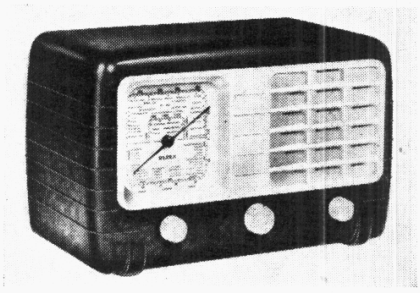
Supplement to The Wireless & Electrical Trader, May 1, 1948

"TRADER" SERVICE SHEET

859

ULTRA T401

THREE-BAND A.C. SUPERHET



The appearance of the Ultra T401 three-band A.C. superhet.

REMOVABLE tuning assemblies are a feature of the Ultra T401 3-valve (plus rectifier) 3-band A.C. superhet, designed to operate from A.C. mains of 200-260 V, 40-100 c/s. The S.W. range is 16-50 m.

Instructions for removing the tuning units are given under "Dismantling the Set" overleaf, and points of interconnection are shown in the circuit diagram and chassis illustrations. The plastic cabinet is supplied alternatively in a standard finish of brown and cream or in other colours instead of the brown.

An attached aerial is wound on the back of the receiver for use in temporary installations, a plug being provided for its connection to the aerial socket. It may be used wound or unwound, according to requirements.

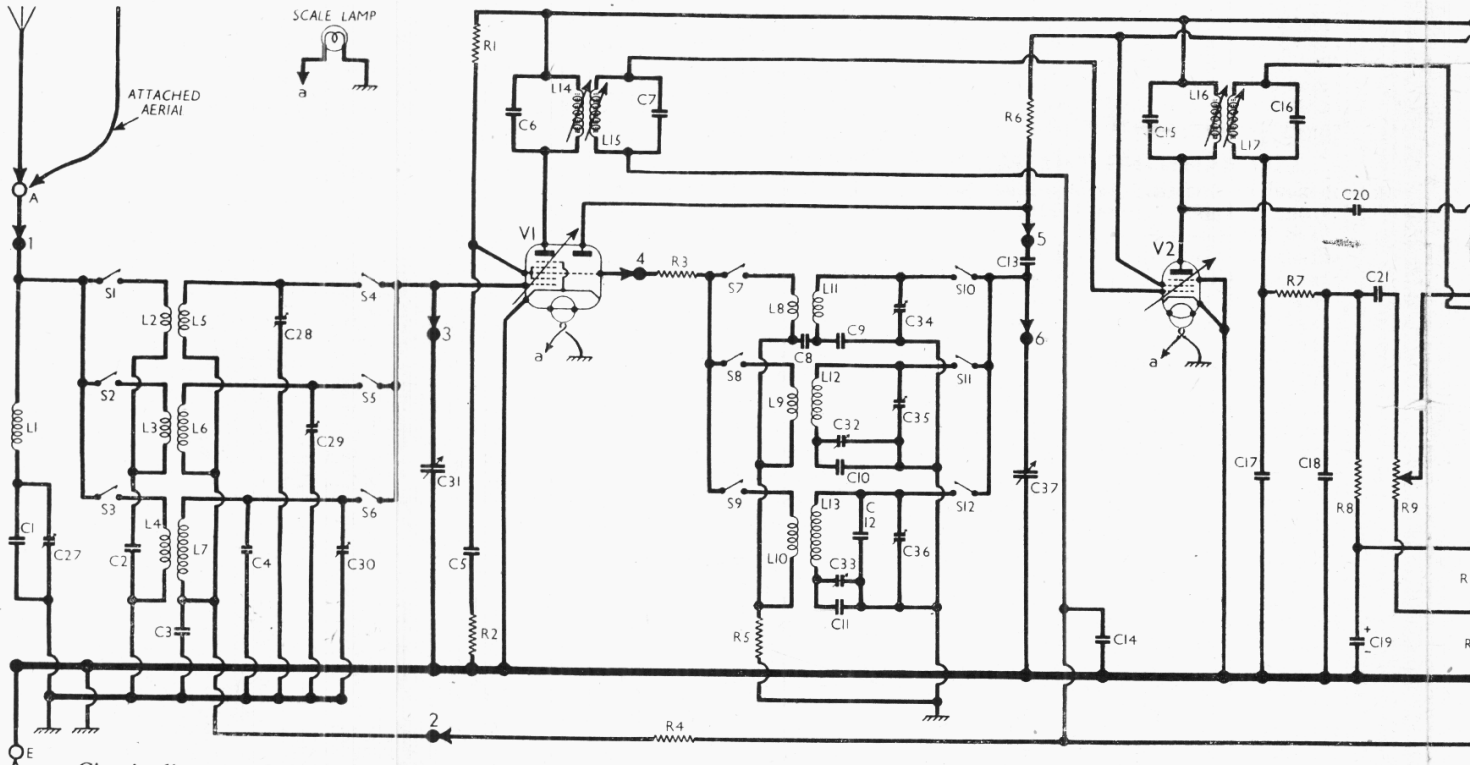
Release dates and original prices: Brown and cream plastic cabinet, February, 1946, £13 17*s* 6*d*, *increased July,* 1946, *to* £15; *all other colours, December,* 1946, £15 15*s*. *Purchase tax is not included in these prices.*

CIRCUIT DESCRIPTION

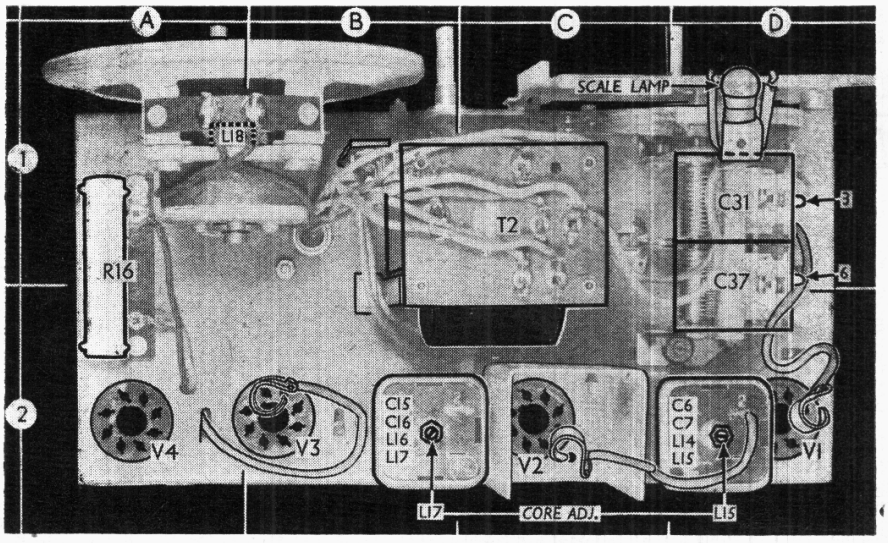
Aerial input is via coupling coils **L2** (S.W.), **L3** (M.W.) and **L4** (L.W.) to single-tuned circuits **L5, C31** (S.W.), **L6, C31** (M.W.) and **L7, C31** (L.W.). A tuned acceptor circuit **L1, C1, C27** between aerial and earth sockets filters out interference at the intermediate frequency.

First valve **(V1, Mazda metallized TH41)** is a triode-heptode operating as frequency changer with internal coupling. Triode oscillator anode coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.) are tuned by **C37;** parallel trimming by **C34** (S.W.), **C35** (M.W.) and **C12, C36** (L.W.), and series tracking by **C9** (S.W.), **C10, C32** (M.W.) and **C11, C33** (L.W.). Reaction coupling to grid circuit by coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.), with additional coupling on S.W., via **C8,** from the common impedance of **C9** in grid and anode circuits. This is made possible by the inclusion of the C.G. resistor **R5** in the low potential end of the circuit.

Second valve **(V2, Mazda metallized VP41)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-transformer couplings **C6, L14, L15, C7** and **C15, L16, L17, C16** in which the tuning capacitors are fixed and alignment adjustments are



Circuit diagram of the Ultra T401 three-band A.C. superhet. The points of interconnection of the aerial and oscillator tuning assem are numbered **1** to **6,** the earth return in each case being effected via the screws securing the assembly to the metal chassis. Two smoothing circuits are provided; **V1** oscillator anode and **V2** screen being fed from the rectifier cathode via **R15, C24,** and the rest of receiver deriving its H.T. supply from a low resistance smoothing circuit **R16, C26.** This type of smoothing circuit was not employe early production chassis, prior to Serial No. 5001, when **R15** was omitted, **R6** joined to the junction of **R16, C26,** and **V2** screen was from the same point via a 2,700Ω resistor decoupled by the 4μF capacitor which we show as **C24.**



Plan view of the chassis, indicating the intermediate frequency transformer secondary core adjustments **L15** and **L17**, which are normally covered by metal screening caps. Connections **3** and **6** of the aerial and oscillator tuning units, respectively, are shown.

carried out by varying the positions of the iron-dust cores.

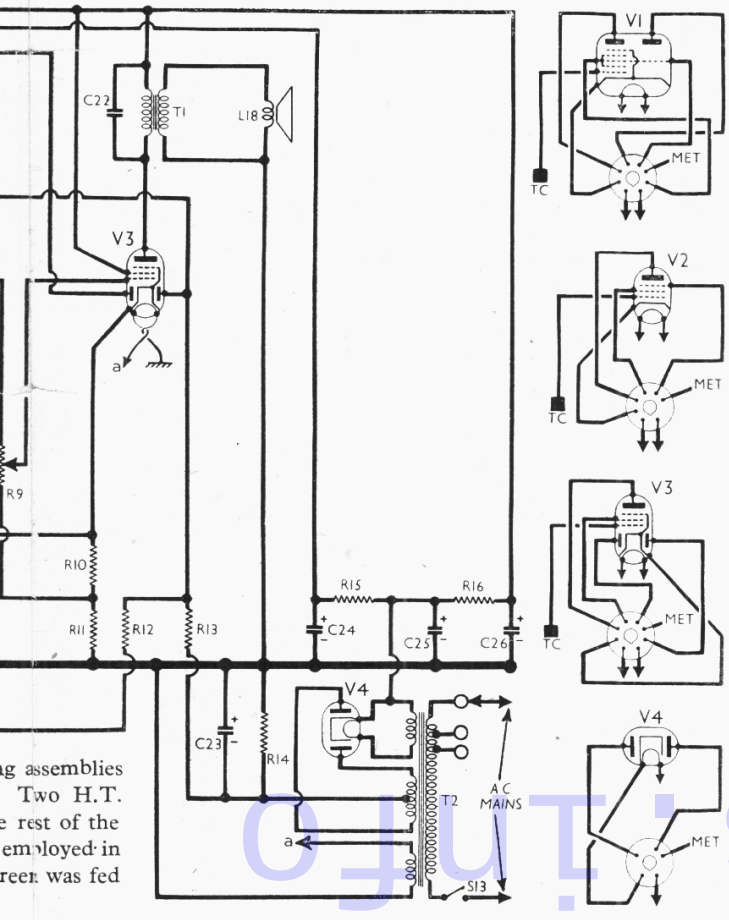
Intermediate frequency 470 kc/s.

Diode second detector is part of double diode beam tetrode output valve **(V3, Mazda metallized PEN45DD).** Audio frequency component in rectified output is developed across load resistor **R8** and passed via A.F. coupling capacitor **C21** and manual volume control **R9** to C.G. of tetrode section. I.F. filtering by **C17, R7, C18** in diode circuit, and fixed tone correction by **C22** in tetrode anode circuit.

Second diode of **V3,** fed from **V2** anode via **C20,** provides D.C. potential which is developed across load resistor **R13** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control.

H. T. current is supplied by I.H.C. full-wave rectifying valve **(V4, Mazda metallized UU6).** Smoothing of oscillator anode and **V2** screen supply by **R15** and electrolytic capacitor **C24,** and for the rest of the receiver by **R16** and electrolytic capacitors **C25, C26.**

Fixed G.B. for **V1, V2** and part of the A.V.C. delay voltage, is obtained from the drop across **R14** in the H.T. negative lead to chassis, and G.B. for **V3** tetrode section and the remainder of the A.V.C. delay voltage is developed across **R10, R11** in **V3** cathode lead to chassis.



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COMPONENTS AND VALUES

If the component numbers given in the following tables are used when ordering replacements, dealers should mention the fact, as these numbers may differ from those in the manufacturers' diagram.

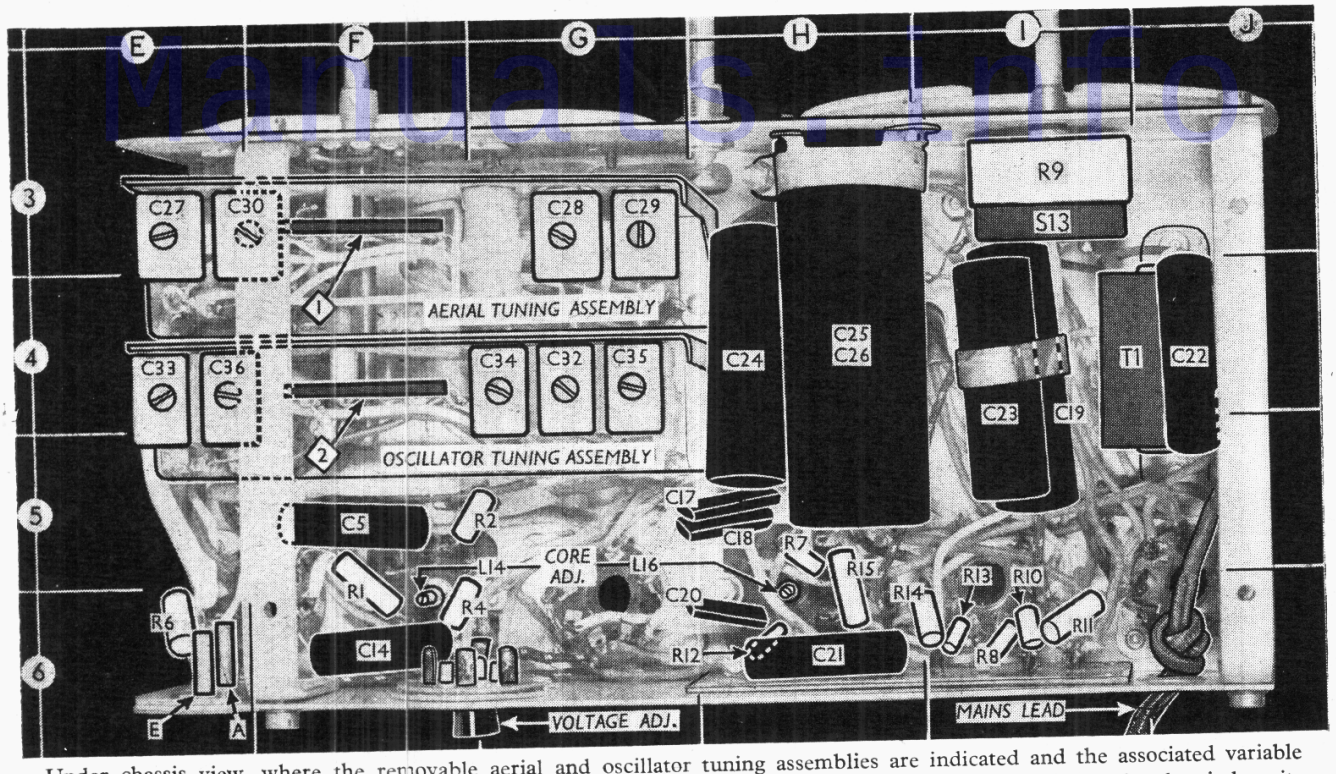
	RESISTORS	Values (ohms)	Locations
R1	V1 S.G. H.T. feed ...	27,000	F6
R2	V1 S.G. stabilizer ...	68	F5
R3	V1 Osc. stabilizer ...	100	K8
R4	V1 hept. C.G. decoup.	100,000	F6
R5	V1 osc. C.G. ...	47,000	L8
R6	Osc. H.T. feed ...	27,000	E6
R7	I.F. stopper ...	100,000	H5
R8	Sig. diode load ...	470,000	I6
R9	Volume control ...	1,000,000	I3
R10	V3 G.B. and part A.V.C. delay ...	180	I6
R11		390	I6
R12	A.V.C. decoupling	1,200,000	H6
R13	A.V.C. diode load ...	1,000,000	I6
R14	V1, V2 fixed G.B., part A.V.C. delay	47	H6
R15	H.T. smoothing resistors	10,000	H6
R16		1,200	A1

	CAPACITORS	Values (μF)	Locations.
C1	I.F. filter tuning ...	0·00018	K7
C2	S.W., M.W. aerial series	0·00047	L7
C3	V1 hept. C.G. decoup.	0·05	L7
C4	L.W. fixed trim. ...	0·000047	K7
C5	V1 S.G. decoupling	0·05	F5
C6	1st I.F. transformer tuning	0·00012	D2
C7		0·00012	D2
C8	V1 osc. C.G. ...	0·00018	L8
C9	S.W. tracker ...	0·005	K8
C10	M.W. tracker ...	0·0005	L8
C11	L.W. tracker ...	0·00018	K8
C12	L.W. trimmer ...	0·0001	K8
C13	Osc. anode coup. ...	0·0005	K8
C14	V2 C.G. decoupling	0·05	F6
C15	2nd I.F. transformer tuning	0·00012	B2
C16		0·00012	B2
C17	I.F. by-passes ...	0·0001	H5
C18		0·0001	H5
C19*	V3 cath. by-pass ...	50·0	I5
C20	A.V.C. coupling ...	0·00001	H6
C21	A.F. coupling ...	0·005	H6
C22	Tone corrector ...	0·02	J4
C23*	G.B. by-pass ...	100·0	I5
C24*	H.T. smoothing capacitors ...	4·0	H4
C25*		16·0	H4
C26*		24·0	H4
C27‡	I.F. filter tuning ...	0·00007	K7
C28‡	Aerial S.W. trim. ...	0·00007	L7
C29‡	Aerial M.W. trim. ...	0·00007	L7
C30‡	Aerial L.W. trim. ...	0·00007	K7
C31†	Aerial tuning ...	—	D1
C32‡	Osc. M.W. track. ...	0·00007	L8
C33‡	Osc. L.W. track. ...	0·00007	K8
C34‡	Osc. S.W. trim. ...	0·00007	L8
C35‡	Osc. M.W. trim. ...	0·00007	L8
C36‡	Osc. L.W. trim. ...	0·00007	K8
C37†	Oscillator tuning ...	—	D2

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	I.F. filter coil ...	7·2	L7
L2	Aerial coupling coils	0·3	L7
L3		2·6	L7
L4		12·5	K7
L5	Aerial tuning coils	Very low	L7
L6		2·2	L7
L7		13·0	K7
L8	Oscillator reaction coils	6·0	L8
L9		1·0	L8
L10		3·5	K8
L11	Oscillator tuning coils	Very low	L8
L12		3·2	L8
L13		7·1	K8

(Continued overleaf)



Under chassis view, where the removable aerial and oscillator tuning assemblies are indicated and the associated variable trimming and tracking capacitors involved in circuit alignment are identified. Diagrams of the two waveband switch units appear in col. 5, and the tuning assemblies are seen in detail in our sketches in cols. 5 and 6.

	OTHER COMPONENTS (*continued*)		Approx. Values (ohms)	Location
L14	1st I.F. trans.	Pri.	6·5	D2
L15		Sec.	6·5	D2
L16	2nd I.F. trans.	Pri.	6·5	B2
L17		Sec.	6·5	B2
L18	Speech coil		2·5	A1
T1	Output trans.	Pri.	360·0	J4
		Sec.	1·0	J4
T2	Mains trans.	Pri., total	43·0	C1
		Heat. sec.,	Very low	C1
		Rect. heat. sec. ...	0·1	C1
		H.T. sec., total ...	480·0	C1
S1-S12	W/band switches...		—	F3
S13	Mains sw, g'd R9		—	I3

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 220-240 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the M.W. band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being the negative connection.

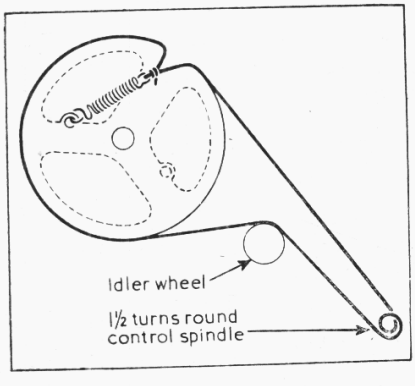
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH41	192	1.4	74	4·7
	Oscillator			
	85	3·6		
V2 VP41	192	9.8	192	2·5
V3 PEN45DD	180	28·5	192	5.8
V4 UU6	235†	—	—	—

† Each anode, A.C.

DRIVE CORD REPLACEMENT

Eighteen inches of cord, known to the manufacturers as "Green No. 1D," is required to replace the tuning drive, and this length allows an ample margin for tying off.

Access may be gained to the drive upon removal of the tuning pointer (pull off) and scale assembly (two hexagon-head self-tapping screws and two brass collars which fit between the scale backing plate and the front chassis member). The self-explanatory sketch (below) shows the course taken by the drive cord, as seen when viewing the chassis from the front with the gang at maximum capacitance, after removal of the scale assembly.



Sketch showing the course of the tuning drive cord as seen from the front of the chassis with the gang at maximum capacitance, after removal of the scale assembly.

GENERAL NOTES

Chassis Construction.—The chassis may be conveniently divided into three parts for the purpose of description : the chassis pressing, with all components mounted directly on it; and two tuning assemblies which contain all the components associated with the variable tuning circuits, aerial and oscillator respectively, with the exception of the ganged tuning capacitors.

Throughout this *Service Sheet* these are referred to as chassis, aerial tuning assembly and oscillator tuning assembly.

Switches.—S1-12 are the waveband switches ganged in two rotary units inside the tuning assemblies beneath the chassis. The units are indicated in our under-chassis view and sketches of the tuning assemblies, and are shown in detail in the diagrams in col. 5, where they are drawn as seen when viewed from the rear of an inverted chassis.

The table (col. 4) gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

Coils.—The aerial and oscillator circuit coils are mounted in their respective tuning assemblies, together with their associated trimmers, trackers and other components.

All components in the two assemblies are shown in the sketches (cols. 5 and 6) where they are drawn as seen when viewed from the rear of an inverted chassis. Instruction for removal and replacement are given under "Dismantling the Set."

The I.F. transformers **L14, L15** and **L16, L17** are mounted in two screened

units on the chassis deck, their core adjustments projecting from either end. Each unit is provided with a detachable metal top screening cover.

Scale Lamp.—This is an Osram M.E.S. type lamp with small, clear, spherical bulb, rated at 6.5 V, 0.3 A.

Capacitors.—**C23** is a cardboard cased tubular electrolytic of small dimensions, mounted in a clip beneath the chassis. It is a 100 μF unit, rated at 6 V D.C. working.

C25, C26 are two dry electrolytics in a waxed cardboard container mounted horizontally in a clip beneath the chassis.

Switch Table

Switch	S.W.	M.W.	L.W.
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	—	C	—
S6	—	—	C
S7	C	—	—
S8	—	C	—
S9	—	—	C
S10	C	—	—
S11	—	C	—
S12	—	—	C

Both units are rated at 350 V D.C. working. The red tag is the positive connection of **C25** (16 μF), the plain tag is the positive of **C26** (24 μF), and the black tag is the common negative connection.

Chassis Divergencies

In chassis prior to Serial No. 5001 **R15** may be omitted, when **R6** will be connected to the main H.T. line from **R16, C26** and a 2,700 Ω resistor will be provided to feed **V2** screen, which is then decoupled by the electrolytic capacitor which we show as **C24** (4 μF).

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub screws) and felt washers;

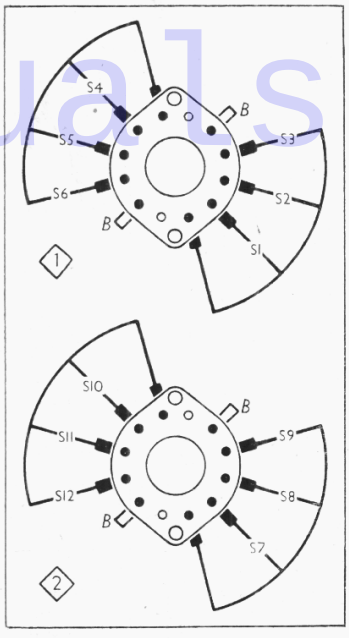
withdraw the four countersunk-head screws (with steel washers) securing the chassis to the base of the cabinet, and slide out chassis and speaker as a single unit.

Removing Tuning Assemblies.—Switch set to S.W., remove the two cheese-head screws (with lock washers) securing the waveband switch spindle and locator to the front chassis flange, and withdraw the switch spindle;

viewing the chassis deck from the rear, remove the right-hand pair of cheese-head mains transformer fixing screws (with washers), and the two brass cheese-head screws (with lock washers) to the right of the tuning gang;

from the underside of the chassis remove the two cheese-head screws (with lock washers) securing the cross-brace above the assemblies to the chassis flanges, and lift out the cross-brace;

the assemblies may now be tilted for inspection, to the extent of the connecting leads, but if it is desired to remove them the six leads must be unsoldered at points indicated in our plan view of the chassis and sketches of the assemblies by the numbers one to six.



Diagrams of the two waveband switch units, drawn as seen when viewing an inverted chassis from the rear. The associated switch table is in col. 4.

When replacing, see that the rotors of the waveband switch units have not been disturbed; their positions should be as indicated in our sketches of the tuning assemblies (below) and before inserting the switch spindle see that it is turned fully anti-clockwise in its locating disc and that the flat provided for the control knob grub screw faces approximately toward the tuning control spindle.

The six leads should be reconnected to the numbered points indicated in our plan view of the chassis and sketches of the assemblies, as follows: plastic-covered screened lead from **A** socket to 1; red from **R4,** to 2; blue from **S4-S6,** to 3; blue from pin 5 on **V1,** to 4; yellow from pin 4 on **V1,** to 5; black/white from **S10-S12,** to 6.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator, via an 0.05 μF capacitor in the "live" lead, to control grid (top cap) of **V1** and the **E** socket, leaving the existing top cap connector in position. Switch set to M.W., tune to 550 m on scale, feed in a 470 kc/s (638.8 m) signal, and adjust the cores of **L17, L16, L15** and **L14** (location references B2, H6, D2, F6) for maximum output, keeping the input low to avoid A.V.C. action.

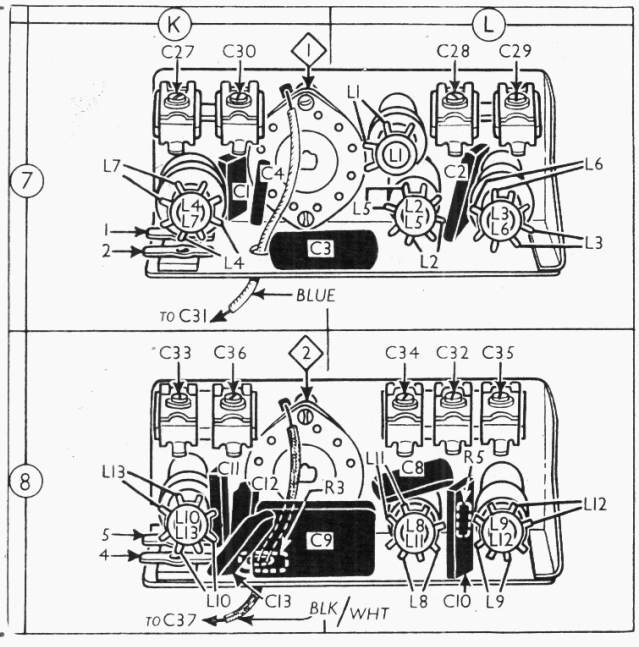
R.F. and Oscillator Stages.—Transfer "live" signal generator lead to **A** socket, via a suitable dummy aerial. With the gang at maximum capacitance the pointer should be horizontal, and it may be adjusted in position by rotating it on the gang spindle.

I.F. Filter.—Feed in a strong 470 kc/s signal and adjust **C27** (E3) for minimum output.

M.W.—Tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C35** (G4), then **C29** (G3), for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust **C32** (G4) for maximum output.

L.W.—Switch set to L.W., tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C36** (E4), then **C30** (E3), for maximum output. Tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal, and adjust **C33** (E4) for maximum output.

S.W.—Switch set to S.W., tune to 20 m on scale, feed in a 20 m (15 Mc/s) signal, and adjust **C34** (G4), then **C28** (G3), for maximum output. Check calibration at 50 m (6 Mc/s).



Sketches of the aerial (upper) and oscillator (lower) tuning assemblies, drawn as seen when viewing an inverted chassis from the rear. The connecting tags of each coil winding are identified, and the waveband switch units are shown in detail in the diagrams at the top of col. 5.

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