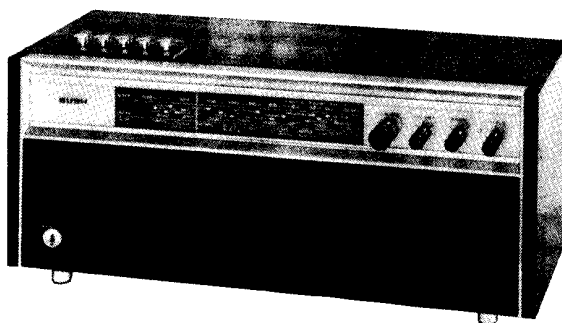


BUSH SERVICE INFORMATION

MODEL VHF102 RADIO RECEIVER



SPECIFICATION

GENERAL

Model VHF102 is a fully transistorised, mains operated AM-FM table model radio receiver incorporating ten transistors, three crystal diodes and utilising silicon diodes as power supply rectifiers. It is designed to cover the Long, Medium and VHF wavebands. An internal ferrite rod is provided for the Long and Medium bands with a folded dipole for the VHF band. Provision is also made for use of an external aerial on the VHF band only. The receiver is housed in a sealed cabinet which forms an acoustic chamber.

PRESENTATION

The receiver is housed in a wooden cabinet with four small aluminium feet fitted with non scratch pads. On the front of the cabinet is a padded loudspeaker grille which extends to the full width of the cabinet. Above the grille is a tuning scale which is recessed back from the cabinet front. Projecting from the right hand side of this scale are tuning, volume, bass and treble controls. On top of the cabinet, to the left hand side are located five push buttons selecting OFF-LW-MW-VHF and GRAM. The tape socket and the external VHF aerial connectors are located at the rear of the cabinet.

CABINET DIMENSIONS

Height: 8 $\frac{5}{8}$ in (22cm)
Width: 18 $\frac{1}{8}$ in (47.7cm)
Depth: 6 $\frac{3}{4}$ in (17.2cm)
Weight: 13 $\frac{1}{2}$ lb (6kg)

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

CONTROLS

Top Left: Five push button switches selecting OFF—LW—MW—VHF and GRAM.

Front Right: Tuning, Volume, Bass and Treble.

PILOT LAMPS

Two 6.5 volts 1 watt for illumination of the tuning scale.

WAVEBANDS

L.W. Band: 1070 to 1900 metres (280 kHz–158 kHz)
M.W. Band: 187 to 570 metres (1605 kHz–525 kHz)
V.H.F. Band: 88 MHz–108 MHz.

INTERMEDIATE FREQUENCIES

L.W. and M.W. Bands: 470 kHz, oscillator high with respect to the signal.
V.H.F. Band: 10.7 MHz, oscillator low with respect to the signal.

AERIALS

An internal ferrite rod aerial serves the L.W. and M.W. bands and a folded dipole aerial serves the V.H.F. band. At the rear of the cabinet a connection is provided for the use of an external VHF aerial.

MAINS SUPPLY

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

POWER CONSUMPTION

22 watts.

AUDIO OUTPUT

10 watts Music Power Rating at 1000 Hz.

LOUDSPEAKER

6×4 inches (15×10cm) elliptical. Impedance 5 ohms. Flux 14,000 lines per square centimetre using a ceramic magnet and a long throw voice coil.

AUTOMATIC GAIN CONTROL

One controlled stage on the L.W. and M.W. bands only.

TAPE SOCKET

A 5-pin DIN type socket is provided at the rear of the receiver for recording, playback from a tape recorder or for reproduction from a record player.

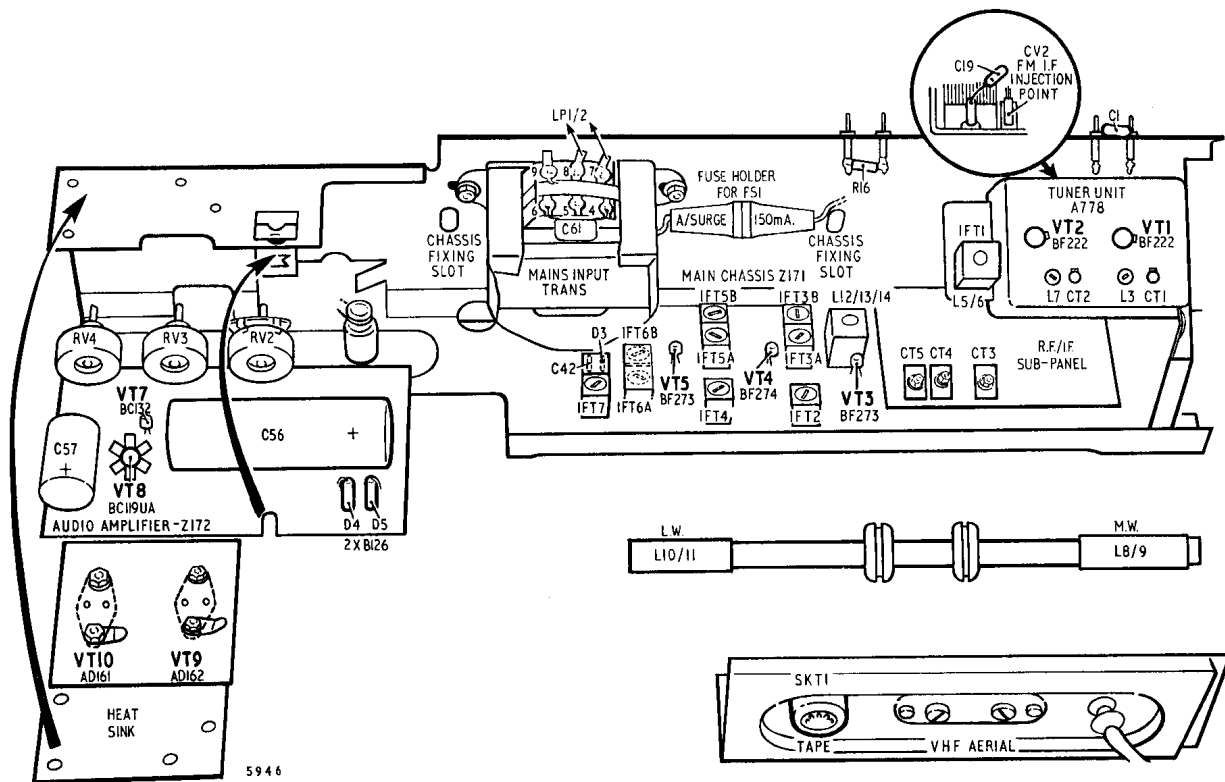


Fig. 1 Rear view of chassis.

DISMANTLING

REMOVAL OF CHASSIS

- 1 Disconnect the mains supply, free the two leads connected to the VHF aerial connector and remove the cabinet back.
- 2 Remove the plastic foam pad from the cabinet, see note 7. Pull off the Tuning, Volume, Bass and Treble control knobs.
- 3 Place the cabinet face downwards. Disconnect the pilot lamp connectors from the mains transformer and the loudspeaker connectors from the cabinet base.
- 4 Release the mains lead clamped to the cabinet base and remove the VHF aerial and Tape socket panel by unscrewing the two 4BA nuts securing the panel to the cabinet base.

- 5 Disengage the ferrite rod aerial from its mounting bracket.

- 6 Remove one 4BA nut and one 4BA screw securing the chassis to the underside of the cabinet and carefully lift the chassis out of the cabinet.

- 7 When reassembling reverse the above procedure, but note that as the cabinet is a sealed acoustic chamber, it is important that the sealing rubber fitted round the push-buttons, control spindles and VHF aerial/tape socket panel and also the plastic foam fitted round the edge of the back cover provide an adequate seal.

ALIGNMENT

PRELIMINARY NOTES

- 1 Equipment required.

(a) A suitable signal generator covering 214 kHz to 1500 kHz, 10.7 MHz and 88 to 108 MHz with provision for a.m. and f.m. modulated signal as required.

(b) A power output meter with ranges to cover 0–10 watts to match 5 ohms impedance.

(c) A 20,000 ohms per volt meter or a d.c. valve voltmeter (0 to 2.5 volts). A microammeter, 5–0–5 μ A, (balance meter).

(d) Dummy aerial (a loop of insulated wire) (see Fig. 4).

(e) 0.1 μ F isolating capacitor.

(f) A matched pair of 50 k Ω resistors (see Fig. 2).

- 2 If the cabinet back only is removed, alignment may be carried out without removing the chassis.

- 3 The signal generator should be switched on about 15 minutes before commencing alignment.

- 4 Disconnect the loudspeaker and connect the power output meter in its place.

- 5 Set the receiver Volume control to maximum unless otherwise stated.

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. signal input as necessary.

- 1 Switch the receiver to MW and set the tuning pointer to approximately 1000 kHz (300 metres).

- 2 Set the signal generator to 470 kHz a.m. modulated at 30% 400 Hz. Inject the signal via a 0.1 μ F capacitor between L8/9 (tag D) and chassis (tag A) on the ferrite rod aerial.

- 3 Align IFT7, IFT5B, IFT5A, IFT3B and IFT3A in that order for maximum audio output. Align each IFT once only.

F.M. Circuits

Notes: (a) Connect the d.c. voltmeter, the balance meter and the two 50k ohms resistors into the circuit as shown in Fig. 2.

(b) Signal input level should be maintained to produce an output of 1 volt d.c. on the voltmeter connected across C38.

(c) The magnetic screen fitted over the IFT6 should be lifted off for alignment purposes.

Alignment (continued)

- 1 Switch the receiver to VHF and set the tuning pointer to approximately 94 MHz.
- 2 Set the signal generator to 10.7 MHz, unmodulated. Inject the output to TP 1 (see Fig. 10) and chassis, 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 RV1 to mid position and align IFT6A for maximum d.c. output and then IFT6B for zero on the balance meter.
- 4 Align the cores of IFT4 and IFT2 in that order for maximum d.c. output. Re-align IFT6A for maximum d.c. output and the IFT6B for zero on the balance meter.
- 5 Switch the signal generator to F.M., modulated 30% at 400 Hz. Adjust the signal input to maintain a level of 1 volt d.c. on the voltmeter. Set the Volume control for an output of 50mW on the power output meter. Switch to A.M., modulated 30% at 400 Hz and readjust RV1 for minimum audio output. Readjust IFT6B for zero on the Balance meter and then RV1 for minimum output on the output meter.

Operation	Waveband	Sig. Gen. Freq. (mod. 30% 400 Hz)	Tuning Pointer Setting	Adjust for Maximum Output
OSCILLATOR				
1	M.W.	600 kHz	500 metres	L12/13/14
2	M.W.	1500 kHz	200 metres	CT4
Repeat operations 1 and 2 until calibration is correct.				
AERIAL				
3	M.W.	600 kHz	500 metres	L8/9
4	M.W.	1500 kHz	200 metres	CT3
Repeat operations 3 and 4 until tracking is correct.				
5	L.W.	214 kHz	1400 metres	CT5*
6	L.W.	214 kHz	1400 metres	CT5/L10/11†

* To off set any pulling effects, rock the tuning control a few degrees either side.

† During manufacture the ferrite aerial coil is set to have an inductance of 1.9 mH and should not require further adjustments. If disturbed, follow operations 5 and 6 then check the alignment of the Medium waveband.

V.H.F. TUNER ALIGNMENT

Note: During manufacture adjustments are made to the VHF tuner using special equipment and further adjustments should not be made unless components are known to have been disturbed. If this is the case, follow the procedure below for realignment:—

- 1 Switch the receiver to VHF and inject 10.7 MHz unmodulated signal to CV2 (see Fig. 1). The d.c. voltmeter and the balance meter should be connected as shown in Fig. 2.
- 2 Adjust the secondary and then the primary of IFT1 for maximum output on the d.c. voltmeter, maintaining the

Operation	Sig. Gen. Freq. (Unmodulated)	Tuner Pointer Setting	Adjust for Max. d.c. Output
1	88 MHz	88 MHz	L7
2	108 MHz	108 MHz	CT2
Repeat operations 1 and 2 until calibration is correct.			
3	92 MHz	92 MHz	L3
4	104 MHz	104 MHz	CT1
Repeat operations 3 and 4 until tracking is correct.			

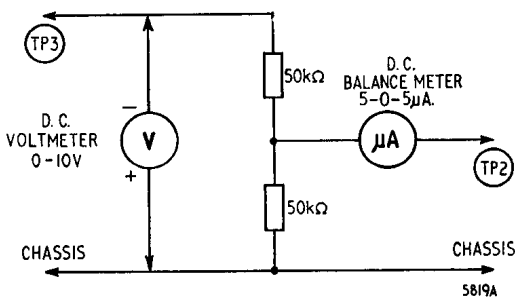


Fig. 2 Meter connections for F.M. alignment.

Note: To align IFT1 see V.H.F. Tuner Alignment below.

R.F. ALIGNMENT

A.M. Circuits

Notes: (a) The output from the signal generator should be coupled by a 10in. diameter loop of wire in series with a resistor of a value to match the output impedance of the generator. The loop should be placed about two feet from the receiver with its plane at right-angles to the ferrite rod aerial, see Fig. 4. Ensure that the tuning pointer is in line with the datum marks (see Fig. 3) at the low frequency end of the tuning scale when the tuning capacitors are 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.

input level of the signal to produce 1 volt d.c. on the voltmeter. The outer alignment peak for the cores of L5 and L6 is the correct one.

3 For calibration of the VHF band ensure that the screening cover of the tuner unit is securely in position. Check that the tuning pointer is in line with the datum marks (see Fig. 3) at the low frequency end of the tuning scale when the tuning capacitors are fully meshed.

4 Connect the signal generator to the external VHF aerial connector and chassis and realign in accordance with the table below:—

Tuner Pointer Setting	Adjust for Max. d.c. Output
88 MHz	L7
108 MHz	CT2
92 MHz	L3
104 MHz	CT1

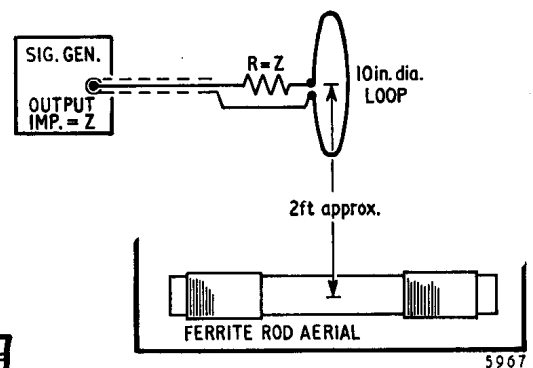


Fig. 4 Showing signal generator coupling.

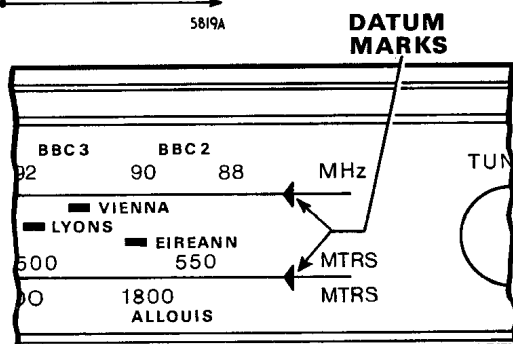
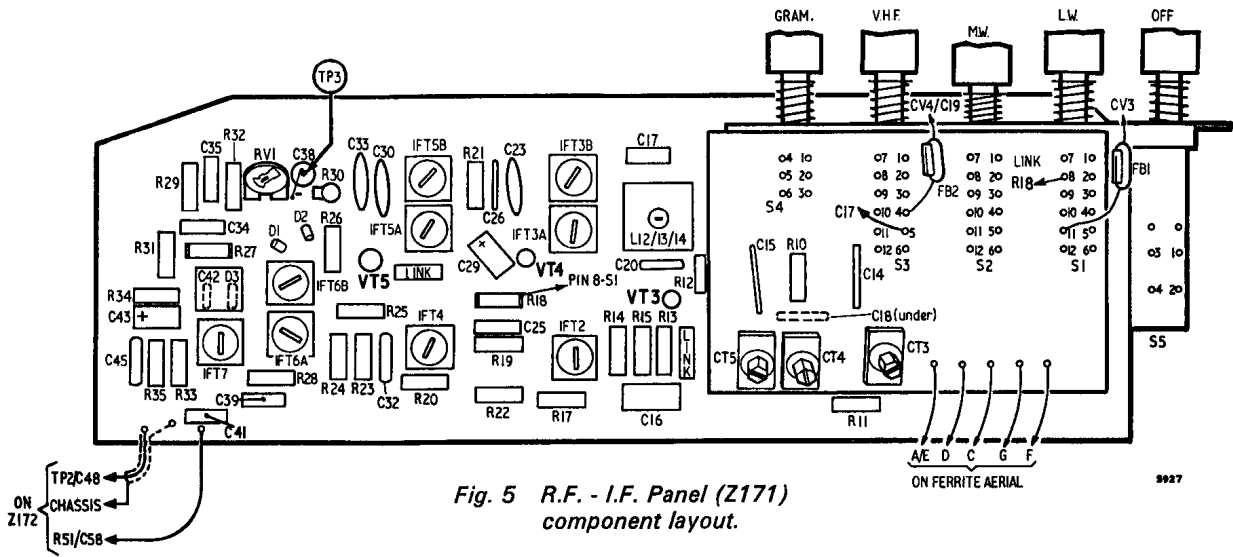
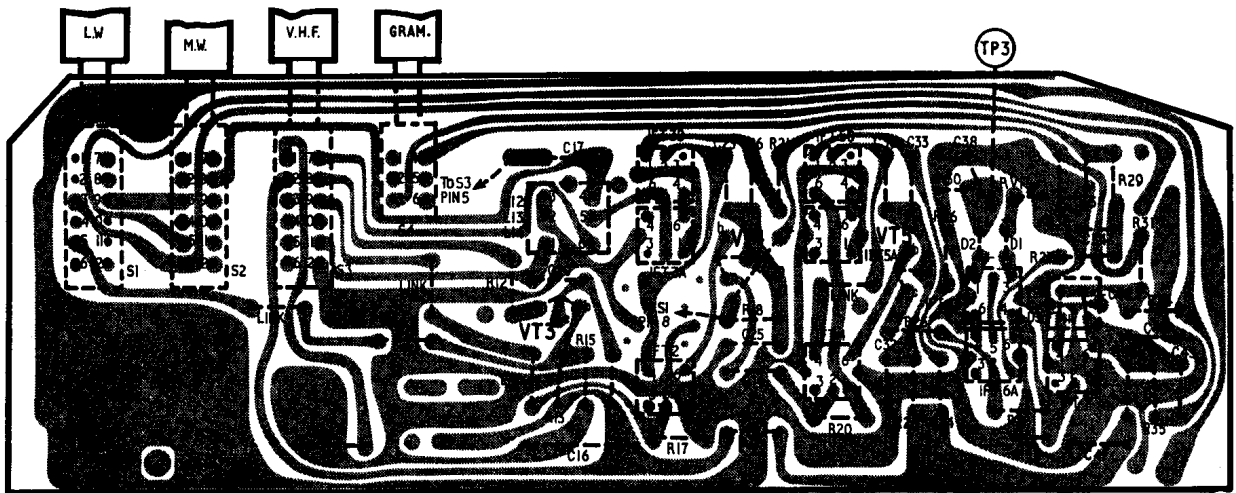


Fig. 3 Showing datum marks.

MISC	D3	RVI	D2	IFT6B	VT5	IFT5A	IFT5B	IFT3A	VT4	IFT3B	L12/S1/4	VT3	CT5	S4	CT4	S3	FB2	S2	S1	FBI
R	34	31	29	32	30	26	24	25	20	21	19	22	18	17	14	15	13	12	10	11
C	43	35	34	38	33	30	29	26	23	25	16	15	14	18						



MISC	S1	S2	S3	S4	L12/S1, L14	VT3	IFT3B	IFT3A	VT4	IFT5B	IFT5A	VT5	IFT6B	D2	RVI	D1	D3	IFT7					
R			11		12	13	15	14	17	18	19	21	22	20	25	26	30	33	38	35			
C				18			17	20	16			25	26	29	30	32	32	39	41	34	42	43	45



MISC	RV4	VT6	RV3	RV2	D4	D5
R	46	45	44	51	52	50
C	55	54	58	51	52	53

MISC	RV4	VT7	VT6	RV5	RV2	D4	D5	TP2
R	46	45	44	51	52	50	47	48
C	55	54	58	51	52	49	56	46

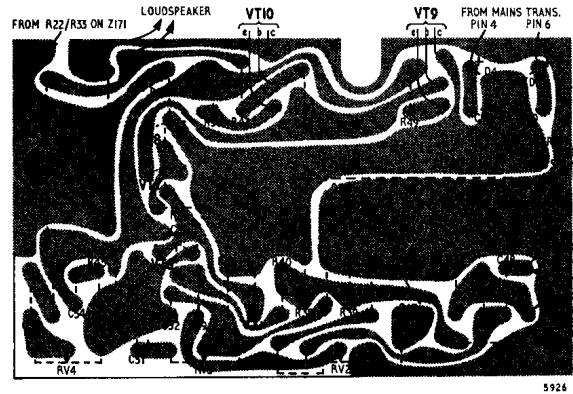
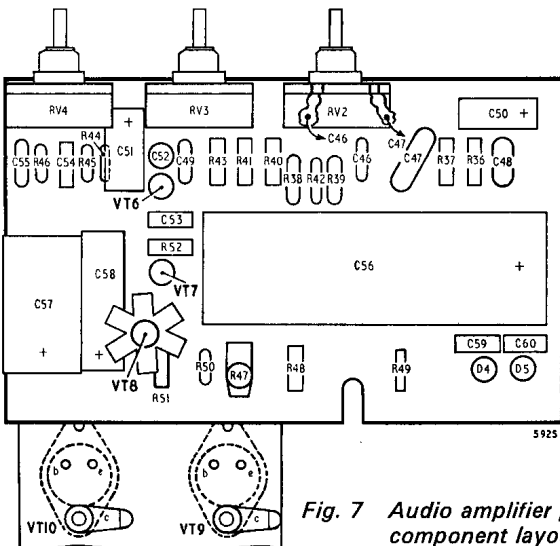


Fig. 8 Audio amplifier panel (Z172) printed side.

MISC	IFT1 L5/6	TPI VT2	L4 L7	CT2	VT1 L3	CT1	L1/2
R	7	6 5	4	3	1	2	
C	12 13	8 11	9	6 5	4	2	3

MISC	IFT1 L5/L6	VT2	L7 L4	CT2	L3 VT1	CT1	L2
R	7	5 6	4	3	1	2	
C	13 12	8 11	9 7	6 5	4	2	3

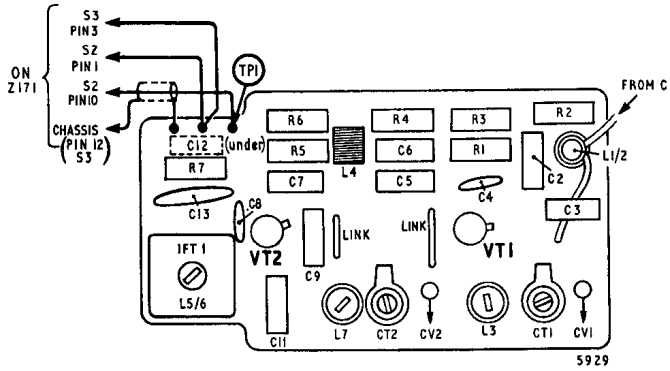


Fig. 10 V.H.F. Unit (A778)
component side.

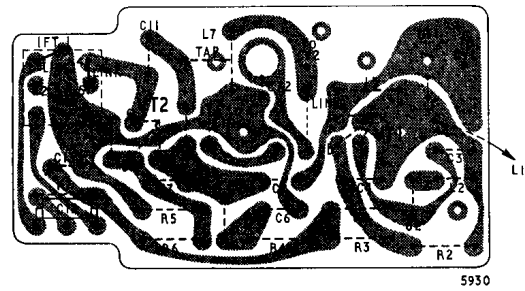


Fig. 11 V.H.F. Unit (A778)
printed side.

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. 12.

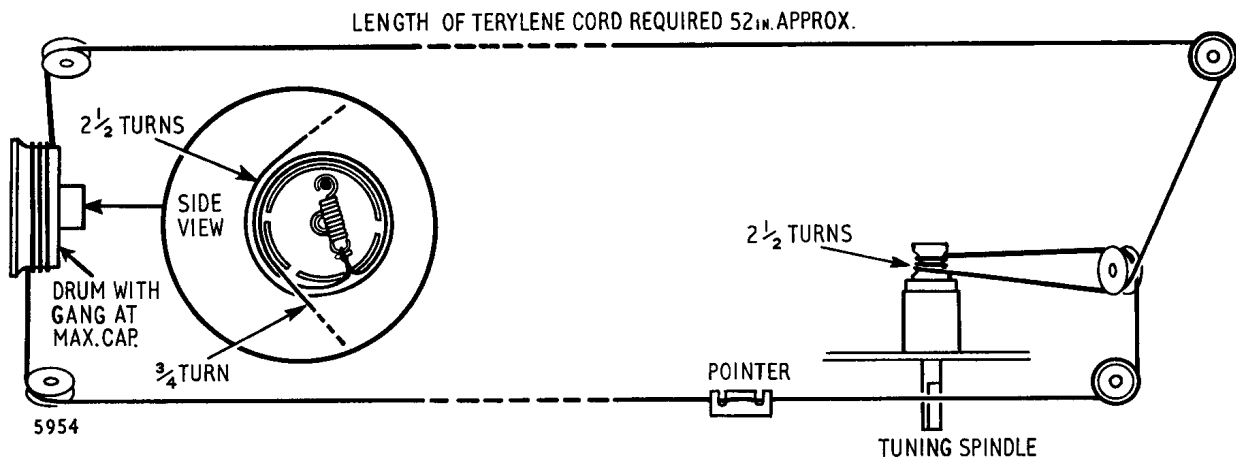


Fig. 12 Cord drive.

Refit the pointer ensuring that it is in line with the datum marks (see Fig. 3) at the low frequency end of the scale with the tuning capacitors fully meshed.

PARTS LIST

CAPACITORS

Ref.	Value (μ F)	Value (pF)	Tolerance (\pm %)	Rating (volts)	Part Number	Ref.	Value (μ F)	Value (pF)	Tolerance (\pm %)	Rating (volts)	Part Number
C1		22	5	750	2505 0837	C19		5.6	0.5	500	2505 0266
C2		82	10	500	2525 0590	C20	0.022		20	250	2601 0033
C3		30	5	750	2525 0619	C21		250	Part of IFT3A		
C4	0.01		-20+80	50	2566 0019	C22		150	Part of IFT2		
C5		4.7	0.25	750	2521 0567	C23	0.003		20	500	2611 0039
C6		200	10	750	2535 0407	C24		250	Part of IFT3B		
C7		30	5	750	2525 0619	C25	0.047		20	160	2614 0111
C8	0.01		-20+80	50	2566 0019	C26	0.022		20	250	2601 0033
C9		4.7	0.25	750	2521 0567	C27		250	Part of IFT5A		
C10		180	Part of IFT1			C28		150	Part of IFT4		
C11		68	5	750	2525 0462	C29	8		-10+50	40	2751 0426
C12		47	10	500	2501 0657	C30	0.003		20	500	2611 0039
C13	0.05		-20+80	50	2566 0032	C31		250	Part of IFT5B		
C14		120	2	350	2701 0478	C32	0.022		20	250	2601 0033
C15		360	2	350	2701 0582	C33	0.003		20	500	2611 0039
C16	80		-10+50	16	2751 0323	C34		200	10	750	2535 0407
C17		430		125	2651 0467	C35		2200	20	500	2561 0466
C18	0.01		20	250	2601 0008	C36		270	Part of IFT6A		

Ref.	Value (μ F)	Tolerance (pF)	Tolerance (\pm %)	Rating (volts)	Part Number
C37		47	Part of IFT6B		
C38	5		-10+50	64	2751 0499
C39		500	10	500	2535 0080
C40		165	Part of IFT7		
C41	0.1		20	250	2601 0070
C42	0.01		20	50	2611 0052
C43	8		-10+50	40	2751 0426
C44		1000	-20+80	1250	2561 0363
C45	0.01		20	250	2601 0008
C46	0.033		20	250	2601 0045
C47	0.15		20	250	2601 0057
C48	0.1		20	250	2601 0070
C49	0.047		20	250	2601 0057
C50	40		-10+100	16	2751 0311
C51	125		-10+50	16	2751 0335
C52	6.8		20	15	2770 0021
C53	10		5	500	2521 0129
C54		270	20	500	2533 0196
C55	0.022		20	250	2601 0033
C56	3000		-20+100	30	2757 0356
C57	1000		-10+50	16	2751 1212
C58	160		-10+50	25	2751 1224
C59		1000	20	500	2533 0068
C60		1000	20	500	2533 0068
C61	0.1		20	250	2601 0008

VARIABLE CAPACITORS

Ref.	Value	Description	Part Number
CT1	1-8 pF	V.H.F. r.f. trimmer	2917 0059
CT2	1-8 pF	V.H.F. osc. trimmer	2917 0059
CT3	3-30 pF	M.W. aerial trimmer	2911 0646
CT4	3-30 pF	M.W. osc. trimmer	2911 0646
CT5	3-30 pF	L.W. osc. trimmer	2911 0646

RESISTORS

Ref.	Value (ohms)	Tolerance (\pm %)	Rating (watts)	Part Number
R1	680	10	0.2	2001 0680
R2	120k	5	0.2	2001 2317
R3	22k	10	0.2	2001 0874
R4	1k	10	0.2	2001 0709
R5	4.7k	10	0.2	2001 0795
R6	1.5k	10	0.2	2001 0722
R7	470	10	0.2	2001 0667
R8	470	20	0.25	2021 0127
R9	470	20	0.25	2021 0127
R10	150k	10	0.2	2001 0989
R11	3.3k	10	0.2	2001 0771
R12	270	10	0.2	2001 0631
R13	3.3k	10	0.2	2001 0771
R14	1.5k	10	0.2	2001 0722
R15	18k	10	0.2	2001 0862
R16	390k	10	0.25	2028 1237
R17	5.6k	10	0.2	2001 0801
R18	470	10	0.2	2003 0654
R19	270	10	0.2	2001 0631
R20	5.6k	10	0.2	2001 0801
R21	2.2k	10	0.2	2001 0746
R22	120	10	0.2	2001 0576
R23	1k	10	0.2	2001 0709
R24	3.3k	10	0.2	2001 0771
R25	150	10	0.2	2003 0599
R26	5.6k	10	0.2	2001 0801
R27	150	10	0.2	2001 0588
R28	6.8k	10	0.2	2001 2986
R29	10k	10	0.2	2001 0837
R30	18k	10	0.2	2001 0862
R31	18k	10	0.2	2002 0880
R32	180k	10	0.2	2001 0990
R33	15k	10	0.2	2001 0850
R34	2.7k	10	0.2	2001 0765
R35	3.3k	10	0.2	2001 0771
R36	330k	10	0.2	2001 1027
R37	680k	10	0.2	2001 1052
R38	68k	2	0.25	2053 2921
R39	91k	2	0.25	2053 2908
R40	680k	10	0.2	2001 1052
R41	27k	10	0.2	2001 0886
R42	39	5	0.125	2052 1418

Ref.	Value (ohms)	Tolerance (\pm %)	Rating (watts)	Part Number
R43	100k	10	0.2	2001 0965
R44	10k	5	0.125	2052 2046
R45	5.6k	5	0.125	2052 1984
R46	1k	5	0.125	2052 1789
R47	220	15	0.5	2008 0621
R48	6.8	10	0.2	2001 2986
R49	1	10	0.125	2061 2825
R50	1	10	0.125	2061 2825
R51	1.2k	10	0.2	2001 0710
R52	3.3k	10	0.2	2001 0771

VARIABLE RESISTORS

Ref.	Value (ohms)	Description	Part Number
RV1	500	A.M. rejector	2355 4265
RV2	250k	Volume control	2353 0480
RV3	500	Bass control	2353 0509
RV4	200k	Treble control	2353 0492

TRANSISTORS AND DIODES

Ref.	Description	Part Number
VT1	R.F. amplifier (F.M.)	3632 1047
VT2	Mixer/oscillator (F.M.)	3632 1047
VT3	Mixer/oscillator (A.M.)	3632 1060
	I.F. amplifier (F.M.)	
VT4	Common i.f. amplifier	3632 1084
VT5	Common i.f. amplifier	3632 1060
VT6	Pre-amplifier	3632 1734
VT7	Compound driver stage	3632 1667
VT8		3632 1631
VT9	Complementary pair, output stage	3634 0030
VT10		
D1	Detector (F.M.)	3641 0020
D2	Detector (F.M.)	3641 0020
D3	Detector (A.M.)	3641 0093
D4	Power supply rectifier	3643 0018
D5	Power supply rectifier	3643 0018

INDUCTORS AND TRANSFORMERS

Ref.	D.C. Resistance (ohms)	Part Number
L1	less than 0.5	7100 1530
L2		
L3		
L4	less than 0.5	6811 0273
L5	less than 0.5	6811 0285
L6	Pins 4 & 6 less than 0.5	7100 2479
L7	Pins 2 & 3 less than 0.5	
L8	less than 0.5	6811 0261
L9	Pins A & C less than 0.5	*7100 3538
L10	Pins A & B less than 0.5	
L11	Pins E & G 8.5	
L12	Pins E & H 1	
L13	Pins 3 & 4 2.5	
L14	Pins 1 & 2 less than 0.5	7100 3058
L15	Pins 5 & 6 less than 0.5	
L16	Pins 1 & 3 less than 0.5	3222 0650
L17	Pins 4 & 6 less than 0.5	
L18	Pins 3 & 6 5.5	3221 0735
L19	Pins 1 & 2 3.5	
L20	Pins 4 & 6 less than 0.5	3221 0693
L21	Pins 1 & 3 9.5	
L22	Pins 1 & 3 less than 0.5	3222 0650
L23	Pins 4 & 6 less than 0.5	
L24	Pins 1 & 2 3.5	3221 0735
L25	Pins 3 & 6 5.5	
L26	Pins 4 & 6 less than 0.5	3221 0693
L27	Pins 1 & 3 9.5	
L28	Pins 2 & 4 less than 0.5	3222 0649
L29	Pins 1 & 5 less than 0.5	
L30	Pins 4 & 6 less than 0.5	3222 0637
L31	Pins 1 & 3 1	
L32	Pins 1 & 3 5	3221 0668
	Pins 4 & 6 1	
Mains trans-former	Pins 1 & 3 200	7000 1893
	Pins 4 & 6 4.8	
	Pins 7 & 8 less than 1	

* M.W./L.W. aerial coils with ferrite rod

CABINET

Title	Description	Part Number
Cabinet.....	with fittings.....	AS56328
Clip.....	for mains cable.....	4762 0523
Escutcheon.....	button surround.....	6145 0455
Foot (4).....	moulded, less pads.....	6165 0031
Fuse (FS1).....	150 mA Anti-Surge.....	3461 0091
Fuse holder.....	3469 0049
Grille assembly.....	covered, with emblem.....	7600 7929
Lamp (2).....	6.5 volts, 1 watt.....	3615 0095
Lampholder assembly.....	with leads.....	7500 3442
Loudspeaker (5 ohms).....	6in. x 4in.....	3213 0271
Pad (4).....	for foot.....	6165 0158
Plate.....	Bush emblem.....	6435 0770
Scale.....	tuning.....	6451 0542
Sealing strip.....	under knobs.....	5013 0079
Sealing strip.....	under push buttons.....	5013 0067
Trim.....	top.....	6862 0317
Trim.....	bottom.....	6862 0329
Trim (2).....	sides.....	6862 0330
Trim.....	scale, right-hand side.....	6402 1464
Trim.....	scale, left-hand side.....	6402 1476 /

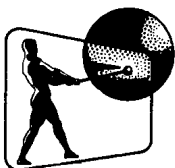
CHASSIS

Title	Description	Part Number
Audio amplifier assembly (Z172).....	complete with components.....	7300 2938
Bead, ferrite assembly.....	on V.H.F. unit leads.....	3241 0761
Cord, drive assembly.....	with tension spring. Less pointer.....	7600 7972
Drum and pinion assembly.....	tuning drive.....	7600 7406
Gasket.....	for tape socket/aerial panel.....	5114 0251
Heat sink assembly.....	with audio output transistors.....	7600 7959
I.F. and R.F. boards assembly (Z171).....	complete with components.....	7200 1082
Plate.....	scale backing.....	5016 0114
Pointer.....	tuning.....	6403 0076
Panel.....	for VHF aerial, less screws.....	3451 0151
Push-on-fix.....	for tape socket.....	4720 1472
Socket.....	tape, 5 way D.I.N.....	3432 3004
Socket and bracket assembly.....	complete.....	7600 7935
VHF unit (A778).....	complete with tuning gang.....	7300 2136

MODIFICATIONS

- 1 In early receivers VT4 (BF274) was type BF273, Part Number 3632 1060, this change has been introduced to reduce variations in receiver gain.
- 2 In early receivers VT6 (BC153) was type BC154, Part Number 3632 1084, this change has been incorporated in order to reduce the hum level.
- 3 In early receivers capacitor C61 was not fitted. The addition of this capacitor reduces modulation hum on the Long waveband.
- 4 In early receivers the fuse FS1 was not fitted.
- 5 Some receivers were fitted with 180kΩ resistors across pins 1 and 3 of IFT3-A and -B also IFT5-A and -B.

THE SERVICE DEPARTMENT



RANK BUSH MURPHY

A DIVISION OF THE RANK ORGANISATION

DRAYTON ROAD . BOREHAM WOOD . HERTFORDSHIRE . ENGLAND
 Telephone: 01-953 6151 . Telex: 262741 . Cables: Rankboom Boreham Wood

Issued by the Technical Publications Department at R.B.M. Ltd., London, W.4.