"TRADER" SERVICE SHEET

1207

FERRANTI 945 &

A.C. Mains/battery Portable Superhe

EMPLOYING a quiescent push-pull output stage, the Ferranti 955 is a 6-valve 2-band A.C./A.D. portable superhet. A ferrite rod internal aerial is fitted and provision is also made for the connection of an external aerial and earth. The waveband ranges covered are 187-570m and 1,100-1,900m.

Model 945 is an earlier version of the 955 and the differences between them are explained in "General Notes."

Release dates: 945, *May* 1954; 955, *April* 1955. *Original price, both models,* £15 10s. *Purchase tax and batteries extra.*

CIRCUIT DESCRIPTION

The M.W. and L.W. aerial coils **L1** and **L2** are mounted at opposite ends of a length of ferrite rod to form the internal aerial and are tuned by **C28.** Provision is made for the connection of an external aerial, which on M.W. is coupled via **S1, L2** to **L1,** and on L.W. is coupled to **L2** via a tapping on the coil.

First valve **(V1, Mullard DK96)** is a heptode which operates as the frequency changer with electron coupling. A single oscillator grid coil **L3** is employed for both M.W. and L.W. operation and is tuned by **C30.** L.W. coverage is obtained by shunting **L3** with **C8, C31.** Parallel trimming by **C29, C9** (M.W.) and **C29, C31, C8, C9** (L.W.); series tracking by **C7** (M.W. and L.W.). Oscillator reaction coupling by **L4.** Oscillator stabilization by **R4.**

Second valve **(V2, Mullard DF96)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C3, L5, L6, C4** and **C12, L7, L8, C13.**

Intermediate frequency 470 kc/s

Diode signal detector is part of diode pentode valve **(V3, Mullard DAF96).** Audio frequency component in its rectified output is developed across volume control **R10,** which operates as diode load, and is passed via **C16** to pentode section. A small degree of positive delay bias is applied to the diode via potential divider **R11, R12** across the L.T. supply.

D.C. component in the detector output is fed back via decoupling circuit **R9, C6** to **V1** and **V2** giving automatic gain control.

A.F. output from **V3** is passed via **C20** to one half of quiescent push-pull output stage **(V6, Mullard DL96);** and via **R16, C18,** phase invertor valve **(V4, Mullard DAF96)** and **C19** to second half of push-pull output stage **(V5, Mullard DL96).** The gain of the phase invertor is reduced to unity by feeding its control grid from the negative feed-back circuit **R16, R17.**

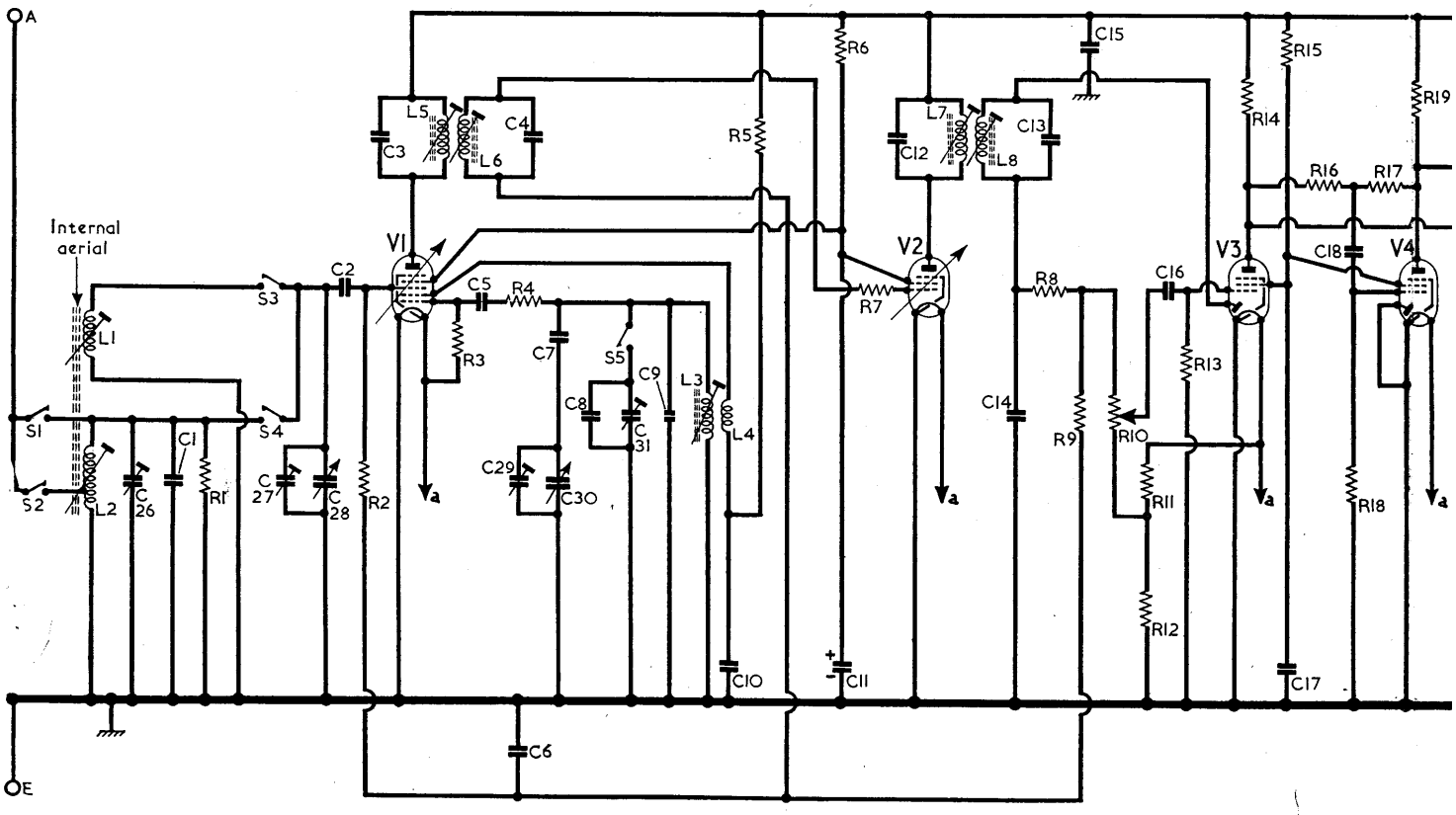
Grid bias for the output valves is obtained from the voltage drop across **R22** in the H.T. negative lead to chassis.

For battery operation switches **S7(B)** and **S9(B)** close as indicated by the suffix **(B).** For mains operation, switches **S6(M), S8(M)** and **S10(M)** close.

H.T. current for mains operation is supplied by half-wave metal rectifier **MR2 (Westinghouse 15D19).** Smoothing by **R23** and electrolytic capacitors **C24, C25.** L.T. current for mains operation is supplied by full wave metal rectifier **MR1 (Westinghouse 4D958).** Smoothing by choke **L10** and electrolytic capacitors **C22, C23.**

VALVE ANALYSIS

Valve voltages and currents given in the table in column 4 were measured in our sample receiver which was operating from A.C. mains of 240V. The receiver was



Circuit diagram of the Ferranti 955. Small differences that occur in the earlier version, model 945, are described under "General Notes"

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switched to M.W. and tuned to a point at the high wavelength end of the band where there was no signal pick-up.

Voltages were measured with an Avo Electronic Testmeter, chassis being the negative connection in every case. The voltage measured across **C25** was 100V, and across **R22** it was 6.5V (positive connection to chassis). The total A.C. mains current was 100mA. When operating from a new set of batteries, the total H.T. current was 12mA, and the total L.T. current was 200mA.

Valve	Anode V	Anode mA	Screen V	Screen mA
V1 DK96 ...	95 Oscillator 40	0·44 1·5	69	0·12
V2 DF96 ...	95	1·9	69	0·3
V3 DAF96 ...	29	0·06	24	0·02
V4 DAF96 ...	27	0·08	24	0·02
V5 DL96 ...	93	3·2	95	0·7
V6 DL96 ...	93	3·2	95	0·7

GENERAL NOTES

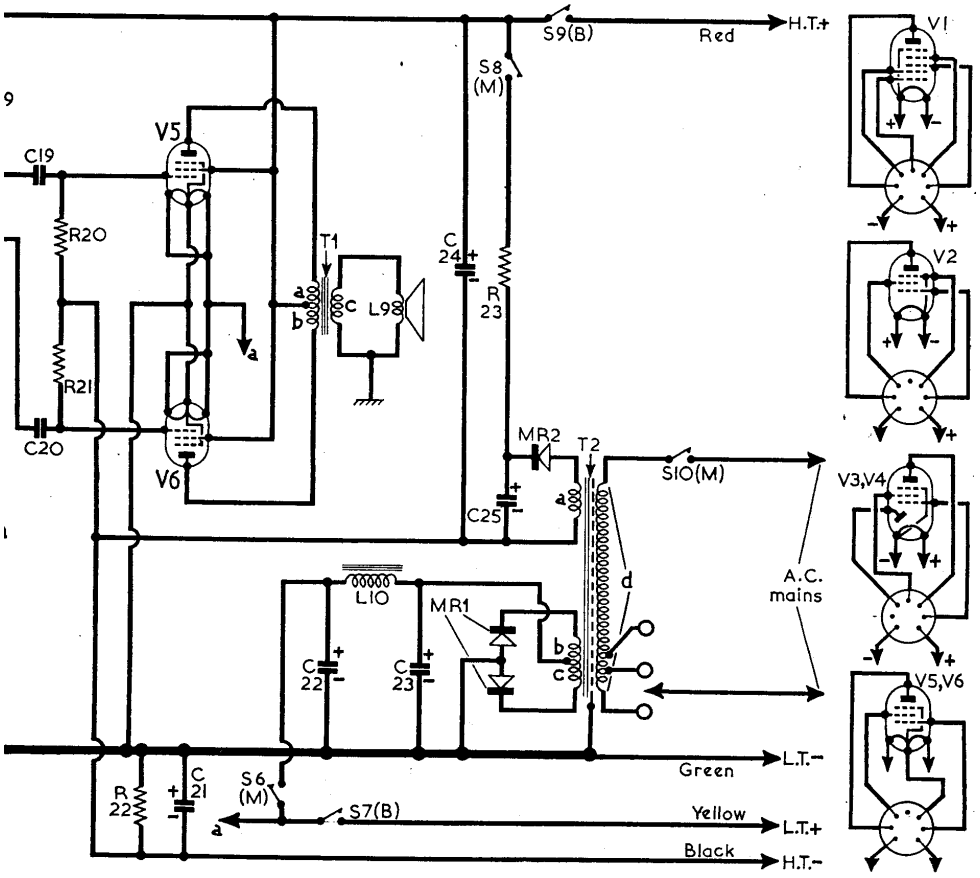
Switches.—S1-S5 are the waveband switches, ganged in a single rotary unit on the rear of the chassis. This unit is indicated in the rear illustration of the chassis and shown in the diagram overleaf (col. 3).

Appearance of the Ferranti 955.

S6(M)-S10(M) are the mains/battery change-over switches ganged in a single unit on the rear of the chassis. This unit is indicated in the rear illustration of the chassis and shown in the diagram overleaf (col. 3). For mains operation, switches **S6(M), S8(M)** and **S10(M)** close, as indicated by the suffix **(M)**. For battery operation, switches **S7(B)** and **S9(B)** close. The switch operations, starting from the fully anti-clockwise position of the control are: Mains; off; battery.

Drive Cord.—About 45in of nylon-braided glass yarn is required for a new

(Continued col. 1 overleaf)



' in column 2 overleaf. **L1, L2** are the windings of the ferrite rod internal aerial.

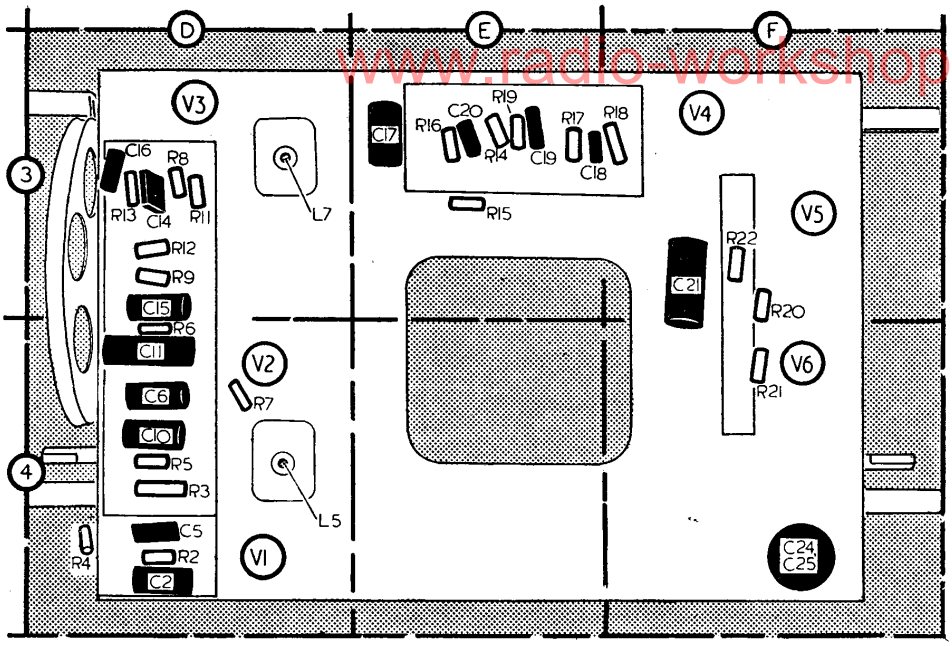
CAPACITORS		Values	Locations
C1	L.W. aerial shunt	150pF	C2
C2	V1 C.G.	200pF	D4
C3	1st I.F. trans.	100pF	C2
C4	tuning	100pF	C2
C5	V1 osc. C.G. ...	100pF	D4
C6	A.G.C. decoupling	0·05μF	D4
C7	Osc. tracker ...	560pF	C2
C8	L.W. osc. trimmer	480pF	C2
C9	M.W. osc. trimmer	15pF	C2
C10	H.T. decoupling	0·05μF	D4
C11*	S.G. decoupling ...	2μF	D4
C12	2nd I.F. trans.	100pF	C1
C13	tuning	300pF	C1
C14	I.F. by-pass ...	100pF	D3
C15	H.T. by-pass ...	0·1μF	D3
C16	A.F. coupling ...	0·005μF	D3
C17	S.G. decoupling ...	0·1μF	E3
C18	A.F. couplings ...	0·001μF	E3
C19		0·005μF	E3
C20		0·005μF	E3
C21*	G.B. by-pass ...	25μF	F3
C22*	L.T. smoothing ...	2,500μF	B1
C23*		2,500μF	B1
C24*	H.T. smoothing ...	32μF	A2
C25*		32μF	A2
C26‡	L.W. aerial trim.	40pF	C1
C27‡	M.W. aerial trim.	40pF	C1
C28†	Aerial tuning ...	—	C1
C29‡	M.W. osc. trim. ...	40pF	C1
C30†	Osc. tuning ...	—	C1
C31‡	L.W. osc. trim. ...	40pF	C2

* Electrolytic † Variable ‡ Pre-set.

RESISTORS		Values	Locations
R1	L.W. aerial shunt	330kΩ	B1
R2	V1 C.G.	1MΩ	D4
R3	V1 osc. C.G. ...	27kΩ	D4
R4	Osc. stabilizer ...	560Ω	D4
R5	Osc. anode feed ...	33kΩ	D4
R6	S.G. H.T. feed ...	33kΩ	D4
R7	V2 C.G. stopper ...	3·3kΩ	D4
R8	I.F. stopper ...	47kΩ	D3
R9	A.G.C. decoupling	2·2MΩ	D3
R10	Volume control ...	500kΩ	A1
R11	V3 G.B. pot.	220Ω	D3
R12	divider ...	330Ω	D3
R13	V3 C.G.	10MΩ	D3
R14	V3 anode load ...	1MΩ	E3
R15	S.G. H.T. feed ...	1·5MΩ	E3
R16	Neg. feed-back ...	3·3MΩ	E3
R17		3·3MΩ	E3
R18	V4 C.G.	10MΩ	F3
R19	V4 anode load ...	1MΩ	E3
R20	V4, V5 C.G.	2·2MΩ	F3
R21	resistors ...	2·2MΩ	F4
R22	V4, V5 G.B. ...	560Ω	F3
R23	H.T. smoothing ...	820Ω	A2

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Internal aerial coils	0·75	B1
L2		6·5	C1
L3	Osc. tuning coil ...	1·5	C2
L4	Osc. reaction coup.	1·0	C2
L5	1st I.F. trans. Pri.	7·5	C2
L6	Sec.	7·5	C2
L7	2nd I.F. trans. Pri.	7·5	C1
L8	Sec.	3·2	C1
L9	Speech coil ...	2·5	—
L10	L.T. smoothing choke	6·0	B1
MR1	L.T. rectifier ...	—	A2
MR2	H.T. rectifier ...	—	A2
T1	O.P. trans. a ...	160·0	A1
	b ...	160·0	
	c ...	—	
T2	Mains trans. a ...	800·0	A2
	b ...	6·5	
	c ...	6·5	
	d, total	880·0	
S1-S5	Waveband switches	—	C2
S6(M)-S10(M)	Mains/batt. sw. ...	—	A2

Dealers are reminded that if component numbers given in the above tables are used when ordering replacements, it is advisable to mention the fact on the order, as these numbers may differ from those used in the manufacturers' circuit diagram.



Front view of the chassis, with the tuning scale backing plate removed to show the components along the top edge of the assembly.

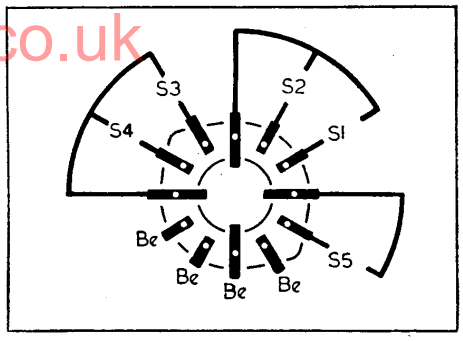


Diagram of the waveband switch unit.

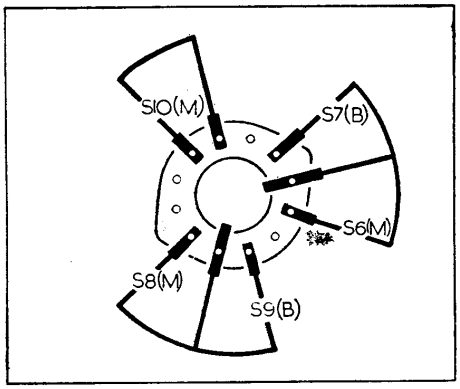


Diagram of the mains/battery switch unit.

General Notes—*continued*

drive cord, which should be run as shown in the sketch seen below, where it is viewed from the rear (tuning control) end of an upright chassis.

With the gang turned to maximum capacitance, tie one end of the drive cord to the spring and lead the cord off clockwise round the drum, pulling against the gang stop. The spring should be extended to about 1in when the cord is correctly tensioned.

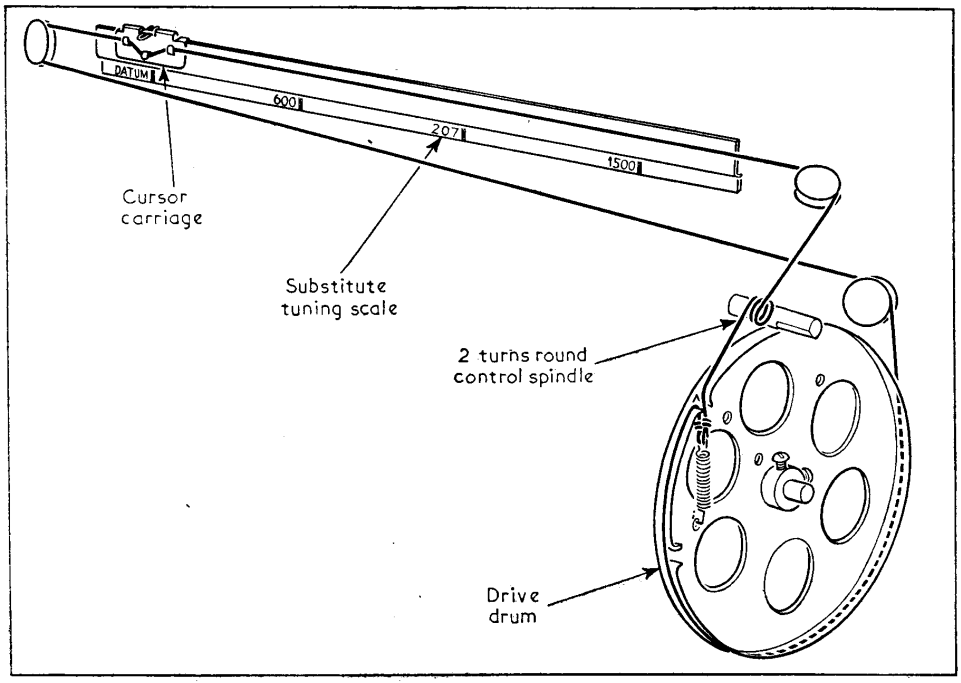
Output Stage.—The following method can be used to check the phase splitter and push-pull output stages.

Momentarily short-circuit **V5** control grid (pin 6) to the H.T. negative line (junction **R20, R21**). If the receiver is normal, the output will fall by half. If the output does not change, or if it increases slightly, then either **V4** or **V5** is faulty. If the output falls to zero then **V6** is faulty.

If replacement of either **V3** or **V4** results in instability, then the two valves should be reversed in position.

Model 945.—The following differences occur between model 955, on which this *Service Sheet* was prepared, and the earlier version, model 945. **C8** was 500pF, and **C31** was omitted. A slightly different cabinet was employed as can be seen in the photograph of the receiver at the foot of column 4.

Batteries.—The batteries recommended by the manufacturers are, H.T., Ever Ready B107, rated at 90V; L.T., Ever Ready AD14, rated at 1.5V.



Sketch of the drive cord system as seen from the right-hand rear corner of the chassis with the gang turned to maximum capacitance.

DISMANTLING

Removing Chassis.—Unplug battery leads and withdraw batteries;

remove the tuning and volume control knobs (secured by grub screws);

remove the two switch control knobs (pull-off);

unsolder the **A** and **E** leads from their terminals on the side of the carrying case;

unscrew four captive bolts securing sides of chassis to front of carrying case, and withdraw chassis.

CIRCUIT ALIGNMENT

In order to make the I.F. adjustments accessible, the chassis should be removed from its carrying case as described under "Dismantling" above.

I.F. Stages.—Switch receiver to L.W. and tune to 1,900m. Connect output of signal generator, via an 0.1 μF capacitor in the live lead, to control grid (pin 6) of **V1** and chassis. Fully unscrew the core of **L6** (location reference C2). Feed in a 470 kc/s signal and adjust the cores of **L8** (C1), **L7** (D3), **L6** (C2) and **L5** (D4) in that order for maximum output. The cores should be set to the peak nearer the adjusting end of the coil can. Repeat

these adjustments until no further improvement results.

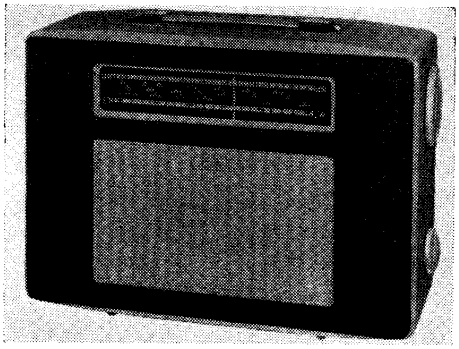
R.F. and Oscillator Stages.—As the tuning scale remains fixed to the carrying case when the chassis is withdrawn, reference should be made to the substitute calibration marks on the rear edge of the scale backing plate. Check that with the gang at maximum capacitance, the cursor coincides with the calibration mark at the extreme left-hand end (viewed from rear) of the backing plate.

M.W. Oscillator.—Switch receiver to M.W. and tune to 600 kc/s calibration mark. With the signal generator still connected to **V1** control grid, feed in a 600 kc/s (500 m) signal and adjust the core of **L3** (C2) for maximum output. Tune receiver to 1,500 kc/s calibration mark, feed in a 1,500 kc/s (200 m) signal and adjust **C29** (C1) for maximum output. Repeat these adjustments until no further improvement results.

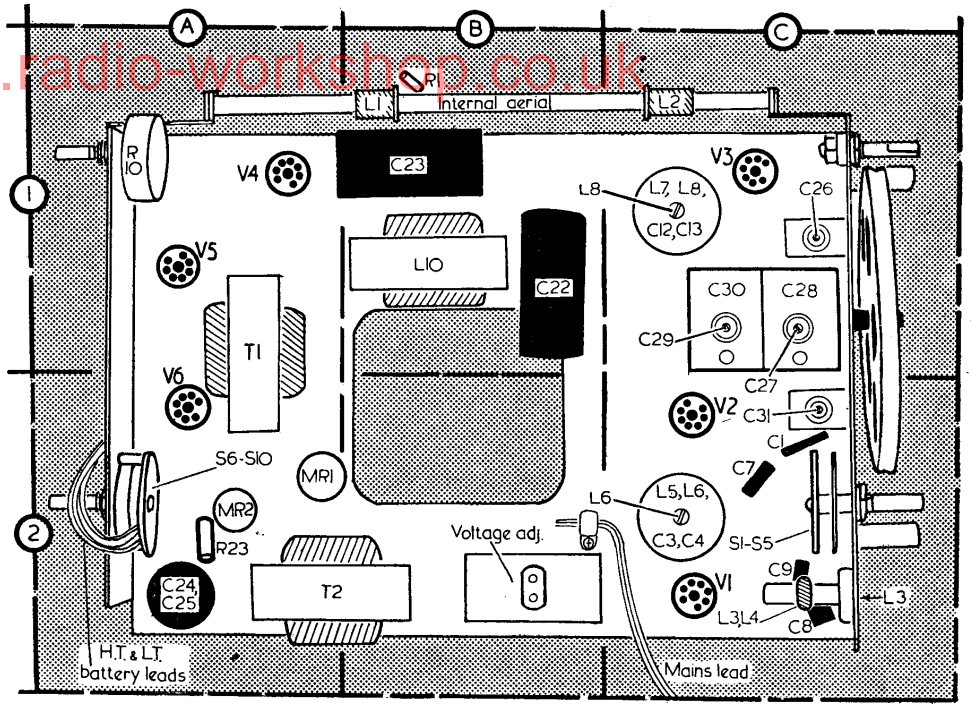
L.W. Aerial.—Switch receiver to L.W. and tune receiver to 207 kc/s calibration mark. Set **C26** (C1) to half a turn anticlockwise from maximum capacitance. Transfer signal generator leads, via a 400 Ω series resistor, to a loop consisting of two or three 10in diameter turns of wire. Place the loop about 12in from the ferrite rod aerial and at right angles to it. Feed in a 207 kc/s (1,450 m) signal and, while rocking the gang, adjust the inductance of **L2** (C1) for maximum output by sliding it along the ferrite rod. Final adjustments to C26 and C31 are made after the adjustment of the M.W. aerial circuit.

M.W. Aerial.—Switch receiver to M.W. and tune to 600 kc/s calibration mark. With the signal generator still connected to the loop, feed in a 600 kc/s (500 m) signal and, while rocking the gang, adjust the inductance of **L1** (B1) for maximum output by sliding it along the ferrite rod. Tune receiver to 1,500 kc/s calibration mark, feed in a 1,500 kc/s (200 m) signal and adjust **C27** (C1) for maximum output. Repeat these adjustments until no further improvement results.

C26, C31.—Switch receiver to L.W. and tune to 207 kc/s calibration mark. With the signal generator output still connected to the loop, feed in a 207 kc/s (1,450 m)) signal and adjust **C26** (C1) and **C31** (C2) for maximum output whilst rocking the gang for optimum results.



Appearance of the Ferranti 945.



Rear illustration of the chassis. The waveband switch unit **S1-S5** and the mains/battery switch unit **S6-S10** are identified. These units are shown in detail in col. 3.

ADDITIONAL NOTES AND MODIFICATIONS

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