

# BUSH SERVICE INFORMATION

## MODEL TR132 PORTABLE RADIO



4514

### SPECIFICATION

#### GENERAL

Model TR 132 is a battery operated portable receiver with coverage of the Long and Medium wavebands, whilst an additional range provides electrical bandspread of the high frequency end of the Medium waveband.

The receiver incorporates seven transistors and one crystal diode in a superhet circuit in which a self-oscillating mixer technique is employed. There are two stages of i.f. amplification followed by a crystal diode detector. The audio stages comprise one stage of audio amplification followed by a driver which is transformer coupled to the push-pull output transistors. A 15 ohm loudspeaker is fitted, and the receiver operates from a single 9-volt battery.

A feature of the circuit is the inclusion of separate aerial coils for use with a properly installed car aerial using a screened feeder. Selection of the car aerial circuit is facilitated by a switch at the front of the receiver.

#### PRESENTATION

The padded wooden cabinet is covered with blue plastic material. At the top of the cabinet is a light grey plastic moulding enclosing the tuning scale. To the right of the scale is the tuning knob, and at the extreme left are the three waveband press buttons. The loudspeaker grille is in white finished perforated aluminium and enclosed in a chrome bezel. Above the grille are the three edge operated controls, the functions of which are indicated on a narrow strip of brush finished aluminium positioned on the front face of the top moulding. A rigid carrying handle covered with blue plastic material is fitted, being pivoted from two chrome bosses. At the rear of the cabinet is a light grey plastic panel through which the Car aerial and Earphone sockets are accessible. Access to the battery compartment is by means of a detachable plastic panel which is secured by a single quick release catch. Four plastic feet are provided underneath the cabinet, being integral with the detachable plastic panel.

#### CABINET DIMENSIONS

Height: 7 in. (17.8 cm)  
Width: 12 in. (30.4 cm)  
Depth: 3½ in. (9.25 cm)

The above dimensions include projections. The total height with the carrying handle erected is 7½ in. (20 cm).  
Weight: 5 lb. (2.27 kg)

#### WAVEBANDS

L. W. band — 1,070-1,900 metres (280 to 158 kc/s)  
M. W. band — 187-570 metres (1,605 to 525 kc/s)  
B. S. band — 187-210 metres (1,605 to 1,430 kc/s)

#### CONTROLS

Top left: Three press buttons selecting—M.W.; L.W.; B.S.  
Top right: Tuning.  
Top front: L to R: Car aerial/Internal aerial change-over switch; Volume; Tone/On-Off.

#### AERIALS

An internal ferrite rod aerial is fitted serving the three ranges, and a socket is provided at the rear of the cabinet for use with a car aerial. The selection of internal or external aerial is controlled by the two position switch at the front of the receiver.

#### AUTOMATIC GAIN CONTROL

One controlled stage.

#### INTERMEDIATE FREQUENCY

470 kc/s., oscillator high with respect to signal.

#### BATTERY

One Ever-Ready PP9 battery, or equivalent type. The battery consumption is 14 mA quiescent and 17 mA at average listening level.

#### AUDIO OUTPUT

1 watt

#### LOUDSPEAKER

6 in. x 4 in. (15 x 10 cm) elliptical. Flux density 10,000 lines per square centimetre. Impedance 15 ohms.

#### TRANSISTORS

##### Mullard type

VT1	AF117	mixer/oscillator
VT2	AF117	i.f. amplifier
VT3	AF117	i.f. amplifier
VT4	OC71	audio amplifier
VT5	OC81D	driver stage
VT6	OC81	} push-pull output
VT7	OC81	

#### CRYSTAL DIODE

MR1 OA90 detector

#### EARPHONE SOCKET

A socket is provided at the rear of the cabinet into which may be plugged an earpiece of 20-1000 ohms impedance. Alternatively, this socket may be used with an external loudspeaker of 15 ohms impedance.

#### TAPE RECORDING

No special provision has been made, but the earphone socket provides a low-impedance output source to which a tape recorder may be connected. The connecting lead should be terminated with a resistor of about 15 ohms. It should be noted that the internal loudspeaker will be muted when using this method of recording.

## DISMANTLING

**Removal of chassis**

- 1 Remove the plastic cabinet base, disconnect and remove the battery, then unplug the loudspeaker leads.
- 2 Remove the two chassis securing screws located at the top inside of the battery compartment, also the two screws securing the plate containing the cabinet base retaining spring.
- 3 Lift out the chassis, complete with the top moulding, from the top of the cabinet.

**Removal of top moulding**

- 1 Pull off the tuning knob and the three waveband buttons.
- 2 Undo the two screws concealed beneath the tuning knob, also the two screws beneath the Medium and Bandsread press buttons, (see Fig. 1).
- 3 Remove the top moulding, sliding it forwards to clear the edge operated knobs, then lift clear.

**Removal of tuning scale**

- 1 Remove the four fixing screws securing the scale to the chassis, release the cord from the tuning pointer carrier, then lift the scale clear.

**Reassembly**

Reassemble by reversing the above procedures, taking care that the tuning pointer is aligned with the datum marks to the right of the scale, with the tuning capacitor fully meshed, before replacing the top moulding.

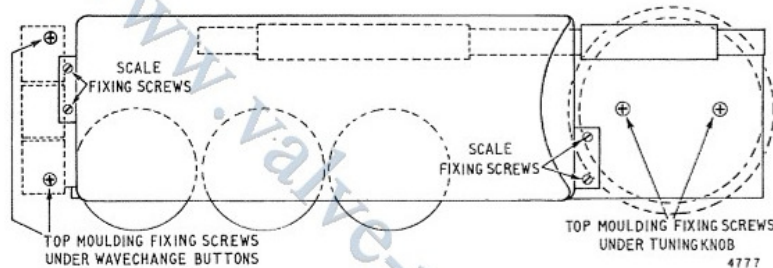


Fig. 1. Top view of chassis showing fixing screws.

## MAINTENANCE

**Replacement of cord drive**

1 Remove the receiver chassis from the cabinet as outlined in the dismantling procedure above. Remove the top moulding and tuning scale from the chassis.

2 Approximately 40 inches of glass nylon cord will be required to make up the new cord drive assembly shown in the lower diagram of Fig. 2.

3 Taking the new assembly, hold the tuning drum with the tuning gang fully meshed.

4 Loop the cord round the spring at 'A' (see Fig. 2), approximately 14 ins. from the eyelet. Take this measured length of cord, via the slot, passing it round the drum  $\frac{2}{3}$  of a turn counter-clockwise.

5 Continue taking the measured length of cord over pulley 'B' and round pulley 'C'. The eyelet should now take up the position as shown in the diagram.

6 Wind the cord  $2\frac{1}{2}$  turns clockwise round the capstan from top to bottom.

7 Taking the cord over pulley 'D', pass it down onto the drum and wind on  $2\frac{2}{3}$  turns counter-clockwise, finishing at 'A'.

8 It will ease final adjustment if the cord is slipped off one of the pulleys whilst the drum spring is tensioned.

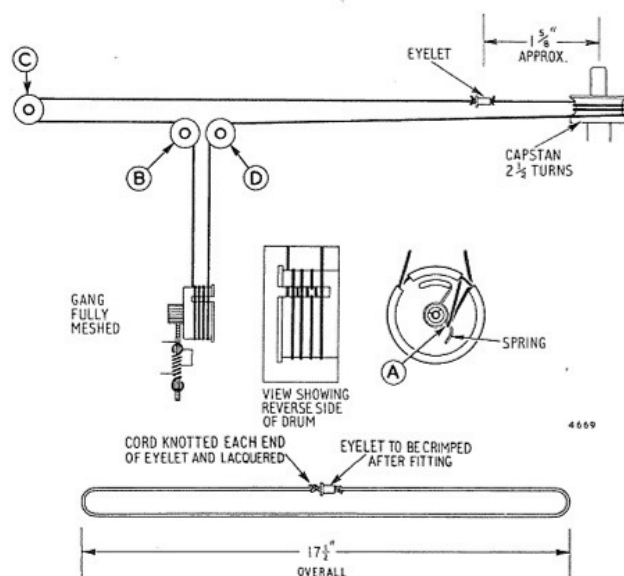


Fig. 2. Cord drive.

Continued on page 6.



## ALIGNMENT PROCEDURE

## PRELIMINARY NOTES

- 1 Equipment required:
  - (a) An a.m. signal generator to cover 158 kc/s to 1,605 kc/s, modulated 30% at 400 c/s.
  - (b) A power output meter with ranges to cover 0-1 watt, to match 15 ohms impedance.
  - (c) Suitable trimming tools for adjusting the iron dust cores and r.f. trimmers.
  - (d) An Avometer, Model 8 (or suitable instrument) for adjusting RV3, (see page 6).
  - (e) An 8-2k resistor fitted with crocodile clips for desensitizing purposes.
  - (f) A dummy car aerial (see Fig. 3).
- 2 The signal generator should be switched on about 15 minutes before commencing the alignment.
- 3 The chassis must be removed from its case for alignment purposes.
- 4 Connect the output meter to the receiver by means of the earphone socket if a suitable plug is available.
- 5 Set the Volume control to maximum, and the Tone control for maximum treble response. During the alignment the signal input should be adjusted to maintain the output at 50 mW each time a trimming adjustment is made.

## I.F. ALIGNMENT

*NOTE:* The outer peak is the correct one for these adjustments. All IFTs have single tuned windings with the exception of IFT1, the primary core of which is located at the bottom of the can.

- 1 Switch the receiver to the Medium waveband and set the tuning pointer to about 300 metres. Check that the Car aerial switch is in the 'INT' position.
- 2 Set the signal generator to 470 kc/s, modulated 30% at 400 c/s. Connect the output via a 0.1  $\mu$ F isolating capacitor to the junction of C11/R2, and align IFT3, IFT2 and IFT1 in that order for maximum audio output. Align each IFT once only.

## R.F. ALIGNMENT

*NOTE:* It is essential that the receiver circuits are aligned in the following order: (a) oscillator circuits, (b) external aerial circuits, (c) internal aerial circuits.

## Oscillator Circuits

The signal generator should be connected to the receiver via the dummy car aerial (see Fig. 3). Ensure that the tuning pointer is aligned with the datum dots to the right of the scale with the tuning capacitor fully meshed.

Check that the Car aerial switch is in the 'CAR' position before carrying out the following procedure:—

Operation	Waveband	Sig. Gen. Frequency (mod. 30% 400 c/s)	Tuning Pointer Setting	Adjust for Maximum Output
1	M.W.	600 kc/s	500 metres	L11/12/13
2	M.W.	1500 kc/s	200 metres	CT19
Repeat operations 1 and 2 and check calibration.				
3	L.W.	214 kc/s	1400 metres	CT26
4	B.S.	1500 kc/s	200 metres	L8/9/10

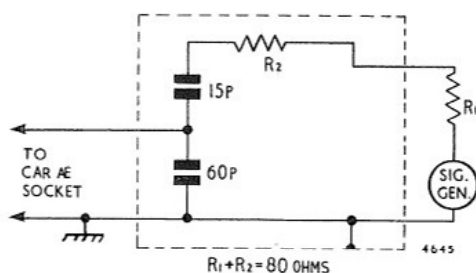
## External Car Aerial Circuits

The signal generator should be connected to the receiver via the dummy car aerial (see Fig. 3).

Check that the Car aerial switch is in the 'CAR' position before carrying out the following procedure:—

Operation	Waveband	Sig. Gen. Frequency (mod. 30% 400 c/s)	Tuning Pointer Setting	Adjust for Maximum Output
1	M.W.	600 kc/s	500 metres	L5/6
2	B.S.	1500 kc/s	200 metres	CT4†
3	M.W.	1500 kc/s	200 metres	CT6
Repeat operations 1 to 3, in the order given for optimum gain at both frequencies.				
4	L.W.	214 kc/s	1400 metres	CT3

L7 has been pre-set at the factory during production. It is unlikely to require further adjustment and therefore no procedure is given for this item in the above table.



† *NOTE:* Where the receiver is used with a properly installed car aerial, it is possible to optimise the setting of the trimmer CT4 via the small hole in the back moulding. The trimmer should be adjusted for maximum signal from any desired station on the B.S. range.

Fig. 3. Input circuit—dummy car aerial.

**R. F. ALIGNMENT**

**Internal Aerial Circuits**

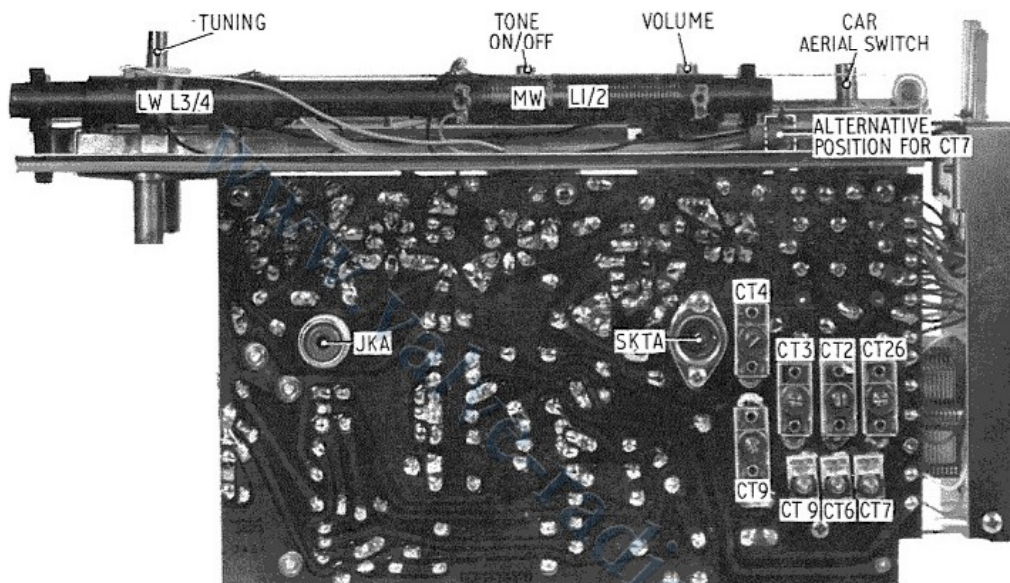
The signal generator should be coupled to the receiver by a loop of insulated wire placed about 3 feet from the receiver and with its plane at right-angles to the ferrite rod aerial.

The receiver may be temporarily desensitized by connecting an 8.2k resistor between the junction R10/R12 and chassis. This may be necessary for the purpose of r.f. alignment under conditions of interference.

Check that the Car aerial switch is in the 'INT' position before carrying out the following procedure:—

Operation	Waveband	Sig. Gen. Frequency (mod. 30% 400 c/s)	Tuning Pointer Setting	Adjust for Maximum Output
1	M.W.	600 kc/s	500 metres	L1/2*
2	M.W.	1500 kc/s	200 metres	CT7
Repeat operations 1 and 2 for optimum gain at both points.				
3	L.W.	214 kc/s	1400 metres	CT2
4	B.S.	1500 kc/s	200 metres	CT9

\* Move coil former along ferrite rod to adjust.



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Fig. 4. Chassis viewed from wiring side.

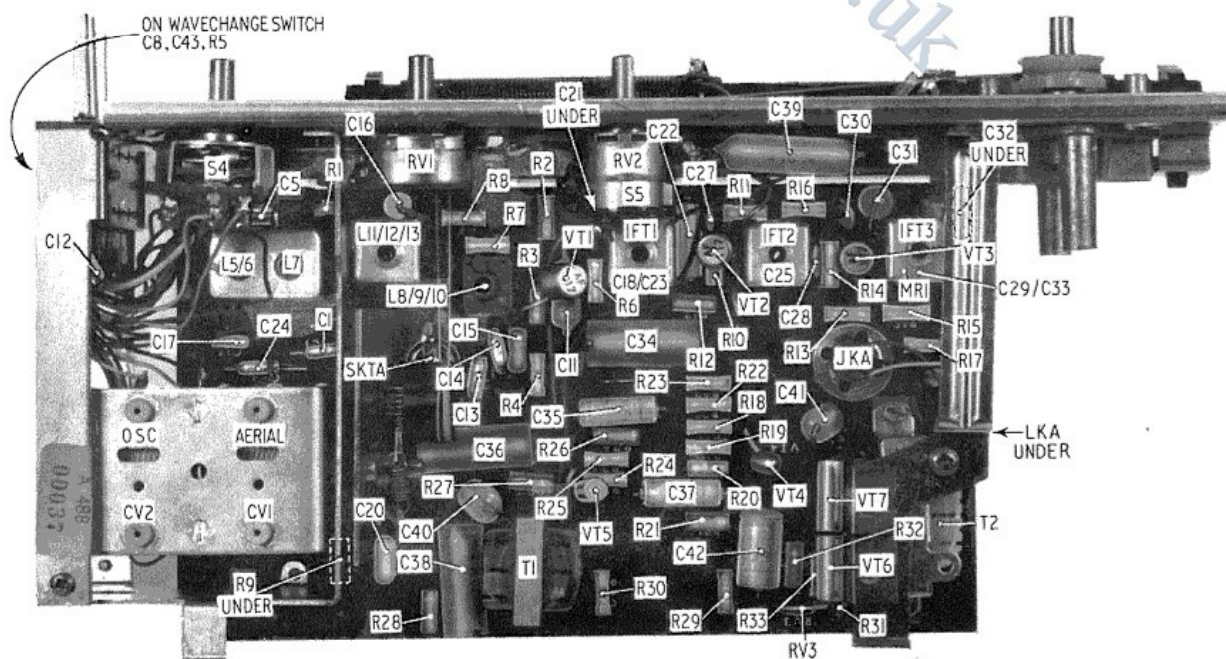


Fig. 5. Chassis viewed from component side.





## MAINTENANCE—Continued

## ADJUSTMENT OF RV3

The replacement of components in the output stage may necessitate the resetting of RV3. This pre-set control should be reset in accordance with the following procedure:—

1 Observe, then remove the link LKA located to the right of the printed board viewed on the component side (see Fig. 5).

2 Connect an Avometer model 8 in place of the link (observing the correct polarity).

3 With a battery voltage of 9 volts to the receiver, and with the Volume control turned to minimum, adjust RV3 for a meter reading in accordance with the table below.

Ambient temperature	Adjust RV3 for:
65°F	7.0 mA
73°F	8.4 mA
82°F	9.7 mA
91°F	11.4 mA

NOTE: Replace LKA after the adjustment has been made.

## PARTS LIST

## ABBREVIATIONS

Ps—Polystyrene; Pe—Polyester; SC—Silvered Ceramic; CD—Ceramic Disc; E—Electrolytic; S. Var.—Semi-Variable.

## CAPACITORS

Reference	Value		Type	Tolerance (± %)	Rating (volts)	Part Number
	(μF)	(pF)				
C1		82	Ps.	2½	125	AP65931
CT2		10–80	S. Var.	—	—	AP34914
CT3		10–80	S. Var.	—	—	AP34914
CT4		10–80	S. Var.	—	—	AP34914
C5		3300	Ps.	10	125	AP35095
CT6		2–25	S. Var.	—	—	AP34913
CT7		2–25	S. Var.	—	—	AP34913
C8		310	Ps.	2½	125	AP65793
CT9		10–80	S. Var.	—	—	AP34914
C10			—	—	—	—
C11	0.01		Pe.	10	125	AP29981
C12		470	Ps.	2½	125	AP35081
C13		680	Ps.	2½	125	AP64242
C14		470	Ps.	2½	125	AP35081
C15		47	SC	10	500	AP26425
C16	0.022		Pe.	10	125	AP41215
C17		556	Ps.	2½	125	AP64064
C18		250	Ps.	2½	125	AP65903
CT19		2–25	S. Var.	—	—	AP34913
C20		10	SC	5	750	AP24629
C21	0.1		Pe.	10	125	AP29922
C22	10		E	+50–10	64	AP70840
C23		250	Ps.	2½	125	AP65903
C24		470	Ps.	2½	125	AP35081
C25		220	Ps.	2½	125	AP34893
CT26		10–80	S. Var.	—	—	AP34914
C27	0.1		CD	+50–25	3	AP65078
C28	0.1		CD	+50–25	3	AP65078
C29		220	Ps.	2½	125	AP34893
C30	0.1		CD	+50–25	3	AP65078
C31	0.1		Pe.	10	125	AP29922
C32	0.01		Pe.	10	125	AP29981
C33	0.01		SC	+80–20	30	AP65014
C34	100		E	+100–20	10	AP66520
C35	10		E	+50–10	64	AP70840
C36	100		E	+100–20	10	AP66520
C37	10		E	+50–10	64	AP70840
C38	100		E	+100–20	10	AP66520
C39	0.22		Pe.	10	125	AP29921
C40	0.1		Pe.	10	125	AP29922
C41	0.1		Pe.	10	125	AP29922
C42	200		E	+50–10	10	AP66189
C43		22	SC	2½	750	AP43242
CV1/2	523 pF Swing		Gang	—	—	CP34983

## RESISTORS

Reference	Value (ohms)	Tolerance (± %)	Rating (watts)	Part Number
R1	56k	10	½	AP33010
R2	47	10	½	AP32788
R3	6.8k	10	½	AP32944
R4	27k	10	½	AP32986
R5	39k	10	½/10	AP32560

## PARTS LIST—Continued

## RESISTORS, (continued)

Reference	Value (ohms)	Tolerance (± %)	Rating (watts)	Part Number
R6	330	10	$\frac{1}{8}$	AP32848
R7	330	10	$\frac{1}{8}$	AP32848
R8	1k	10	$\frac{1}{8}$	AP32884
R9	120k	10	$\frac{1}{8}$	AP33034
R10	120k	10	$\frac{1}{8}$	AP33034
R11	680	10	$\frac{1}{8}$	AP32872
R12	18k	10	$\frac{1}{8}$	AP32974
R13	22k	10	$\frac{1}{8}$	AP32980
R14	4.7k	10	$\frac{1}{8}$	AP32932
R15	330	10	$\frac{1}{8}$	AP32848
R16	1k	10	$\frac{1}{8}$	AP32884
R17	560	10	$\frac{1}{8}$	AP32866
R18	1.5k	10	$\frac{1}{8}$	AP32896
R19	15k	10	$\frac{1}{8}$	AP32968
R20	82k	10	$\frac{1}{8}$	AP33022
R21	5.6k	10	$\frac{1}{8}$	AP32938
R22	68	10	$\frac{1}{8}$	AP32800
R23	1k	10	$\frac{1}{8}$	AP32884
R24	8.2k	10	$\frac{1}{8}$	AP32590
R25	39k	10	$\frac{1}{8}$	AP32998
R26	470	10	$\frac{1}{8}$	AP32860
R27	56	10	$\frac{1}{8}$	AP32794
R28	270	10	$\frac{1}{8}$	AP32842
R29	3.9k	10	$\frac{1}{8}$	AP32926
R30	150	10	$\frac{1}{8}$	AP32824
R31	3.3	$\frac{1}{2}$	$\frac{1}{4}$	AP70262
R32	10k	10	$\frac{1}{8}$	AP32956
R33	150	10	$\frac{1}{8}$	AP32824

## RESISTORS, VARIABLE

Reference		Value (ohms)	Tolerance (± %)	Rating (watts)	Part Number
RV1	Vol. on/off	5k	20	1	AP34911
RV2	Tone	10k	25	$\frac{1}{4}$	CP35068
RV3	Bias, pre-set	1.5k-5k	—	—	AP70087

## COILS AND TRANSFORMERS

Reference	Description	D.C. Resistance (ohms)	Part Number
L1	M. W. Aerial Coil	less than 0.5	CS35179
L2		less than 0.5	
L3	L. W. Aerial Coil	8	CS35178
L4		1	
L5	Car Aerial Coil	2.5	CS35013
L6		less than 0.5	
L7	B.S. Osc. Coil	10.5	CS34521
L8		1.5	
L9	L. W. & M. W. Osc. Coil	less than 0.5	CS34997
L10		less than 0.5	
L11	1st I.F. Transformer	less than 0.5	CS34923
L12		less than 0.5	
L13	2nd I.F. Transformer	2.5	CS35000
L14		9	
L15	3rd I.F. Transformer	9	CS34979
L16		9	
L17	Driver Transformer	less than 0.5	BS70096
L18		9.5	
L19	Output Transformer	2	CS34645
T1		Prim. -120	
T2	Sec. -100		
	Prim. -5		
	Sec. -1.3		

## TRANSISTORS AND DIODE

Reference	Type	Description	Part Number
VT1	AF117	Mixer/Oscillator	AP65079
VT2	AF117	1st I.F. Amplifier	AP65079
VT3	AF117	2nd I. F. Amplifier	AP65079
VT4	OC71	Audio Amplifier	AP63008
VT5	OC81D	Driver Stage	AP64014
VT6	OC81	Push-pull Output	(Pack, L.F.H.3)
VT7	OC81		
MR1	OA90	Detector	AP65044



## MECHANICAL PARTS AND FITTINGS

## CABINET

Title	Part Number	Description
Bezel	DP34899	surround for loudspeaker grille.
Cabinet with fittings	AS72035	
Cabinet base	EP35051	less locking stud and washers.
Cover, moulded	CS34977	cabinet top, with lens and printed trim.
Emblem	AP34970	printed 'BUSH'.
Fabric	165 054 004	
Felt lace (4)	AP60607	spacers on tuning knob.
Grille, sprayed	CP34973	less emblem and bezel.
Handle assembly	AS72036	with pivot and circlip less tee-nut.
Knob assembly, tuning	CS34978	
Loudspeaker	CP35058	15 ohms impedance.
Pivot (2)	AP34678	for handle.
Plate, decorative	AP34723	on back of cabinet with ventilation grille, less push-on-fix.
Stud, locking	AP34986	to lock base to cabinet, less washers.
Tee nut (2)	AP34993	for securing handle assembly to cabinet.
Trim	CP34898	printed surround for controls.
Washer, rubber (2)	AP34988	for retaining locking stud.

## CHASSIS

Title	Part Number	Description
Bearing, cast	DP34673	for mounting capstan, securing top panel and chassis.
Button, moulded (3)	CP34676	for wavechange switch, less spring.
Clip, heat sink (2)	AP34990	for output transistors.
Clip, moulded (2)	CP35055	for retaining ferrite aerial.
Core, ferrite (3)	AP81395	for L5/L6, L7 and L11/12/13.
Core, ferrite	AP65461	for L8/9/10.
Core, ferrite (4)	AP65011	for L14, L15, L16/17 and L18/19.
Ferrite rod	AP24237	less aerial coils L1/2 and L3/4.
Knob, volume	CP34672	
Knob (2)	AS72037	with red marker, for tone/on/off and aerial switch.
Panel, printed circuit	AS72038	with components and transistors.
Push-on-fix	AP35186	for securing socket for earpiece.
Scale, printed	DP34740	
Socket, miniature	BP35185	for earpiece, less push-on-fix, and spacer.
Socket, co-axial	AP70494	for external aerial.
Spacer, moulded	AP34897	for earpiece socket.
Spring (3)	AP34989	for retaining wavechange switch buttons.
Switch, push button	AP34910	wavechange switch.
Switch, rotary	CP34918	aerial change-over switch.

## TUNING DRIVE

Title	Part Number	Description
Bracket with pulleys	BS34980	
Capstan and shaft	AS34770	tuning spindle.
Drive cord	160 000 012	white terylene.
Drum and pinion	AS34981	
Gear, split	CP63035	on gang spindle, less spring.
Pointer assembly	AS35079	less pointer carriage.
Pointer carriage	CP34743	less pointer guide and pointer assembly.
Pointer guide	BP34741	less pointer assembly and carriage.
Pulley (3)	AP66171	for drive cord.
Spring, extension	AP63031	for split gear.
Spring, tension	AP67014	inside drum, for tensioning drive cord.

## THE SERVICE DEPARTMENT



# BUSH RADIO

A DIVISION OF THE RANK ORGANISATION



BESSEMER ROAD · WELWYN GARDEN CITY · HERTFORDSHIRE · ENGLAND  
 Tel: Welwyn Garden 23434 · Telex: 22174 · Grams and Cables: Rankboom Welwyn Garden City

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