TRADER SERVICE SHEETS

RECEIVER SERIES (NUMBER NINETEEN)

THE Ultra Model 22 is a superhet of advanced design, the A.C. model having three valves (two of them multiple types) and a rectifier. It was the first set to embody the triode-pentode frequency changer valve. This service sheet deals with the table model A.C. receiver, but an A.C. radiogram and corresponding D.C. models are also available.

Much of the information given below is applicable to the A.C. radiogram, but the provision for gramophone reproduction has involved certain modifications and additions to the circuit to enable the connection and switching of the pick-up to be accomplished. There is no provision for pick-up in the table model.

CIRCUIT DESCRIPTION

Aerial input by way of aperiodic coupling coils L1, L2 to inductively coupled band-pass filter. Primary L8, L4 tuned by C21; secondary L6, L7 tuned by C23; coupling coil L5. First valve (V1, Mazda metallised AC/TP) is a triode-pentode functioning as frequency-changer with cathode injection. Triode section forms separate oscillator with anode coils L9, L10 tuned by C25, and coupling coil L8 in common cathode circuit. One variable-mu pentode intermediate frequency amplifier (V2, Mazda metallised AC/VP1) with tuned-primary tuned-secondary transformer couplings L11, L12 and L13, L14. I.F. 456 KC/S. Diode second detector forming part of

ULTRA MODEL 22

A.C. SUPERHET

double diode pentode (V3, Mazda AC2/Pen DD). Second diode provides voltage which is developed across R10 and R11 and fed back as G.B. to frequency-changer and I.F. valves, thus giving automatic volume control. Delay voltage obtained from resistances R13 and R14 in cathode circuit. Output from rectifier diode is fed to control grid of pentode section by way of manual volume control R12 and coupling condenser C10. Tone compensation by means of condensers C12 and C14 and resistance R18. Two-point tone control by switch S6 and additional condenser C13.

H.T. supplied by I.H.C. full-wave rectifying valve (V4, Mazda UU60/250). Smoothing by speaker field L17 and electrolytic condensers C15, C16. Mains disturbance suppression by buffer condensers C17, C18.

DISMANTLING THE SET

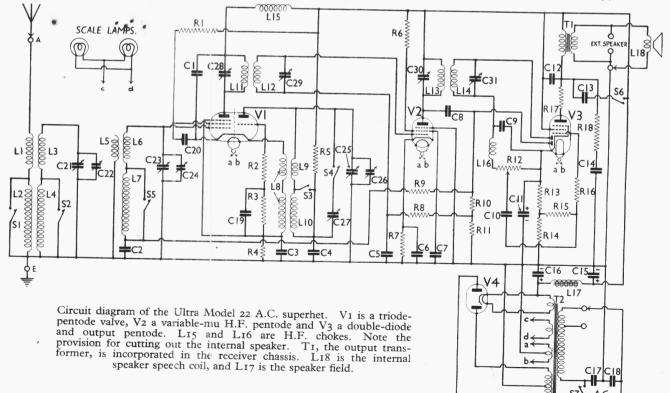
Removing Chassis.—Remove back of set. Remove control knobs (grub screws). Remove wooden strip from inside of top

of cabinet holding speaker against front of cabinet (2 wood screws). Remove four screws from underside of base of cabinet holding chassis in position. Chassis and speaker can now be withdrawn.

Removing Speaker.—This is held to vertical metal plate by four screws and nuts. If it becomes necessary to remove speaker, first remove chassis from cabinet, and untie gauze dust bag. Unsolder the four leads connecting to the terminal strip. Then remove nuts and bolts with their lock-nuts and washers. When reconnecting speaker, the wires are connected to the tags as follows: Left-hand tag, red; 2nd from left, black and white; 3rd from left, black and white; 4th from left, blank; right-hand tag, green and black.

The tags are connected to the speaker as follows: Extreme left and right, field coil **L17**; 2nd and 4th from left, speech coil **L18**; 3rd and 4th from left, hum bucking coil.

(Continued overleaf)



VALVE ANALYSIS

ULTRA MODEL 22 SUPERHET (cont'd)

COMPONENTS AND VALUES

Condensers	Values (μF)
C1 C2 C3 C3 V1 pent. anode decoupling V1 cathode by-pass C4 V1 osc. anode decoupling V2 cont. grid decoupling V2 cont. grid decoupling V2 cont. grid decoupling V2 cont. grid decoupling V2 cathode by-pass C7 V2 cathode by-pass C8 A.V.C. diode coupling C9 Rect. H.F. filter L.F. coupling to V3 V3 cathode by-pass C11 C12 C13 Tone control condensers H.T. smoothing, electrolytics Amins interference suppressors V1 osc. coupling C20 V1 pent. aux. grid by-pass V3 cathode by-pass C11 Band-pass pri. tuning C21 Band-pass pri. tuning C32 Band-pass sec. tuning C34 Sit I.F. trans. pri. tuning C30 C31 C31 C31 C41 C52 C53 C53 C54 C55 C56 C56 C57 C57 C58 C57 C58 C59 C59 C50 C50 C50 C51 C51 C51 C51 C52 C53 C53 C54 C55 C55 C56 C57 C57 C58 C57 C58 C57 C58 C59 C59 C50 C50 C50 C50 C51 C50 C51 C50 C51 C50 C51 C50 C51 C50	0·I 0·05 0·5 0·1 0·05 0·1 0·05 0·1 0·05 0·0002 0·0002 0·001 50·0 0·001 0·001 0·001 0·001 0·001 0·001 0·001 0·001 0·001 0·001 0·001 0·0002 0·I

Resistances		Values (ohms)
R1 R2 VI aux. grid H.T. feed VI harmonic suppressor VI triode grid resistance R4 VI fixed G.B. resistance R5 VI osc. anode decoupling R6 V2 aux. grid H.T. feed R7 V2 fixed G.B. resistance R8 R9 V2 cont. grid decoupling V1 cont. grid decoupling V1 cont. grid decoupling A.V.C. diode load V3 G.B. and A.V.C. delay Voltage resistances V3 grid H.F. stopper V3 grid H.F. stopper V3 grid ecircuit stabiliser Tone comp. resistance	· · · · · · · · · · · · · · · · · · ·	25,000 1,000 50,000 480 80,000 30,000 165 1,000,000 250,000 750,000 500,000 1,000 60 15,000

	Other Components	Values (ohms)
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12 L13 L14 L15 L16 L17	Aerial coupling coils	1.5 48.5 4.7 11.3 1.3 4.7 11.3 1.2 8.5 4.0 5.6 5.6 5.6 5.6 5.6 5.6 5.6 5.6 5.6 5.6
Ti	Speaker input trans. { Pri. Sec.	400.0
Т2	Mains trans. Pri. total Heater sec. Lamp sec. Rect. L.T. sec. H.T.	31.0 0.10 0.12 0.12
S1-S5 S6 S7	Waveband switches, ganged Tone control switch Mains switch (ganged R12)	

All the voltage readings given below were measured with a high resistance voltmeter from the points indicated to chassis. No aerial or earth was connected. Current measurements were made with the meter inserted in the low H.F. potential ends of the circuits where necessary to avoid instability.

Valve	Anode Volts	Anode Current	Screen Volts	Screen Current
VI AC/TP* V2 AC/VPI V3 AC2/PenDD V4 UU60/250	274 274 260 330†	31.0 6.0 8.0	200 195 274	2·5 2·5 6·0

*Osc. anode (triode), 110 V 1.5 mA. †Each

GENERAL NOTES

Switches.—S1-S5 are the ganged wavechange switches, mounted in a single unit under the chassis. They, and the signal frequency coils **L1-L7**, are covered with a rectangular screen, which has been removed in our under-chassis view.

Switches **S1**, **S2**, **S3** and **S5** are closed on the M.W. band, and open on the L.W. band. **S4** is open on the M.W. band and closed on the L.W. band.

It is an easy matter to clean or re-set the contacts should this become necessary.

86 is the Q.M.B. tone control switch, at the rear of the chassis. 87 is the mains switch ganged with the manual volume control R12.

Coils.—The signal frequency coils, with the switches, are enclosed in a

screening box below the chassis. There are three coil units above the chassis, containing the two I.F. transformers L11, L12 and L13, L14, and the oscillator coils L8, L9, L10. The various trimmers are reached through holes in the tops of the screening cans.

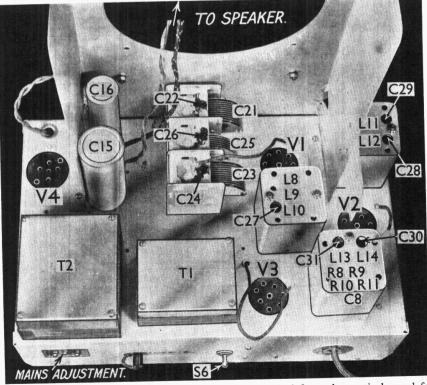
If a coil becomes faulty it will probably be best to remove and replace the whole unit, as it is a little difficult (though not impossible) to remove the cans and leave the coils in position. The coil leads are colour coded, and notes should be taken of the connections before removing.

In the case of the second I.F. transformer unit (nearest the back of the chassis), this also incorporates C8, and R8, R9, R10, R11. If the screening can is removed, the resistances are easily identified as follows. There are three arranged vertically, R9, R10 and R11, and the colour coding will identify these. The remaining one, R8, is mounted horizontally at the bottom of the coil

In the case of the I.F. transformer units, the primaries are the upper coils, and the secondaries the lower ones, looking at the coils as they are mounted on the chassis.

External Speaker. — The external speaker sockets are across the secondary of the output transformer **T1**, and a low resistance speaker must therefore be used for extension work. The type recommended by Ultra is the Ultra "Imp" P.M.M.C. model, type S.

There is provision for cutting out the internal speaker by withdrawing a plug, if desired.



Plan view of the chassis. The speaker has been removed from the vertical panel for clarity. Note that the coil unit L13, L14 also contains a fixed condenser and four resistances. The pilot lights are hidden in this illustration. VI has a 9-socket valve-holder.

Sets with a serial number below \$3400 had a slightly different arrangement. There were two sockets into which the leads from the internal speaker were plugged. The internal speaker plugs had sockets at the top to take an external speaker.

Scale Lamps.—There are two of these, connected in parallel, and fed from a separate winding on the mains transformer. They are easily replaceable, the bulbs being Osram M.E.S. types,

rated at 4.5 V, 0.3 A.

Valve VI.—This is an AC/TP triodepentode frequency changer, having a 9-pin base. We give a diagram showing the pin connections. Apart from the fact that the two sections of the valve have a common heater-cathode assembly, they are quite distinct. The pentode section has variable-mu characteristics, and its suppressor grid is brought out to a pin on the base. The top cap of the valve is connected to the pentode control grid. This type of valve should not be confused with the heptode or octode types, which utilise electron coupling for frequency changing.

Valve V2.—This is an H.F. pentode, type AC/VP1. It has a seven-pin base, with the suppressor grid brought out to one of the pins. A diagram of the base connections will be found in Service Sheet No. 9, page 161, 3rd column,

right-hand diagram.

Valve V3.—This is an AC2/PenDD, a combined double diode and output pentode. It has a 7-pin base. A diagram of its connection is given on this page.

Condenser C11. This is a dry electrolytic type, and should it need replacing, the correct polarity must be observed

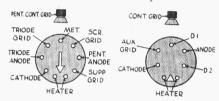
Coil L5.—Note that this has one end connected to earth, but the other end is free.

CIRCUIT ALIGNMENT

The following instructions for ganging the receiver are issued by the makers: Where no local signal generator is

available.

Set the short hand of the tuning dial to cover the last spot on the M.W. side of the scale before the "12 o'clock" position, with the tuning condenser at maximum. Switch the set to the M.W. position.



Underside views of the bases of V1 (left) and V3 (right), showing the pin and top cap connections.

Tune to the wavelength of Fécamp (206 m.) and adjust C26 until this station is received at its best volume.

Now tune in a weak signal at about 350 m. and adjust C22 and C24 until the best signal strength is obtained.

Switch the set on to the L.W. band and tune in a weak signal at about 1,500 m. Now adjust L.W. padder C27 until

maximum strength is obtained from this station.

These operations should be carried out with a screw-driver having a long insulated handle in order to prevent hand capacity effects.

It may be necessary also to readjust slightly the I.F. trimmers C28, C29, C30. C31. These should be adjusted in rotation until the maximum sound output is obtained.

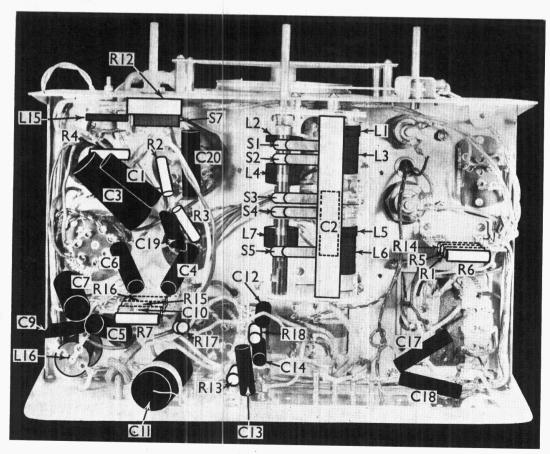
B. Where a local signal generator is available.

Set the short hand of the scale pointer to cover the dot on the immediate lefthand side of the "12 o'clock" position, with the tuning condenser at maximum. Switch the set to cover the M.W. band.

Line up the I.F. transformers by means of the trimmers C28, C29, C30, C31 in rotation, the oscillator being set at 456 KC/S. No very great adjustments of the screws should be needed. As the trimmers come into line, the volume, and consequently the "spread," will increase, and it is advisable to reduce the input progressively as this occurs, in order to facilitate the identification of the correct trimming position.

Set the signal generator to 200 metres and the tuning control to this position on scale. Adjust trimmers C26, C22, C24 respectively until the peak signal is reached. If a heterodyne whistle is noted just above the London Regional station, re-trim C22 and C24 until it disappears.

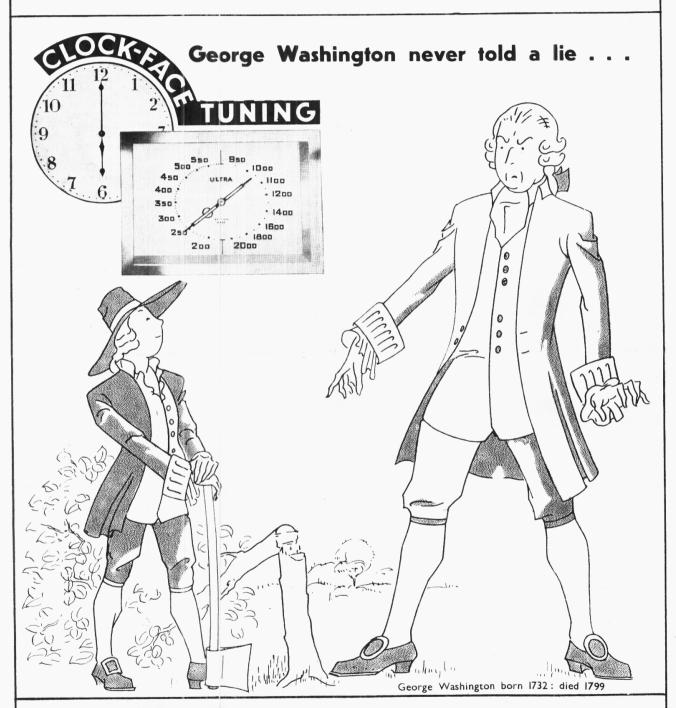
Set generator and tuning to 1,500 m., and trim C27 until the maximum signal is reached.



Under-chassis view. The rectangular screen over band - pass coils and switch unit has been removed. C2 beneath switch unit supporting member. Some of the condensers and resistances are on vertical paxolin panels, and in our illustration the lower components on each panel are indicated by dotted lines. Note the H.F. chokes L15 and L16.

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Things Not Yet Copied: No. 3



ULTRA INVENTED CLOCK-FACE TUNING