

NUMBER SIXTY-SIX

'TRADER' SERVICE SHEETS

ULTRA MODEL 25 3-VALVE A.C. SUPERHET

THE Ultra Model 25 receiver is an A.C. superhet employing three valves (plus valve rectifier). The frequency changer is a triode-pentode, while the third valve is a double diode output pentode. A neon tuning indicator is fitted, and there is provision for connection of a pick-up, and an external speaker.

Both table and console models are available, the differences in the latter being the subject of a paragraph in "General Notes."

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1**, **L2** to inductively coupled band-pass filter. Primary **L3**, **L4**, tuned by **C23**; secondary **L6**, **L7** tuned by **C25**; image suppression by coil **L5**.

First valve is a triode-pentode (**V1**, Mazda metallised AC/TP) operating as frequency changer with cathode injection. Triode section forms separate oscillator with anode coils **L10**, **L11** tuned by **C28**, and coupling coils **L8**, **L9** in common cathode circuit. Tracking by specially shaped condenser plates and fixed condenser **C7** (L.W.).

Second valve, a variable-mu H.F. pentode (**V2**, Mazda metallised AC/VP1) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L12**, **L13** and **L14**, **L15**.

Intermediate frequency 456 KC/S.

Neon tuning indicator in anode H.T. feed circuit to **V2**.

Diode second detector forms part of double-diode output pentode (**V3**, Mazda metallised AC2/PenDD). Second diode, fed from **V2** anode by condenser **C17**, provides D.C. potential which is developed across load resistances **R21**, **R22**, and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along cathode resistances **R19**, **R20**.

Audio-frequency output from signal diode is developed across load resistance **R14** and passed via coupling condenser **C13**, switch **S7**, manual volume control **R15**, and I.F. stopper **R16**, to control grid of **V3** pentode section. Fixed tone compensation in anode circuit by im-

pedance-limiting filter **R17**, **C16**, and fixed condenser **C15**. Two-point tone control by condenser **C14** and **S8**. Provision for connection of low resistance external speaker across secondary of output transformer **T2**. Plug and socket device enables internal speaker to be cut out. Special 1:8 transformer **T1** enables output from any normal gramophone pick-up to be stepped-up for feeding directly into **V3** pentode section, via switch **S6** and volume control **R15**.

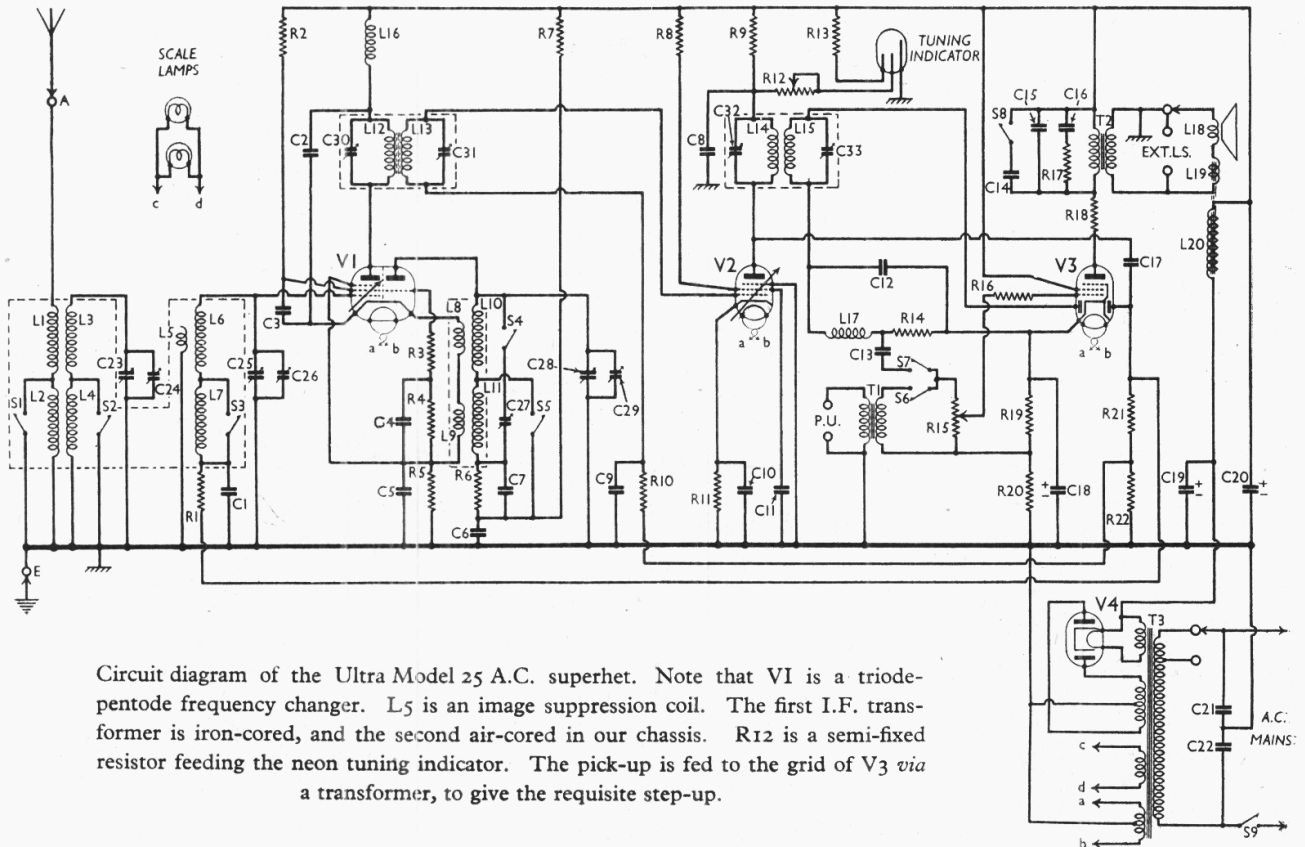
H.T. current is supplied by full-wave rectifying valve (**V4**, Mazda UU3).

Smoothing by speaker field winding **L20** and electrolytic condensers **C19**, **C20**. Mains disturbance suppression by condensers **C21**, **C22**.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the back (six wood screws and washers) and the three control knobs (recessed grub screws). Remove the flat wooden strip holding top of chassis against cabinet front. Remove the four bolts (with large washers) holding the chassis. The chassis and the speaker may now be withdrawn as a complete unit. *When replacing the control knobs*, turn the switch to the gramophone (furthest clockwise) position and see that the letter "G" on the switch knob is uppermost.

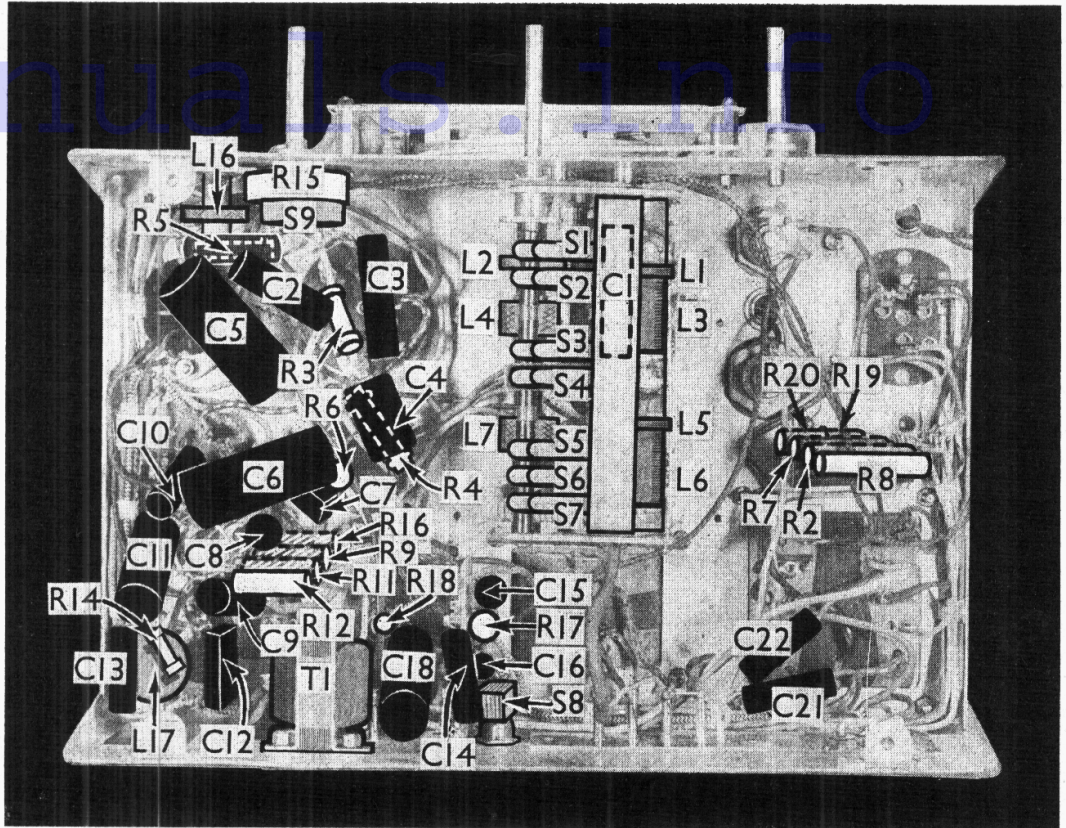
Removing Speaker.—Since the speaker is held to the chassis extension by four countersunk-head screws (each with a



Circuit diagram of the Ultra Model 25 A.C. superhet. Note that V1 is a triode-pentode frequency changer. L5 is an image suppression coil. The first I.F. transformer is iron-cored, and the second air-cored in our chassis. R12 is a semi-fixed resistor feeding the neon tuning indicator. The pick-up is fed to the grid of V3 via a transformer, to give the requisite step-up.

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Under - chassis view. The rectangular screen over the signal frequency coils and the switch unit has been removed. R19 and R20 are formed by a single centre - tapped resistance in our chassis, but may be separate in others, in which case R19 will be found beneath C14. R12 is a semi-fixed resistance in our chassis, but may be a fixed one in others. (See General Notes.)



washer, spring washer, nut and lock nut), it will be necessary to remove the chassis before the speaker can be removed. Unsolder leads to speaker terminal panel, when the speaker can be removed by withdrawing the securing bolts. When replacing, see that the terminal leads as at the top and re-connect the leads as follow, numbering the tags from left to right: —1, black; 2, yellow; 3, green-black; 4, blank; 5, red.

COMPONENTS AND VALUES

Condensers		Values (μF)
C1	V1 pent. cont. grid decoupling	0.05
C2	V1 pent. anode decoupling	0.1
C3	V1 pent. S.G. by-pass	0.1
C4	V1 triode grid condenser	0.0002
C5	V1 cathode by-pass	0.5
C6	V1 triode anode decoupling	0.5
C7	Oscillator L.W. tracker	0.5
C8	V2 anode decoupling	0.004
C9	V2 cont. grid decoupling	0.1
C10	V2 cathode by-pass	0.05
C11	V2 S.G. by-pass	0.1
C12	V2 anode decoupling	0.5
C13	I.F. by-pass	0.0002
C14	L.F. coupling to V3 pentode	0.01
C15	Tone control condenser	0.01
C16	Fixed tone compensator	0.001
C17	Part of tone comp. filter	0.01
C18	Coupling to V3 A.V.C. diode	0.0002
C18*	V3 cathode by-pass	50.0
C19*	H.T. smoothing	8.0
C20*	H.T. smoothing	16.0
C21	Mains interference suppressors	0.01
C22	Mains interference suppressors	0.01
C23	Band-pass primary tuning	—
C24	Band-pass primary trimmer	—
C25	Band-pass secondary tuning	—
C26	Band-pass secondary trimmer	—
C27	Oscillator L.W. trimmer	—
C28	Oscillator tuning	—
C29	Oscillator trimmer	—
C30	1st I.F. trans. pri. tuning	—
C31	1st I.F. trans. sec. tuning	—
C32	2nd I.F. trans. pri. tuning	—
C33	2nd I.F. trans. sec. tuning	—

* Electrolytic. * Pre-set.

Resistances		Values (ohms)
R1	V1 pent. cont. grid decoupling	1,000,000
R2	V1 pent. S.G. H.T. feed	25,000
R3	V1 harmonic suppressor	1,000
R4	V1 triode grid resistance	50,000
R5	V1 fixed G.B. resistance	480
R6	L.W. tracker by-pass	4,000
R7	V1 triode anode decoupling	80,000
R8	V2 S.G. H.T. feed	30,000
R9	V2 anode decoupling	12,000
R10	V2 cont. grid decoupling	1,000,000
R11	V2 fixed G.B. resistance	165
R12	Neon T.I. feed resistance	40,000
R13	Neon T.I. exciter resistance	2,000,000
R14	V3 signal diode load	500,000
R15	Manual volume control	1,000,000
R16	V3 cont. grid I.F. stopper	1,000
R17	Part of tone comp. filter	15,000
R18	V3 anode circuit stabiliser	60
R19	V3 G.B. and A.V.C. delay	138
R20	volume resistances	138
R21	V3 A.V.C. diode load	250,000
R22	V3 A.V.C. diode load	750,000

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	Image suppression coil	1.3
L6	Band-pass secondary coils	4.7
L7	Band-pass secondary coils	11.3
L8	Oscillator coupling coils, total	1.2
L9	Oscillator coupling coils, total	1.2
L10	Oscillator tuning coils	8.5
L11	Oscillator tuning coils	4.0
L12	1st I.F. transformer	4.2
L13	1st I.F. transformer	4.2
L14	2nd I.F. transformer	5.6
L15	2nd I.F. transformer	5.6
L16	V1 pent. anode choke	55.0
L17	I.F. choke	110.0
L18	Speaker speech coil	3.7
L19	Hum neutralising coil	0.15
L20	Speaker field winding	1,500.0

Other Components (Cont'd.)		Values (ohms)
T1	Pick-up transformer	{ Pri. 100.0 Sec. 1,400.0
T2	Output transformer	{ Pri. 400.0 Sec. 0.25
T3	Mains trans.	{ Pri. total 31.0 Heater sec. 0.12 Lamp sec. 0.3 Rect. heat sec. 0.16 H.T. sec. 660.0
S1-S5	Waveband switches	—
S6, S7	Radio-gram. changeover switches.	—
S8	Tone control switch	—
S9	Mains switch, ganged R15	—

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured with the receiver operating on 225 V mains, with no signal input and with the volume control at maximum. Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 AC/TP*	255	7.7	185	2.45
V2 AC/VP1	135	8.8	180	1.95
V3 AC/2Pen/DD	240	31.0	250	6.75
V4 UU3	315†	—	—	—

* Osc. anode (G2) 75 V, 1.65 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S7 are the wavechange and radio-gram. switches, mounted in a single unit beneath the chassis. They, and the signal frequency coils, are

(Continued overleaf)

ULTRA 25 (Contd.)

covered by a rectangular metal screening box, held to the chassis by four self-tapping screws. This screen has been removed in our under-chassis view to show the switches and coils. The switches are clearly indicated, and the following table gives their settings for the M.W., L.W. and Gram. positions. O indicates open, and C closed.

Position	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇
M.W. . . .	C	C	C	O	C	O	C
L.W. . . .	O	O	O	C	O	O	C
Gram. . . .	O	O	O	O	C	C	O

S8 is the Q.M.B. tone switch at the rear of the chassis which is closed when depressed. **S9** is the Q.M.B. mains switch, ganged with the volume control **R15**.

Coils.—The signal frequency coils **L1-L7**, with the switches, are enclosed in a rectangular screening box beneath the chassis. These coils are wound on two formers, the M.W. coils being on one, and the L.W. on the other.

On top of the chassis there are three screened units, one for the oscillator coils **L8-L11** and two for the two I.F. transformers, **L12, L13** and **L14, L15**. The various trimmers are reached through holes in the tops of the screens.

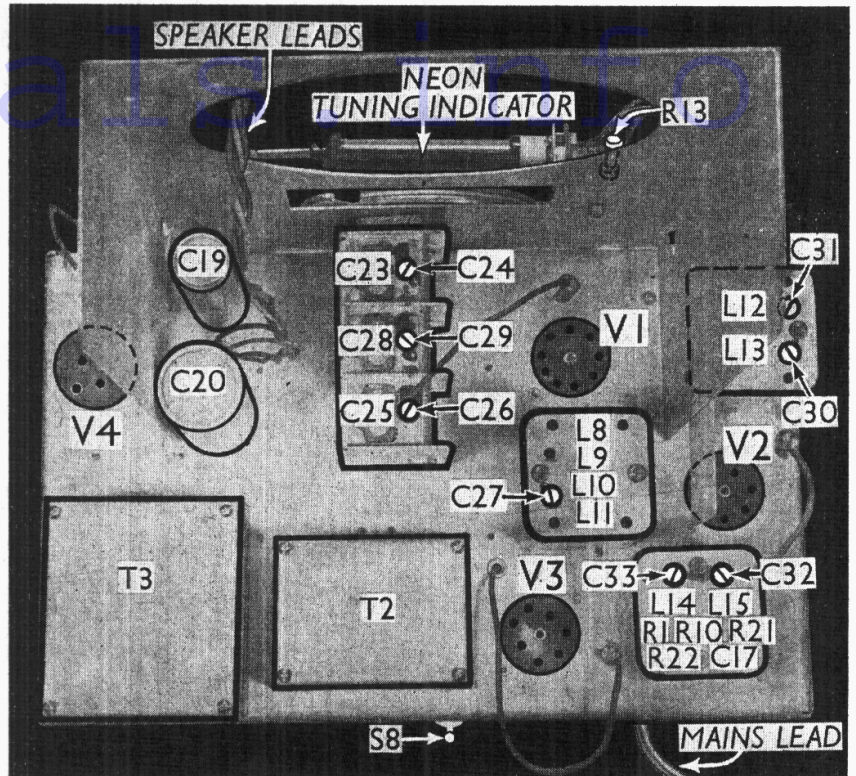
In the case of the second I.F. transformer, **L14, L15**, this unit also contains **C17**, and **R1, R10, R21, R22**. To get at these, the screen must be removed (two nuts beneath chassis, and two on top of screen). The resistances may be identified by their colour coding except that two of them, **R1** and **R10**, have the same value (1 M Ω). In chassis above No. A7000 approx., **R10** is the resistance mounted horizontally at the bottom of the unit, the other resistances being arranged vertically. Early chassis had a slightly different arrangement of the components inside the screen, the two coils being mounted with their axes horizontal, as in the case of the **L12, L13** unit.

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Plan view of the Ultra 25 chassis, with the speaker removed. Note the position of **R13**. The second I.F. transformer screening box contains, in addition to the coils and trimmers, a fixed condenser and four resistances.

It would appear that the coils mounted with horizontal axes are iron-cored, which accounts for the lower D.C. resistance of the first I.F. transformer coils in our chassis.

Scale Lamps.—Two Osram M.E.S. types, rated at 4.5 V, 0.3 A are employed.

External Speaker.—This should be of the low resistance type. An Ultra "Imp" P.M. M.C. model, Type S, is recommended.

Resistances R19, R20.—In our chassis, these are formed of a single unit, centre tapped. In earlier models, they may be separate, **R20** remaining where **R19, R20** are shown in our under-chassis view, and **R19** being removed to the left side of the vertical panel near the tone control switch **S8**.

Resistances R12, R11, R9, R16.—The arrangement of these resistances in our under-chassis view are as found in our chassis, **R12**, the neon T.I. feed resistance being at the top. It is a semi-fixed type, a metal band being used for adjustment. Earlier models may have **R11** at the top, **R9** next and then **R12**. In these cases, **R12** may have been a fixed 30,000 Ω resistance.

Condenser C8.—This has a value of 0.1 μ F in our chassis, but in original production models it may be 0.002 μ F.

Console Models.—These are fitted with a 10 in. speaker, and certain of the component values are altered. In the case of **T2**, the output transformer, the resistances are: Primary, 385 Ω , Secondary, 0.2 Ω . The mains transformer **T3** has a different H.T. secondary, with a total resistance of 770 Ω . The speaker

field is 3,000 Ω , and the total resistance of the speaker speech and hum bucking coils is 4.0 Ω .

RECEIVER ALIGNMENT

A. Where a signal generator is not available.—Set the short hand to cover the short line on the M.W. side before the "12 o'clock" position with the tuning condenser at maximum. Tune to a station near the bottom of the M.W. band, and adjust **C29** for maximum volume. Now tune in a weak signal at about 350 m. and adjust **C24** and **C26** for maximum volume. Switch receiver to L.W. and tune in a weak signal at about 1,500 m. Now adjust **C27** for maximum volume.

The I.F. trimmers **C30, C31, C32** and **C33** may also need slight re-adjustment for maximum volume.

B. Where a signal generator is available.—Set the short hand of pointer to cover the short line on the immediate L.H. side of the "12 o'clock" position with the condenser at maximum on the M.W. range. Line up the I.F. transformers at 456 KC/S, adjusting the trimmers **C30-C33** in order. As the trimmers come into line the volume will increase, and the input should be progressively reduced.

Now set the generator to 200 m. and the tuning condensers to this position on the scale. Adjust **C29, C24** and **C26** for maximum output. If a heterodyne whistle is noted just above London Regional, re-trim **C24** and **C26** until it disappears. Set generator to 1,500 m., tune set to this position on scale, and adjust **C27** for maximum output.