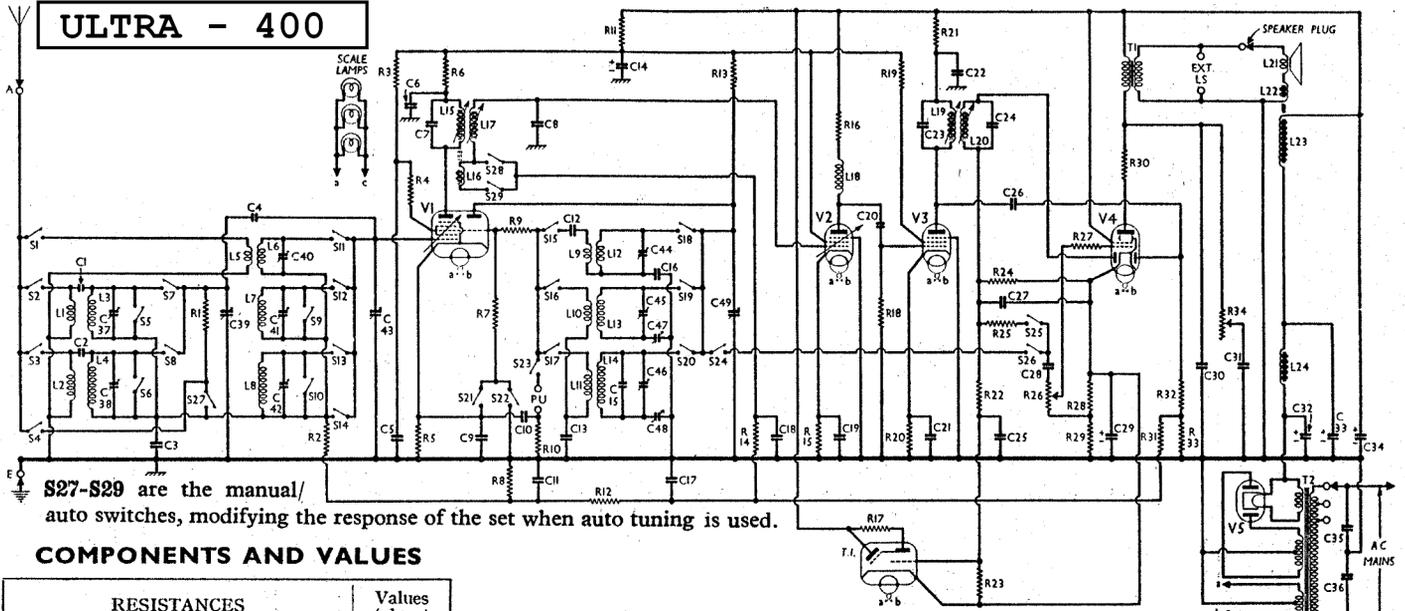


ULTRA - 400



S27-S29 are the manual/auto switches, modifying the response of the set when auto tuning is used.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	Band-pass pri. damping	100,000
R2	V1 pentode CG decoupling	25,000
R3	V1 SG HT feed	20,000
R4	V1 SG RF stopper	60
R5	V1 fixed GB resistance	165
R6	V1 pent. anode HT feed	4,000
R7	V1 osc. CG resistance	25,000
R8	Part of AVC line filter	1,500,000
R9	V1 osc. CG stabiliser	60
R10	V1 osc. CG PU decoupling	1,000,000
R11	V1 HT and V2, V3 SG's HT feed	7,000
R12	Part of AVC line filter	1,000,000
R13	V1 osc. anode HT feed	40,000
R14	V2 CG decoupling	1,000,000
R15	V2 fixed GB resistance	700
R16	V2 anode load corrector	3,000
R17	T.I. anode HT feed	1,000,000
R18	V3 CG resistance	1,000,000
R19	V3 SG RF stopper	60
R20	V3 fixed GB resistance	700
R21	V3 anode HT feed	4,000
R22	T.I. CG feed resistances	1,500,000
R23	V4 signal diode load	750,000
R24	V4 signal diode load	500,000
R25	IF stopper	50,000
R26	Manual volume control	1,000,000
R27	V4 tetrode CG stopper	1,000
R28	V4 tetrode GB and AVC delay resistance	160
R29	V4 tetrode anode stabiliser	480
R30	V4 tetrode anode stabiliser	60
R31	Part of AVC line filter	1,000,000
R32	V4 AVC diode load resistances	1,000,000
R33	V4 AVC diode load resistances	250,000
R34	Variable tone control	2,000,000

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial MW coupling coil	11·0
L2	Aerial LW coupling coil	70·0
L3	Band-pass primary coils	1·5
L4		20·0
L5	Aerial SW coupling coil	0·2
L6	Aerial SW tuning coil	0·05
L7	Band-pass secondary coils	1·5
L8		20·0
L9	Osc. circuit SW reaction	7·5
L10	Osc. circuit MW reaction	1·0
L11	Osc. circuit LW reaction	1·2
L12	Osc. circuit SW tuning coil	0·05
L13	Osc. circuit MW tuning coil	5·5
L14	Osc. circuit LW tuning coil	9·6
L15	1st IF trans. pri. coil	4·25
L16	Part IF coupling (auto)	0·25
L17	1st IF trans. sec. coil	4·25
L18	V2 anode RF choke	42·0
L19	2nd IF trans.	Pri. 4·25
L20		Sec. 4·25
L21	Speaker speech coil	2·0
L22	Hum neutralising coil	0·1
L23	Speaker field coil	1,000·0
L24	HT smoothing choke	315·0
T1	Output trans.	Pri. 295·0
T2		Sec. 0·35
T2	Mains trans. Pri., total	16·5
T2	Heater sec., total	0·1
T2	Rect. heat. sec.	0·1
T2	HT sec., total	340·0
S1-S20	Waveband switches	—
S21-26	Radio/gram. change switches	—
S27-29	Manual/auto change switches	—
S30	Mains switch, ganged R26	—

CONDENSERS		Values (μF)
C1	Aerial MW top coupling	0·000005
C2	Aerial LW top coupling	0·00001
C3	Band-pass bottom coupling	0·025
C4	Small coupling	Very low
C5	V1 SG decoupling	0·1
C6	V1 pent. anode decoupling	0·1
C7	1st IF transformer fixed tuning condensers	0·00015
C8	V1 cathode by-pass	0·1
C9	V1 triode CG PU decoupling	0·1
C10	Part of AVC line filter	0·05
C11	V1 osc. SW CG condenser	0·0001
C12	V1 osc. MW and LW CG cond.	0·001
C13	V1, V2 and V3 SG's decoupling	8·0
C14*	Osc. circuit LW fixed trimmer	0·00006
C15	Osc. circuit SW tracker	0·004
C16	Part of AVC line decoupling	0·05
C17	V2 CG decoupling	0·05
C18	V2 cathode by-pass	0·1
C19	V2 to V3 IF coupling	0·00005
C20	V3 cathode by-pass	0·1
C21	V3 anode decoupling	0·1
C22	2nd IF transformer fixed tuning condensers	0·00015
C23	T.I. CG decoupling	0·1
C24	Coupling to V4 AVC diode	0·0002
C25	IF by-pass	0·0002
C26	AF coupling to V4 tetrode	0·01
C27	V4 cathode by-pass	50·0
C28	Fixed tone corrector	0·004
C29*	Part of variable tone control	0·025
C30	HT smoothing condensers	8·0
C31	HT smoothing condensers	4·0
C32*	HT smoothing condensers	16·0
C33*	HT smoothing condensers	0·0002
C34*	HT smoothing condensers	0·0002
C35	Mains RF by-pass condensers	—
C36	Mains RF by-pass condensers	—
C37†	Band-pass pri. MW trimmer	—
C38†	Band-pass pri. LW trimmer	—
C39†	Band-pass primary tuning	—
C40†	Aerial circuit SW trimmer	—
C41†	Band-pass sec. MW trimmer	—
C42†	Band-pass sec. LW trimmer	—
C43†	Band-pass secondary and SW aerial tuning	—
C44†	Osc. circuit SW trimmer	—
C45†	Osc. circuit MW trimmer	—
C46†	Osc. circuit LW trimmer	—
C47†	Osc. circuit MW tracker	—
C48†	Osc. circuit LW tracker	—
C49†	Oscillator circuit tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating on mains of 226 V, using the 220-240 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/TH1	166	2·2	72	5·1
	Oscillator	2·5		
V2 AC/VP2	255	4·1	180	1·1
V3 AC/VP2	248	4·4	180	1·1
V4 AC/5Pen/DD	255	44·0	272	8·0
V5 UU4	336†	—	—	—
T.I. ME4T	42	0·2	—	—
	Target	0·8	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—S1-S26 are the waveband and radio-gram switches, in four rotary units beneath the chassis, indicated in our under-chassis view, and shown in detail in the diagrams in col. 6 where units 1, 2 and 3 are as viewed from the front of the chassis, and unit 4 from the rear. The table (col. 5) gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and C, closed.

S27-S29 are the manual-auto switches, in a separate rotary unit above the chassis, indicated in our plan chassis view. A diagram of this unit, seen from the rear of the chassis, is in col. 6. In the manual (anti-clockwise) position, S28 is closed, and S27 and S29 open. In the auto (clockwise) position, S27 and S29 are closed, and S28 open.

S30 is the QMB mains switch, ganged with the volume control R26.

Coils.—All the coils, with the exception of the IF transformers, are beneath the chassis in small screened and unshielded units inside three box-like assemblies, which carry the trimmers and the switch units, and also contain many of the other components. Some of these are difficult to indicate in a two-dimensional view, but their positions are shown in all cases.

The IF transformers L15, L16, L17 and L19, L20 are in two screened units on the chassis deck, and their inductance trimmers can be reached through holes in the sides of their cans. The IF choke L18 is in a screened unit beneath the chassis, behind the centre of the front member.

The smoothing choke L24 is mounted beneath the speaker, while the transformer T1 is on the cabinet, to the left of the speaker.

Scale Lamps.—These are three Osram MES types, rated at 6·5 V, 0·3 A. Note that they are connected across the points a and c on the heater secondary of T2, and so get a higher voltage than the valve heaters.

Chassis Divergencies.—C4, S4, S5, S6, S9 and S10 were not shown on the makers' diagram. S4 is an "incidental" switch. C17 was 0·05 μF in our chassis, not 0·00015 μF as in the makers' diagram.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

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CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V1**, and chassis, switch set to "Manual," feed in a 456 KC/S signal, and adjust the iron cores of **L20**, **L19**, **L17** and **L15**, in that order, for maximum output.

RF and Oscillator Stages.—With gang at maximum, pointer should cover horizontal line at the high wavelength end of the scale. Connect signal generator to **A** and **E** sockets.

MW.—Switch set to MW (manual), tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust **C45**, then **C41** and **C37**, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C47** for maximum output, while rocking the gang for optimum results. Repeat these adjustments.

LW.—Switch set to LW (manual), tune to 1,300 m on scale, feed in a 1,300 m (230 KC/S) signal, and adjust **C46**, then **C42** and **C38**, for maximum output. Feed in a 1,700 m (176 KC/S) signal, tune it in, and adjust **C48** for maximum output, while rocking the gang for optimum results. Repeat these adjustments.

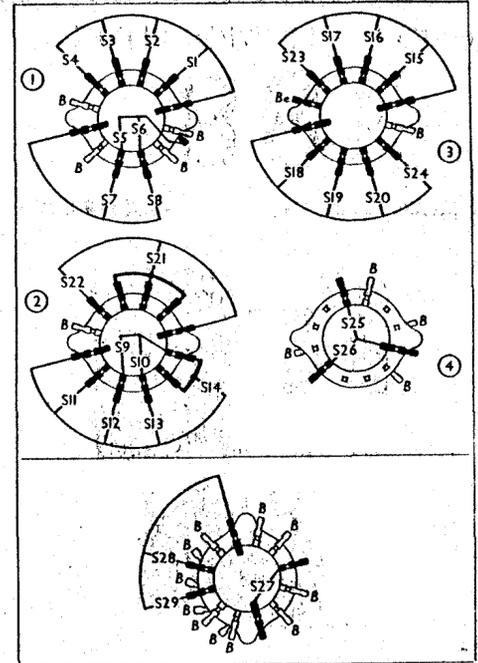
SW.—Switch set to SW (manual), tune to 19 m on scale, feed in a 19 m (15.8 MC/S) signal, and adjust **C44**, then **C40**, for maximum output. If **C40** is found to be fully opened, it should not be altered.

AUTOMATIC STATION SELECTION

A full description of the press-button dial assembly was given in *Radio*

TABLE AND DIAGRAMS OF THE SWITCH UNITS

Switch	Gram.	LW	MW	SW
S1	—	—	—	C
S2	—	—	C	—
S3	—	C	—	—
S4	C	—	—	—
S5	—	—	—	C
S6	—	—	C	C
S7	—	—	C	C
S8	—	C	—	—
S9	—	—	—	C
S10	—	—	C	C
S11	—	—	—	C
S12	—	—	C	—
S13	—	C	—	—
S14	C	—	—	—
S15	—	—	—	C
S16	—	—	C	—
S17	—	C	—	—
S18	—	—	—	C
S19	—	—	C	—
S20	—	C	—	C
S21	—	C	C	C
S22	C	—	—	—
S23	C	—	—	—
S24	C	—	—	—
S25	—	—	C	C
S26	C	—	—	—



Maintenance for May 21, 1938, and it is also included in pages 8 and 11 of the *ABC of Automatic Tuning*.

The following adjustment instructions are issued by the manufacturers:

With the spanner provided, unscrew the centre boss holding the bakelite press-button cover and take the cover off. There is a small raised number on the press-button plate against each press button, and each button covers a section of the wavelength scale, as in the table below.

Buttons	MW (metres)	LW (metres)
1 and 5	450-550	1,700-2,000
2 and 6	330-490	1,300-1,800
3 and 7	230-390	950-1,400
4 and 8	200-260	850-1,050

Each button overlaps the range of the button above and below it, but when setting press-buttons remember that the actuating rods on them are like the spokes of a wheel and cannot cross one another. For example, button 1 covers 450-550 m, and button 2 covers 330-490 m. If button 1 is set to 460 m, it will not be possible to set button 2 to 470 m, but only to a station between 330 and 460 m. As there is practically no broadcasting between 850 and 1,050 m, button 5 can be used on the 200-260 m section, in addition to button 4.

The first four switch units are those situated beneath the chassis. The first three are as viewed from the front of the underside of the chassis, and the fourth as viewed from the rear. The fifth unit, at the bottom, is for manual/auto switching, and is drawn as seen from the rear of the top deck of the chassis.

Switch the set on, and turn the manual-automatic switch to "Auto." Next find the wavelength of the desired station and the correct button to use for it. Pull off the station name cover, and place the spanner jaws in the slots of the collar nut of the press-button you are re-setting.

Push the button down with the spanner and with the other hand turn the press-button plate round till the button latches. The button must be held pushed in with the spanner until the following operations are completed. Hold the press-button plate firmly with the left hand, and slacken the collar nut with the spanner. Do *not* remove the collar nut. Now turn the press-button plate round and tune the station in accurately, as shown by the tuning indicator. Finally, holding the press-button plate firmly, tighten the collar nut.