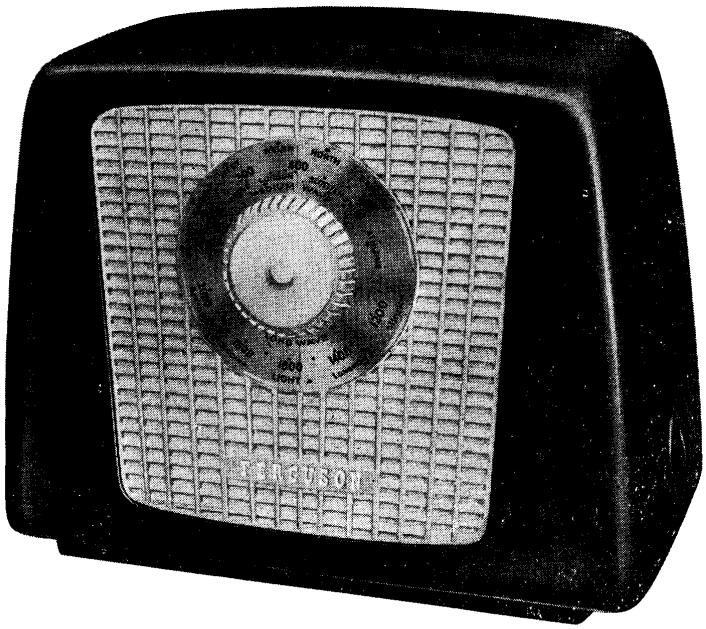
SERVICE MANUAL



AC/DC mains transportable receiver

CONTENTS

ILLUSTRATIONS

MODEL 352U

1. GENERAL SPECIFICATION

1.1. DESCRIPTION

This transportable receiver is housed in a moulded plastic cabinet and employs three valves in a two waveband superheterodyne circuit with ferrite-rod aerial. Sockets for optional external aerial and earth are provided. A circular Tuning scale, edge-lighted and calibrated in wavelength and station names, is fitted at the front of the receiver and the Waverange Switch and Volume Control/On-Off switch are located at the sides. The output stage delivers 1.5 Watts to a sensitive 6" x 4" elliptical loudspeaker of the permanent magnet type. H.T. current is supplied by a contact-cooled metal rectifier.

The receiver is suitable for operation on 200 to 250 Volt A.C. or D.C. mains (40 to 100 cycles A.C.).

1.2. WAVEBAND COVERAGE

Medium Wave — 175 to 565 Metres.

Long Wave — 1080 to 2080 Metres.

1.3. CONTROLS

There are three controls as follows :—

Left-hand side — **Waverange Switch.**

Front — **Tuning Control.**

Right-hand side — **Volume Control/On-Off Switch.**

1.4. VALVES

V1.	**UCH 81**	Frequency Changer.
V2.	**UBF 80**	I.F. Amplifier and Detector.
V3.	**UCL 83**	Audio Amplifier and Output.

1.5. CABINET

Moulded plastic cabinet, with inset in contrasting colour, measuring approximately $12\frac{1}{4}$ in. wide x $9\frac{1}{2}$ in. high x 6 in. deep.

2. INSTALLATION

2.1. MAINS VOLTAGE ADJUSTMENT

This is shown in Fig. 1 and consists of a clip lead which may be transferred to the appropriate tapping on the ballast resistor.

2.2. EXTERNAL AERIAL

The use of an external aerial and earth will increase the sensitivity of the receiver and reduce the directional properties of the ferrite-rod aerial. Not more than about 30 feet of wire should be used. The earth connection should, of course, be as short and direct as possible.

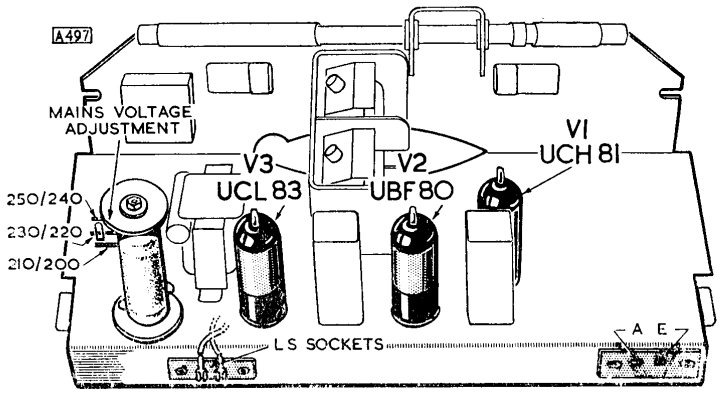


Fig. 1. Rear view of receiver chassis, showing locations of valves, etc.

3. THE CIRCUIT

3.1. CIRCUIT DESCRIPTION

The ferrite-rod aerial **L1**, **L2** is tuned by **C7** with trimmers **C4** on M.W. and **C5**, **C6** on L.W. selected by the switch **S1B**. On M.W., **S1A** connects **L3** in parallel with **L2**, the L.W. section of the ferrite-rod aerial coil. **C1** and **C2** are external aerial and earth isolating capacitors and **C3** is included in the low potential side of the aerial tuned circuit to provide a point of connection for the external aerial. **R1**, in parallel with **C3**, prevents modulation hum by limiting the grid circuit impedance of **V1** at low frequencies.

Signal voltages developed across the aerial tuned circuit are applied

through **C8** to the heptode control grid of the triode-heptode Frequency Changer **V1 (UCH 81).**

The triode section of **V1** is employed as a tuned anode oscillator. The oscillator anode is capacitively coupled by **C9** to the tuned circuit formed by **L5** and **C17** with padder **C11** and trimmers **C16** (M.W.) and **C14, C15** (L.W.) selected by the switch **S1C.** Feedback winding **L4** is connected through the coupling capacitor **C10** to the oscillator grid.

V1 heptode anode is transformer coupled by **C12, L6, L7, C13** to the control grid of the double-diode pentode **V2 (UBF 80),** which functions as I.F. Amplifier and Detector. The screen grids of **V1** and **V2** are fed through the common decoupling resistor **R3** with bypass capacitor **C18.**

A further I.F. transformer **C19, L8, L9, C20** couples **V2** pentode anode to one of the diode anodes operating as signal rectifier. The other diode anode is not used and is connected to **V2** cathode. The signal diode load is **R8,** which also functions as volume control. **R7, C21** and **C22** comprise an I.F. filter. The D.C. component of the rectified signal voltage developed across **R8** is fed as A.G.C. bias to the control grids of **V1** and **V2** through the decoupling circuit **R6, C23.**

Audio frequency voltages appearing across **R8** are coupled by **C24** to the triode grid of the triode-pentode **V3 (UCL 83)** which combines the functions of Audio Amplifier and Output Valve. The triode section of **V3** operates with grid leak bias and is resistance-capacitance coupled by **R10, C25** and **R11** to the control grid of the pentode section which is self-biased by **R12, C28** in its cathode circuit. **V3** pentode anode is transformer coupled by **T1** to the loudspeaker. Tone correction is effected by **C26** across **T1** primary and by the inclusion of **C27** between **V3** pentode anode and control grid to provide a measure of high frequency negative feedback.

All valve heaters and the pilot lamps **PL1** and **PL2,** shunted by the Brimistor **X2,** are series connected and fed from the mains through **R15, R16** and **R17. C31** is a mains R.F. bypass capacitor. High tension supply is by the Half-Wave Metal Rectifier **W1** (Westinghouse 18.RA.1-1-16-1) with the reservoir capacitor **C30** and the smoothing filter **R13, C29. R14** is the rectifier peak current limiter and the Brimistor **X1** limits the charging current of the smoothing capacitors when the receiver is first switched on, thus protecting the pilot lamps.

V3 pentode anode supply is taken from the input side of the smoothing filter; all other H.T. feeds from the smoothed side.

See Page 4.

4. CIRCUIT ALIGNMENT

Re-alignment can be carried out without removing the chassis from the cabinet.

I.F. Alignment

Connect the signal generator output between the junction of **C7** and **C8** (a convenient point of connection is the front section of the gang) and chassis. Isolating capacitors of 0.01μF and of adequate working voltage should be used. Connect an output meter to the loudspeaker sockets. Switch to M.W., turn volume control to maximum and close gang.

Inject a signal of 470 Kc/s and adjust the cores of **L9, L8, L7** and **L6** in that order for maximum output, reducing the input voltage as each circuit is brought to resonance in order to avoid A.G.C. action.

R.F. Alignment

With the chassis secured in the cabinet, check that the tuning scale is correctly positioned as follows :—

When the gang is closed, the top cursor line on the scale backing plate should be central between the M.W. 550 metre calibration spot (black) and the L.W. 1100 metre calibration spot (red).

Sufficient signal voltage for alignment purposes can be induced in the ferrite-rod aerial if the output lead of the signal generator is laid near the cabinet with a closed loop consisting of a few inches of wire connected across its output terminals.

The medium waveband must be aligned first.

1. Switch to M.W. and turn tuning dial so that the upper cursor line is coincident with the M.W. pad point, a small dot at 517.2 metres (580 Kc/s). Inject a 580 Kc/s signal and adjust **L5** and **L3** for maximum output, taking especial care to ensure that **L3** is exactly peaked.

2. Turn tuning dial so that the upper cursor line coincides with the M.W. trim point 214.3 metres (1400 Kc/s). Inject a 1400 Kc/s signal and adjust **C16** and **C4** for maximum output.

Repeat 1 and 2 until no further improvement results.

3. Switch to L.W. and turn tuning dial so that the lower cursor line coincides with the L.W. trim point, the smaller red dot at 1364 metres (220 Kc/s).

Inject a 220 Kc/s signal.

Adjust **C14** and **C5** for maximum output.

3.2. CIRCUIT DETAILS

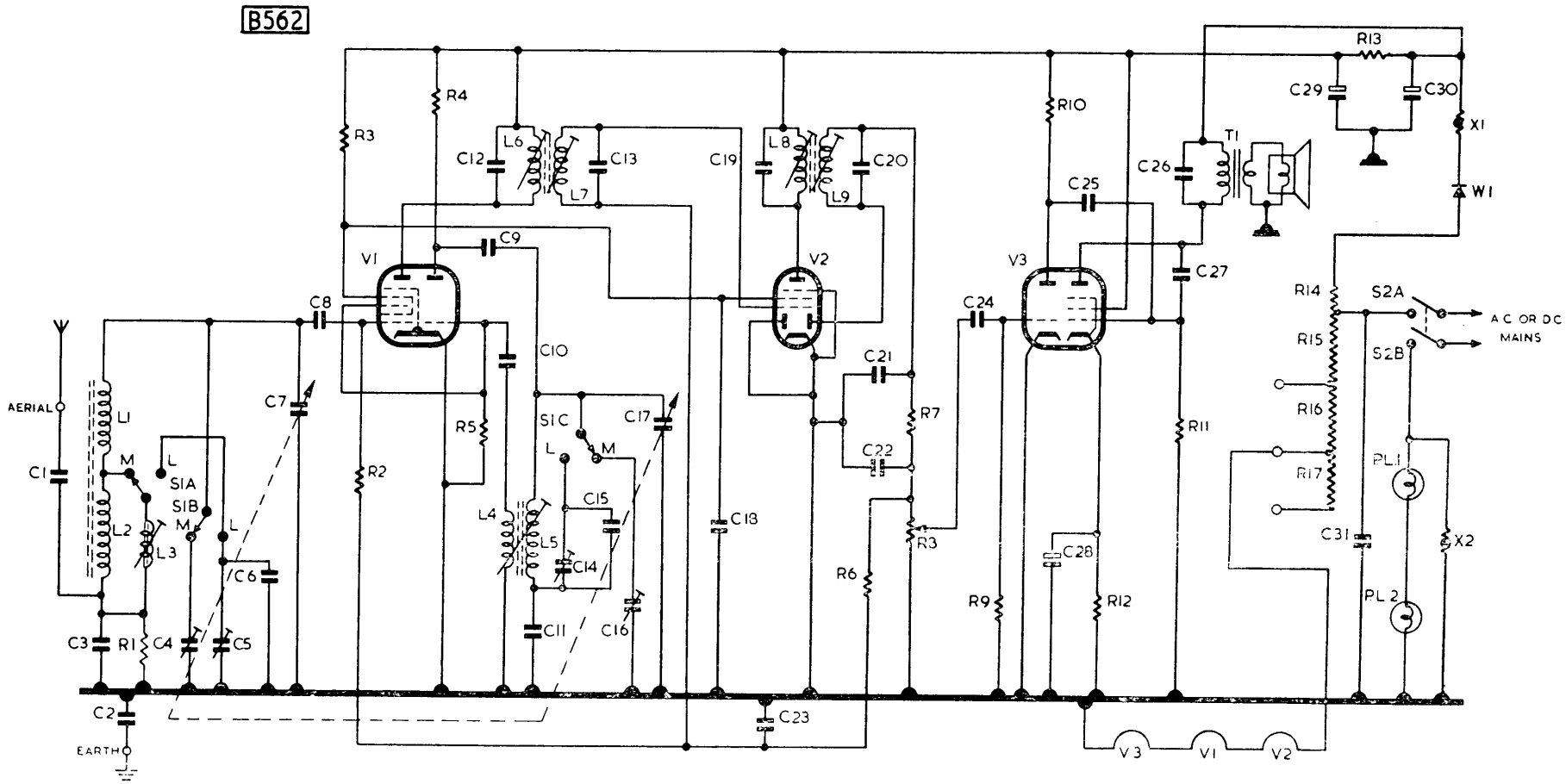


Fig. 2. Circuit diagram of Model 352U.

CAPACITORS

(20% tolerance, 350 V. working unless otherwise stated)

Ref.	Value	Rating	Function	Location
C 1	0.001 uF	1000 V.	Aerial isolating	E2
C 2	0.05 uF	1000 V.	Earth isolating	E2
C 3	3000 pF	5%	Aerial coupling	F1
C 4	4-40 pF		M.W. aerial trimmer	E2
C 5	4-40 pF	}	L.W. aerial trimmer	E2
C 6	80 pF	5% }		
C 7	528 pF†		Aerial tuning	B1
C 8	220 pF		V1 C.G. coupling	F1
C 9	220 pF		Osc. anode coupling	F2
C10	56 pF		Osc. grid coupling	F2
C11	390 pF	2%	Oscillator padder	F2
C12	200 pF‡	2% }	1st I.F.T. tuning	C2
C13	200 pF‡	2% }		
C14	4-40 pF	}	L.W. osc. trimmer	E2
C15	390 pF	2% }		
C16	4-40 pF		M.W. osc. trimmer	E2
C17	528 pF†		Oscillator tuning	B1
C18	0.1 uF		V1, V2 S.G. bypass	F2
C19	200 pF‡	2% }	2nd I.F.T. tuning	B2
C20	200 pF	2% }		
C21	100 pF	}	I.F. filtering	G2
C22	100 pF	}		
C23	0.05 uF	250 V.	A.G.C. decoupling	F2
C24	0.01 uF	150 V.	V3 triode coupling	G2
C25	0.003 uF		V3 pentode C.G. coupling	G2
C26	0.005 uF	1000 V. }	Tone correction	A1
C27	30 pF	}		G2
C28	50 uF*	25 V.	V3 cathode bypass	G2
C29	50 uF*	275 V.	H.T. smoothing	H1
C30	50 uF*	275 V.	H.T. reservoir	H1
C31	0.01 uF	1000 V.	Mains R.F. bypass	G1

† "Swing" value.
‡ 125 pF in earlier receivers.
* Electrolytic.

RESISTORS

(20% tolerance ¼ Watt carbon unless otherwise stated)

Ref.	Value ohms.	Rating	Function	Location
R 1	3.3 K		L.W. aerial shunt	F1
R 2	470 K		V1 heptode grid leak	F2
R 3	33 K	½ W.	V1, V2 S.G. feed	F2
R 4	22 K	½ W.	Osc. anode feed	F2
R 5	47 K		Osc. grid leak	F2
R 6	1.5 M		A.G.C. decoupling	G2
R 7	100 K		I.F. filtering	G2
R 8	500 K	Carbon Potr.	Volume Control	G1
R 9	10 M		V3 triode grid leak	G2
R10	100 K		V3 anode load	G2
R11	270 K		V3 pentode grid leak	G2
R12	330	10% ¼ W.	V3 cathode bias	G2
R13	1.5 K	1 W.	H.T. smoothing	A1
R14	120	5% (W.W.)	Rect. current limiter	A2
R15	1100	5% }	Ballast resistors	A2
R16	200	5% } (W.W.)		
R17	200	5% }		

VALVES

(All Mullard Types)

Ref.	Type	Function	Location
V1	UCH 81	Frequency Changer	C2
V2	UBF 80	I.F. Amplifier and Detector	C2
V3	UCL 83	Audio Amplifier and Output	B2

INDUCTORS AND TRANSFORMERS

(D.C. resistance not given if less than 1 ohm)

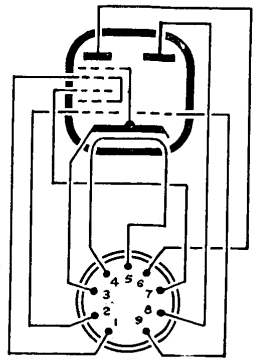
Ref.	Function	Approx. D.C. ohms.	Location
L 1	M.W. Aerial Coil	—	A1
L 2	L.W. Aerial Coil	—	D1
L 3	M.W. Loading Coil	—	E1
L 4	Oscillator Feedback Coil	—	F2
L 5	Oscillator Tuning Coil	2	F2
L 6	1st I.F. Transformer	Pri. 8	C2
L 7		Sec. 8	
L 8	2nd I.F. Transformer	Pri. 8	B2
L 9		Sec. 8*	
T 1	Output Transformer	Pri. 500	B1
		Sec. —	

* 6 ohms in earlier receivers.

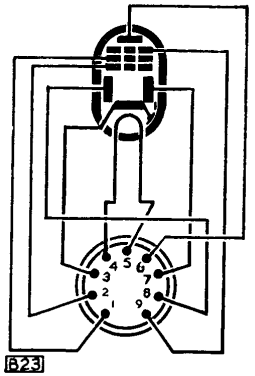
MISCELLANEOUS

Ref.	Function and Description	Location
S1A & B	Aerial Circuit Switch	E1
S1C	Oscillator Circuit Switch	E1
S2A & B	On-Off Switch (ganged with R8)	G1
X1	Brimistor CZ2	A1
X2	Brimistor CZ2 (P.L. shunt)	G1
W1	H.T. Rectifier (Westinghouse 18.RA.1-1-16-1)	A1
PL1, PL2	8V., 0.15A. Pilot Lamps	B1 & C1

VALVE BASE CONNECTIONS



UCH 81



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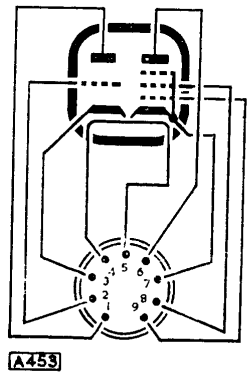

UCL 83

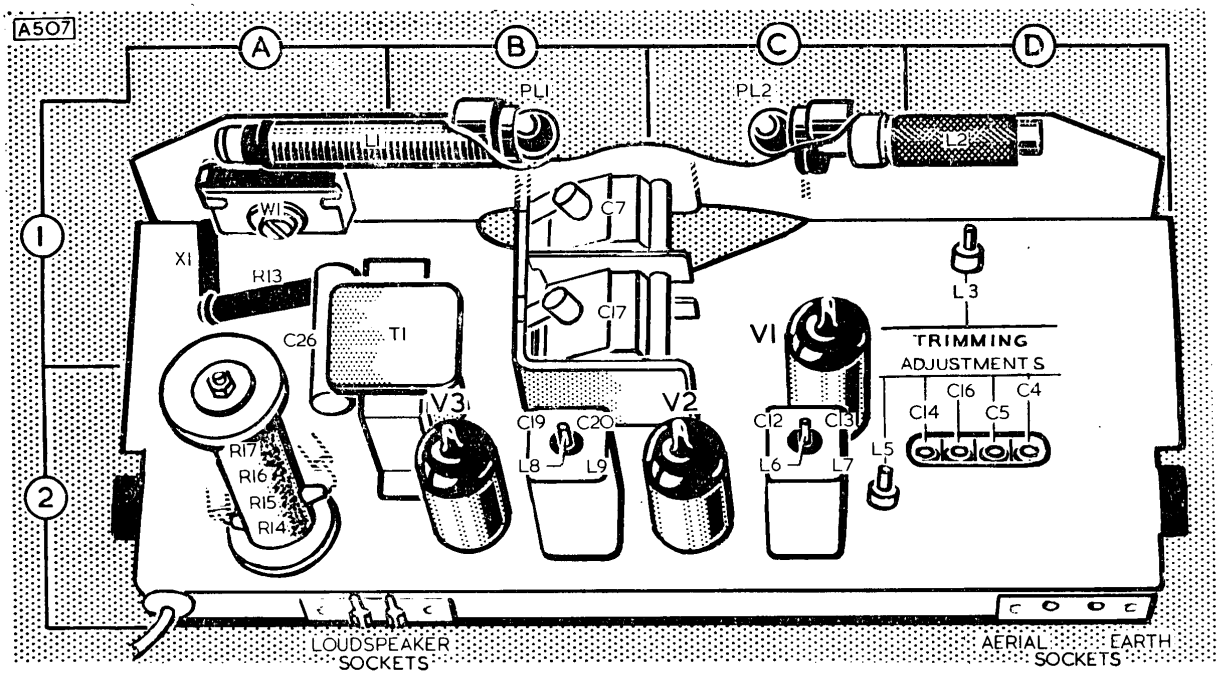

Fig. 3. Plan view of receiver chassis, showing locations of valves and components.

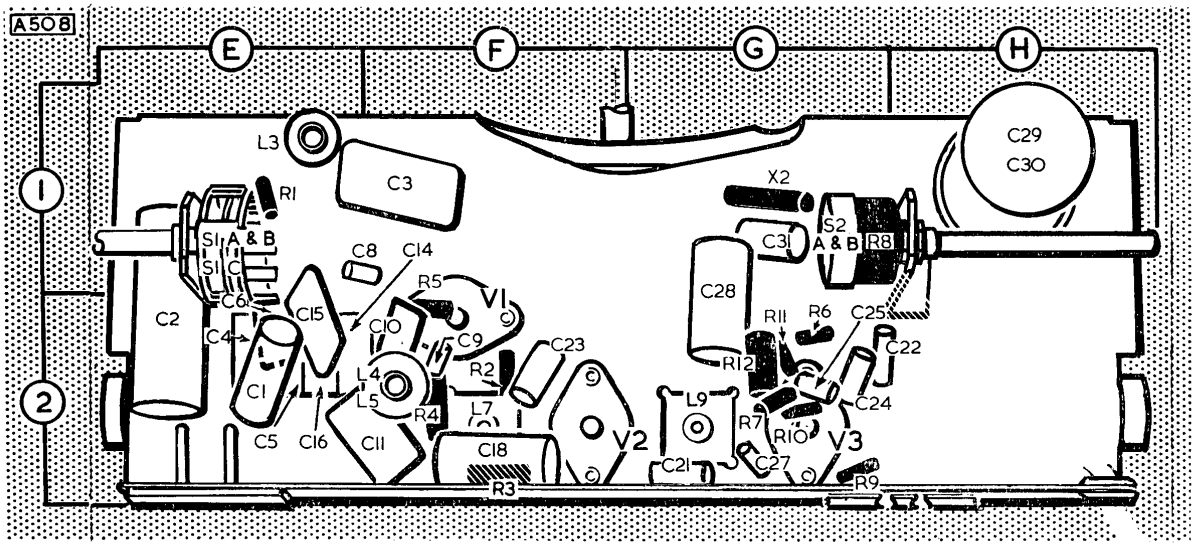

Fig. 4. Underside of receiver chassis, showing locations of components.

5. VOLTAGE & CURRENT MEASUREMENTS

The following readings were taken with an input of 225 Volts 50 cycles to the 220-230 Volt tapping.

The receiver was switched to the M.W. band, there was no signal input and voltages were measured on the 250 Volt and 10 Volt ranges, as applicable, of a Model 8 Avometer.

GENERAL MEASUREMENTS

Unsmoothed H.T.	200 V.
Smoothed H.T.	175 V.
Total H.T. Current	40 mA.
Heater Current	100 mA.

VALVE MEASUREMENTS

Ref.		Anode Volts	Anode mA	Screen Volts	Screen mA	Cathode Volts
V1.	UCH 81					
	(Heptode) ...	175	0.8	48	2.5	—
	(Triode) ...	96	3.5	—	—	—
V2.	UBF 80	175	3.2	48	1.2	—
V3.	UCL 83					
	(Triode) ...	92	0.8	—	—	—
	(Pentode) ...	183	25	175	4.4	9.5

6. MECHANICAL DETAILS

6.1. REMOVING THE CHASSIS

The majority of the components are accessible when the cabinet back and bottom panel is removed, but should removal of the chassis become necessary this can be done as follows :—

1. Unplug the loudspeaker leads.

2. Remove the control knobs. These are held by spring clips and can be drawn off the spindles. This will be facilitated by slipping a length of thin string behind the control knob flange, crossing the ends to encircle the shank and pulling gently forward. The calibrated perspex dial is secured by a grub screw and when this is slackened, the dial can be drawn off the gang spindle.

3. Remove the two self-tapping chassis fixing screws ; one at each side of the chassis front plate. The chassis may then be withdrawn from the cabinet.

6.2. REPLACING THE CHASSIS

The following should be noted :—

1. Check that the grommets are in position on the two projecting lugs at the sides of the chassis. The grommets are necessary to ensure that the chassis is correctly supported in the grooves moulded in the sides of the cabinet.

2. Do not omit to replace the washers on the chassis fixing screws.

3. The perspex dial should be positioned with the M.W. 550 metre marker and the L.W. 1100 metre marker equi-distant about the top cursor line on the scale backing plate when the gang is closed.

4. When pushing the control knobs on to the spindles, support the components concerned with the free hand to avoid undue stress on the mountings.

6.3. PILOT LAMP REPLACEMENT

The pilot lamp holders are located in the cut outs in the chassis front plate. They can be disengaged by sliding them sideways. When replacing, take care that the leads do not foul the gang rotor.

7. SPARE PARTS LIST

Part Description	Part No.
Aerial (Ferrite Rod)	Y10215
Aerial Loading Coil	Y10149
Cabinet	V10200
Cabinet Back	W10222
Capacitors :	
3000 pF 5% P.S.M.	P302G35
390 pF 2% P.S.M.	P391R35
50—50μF 275 V. Electrolytic	Z13200/2
Control Knobs :	
Waverange	Y10207
Waverange Knob Clip	37314
Volume	Y10206
Volume Knob Clip	37314
Tuning	Y10204
Tuning Knob Clip	Z7058
Dial (Perspex)	Y10203
Dial Clip	Z7057
Gang Capacitor	Z10210
I.F. Transformer	Y10194
Loudspeaker	Z10233
Mains Dropper	Z10227
Oscillator Coil	Y10219
Output Transformer	Z8401
Pilot Lamp Holder	Z8413
Rectifier	Z10164
Trimmer Bank	Z10211
Volume Control	Z10209
Waverange Switch	Z10208