

BUSH SERVICE INFORMATION

MODEL TR90CL & DL TRANSISTOR RADIO



USE IN CONJUNCTION WITH TP1545 (SERVICE INFORMATION TR90C & D Mk. 11) NOTING ANY DIFFERENCES GIVEN HERE.

GENERAL

The TR90CL or DL is a two-waveband, battery operated receiver using 7 transistors and 1 crystal diode, with provision for the selection of pre-set tuned 208 metres (Luxembourg).

CABINET

TR90CL as TR90C Mk. 11.
TR90DL as TR90D Mk. 11.

CONTROLS

As TR90C & D Mk. 11 except that there is a three-button wavechange switch in the centre of the top panel:—
L.W., M.W. and '208'.

ALIGNMENT PROCEDURE

As in TP1545 with the addition of the following notes.

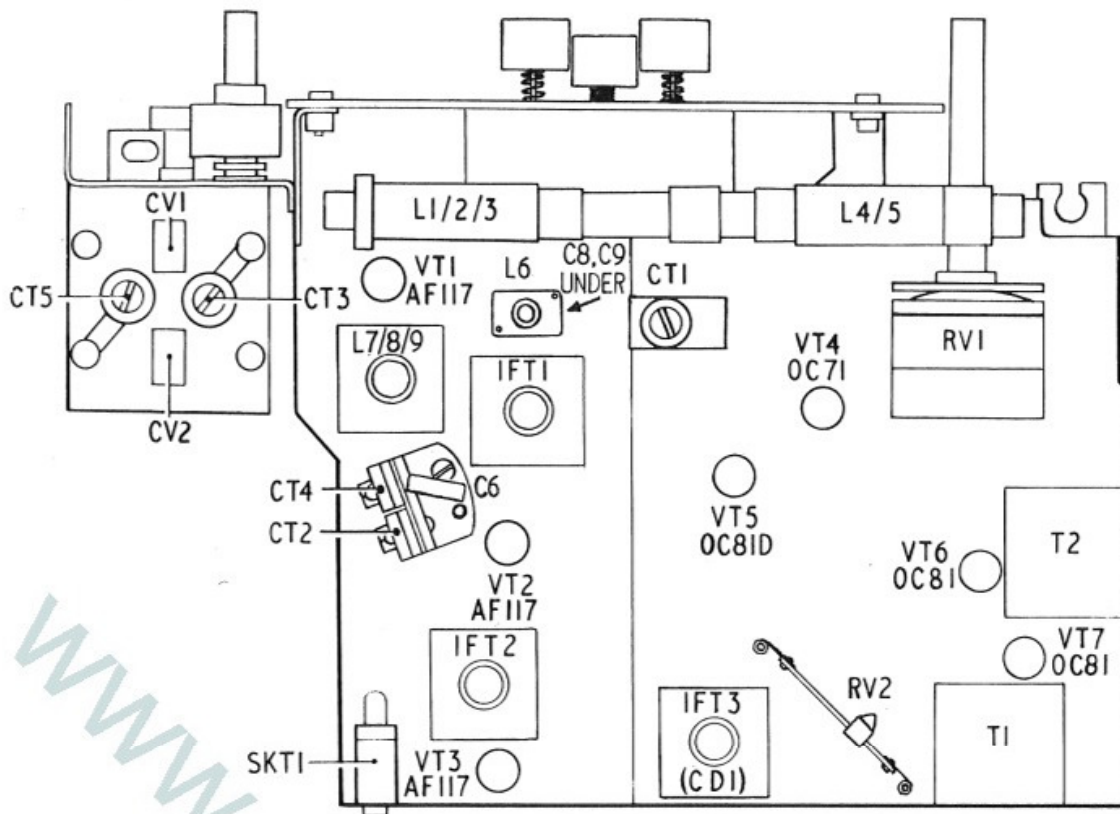
PRELIMINARY NOTES

- 1 The signal generator should also be capable of being modulated 80% at 5 kc/s for the setting up of the 208 (Luxembourg) button.

R.F. ALIGNMENT

Operation	Waveband	Signal Generator Frequency (modulated 80% at 5 kc/s)	Adjustment
6	'208' button	1439 kc/s	L6* CT4 (for maximum)

*A signal level of 1mV should be injected into the car aerial socket and the core of L6 adjusted for MINIMUM output (the output will rise on either side of the correct tuning point when the core of L6 is slowly rotated in either direction). Finally, check the tuning of the receiver against the Luxembourg transmission.



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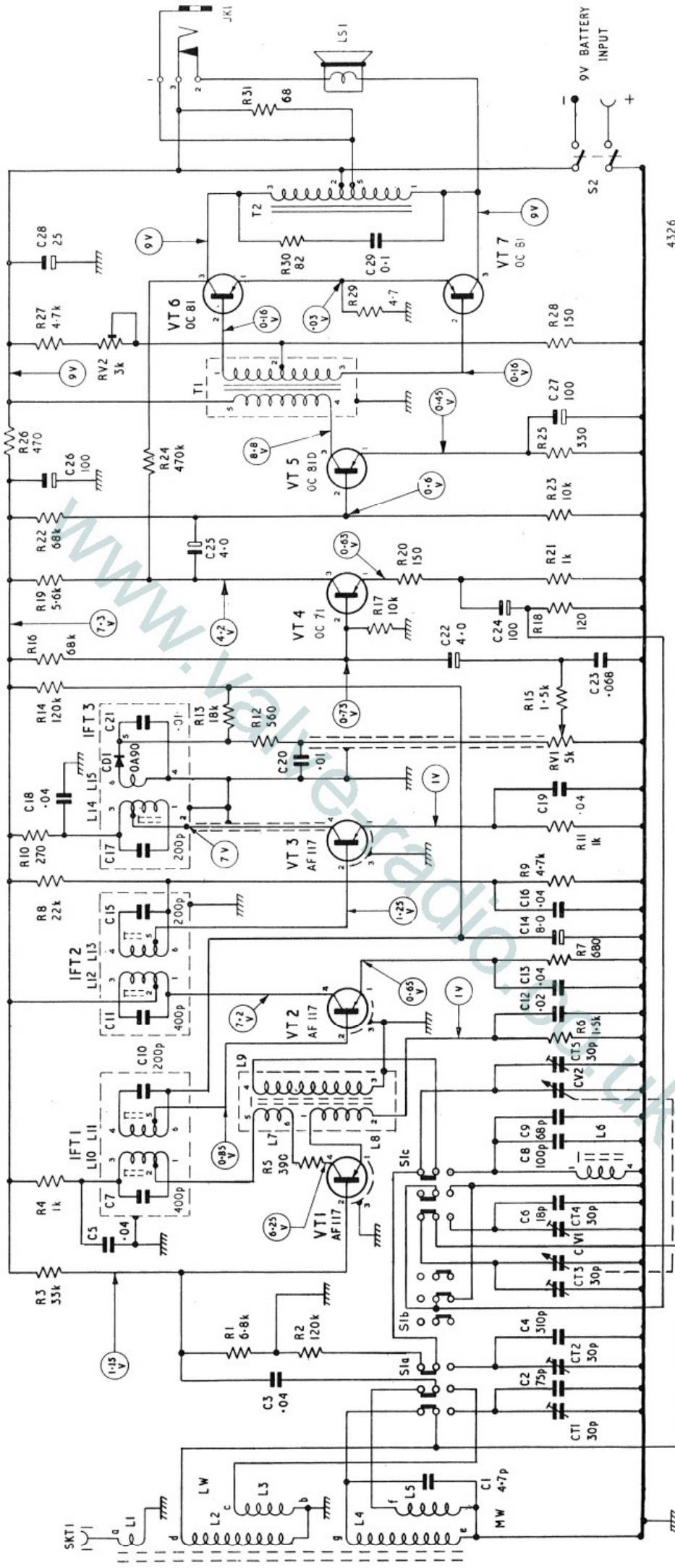
Fig. 1 Front of chassis

PARTS LIST

Note: Ordering these part numbers will give the right type and rating of component. When fitting replacements from stock always use the same type and rating as that of the component being replaced.

CAPACITORS

Reference	Value		Tolerance (%±)	Rating (volts)	Part Number
	μF	pF			
C1		4.7	10	750	AP24639
C2		75	2pF	125	AP63371
C3	0.04		20	150	AP61237
C4		310	2½	125	AP65795
C5	0.04		20	150	AP61237
C6		18	10	125	AP69864
C7		400	2½	125	AP64076
C8		100	2	200	AP40872
C9		68	10	750	AP31961
C10		200	2½	125	AP64075
C11		400	2½	125	AP64076
C12	0.02		20	150	AP22251
C13	0.04		20	150	AP61237
C14	8.0		+100-20	6	AP64286
C15		200	2½	125	AP64075
C16	0.04		20	150	AP61237
C17		200	2½	125	AP64075
C18	0.04		20	150	AP61237
C19	0.04		20	150	AP61237
C20	0.01		20	150	AP62651
C21	0.01		+50-25	12	AP67222
C22	4.0		+100-25	15	AP64288
C23	0.068		10	125	AP69240
C24	100		+100-20	6	AP67548
C25	4.0		+100-20	15	AP64288
C26	100		+100-20	10	AP62170 or AP66520
C27	100		+100-20	6	AP67548
C28	25		+100-20	15	AP67580
C29	0.1		20	200	AP67502
CT1	3-30		2-bank trimmer		AP21918
CT4	3-30				
CT2	3-30		trimmer		AP23949
CT3	3-30		on gang		BP63275
CT5	3-30				
CV1	343				
CV2	177		ganged		



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NOTES.

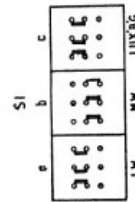
1. All values of resistance in Ohms and all values of Capacitance in μF unless otherwise stated.
2. Voltages indicated are negative with respect to chassis and measured with AVO No.8 under no signal conditions and with Volume Control set to zero.



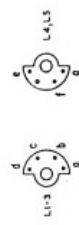
JACK SOCKET
VIEWED ON TAGS.
4327



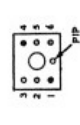
OUTPUT & DRIVER
TRANSFORMER



SWITCH CONTACTS
SHOWN IN M.V. POSITION



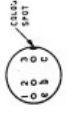
FERRITE AERIAL
VIEWED OUTWARDS FROM CTR. OF ROD.



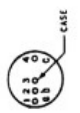
OSC. SHUNT COIL
VIEWED FROM ABOVE.



OSC. COIL &
IFT. L2 & 3.
VIEWED FROM BELOW.



BASE OF TRANSISTORS
VT4-7



BASE OF TRANSISTORS
VT1-3

Fig. 2 Circuit Diagram

RESISTORS As in TP1545 with the following exceptions

Reference	Value (ohms)	Tolerance (±%)	Rating (watts)	Part Number
R1	6.8k	10	1/2	AP25306
R2	120k	10	1/2	P6888
R3	33k	10	1/2	AP25354
R4	1k	10	1/2	AP25246
R5	390	10	1/2	AP32416

COILS AND TRANSFORMERS As in TP1545 with the following exceptions

Reference	Description	Resistance (ohms)	Part Number
L6	208 osc. shunt coil	2.4	AS69851
L7		0.2	
L8	oscillator coil	0.6	BS67527
L9		4.0	

MISCELLANEOUS

As in TP1545 with the following exceptions

Description	Part Number
Escutcheon strip	CP69256
Knob 'L.W.'	AS69801
Knob 'M.W.'	AS69802
Knob '208'	AS69803
Switch mechanism	CP69255
Switch mounting plate	AP69253

SPARES AND SERVICE

When ordering replacement components please quote:—

- 1 Model number and serial number of the radio receiver.
- 2 Description and part number of components and the quantity required.
To avoid unnecessary delay, send orders for replacement parts and requests for technical information to:—

THE SERVICE DEPARTMENT



BUSH RADIO

A DIVISION OF THE RANK ORGANISATION



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BUSH SERVICE INFORMATION

Model TR90c & D Mk II Transistor portable Radio



SPECIFICATION

GENERAL

The TR90C or D, Mk II is a two-waveband, battery-operated receiver using 7 transistors and 1 crystal diode.

CABINET

TR90C Grey moulded plastic cabinet with contrasting band on blue plastic material.

TR90D Pale cream moulded plastic cabinet with contrasting band of dark tan plastic material.

Both models have gold trims and a chrome dial surround.

DIMENSIONS

Height 7 in.

Width 8 $\frac{3}{4}$ in.

Depth 2 $\frac{1}{2}$ in.

Weight 2 lb. 14 oz. (without batteries)

CONTROLS

The controls are on top of the case. They are, from left to right: combined Volume control and On/Off switch, two-button wavechange switch, Tuning control.

WAVEBANDS

M.W. band 187 to 570 metres (1605 to 525 kc/s).

L.W. band 1070 to 1900 metres (280 to 158 kc/s).

INTERMEDIATE FREQUENCY

470 kc/s.

AERIAL

An internal ferrite-rod aerial is fitted for use on both wavebands. There is also provision for connecting a car-type external aerial.

PHONE SOCKET

A socket is provided into which an earpiece having an impedance of not more than 300 ohms may be plugged. This socket may also be used for connecting an extension speaker of 3 ohms impedance.

LOUDSPEAKER

4-in. circular, flux density 10,000 lines per sq. cm., nominal impedance 70 ohms.

TRANSISTORS

Mullard, p.n.p. junction types

AF117 mixer/oscillator

AF117 i.f. amplifier

AF117 i.f. amplifier

OC71 audio amplifier

OC81D driver

OC81 } push-pull output

OC81 }

CRYSTAL DIODE

Mullard type

OA90 detector

SOUND OUTPUT

350mW.

BATTERY

9-volt Ever-Ready type PP7 or equivalent.

BATTERY CONSUMPTION

20mA average

ALIGNMENT PROCEDURE

PRELIMINARY NOTES

- 1 Equipment required:—
 - 1 A signal generator with a frequency range of 214 kc/s to 1,500 kc/s 30% modulated at 400 c/s.
 - 2 An output wattmeter with a range of 0-200 mW or a 20,000Ω/V meter to measure the voltage across the speech coil.
 - 3 A special non-ferrous trimming tool suitable for adjusting the IFT and oscillator cores.
- 2 The chassis must be aligned outside the cabinet.
- 3 The signal generator should be switched on about 15 minutes before beginning the alignment.
- 4 Set the receiver volume control to maximum. During alignment the signal input should be adjusted to maintain the output at 50 mW or 1.87V when using the avometer connected across the speech coil of the loudspeaker each time a trimming adjustment is made.

Note An auxiliary scale giving alignment frequency settings is printed on the reverse face of the tuning scale backplate.

I.F. ALIGNMENT

Note The outer peak is the correct one for all IFT adjustments.

- 1 Set each core to the end of the former.
- 2 Switch the receiver to M.W. band and set the tuning control to about 1000 Kc/s (300 metres).
- 3 Set the signal generator to 470 kc/s modulated 30 per cent. at 400 c/s. Connect the output via a 0.1 μF isolating capacitor to the junction of C3 and S1d and align IFT3, IFT2 and IFT1, in that order, for maximum audio output. Align each IFT once only.

R.F. ALIGNMENT

Notes For r.f. alignment the signal generator should be coupled to the receiver by a loop of insulated wire placed about 3 feet from the chassis and with its plane at right angles to the ferrite-rod aerial. On the reverse face of the tuning scale backplate is an auxiliary scale giving the alignment-frequency settings.

For r.f. alignment under conditions of interference, the receiver may be temporarily desensitized by connecting an 8.2k ohm resistor between the junction of R13 and R14 (i.e. pin 6 of IFT1) and chassis.

Operation	Waveband	Signal Generator Frequency	Adjustment (for maximum output)
1	M.W.	600 kc/s	L6/L7/L8 (Oscillator)
2	M.W.	1,500 kc/s	CT4 (Oscillator) and CT3 (Aerial)
3	repeat operations 1 and 2		
4	L.W.	214 kc/s	CT2 (Oscillator) and CT1 (Aerial)
5	Check calibration.		

REPLACING THE FERRITE ROD OR AERIAL COILS

If a coil or the ferrite aerial rod is replaced, the coils must be set according to the following procedure. This should be carried out with the receiver in the cabinet.

INITIAL SETTING

Making sure that the original sleeving is kept in position, slide the M.W. coil, tag end first, on to the right hand end of the rod and the L.W. coil, tag end first, on to the left hand end. Set them both with the former $\frac{1}{4}$ in. from the end of the rod. These are starting positions only. The tolerance on rods is such that the final positions may be quite different.

ALIGNMENT

Operation	Waveband	Sig. gen. Frequency (mod. 30% at 400c/s)	Tuning pointer setting	Adjust for max. output
1	L.W.	176kc/s	1700 metres	L1/2/3
2	L.W.	250kc/s	1200 metres	CT1
Repeat operations 1 and 2				
3	Carry out the M.W. alignment procedure as given in the table above.			

After alignment seal the coil formers with wax.

MAINTENANCE

DISMANTLING

- 1 Unscrew the coin-slotted screw in the middle of the receiver cover and remove the cover.
- 2 Unclip and remove the batteries.
- 3 Remove the Volume and Tuning knobs.
- 4 Remove the two 4BA nuts and one 4BA screw securing the chassis which may now be partially removed to give access to the bottom of the chassis. To remove the chassis completely unsolder the speaker connections (tags 2 and 5) to the output transformer and the leads to the earpiece socket.

CORD DRIVE

The pulley is retained by a press stud to the scale backplate and it may be detached to facilitate assembly of the cord drive.

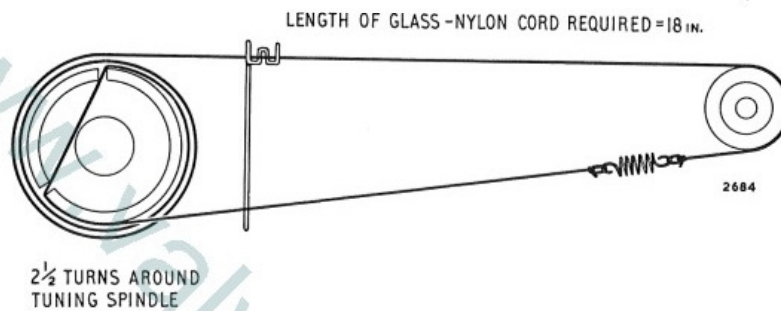


Fig. 3 Cord Drive (viewed from rear)

If the gear drive is changed the gears must be greased with Rocal Kilopoise 8S grease.

OUTPUT STAGES (Setting of RV3)

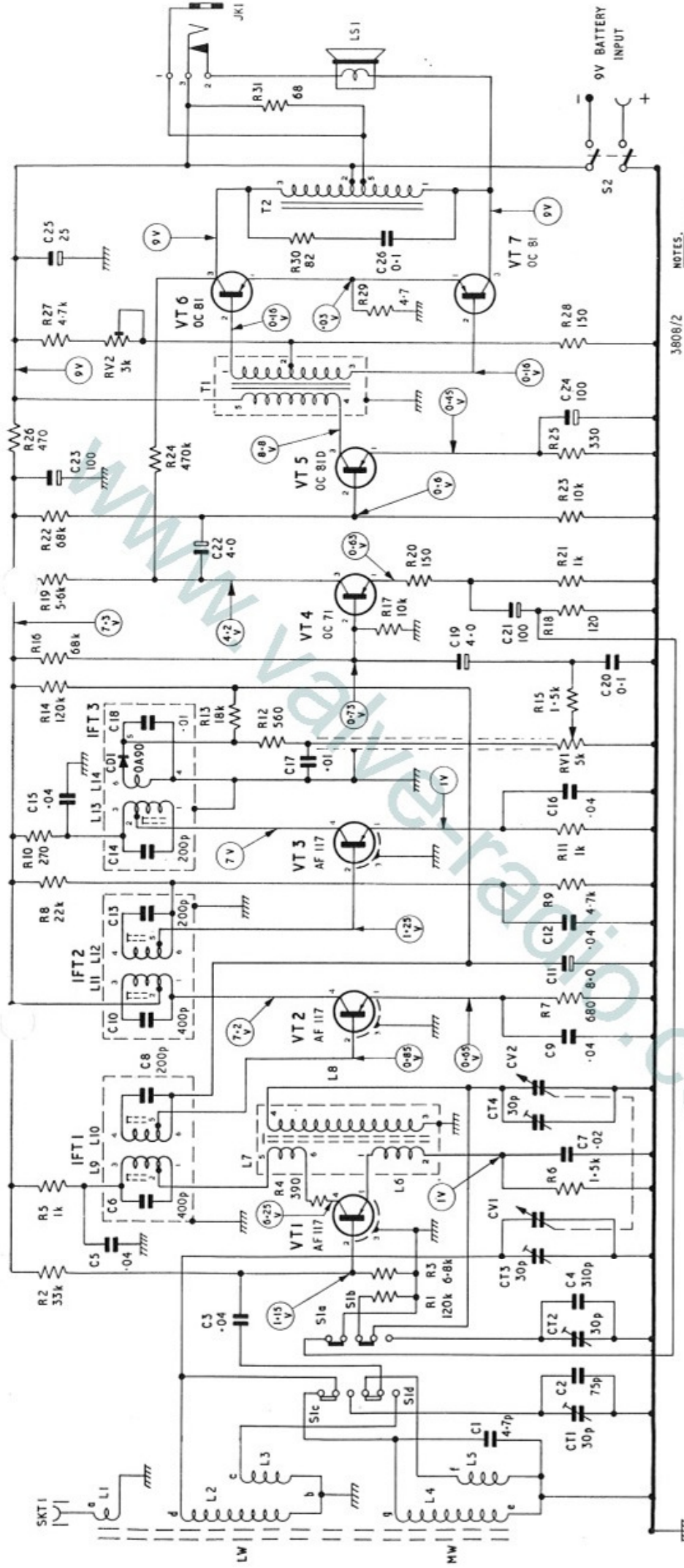
If any components of the output are replaced, it will be necessary to reset the bias control RV3 as follows:—

- 1 Connect the receiver to a 9 volt power supply.
- 2 Connect an Avometer 8 across R29, 4.7Ω (positive lead to chassis).
- 3 Set Avometer 8 to 50μA range, and switch on receiver.
- 4 With volume at minimum adjust RV3 for a meter reading of 7 on the 0-25 scale.

Check that the total quiescent current of the receiver is 14mA (± 1.5 mA).

Note: The above readings are dependent on ambient temperature and quoted figures are for an air temperature of 65°F (18°C). See table below for other conditions.

Temperature		Reading on 0-25 scale	Total Iq
°C	°F		
18	65	7	14mA
23	73	8.4	15.4mA
28	82	9.7	16.7mA
33	91	11.4	18.4mA

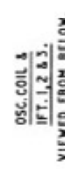
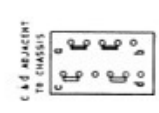


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NOTES.

1. ALL VALUES OF RESISTANCE IN OHMS & ALL VALUES OF CAPACITANCE IN μ F UNLESS OTHERWISE STATED.

2. VOLTAGES INDICATED ARE NEGATIVE WITH RESPECT TO CHASSIS & MEASURED WITH AVO M.B UNDER NO SIGNAL CONDITIONS & WITH VOLUME CONTROL SET TO ZERO.



Voltage readings less than 1V taken on the 2.5V range of the Avo model 8.
 Voltage readings above 1V taken on the 10V range of the Avo model 8.
 Current readings less than 1mA taken on the 1mA range of the Avo model 8.
 Current readings between 1mA and 10mA taken on the 10mA range of the Avo model 8.
 Current readings above 10mA taken on the 100mA range of the Avo model 8.

Fig. 4 Circuit Diagram

PARTS LIST

Note Ordering to these part numbers will give the right type and rating of component. When fitting replacements from stock always use the same type and rating as that of the components being replaced.

CAPACITORS

Reference	Value		Tolerance (± %)	Rating (volts)	Part Number
	μF	pF			
C1	—	4.7	10	750	AP24639
C2	—	75	2p	125	AP63371
C3	0.04	—	20	150	AP61237
C4	—	310	2½	125	AP65795
C5	0.04	—	20	150	AP61237
C6	—	400	2½	125	AP64076
C7	0.02	—	20	150	AP22251
C8	—	200	2½	125	AP64075
C9	0.04	—	20	150	AP61237
C10	—	400	2½	125	AP64076
C11	8.0	—	+100—20	6	AP64286
C12	0.04	—	20	150	AP61237
C13	—	200	2½	125	AP64075
C14	—	200	2½	125	AP64075
C15	0.04	—	20	150	AP61237
C16	0.04	—	20	150	AP61237
C17	0.01	—	20	150	AP62651
C18	0.01	—	+50—25	12	AP67222
C19	4.0	—	+100—20	15	AP64288
C20	0.1	—	10	125	AP29922
C21	100	—	+100—20	6	AP67548
C22	4.0	—	+100—20	15	AP64288
C23	100	—	+100—20	10	AP62170 or AP66520
C24	100	—	+100—20	6	AP67548
C25	25	—	+100—20	15	AP67580
C26	0.1	—	20	200	AP67502
CT1	—	3-30	—	—	AP23949
CT2	—	3-30	—	—	AP23949
CT3-4	—	3-30	—	—	—
CV1	—	343	ganged	—	BP63275
CV2	—	177	—	—	

RESISTORS

Reference	Value (ohms)	Tolerance (± %)	Rating (watts)	Part Number
R1	120k	10	¼	P6888
R2	33k	10	¼	AP25354
R3	6.8k	10	¼	AP25306
R4	390	10	¼	AP32416
R5	1k	10	¼	AP25246
R6	1.5k	10	¼	AP25258
R7	680	10	¼	AP25234
R8	22k	10	¼	AP25342
R9	4.7k	10	¼	AP25294
R10	270	10	¼	AP25204
R11	1k	10	¼	AP25246
R12	560	10	¼	AP25228
R13	18k	10	¼	AP25336
R14	120k	10	¼	AP25396
R15	1.5k	10	¼	AP25258
R16	68k	10	¼	AP25378
R17	10k	10	¼	AP25318
R18	120	10	¼	AP25180
R19	5.6k	10	¼	AP25300
R20	150	10	¼	AP25186
R21	1k	10	¼	AP25246
R22	68k	10	¼	AP25378
R23	10k	10	¼	AP25318
R24	470k	10	¼	AP25438
R25	330	10	¼	AP25210
R26	470	10	¼	AP25222
R27	4.7k	10	¼	AP25294
R28	150	10	¼	AP25186
R29	4.7	½Ω	¼	AP63262
R30	82	10	¼	AP25168
R31	68	10	¼	AP25162
RV1	5k	—	—	BP67914
RV2	3k	—	—	AP67503

COILS AND TRANSFORMERS

Reference	Description	Resistance (ohms)	Part Number
L1	aerial coupling coil	1.0	
L2	} l.w. ferrite aerial coil	12.5	DS33730
L3		2.0	
L4	} m.w. ferrite aerial coil	1.5	DS33731
L5		less than 1.0	
L6	} oscillator coil	0.2	BS67527
L7		0.6	
L8		4.0	
IFT1	i.f. transformer	Pri. 5.5; sec. 8	BS67525
IFT2	i.f. transformer	Pri. 5.5; sec. 8	BS67525
IFT3	i.f. transformer	Pri. 8; sec. 1	BS67526
T1	driver transformer	Pri. 138; sec. 120 (57-63)	BS65498
T2	output transformer	Pri. 4.6 (2.1+2.5); sec. 0.2	BS63320

Note All resistance figures are approximate.

MISCELLANEOUS PARTS LIST

Description	Part Number		
	TR90C	TR90C&D	TR90D
Aerial, ferrite, complete		DS63296	
Aerial socket		AP61162	
Battery leads		CS63305	
Cabinet front	EP63022		AP65985
Cabinet rear	EP63023		AP65986
Chromium trim		CP63026	
Core ferrite (i.f.)		AP65461	
Escutcheon strip		BP65967	
Ferrite rod		AP63317	
Handle		CP63102	
Handle pivot		AP63737	
Handle pivot clip		AP63807	
Handle pivot spacer		AP63096	
Handle pivot washer		AP63098	
Heat sink clip		AP67600	
Jack socket		BP65088	
Jack socket and leads		AS65963	
Knob, L.W.		AS63359	
Knob, M.W.		AS63308	
Knob, tuning or volume		AS63733	
Panel, riveted (auxiliary scale)		AS63301	
Pointer		AP63138	
Pulley		AP62772	
Pulley snap fastener		AP63103	
Scale moulded backplate		BP65968	
Scale printed		DP63757	
Speaker, 4" P.M. 70Ω		AP66094	
Switch mechanism		BS63307	
Switch slider		AP67536	
Switch stator		AP67537	
Switch stator securing plate		AP63252	
Tuning spindle assembly		AS63732	
Tuning drive cord		AS63310	

MODIFICATIONS

C20 may be $0.068\mu\text{F}$ 10% 125v AP69240

www.valve-radio.co.uk

SPARES AND SERVICE

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- 2 Description and part number of components and the quantity required.

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