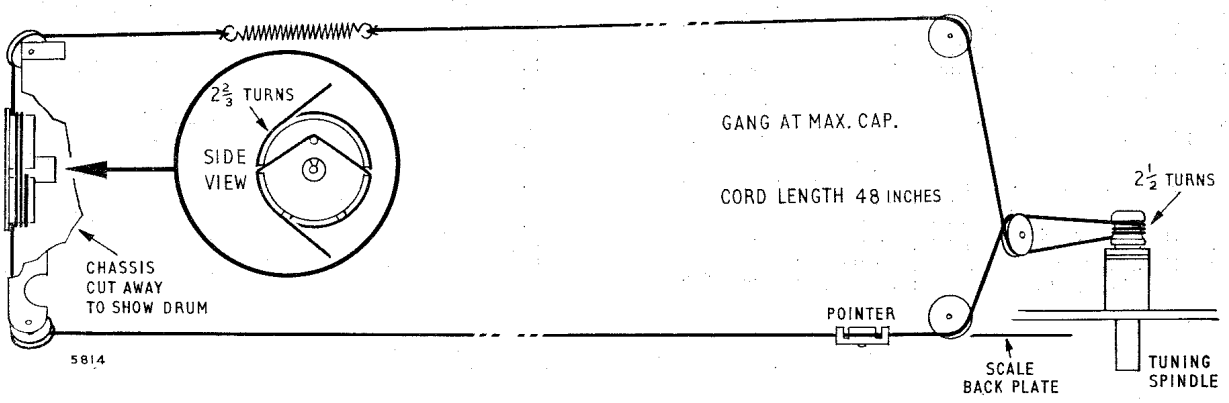


Fig. 8 Cord drive

After replacing the drive cord, turn the tuning capacitor to the fully meshed position and set the pointer to line up with the datum marks at the low frequency end of the tuning scale (see Fig. 7).

ELECTRICAL PARTS LIST

CAPACITORS

Reference	Value (μF)	Value (pF)	Tolerance (± %)	Rating (Volts)	Part Number
C1		22	5	750	2505 0837
C2		82	10	500	2525 0590
C3		30	5	750	2521 0439
C4		120	2	350	2701 0478
C5	0·01		+80−20	50	2566 0019
C6	0·1		20	250	2601 0070
C7	0·1		20	250	2601 0070
C8		360	2	350	2701 0582
C9		200	10	750	2535 0407
C10	0·1		20	250	2601 0070
C11	0·1		20	250	2601 0070
C12		30	5	750	2521 0439
C13	0·047		20	250	2601 0057
C14	0·01		20	50	2611 0052
C15		430	2·5	125	2651 0467
C16		5·6	±0·5 pF	750	2503 0620
C17	0·01		+80−20	50	2566 0019
C18	0·02		20	50	2611 0064
C19	40		+50−10	16	2751 0311
C20		4·7	±0·25 pF	750	2525 0061
C21	80		+50−10	16	2751 0323
C22		180	2·5	30	2653 0107
C23		250	Part of IFT 3A		
C24		150	Part of IFT 2		
C25	0·047		20	250	2601 0057
C26	47		10	500	2501 0657
C27	0·003		20	50	2611 0039
C28		27	10	500	2525 0796
C29	0·05		20	50	2611 0106
C30		250	Part of IFT 3B		
C31		68	5	750	2525 0462
C32	—		—	—	—
C33	0·02		20	50	2611 0064
C34		250	Part of IFT 5A		
C35		150	Part of IFT 4		
C36	8		+50−10	40	2751 0426
C37	0·003		20	50	2611 0039
C38	0·02		20	50	2611 0064
C39		250	Part of IFT 5B		
C40	0·003		20	50	2611 0039
C41	0·05		+80−20	50	2566 0032
C42	2000		+50−10	25	2757 0277
C43		200	10	750	2535 0407
C44	160		+50−10	25	2751 1224
C45		270	Part of IFT 6A		
C46	0·005		20	50	2611 0040
C47	400		+50−10	16	2751 1194
C48		47	Part of IFT 6B		
C49	5		+50−10	64	2751 0499
C50		500	10	500	2535 0080
C51		165	Part of IFT 7		
C52	0·01		20	50	2611 0052
C53	8		+50−20	40	2751 0426
C54	0·01		20	50	2611 0052
C55		4·7	±0·25 pF	750	2525 0061
C56		1000	+80−20	1250	2561 0363

VARIABLE CAPACITORS

Reference	Value	Description	Part Number
CT1	3–30 pF	M.W. Aerial trimmer	2911 0646
CT2	3–30 pF	M.W. Osc. trimmer	2911 0646
CT3	1–8 pF	V.H.F. r.f. trimmer	2913 0059
CT4	3–30 pF	L.W. Osc. trimmer	2911 0646
CT5	1–8 pF	V.H.F. Osc. trimmer	2917 0059

Reference	Value	Description	Part Number
CV1	392 pF	Tuning Gang	2901 0093
CV2	11 pF		
CV3	392 pF		
CV4	22 pF		

RESISTORS

Reference	Value (ohms)	Tolerance (± %)	Rating (watts)	Part Number
R1	470	20	0·25	2028 0129
R2	470	20	0·25	2028 0129
R3	680	10	0·25	2001 0680
R4	15	10	0·25	2024 0466
R5	120k	5	0·25	2001 2317
R6	22k	10	0·25	2001 0874
R7	56k	10	0·25	2001 0928
R8	3·3k	10	0·25	2001 0771
R9	330k	10	0·25	2001 1027
R10	680k	10	0·25	2001 1052
R11	1k	10	0·25	2001 0709
R12	4·7k	10	0·25	2001 0795
R13	1·5k	10	0·25	2001 0722
R14	270	10	0·25	2001 0631
R15	3·3k	10	0·25	2001 0771
R16	56k	2	0·25	2053 2086
R17	75k	2	0·25	2053 2878
R18	1·5k	10	0·25	2001 0722
R19	270k	10	0·25	2001 1015
R20	18k	10	0·25	2001 0862
R21	27k	10	0·25	2001 0893
R22	15	10	0·25	2001 0461
R23	5·6k	10	0·26	2001 0801
R24	56k	10	0·25	2001 0928
R25	15k	10	0·25	2001 0850
R26	470	10	0·25	2003 0654
R27	5·6k	10	0·25	2001 0801
R28	270	10	0·25	2001 0637
R29	5·6k	10	0·25	2001 0801
R30	1k	10	0·25	2001 0709
R31	470	10	0·25	2001 0667
R32	750	5	0·25	2001 1738
R33	150	10	0·25	2003 0599
R34	18	10	0·25	2001 0473
R35	2·2k	10	0·25	2001 0746
R36	2·2	0·25	0·25	2001 2913
R37	2·2	0·25	0·25	2001 2913
R38	3·3k	10	0·25	2001 0771
R39	120	10	0·25	2001 0576
R40	5·6k	10	0·25	2001 0801
R41	680	10	0·25	2001 0680
R42	150	10	0·25	2001 0588
R43	6·8k	10	0·25	2001 0813
R44	10k	10	0·25	2001 0837
R45	18k	10	0·25	2002 0880
R46	18k	10	0·25	2001 0862
R47	180k	10	0·25	2001 0990
R48	15k	10	0·25	2001 0850
R49	330	10	0·25	2001 0643
R50	5·6k	10	0·25	2001 0801

VARIABLE RESISTORS

Reference	Value (ohms)	Tolerance (± %)	Description	Part Number
RV1	250k	20	Volume control	2353 0431
RV2	500	20	A.M. rejector	2355 4265

INDUCTORS AND TRANSFORMERS

Reference	Description	D.C. Resistance (ohms)	Part Number
L1	F.M. aerial coils	less than 0·5	7100 1530
L2		less than 0·5	
L3	F.M. r.f. coil	less than 0·5	6811 0273
L4	F.M. i.f. rejector	less than 0·5	6811 0285
L5	F.M. oscillator	less than 0·5	6811 0261
L6	M.W. aerial	1	AP 55827
L7		1	
L8	L.W. aerial	9·5	AP 55828
L9		1	
L10	A.M. oscillator	Pins 3 & 4 2·5 Pins 1 & 2 less than 0·5 Pins 5 & 6 less than 0·5	7100 3058
L11	IFT3 Pri. (A.M.)	Pins 3 & 6 3·5	3221 0735
L12		Pins 1 & 2 5·5	
L13	IFT2 Pri. (F.M.)	Pins 1 & 3 less than 0·5	3222 0650
	Sec. (F.M.)	Pins 4 & 6 less than 0·5	
L14	IFT3 Sec. (A.M.)	Pins 4 & 6 less than 0·5	3221 0693
L15		Pins 1 & 3 9·5	
L16	IFT4 Pri. (F.M.)	Pins 1 & 3 less 0·5	3222 0650
L17	IFT4 Sec. (F.M.)	Pins 4 & 6 less than 0·5	
L18	IFT5 Pri. (A.M.)	Pins 1 & 2 3·5	3221 0735
L19		Pins 3 & 6 5·5	
L20	IFT5 Sec. (A.M.)	Pins 4 & 6 less than 0·5	3221 0693
L21		Pins 1 & 3 9·5	
L22	IFT6A Pri. (F.M.)	Pins 2 & 4 less than 0·5	3222 0649
L23		Pins 1 & 5 less than 0·5	
L24	IFT6B Sec. (F.M.)	Pins 4 & 6 less than 0·5	3222 0637
L25		Pins 1 & 3 1	
L26	IFT7 Pri. (A.M.)	Pins 1 & 3 5	3221 0668
L27	Sec. (A.M.)	Pins 4 & 6 1	
L28	IFT1 Pri. (F.M.)	Pins 4 & 6 less than 0·5	7100 2479
L29	Sec. (F.M.)	Pins 2 & 3 less than 0·5	
Mains Transformer	Pri.	Pins 1 & 3 310	7000 1431
	Sec.	Pins 4 & 5 3·5	

MISCELLANEOUS PARTS LIST

CABINET

Title	Description	Part Number
Back	for Cabinet VHF101	6721 0107
Back	for Cabinet A857	6721 0119
Cabinet	for VHF101, Tropical Olive	AS 55576
	Teak	AS 55577
Cabinet	for A857, White	AS 56327
	Orange	AS 56329
Knob Control (2)	volume and tuning	7600 6177
Knob Push (3)	black VHF101	6121 0353
Knob Push	red VHF101	6121 0365
Lamp (2)	8 volts, 1·2 watts	3615 0113
Lampholder (2)	—	7600 2280
Loudspeaker 10 ohms	6" × 4" (15cm × 10cm)	3132 0295
Scale	printed VHF101	6451 0451
Scale	printed A857	6451 0463
Socket and Bracket	audio connections	7500 2292
Socket	loudspeaker and mains top connection	3445 0087

CHASSIS

Title	Description	Part Number
Aerial	ferrite assembly complete	7100 3538
Audio Amplifier A784	complete	7300 2148
Boards, I.F. Panel and Switch Panel	complete	7200 0856
Coil, Aerial	medium wave	AP 55827
Coil, Aerial	long wave	AP 55828
Cord Drive Assembly	with tension spring	7600 6189
Drum and Pinion Assembly		7600 7406
Rod, Ferrite	less coil	3241 0654
V.H.F. Unit	complete with tuning gang	7300 2136

MODIFICATIONS

1 In later receivers C56 (1000 pF) has been added to eliminate hand capacity effect from the metal front of the cabinet.
2 Resistor R7 (56k ohms) is now changed to 150k ohms to improve oscillator performance under limit conditions.

THE SERVICE DEPARTMENT

RANK BUSH MURPHY LIMITED

A COMPANY WITHIN THE RANK ORGANISATION

DRAYTON ROAD . BOREHAM WOOD . HERTFORDSHIRE . ENGLAND

Telephone: 01-953 6151 · *Telex:* 262741 · *Cables:* Rankboom Boreham Wood

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