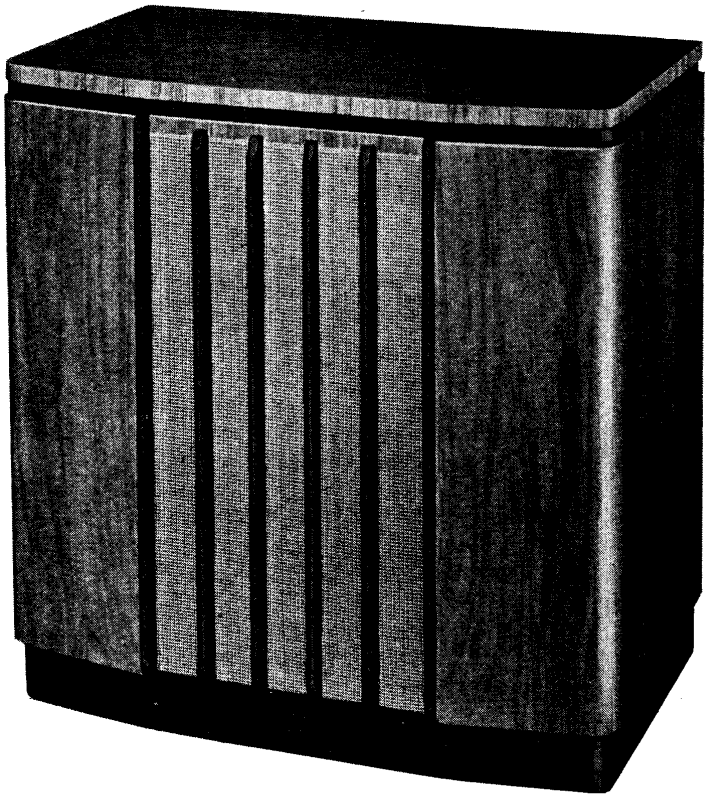
MODEL 327 URG



1. GENERAL SPECIFICATION

1.1. Description

Model 327 URG is an automatic radio-gramophone for A.C. or D.C. mains operation and incorporating a three waveband, five valve (including rectifier) receiver chassis.

Negative feedback is applied over the audio frequency stages and the tone control is included in the feedback loop. Switched sockets for the connection of an external loudspeaker of 2 — 3Ω impedance are provided.

1.2. Controls

The four controls are located on the top panel and are as follows :

Tuning Control.
Waverange/Gram. Switch.
Volume Control.
Tone Control/On-Off Switch.

The functions of these controls are indicated on the panel.

1.3. Waveband Coverage

Short Wave
15.7 to 55.4 Metres.
Medium Wave
184 to 575 Metres.
Long Wave
733 to 2050 Metres.

1.4. Valves (All Mullard Types)

V1 UCH42 Frequency Changer.
V2 UBF80 I.F. Amplifier, Detector and A.G.C.
V3 UF41 Audio Amplifier.
V4 UL41 Audio Output.
V5 UY41 H.T. Rectifier.

1.5. Record Changer

Garrard RC.80M/UNIV fitted with turnover crystal pick-up with sapphire styli. Record capacity —ten 12-inch, 10-inch or 7-inch records. Speeds—78, 45 or 33⅓ r.p.m.

1.6. Power Output

3.5 Watts maximum.

1.7. Loudspeaker

Permanent magnet, 8-inch. Speech coil impedance—3 ohms.

1.8. Power Supply—Mains

200 to 250 Volts A.C. (40 to 60 cycles) or D.C.

Power consumption :
Radio 45 Watts approx.
Gram. 65 Watts approx.

1.9. Cabinet

Console, in selected veneers, measuring 27½in. high x 27in. wide x 16¼ deep.

2. INSTALLATION AND OPERATION

2.1. Mains Voltage and Motor Speed Adjustments.

The mains voltage adjustment is located at the rear of the chassis and has three positions for 200—210V., 220—230V. and 240—250V.

The positions of the links on the motor terminal block (beneath turntable) differ according to whether the supply is A.C. or D.C. It may therefore be necessary to re-set the links ; the positions for each type of supply are shown on the terminal block cover and in the record changer manufacturer's instruction leaflet. This should be consulted also if the motor speed requires adjustment.

2.2. External Loudspeaker

Connection should be made to the plug and socket at the rear of the cabinet. When the plug is vertical in the socket, both internal and external loudspeakers will operate. If the plug is twisted anti-clockwise as indicated on the socket panel, the internal loudspeaker will be disconnected.

2.3. Gramophone Record Reproduction

The record changer fitted to this model accommodates up to ten 12, 10 or 7 inches diameter records at one loading. Records of different sizes or playing speeds must not be mixed. Before playing records check that the record size and speed selectors are set to the correct positions. It is most important to ensure that the correct stylus is used. The turnover knob on the pick-up head is marked " 78 " on one side and " 33—45 " on the other and it should be turned so that the marking which corresponds with the speed of the records to be played is uppermost. Serious damage to records and stylus may result if the incorrect stylus is used.

Seven inch records with large centre holes must be fitted with centre hole adaptors. Do not use chipped, cracked or badly warped records. These may damage the stylus or cause erratic operation of the changer mechanism.

Should the record changer be stopped with the pick-up arm not on its rest, the pick-up should not be handled, but the Stop/Start control moved to " Start " when the pick-up will automatically lift and return to its rest position if no more records are on the record spindle. A safety device, which prevents the pick-up arm from moving from its rest position unless one or more records are on the spindle, is incorporated in the record changer.

For further information on operation and maintenance, consult the record changer manufacturer's instruction leaflet.

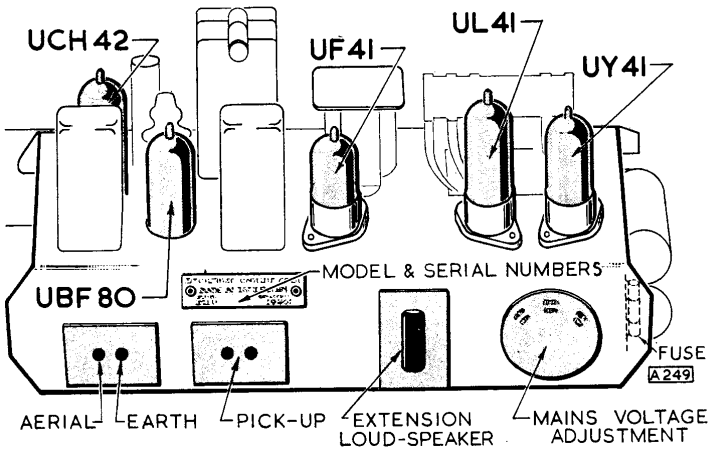


Fig. 1. Rear view of receiver chassis, showing locations of valves, etc.

3. THE CIRCUIT

3.1. Circuit Description

The aerial is connected via **C1** to the coupling coils **L1** (S.W.) or **L2** (M. & L.W.). On M.W. **L2** is shunted by **R1** and **C2** in series but on L.W. **R1** is short-circuited and **C2** is directly across the coil which is then resonant at a frequency outside the L.F. limit of the L.W. band. The appropriate tuning coil, with its associated trimmer, is connected across the tuning capacitor **C8** and, via blocking capacitor **C7**, to the control grid of **V1 (UCH 42)** the Frequency Changer.

The tuned-grid oscillator, with its tuning capacitor **C12** is connected via switch **S2A** to the coils **L6** (S.W.), **L7** (M.W.), and **L8** (L.W.). Feedback on S.W. and M.W. is by means of the parallel-fed anode coil **L9**. Additional coupling occurs across the reactance of the S.W. or M.W. padders, **C19** or **C20**, to which the low potential end of **L9** is switched. The series resistor **R8** serves to limit the rise in oscillator voltage which occurs at the high

frequency end of the S.W. band. **R7** functions as a limiter on the M.W. band. On the L.W. band **C21** and **C22** in parallel, form the padder in series with **C18** across which coupling takes place. When on M.W., the L.W. oscillator coil is effectively short-circuited by **S2B.** On S.W., both M.W. and L.W. oscillator coils are short-circuited.

The Frequency Changer is coupled to the I.F. amplifier **V2 (UBF 80)** by means of the first I.F. transformer **L10, C13, L11, C14. V2** incorporates two diode anodes which function as detector and A.G.C. rectifier, the former being coupled to the pentode section of **V2,** by the 2nd I.F. transformer, **L12, C23, L13, C24.** The A.G.C. diode is fed from the anode of **V2,** via capacitor **C25.** Delay voltage is the potential difference across the back bias resistor **R26,** to the negative end of which the D.C. load, consisting of **R9, R11** and **R17** in series, is returned. Filtering is provided by the capacitors **C27** and **C28,** and the A.G.C. voltage is tapped off at the junction of **R9** and **R11.** The I.F. transformers are trimmed by the adjustment of the iron dust cores of the coils.

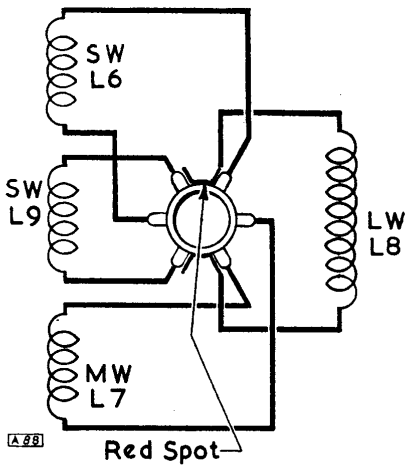
The Intermediate Frequency is 470 Kc/s.

The manual Volume Control **R15** forms the detector load and is connected to the 2nd I.F.T. secondary via the switch **S2B** and the filtering components **R12, C29,** and **C30.** The fourth position of the switch connects the pick-up to **R15** via the isolating capacitors **C31** and **C32** and the potential divider **R13, R14. S1B** simultaneously disconnects the H.T. supply from **V1** and **V2.**

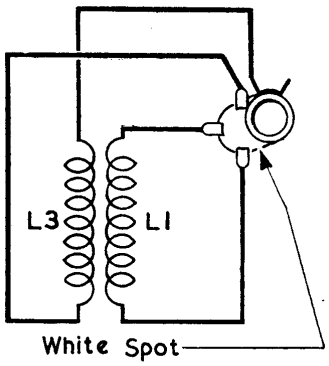
The radio or gramophone signal voltage appearing across **R15** is applied to the grid of **V3 (UF 41)** via the coupling capacitor **C33. V3** is self-biased by the potential difference across the potentiometer **R21** in its cathode circuit. The negative feedback voltage from a tertiary winding on the output transformer is applied to the cathode of **V3** via **R24** and **R20. C35,** connected from the junction of **R20** and **R24** to the slider of **R21,** provides tone control. When the slider is at the high potential end of its travel, **C35,** by partially short-circuiting **R20,** increases the feedback at high frequencies, thus causing the amplifier response to fall. The feedback voltage is reduced at high frequencies when the slider is at the low potential end of its travel, and so the amplifier response will rise.

Audio frequency voltages developed across **V3** anode load **R19** (decoupling is by **R18** and **C34**) are applied to the control grid of **V4 (UL 41)** via the coupling capacitor **C36. V4** whose anode H.T. supply is unsmoothed, is coupled to the loudspeaker by the output transformer **T1. V4** is cathode biased by **R25** bypassed by **C39.**

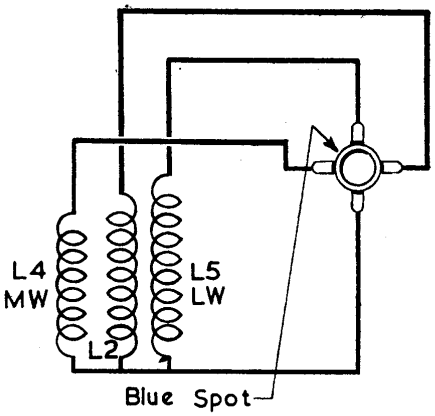
H.T. current is supplied via the half-wave rectifier **V5 (UY 41)** and the reservoir **C42.** Smoothing of the supply is effected by the two-section filter **R28, C41** and **R27, C40. R26** in the negative H.T. line provides standing bias for **V1** and **V2** and delay voltage for the A.G.C. diode. All the valve heaters and the pilot lamps **PL1** and **PL2** are series connected and fed from the mains through the ballast resistor **R29 b—d ; R29a** is the rectifier current limiter. The pilot lamps are shunted by **R30** and the **Brimistor X1** to protect them against switching surges. A fuse **F1** and the R.F. filter **L14, L15, C43** are included in the mains input circuit.



S M & L OSCILLATOR COILS



S W AERIAL COIL



M & L AERIAL COILS

Fig. 2. Coil connections viewed from the top of the formers ; i.e., as shown in Figs 4 and 5.

3.2. CIRCUIT DETAILS

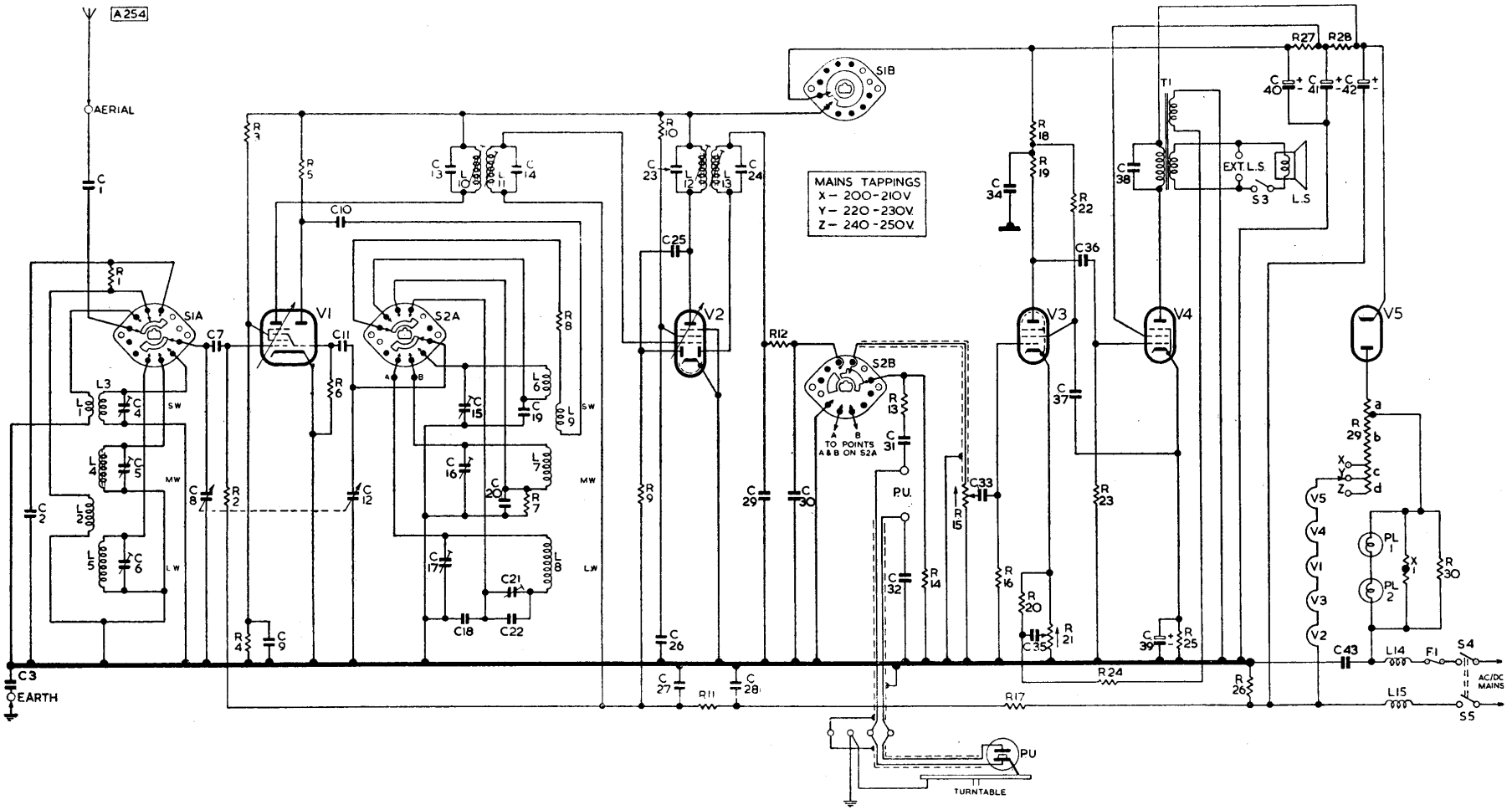


Fig. 3. Circuit diagram of Model 327 URG. Values of all components are given below.

CAPACITORS

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

Ref.	Value	Rating	Function	Location
C 1	0.001 uF	1000 V.	Aerial series	G1
C 2	500 pF	10%	L.W. ae. coupling shunt	G1
C 3	0.05 uF	1000 V.	Earth isolating	H2
C 4	15 pF*	Pre-set	S.W. aerial trimmer	G1
C 5	40 pF*	Pre-set	M.W. aerial trimmer	G1
C 6	65 pF*	Pre-set	L.W. aerial trimmer	G1
C 7	200 pF		V1 hex. C.G. coupling	H1
C 8	528 pF†	Variable	Aerial tuning	B1
C 9	0.1 uF		V1 S.G. decoupling	H1
C10	200 pF		Oscillator anode coupling	H1
C11	50 pF		Oscillator C.G. coupling	H1
C12	528 pF†	Variable	Oscillator tuning	B1
C13	100 pF	2%	1st I.F.T. tuning	A2
C14	100 pF	2%		
C15	15 pF*	Pre-set	S.W. oscillator trimmer	H2
C16	40 pF*	Pre-set	M.W. oscillator trimmer	G2
C17	65 pF*	Pre-set	L.W. oscillator trimmer	G2
C18	500 pF	10%	L.W. oscillator feedback	G1
C19	3550 pF	5%	S.W. padder	H1
C20	560 pF	1%	M.W. padder	H1
C21	80 pF*	Pre-set	L.W. padder	H2
C22	200 pF	5%		
C23	100 pF	2%	2nd I.F.T. tuning	B2
C24	180 pF	2%		
C25	50 pF		A.G.C. coupling	G2
C26	0.1 uF		V2 S.G. decoupling	H2
C27	0.1 uF		A.G.C. decoupling	H2
C28	0.1 uF		A.G.C. decoupling	F2
C29	100 pF		I.F. filter	B2
C30	100 pF			
C31	0.005 uF	1000 V.	P.U. isolating	H2
C32	0.05 uF	500 V.	P.U. isolating	G2
C33	0.005 uF		V3 C.G. coupling	G2
C34	0.1 uF		V3 H.T. decoupling	F1
C35	0.01 uF		Part tone control circuit	F2
C36	0.003 uF		V4 C.G. coupling	F2
C37	0.05 uF		V3 S.G. decoupling	F2
C38	0.005 uF	1000 V.	Tone compensation	C2
C39	50 uF‡	12 V.	V4 cathode bypass	F2
C40	24 uF‡	275 V.	H.T. smoothing	E2
C41	24 uF‡	275 V.		
C42	32 uF‡		H.T. reservoir	E2
C43	0.01 uF	1000 V.	Mains R.F. bypass	F2

* Maximum capacitance

‡ Electrolytic

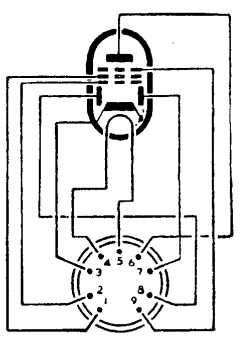
† " Swing " value ; i.e. minimum to maximum capacitance

RESISTORS

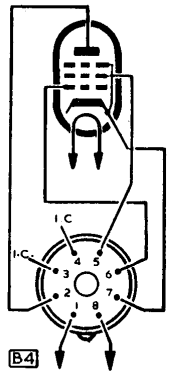
(All ¼ Watt carbon, 20% tolerance unless otherwise stated)

Ref.	Value	Rating	Function	Location
R 1	3.3 KΩ		M.W. ae. coupling shunt	G1
R 2	1 MΩ		V1 hex. grid leak	H1
R 3	18 KΩ	10% 1 W.	V1 S.G. potential	H2
R 4	27 KΩ	10% ½ W.	divider	H1
R 5	22 KΩ	½ W.	Osc. H.T. feed	H2
R 6	47 KΩ		Osc. grid leak	H1
R 7	3.3 KΩ	10%	M.W. osc. limiter	H1
R 8	220 Ω		S.W. osc. limiter	G1
R 9	470 KΩ		A.G.C. diode load	H2
R10	68 KΩ	½ W.	V2 S.G. feed	H2
R11	470 KΩ		A.G.C. decoupling	F2
R12	100 KΩ		I.F. Filter	B2
R13	470 KΩ		P.U. output	H2
R14	1 MΩ		potential divider	G2
R15	500 KΩ	Carbon Pot.	Volume control	F1
R16	3.3 MΩ		V3 grid leak	G2
R17	470 KΩ		A.G.C. decoupling	F1
R18	100 KΩ		V3 H.T. decoupling	F2
R19	1 MΩ		V3 anode load	F2
R20	47 KΩ		Part N.F.B. circuit	F2
R21	2.5 KΩ	Carbon Pot.	Tone control	E1
R22	4.7 MΩ		V3 S.G. feed	G2
R23	1 MΩ		V4 grid leak	F2
R24	10 KΩ		Part N.F.B. circuit	F2
R25	270 Ω	10% ½ W.	V4 grid bias	F2
R26*	33 Ω	10%	V1, V2 grid bias	E1
R27	1.5 KΩ	1 W.	H.T. smoothing	F1
R28	680 Ω	½ W.		E2
R29a	130 Ω	5%		D1
b	700 Ω	5% W.W.		D1
c	200 Ω	5% 0.1 A.	Mains Dropper	C1
d	200 Ω	5%		C1
R30	330 Ω	½ W.	P.L. shunt	F1

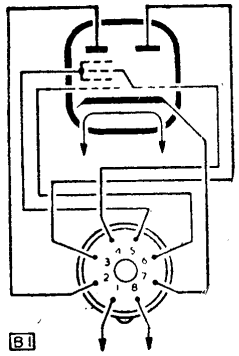
* A.G.C. delay volts, together with standing bias for V1 and V2 are developed across this resistor. Any substantial departure from the value specified will affect the overall sensitivity of the receiver.



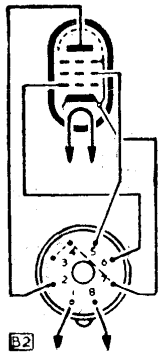
UBF 80



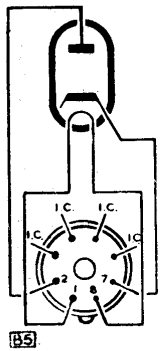
UL 41



UCH 42



UF 41



UY 41

INDUCTORS AND TRANSFORMERS

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

Ref.	Function		Approx. D.C. res.	Location
L 1	S.W. aerial coupling		2.3	A1
L 2	M.W. & L.W. aerial coupling		28.0	A1
L 3	S.W. aerial tuning		—	A1
L 4	M.W. aerial tuning		2.6	A1
L 5	L.W. aerial tuning		30.0	A1
L 6	S.W. oscillator tuning		—	H1
L 7	M.W. oscillator tuning		2.5	H1
L 8	L.W. oscillator tuning		15.0	H1
L 9	S.W. & M.W. oscillator feedback		1.0	H1
L10	1st I.F. Transformer	Pri.	8.0	A2
L11		Sec.	8.0	A2
L12	2nd I.F. Transformer	Pri.	8.0	B2
L13		Sec.	6.0*	B2
L14	Mains filter chokes		3.4	F1
L15			3.4	F1
T 1	Audio output transformer	Pri.	290.0	C1
		Sec.(Output)	—	
		Sec.(N.F.B.)	13.0	

* No external connections ; R12 is included in I.F.T. can.

VALVES

(All Mullard Types)

Ref.	Type	Function	Location
V1	UCH42	Frequency Changer	A1
V2	UBF80	Detector, I.F. Amp & A.G.C.	A2
V3	UF41	Audio Amplifier	B2
V4	UL41	Audio Output	C2
V5	UY41	H.T. Rectifier	D2

MISCELLANEOUS

Ref.	Function and Description	Location
S1A	Aerial coils switch	G1
S1B	Radio/Gram H.T. switch	G1
S2A	Oscillator coils switch	G1
S2B	Radio/Gram switch	G1
S3	Internal L.S. switch	Cab.
S4	Mains On-Off switches (ganged R21)	E1
S5		
PL1	Scale lamps 8V. 0.15 A.	Scale frame
PL2		
X1	Brimistor CZ2	F1
F1	Fuse 1 Amp.	E2

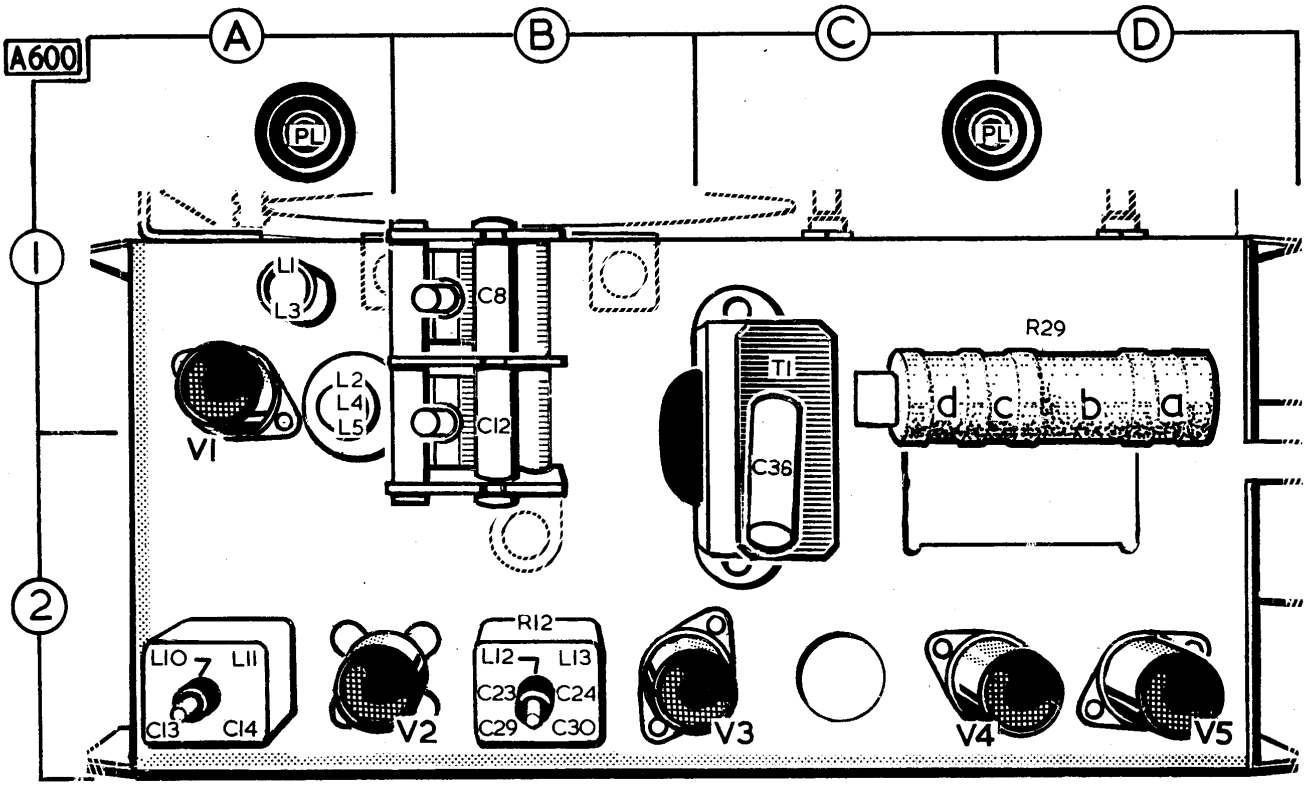


Fig. 4. Plan view of receiver chassis, showing locations of valves and components.

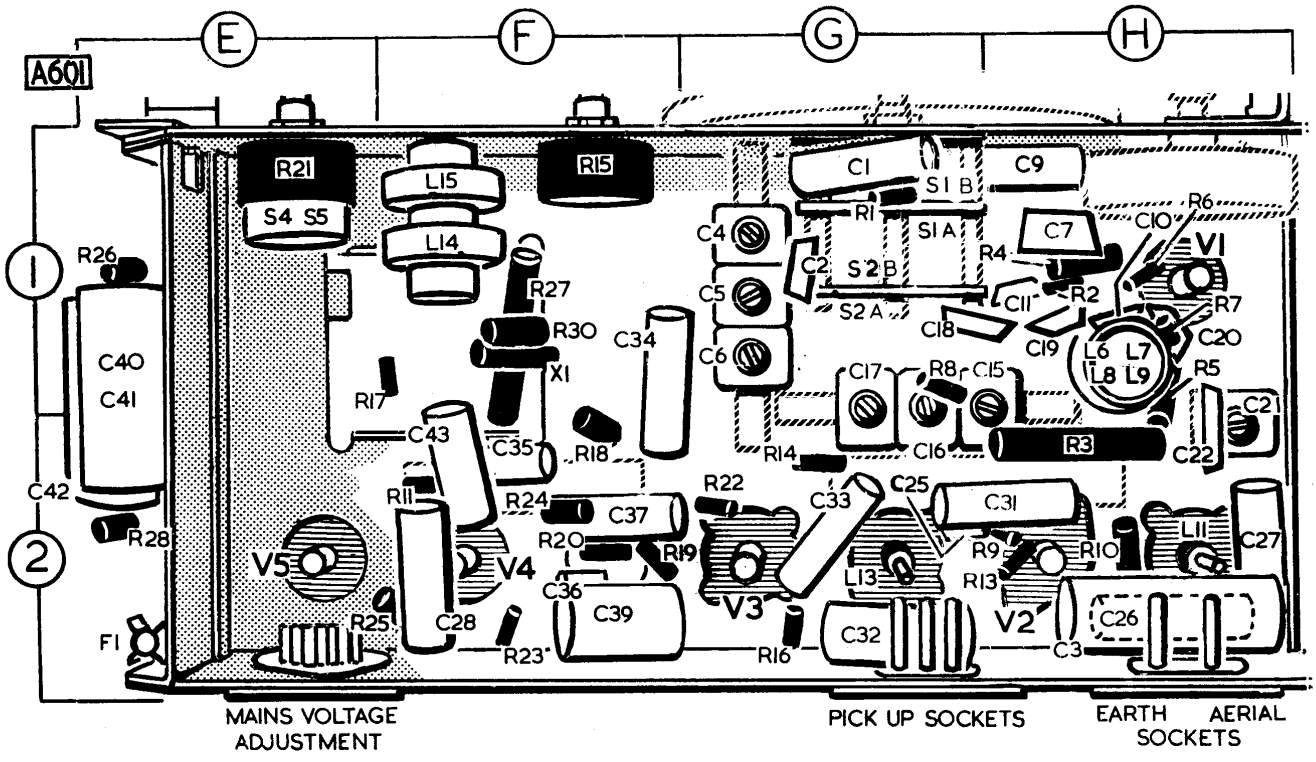


Fig. 5. Underside view of receiver chassis, showing locations of components.

4. CIRCUIT ALIGNMENT

To re-align the receiver, it is necessary to remove the chassis from the cabinet (see 6.1.).

4.1. I.F. Stages

Connect the "Direct" output of the signal generator, via a 0.1μF capacitor, to the control grid of **V1** (a convenient point of connection is the front section of the gang **C8**) and inject a 470 Kc/s signal. Switch set to M.W., turn volume control to maximum and close gang. Adjust the cores of **L13, L12, L11** and **L10** for maximum output, progressively reducing the input voltage as each circuit is brought to resonance.

4.2. R.F. and Oscillator Stages.

The signal generator should be connected, via a standard "dummy aerial," to the aerial and earth sockets of the receiver. Calibration points are indicated by dots on the wavelength scales. Those at the low-frequency ends giving the cursor position with the gang closed. Align at the following frequencies in the order given :

L.W. 350 Kc/s (857 M.). Trim **C17** and **C6** for max. output.

160 Kc/s (1875 M.). Adjust **C21** for max. output.

Repeat until no further improvement results.

M.W. 1,500 Kc/s (200 M.). Trim **C16** and **C5** for max. output.

580 Kc/s (517 M.). Check calibration.

S.W. 17 Mc/s (17.7 M.). Trim **C15** for max. and slightly rock gang whilst adjusting **C4** for max. output.

6 Mc/s (50 M.). Check calibration.

The inductance of the S.W. aerial and oscillator coils may be adjusted, within limits, by means of the half turn of wire **inside the former** which terminates the winding.

Fixed tracking is employed on S.W. and M.W. If the calibration checks at 6 Mc/s or 580 Kc/s show discrepancies, the padder **C19** or **C20)** or tuning coil **L6** or **L7)** may be faulty.

The S.W. and M.W. check points have a tolerance of $\pm$ 1/16 inch.

5. VOLTAGE AND CURRENT MEASUREMENTS

Voltage and current figures given in the tables below were measured in receivers operating on 230 Volts (50 cycles A.C.) using the 220—230 Volt tapping.

All voltage readings above 10 were taken on the 400 Volt range of a Model 7 Avometer, chassis being the negative connection except in the case of the voltage across **R26** when the chassis was the positive connection. The receiver was switched to M.W. and the gang set to maximum capacitance with no signal input.

GENERAL MEASUREMENTS

Total H. T. current	64 mA.
H.T. voltage (across C42)	232 V.
H.T. voltage (across C41)	212 V.
H.T. voltage (across C40)	184 V.
Bias voltage (across R26)	2.1 V.

VALVE MEASUREMENTS

Ref.	Type		Anode Volts	Anode mA.	Screen Volts	Screen mA.	Cathode Volts
V1	UCH 42	Hexode	184	2.3	75	4.7	—
		Triode	75	4.4	—	—	—
V2	UBF 80		184	3.7	82	1.5	—
V3	UF 41		*	*	*	*	0.25
V4	UL 41		218	40.0	212	7.0	12.5
V5	UY 41		—	—	—	—	232.0

* These measurements are impracticable because of high circuit resistances.

6. MECHANICAL DETAILS

6.1. Removing the Chassis

First remove the four control knobs. Next unplug the pick-up leads, disconnect the loudspeaker leads and the motor mains lead and release the receiver mains lead from its cleat. Remove the two woodscrews which secure the top of the scale backing plate to the cabinet. The chassis is mounted on a board which is held by two screws. When these are removed the chassis may be withdrawn from the cabinet. Do not omit to insulate the ends of the motor mains lead before connecting the receiver to the mains.

6.2. Tuning Drive

Fig. 6 shows the arrangement of the tuning drive cord viewed from below the front edge of the chassis with the scale backing plate removed, and the cursor guide bar "cut away." The drum is shown in the position it should occupy when the gang is at maximum capacitance.

A length of approximately 72 inches should be allowed for the drive cord, one end of which should be secured to the tag on the drum. The cord should then be passed through the slot in the drum and threaded around the pulleys and drive spindle in the direction indicated by the arrows in the diagram. The free end should be returned through the slot in the drum and attached to the spring which should then be extended to about 2 ins. for the correct tension. When the scale backing plate has been replaced, the cursor may be slipped on to the guide bar and clipped to the cord in a position such that it coincides with the three dots at the low-frequency ends of the tuning scales.

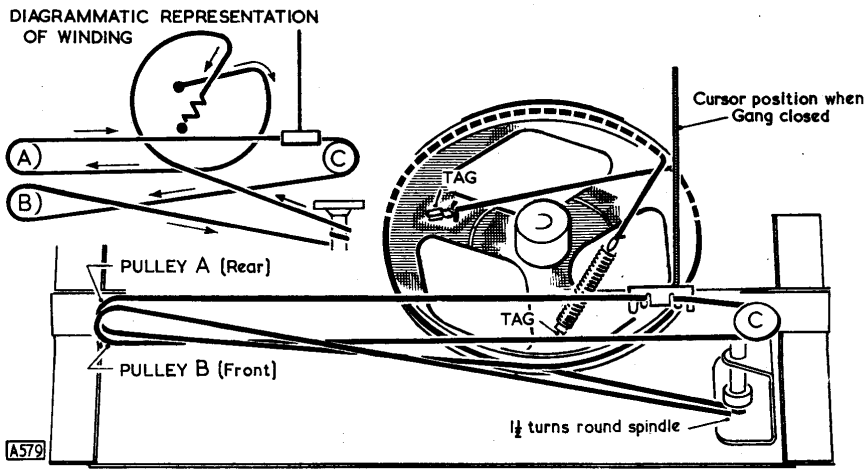


Fig. 6. The tuning drive.

7. SPARE PARTS LIST

Part Description	Part No.
Cabinet	V14652/1
Cabinet Back	W14671
Capacitors (P.S.M.) :	
560 pF 1% (C20)	P561B35
3550 pF 5% (C19)	41102
Coil. S.W. Aerial	Y6889
Coil. M. & L.W. Aerial	Y6890
Coil. S., M. & L.W. Oscillator	Y6891
Control Knob (Tuning, Volume & Tone)	Y8488
Control Knob (Waverange)	Y8488/7
Control Knob Spring	37302
Cursor Assembly	Z7223
Drive Drum	Z7349
Electrolytic Capacitors :	
24 + 24μF 275V.	Z13206/3
32μF 350V.	Z13206/2
50μF 12V.	Z13209/2
I.F. Transformer (First)	Y5437/1
I.F. Transformer (Second)	Y7170
Internal L.S. Switch	Z4450
Loudspeaker	Z11670
Mains Dropper (R29a—d)	Z13404
Mains Filter Choke (L14, L15)	Y1575
Output Transformer	Z7428
Scale	Y11068
Tone Control/On-Off Switch	Y13023/1
Trimmer Bank (15 + 40 + 65 pF)	Z13909
Trimmer (8 — 80 pF)	Z13904
Tuning Capacitor (Gang)	X4441/2
Volume Control	Y13018/2
Waverange Switch	X7100