

ULTRA 400 WITH ROBOT TUNING

THE Robot tuning mechanism is a telephone-dial type. In a circular moulding, mounted on the condenser shaft, are eight finger holes. Below the holes are buttons mounted on springy arms radiating from the condenser shaft.

When a finger is inserted the button is pressed against a back plate. The dial is then turned until the gang reaches the position for the required station, whereupon a stud on the underside of the button engages with a spring-controlled detent.

The exact stopping position is determined by rotating the press button on its "finger," the stud on the underside being mounted on a short radial arm.

An important feature is that diametrically opposite buttons cover similar wave ranges, and therefore two stations on closely adjacent wavelengths can be tuned in.

A number of printed station names are provided, and these are easily fitted into holders on the ends of the push buttons.

CIRCUIT.—A set of band-pass coils provides the aerial coupling to the signal grid of V1, a triode-hexode frequency changer, on the medium and long bands. On the short waves coupling is effected by an H.F. transformer.

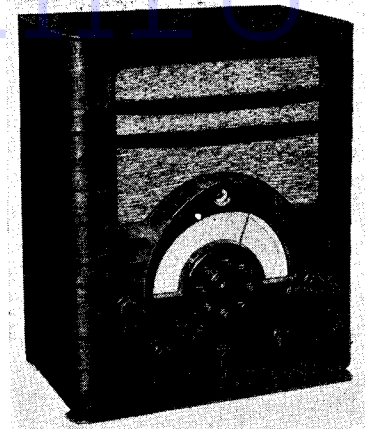
It will be noticed that in the oscillator

section the oscillator grid condenser is at the earthy end of the coil on the M.W. and L.W. bands. Pick-up potentials are applied to the oscillator grid of V1, whereby R8 operates as the load and the triode section of V1 becomes an L.F. amplifier.

An iron-cored I.F. transformer, tuned to 465 kc., couples V1 to V2, an H.F. pentode operating as the first I.F. amplifier. V2 in turn is choke coupled to V3, another H.F. pentode. V1 and V2 but not V3 are A.V.C. controlled.

A further iron-cored I.F. transformer couples V3 to the demodulating diode of V4, a double-diode output pentode, and the associated diode load. The other diode of V4, fed by C24 from the anode of V3, provides the impulse operating the A.V.C. network.

The demodulated signal passes via an H.F. stopper resistance and gram-radio switch to an L.F. coupling condenser and a volume control, and thence to the grid of the pentode section of V4. A pentode compensator condenser C22 is included, and R25 and C23 modify tone. The visual tuning indicator is fed from the same source as the pentode section of V4.



A Robot telephone-type automatic tuning dial is a feature of the Ultra model 400 five-valve three-band superhet.

Mains equipment consists of a transformer, a full-wave rectifying valve V5, electrolytic smoothing condensers and two smoothing chokes (one of which is the speaker field). Two suppressor condensers are included to minimise mains interference.

VALVE READINGS

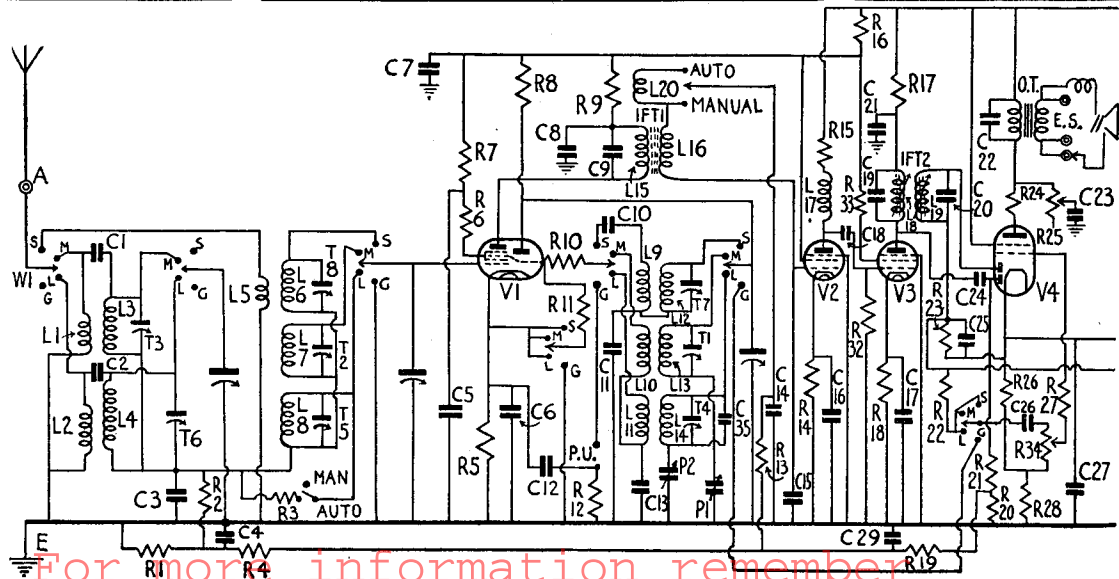
No signal. Volume maximum. M.W. min. cap 200 volt. A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
1	(All Mazda) AC/VP2 (7) ..	Anode ..	148	2
		Screen ..	60	6
		Osc. anode ..	60	2.8
2	AC/TH1 (7) ..	Anode ..	245	4.5
		Screen ..	170	1
3	AC/VP2 (7) ..	Anode ..	245	4.6
		Screen ..	170	1.2
4	AC5/Pen D.D. (7)	Anode ..	250	43
		Screen ..	265	7.5
5	U.U.4 (4) ..	Heaters	362	—

RESISTANCES

R.	Purpose.	Ohms.	R.	Purpose.	Ohms.
1	A.V.C. line return ..	1.5 meg.	18	V3 cathode bias ..	700
2	V1 A.V.C. feed ..	25,000	19	A.V.C. line decoupling ..	1 meg.
3	V1 auto grid shunt ..	100,000	20	A.V.C. diode load (part) ..	250,000
4	V1 A.V.C. decoupling ..	1 meg.	21	A.V.C. diode load (part) ..	1 meg.
5	V1 cathode bias ..	165	22	H.F. stopper ..	51,000
6	V1 screen stabiliser ..	60	23	Demodulating diode load ..	500,000
7	V1 screen decoupling ..	20,000	24	V4 anode stabiliser ..	60
8	Osc. anode ..	40,000	25	Tone control ..	2 meg.
9	V1 anode decoupling ..	4,000	26	V4 and T.I. cathode bias (part) ..	160
10	Osc. grid stopper ..	60	27	V4 grid stopper ..	1,000
11	Osc. grid leak ..	25,000	28	V4 and T.I. cathode bias (part) ..	480
12	Pick up decoupling ..	1 meg.	29	T.I. grid feed ..	1.5 meg.
13	V2 A.V.C. decoupling ..	1 meg.	30	T.I. grid leak ..	750,000
14	V2 cathode bias ..	700	31	T.I. anode feed ..	1 meg.
15	V2 anode H. F. load ..	3,000	32	V3 grid leak ..	1 meg.
16	H.T. line decoupling ..	7,000	33	V3 screen stabiliser ..	60
17	V3 anode decoupling ..	4,000	34	Volume control ..	1 meg.

Auto tuning is obtained mechanically and the circuit is mainly conventional. Unusual, however, is the use of two I.F. amplifiers, V2 and V3, the first of which is choke, not transformer, coupled. On auto the aerial and first I.F. circuits are widened.



For more information remember

Chassis Removal.—A false bottom gives access to the underside of the chassis.

Remove the back of the cabinet and the five spring-fixed control knobs. Unscrew the centre boss of the press-button plate and remove the bakelite cover.

Take out the four chassis securing bolts from the base and withdraw the visual tuning indicator, complete with base, from the holder above the dial. The leads to the speaker panel will be found to be of sufficient length to allow the chassis to be withdrawn from the cabinet.

The speaker and smoothing choke may be removed, but this should not be found necessary. The leads to the right-hand speaker panel are connected (looking from the back) as follows: Green-black to top tag, yellow to next tag, next is blank, red lead to bottom tag. The other cable is connected to the left-hand panel, with

black-white lead and black systoflex to top tag, green lead and thick green systoflex to next tag, blue lead and thin green systoflex to next tag, and black lead and black systoflex to remaining bottom tag.

Special Notes.—The mains adjustment device at the rear of the chassis takes the form of a common socket adapted to be bridged by a metallic member to one of three circuits.

The receiver has three dial lights rated at 6.5 volts .3 amp, and fitted in screw-in holders clamped to the dial assembly.

Sockets at the rear of the chassis provide connections for a pick-up and extension speaker. The speaker should be of the low impedance permanent magnet type.

The separate smoothing choke is located on the front of the cabinet near the speaker.

C1, C2, C10, C11 and C13 are contained in the respective compartments of the coil units under the trimmer assemblies. C15 is contained in I.F.T.1 and C24, R19, R20 and R21 in I.F.T.2.

As the coil pack is inaccessible from the point of view of coil resistance tests we have not appended our usual list of winding resistance or drawings of switches.

Circuit Alignment Notes

As the Robot system of automatic tuning is entirely mechanical the alignment follows standard practice.

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer. Switch set to M.W. band, turn gang to maximum capacity, volume to maximum and tone to "high." Connect a service oscillator between the top grid cap of V1 and chassis.

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Ultra 400 on Test

MODEL 400.—Standard model for A.C. mains, 200-260 volts, 40-100 cycles. Price 13½ gns.

DESCRIPTION.—Four-valve, plus rectifier, table superhet, covering three wavebands and with Robot dial automatic tuning.

FEATURES.—Full-vision scale calibrated in metres and station names. Mechanical system of telephone-type dial automatic tuning with choice of eight station settings. Controls for tone, combined volume and master switch, wave selection, tuning and auto-manual switch. Visual tuning indicator. Sockets for pick-up and low-impedance extension speaker. Elliptical speaker.

LOADING.—80 watts.

Sensitivity and Selectivity

SHORT WAVES (16.8-50 metres).—Representative gain and selectivity. Easy control, no noticeable drift. Gain well maintained.

MEDIUM WAVES (200-550 metres).—Excellent sensitivity. Well maintained over the band. Local stations spread on adjacent channels. Clean background.

LONG WAVES (900-2,000 metres).—Good sensitivity and excellent selectivity. Deutschlandsender received with extremely small side splash. All other main stations easily received. Good volume.

Acoustic Output

Ample volume for an ordinary room, with a well-balanced tone, the control not being too vigorous in action. Speech is pleasing and musical reproduction well balanced.

Robot Dial

The dial action is easy and has a very nice touch. Adjustment is easy and over a considerable period of test no drift or other trouble developed. The whole job is very well produced from an engineering point of view.

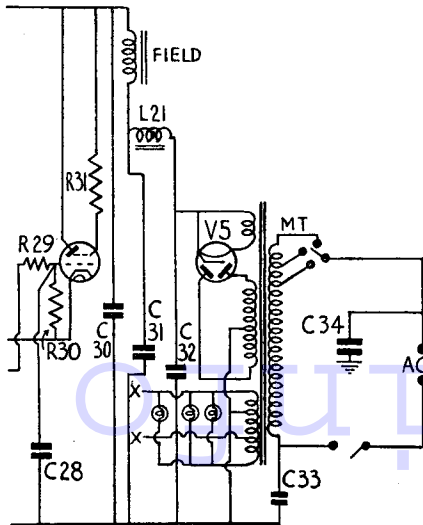
CONDENSERS

C.	Purpose.	Mfds.
1	M.W. top aerial coupling	.000005
2	L.W. top aerial coupling	.00001
3	Bottom bandpass coupling	.025
4	V1 A.V.C. decoupling	.05
5	V1 screen decoupling	.1
6	V1 cathode bias shunt	.1
7	H.T. line decoupling	.8
8	V1 anode decoupling	.1
9	I.F.T.1 prim. fixed trimmer	.00015
10	S.W. osc. grid coupling	.0001
11	S.W. osc. fixed padder	.004
12	Pick up decoupling	.1
13	M.W. and L.W. osc. grid	.001
14	V2 A.V.C. decoupling	.05
15	I.F.T.1 sec. fixed trimmer	.00015
16	V2 cathode bias shunt	.1
17	V3 cathode bias shunt	.1
18	V3 grid coupling	.00005
19	I.F.T.2 prim. fixed trimmer	.00015
20	I.F.T.2 sec. fixed trimmer	.00015
21	V3 anode decoupling	.1
22	Pentode compensator	.004
23	Tone control	.025
24	A.V.C. diode coupling	.0002
25	H.F. bypass	.0002
26	L.F. coupling	.01
27	V4 and T.I. cathode bias shunt	50
28	T.I. grid decoupling	.1
29	A.V.C. line decoupling	.05
30	H.T. smoothing	16
31	H.T. smoothing	4
32	H.T. smoothing	8
33	Mains suppressor	.0002
34	Mains suppressor	.0002
35	L.W. osc. fixed trimmer	.00006

QUICK TESTS

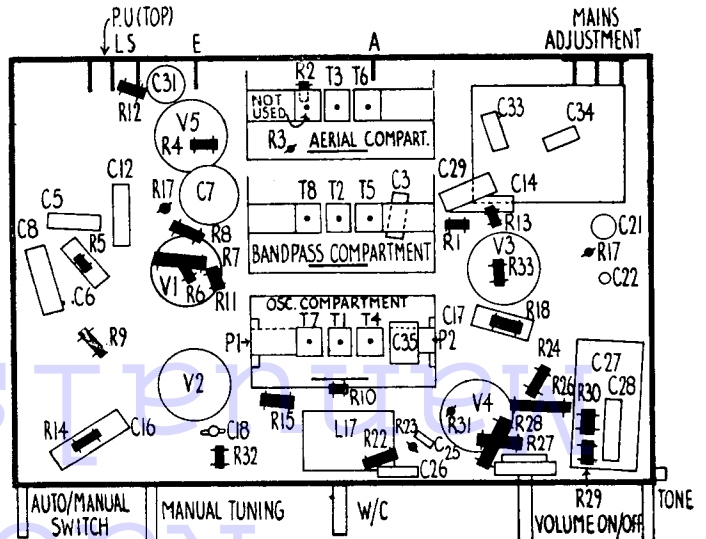
These are available on the leads to the speaker panel:—

- Red lead, 362 volts, unsmoothed H.T.
- Green-black lead, 340 volts, smoothed H.T.
- Black-white lead, 250 volts, smoothed H.T.
- Black lead, 265 volts, smoothed H.T.



Left, the tuning indicator and mains sections of the circuit. The circuit is shown divided solely for reasons of presentation.

Right, the layout diagram of the underside of the Ultra chassis. Because of the very compact arrangement of the tuning pack the usual coil and switch details are omitted. The top "deck" diagram is given on page 18.



McMichael 373 Transportable

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rear of the chassis enable an extension loudspeaker to be operated. The external speaker should be of the low impedance type (2 ohms). A special two-pin plug enables both speakers to be controlled.

Sockets adjacent to the above sockets are for a pick-up. When the special plug is pushed home the radio section of the receiver is rendered inoperative.

A QMB switch at the rear of the chassis effects noise suppression if desired, and operates when the switch is "up."

The single pilot light is located in a screw-in holder secured to the front of the cabinet and visible through an aperture. The bulb is rated at 2 volts .1 amp., and is an MES base type.

The waveband indication and pointer illumination lights, of which there are three, are also rated at 2 volts .1 amp.

R11, R22, C15 and C16 are inside the can housing IFT2. The tone control resistance, R21, is mounted on the side of the cabinet with associated condenser C23. C2 is on the wavechange switch on the front of the chassis.

In our particular chassis, a .00001 mfd. fixed condenser was connected across the long wave section (L1) of the frame aerial.

Alignment Notes

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer. Switch set to MW band, turn gang to maximum and tone to "high"

position. Connect a service oscillator between the top grid cap of V2 and chassis.

Tune service oscillator to 128.5 kc., and adjust the trimmers of IFT2 and then IFT1 for maximum response, reducing the input from the service oscillator as the circuits come into line.

Signal Circuits.—With gang at maximum, check that the leading edge of the medium wave tuning light is in line with the last calibration mark found 3-16 in. from the top (high wavelength) end of the medium wave scale. Adjust it if necessary by means of the set screws on the condenser coupling.

Connect the leads of a service oscillator to a few turns of wire and inductively inject a signal into the frame aerial, keeping the input as low as possible consistent with reliable peaks in the output meter.

Medium Waves.—Tune set and oscillator to 214 metres (1,400 kc.). On the set scale this is the short line opposite Radio Lyons. Adjust T1 and then T2 for maximum response.

The medium wave padding is fixed, but if calibration is very much out at 500 metres (600 kc.), compensate with T1 and then retrim T2 on a 214 metres signal for maximum sensitivity.

Long Waves.—Tune set and oscillator to 1,000 metres (300 kc.) and adjust T3 and then T4 for maximum response.

The long wave padding is fixed.

Short Waves.—There are no trimming adjustments.

VIDOR 277 A.C. FIVE

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Repeat both operations until no further improvement results.

Medium Waves, B3.—Tune set and oscillator to 200 metres (1,500 kc.), and adjust T3 and T4 for maximum.

Tune set and oscillator to 550 metres (545 kc.), and adjust P2 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement results.

Short Waves, B2 (50 to 170 metres).—Tune set and oscillator to 50 metres (6 mc.) and adjust T5 and then T6 for maximum.

Tune set and oscillator to 170 metres (1,765 kc.), and adjust P3 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement results.

Short Waves, B1 (13.5 to 51 metres).—Replace dummy aerial with a 30 to 40 mfd. fixed condenser.

Tune set and oscillator to 13.5 metres (22.2 mc.), and adjust T7 and then T8 for maximum response.

The short-wave padding is fixed, but check calibration throughout the range covered.

Replacement Condensers

Two exact service replacement condensers for the 277 are available from A. H. Hunt, Ltd. For the block containing C19 and C20 there is unit list number 1931A, at 8s 6d., and for C15, unit 2918, price 1s. 9d.

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Tune service oscillator to 456 kc. and adjust the iron cores of I.F.T.2 and then I.F.T.1 for maximum response, reducing the input from the service oscillator as the circuits come into line to render the A.V.C. inoperative. A non-metallic trimming tool should be used.

Signal Circuits.—Adjust the tuning pointer so that it coincides with the black dial line when the gang is fully closed.

Connect the service oscillator to the A and E sockets via a dummy aerial, only feeding sufficient input from the service oscillator to obtain reliable peaks in the output meter.

Medium Waves.—Tune set and oscillator to 200 metres (1,500 kc.) and adjust T1, T2, and then T3 for maximum.

Tune set and oscillator to 500 metres (600 kc.) and adjust P1 for maximum simultaneously rocking the gang.

Repeat both operations.

Long Waves.—Tune set and oscillator to 1,000 metres (300 kc.) and adjust T4, T5 and T6 respectively for maximum response.

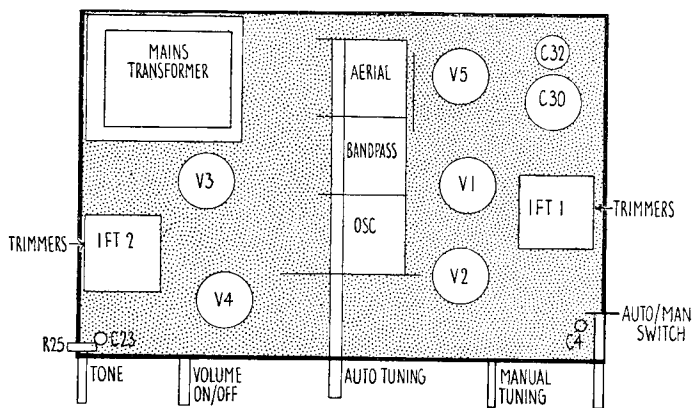
Tune set and oscillator to 1,700 metres (176.5 kc.) and adjust P2 for maximum simultaneously rocking the gang.

Repeat both operations.

Short Waves.—Tune set and oscillator to 17 metres (17,647 kc.) and adjust T7 and the T8 for maximum

The short wave padding is fixed, but check calibration throughout the range covered.

Right, is the layout diagram for the top of the chassis.



Button Adjustment

The buttons are calibrated on the actual stations themselves and not by means of generator signals.

Unscrew the centre boss, with the spanner provided, and take off the bakelite press-button cover, thereby obtaining access to the buttons. The buttons are numbered and each covers a section of the wavelength scale as follows:—

Press buttons 1 and 5, 450 to 550 or 1,700 to 2,000 metres.

Press buttons 2 and 6, 330 to 490 or 1,300 to 1,800 metres.

Press buttons 3 and 7, 230 to 390 or 950 to 1,400 metres.

Press buttons 4 and 8, 200 to 260 or 850 to 1,050 metres.

To set a button for the desired station,

find the correct button to use from the table (according to wavelength) and insert the station name from the printed sheet into the name cover.

Push the button down with the spanner provided and rotate the entire plate until the button latches. Then, still keeping the button pressed down in the slot, unscrew the collar nut half a turn and rotate the entire plate until the desired station is tuned in spot on. Then screw up again making sure that the station is still accurately tuned in.

Repeat operations on different stations until all the buttons are used.

Replacement Condensers

Exact replacement condensers by A. H. Hunt, Ltd., are: for C30, 3,060, 6s. 9d.; C32, 3,068, 5s.; C7, 4,107, 3s.; C31, 2,546, 2s. 3d., and for C27, 2,899, 3s. 6d.