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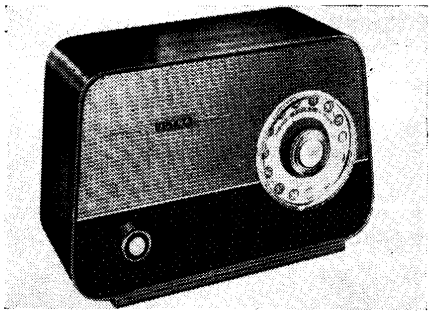
"TRADER" SERVICE SHEET

1395

ULTRA FM950

"Troubadour" F.M. Receiver



Appearance of the Ultra FM950.

DESIGNED to operate from A.C. or D.C. mains of 200-250V, 40-100c/s in the case of A.C., the Ultra FM950 Troubadour receiver covers the F.M. range only in Band II, its tuning range being 87.5-101Mc/s. An internal aerial is run round the back cover, but provision is made for the connection of an external aerial, with a "parking" socket for the internal aerial plug. Sockets are provided for an external speaker. The Troubadour A.M. model U960, although of somewhat similar appearance, is not covered, as it uses an entirely different circuit.

Release date and original price: September 1957, £10 19s. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Input via aerial coupling transformer **L1, L2** is applied to cathode of earthed grid R.F. amplifying valve **V1a** and passed on from its anode circuit, which is permeability tuned by **L3** and associated capacitors, to control grid circuit of oscillator valve **V1b,** to which it is coupled via **C6** and **C7.**

V1b operates as self-oscillating additive mixer, its frequency being determined by the tuning circuit **L4, C6, C7, C8,** in which the coil is permeability tuned, as is **L3,** and the cores of the two coils are ganged. Reaction coupling is provided by **L5** via **C9.**

The desired intermediate frequency is selected by I.F. transformer **L6, L7** in **V1b** anode circuit, and passed to two-stage I.F. amplifier **V2, V3,** whose tuning circuits comprise the intervalve transformer **L8, L9** and discriminator transformer **L10, L11, L12.**

Negative feed-back coupling between anode and screen grid circuits by **C18** and **C23** helps to ensure stability. On strong signals **V3** operates as a limiter, and grid current flowing through **R8**

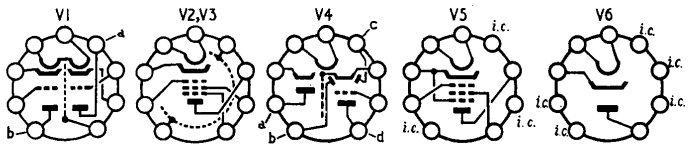
(*Continued overleaf col.* 1)

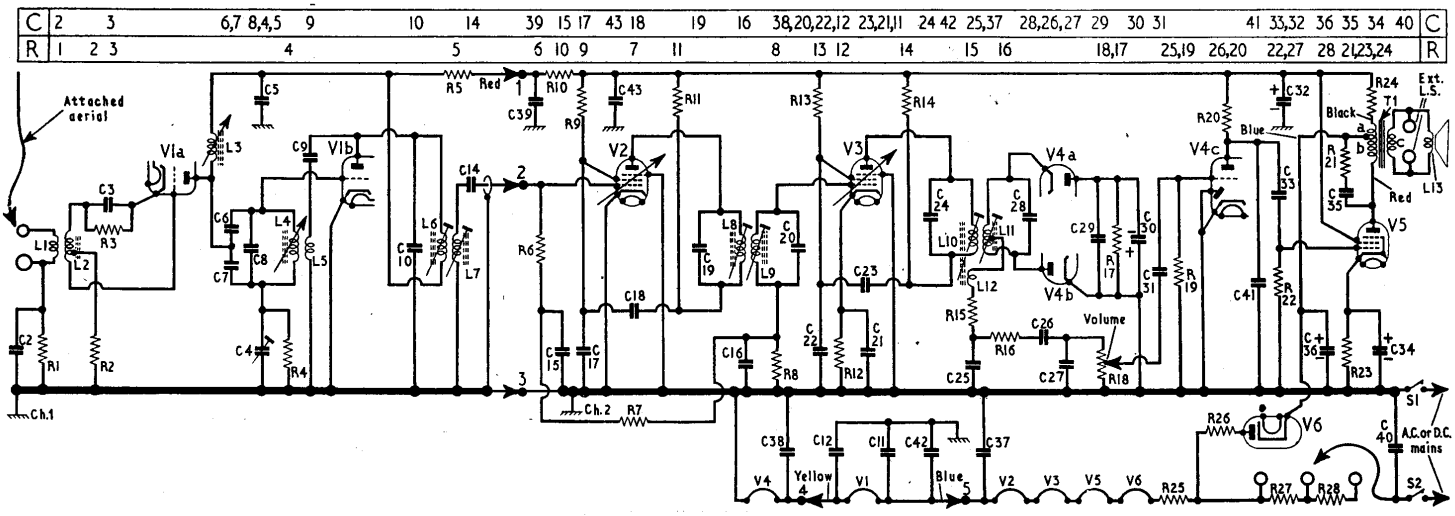
COMPONENT VALUES AND LOCATIONS

Resistors		
R1	1·5MΩ	D3
R2	56Ω	A1
R3	150Ω	A1
R4	1MΩ	D3
R5	1·2kΩ	D3
R6	47kΩ	A2
R7	1MΩ	A2
R8	10kΩ	A2
R9	22kΩ	A2
R10	330Ω	A1
R11	2·2kΩ	A2
R12	68Ω	A2
R13	22kΩ	B2
R14	2·2kΩ	B2
R15	68Ω	B2
R16	10kΩ	B1
R17	47kΩ	B1
R18	0·5MΩ	C2
R19	4·7MΩ	C1
R20	220kΩ	C1
R21	6·8kΩ	B2
R22	470kΩ	C2
R23	470Ω	C2
R24	1kΩ	B2
R25	300Ω	C1
R26	100Ω	C1
R27	96Ω	C1
R28	100Ω	C1
Capacitors		
C1†	—	—
C2	0·001μF	D3
C3	0·001μF	A1
C4	30pF	D3
C5	820pF	D3
C6	10pF	D3
C7	10pF	D3
C8	14pF	D3
C9	15pF	D3
C10	10pF	D3
C11	0·003μF	D3
C12	0·003μF	D3
C13†	—	—
C14	680pF	D3
C15	0·001μF	A2
C16	0·002μF	A2
C17	0·01μF	A1
C18	0·003μF	A2
C19	27pF	A2
C20	27pF	A2
C21	0·01μF	A2
C22	0·003μF	B1
C23	0·003μF	B1
C24	10pF	B2
C25	400pF	B1
C26	0·04μF	B1
C27	0·01μF	C1
C28	56pF	B2
C29	0·001μF	B1
C30	5μF	B2
C31	0·005μF	C2
C32	50μF	B2
C33	0·03μF	C2
C34	25μF	C2
C35	0·04μF	B2
C36	50μF	B2
C37	0·01μF	A1
C38	0·01μF	B2
C39	0·01μF	B1
C40	0·001μF	C1
C41	200pF	C1
C42	0·003μF	D3
C43	0·01μF	B1
Coils*		
L1	—	A1
L2	—	A1
L3	—	D3
L4	—	D3
L5	—	D3
L6	—	D3
L7	—	D3
L8	—	A2
L9	—	A2
L10	—	B2
L11	—	B2
L12	—	B2
L13	3·0	—
Miscellaneous*		
T1 a	7·0	—
T1 b	250·0	—
T1 c	—	—
S1, S2	—	C2

**Approximate D.C. resistance in ohms.*
†*Not included.*

Diagrams of the valve base connections as seen from the free ends of the pins.





Circuit diagram of the Ultra FM950. In this model the manufacturers have printed component numbers on the printed circuit panel. Therefore, in order to avoid possible confusion, the same numbering has been adopted in our diagram. A location key is provided at the top of the diagram.

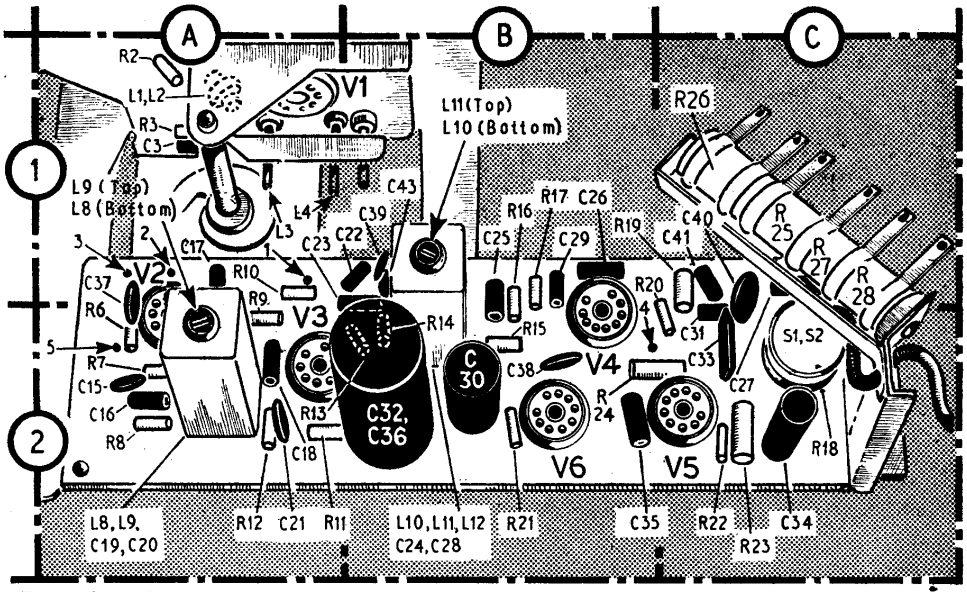
Circuit Description—*continued*

causes a voltage-drop, which is fed back as an A.G.C. potential to **V2**. Its operation is delayed by a bias of 1V developed across **R12**.

Intermediate frequency 10.7Mc/s.

Ratio detector comprises two of the diodes of **V4**, which is a triple-diode-triode valve. The two diodes **V4a, V4b** develop their D.C. output across **R17, C30,** while their A.F. output is developed across **C25**. It is then passed via de-emphasis network **R16, C26, C27** and volume control **R18** to the control grid of the triode section **V4c**. The third diode in **V4** is not used. G.B. for **V4c** is derived from the flow of grid current through **R19.**

Resistance - capacitance coupling by **R20, C33** and **R22** between **V4c** and output valve **V5**. H.T. current is supplied by I.H.C. half-wave rectifier **V6** and smoothed by **C36, R24, C32,** residual hum being neutralized by passing the H.T. current through section **a** of primary winding of output transformer **T1**. Provision is made for the connection of a low impedance external speaker to the insulated secondary winding **c** on **T1.**



Rear view of the chassis. The numbered arrows in location references A1, A2 and B2, show the points of inter-connection between the tuner unit and the printed circuit panel, and are also indicated in the circuit diagram overleaf.

CIRCUIT ALIGNMENT

Equipment Required.—An amplitude modulated signal generator that can be tuned to 10.7Mc/s and 94Mc/s, with 30 per cent modulation; an output meter, which should be connected to the external speaker sockets; a valve voltmeter or diode probe; a screwdriver-type trimming tool.

Release chassis as described under "Dismantling," so as to gain access to cores and connections on printed circuit side of chassis. Turn volume control to maximum, but adjust it if necessary during alignment to prevent output reading from exceeding 300mW. Ensure that chassis is at neutral mains potential.

I.F. Stages.—Disconnect **C26** (B1) from top of volume control by unsoldering its lead from the printed circuit. Disconnect one end of the electrolytic capacitor **C30** (B2). Connect pin 2 of **V4** (B1) to top of volume control.

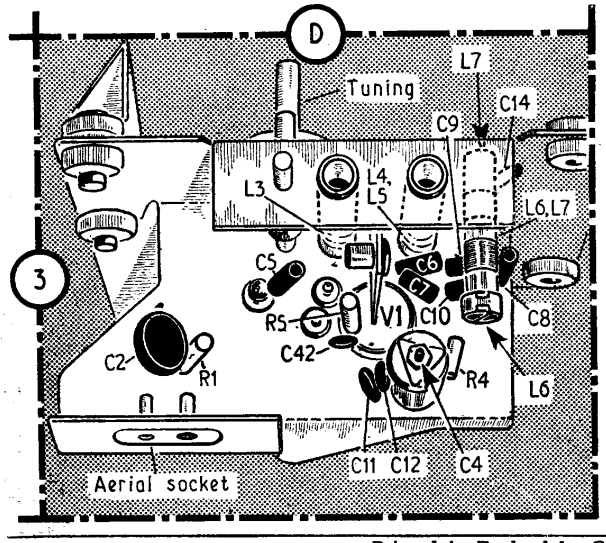
Feed in at **V3** control grid (pin 2) a 20mV modulated signal at 10.7Mc/s, and adjust **L10** and **L11** cores for maximum output. Transfer signal generator to pin 2 of **V2** (co-axial lead connection from tuner), reduce signal input to 1mV, adjust **L8** and **L9** for maximum output.

Remove temporary connection from top of volume control, and reconnect **C26** and **C30.** Reassemble chassis on baffle, and replace tuning pointer. Turn tuning spindle fully anti-clockwise, and pointer to low frequency end of scale (marked 88Mc/s).

Connect signal generator to aerial socket, tune it to 94Mc/s, and feed in a 100μV modulated signal. Fit transparent tuning knob to spindle, tune to 94Mc/s on scale.

Connect valve voltmeter (or diode probe) between **VIa** anode and chassis, and adjust the oscillator neutralizing capacitor **C4** for *minimum* reading on the valve voltmeter. The valve voltmeter may then be disconnected.

Still feeding in the 94 Mc/s signal, adjust the core of **L4** (A1) for maximum output. Then adjust the cores of **L3** (A1) and **L6, L7** (D3) for maximum output. Remove signal generator and output connections.



Plan view of the tuner unit. The cores of **L3** *and* **L4, L5** *are adjusted from the reverse side of the unit, and the adjustments are indicated in the illustration of the rear view of the chassis, in location reference A1.*

CHASSIS DIVERGENCIES

In some chassis there may be a 2.7kΩ resistor connected between the negative side of **C30** and pin 2 of **V4** (**V4a** anode), in which case it will be labelled on the chassis **R18.** In our receiver it was replaced by a wire link.

Whether **R18** is required or not depends upon the type of discriminator transformer, of which there are two. When **R18** is present, the A.F. load capacitor **C25** will be 100pF, with ±5 per cent tolerance, but when **R18** is omitted, as in our case, **C25** is 400pF, with ±2 per cent tolerance.

DISMANTLING

Place receiver face-down and remove the four self-tapping screws holding back cover, then withdraw back cover and cabinet surround;
remove large transparent tuning knob (grub screw), tuning pointer (pull-off), and volume control knob (pull-off);
remove three 4BA nuts (with washers) holding flanges at ends of chassis to baffle, and 4BA screw (with two large washers, a small washer, and a brass sleeve, passing through a rubber grommet) holding upper structure of chassis to brass pillar on baffle;
remove two self-tapping screws (with washers) from brackets at lower edge of baffle, holding rear cover support members to baffle, and swivel supports away, when chassis can be turned over within limits imposed by rather short speaker leads.
Better access can be gained by removing speaker from baffle (four 4BA nuts) to extent of external speaker leads.

VALVE ANALYSIS

Valve voltages given in the table below are those derived from the manufacturers' information. They were measured with a high resistance meter, chassis being the negative connection in every case.

Valve Table

Valve		Anode	Screen	Cath.
V1 UCC85	a	140	—	0·4
	b	140	—	—
V2 UF89 ..		138	78	—
V3 UF89 ..		138	78	1·0
V4c UABC80 ..		51	—	—
V5 UL84 ..		205	162	14·5
V6 UY85 ..		—	—	207·0[1]

[1]*Cathode current 71mA.*

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