

'TRADER' SERVICE SHEET

171

ULTRA 103

4-VALVE BATTERY SUPERHET

A BATTERY-OPERATED superhet chassis employing four valves is incorporated in the Ultra 103 receiver, the frequency changer being a triode-pentode.

CIRCUIT DESCRIPTION

Aerial input via variable potentiometer control **R1** and coupling coils **L1, L2** to inductively coupled band-pass filter. Primary **L3, L4** tuned by **C19**; secondary **L6, L7** tuned by **C21**.

First valve (**V1, Mazda metallised TP22**) is a triode-pentode operating as frequency changer with cathode injection. Oscillator anode coils **L10, L11** are tuned by **C23**; parallel trimming by **C24** (M.W.) and **C25** (L.W.); tracking by shaped tuning condenser plates and fixed series condenser **C6** (L.W.); oscillator coupling coils **L8, L9** are in filament circuit.

Single variable-mu pentode intermediate frequency amplifier (**V2, Mazda metallised VP210**) operates with tuned-primary tuned-secondary transformer couplings **C26, L13, L14, C27** and **C28, L15, L16, C29**.

Intermediate frequency 456 KC/S.

Diode second detector is part of double diode triode valve (**V3, Mazda metallised L21 DD**). Audio-frequency component in rectified output is developed across I.F. manual volume control **R8** (ganged with aerial input control **R1**), and passed via coupling condenser **C10** to C.G. of triode section which operates as L.F. amplifier. I.F. filtering by choke **L17** and by-pass condensers **C9** and **C12**.

Second diode of **V3**, fed from **V2** anode via condenser **C11**, provides D.C. potential which is developed across load resistance

R12 and fed back through decoupling circuit **R9, C4** as G.B. to F.C. and I.F. valves giving automatic volume control.

Parallel-fed transformer coupling by **R11, C13** and **T1** between **V3** triode and double pentode output valve (**V4, Mazda QP230**) which operates on quiescent push-pull system.

A.V.C. delay voltage and G.B. voltages for **V3** and **V4** are obtained automatically from drop along resistances **R15, R16** in common H.T. negative line.

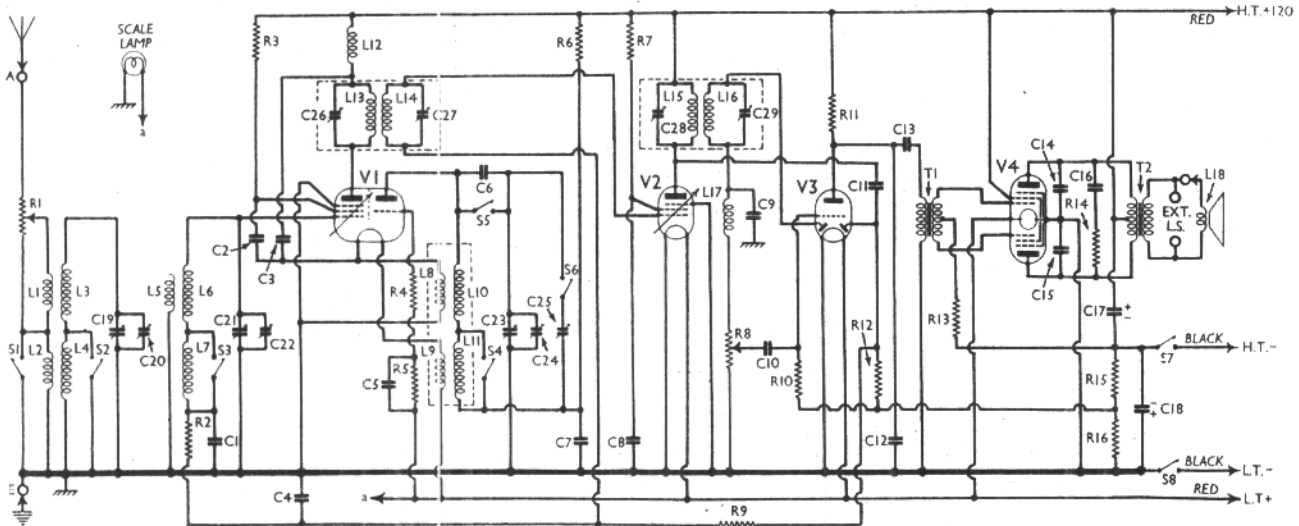
COMPONENTS AND VALUES

CONDENSERS	Values (μF)
C1	V1 pent. C.G. decoupling .. 0.05
C2	V1 pent. S.G. by-pass .. 0.1
C3	V1 pent. anode decoupling .. 0.1
C4	A.V.C. line decoupling .. 0.05
C5	V1 osc. C.G. condenser .. 0.0002
C6	Oscillator L.W. tracker .. 0.0003
C7	V1 osc. anode decoupling .. 0.1
C8	V2 S.G. by-pass .. 0.1
C9	I.F. by-pass .. 0.0001
C10	L.F. coupling to V3 triode .. 0.01
C11	Coupling to V3 A.V.C. diode .. 0.0002
C12	V3 triode anode I.F. by-pass .. 0.0001
C13	L.F. coupling to T1 .. 0.15
C14	— .. 0.002
C15	— .. 0.002
C16	Tone correction condensers .. 0.004
C17*	H.T. supply reservoir .. 8.0
C18*	Auto G.B. circuit by-pass .. 50.0
C19†	Band-pass primary tuning .. —
C20†	Band-pass primary trimmer .. —
C21†	Band-pass secondary tuning .. —
C22†	Band-pass secondary trimmer .. —
C23†	Oscillator circuit tuning .. —
C24†	Osc. circuit M.W. trimmer .. —
C25†	Osc. circuit L.W. trimmer .. —
C26†	1st I.F. trans. pri. tuning .. —
C27†	1st I.F. trans. sec. tuning .. —
C28†	2nd I.F. trans. pri. tuning .. —
C29†	2nd I.F. trans. sec. tuning .. —

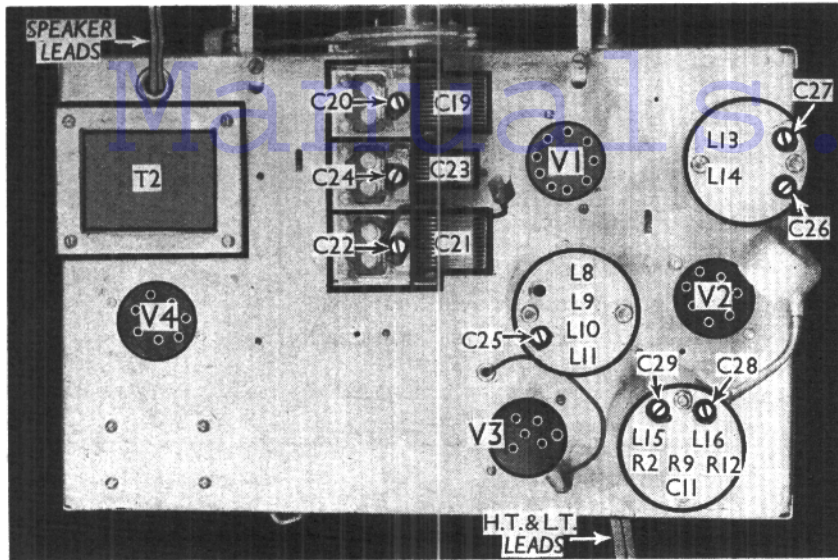
* Electrolytic. † Variable. ‡ Pre-set.

RESISTANCES	Values (ohms)
R1	Aerial input control .. 2,000
R2	V1 pent. C.G. decoupling .. 1,000,000
R3	V1 pent. S.G. H.T. feed .. 200,000
R4	V1 osc. harmonic suppressor .. 1,000
R5	V1 osc. C.G. resistance .. 250,000
R6	V1 osc. anode decoupling .. 2,000
R7	V2 S.G. H.T. feed .. 100,000
R8	V3 signal diode load .. 500,000
R9	A.V.C. line decoupling .. 1,000,000
R10	V3 triode C.G. resistance .. 2,000,000
R11	V3 triode anode resistance .. 50,000
R12	V3 A.V.C. diode load .. 1,000,000
R13	V4 C.G.'s stabiliser .. 150,000
R14	Tone correction resistance .. 30,000
R15	— .. 685
R16	Auto G.B. resistances .. 115

OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coils .. 1.5
L2	— .. 48.3
L3	Band-pass primary coils .. 4.7
L4	— .. 11.3
L5	L6 loading coil .. 1.3
L6	Band-pass secondary coils .. 4.7
L7	— .. 11.3
L8	Oscillator coupling coils .. Very low
L9	— .. Very low
L10	Oscillator tuning coils .. 8.5
L11	— .. 4.0
L12	V1 pent. anode H.F. choke .. 55.0
L13	1st I.F. trans. Pri. .. 5.6
L14	— Sec. .. 5.6
L15	2nd I.F. trans. Pri. .. 5.6
L16	— Sec. .. 5.6
L17	I.F. filter choke .. 500.0
L18	Speaker speech coil .. 2.6
T1	Intervolve trans. Pri. .. 1,240.0
	— Sec. total .. 2,480.0
T2	Output trans. Pri. total .. 510.0
	— Sec. .. 0.23
Sr-S6	Waveband switches .. —
S7	H.T. circuit switch } ganged R1 .. —
S8	L.T. circuit switch } and R8 .. —



Circuit diagram of the Ultra 103 4-valve battery superhet. Automatic grid bias is provided. L5 is a loading coil for L6.



Plan view of the chassis. Note that the second I.F. transformer contains a number of components in addition to its trimmers.

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (four counter-sunk-head wood screws) gives access to most of the under-chassis components.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, remove the three control knobs (recessed grub screws) and the three bolts (with claw washers) holding the chassis to the bottom of the cabinet. The chassis can then be withdrawn to the extent of the speaker leads, which is adequate for normal purposes.

Removing Speaker.—To remove the speaker from the cabinet, remove two of the clamps (nuts and spring washers) holding the speaker to the sub-baffle and slacken the other. When replacing, see that the tags for the connections to the chassis are on the left.

VALVE ANALYSIS

Valve voltages and currents, given in the table below, are those measured in our receiver when it was operating on a new H.T. battery reading 128 V. 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 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TP22*	118	1.1	45	0.3
V2 VP210	118	2.1	60	0.6
V3 L21/DD	60	1.0	—	—
V4 QP230	118†	1.9†	118	0.9

* Oscillator anode, 110 V, 1.3 mA.
† Each anode.

GENERAL NOTES

Switches.—S1-S6 are the waveband switches, ganged together in a single unit beneath the chassis, and indicated in our under-chassis view. All the switches, with the exception of S6 are closed on

the M.W. band, and open on the L.W. band. S6 is open on the M.W. band and closed on the L.W. band.

S7 and S8 are the H.T. and L.T. circuit switches, of the Q.M.B. type, ganged with the dual volume control R1, R8.

Coils.—L1-L7 are beneath the chassis, mounted on two tubular formers below the switch unit. The M.W. coils are on one former, and the L.W. ones on the other. L1 is wound over L3, and L5 over L6.

L8-L11, and the I.F. transformers L13, L14 and L15, L16 are in three screened units on the chassis deck, which contain the associated trimmers. The second I.F. transformer also contains C11, R2, R9 and R12.

L12 and L17 are two H.F. chokes, beneath the chassis.

Scale Lamp.—This is an Osram M.E.S. type, with a small bulb, and is rated at 3.5 V, 0.15 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low resistance (about 30) external speaker.

Batteries.—L.T., Exide CZH3 30 AH celluloid-cased 2 V cell. H.T., Drydex H1132 120 V H.T. battery. Automatic grid bias is employed.

Battery Leads and Voltages.—Black rubber lead, spade tag, L.T. negative; Red rubber lead, spade tag, L.T. positive 2 V; Black lead and plug, H.T. negative; Red lead and plug, H.T. positive 120 V.

Resistances R2, R9, R12.—These are all 1 MO resistances, and are included in the second I.F. transformer, with C11. If the coil can is removed, then looking from above the chassis, the horizontal resistance is R2, that vertically above it is R9, while R12 is also vertical, but below C11.

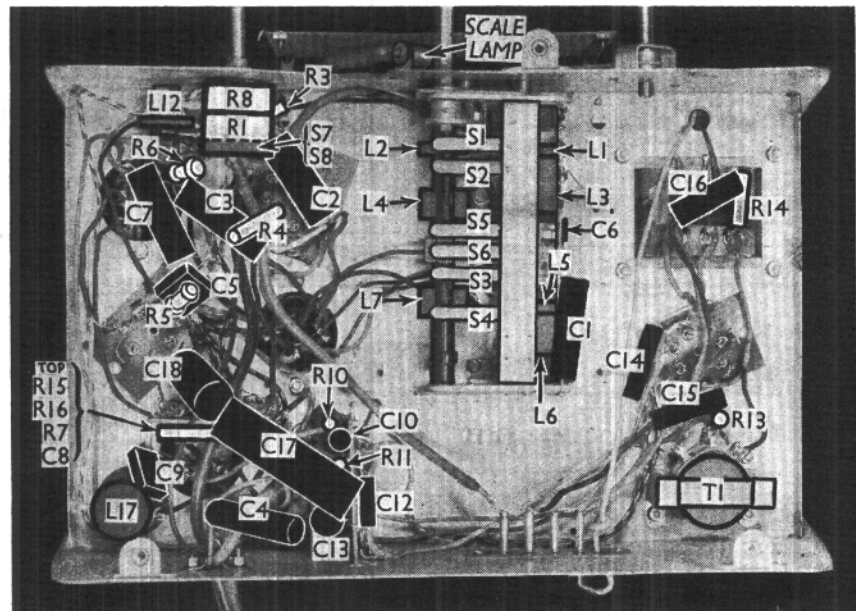
CIRCUIT ALIGNMENT

Set pointer to cover the horizontal line at the higher wavelength end of the scale, above the 2,000 m. mark when the gang condenser is at maximum. The pointer is a friction fit on the spindle.

I.F. Stages.—Feed in a 456 KC/S signal, and adjust C29, C28, C27 and C26 for maximum output, reducing the input progressively.

H.F. and Oscillator Stages.—Feed in a 200 m. signal, switch set to M.W., and adjust pointer to 200 m. on the scale. Adjust C24, C20 and C22 for maximum output. If a heterodyne whistle is noticed just above London Regional, re-adjust C20 and C22 until it disappears.

Feed in a 1,500 m. signal, switch set to L.W., and adjust pointer to 1,500 m. on scale. Adjust C25 for maximum output.



Under-chassis view. The switches are all clearly marked, the coils L1-L7 being beneath them. The screen has been removed from the coil and switch assembly.