BUSH | MURPHY

SERVICE INFORMATION

BUSH MODEL TR146
MURPHY MODEL B822
PORTABLE RADIOS


TR146


B822

SPECIFICATION

GENERAL

These models are battery-operated portable receivers incorporating seven transistors and one crystal diode. All models are electrically identical and differ only in presentation. The receivers have coverage of the Long and Medium wavebands, whilst an additional range provides electrical bandspread of the high frequency end of the Medium waveband.

The moulded plastic cabinet is fitted with a rigid carrying handle of anodised aluminium pivoted from two bosses on the cabinet sides. At the top of the cabinet are the tuning scale and receiver controls, comprising three push buttons and two edge-operated control knobs. On the right-hand side of the cabinet are two sockets, the top one for use with a car aerial and the other for use with an earpiece. The loudspeaker grille is of perforated metal and the cabinet back is detachable for battery replacement. The information contained in this publication applies to all models except where otherwise stated.

PRESENTATION

TR146A : Black moulded cabinet, control knobs and push buttons.

TR146B : Brown moulded cabinet with white control knobs and push buttons.
Both models have four-part tuning scales of brush finished aluminium.

B822A : Grey moulded cabinet with white control knobs and push buttons.

B822B : Brown-grey moulded cabinet with white control knobs and push buttons.
Both models have twin clear plastic tuning scales with a background colour in ochre.

DIMENSIONS

Height: $5\frac{1}{16}$ in.
Width: $9\frac{3}{8}$ in.
Depth: $3\frac{7}{8}$ in.
Height with handle erect: 7in.
Weight: $2\frac{1}{2}$ lb (excluding battery)

CONTROLS

Top, L to R: Three push buttons selecting L.W., M.W., B.S., Volume On/Off, Tuning.

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)

INTERMEDIATE FREQUENCY

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

AERIAL

An internal ferrite rod aerial is fitted serving the three ranges, and a socket is provided at the side of the receiver for use with a car aerial.

AUTOMATIC GAIN CONTROL

One controlled stage.

BATTERY AND CONSUMPTION

One 9-volt Ever Ready type PP7 or any U.K. equivalent type. The battery consumption is 14 mA quiescent (at 18°C) and 18 mA at average listening level.

AUDIO OUTPUT

500 mW

LOUDSPEAKER

$5\frac{3}{8}$ in. × $2\frac{3}{4}$ in. elliptical. Impedance 15 ohms. Flux density 9,500 lines per square centimetre.

TRANSISTORS

Mullard type

VT1 AF117 mixer/oscillator
VT2 AF117 i.f. amplifier
VT3 AF117 i.f. amplifier
VT4 OC71 audio amplifier
VT5 OC81D or AC128 driver stage
VT6 OC81 or AC128 } push-pull output
VT7 OC81 or AC128 } matched pair

CRYSTAL DIODE

D1 OA90 detector

EARPIECE SOCKET

A socket is provided at the side of the receiver 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, or for tape recording provided that the recorder has an input impedance of not less that 15 ohms.

DISMANTLING

REMOVING THE CHASSIS

1 Place the cabinet face downwards, remove the detachable back, then remove the battery.

2 Unscrew the four 4BA cheese head screws securing the chassis to the cabinet, (one screw to each corner of the chassis).

3 Lift out the chassis to the extent of the aerial and loudspeaker leads. Unsolder the leads if total removal of the chassis is required.

4 Replace the chassis by reversing the above procedure.

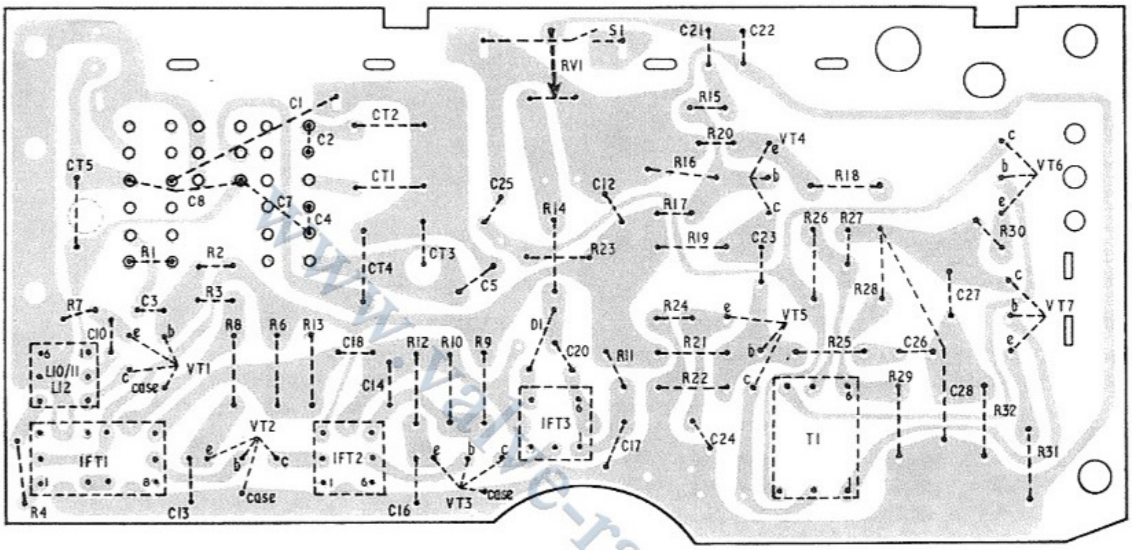

Fig. 1 *Printed wiring board—copper side.*

R	31 30 32 29 28 18 25 15 26 27 20 16 19 21 17 24 22 11 23 14 9 10 12 13 6 2 8 3 1 7 4
C	27 28 26 22 23 21 24 12 17 20 15 25 5 16 14 18 11 2 4 7 8 13 3 10 6 1 9
MISC	VT6 VT7 T1 VT4 VT5 RV1/S1 D1 IFT3 VT3 CT1 CT3 CT2 CT4 IFT2 VT2 VT1 CT5 L10/11/12 IFT1 CV1/2

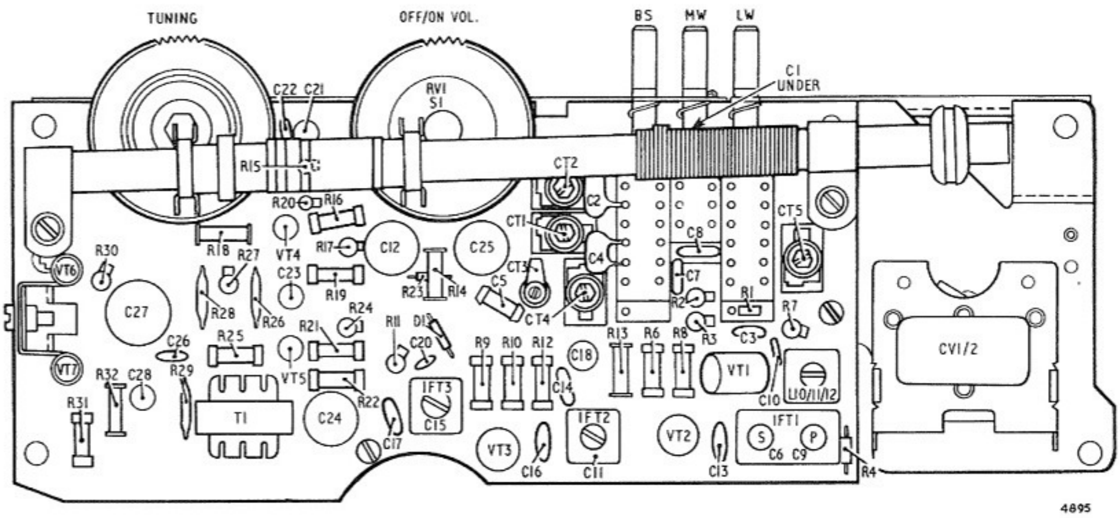

Fig. 2 *Receiver chassis component layout.*

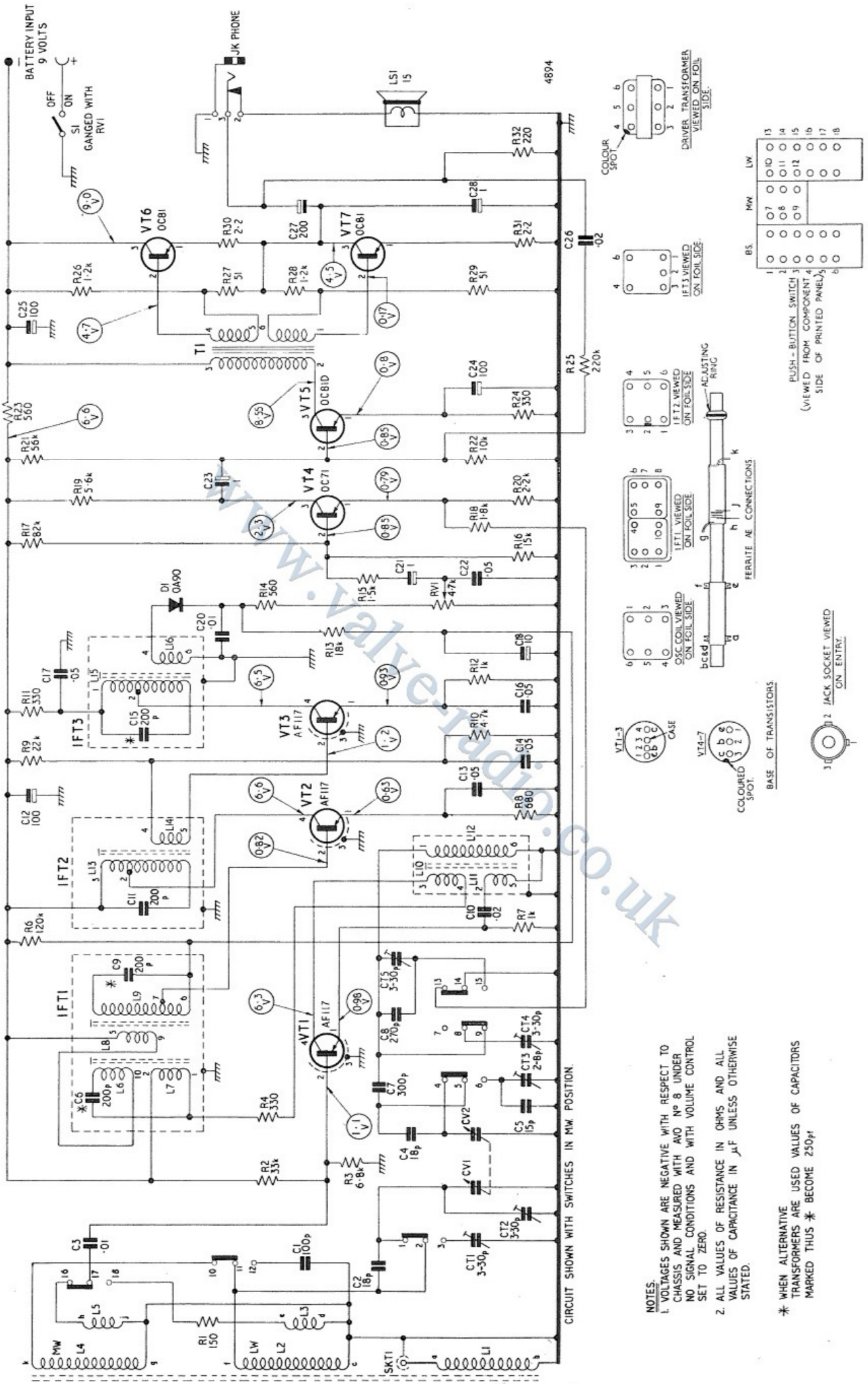

Fig. 3 *Circuit diagram.*

ALIGNMENT PROCEDURE

PRELIMINARY NOTES

1 Equipment required:—

(a) An a.m. signal generator to cover 158 kc/s—1605 kc/s.

(b) An output wattmeter with a range 0-500 mW to match 15 ohms impedance.

(c) A non-metallic trimming tool for adjusting the iron dust cores and r.f. trimmers.

(d) A 0·1 μF capacitor for i.f. injection purposes, a 10 pF capacitor for injecting r.f. calibration signals into the aerial socket, and an 8·2k resistor for temporarily desensitizing the receiver under conditions of interference.

2 The i.f. and r.f. alignment may be carried out after removing the back of the cabinet.

3 Connect the output meter to the receiver by means of the earpiece socket and a suitable plug.

If the output meter is connected in parallel with the loudspeaker care must be exercised to ensure that the power output is not allowed to rise to a level high enough to damage the output transistors (not greater than 75 mW).

4 The signal generator should be switched on about 15 minutes before commencing the alignment.

5 Set the Volume control to maximum, and maintain the output at 50 mW by adjusting the input signal each time a trimming adjustment is made (20 mW if the loudspeaker is left in circuit).

I.F. ALIGNMENT

1 Switch the receiver to the Medium waveband and set the tuning pointer to about 300 metres.

2 Set the signal generator to 470 kc/s, modulated 30% at 400 c/s. Connect the output via a 0·1 μF isolating capacitor to the base of VT1 (junction of R2 and R3), the chassis connection being the return point for the signal.

3 Align IFT3, IFT2 and IFT1, in that order, for maximum audio output. Align each transformer once only.

R.F. ALIGNMENT

NOTE:—Ensure that the tuning pointer is in line with the datum dot at the low frequency end of the tuning scale when the tuning gang is fully meshed.

Oscillator Circuits

The signal generator should be connected to the aerial socket via a 10 pF capacitor. Under conditions of interference, the receiver may be temporarily desensitized by connecting an 8·2 k resistor between the junction of R6 and R13, and chassis.

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	L10/11/12
2	M.W.	1500 kc/s	200 metres	CT4
	Repeat operations 1 and 2 and check calibration			
3	L.W.	214 kc/s	1400 metres	CT5
4	B.S.	1439 kc/s	208 metres	CT3

Aerial Circuits

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

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	Adjusting ring*
2	M.W.	1500 kc/s	200 metres	CT2
	Repeat operations 1 and 2 for optimum gain at both points.			
3	L.W.	214 kc/s	1400 metres	No adjustment
4	B.S.	1500 kc/s	200 metres	CT1

** See ferrite aerial connections Fig. 3*

MAINTENANCE

REPLACEMENT OF CORD DRIVE

To replace the cord drive, first remove the chassis from the cabinet as described in the dismantling procedure. Set the tuning capacitor to maximum, then remove the two Phillips head screws securing the scale backing plate and lift clear. Remove the twin scale pointer assembly and fit the replacement drive cord in accordance with the diagram shown below.

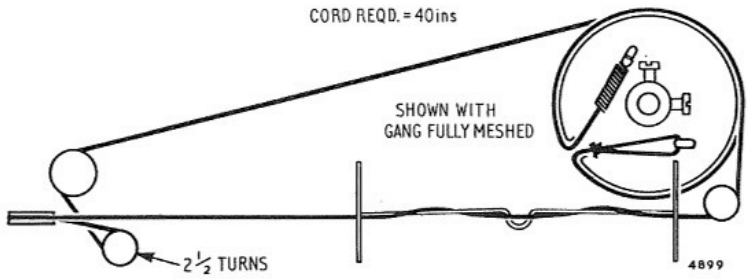

Fig. 4 *Correctly fitted cord drive.*

Replace the scale pointer assembly and backing plate ensuring that the left hand pointer is in line with the datum dot at the low frequency end of the scale with the tuning gang fully-meshed.

PARTS LIST

ABBREVIATIONS: E Electrolytic M Mylar PT Polyester tubular SC Silvered ceramic

CAPACITORS

Reference	Type	Value µF	Value pF	Tolerance (±%)	Rating (volts)	Part Number
C1	PT		100	2½	125	AP65689
C2	SC		18	0·5 pF	750	AP72205
C3	M	0·01		20	50	AP72093
C4	SC		18	1·0 pF	500	AP72535
C5	SC		15	10	500	AP72534
C6	SC		200	—	—	—
C7	PT		300	2½	125	AP65706
C8	PT		270	2½	125	AP47696
C9	SC		200	—	—	—
C10	M	0·02		20	50	AP72094
C11	SC		200	—	—	—
C12	E	100		−20+100	10	AP48291
C13	M	0·05		20	50	AP72095
C14	M	0·05		20	50	AP72095
C15	SC		200	—	—	—
C16	M	0·05		20	50	AP72095
C17	M	0·05		20	50	AP72095
C18	E	10		−20+100	25	AP48290
C19	—	—	—	—	—	—
C20	M	0·01		20	50	AP72093
C21	E	1		−20+100	75	AP48289
C22	M	0·05		20	50	AP72095
C23	E	1		−20+100	75	AP48289
C24	E	100		−20+100	10	AP48291
C25	E	100		−20+100	10	AP48291
C26	M	0·02		20	50	AP72094
C27	E	200		−20+100	10	AP48293
C28	E	1		−20+100	75	AP48289

CAPACITORS, VARIABLE

Reference	Value (pF)	Description	Part Number
CT1	3–30	B.S. aerial trimmer	AP72208
CT2	3–30	M.W. aerial trimmer	AP72208
CT3	1–8	B.S. oscillator trimmer	AP81967
CT4	3–30	M.W. oscillator trimmer	AP72208
CT5	3–30	L.W. oscillator trimmer	AP72208
CV1	299·6	Tuning gang	CP72060
CV2	299·6		

PARTS LIST—Continued

RESISTORS

Reference	Value (ohms)	Tolerance (±%)	Rating (watts)	Part Number
R1	150	10	0·1	AP68851
R2	33k	10	0·2	AP71398
R3	6·8k	10	0·2	AP71350
R4	330	10	0·1	AP68875
R5	—	—	—	—
R6	120k	10	0·2	AP33034
R7	1k	10	0·2	AP71290
R8*	680	10	0·2	AP32872
R9	22k	10	0·2	AP32980
R10	4·7k	10	0·2	AP32932
R11	330	10	0·2	AP71254
R12	1k	10	0·2	AP32884
R13	18k	10	0·2	AP72099
R14	560	10	0·2	AP72100
R15	1·5k	10	0·2	AP71302
R16	15k	10	0·2	AP32968
R17	82k	10	0·2	AP71428
R18	1·8k	10	0·2	AP47371
R19	5·6k	10	0·2	AP32938
R20	2·2k	10	0·2	AP71314
R21	56k	10	0·2	AP33010
R22	10k	10	0·2	AP32956
R23	560	10	0·1	AP32428
R24	330	10	0·2	AP71254
R25	220k	10	0·2	AP33052
R26	1·2k	5	$\frac{1}{8}$	AP34141
R27	51	5	0·2	AP71198
R28	1·2k	5	$\frac{1}{8}$	AP34141
R29	51	5	$\frac{1}{8}$	AP34075
R30	2·2	$\pm\frac{1}{2}$ ohm	0·2	AP72098
R31	2·2	$\pm\frac{1}{2}$ ohm	0·2	AP33182
R32	220	10	0·2	AP47558

RESISTOR, VARIABLE

Reference	Value (ohms)	Description		Part Number
RV1	4·7k Log.	Volume control & switch with knob	TR146A only	AS50885
			Other models	AS50939

COILS AND TRANSFORMERS

Reference	Description	D.C Resistance (ohms)	Part Number
L1	Ext. aerial coupling coil	1	
L2	L.W. aerial coil	less than 0·5	AS51396
L3		1·3	
L4	M.W. aerial coil	less than 0·5	AS51395
L5		less than 0·5	(with rod)
L6	1st i.f. transformer	3·5	BP73314
L7		1·5	
L8		less than 0·5	
L9		5	
L10	Oscillator coils	0·5	BP73313
L11		less than 0·5	
L12		2·6	
L13	2nd i.f. transformer	6·5	BP73315
L14		less than 0·5	
L15	3rd i.f. transformer	5·7	BP73316
L16		1	
T1	Driver transformer	pins 2–3 180 pins 4–5 46 pins 1–6 51	BS66277

* *See Modifications page 8.*

PARTS LIST—Continued

MISCELLANEOUS PARTS LIST

NOTES:—The parts listed without a model No. are common to all four models. Figures in brackets denote quantity if more than one is used.

Title	Part Number	Description
Cabinet		
Bracket, back, B822A/B	AP49008	for securing upper centre of back
Bracket, clamping, TR146A/B (4)	AP72077	for retaining bottom front edge of scale
Bracket, tapped, B822A/B (2)	AP47726	for securing upper outer corners of back and chassis
Bracket, tapped, TR146A/B (2)	AP47351	for securing top corners of chassis
Cabinet, with fittings, B822A	AS51497	—
Cabinet, with fittings, B822B	AS51498	—
Cabinet, with fittings, TR146A	AS51393	—
Cabinet, with fittings, TR146B	AS51394	—
Cabinet back ass., B822A	DS48342	complete with fittings
Cabinet back ass., B822B	DS48343	complete with fittings
Cabinet back ass., TR146A	DS47359	complete with fittings
Cabinet back ass., TR146B	DS47388	complete with fittings
Gasket, grille, B822A/B	DP47718	backing for front grille
Gasket, grille, TR146A/B	CP47365	backing for front grille
Gasket, speaker	AP72089	fitted between cabinet and face of speaker
Grille, B822A/B	DP47717	for front of receiver, perforated alumium
Grille, TR146A/B	CP72086	for front of receiver, slotted aluminium
Handle	CP72078	less pivots
Loudspeaker	BP72059	$5\frac{3}{8}$ ins. by $2\frac{3}{4}$ ins., 15 ohms impedance
Nut, captive	AP61881	fitted to back for back fixing screw
Nut, moulded, 4BA (4)	AP44517	for retaining speaker
Nut, Spire Speed (4)	AP60766	for retaining speaker fixing bolts
Nut, Spire Speed, TR146A/B (4)	AP60718	for securing top rear of scale and brackets AP47351
Pivot, handle (2)	AP72061	less fittings
Plate, decorative, B822A	BP47723	with model No. on back of receiver
Plate, decorative, B822B	BP47724	with model No. on back of receiver
Plate, decorative, B822A/B	CP48297	control panel, surrounds knobs and buttons
Plate, decorative, TR146A	BP47581	with model No. on back of receiver
Plate, decorative, TR146B	BP47582	with model No. on back of receiver
Plate, decorative, TR146A/B	CP47353	control panel, surrounds knobs and buttons
Plate, emblem, TR146A/B	AP50611	badge on front grille
Plate, motif, B822A/B	AP50612	badge on front grille
Push-on-fix (2)	AP48542	for securing car aerial and earphone sockets
Push-on-fix (2)	AP47364	for retaining handle pivots
Scale, tuning, B822A/B	CP48398	—
Scale, tuning, TR146A/B	EP72076	—
Screw, special 2BA	AP72067	back fixing screw
Socket, car aerial	AP72212	less push-on-fix
Socket, earphone, white	AP47382	for all models except TR146A, less push-on-fix
Socket, earphone, black	AP72211	for model TR146A only, less push-on-fix
Spacer, tapped, 4BA	AP47520	bottom left-hand chassis fixing pillar
Spacer, tapped, 4BA	AP72090	bottom right-hand chassis fixing pillar
Trim, chromed, B822A/B	AP48400	along top front edge of cabinet
Washer, decorative (2)	AP72062	on handle pivots
Washer, felt (2)	AP72063	for handle pivots
Washer, special	AP66449	retains back fixing screw in cabinet base
Window, scale, TR146A/B	CP72073	covers tuning scale
Chassis		
Aerial, ferrite	AS51395	with M.W. coil less L. W. coil
Bracket, gang mounting	AS47656	complete with left-hand drive cord pulley
Bracket, pulley	AS47658	adjacent to drive cord capstan
Bracket, pulley	AS47657	right-hand support for pointer backing plate
Bush (3)	AP12418	grommets for mounting tuning gang
Bush, bearing	AP48504	on spindle of tuning control
Button, TR146B & B822A/B (3)	AP47380	white, for wavechange switch
Button, TR146A (3)	AP72085	black, for wavechange switch
Capstan	AP72070	for drive cord, less retaining screw

PARTS LIST—Continued

Title	Part Number	Description
Chassis		
Clip, heat sink (2)	AP67600	for output transistors
Clip, plastic (2)	AP63356	for retaining ends of ferrite rod aerial
Connector, battery	AP63404	positive
Connector, battery	AP63405	negative
Cord drive, 40 in.	160 000 012	white terylene, type M336C
Drum; drive cord	AP47521	on spindle of tuning gang
Grommet	AP26410	on ferrite rod, less adjusting ring
Knob assembly TR146A	AS50886	black, for tuning control
Knob assembly TR146B & B822A/B	AS50940	white, for tuning control
Knob, moulded TR146A	AP50884	black, knurled outer ring for volume control with red line
Knob, moulded TR146B & B822A/B	AP50938	white, knurled outer ring for volume control with red line
Panel, printed	ES49038	complete with all components
Plate, diffusion	AP48627	backing for pointer
Pointer assembly TR146A/B	AS48628	with red sleeving
Pointer assembly B822A/B	AS49072	with white sleeving
Ring adjusting	AP47383	for ferrite rod adjustment
Screw, 6BA	205 621 803	countersunk-head, for retaining drive capstan
Spindle, tuning	AP49049	for tuning control
Spring, tension	AP1941	for tensioning drive cord
Strip, reinforcing	AP47355	along printed panel, behind controls
Switch, push button	CP72209	wavechange switch less push buttons

MODIFICATIONS

1. On some models VT5-7 are type AC 128.
2. R8 on later models is 820Ω, ±10%, 0.2W. Pt. No. AP32878.

THE SERVICE DEPARTMENT

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