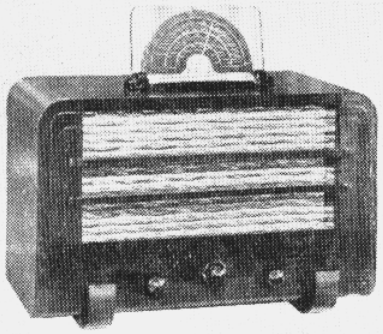
'TRADER' SERVICE SHEET 300

ULTRA 121, 133, 140 AND 150



THE Ultra 121 AC 3-band superhet chassis is very similar to that in the 133 and 140 radiograms and the 150 automatic radiogram, but this *Service Sheet* was prepared on a 121. The differences in the radiograms are explained under "General Notes."

CIRCUIT DESCRIPTION

Aerial input on MW and LW via coupling coils and condensers **L1, C1** (MW) and **L2, C2** (LW) to capacity coupled band-pass filter. Primary coils **L3** (MW) and **L4** (LW) are tuned by **C29**; secondaries **L7** (MW) and **L8** (LW) by **C33.** Bottom coupling by **C3** and top coupling by small capacity **C4.** On SW, input is via coupling coil **L5** to single tuned circuit **L6, C33.**

First valve (**V1, Mazda metallised AC/TH1**) is a triode hexode operating as frequency changer with internal coupling. Triode anode coils **L12** (SW), **L13** (MW) and **L14** (LW) are tuned by **C39**; parallel trimming by **C34** (SW), **C35** (MW) and **C13, C36** (LW); series tracking by **C12** (SW), **C37** (MW) and **C38** (LW). Reaction by grid coils **L9** (SW), **L10** (MW) and **L11** (LW).

Second valve (**V2, Mazda metallised A.C/VP2**) is variable-mu RF pentode operating as intermediate frequency amplifier with iron-cored tuned-primary tuned-secondary transformer couplings **C7, L15, L16, C8,** and **C18, L17, L18, C19.**

Intermediate frequency 456 KC/S.

Diode second detector is part of double diode pentode output valve (**V3, Mazda A.C2/Pen/DD**). Audio frequency component in rectified output is developed across load resistance **R14** and passed via switch **S22,** AF coupling condenser **C21,** IF stopper **R11,** manual volume control **R12** and grid stopper **R13** to CG of pentode section. Provision for connection of gramophone pick-up between **C21** and chassis, via **S21.** On gramophone position of wave-change control **S22** opens, muting radio, whilst on all other positions gramophone sockets are short-circuited by **S20.** Provision for connection of low impedance external speaker across secondary of transformer **T1,** whilst a plug and socket device permits the internal speaker to be muted. Fixed tone correction in anode circuit of **V3** by condenser **C24.**

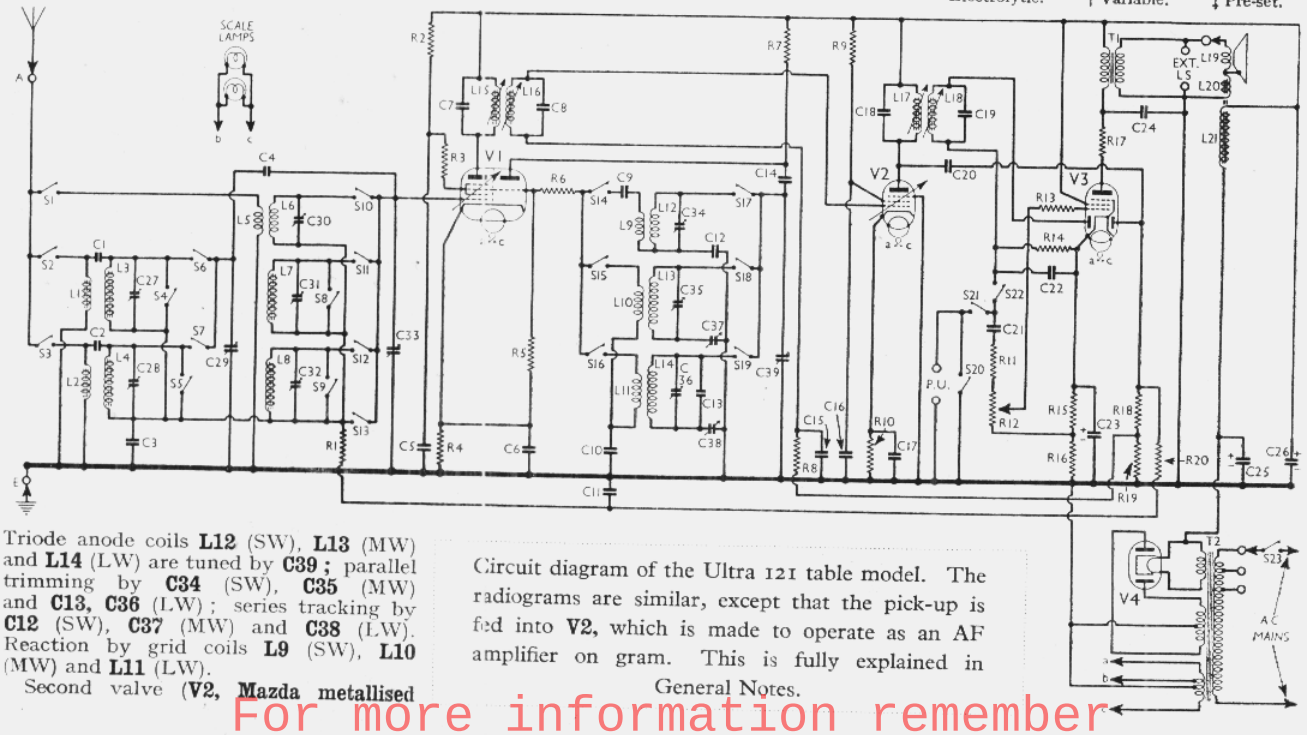
Second diode of **V3,** fed via **C20** from **V2** anode, provides DC potentials which are developed across load resistances **R18, R19** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistances **R15, R16** in cathode circuit.

HT current is supplied by IHC full-wave rectifying valve (**V4, Mazda UU4**). Smoothing by speaker field **L21** and dry electrolytic condenser **C25, C26.**

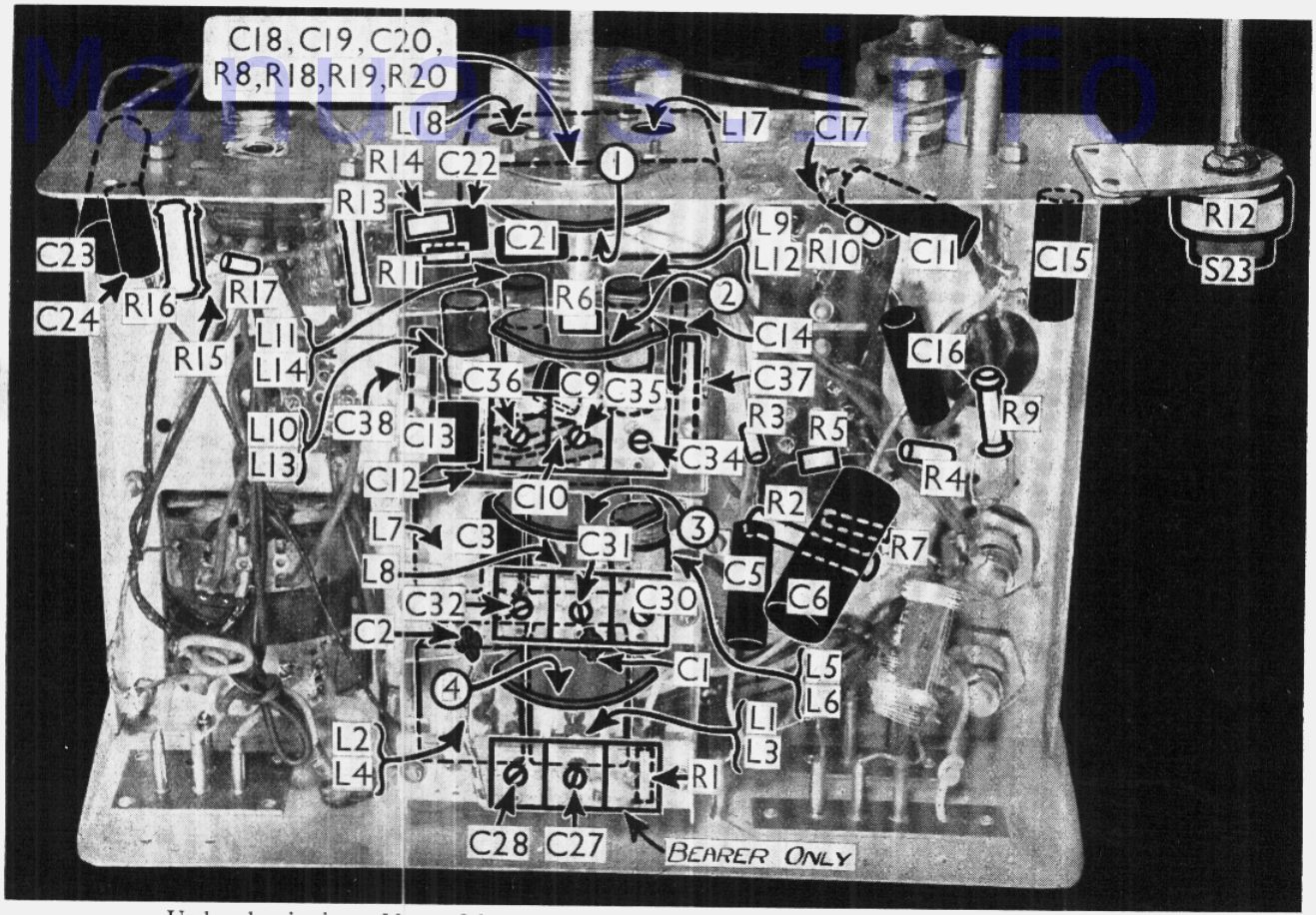
COMPONENTS AND VALUES

	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 cathode by-pass	0·5
C7	1st IF trans. pri. fixed trimmer	0·00015
C8	1st IF trans. sec. fixed trimmer	0·00015
C9	V1 osc. SW CG condenser	0·0001
C10	V1 osc. MW and LW coupling	0·001
C11	AVC line decoupling	0·05
C12	Osc. circuit SW tracker	0·004
C13	Osc. circuit LW fixed trimmer	0·00006
C14	V1 osc. anode coupling	0·0001
C15	V2 CG decoupling	0·05
C16	V2 SG decoupling	0·1
C17	V2 cathode by-pass	0·1
C18	2nd IF trans. pri. fixed trimmer	0·00015
C19	2nd IF trans. sec. fixed trimmer	0·00015
C20	Coupling to V3 AVC diode	0·0002
C21	AF coupling to V3 pentode	0·01
C22	IF by-pass	0·0002
C23*	V3 cathode by-pass	50·0
C24	Fixed tone corrector	0·004
C25*, C26*	H.T. smoothing	8·0, 16·0
C27‡	Band-pass pri. MW trimmer	—
C28‡	Band-pass pri. LW trimmer	—
C29†	Band-pass pri. tuning	—
C30‡	Aerial circuit S.W. trimmer	—
C31‡	Band-pass sec. MW trimmer	—
C32‡	Band-pass sec. LW trimmer	—
C33†	Band-pass sec. and SW aerial tuning	—
C34‡	Osc. circuit SW trimmer	—
C35‡	Osc. circuit MW trimmer	—
C36‡	Osc. circuit LW trimmer	—
C37‡	Osc. circuit M.W. tracker	—
C38‡	Osc. circuit LW tracker	—
C39†	Oscillator circuit tuning	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Ultra 121 table model. The radiograms are similar, except that the pick-up is fed into **V2,** which is made to operate as an AF amplifier on gram. This is fully explained in General Notes.



Under-chassis view. Many of the components are hidden from view, but are indicated by arrows.

	RESISTANCES	Values (ohms)
R1	V1 hexode CG decoupling	25,000
R2	V1 SG HT feed	20,000
R3	V1 SG anti-parasitic resistance	60
R4	V1 fixed GB resistance	165
R5	V1 osc. CG resistance	25,000
R6	V1 osc. reaction stabiliser	60
R7	V1 osc. anode H.T. feed	40,000
R8	V2 C.G. decoupling	1,000,000
R9	V2 SG HT feed	3,000
R10	V2 fixed GB resistance	30
R11	IF stopper	10,000
R12	Manual volume control	1,000,000
R13	V3 pent. CG RF stopper	1,000
R14	V3 signal diode load	500,000
R15	V3 pent. GB and AVC delay voltage resistances	138
R16		138
R17	V3 pent. anode RF stopper	60
R18	V3 AVC diode load resistances	250,000
R19		750,000
R20	AVC line decoupling	1,000,000

*May be 30,000 Ω. †May be 480 Ω.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial MW coupling coil	15·0
L2	Aerial LW coupling coil	70·0
L3	Band-pass primary coils	1·5
L4		19·0
L5	Aerial SW coupling coil	0·25
L6	Aerial SW tuning coil	0·05
L7	Band-pass secondary coils	1·6
L8		18·0
L9	Oscillator grid SW reaction	7·0
L10	Oscillator grid MW reaction	1·0
L11	Oscillator grid 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	9·5
L15	1st IF trans. Pri.	4·0
L16	1st IF trans. Sec.	4·0

	OTHER COMPONENTS (*Continued*)	Approx. Values (ohms)
L17	2nd IF trans. Pri.	4·0
L18	2nd IF trans. Sec.	4·0
L19	Speaker speech coil	2·0
L20	Hum neutralising coil	0·05
L21	Speaker field coil	1,400·0
T1	Speaker input trans. Pri.	462·0
	Speaker input trans. Sec.	0·3
T2	Mains trans. Pri., total	28·0
	Mains trans. Heater sec., total	0·07
	Mains trans. Rect. heat. sec.	0·12
	Mains trans. HT sec., total	565·0
S1-S19	Waveband switches	—
S20-22	Radio-gram. change switches	—
S23	Mains switch, ganged R12	—

DISMANTLING THE SET

Removing Chassis.—Turn the tuning scale pointer to about 430 m; remove the switch knob (pull off) and the other three control knobs (recessed grub screws). Now remove the four bolts (with washers) holding the chassis to the bottom of the cabinet, and withdraw the scale lamps. Next remove the round-head screw at the back of the tuning scale housing and carefully pull the pointer assembly down inside the cabinet.

The chassis can now be withdrawn to the extent of the speaker leads. *When replacing*, see that the scale pointer is correctly positioned before inserting the assembly into the scale housing.

If it is desired to free the chassis entirely, unsolder the speaker leads and *when replacing*, connect them as follows, numbering the tags from left to right:—1, no external connection; 2, black; 3, blue; 4, black/white; 5, green; 6, red; 7, yellow.

Removing Speaker. — Unsolder the leads and remove the two top clamps (nuts and spring washers) holding it to the sub-baffle. *When replacing*, see that the transformer is at the bottom and connect the leads as above.

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/TH1	248	2·9	89	7·7
	Oscillator			
	68	3·8		
V2 AC/VP2	248	16·0	230	5·3
V3 AC/2Pen/DD	230	30·0	248	6·5
V4 UU4	350†	—	—	—

† Each anode, AC.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 227 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.

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

Continued overleaf

ULTRA 121—*Continued*

GENERAL NOTES

Switches.—**S1-S19** are the waveband, and **S20-S22** the radio to gram. switches, ganged in four rotary units beneath the chassis. The units are indicated in our under-chassis view, and are shown in detail in the diagrams in column 3 where they are drawn as seen looking from the rear of the chassis in the case of the first unit, and from the front of the chassis in the case of the other three units.

The table below gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open and **C** closed.

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

S23 is the QMB mains switch, ganged with the volume control **R12.**

Coils.—All the coils, with the exception of the first IF transformer, are beneath the chassis, and are in small screened and unscreened units inside three box-like assemblies which carry the trimmers and the switch units, and also contain many of the other components.

The second IF transformer, **L17, L18,** is beneath the chassis, behind the front member, and the inductance trimmers (iron cores) can be reached for adjustment through holes in the front of the chassis.

The first IF transformer, **L15, L16,** is on the chassis deck, and its inductance trimmers are reached through holes in the side of the can.

Scale Lamps.—These are two Osram MES types, rated at 4.5 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2-4 O) external speaker. A plug and socket device enables the internal speaker to be muted, if desired.

Bearer Trimmer.—It will be noticed in the under chassis view that the trimmer next to **C27, C23** is marked "Bearer Only." It serves as a convenient fixing for **R1,** which is wired across it, but it is not shown in the circuit diagram or lists of components, since its capacity serves no useful purpose.

Chassis Divergencies. — On early receivers an additional iron-cored coil and 0·001 μF fixed condenser in parallel are fitted between the aerial socket and the common connection of **S1, S2** and **S3,** forming a 456 KC S rejector.

On these models the suppressor grid of **V2** was not connected to chassis, but was joined, via a 1·5 MO resistance, to the junction of **L18** and **R14,** while a 0·05 μF condenser was connected from suppressor grid of **V2** to chassis. This gave a measure of inter-station noise suppression. Connections were made to switches in the upper section of our third switch unit, so that the noise suppression was cut out on SW, leaving the circuit as in the later models.

In the early models **R9** and **C16** were not present, the screen of **V2** going direct to the HT line; an additional band-pass coupling condenser (0·075 μF) is switched into circuit across **C3** by switches in the upper half of unit 3.

Radiogram Modifications.—In the radiogram models 133, 140 and 150, the pick-up input is fed into the CG of **V2** on gram. The connection from the bottom of **L16** and the top of **R8** is broken, and the pick-up sockets are connected to **L16** and **R8** respectively. Across the sockets is a 10,000 O resistance and a 0·0002 μF condenser.

The SG of **V2** is used as the anode of a triode, and **R9** is replaced by two resistances, 15,000 O and 7,000 O, in series, the first being nearest the H.T. line. From the junction of the two there is 2 μF decoupling condenser to chassis. **C16** becomes 0·001 μF, and from the SG of **V2** a 0·1 μF coupling condenser is connected to the centre contact of a SPCO switch.

On radio this switch connects the coupling condenser to chassis, and on gram. to one of the outer contacts of another SPCO switch. The upper end of **C21** goes to the centre contact of this second switch, and hence, on gram., to the coupling condenser. On radio **C21** is connected to the bottom end of **L18.**

CIRCUIT ALIGNMENT

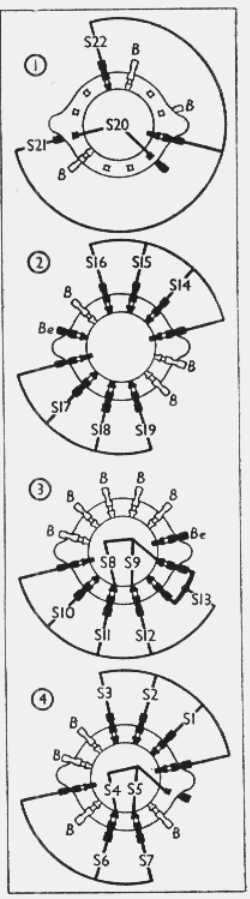
IF Stages.—Connect signal generator to control grid (top cap) of **V1,** and chassis, feed in a 456 KC/S signal, and adjust iron cores of **L18, L17, L16** and **L15,** in that order, for maximum output.

In early models, where the IF rejector is used, feed the 456 KC/S signal into **A** and **E** sockets, and adjust core of the filter coil for *minimum* output.

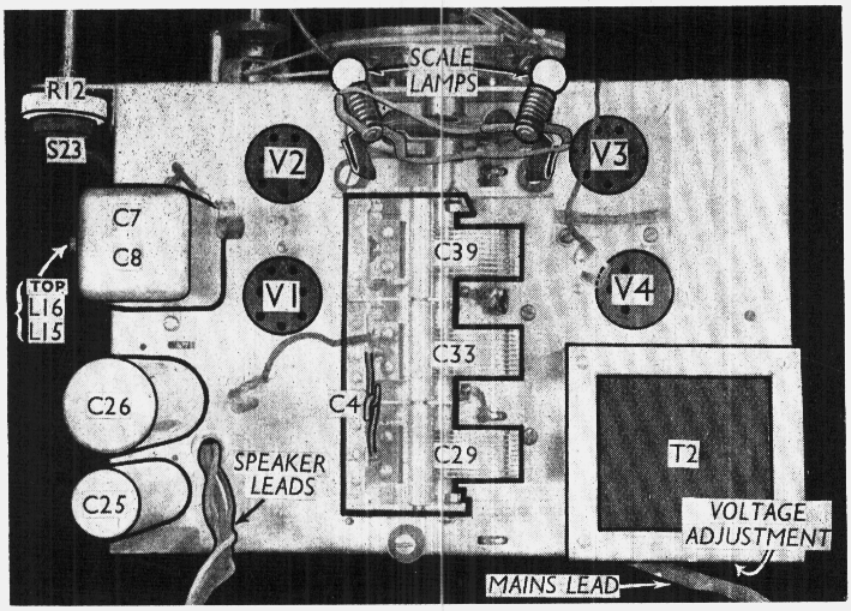
RF and Oscillator Stages.—Connect signal generator to **A** and **E** sockets. Switch set to MW, tune to 200 m on scale, feed in a 200 m signal and adjust **C35,** then **C31** and **C27,** for maximum output. Feed in a 500 m signal, tune it in, and adjust **C37** for maximum output, rocking the gang for optimum results. Repeat.

Switch set to LW, tune to 1,500 m on scale, feed in a 1,500 m signal and adjust **C36,** then **C32** and **C28,** for maximum output. Feed in a 1,700 m signal, tune it in, and adjust **C38** for maximum output, while rocking the gang. Repeat these LW adjustments.

Switch to SW, tune to 17 m on scale, feed in a 17 m signal, and adjust **C34,** then **C30,** for maximum output. Check at 30 m and 51 m.



Switch diagrams, looking from the underside of the chassis in the directions of the arrows in the under-chassis view.



Plan view of the chassis. The second IF transformer is beneath the chassis.

Printed in Great Britain as a supplement to *The Wireless & Electrical Trader* by Sanders Phillips & Co., Ltd., The Baynard Press, Chryssell Road, London, S.W.9