MULLARD MAS7
PHILIPS 747

Four-valve, plus rectifier and cathode-ray visual tuner, three waveband superhet. A mains aerial device is provided and sockets for a high-impedance pick-up and low-impedance extra speaker. For AC mains 100-250 *volts,* 50-100 *cycles. A convertor unit may be found making the instrument suitable for operation from DC as well as AC mains. Marketed by Mullard Wireless Service Co., Ltd., and Philips Lamps, Ltd., Century House, Shaftsbury Avenue, London, WC2.*

THE aerial input is fed via the wave-change switch to the aperiodic coil L7 (MW) which is coupled inductively and also by L29 and C23 to the primary, L9, of the bandpass filter. C9 tunes the primary and the circuit is coupled by L30 and C25 to the secondary circuit of the filter, L11 tuned by C10.

On LW, the additional coils L8, L10 and L12 are brought into circuit with extra coupling via C24. SW signals are fed from the aerial via C41 to a single tuned circuit comprising L13, tuned by C10.

An IF filter circuit is incorporated between aerial and earth and comprises L6, tuned by the trimmer C12. Image suppression is effected by C13 and C22.

Signals from the tuned circuits are fed to the control grid of an octode frequency-changer, V1, which is cathode biased by R7 and R8, decoupled

Continued overleaf

VALVE READINGS

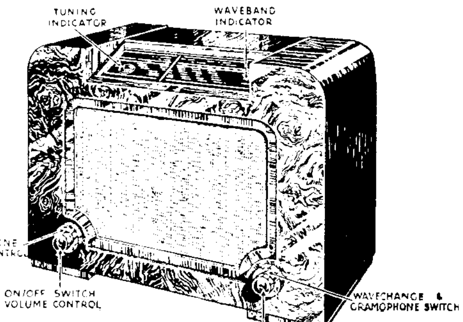
V	Type	Electrode	Volts	Mas
1	FC4	Anode	245	2
		Osc Anode ..	110	1.8
		Screen	110	5
		Cathode	2	—
2	VP4B	Anode	245	6
		Screen	160	2
		Cathode	3.4	—
3	TDD4 ..	Anode	96	.8
		Cathode	2	—
4	PEN4DD ..	Anode	230	30
		Screen	250	5.3
		*Grid	6.5	—
5	TV4	Tuning Indicator		
6	DW2	Rectifier ..		

* Measured across R25.

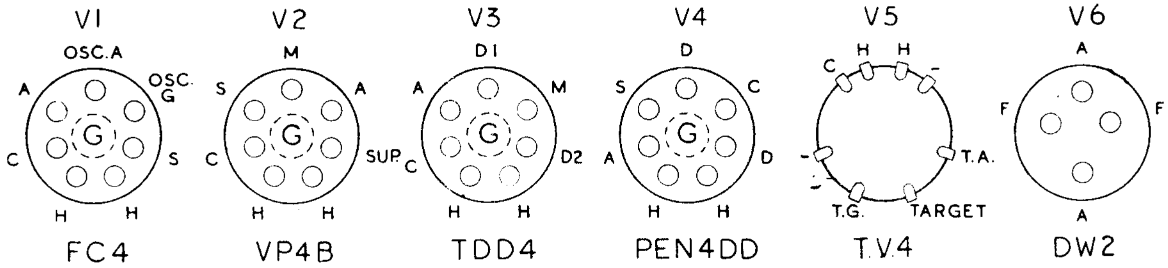
CAPACITORS

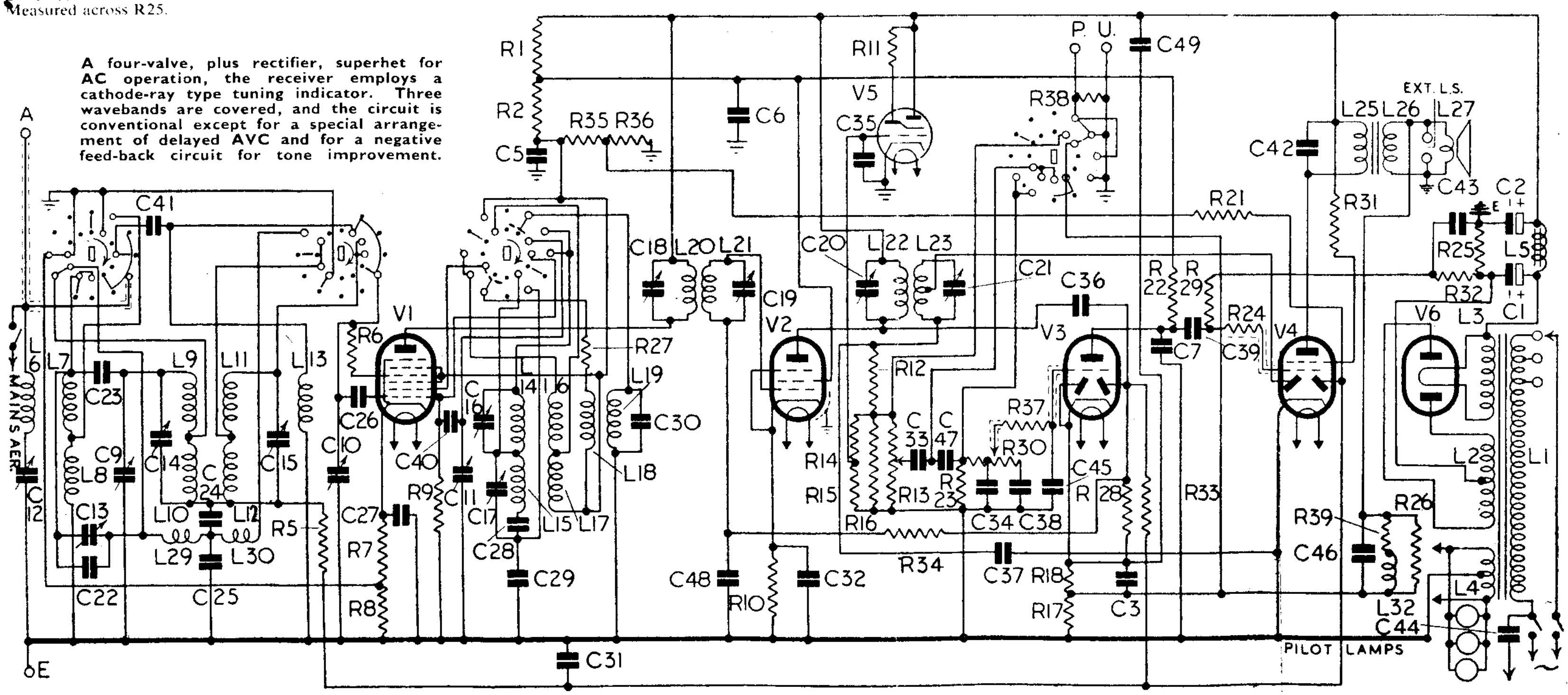
C	Mfd	C	Mfd
1	32	7	.0004
2	32	22	20 mmfd
3	50	23	10 mmfd
5	.1	24	.016
6	32	25	.025

C	Mfd
26	2 mmfd
27	.05
28	.0007
29	1490 mmfd
30	6.4 mmfd
31	.1
32	.1
33	.005
34	250 mmfd
35	.05
36	20 mmfd.
37	50 mmfd
38	640 mmfd
39	.02
40	.0001
41	16 mmfd
42	.002
43	.125
44	.0005
45	.0001
46	.05
47	250 mmfd
48	.1
49	.001



The Mullard MAS7 version of the receiver

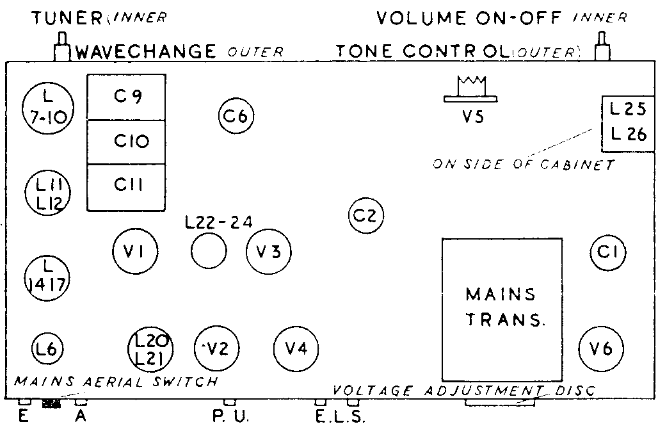




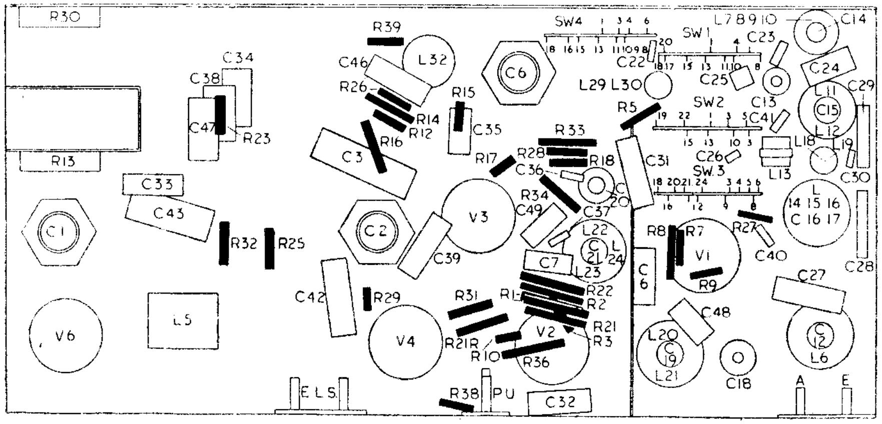
A four-valve, plus rectifier, superhet for AC operation, the receiver employs a cathode-ray type tuning indicator. Three wavebands are covered, and the circuit is conventional except for a special arrangement of delayed AVC and for a negative feed-back circuit for tone improvement.

RESISTORS

R	Ohms
1	2 x 10,000
2	2 x 10,000
5	100,000
6	32
7	250
8	10,000
9	50,000
10	400
11	2 meg
12	250,000
13	500,000
14	5 meg
15	1.6 meg
16	1.6 meg
17	20
18	3,200
21	9 meg
22	100,000
23	800,000
24	10,000
25	125
26	320
27	50
28	500,000
29	500,000
30	600,000
31	50
32	320,000
33	1 meg
34	2 meg
35	32,000
36	64,000
37	160,000
38	100,000



These two diagrams identify the parts both on top and underneath the chassis. HF wires are bare, and care should be taken not to displace them. Where they approach each other, there should be at least ⅛th inch clearance



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by C27. R8 is in circuit on pickup only and de-sensitises the V1 stage.

The oscillator section of V1 employs tuned grid circuits comprising L14 (MW), L15 (LW), and L19 (SW). R9 and C40 are the grid leak and condenser, the latter being short circuited on MW and LW.

From V1 an IF transformer, L20 L21, transfers the signal to the grid of the variable-mu HF pentode V2. This valve is cathode biased by R10 decoupled by C32.

A second IF transformer, L22 L23, passes on the signal to one diode of the double-diode output pentode V4. The diode load comprises R12, R16 and R13, the latter being the volume control.

From here, signals are fed to the control grid of V3, a double-diode triode, via C33 (and C47 on SW), R30 and R37. These last two resistors and R23 together form the grid leak for V3. The rectified IF voltage across R13 and R16 is used to operate the tuning indicator V5.

One diode of V3 is not used and is connected to cathode, while the second diode is used for automatic volume control and is fed from the anode of

WINDINGS

L	Ohms	L	Ohms
1	30	16	4.5
2	275	17	9
3	very low	18	40
4	very low	19	very low
5	425	20	135
6	140	21	135
7	40	22	135
8	100	23	40
9	4.5	24	95
10	48	25	800
11	4.5	26	.4
12	48	27	3.5
13	very low	29	1
14	12	30	1
15	40	32	175

V2 via C36. The AVC load is R28. There is no delay voltage applied to the diode.

R33 connects the AVC diode of V3 to the second diode of V4 and this diode is maintained at a slight positive voltage from the potentiometer R1, R2, R35 and R36, via a decoupling resistance R21. The voltage on the diode of V4 is slightly above the

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value necessary to render it conducting and does not exceed the negative bias voltage applied to the grid of V1 by the cathode resistance R7. Therefore, no grid current will flow.

The rectified voltage from the AVC diode of V3 will render the diode less positive. This voltage will not be applied to V1 as it will be shunted by the diode of V4 as long as this is conducting.

However, when the negative voltage exceeds the positive voltage the diode will cease to conduct and the negative voltage will be applied to the control grid of V1 as AVC bias. By this means the necessary delay is obtained.

Simple AVC is applied to the grid circuit of V2, the grid circuit of this valve being connected directly to the AVC diode via R34 decoupled by C48.

Returning now to the LF signal which we traced as far as the control grid of V3, a resistance capacity circuit comprising R22, C39 and R29 and grid stopper R24 feeds the signal to the grid of the output pentode V4. A matching transformer L25, L26 passes on the signal to the permanent-magnet low-impedance speaker in which L27 is the speech coil. Sockets are provided for a low-impedance speaker across the secondary L26.

A permanent degree of tone correction is effected by C42 and a variable tone control comprises R30, C34 and C38. Quality correction is provided by the filter R26, L32, C46 and L31, which is connected between the output transformer secondary and the cathode circuit of V3.

On SW, C47 is included in series with the slider of the volume control R13 in order to introduce a certain degree of bass attenuation. C47 is short circuited on MW, LW, and pickup.

Sockets are provided for high-impedance pick-up, the output from which is applied across R13. When on pickup the aerial is disconnected via switch contacts, the control grid of V1 is shorted to earth via C26; the oscillator anode is disconnected and the short circuit across R8 removed.

HT circuits comprise the full-wave rectifier V6 with smoothing effected by a smoothing choke L5 and condensers C1 and C2. Voltages are derived from tappings on the potentiometer network comprising R1, R2, R35 and R36.

GANGING

IF Circuits.—A damping network comprising a 25,000 ohm resistance and a .1 mfd condenser in series is employed across the secondary windings when trimming the primary windings and across the primary windings when trimming the secondary windings.

All trimmers are accessible by laying the cabinet on its side and removing the base plate.

Adjust tuning condenser and volume control to maximum and short circuit R9, C31, C48 and R17. This puts the local oscillator, AVC and quality corrector circuits out of action. Shunt L21 with the damping network and inject a 128 kcs signal into the control grid of V1 via a .032 mfd condenser. Adjust C18 for maximum output.

Transfer damping network to L20 and trim C19 for maximum output.

Shunt L23 with damping network and trim C20 for maximum output.

Transfer damping network to L22 and adjust C21 for maximum output. Remove damping network, and lock trimmers with wax.

MW Band.—The manufacturers recommend the use of a 15 degree jig which slips over the locating pin just above the condenser spindle. This jig ensures that the condenser vanes are advanced exactly 15 degrees when the condenser is turned to the standard trimming position.

With the tuning condenser set at 15 degrees, switch receiver to MW and connect the damping network from the top cap of V2 to earth.

Inject a 208 m signal to the aerial sockets via a suitable dummy aerial. Trim C16, C15, C14, C15 and C16 for maximum output in that order.

LW Band.—Switch to LW and connect a .1 mfd condenser from grid of V1 to earth. Connect the anode of V1 to the aerial socket of an auxiliary receiver via a condenser of 25 mmfd.

Connect the output meter to the output terminals of the auxiliary receiver, and adjust the tuning condenser for maximum output, applying a modulated signal of 760 m to the aerial socket of the MAS7 receiver via a suitable dummy aerial.

Disconnect the auxiliary receiver, remove the condenser from V1 and re-connect the output meter to the MAS7. Remove the .1 mfd condenser and connect the damping network between the top cap of V2 and earth. Adjust C17 for maximum output.

IF Aerial Filter.—Switch receiver to LW and adjust tuning condenser to maximum capacity (2,000m). Inject a strong signal of 128 kcs and adjust C12 for minimum output.

Image Suppressor.—Switch receiver to MW, inject a signal of 403 m into the aerial socket and tune it in on the receiver. Without altering the tuning of the receiver, inject a strong signal of 300 m into the aerial socket and adjust C13 for minimum output.

There are no trimming adjustments on the SW band.

HEAT PUMP DATA

In view of the considerable attention which has been given during the past few years in the USA, Switzerland and elsewhere to the possibilities offered by the heat pump, ERA have published technical report Y/T7 entitled *The Heat Pump for Space Heating. Critical Résumé of Published Information* compiled by D. V. Onslow.

The résumé has been prepared with a view to examining the economics of the heat pump in its application to space heating, especially in view of the present high price of coal.

One of the advantages of the system lies in its capacity to provide heating and cooling alternatively.

The heat pump designed and constructed by Norwich Corporation Electricity Department for heating its new building, comprising 500,000 cubic ft., is of special interest.

An experimental rather than a commercial project, heating experiments are being carried out at Norwich during the winter when it is expected that a coefficient of performance of at least 2.5 will be obtained and as well water at a constant temperature of 52° F may be used a higher figure may be realised. Over a range of condenser temperatures from 90°-130° F COP'S of 4 at 90° F and 2.5 at 130° F have been obtained using river water at 40° F.