"TRADER" SERVICE SHEET
1114

PYE P65MBQ

Portable Superhet for All-dry Battery or A.C. Mains Operation

TWO separate output valves, one for battery operation and the other for mains, are used in the Pye P65MBQ, a 5-valve plus rectifier portable designed to operate from all-dry batteries or from A.C. mains.

The waveband ranges are 1,000-1,950m and 190-550m. The mains voltage range is 200-250V, at 50 c/s, and the receiver must not be connected to D.C. mains. Mains/battery change-over is effected by means of a 3-position switch control, whose third position switches the receiver off.

Release date and original price: August 1952, £16 18s 4d. *Purchase tax and batteries extra.*

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1, C27** (M.W.) and **L1, L2, C27** (L.W.) to heptode valve **(V1, Mullard DK92),** which operates as frequency changer with electron coupling.

Single oscillator grid coil is tuned by **C28** and is used for both wavebands. Parallel trimming by **C29** (M.W.) and **C7, C29** (L.W.); series tracking by **C8** (M.W. and L.W.). Reaction coupling from anode circuit by **L4.**

Second valve **(V2, Mullard DF91)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C3, L5, L6, C4** and **C10, L7, L8, C11.**

Intermediate frequency 470 kc/s.

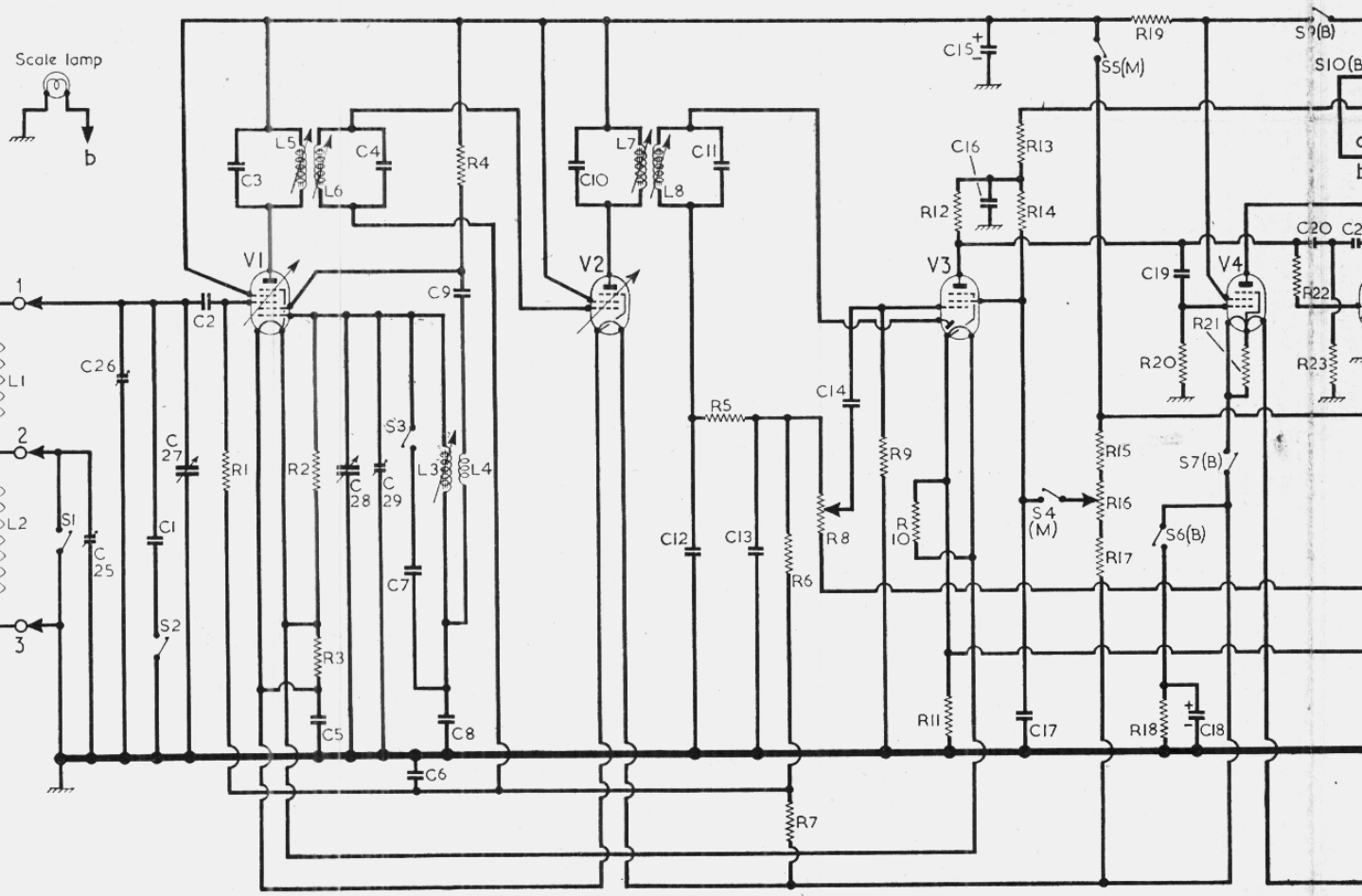
Diode signal detector is part of diode pentode valve **(V3, Mullard DAF91).** Audio frequency component in rectified output is developed across volume control **R8,** which acts as diode load, and passed via **C14** to control grid of pentode section. **R11** is inserted in series with the negative side of the filament circuit to raise **V3** filament voltage with respect to chassis, and thus increase the bias on the valve.

D.C. potential developed across **R8** is fed back as bias to **V1** and **V2** giving automatic gain control.

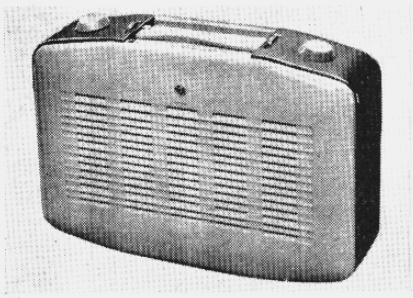
For battery operation, **V3** output is resistance-capacitance coupled by **R12, C19** and **R20** to battery pentode output valve **(V4, Mullard DL94).**

For mains operation, **V3** output is D.C. coupled via **R22** to mains output pentode **(V5, Mullard UL41)** which is triode connected. As **V5** control grid is held positive by the voltage on **V3** pentode anode, correct bias for the valve is obtained by returning the cathode to the H.T. line, the voltage difference between these points being the same as that developed across the more conventional cathode bias resistor.

Tone correction by means of two negative feed-back paths, the first, via **C21, R23** and **C20,** being between the anodes



Circuit diagram of the Pye P65MBQ A.C./A.D. portable superhet. H.T. current for **V1, V2** and **V3** when operating from mains is taken via section **a** is taken via the same path as far as **R16** when it passes down through **R17** to the filament chain. **V5, V6,** the mains transformer **T2,** and part of the H



Appearance of the Pye P65MBQ.

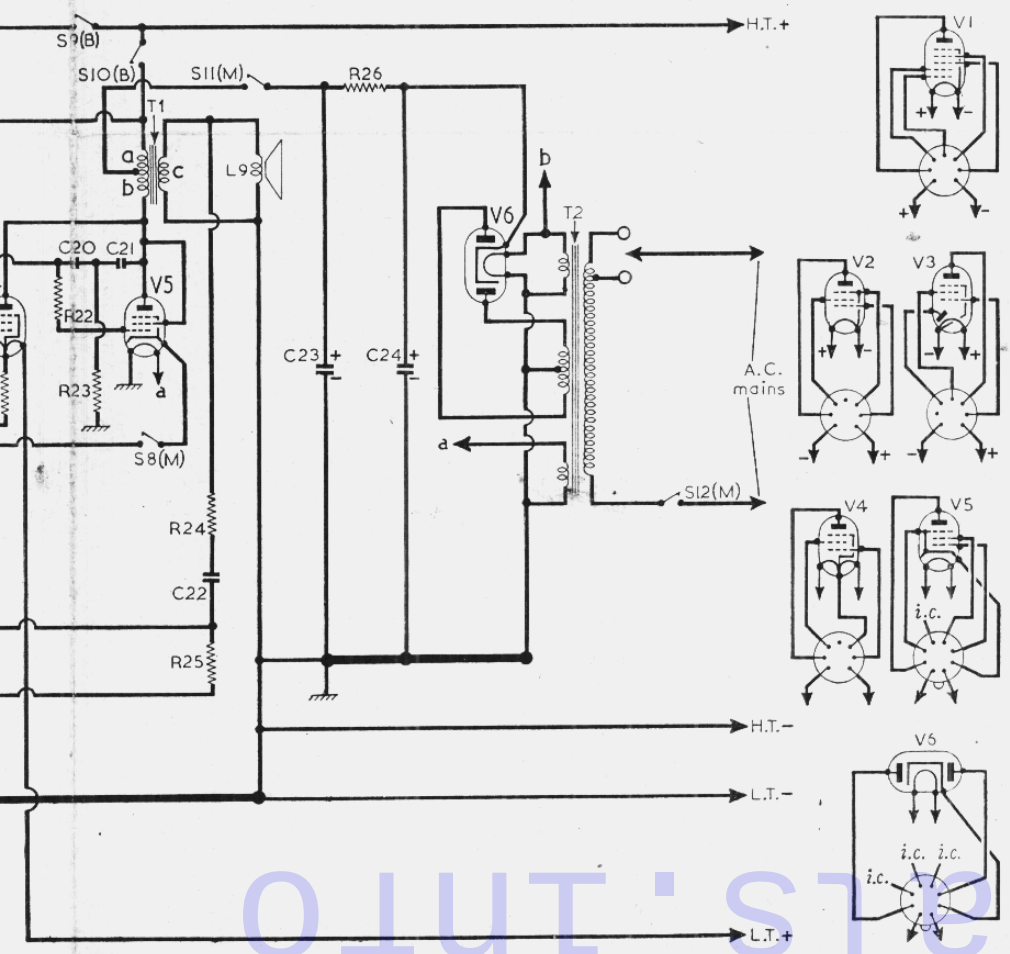
of output valves **V4, V5** and the pentode anode of **V3**, and the second, via **R24, C22, R25,** between **T1** secondary winding and the volume control circuit.

Mains/battery change-over switches **S6(B), S7(B), S9(B)** and **S10(B)** close for battery operation as indicated by the suffix **(B).** Switches **S4(M), S5(M), S8(M), S11(M),** and **S12(M)** close for mains operation. In the "off" position of the switch control all the switches are open.

H.T. current for mains operation is supplied by full-wave H.T. rectifying valve **(V6, Mullard EZ40).** Smoothing by **R26** and electrolytic capacitors **C23, C24.** Residual hum is neutralised by passing H.T. current to **V1-V3** via winding **a** on **T1.** From the top end of winding **a** a H.T. current is first fed to **V3** via **R13, R14.** It is then passed from **V3** screen grid via **S4 (M), R16, R15** and **S5 (M)** to the rest of the receiver. On battery operation, the primary of **T1** is effectively untapped, **S11(M)** then being open.

The filaments of **V1-V3** are series-connected for both mains and battery operation, and **V4** filament being added in series with them, by means of **S7 (B),** for battery operation. On mains operation, filament current is drawn from the H.T. circuit via **R13, R14, S4 (M),** filament voltage adjustment **R16,** and **R17. R16** is adjusted at the factory for correct filament voltage, but in the event of **V3** or **V5** being replaced it should be carefully adjusted as described under "Filament Voltage Adjustment" in "General Notes."

V5 heater is fed from winding **a** on **T2,** and **V6** heater, together with the scale lamp, is fed from winding **b** on **T2. R3, R10, R18** and **R21** by-pass the H.T. current past the filaments. For mains operation **S7(B)** disconnects **V4** from the filament chain, and for battery operation **S8(M)** open-circuits **V5** cathode lead.



via section **a** of **T1** primary winding, and **R13, R14, S4(M), R16, R15** and **S5(M).** Filament current part of the H.T. smoothing circuit are mounted on a separate chassis in the base of the carrying case.

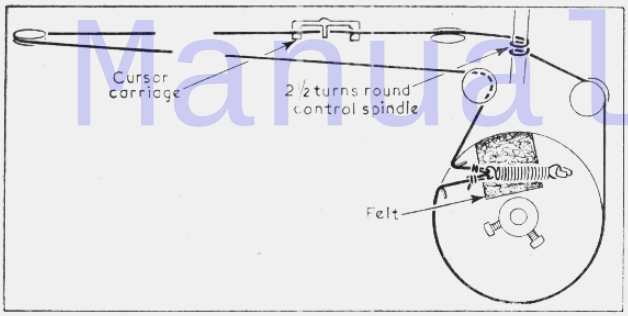
COMPONENTS AND VALUES

	CAPACITORS	Values	Locations
C1	L.W. aerial trim ...	150pF	A1
C2	V1 C.G.	100pF	G3
C3	1st I.F. trans tuning	100pF	B1
C4		100pF	B1
C5	Filament by-pass ...	0·1μF	F2
C6	A.G.C. decoupling	0·02μF	F3
C7	L.W. osc. trim. ...	510pF	A1
C8	Oscillator tracker	560pF	A1
C9	Osc. reaction coup.	100pF	F3
C10	2nd I.F. trans.	100pF	B1
C11	tuning	100pF	B1
C12	I.F. by-passes	100pF	F3
C13		100pF	F2
C14	A.F. coupling ...	500pF	E2
C15*	H.T. smoothing ...	100μF	C1
C16	H.T. decoupling	0·5μF	D2
C17	V3 S.G. decoupling	0·04μF	E2
C18*	Filament by-pass	100μF	C1
C19	A.F. coupling ...	0·01μF	E3
C20	Neg. feed-back	33pF	E2
C21		33pF	E2
C22		0·04μF	F2
C23*	H.T. smoothing	32μF	H4
C24*		32μF	H4
C25‡	L.W. aerial trim....	50pF	A1
C26‡	M.W. aerial trim.	50pF	A1
C27†	Aerial tuning ...	§532pF	A1
C28†	Oscillator tuning	§532pF	A1
C29‡	Oscillator trimmer	50pF	A1

* Electrolytic. † Variable. ‡ Pre-set.
§ "Swing" value, min. to max.

	RESISTORS	Values	Locations
R1	V1 C.G.	1MΩ	G3
R2	V1 osc. C.G. ...	47kΩ	G3
R3	Fil. H.T. shunt ...	1kΩ	G2
R4	Osc. anode feed ...	10kΩ	F3
R5	I.F. stopper ...	100kΩ	F2
R6	A.G.C. decoupling	4·7MΩ	G3
R7	Fixed G.B. feed ...	4·7MΩ	F2
R8	Volume control ...	1MΩ	C1
R9	V3 C.G.	2·2MΩ	E2
R10	V3 H.T. shunt ...	560Ω	E2
R11	Filament bias ...	10Ω	E2
R12	V3 anode load ...	1MΩ	D2
R13	H.T. decoupling	150kΩ	E2
R14	V3 S.G. feed ...	4·7MΩ	E2
R15	Mains H.T. feed	100Ω	C1
R16	Fil. voltage adj. ...	500Ω	D3
R17	Filament ballast ...	390Ω	C1
R18	Fil. H.T. shunt ...	680Ω	C1
R19	H.T. smoothing ...	10kΩ	E2
R20	V4 C.G.	1MΩ	E3
R21	Fil. H.T. shunt ...	390Ω	E3
R22	A.F. coupling ...	100kΩ	H4
R23	Neg. feed-back resistors	100kΩ	E2
R24		22kΩ	F2
R25		820Ω	E2
R26	H.T. smoothing ...	680Ω	H4

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerials	3·5	—
L2		16·0	—
L3	Osc. tuning coil ...	2·5	A1
L4	Osc. reaction coil ...	0·5	A1
L5	1st I.F. trans. Pri.	12·2	B1
L6	Sec.	12·2	B1
L7	2nd I.F. trans. Pri.	12·2	B1
L8	Sec.	12·2	B1
L9	Speech coil ...	2·6	—
T1	O.P. trans. a ...	140·0	C1
	b ...	180·0	
	c ...	—	
T2	Mains trans Pri., total H.T. sec., total ...	700·0	H4
		660·0	
	V6 htr. ...	—	
	V5 htr. ...	—	
S1-S3	Waveband switch...	—	A1
S4(M)-S12(M)	Mains/battery/off switches ...	—	C1



Sketch of the tuning drive system as seen from the front of the chassis with gang at maximum capacitance.

GENERAL NOTES

Switches.—**S1-S3** are the waveband switches ganged in a single rotary unit on the rear of the chassis. The unit is coupled by a lever arrangement to a slide type switch control mounted on the right of the tuning scale (viewed from front of receiver). The switch unit is shown in detail in column 1, where it is drawn as seen from the tuning control end of the chassis. **S1** closes for M.W. operation and **S2, S3** for L.W. operation.

S4(M)-S12(M) are the mains/battery/off switches, ganged in two rotary units on the rear of the chassis. These units are coupled to a slide type switch control on the left of the tuning scale. The switch units are shown in detail in column 3, where they are drawn as seen from the volume control end of the chassis. The **(M)** switches close for mains operation (control towards rear of chassis) and the **(B)** for battery (control in mid position). All the switches open in the "off" position (control towards front).

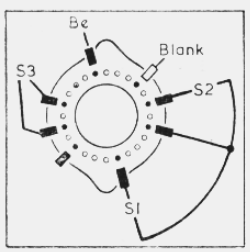


Diagram of the waveband switch unit as seen from the tuning control end of the chassis.

Filament Voltage Adjustment. — **R16** controls the filament voltage and is initially pre-set at the factory. If, however, **V3** or **V5** are replaced, it should be adjusted to give the voltage indicated in the table below between the chassis and the junction of **R7, R17** (positive side of **V2** filament).

Frame Aerials.—These are mounted on a card in the back cover of the carrying case. Connection between the frame aerials and the chassis is made by means of three spring contacts mounted on the end of the tuning gang which bear against three flat contacts on the frame aerial mounting card. The frame aerials are disconnected when the back cover of the carrying case is opened.

R16 Adjustment Table

Voltage at junction of R7 and R17	Mains input voltage	Voltage adj. tapping
4·3	200	200–220
4·4	210	
4·5	220	
4·38	230	225–250
4·5	240	
4·65	250	

Mains Unit.—This is a separate chassis containing the mains output valve **V5** as well as the power supply circuits, and is mounted in the base of the carrying case.

Pilot Lamp.—This is a 6.5V, 0.3A lamp with a large clear spherical bulb and an M.E.S. base, and illuminates a red indicator window in the front of the carrying case when the receiver is operating from A.C. mains.

Resistor R15.—This resistor was not shown in the maker's service manual, but it was present in our chassis. It was added during the production run, and will not be present in early chassis.

I.F. Transformer Trimmers.—These are **C3, C4** and **C10, C11,** and they form an integral part of the top plate of the I.F. transformer assemblies. They are not visible to the eye when the can is removed.

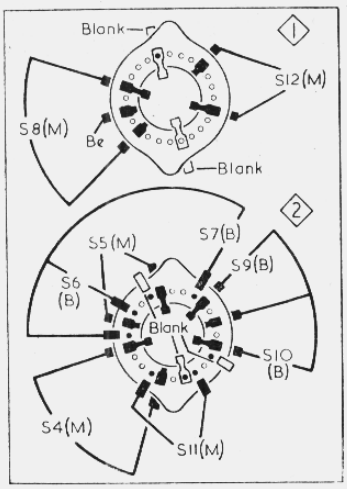


Diagram of the mains/battery/off switch unit, drawn as seen when viewed in the direction of the arrows in our rear view of the chassis.

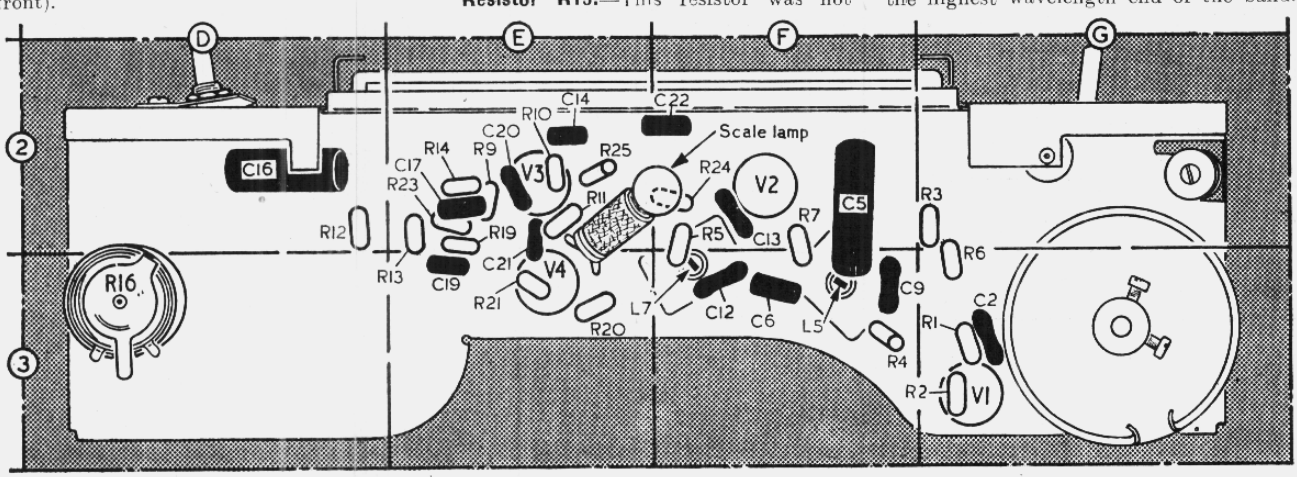
Batteries.—Those recommended by the manufacturers are as follows. H.T., Ever Ready, Batrymax B117 or Vidor L5515, rated at 90V; L.T., Ever Ready AD31 or Vidor L5042, rated at 7.5V.

Drive Cord.—About three feet of nylon braided glass yarn is required for a new drive cord, which should be run as shown in the sketch at the top of column 1.

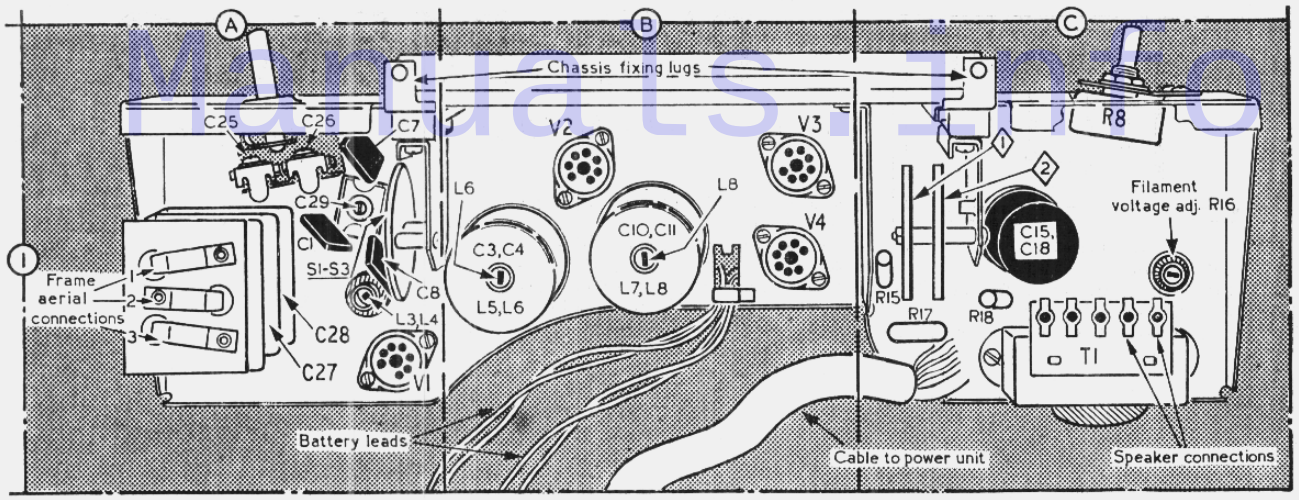
CIRCUIT ALIGNMENT

I.F. Stages. — Remove chassis from carrying case as indicated under "Dismantling," and arrange it on the bench with tuning scale uppermost.

Switch receiver to M.W., and tune it to the highest wavelength end of the band.



Front view of the chassis showing filament voltage potentiometer **R16** on the left. The mains output valve **V5** together with **V6** and its associated components are mounted on a separate chassis which is shown at the foot of cols. 4 and 5.



Rear view of the chassis showing the frame aerial connector springs on the left. The chassis fixing lugs, shown at either end of the tuning scale, lock the front edge of the chassis to the carrying case and are referred to under "Dismantling".

Turn volume control to maximum. Connect output of signal generator, via an 0.1μF capacitor in the "live" lead, to control grid (pin 6) of **V2** and chassis. Feed in a 470kc/s (638.3m) signal and adjust the cores of **L8** (location reference B1), and **L7** (F3) for maximum output. Transfer "live" signal generator lead to control grid (pin 6) of **V1.** Feeding in a 470 kc/s signal, adjust the cores of **L6** (B1) and **L5** (F3) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—Replace chassis in carrying case. Check that with the gang at maximum capacitance the cursor coincides with the high wavelength ends of the tuning scales.

M.W. Oscillator.—Open back cover of carrying case and connect output of signal generator, via a dummy aerial, to top frame aerial connector spring on gang (frame aerial connection 1 in rear chassis view, location reference A1) and to chassis. Tune receiver to 500m, feed in a 500m (600 kc/s) signal and adjust the core of **L3** (A1) for maximum output. Tune receiver to 200m, feed in a 200m (1,500 kc/s) signal and adjust **C29** (A1) for maximum output. Repeat these adjustments until calibration is correct at both ends of the band.

M.W. Aerial.—Close back cover of carrying case, and lay signal generator leads close to the frame aerials. The tuning control knob should be removed to give access to the two holes through which **C25** and **C26** are adjusted during this and the L.W. aerial adjustments. Tune receiver to 200m, feed in a 200m signal and adjust **C26** (A1) for maximum output.

L.W. Aerial.—Switch receiver to L.W., and tune to 1,400m. Feed in a 1,400m (214.3 kc/s) signal and adjust **C25** (A1) (through hole beneath tuning control knob) for maximum output.

DISMANTLING

Removing Chassis.—Open back cover of carrying case (anti-clockwise turn of single fixing screw) and remove batteries;

remove (pull-off) the two control knobs from top of carrying case;

unsolder red and black leads from speech coil tags on speaker;

remove two 4BA screws securing lower ends of chassis to rear of carrying case;

remove two further 4BA screws, on either side of rear edge of tuning scale, which hold the chassis via two sets of chassis lugs to the carrying case (see rear view of chassis, locations A1, C1);

support weight of chassis by means of the carrying handle;

insert blade of screwdriver between the front and rear lugs of each pair, levering out the rear lugs to their fullest extent;

the chassis may now be lowered by about an inch, to clear the control spindles, and then lifted out of the carrying case.

Removing Power Unit.—Remove two 4BA screws securing mains transformer end of chassis to base of carrying case;

lay carrying case on its side and remove two further 4BA screws from side of mains input connector in underside of carrying case.

VALVE ANALYSIS

Valve voltages and currents given in the tables below are those derived from the manufacturers' information, and were measured with the receiver operating from a new set of batteries and from 230V A.C. mains, the voltage adjustment being set to the 225-250V tapping. The receiver was 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 on an Avometer Model 8, chassis being the negative connection in every case.

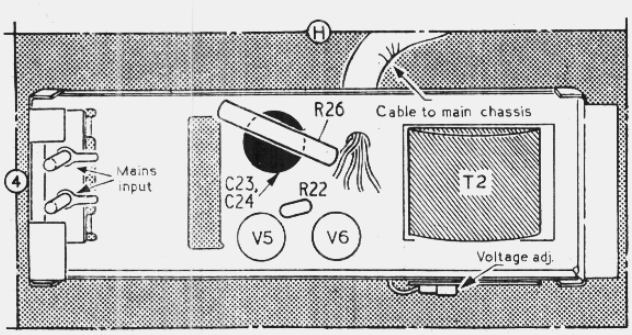
Battery Operation

Valve		Anode		Screen	
		V	mA	V	mA
V1	DK92	51·5 (Oscillator) 37·0	0·57 1·4	51·5	0·13
V2	DF91	51·5	1·28	51·5	0·54
V3	DAF91	24·5	0·05	21·0	0·01
V4	DL94	87·0	5·5	90·0	1·02

Mains Operation

Valve		Anode		Screen	
		V	mA	V	mA
V1	DK92	45·5 (Oscillator) 32·0	0·49 1·35	45·5	0·12
V2	DF91	45·5	1·5	45·5	0·45
V3	DAF91	34·0	0·175	36·0	0·032
V5	UL41†	217·0	51·0	—	—
V6	EZ40	500·0*	—	—	—

* Each anode, A.C. Cathode voltage 260V, cathode current 51·5 mA.
† Cathode 45·5V, 51mA.



Underside view of the mains unit. The voltage adjustment is accessible from the rear of the carrying case, and the mains input connector is inserted through the base of the carrying ing case.

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