

'TRADER' SERVICE SHEET
216

ULTRA 47

4-BAND A.C. SUPERHET

TWO short-wave bands are covered in the Ultra 47 5-valve (plus rectifier) A.C. superhet, the actual ranges being 13.3-30 metres (referred to below as S.W.1) and 30-80 metres (S.W.2). The receiver incorporates a signal frequency amplifier and a sensitivity control.

In its standard form the receiver is suitable for mains of 200-250 V, 40-100 C/S, but a special model is made for 110-130 V. This *Service Sheet* was prepared on a standard model.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.1), **L3** (S.W.2), **L5** (M.W.), **L7** (L.W.) to single-tuned circuits **L2**, **C33** (S.W.1), **L4**, **C33** (S.W.2), **L6**, **C33** (M.W.), **L8**, **C33** (L.W.) which precede variable-mu pentode R.F. amplifier (**V1**, Mazda metallised AC/VP1).

Tuned anode couplings by **L9**, **C34** (S.W.1), **L10**, **C34** (S.W.2), **L11**, **C34** (M.W.), **L12**, **C34** (L.W.), between **V1** and triode-hexode valve (**V2**, Osram metallised X41) which operates as a frequency changer with internal coupling.

Triode oscillator anode coils **L14** (S.W.1), **L16** (S.W.2), **L18** (M.W.), **L20** (L.W.) are tuned by **C44**. Parallel trimming by **C39** (S.W.2), **C40** (M.W.), **C9**, **C41** (L.W.), series tracking by **C10** (S.W.1), **C11** (S.W.2), **C42** (M.W.), **C43** (L.W.).

Sensitivity control on all wave-bands by variable resistance **R4** in cathode circuit of **V1**, and additional fixed resistance **R3** on M.W. and L.W. which is short-circuited on S.W.1 and S.W.2 by switch **S10**.

Single variable-mu R.F. pentode intermediate frequency amplifier (**V3**, Mazda metallised AC/VP1) operates with tuned-primary tuned-secondary transformer couplings **C45**, **L21**, **L22**, **C46**, and **C47**, **L23**, **L24**, **C48**.

Intermediate frequency 456 KC/S.

Diode second detector forms part of double diode triode valve (**V4**, Mazda metallised AC/EL/DD). Audio frequency component in rectified output is developed across load resistance **R15** and passed via **C15**, **S27**, manual volume control **R16** and I.F. stopper **R17** to C.G. of triode section. Provision for connection of gramophone pick-up across **R16** via **S28**.

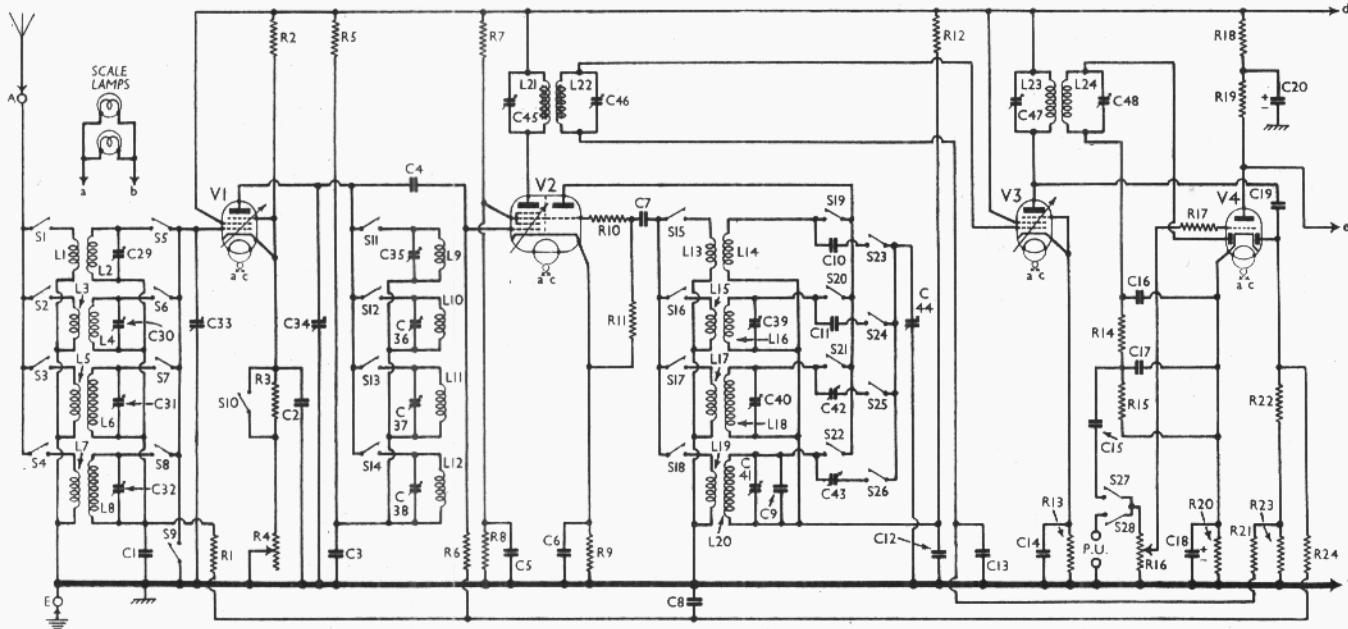
tone control by **C23** connected to slider of **R25**; fixed tone correction in anode circuit by **C24**, **C25** and **R26**. Provision for connection of low impedance external speaker across secondary of **T1**.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V8**, Mazda U83). Smoothing by speaker field coil **L27** and wet electrolytics **C27** and **C28**.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 C.G. decoupling	100,000
R2	Parts of V1 G.B. potentiometer	100,000
R3	meter	1,000
R4	Sensitivity control, part V1 G.B. pot. (variable)	10,000
R5	V1 anode decoupling	10,000
R6	V2 hexode C.G. resistance	1,000,000
R7	V2 hexode S.G. pot.	50,000
R8	V2 hexode S.G. pot.	50,000
R9	V2 fixed G.B.	165
R10	V2 osc. harmonic suppressor	60
R11	V2 osc. C.G. resistance	50,000
R12	V2 osc. anode decoupling	25,000
R13	V3 fixed G.B.	165
R14	I.F. stopper	500,000
R15	V4 signal diode load resistance	500,000
R16	Manual vol. control	1,000,000
R17	V4 triode C.G. I.F. stopper	10,000
R18	V4 triode anode decoupling	50,000
R19	V4 triode anode load	25,000
R20	V4 G.B. resistance	2,000
R21	V3 C.G. decoupling	1,000,000
R22	V4 A.V.C. diode load resistance	250,000
R23	tance	750,000
R24	V1, V2 A.V.C. line decoupling	1,000,000
R25	Part of var. tone cont. circuit, V5 C.G. res.	50,000
R26	Part of fixed tone corrector	15,000
R27	V5 C.G. R.F. stopper	1,000
R28	V5 G.B. resistance	138
R29	V5 anode circuit stabiliser	60

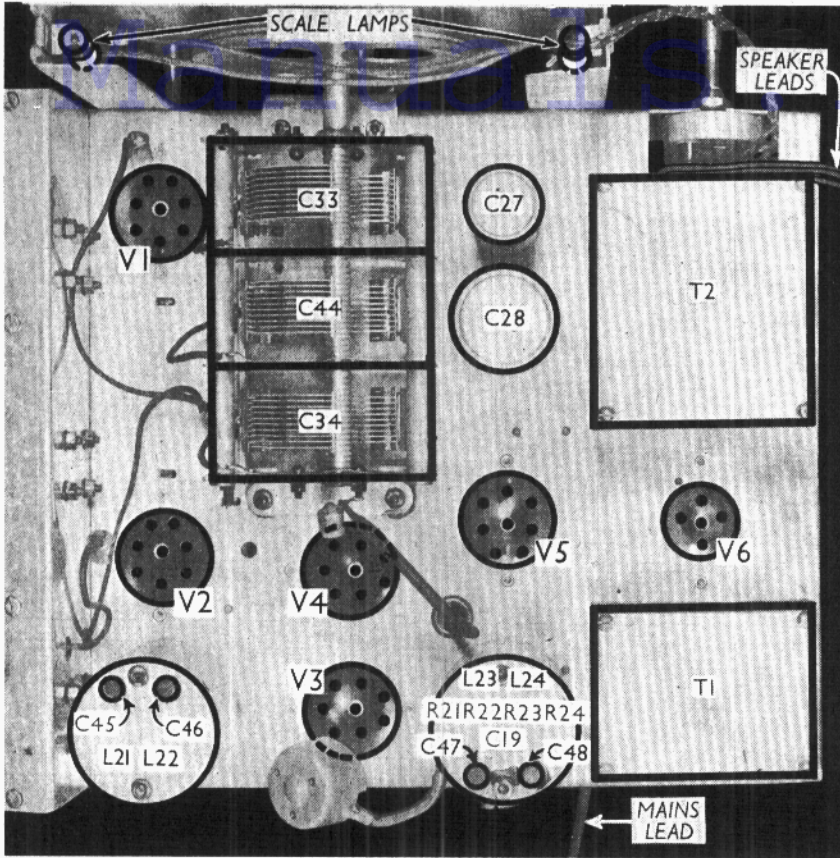
CONDENSERS		Values (μF)
C1	V1 C.G. decoupling	0.05
C2	V1 cathode by-pass	0.1
C3	V1 anode decoupling	0.1
C4	R.F. coupling to V2 hexode	0.0001
C5	V2 S.G. decoupling	0.1
C6	V2 cathode by-pass	0.1
C7	V2 osc. C.G. condenser	0.0001
C8	V1, V2 A.V.C. line decoupling	0.05
C9	Osc. L.W. fixed trimmer	0.0001
C10	Osc. circuit S.W.1 tracker	0.0037
C11	Osc. circuit S.W.2 tracker	0.00165
C12	V2 osc. anode decoupling	0.1
C13	V3 C.G. decoupling	0.05
C14	V3 cathode by-pass	0.1
C15	A.F. coupling to V4 triode	0.01
C16	I.F. stoppers	0.0001
C17	V4 cathode by-pass	50.0
C18*	Coupling to V4 A.V.C. diode	0.0002
C19	V4 triode anode decoupling	2.0
C20*	A.F. coupling to V5	0.1
C21	V4 triode anode I.F. by-pass	0.0002
C22	Part of variable T.C. circuit	0.02
C23	Part of fixed tone corrector	0.001
C24	V5 cathode by-pass	0.01
C25	H.T. smoothing	50.0
C26*		8.0
C27*		32.0
C28*		
C29†	Aerial circuit S.W.1 trimmer	—
C30†	Aerial circuit S.W.2 trimmer	—
C31†	Aerial circuit M.W. trimmer	—
C32†	Aerial circuit L.W. trimmer	—
C33†	Aerial circuit tuning	—
C34†	V1 anode circuit tuning	—
C35†	V1 anode circuit S.W.1 trimmer	—
C36†	V1 anode circuit S.W.2 trimmer	—
C37†	V1 anode circuit M.W. trimmer	—
C38†	V1 anode circuit L.W. trimmer	—
C39†	Osc. circuit S.W.2 trimmer	—
C40†	Osc. circuit M.W. trimmer	—



Second diode of **V4**, fed from anode of **V3** via **C19**, provides D.C. potentials which are developed across **R22** and **R23** and fed back through decoupling circuits as G.B. to R.F., F.C. and I.F. valves, giving A.V.C. Delay voltage is obtained from drop along **R20**.

Resistance-capacity coupling by **R19**, **C21** and **R25** via grid stopper **R27** between **V4** triode and pentode output valve (**V5**, Mazda AC/2 Pen). Variable

Circuit diagram of the Ultra 47 A.C. superhet. An R.F. amplifier is used in front of the triode-hexode frequency changer. The output stage and rectifier section of the diagram is continued across to col. 1 of the opposite page.



Plan chassis view. R21-R24 and C19 are in the second I.F. unit.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial S.W.1 coupling coil	0.5
L2	Aerial S.W.1 tuning coil	0.02
L3	Aerial S.W.2 coupling coil	2.5
L4	Aerial S.W.2 tuning coil	0.1
L5	Aerial M.W. coupling coil	12.0
L6	Aerial M.W. tuning coil	4.0
L7	Aerial L.W. coupling coil	82.0
L8	Aerial L.W. tuning coil	11.5
L9	V1 anode S.W.1 tuning coil	0.02
L10	V1 anode S.W.2 tuning coil	0.1
L11	V1 anode M.W. tuning coil	4.0
L12	V1 anode L.W. tuning coil	11.5
L13	Osc. S.W.1 grid coil	0.2
L14	Osc. anode S.W.1 tuning coil	0.02
L15	Osc. S.W.2 grid coil	0.3
L16	Osc. anode S.W.2 tuning coil	0.1
L17	Osc. M.W. grid coil	0.7
L18	Osc. anode M.W. tuning coil	3.2
L19	Osc. L.W. grid coil	1.0
L20	Osc. anode L.W. tuning coil	5.5
L21	1st I.F. trans.	Pri. 5.6
L22		Sec. 5.6
L23	2nd I.F. trans.	Pri. 5.6
L24		Sec. 5.6
L25	Speaker speech coil	4.6
L26	Hum neutralising coil	0.1
L27	Speaker field coil	930.0
T1	Speaker input trans. former	410.0
		Pri. total 25.5
T2	Mains trans.	Heater sec. 0.04
		Rect. heat. sec. 0.06
		H.T. sec. total 600.0
S1-S26	Wavechange switches	—
S27	Radio-gram switches	—
S28		—
S29	Mains switch, ganged R25	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the six control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

When replacing, note that the small knobs go on the spindles of the volume and sensitivity controls and that as they are marked, they must be placed on the correct spindles.

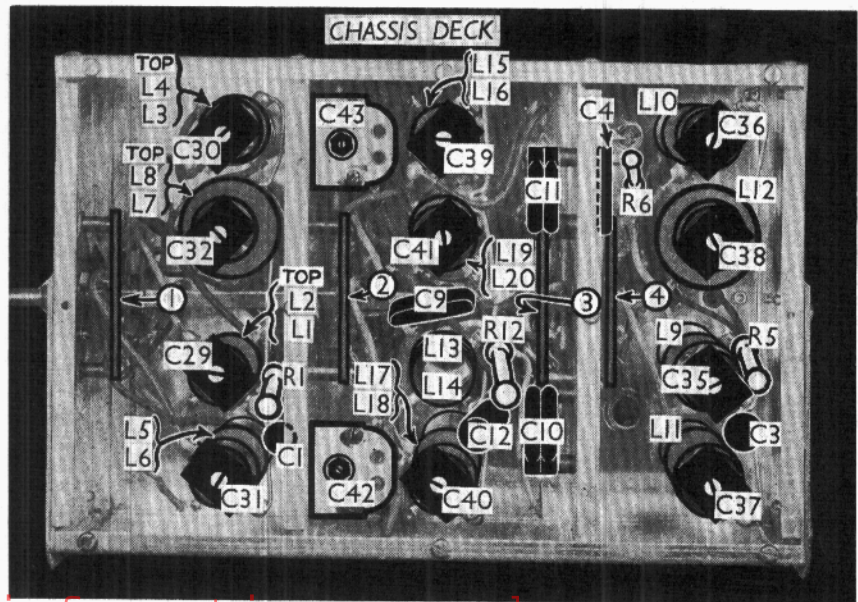
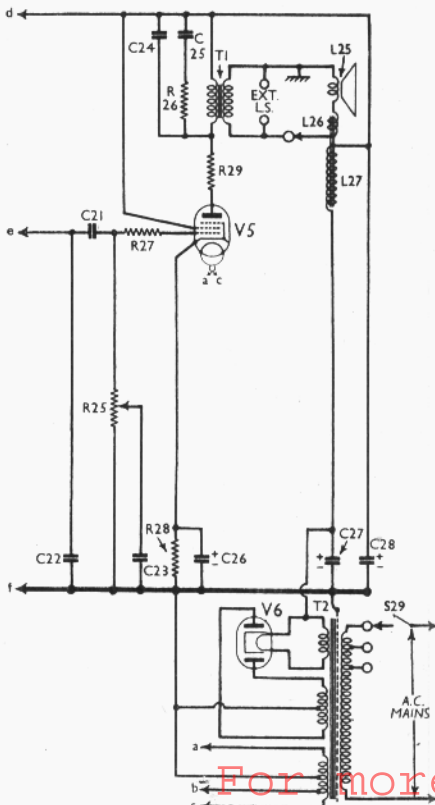
To free the chassis entirely, unsolder the speaker leads and when replacing, connect them as follows, numbering the tags from bottom to top:—1, black; 2, no external connection; 3, green; 4, yellow; 5, red.

Removing Speaker.—To remove the speaker from the cabinet, slacken the three clamps (nuts and spring washers) holding it to the sub-baffle. When replacing, see that the terminal panel is pointing to the top right-hand corner of the cabinet.

CONDENSERS (Continued)		Values (μF)
C41 ‡	Osc. circuit L.W. trimmer	—
C42 ‡	Osc. circuit M.W. tracker	—
C43 ‡	Osc. circuit L.W. tracker	—
C44 ‡	Osc. circuit tuning	—
C45 ‡	1st I.F. trans. pri. tuning	—
C46 ‡	1st I.F. trans. sec. tuning	—
C47 ‡	2nd I.F. trans. pri. tuning	—
C48 ‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

Continued overleaf



Side chassis view, with the cover plate removed.

ULTRA 47—Continued

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 230-250 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band, and both the volume and sensitivity controls were 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 AC/VP1 ..	210	3.7	260	0.8
V2 X41*	260	0.9	70	2.3
V3 AC/VP1 ..	260	12.0	260	3.5
V4 AC/HL/DD	118	1.4	—	—
V5 AC/2Pen.	240	35.0	260	7.6
V6 U3 ..	310†	—	—	—

* Oscillator anode 105 V, 3.4 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S28 are the waveband and pick-up switches, ganged in four rotary units situated inside the coil and switch assembly. The units are indicated in our side-chassis view, and are shown in detail in the diagrams in column 3, where they are seen looking at the side of the chassis, in the directions indicated by the arrows in the side-chassis view.

The table (col. 3) gives the switch positions for the five control settings, starting from fully anti-clockwise. O indicates open, and C closed.

S29 is the Q.M.B. mains switch, ganged with the tone control, R25.

Coils.—All the R.F. and oscillator coils are in a screened and partitioned unit, fitted at the right of the

chassis. A side view of this unit, with the metal cover plate removed, is given. In this view all the coils are identified. They are on twelve tubular formers, singly or in pairs, and all except the L13, L14 unit have a trimmer mounted at the end of the unit. The switch units are also included in the coil assembly, together with a number of other associated components.

The I.F. transformers, L21, L22 and L23, L24 are in two screened units on the chassis deck, with their trimmers. Note that the second transformer contains also R21-R24 and C19.

Scale Lamps.—These are two Osram M.E.S. types rated at 4.5 V, 0.3 A, and wired in parallel across one end and a tapping on the heater winding of T2.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2-4 Ω) external speaker. A plug and socket device permits the internal speaker speech coil circuit to be broken, muting this speaker.

Condenser C28.—This was a 32 μF type in our chassis, but may be 16 μF in earlier models.

Trackers C10, C11.—These each consist of two fixed condensers in parallel in our chassis.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator via a dummy aerial to A and E sockets. Turn sensitivity, volume and tone controls to maximum, fully clockwise. Switch set to M.W., and turn gang condenser to maximum. Feed in a 456 KC/S signal, and adjust C48, C47, C46 and C45 in turn for maximum output, keeping the input low.

R.F. and Oscillator Stages.—When gang is at maximum, the pointer should cover the vertical scale marks.

Switch set to M.W., feed in a 220 m. signal, and tune to 220 m. on scale. Adjust C40, then C31 and C37 for maximum output. Feed in a 500 m. signal, tune it in, and adjust C42, rocking the gang for optimum results. Repeat the 220 m. adjustments.

Switch set to L.W., feed in a 1,000 m. signal, and tune to 1,000 m. on scale. Adjust C41, then C32 and C38 for maximum output. Feed in a 1,700 m. signal, tune it in, and adjust C43, rocking the gang for optimum results. Repeat the 1,000 m. adjustments.

Switch set to S.W.2, feed in a 30 m. signal, and tune it in. Adjust C39 in conjunction with tuning control

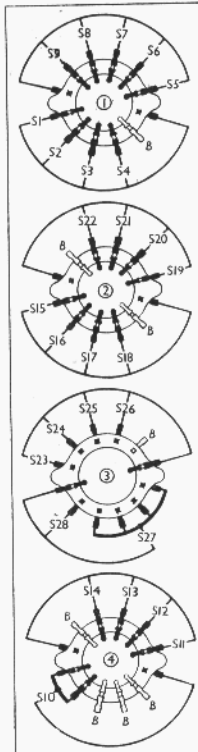
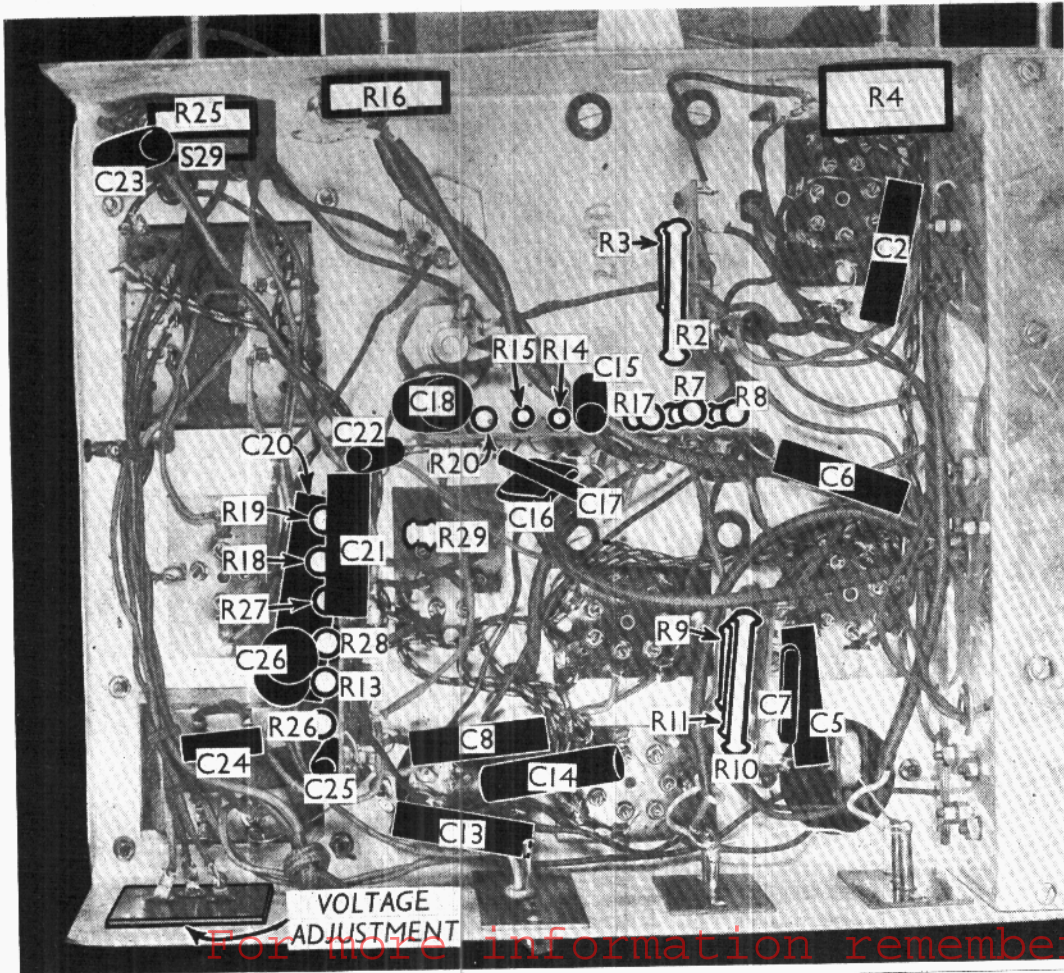
until optimum results are obtained, at the correct scale indication. Now adjust C30 and C36 for maximum output. The correct peak for C39 is that with the trimmer furthest unscrewed. This position should result in a second tuning point at 33 m. on the scale when the 30 m. input voltage is increased.

Switch set to S.W.1, feed in a 15 m. signal and tune it in. Two tuning points, separated by about ½ metre on the scale will be noted. Adjust C29 and C35 until the signal of shortest wavelength is at maximum. If signs of instability are noted below 15 m., screw up C29 and C35 very slightly until instability ceases.

All trimmer adjustments must be made with cover plate on side of coil unit in position.

SWITCH TABLE

Switch	S.W.1	S.W.2	M.W.	L.W.	Gram.
S1	C	O	O	O	O
S2	O	O	O	O	O
S3	O	O	C	O	O
S4	O	O	O	C	O
S5	C	O	O	O	O
S6	O	C	O	O	O
S7	O	O	C	O	O
S8	O	O	O	C	C
S9	O	O	O	O	O
S10	C	C	O	O	O
S11	O	O	O	O	O
S12	C	C	O	O	O
S13	O	O	C	O	O
S14	O	O	O	C	O
S15	C	O	O	O	O
S16	O	C	O	O	O
S17	O	O	C	O	O
S18	O	O	O	C	O
S19	C	O	O	O	O
S20	O	C	O	O	O
S21	O	O	C	O	O
S22	O	O	O	O	O
S23	C	O	O	O	O
S24	O	C	O	O	O
S25	O	O	C	O	O
S26	O	O	O	C	O
S27	C	C	O	O	O
S28	O	O	O	O	C



Above: Switch diagrams looking in the directions of the arrows in the side-chassis view. Left: Under-chassis view.

For more information remember