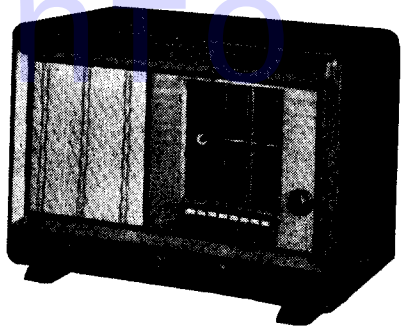
Ultra 500 Three-Band AC Eight

Seven-valve, plus rectifier and CR tuning indicator, three-band superhet with mechanical push-button tuning and push-pull output. Price 15 gns.



CIRCUIT OUTLINE

THE first valve is an HF pentode deriving its input on the three bands from coupled aerial circuits without adjustable trimmers, selected by the usual switch. There is AVC on all bands.

Similar tuned circuits couple V1 to V2, the mixer, which has a conventional oscillator circuit, the hexode section again being provided with AVC.

In the anode circuit of V2 is the first IF transformer. This uses permeability tuned circuits. The lower ends of the transformer windings are not taken to the usual points but go through an additional coupling device consisting of a capacity and coupled coils controlled by a switch.

The arrangement has the effect of increasing the band width on push-button tuning. It is controlled by a three-position switch which, in the second position, back couples the grid of the audio valve to the AVC line. This cuts top and "mush."

The anode circuit of V3 contains the primary winding of the second IFT which works into a double diode, V4. One diode is used for AVC, and the other for demodulation. The diode load has a simple resistance capacity filter.

Audio voltages from the load are taken by a coupling condenser to the grid of V6, the audio amplifier, through a switch which, in the pick-up position, isolates the diode load and takes a connection from the anode load of the oscillator which is then used as a pick-up amplifier.

The voltages across the diode load are also used to control the tuning indicator, V5.

V6, the audio amplifier, by virtue of similar anode and cathode loads, provides a balanced input to V7 and V8, the push-pull output stage. The selectivity switch is also associated with the output circuit, the cathode resistors of the output valves being shunted by a condenser in the third position. Power is derived from V9, a full-wave rectifier, in conjunction with the speaker field and electrolytic condensers.

Wave-change Switches

There are four wafers in this set, three of which are associated with their respec-

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VALVE READINGS

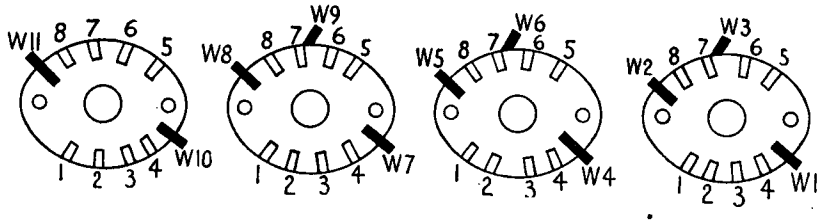
V.	Type.	Anode.	Screen.	Cathode.
1	VP41	170	230	4
2	ACTH1	195 112 (osc.)	105	4
3	VP41	230	110	—
4	DD41	Diodes only.		
5	ME41	Tuning indicator.		
6	HL41	180	—	60
7	AC5PEN	222	230	8
8	AC5PEN	222	230	8
9	UU4	—	—	300

(*All Mazda*).

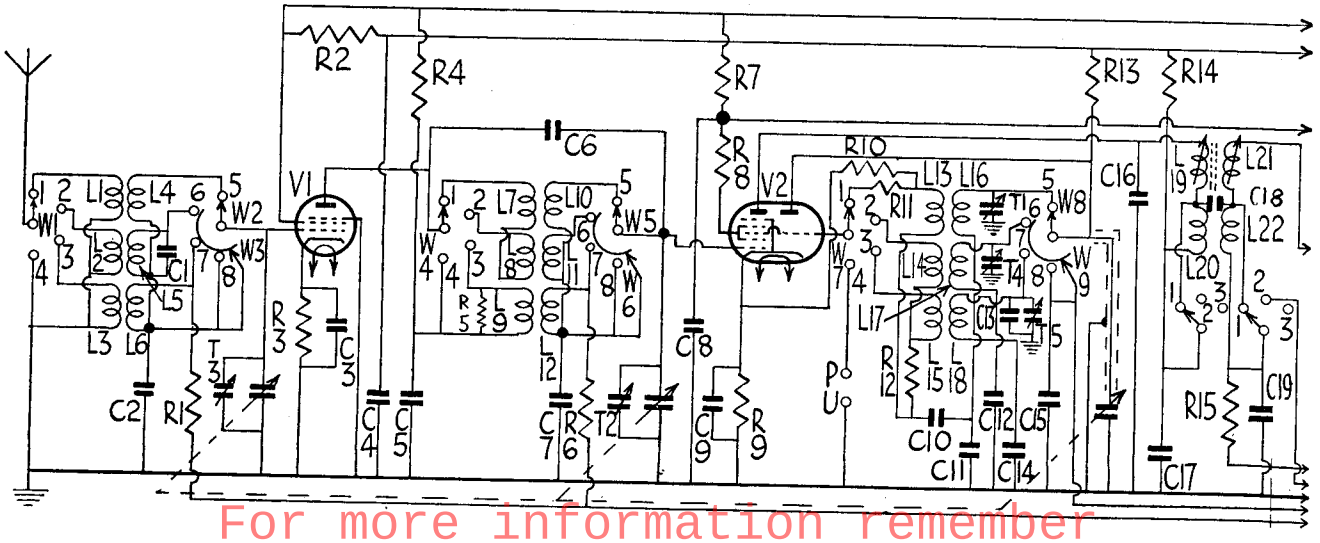
Pilot Lamps—6.5 volts, .3 amp., Osram M.E.S.

WINDINGS (D.C. Resistances)

L.	Ohms.	Range.	Where measured.
1	Low	SW	Aerial and chassis.
2	13.2	MW	Aerial and chassis.
3	110	LW	Aerial and chassis.
4	Low	SW	V1 grid and C2.
5	3.6	MW	V1 grid and C2.
6	36	LW	V1 grid and C2.
7	4.3	SW	V1 anode and C5.
8	.1	MW	V1 anode and C5.
9	6.5	LW	V1 anode and C5.
10	Low	SW	V2 grid and C7.
11	4	MW	V2 grid and C7.
12	33	LW	V2 grid and C7.
13+ R11.	60	SW	Osc. grid and C10.
14	.4	MW	Osc. grid and R12.
15	1	LW	Osc. grid and R12.
16	Low	SW	Osc. anode and C11.
17	3.6	MW	Osc. anode C12.
18	12.6	LW	Osc. anode and C14.
19	9.6	—	V2 anode and L20 tag.
20	4.3	—	On tags.
21	9.6	—	V3 grid and L22 tag.
22	4.3	—	On tags.



Above, the switch banks, with the element nearest the "click" plate on extreme right. Below, the circuit, which is shown divided only for reasons of presentation.



10-MINUTE FAULT-FINDER — ULTRA 500

Power Test

Voltages : V9 cathode, 300; HT line, 230.

Resistances : L26, 420.

Total feed = 300 − 230 ÷ 420 = 166 ma.

Mains loading, 110 watts.

Output Stage, V7 and V8

Inject 5 volts AF at grid of V7 and then grid of V8. Test for equal output from each. If defective, check :—

Voltages : Anodes, 222; screens, 230; cathodes, 8.

Resistances : Anode HT, 240; grid-chassis, 253,000 ohms.

AF Stage, V6

Inject .5 volt AF between grid and R31. If defective, check :—

Voltages : Anode, 180; cathode, 60.

Resistances : Anode—HT, 40,000; cathode—chassis, 32,300 ohms; grid-chassis, 1 meg.

Demodulation, V4

Inject modulated 470-kc. signal V3 anode. If defective, check :—

Resistances : L23, 9.6; L24, 9.6; diode—chassis, 265,000 ohms.

IF Stage, V3

Inject modulated 470-kc. signal V3 grid. If defective, check :—

Voltages : Anode, 230; screen, 110 volts.

Resistances : Screen—HT, 10,000 ohms.

Mixer Hexode, V2

Inject modulated 470-kc. signal V2 grid. If defective, check :—

Voltages : Anode, 195; screen, 105; cathode, 4.

Resistances : Anode—HT, 4,000; screen—HT, 10,060; L19, 9.6; L21, 9.6 ohms.

Oscillator Test, V2

Tune to local station and connect aerial through 5 mmfd. to V2 grid.

If no signals, inject local station frequency plus 470 kc. at osc. grid.

If still defective, check :—

Voltage : Osc. anode, 112.

Resistances : Osc. anode—HT, 12,000; grid—cathode, 25,000 ohms.

Signal Circuits, V1

Tune to local station and connect aerial to V1 anode through 5 mmfd.

If no signals, check HF coil resistances and switches.

If in order, connect aerial to V1 grid.

If defective, check :—

Voltages : Anode, 170; screen, 270; cathode, 4.

Resistances : Anode—HT, 4,000 ohms.

If still defective, check input coils and switches.

Windings (continued)

23	9.6	—		V3 anode and HT line.
24	9.6	—		Signal diode and C27.
25	360	—		R41 and R42.
26	420	—		On strip (black and red leads).
27	10	—		Mains plug.

RESISTANCES

		Ohms.
1	V1 AVC decouple	1 meg.
2	Sub HT line decouple	2,000
3	V1 cathode bias	200
4	V1 anode decouple	4,000
5	V1 LW anode shunt	150
6	V2 AVC decouple	1 meg.
7	V2 and V3 screen decouple	10,000
8	V2 screen stabiliser	60
9	V2 cathode bias	200
10	Osc. grid leak	25,000
11	SW het. volt control	60
12	LW het. volt control	60
13	Osc. anode load	10,000
14	V2 anode decouple	4,000
15	V3 AVC decouple	3 meg.
16	AVC decouple	1 meg.
17	AVC diode load (part)	250,000
18	AVC diode load (part)	750,000
19	IF filter	10,000
20	IF filter	10,000
21	Signal diode load (part)	50,000
22	Signal diode load (part)	250,000
23	V4 cathode pot. (part)	100,000

Resistances (continued)

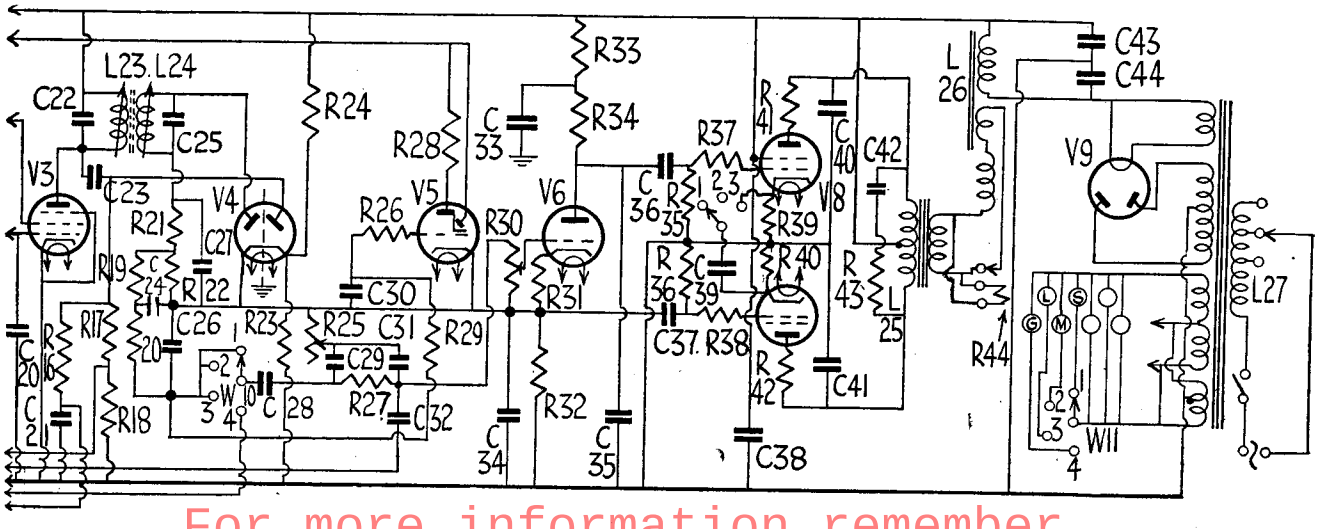
24	V4 cathode pot. (part)	1 meg.
25	Tone control	2 meg.
26	T1 grid filter	2 meg.
27	Tone filter	50,000
28	T1 anode feed	1 meg.
29	T1 grid decouple	2 meg.
30	Volume control	2 meg.
31	V6 cathode bias	2,300
32	V6 cathode load	30,000
33	V6 anode decouple	10,000
34	V6 anode load	30,000
35	V7 grid leak	250,000
36	V8 grid leak	250,000
37	V7 grid stopper	3,000
38	V8 grid stopper	3,000
39	V7 cathode bias	170
40	V8 cathode bias	170
41	V7 anode stabiliser	60
42	V8 anode stabiliser	60
43	Tone correction	30,000
44	Safety shunt	60

CONDENSERS

		Mfds.
1	MW input trimmer	.000005
2	V1 AVC decouple	.05
3	V1 cathode shunt	.01
4	Sub HT line decouple	4
5	V1 anode decouple	.1
6	V2 grid couple	.00001
7	V2 AVC decouple	.05
8	V2 and V3 screen decouple	.01
9	V2 cathode shunt	.01

Condensers (continued)

10	Osc. grid	.0002
11	SW padder	.0035
12	MW padder	.000536
13	LW osc. trimmer	.00003
14	LW padder	.000138
15	Osc. swamp	.0006
16	IFT1 primary tune	.0001
17	V2 anode decouple	.05
18	IFT1 extra coupling	.003
19	V3 AVC decouple	.05
20	IFT1 secondary tune	.0001
21	AVC decouple	.01
22	IFT2 primary tune	.0001
23	AVC coupling	.0002
24	IF filter	.0001
25	IFT2 secondary tune	.0001
26	IF filter	.0002
27	Diode load shunt	.0001
28	LF couple	.01
29	Tone filter	.001
30	T1 grid decouple	.1
31	Tone filter	.0023
32	Top cut	.0001
33	V6 anode decouple	2
34	V6 cathode load bypass	.0002
35	V6 anode load bypass	.0002
36	V7 grid couple	.05
37	V8 grid couple	.05
38	V7 and V8 screen decouple	2
39	V7 and V8 cathode shunt	.1
40	V7 anode shunt	.0002
41	V8 anode shunt	.0002
42	Tone correction	.001
43	HT smoothing	32
44	HT smoothing	16



Ultra Model 500

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tive groups of coils. The first wafer carries W1 and W2, controlling the tuned and untuned aerial circuits. In addition, there is an earthing wipe, W3.

The second wafer is similar to the first, carrying W4, W5 and W6, and controls the HF coils. The third wafer, carrying W7, W8 and W9, controls the tuned and untuned oscillator coils as well as switching the oscillator anode and grid circuits for the pick-up amplifier.

The fourth wafer, mounted behind the tuning pack, has a single wipe which changes over the audio valve grid from the diode load to the pick-up amplifier, and a further wipe which controls the four pilot lamps.

Special Notes

THERE are several modifications compared with some early models. Certain decoupling condensers of .01 are now increased to .035. This is the case with C9 and C19, the object of the alteration being to change the time constant of the AVC network.

In our chassis C18 was found to be .004 and not .003 and the resistance R13 was 20,000 ohms instead of 10,000 ohms. Some early models had a muting switch associated with the PB mechanism.

It is important to note that separate trimmers are not used on aerial and HF circuits, and, accordingly, it is essential to gang the SW band first. When this is correct the MW and LW circuits are automatically adjusted to the correct values.

Chassis Removal

First of all remove the control knobs which are of the spring pull-off type. Next remove the screws which hold the top of the tuning scale against the inside of the cabinet. Remove the pilot lamp which illuminates the push-botton scale.

Release the speaker by unscrewing the holding nuts and take off the clips and remove the speaker from the cabinet. The speaker will still be attached to the chassis by the multiple cable. Finally, remove the chassis retaining bolts.

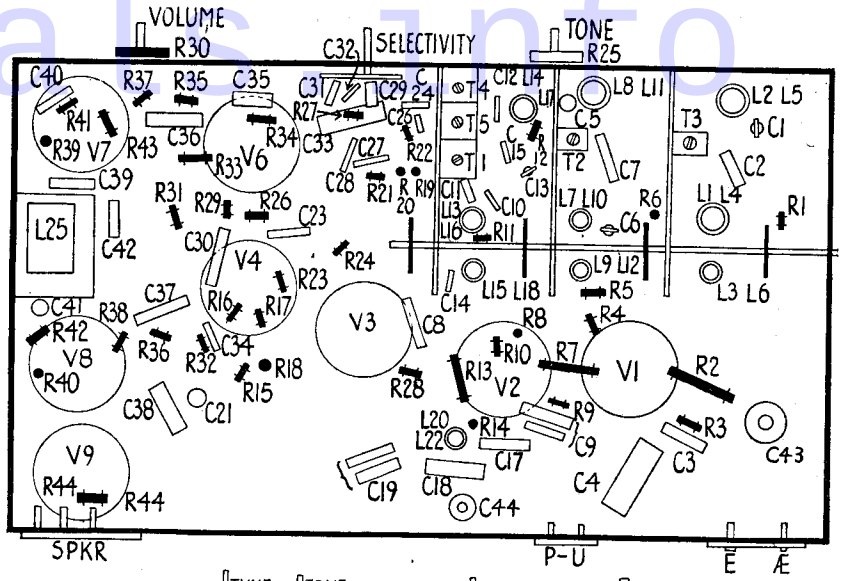
Alignment

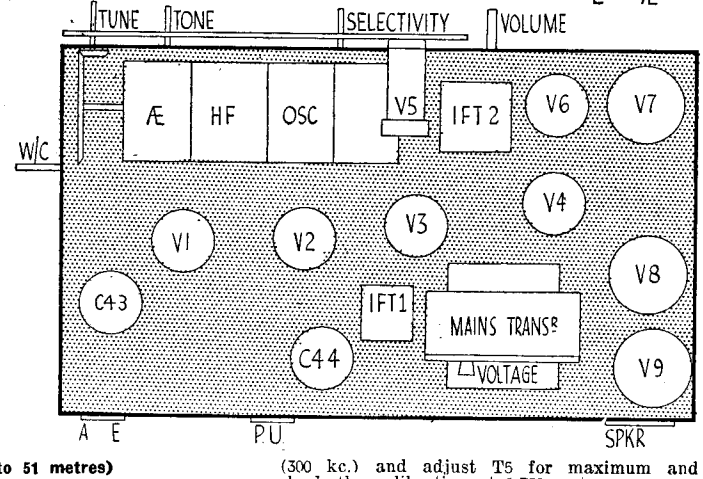
IF Circuits (470 kc.).

Connect output meter to receiver and generator to V2 grid

Tune generator to 470 kc. and adjust the cores of the second IFT and then the first IFT for maximum output.

Use a small input below the AVC value.





All the components, valves and trimmers are easily identified by these chassis diagrams. Note that resistors are in solid black, condensers in outline.

Short Waves (16.5 to 51 metres)

Connect the generator through dummy aerial to the aerial and earth terminals, and tune set and generator to 15.8 megacycles (19 metres) and adjust T1, T2 and T3 for maximum. Check the calibration at 50 metres.

This operation must be carried out in the third selectivity position and also before the other bands are trimmed.

Medium Waves (200 to 550 metres)

Tune set and generator to 200 metres (1,500 kc.) and adjust T4 for maximum.

There is no padding operation, but the calibration should be checked at 500 metres.

Long Waves (900 to 2,000 metres)

Tune set and generator to 1,000 metres (300 kc.) and adjust T5 for maximum and check the calibration at 1,750 metres.

Press-button Adjustment

Tune in a desired station accurately by hand. Unscrew the knob of the button.

Depress the button fully and tighten the knob.

Manually detune the station and then as a check retune by depressing the button.

Exact replacement condensers are available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18. For C43 there is unit 3058, 9s. 6d.; for C44, unit 3056, 7s. 6d.; C38, 2964, 1s. 10d., and C4, 2546, 2s. 3d.

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the control knobs, which are all held by grub-screws.

Slip the two pilot-lamps off the holders and take out the chassis retaining bolts from the bottom of the cabinet. The chassis can then be pulled out of the cabinet.

For complete removal, disconnection of the speaker is necessary. There are two sets of leads. The first has two cores with a red and black wire which go to the muting switch on the back of the press-button unit.

The other leads are on the speaker strip, and the connections, reading from the top downwards, are as follows: Blue, black, vacant, red, vacant.

Alignment

IF Circuits (465 kc.)

Connect the output meter to the set and the generator to the grid of V1.

Tune the generator to 465 kc. and adjust T7, T8, T9 and T10 for maximum.

Use a low input below the AVC level.

Short Waves (16 to 50 metres)

Connect the generator to the aerial and earth through a dummy aerial.

Tune set and generator to 17 metres (17.65 mc.) and adjust T1 and T2 for maximum.

Medium Waves (200 to 550 metres)

Tune set and generator to 220 metres (1,362 kc.) and adjust T3 and T4 for maximum.

Long Waves (1,000 to 2,300 metres)

Tune set and generator to 1,200 metres (250 kc.) and adjust T5 and T6 for maximum.

Press-Button Adjustment

Tune in manually a desired station and then select the button on which it is to appear.

Slacken the knob and depress the button fully. Then retighten the knob, while still depressed, and check the accuracy of the adjustment.

It should be noted that if the set has been correctly aligned, Midland Regional and Luxembourg will appear on the same button simply by changing the wave switch.

A similar adjustment is possible with London Regional and Droitwich.