'TRADER' SERVICE SHEETS

RECEIVER SERIES (NUMBER NINETEEN)

ULTRA MODEL 22

A.C. SUPERHET

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 **L3, 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 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.**

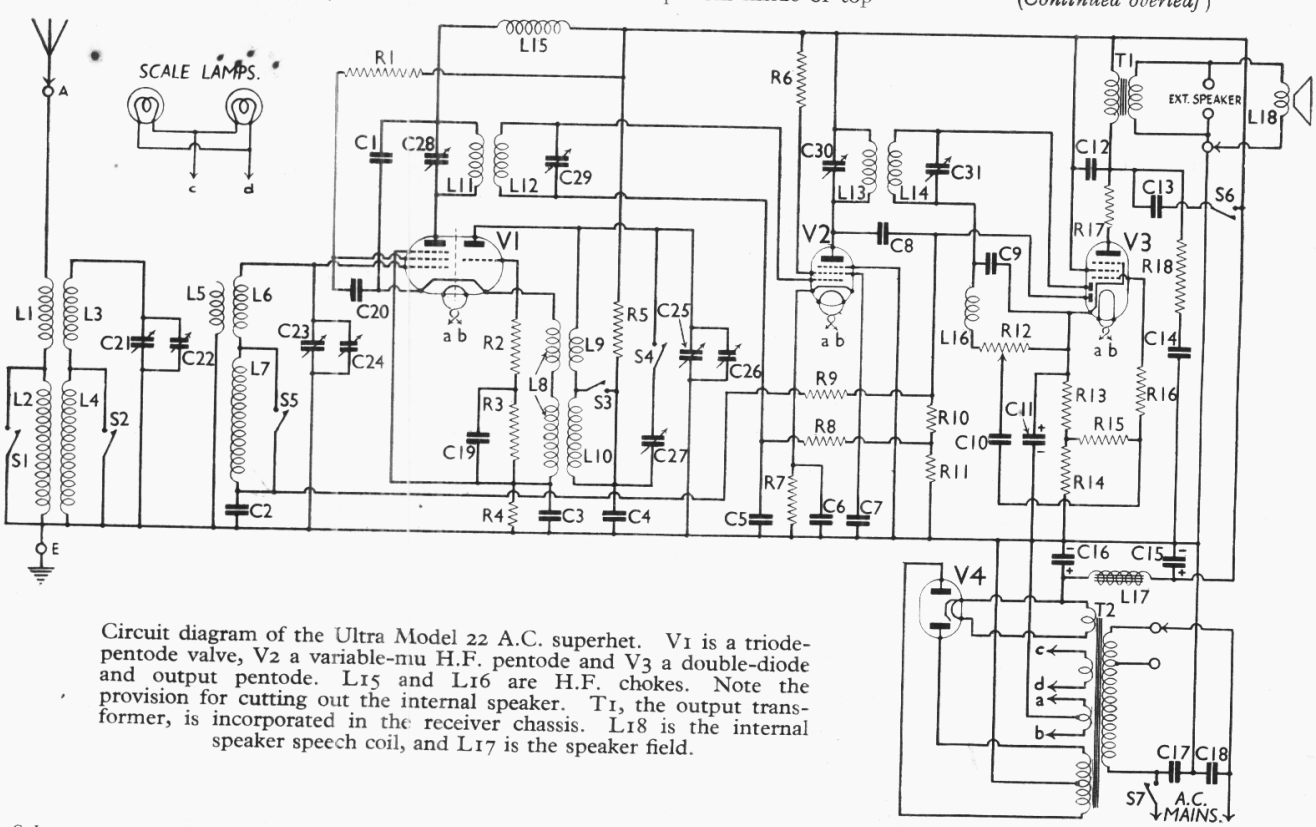
DISMANTLING THE SET

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*)



Circuit diagram of the Ultra Model 22 A.C. superhet. V1 is a triode-pentode valve, V2 a variable-mu H.F. pentode and V3 a double-diode and output pentode. L15 and L16 are H.F. chokes. Note the provision for cutting out the internal speaker. T1, the output transformer, is incorporated in the receiver chassis. L18 is the internal speaker speech coil, and L17 is the speaker field.

C 1

ULTRA MODEL 22 SUPERHET (cont'd)

COMPONENTS AND VALUES

	Condensers	Values (μF)
C1	V1 pent. anode decoupling	0·1
C2	V1 pent. cont. grid decoupling	0·05
C3	V1 cathode by-pass	0·5
C4	V1 osc. anode decoupling	0·1
C5	V2 cont. grid decoupling	0·05
C6	V2 cathode by-pass	0·1
C7	V2 aux. grid by-pass	0·5
C8	A.V.C. diode coupling	0·0002
C9	Rect. H.F. filter	0·0002
C10	L.F. coupling to V3	0·01
C11	V3 cathode by-pass	50·0
C12	Tone control condensers	0·001
C13	Tone control condensers	0·01
C14	Tone control condensers	0·01
C15	H.T. smoothing, electrolytics	16·0
C16	H.T. smoothing, electrolytics	8·0
C17	Mains interference suppressors	0·01
C18	Mains interference suppressors	0·01
C19	V1 osc. coupling	0·0002
C20	V1 pent. aux. grid by-pass	0·1
C21	Band-pass pri. tuning	—
C22	Band-pass pri. trimmer, pre-set	—
C23	Band-pass sec. tuning	—
C24	Band-pass sec. trimmer, pre-set	—
C25	Oscillator tuning	—
C26	Oscillator trimmer, pre-set	—
C27	Oscillator L.W. padder, pre-set	—
C28	1st I.F. trans. pri. tuning	—
C29	1st I.F. trans. sec. tuning	—
C30	2nd I.F. trans. pri. tuning	—
C31	2nd I.F. trans. sec. tuning	—

	Resistances	Values (ohms)
R1	V1 aux. grid H.T. feed	25,000
R2	V1 harmonic suppressor	1,000
R3	V1 triode grid resistance	50,000
R4	V1 fixed G.B. resistance	480
R5	V1 osc. anode decoupling	80,000
R6	V2 aux. grid H.T. feed	30,000
R7	V2 fixed G.B. resistance	165
R8	V2 cont. grid decoupling	1,000,000
R9	V1 cont. grid decoupling	1,000,000
R10	A.V.C. diode load	250,000
R11	A.V.C. diode load	750,000
R12	Manual volume control	500,000
R13	V3 G.B. and A.V.C. delay voltage resistances	138
R14	V3 G.B. and A.V.C. delay voltage resistances	138
R15	V3 grid resistance	1,000,000
R16	V3 grid H.F. stopper	1,000
R17	V3 anode circuit stabiliser	60
R18	Tone comp. resistance	15,000

	Other Components		Values (ohms)
L1	Aerial coupling coils		1·5
L2	Aerial coupling coils		48·5
L3	Band-pass primary coils		4·7
L4	Band-pass primary coils		11·3
L5	Coupling coil		1·3
L6	Band-pass secondary coils		4·7
L7	Band-pass secondary coils		11·3
L8	Oscillator coupling coil		1·2
L9	Oscillator tuning coils		8·5
L10	Oscillator tuning coils		4·0
L11	1st I.F. transformer	Pri.	5·6
L12	1st I.F. transformer	Sec.	5·6
L13	2nd I.F. transformer	Pri.	5·6
L14	2nd I.F. transformer	Sec.	5·6
L15	H.F. choke		55·0
L16	Rect. diode H.F. choke		500·0
L17	Speaker field		1500·0
L18	Speaker speech coil		4·7
T1	Speaker input trans.	Pri.	400·0
T1	Speaker input trans.	Sec.	0·25
T2	Mains trans.	Pri. total	31·0
T2	Mains trans.	Heater sec.	0·12
T2	Mains trans.	Lamp sec.	0·3
T2	Mains trans.	Rect. L.T. sec.	0·16
T2	Mains trans.	H.T. sec.	660·0
S1-S5	Waveband switches, ganged		—
S6	Tone control switch		—
S7	Mains switch (ganged R12)		—

VALVE ANALYSIS

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
V1 AC/TP*	274	8·0	200	2·5
V2 AC/VP1	274	9·0	195	2·5
V3 AC2/PenDD	260	31·0	274	6·0
V4 UU60/250	330†	—	—	—

*Osc. anode (triode), 110 V 1·5 mA. †Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S5** are the ganged wave-change 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.

S6 is the Q.M.B. tone control switch, at the rear of the chassis. **S7** 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.

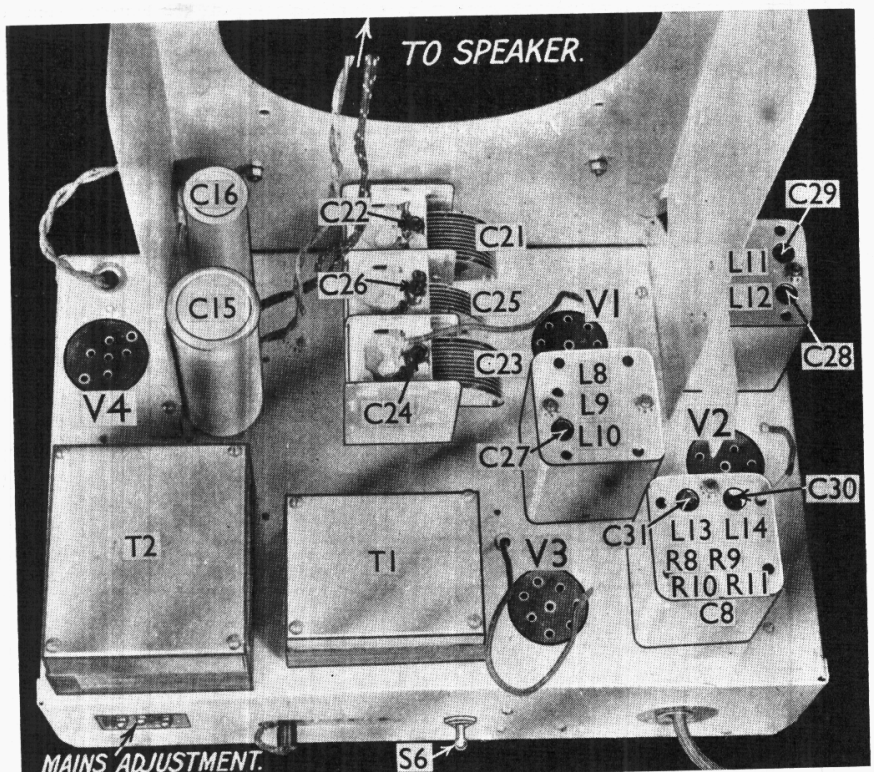
If a coil becomes faulty it will probably be best to remove and replace the whole unit, as it is a little difficult (though not impossible) to remove the cans and leave the coils in position. The coil leads are colour coded, and notes should be taken of the connections before removing.

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 unit.

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. V1 has a 9-socket valve-holder.

Sets with a serial number below S3400 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 V1.—This is an AC/TP triode-pentode 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 50 μF dry electrolytic type, and should it need replacing, the correct polarity must be observed.

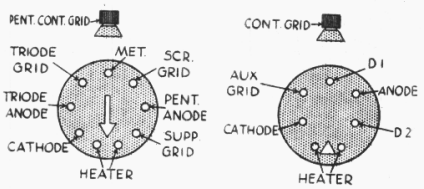
Coil L5.—Note that this has one end connected to earth, but the other end is free.

CIRCUIT ALIGNMENT

The following instructions for ganging the receiver are issued by the makers :

A. 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.

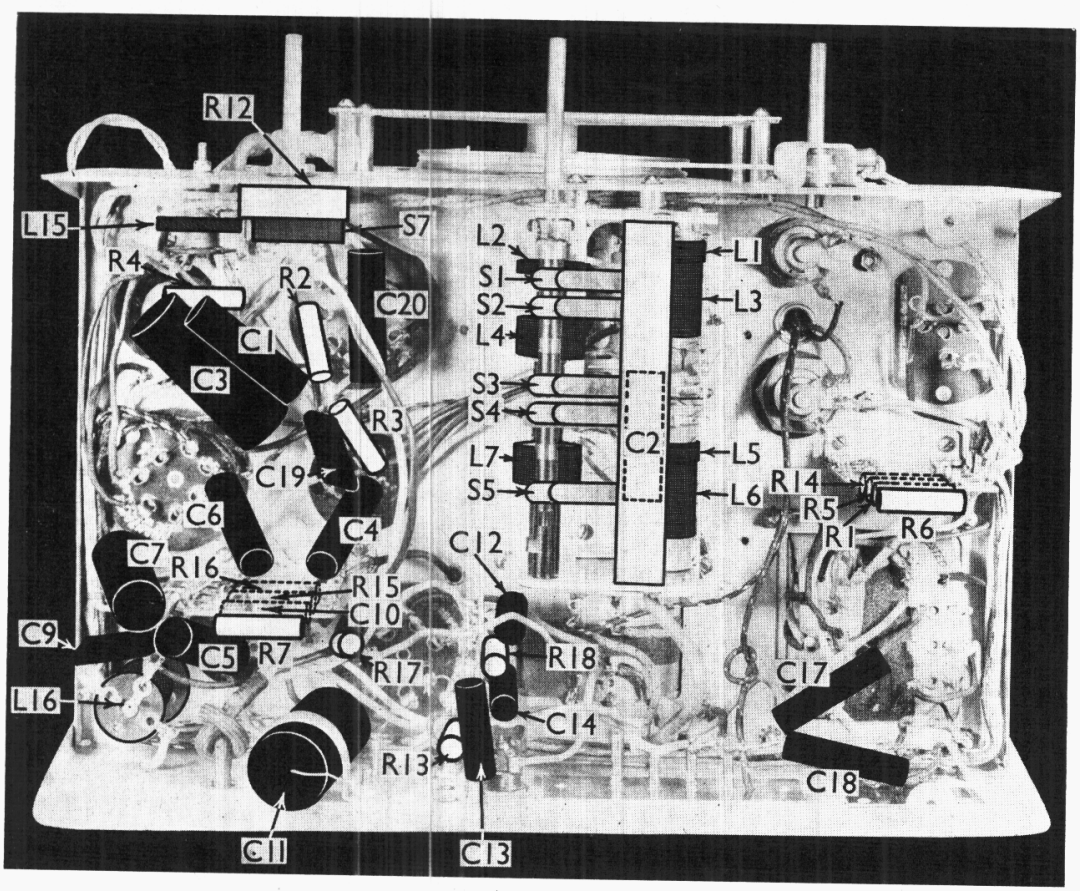
B. Where a local signal generator is available.

Set the short hand of the scale pointer to cover the dot on the immediate left-hand 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.

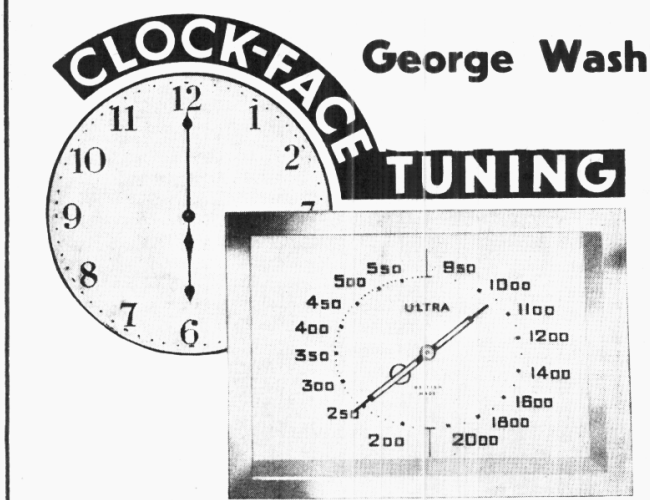
Set the signal generator to 200 metres and the tuning control to this position on scale. Adjust trimmers **C26, C22, C24** respectively until the peak signal is reached. If a heterodyne whistle is noted just above the London Regional station, re-trim **C22** and **C24** until it disappears.

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



Under-chassis view. The rectangular screen over the band - pass coils and switch unit has been removed. C2 is beneath the 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.

Things Not Yet Copied: No. 3



George Washington never told a lie . . .

George Washington born 1732: died 1799

ULTRA Invented Clock-Face Tuning

Announcement of: Ultra Electric Ltd., Chalk Farm, London, N.W.3