"TRADER" SERVICE SHEET

1040

PYE P31MBQ

A.C. mains/Battery Portable

DESIGNED to operate from self-contained dry batteries or from A.C. mains (not D.C. mains) the Pye P31MBQ is a suitcase portable superhet employing four valves and a full-wave metal rectifier. The waveband ranges are 182-560 m and 1,130-2,000 m.

Release date and original price: September 1951; £12 5s 2d without batteries, increased March 1952 to £13 4s 9d. Purchase tax extra.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1, C24** (M.W.) or **L1, L2, C24** (L.W.) precedes a heptode valve **(V1, Mullard DK91)** which operates as frequency changer with electron coupling. Single oscillator grid coil **L3** is tuned by **C25** and covers M.W. and L.W. bands. Parallel trimming by **C5, C26** (M.W.) and **C5, C6, C26** (L.W.); series tracking by **C7** (M.W. and L.W.). Reaction coupling from anode by **L4** via **C8.**

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 **C11, L7, L8, C12.**

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 **R10,** which acts as diode load, and is passed via **C16** to control grid of pentode section. I.F. filtering by **C14, R8** and **C15.** D.C. potential developed across **R10** is fed back as bias to F.C. and I.F. stages giving automatic gain control.

Resistance-capacitance coupling via **R14, C20** and **R16** between **V3** anode and pentode output valve **(V4, Mullard DL94).** A proportion of the speech coil voltage in **T1** secondary is fed back via the potential divider **R21, R22,** in inverse phase, to the grid circuit of **V3.** Additional negative feed-back is applied via **C21** between the anodes of **V4** and **V3.**

For battery operation, power supplies are carried by switches **S4 (B), S6 (B)** and **S7 (B, M),** which close in that position as indicated by the suffix **(B).** For mains operation **S5 (M), S7 (B, M)** and **S8 (M)** close. In the "off" position all the switches open. Lid-operated switches **S9, S10** ensure that the batteries are out of circuit when the lid is closed.

Mains H.T. current is supplied by metal rectifier **(MR1, Westinghouse 15D39)** consisting of two units connected cathode-to-cathode for full-wave operation. Smoothing by **R17** and electrolytic capacitors **C19, C22.** Filament current is taken from the H.T. circuit via ballast resistor **R23.**

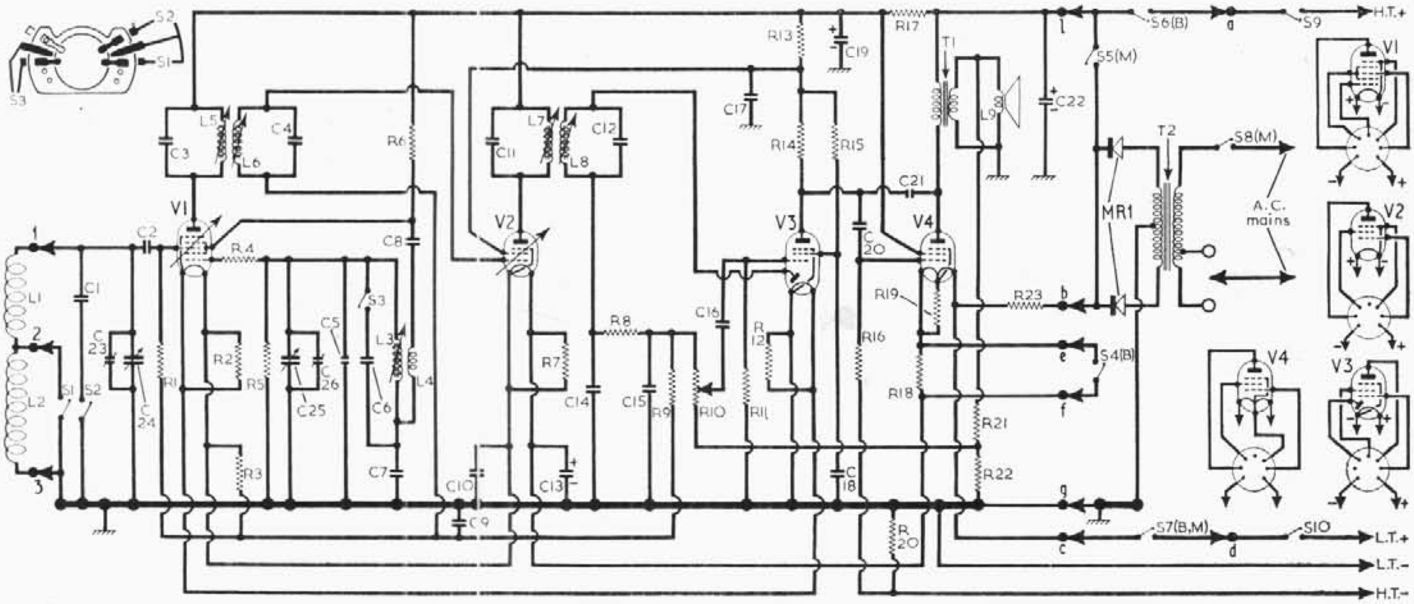
The filaments are connected in series for mains and battery operation. Bias is obtained from the appropriate points in the filament chain, that for **V1** and **V2** being applied to the A.G.C. line via **R3.** For mains operation, G.B. to **V4** is increased by the inclusion of **R18** in the heater chain. For battery operation **R18** is short-circuited by **S4** and the extra bias for **V4** is obtained from the voltage drop across **R20** in the H.T. negative lead to chassis. **R2, R7, R12** and **R19** by-pass the H.T. current from the valves past the filaments.

COMPONENTS AND VALUES

RESISTORS		Values	Locations
R1	V1 C.G.	1MΩ	E3
R2	V1 filament shunt	180Ω	D3
R3	G.B. feed	4·7MΩ	E3
R4	Osc. grid stopper ...	2·2kΩ	D2
R5	V1 osc. C.G. ...	100kΩ	D3
R6	Osc. anode feed ...	10kΩ	D2
R7	V2 filament shunt ...	270Ω	E3
R8	I.F. stopper ...	100kΩ	E3
R9	A.G.C. decoupling	4·7MΩ	E3
R10	Volume control ...	1MΩ	E2
R11	V3 C.G.	10MΩ	E3
R12	V3 filament shunt ...	180Ω	F3
R13	H.T. decoupling ...	27kΩ	F3
R14	V3 anode load ...	1MΩ	F3
R15	V3 S.G. feed ...	10MΩ	F3
R16	V4 C.G.	1MΩ	F3
R17	H.T. smoothing ...	1kΩ	F3
R18	Filament series ...	10Ω	F2
R19	V4 filament shunt ...	680Ω	F2
R20	V4 G.B.	100Ω	F3
R21	Neg. feed-back ...	10kΩ	E2
R22	Neg. feed-back ...	2·2kΩ	E2
R23	Filament ballast ...	1·6kΩ	F2

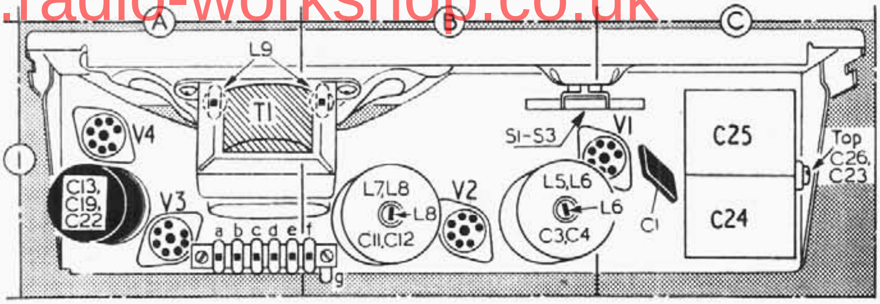
CAPACITORS		Values	Locations
C1	L.W. trimmer ...	180pF	C1
C2	V1 C.G.	100pF	D3
C3	1st I.F. trans. tuning ...	100pF	B1
C4	1st I.F. trans. tuning ...	100pF	B1
C5	Osc. trimmer ...	15pF	D3
C6	L.W. osc. trimmer	510pF	D2
C7	Tracker	560pF	D2
C8	Osc. anode coup. ...	100pF	D2
C9	A.G.C. decoup. ...	0·01μF	D3
C10	Filament by-pass ...	0·1μF	E3
C11	2nd I.F. trans. tuning ...	100pF	B1
C12	2nd I.F. trans. tuning ...	100pF	B1
C13*	Filament smoothing	100μF	A1
C14	I.F. by-passes ...	100pF	E3
C15	I.F. by-passes ...	100pF	E2
C16	A.F. coupling ...	0·002μF	E3
C17	H.T. decoupling ...	0·01μF	F3
C18	V3 S.G. decoup. ...	0·01μF	F3
C19*	H.T. smoothing ...	32μF	A1
C20	A.F. coupling ...	0·01μF	F3
C21	Neg. feed-back ...	15pF	F3
C22*	H.T. smoothing ...	32μF	A1
C23‡	M.W. aerial trim....	35pF	C1
C24†	Aerial tuning ...	528pF	C1
C25†	Oscillator tuning ...	528pF	C1
C26‡	M.W. osc. trim. ...	35pF	C1

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Pye P31MBQ A.C. mains/battery portable. Inset at top left corner is a diagram of the waveband switch unit. The connections between the receiver and the A.C. mains/battery power unit are shown in a vertical row, lettered **a—l.**

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	M.W. frame aerial	3·2	—
L2	L.W. frame aerial ...	15·0	—
L3	Osc. tuning coil ...	2·4	D2
L4	Osc. reaction coil ...	0·5	D2
L5	1st I.F. trans. Pri.	12·0	B1
L6	1st I.F. trans. Sec.	12·0	B1
L7	2nd I.F. trans. Pri.	12·0	B1
L8	2nd I.F. trans. Sec.	12·0	B1
L9	Speech coil ...	2·3	A1
T1	O.P. trans. Pri. ...	700·0	A1
	O.P. trans. Sec. ...	0·5	
T2	Mains trans. Pri. ...	400·0	G4
	Mains trans. Sec. total	410·0	
S1-S3	Waveband switches	—	B1
S4-S8	Mains/battery sw.	—	G4
S9, S10	Lid switches ...	—	F2
MR1	H.T. metal rect. ...	—	G4



Plan view of the chassis. The mains/battery power unit tags **a—g** are seen here.

GENERAL NOTES

Construction.—This receiver consists of a conventional chassis and a small assembly through which the power supplies, from batteries or A.C. mains, are applied. The power supply unit contains the mains transformer, rectifier and mains/battery change-over switch, shown on the right of our circuit diagram and joined to the main receiver diagram via a vertical row of tags coded **a, b, c, d, e, f, g** and **l**.

These tags are indicated in our plan and underside drawings of the chassis, where the tags are coded from **a** to **n**, although on the underside panel only tag **l** is used for this purpose. A drawing of the power supply unit, viewed as seen from above, appears in col. 3.

Switches.—Waveband switching is performed by a simple 2-position 2-pole rotary switch. **S1**

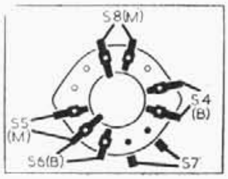


Diagram of the mains/battery change-over switch. (B) Switches close for battery operation, and (M) for mains.

closes on M.W. (control knob anti-clockwise); **S2, S3** close on L.W.

S4(B)-S8(M) are the mains/battery change-over switches, ganged in a 3-position rotary unit operated by a lever. As seen in our drawing of the power supply unit, the lever goes to the left for mains operation, and to the right for battery. In the central position the receiver is switched off.

A diagram of the switch unit is seen above, drawn in the same way up as it stands when in the receiver. The suffix letters **(M)** and **(B)** indicate that the switches close on mains or battery respectively. **S7** closes in both positions.

S9, S10 are two protective switches which prevent the receiver from being accidentally put away with the batteries switched on. They are operated by a plunger which is depressed by the lid when it is closed, opening the two switches.

Batteries.—The recommended L.T. battery is an Ever-Ready Alldry 38 or Vidor L5048, rated at 7.5 V. The recommended H.T. batteries are Ever-Ready Batrymax B126, Vidor L5512 or Drydex Drymax 526, rated at 90 V. The makers point out that if the L.T. battery is left "floating" across the filaments during mains operation, hum will be reduced. For this reason **S7** closes in the mains and battery positions of the control unit.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. They were measured in a receiver which was operating from 210 V A.C. mains, with the voltage adjustment set to the appropriate tapping and the L.T. battery disconnected. The figures quoted for the receiver when operating from a new set of batteries were approximately the same.

Voltage readings were measured on the 10 V and 400 V ranges of a Model 7 Avometer, chassis being the negative connection. The voltage drop across **R18** was 0.6 V when the receiver was operating from A.C. mains, and the voltage drop across **R20** was 0.9 V when operating from batteries. The A.C. voltage from each anode of **MR1** to chassis was 75 V.

Valve	Anode		Screen	
	V	mA	V	mA
V1 DK91	85	0·85	63	2·05
V2 DF91	85	1·9	60	0·8
V3 DAF91	*	*	*	*
V4 DL94	88	3·35	85	0·68

* Readings very low.

DISMANTLING THE SET

The majority of under-chassis components can be made readily accessible by pulling up the battery compartment cover and removing the two 4BA bolts thus revealed, which secure the rear edge of the chassis to the carrying case. The panel may now be hinged upwards and forwards about its front edge for inspection.

If it is desired to gain access to the other side of the chassis for alignment or to replace a valve, it can now be partly withdrawn by sliding the panel back half an inch to disengage it from the front hinging screws, lifting the chassis up, and supporting it on the edges of the carrying case.

Removing Chassis and Mains Unit.—Release chassis from cabinet as before, and unplug leads from batteries, if fitted;

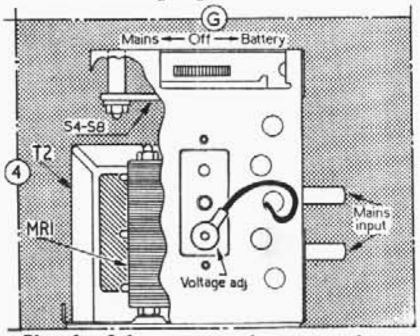
remove wood screw and spacer from top and lower edge of carrying case lid;

remove wood screws holding metal bracket to left-hand inside edge, and lid stay to right-hand inside edge of lid;

pull out cardboard frame aerial cover from lid and unsolder the three leads from the frame aerial tags thus exposed;

remove the wood screw holding the rear edge, and the two 6BA nuts securing the lower edge of the mains unit to the carrying case, and withdraw chassis and mains unit.

When replacing, connect the frame aerial lead numbered 1 in our under-chassis view (location reference D3) to the left-hand of the three frame aerial tags, the lead numbered 2 to the centre tag and the lead numbered 3 to the remaining tag.



Sketch of the power unit, as seen from above.

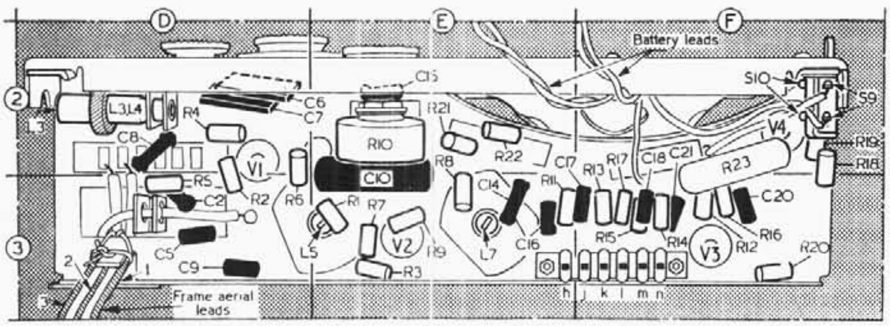
CIRCUIT ALIGNMENT

For the following alignment adjustments the chassis should be partly withdrawn from the carrying case and supported so that all the cores and trimmers are accessible.

I.F. Stages.—Switch receiver to M.W. and tune to 560 m. Connect output of signal generator, via an 0.1 μF capacitor in the "live" lead, to control grid (pin 6) of **V1** and chassis. Feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L8** (location reference B1), **L7** (E3), **L6** (B1) and **L5** (E3) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. effects.

R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance, the lines separating the M.W. and L.W. scales coincide with the cursor lines on the escutcheon. This may be adjusted by slackening the grub screw securing the tuning scale to the gang spindle and rotating the scale relative to the gang. No alignment adjustments are made on L.W.

M.W.—Switch receiver to M.W., tune to 500 m, and with the signal generator connected to **V1** control grid feed in a 500 m (600 kc/s) signal and adjust the core of **L3** (D2) for maximum output. Tune receiver to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C26** (C1) for maximum output. Remove signal generator leads from **V1** control grid and chassis and lay them near the frame aerial. With the receiver tuned to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C23** (C1) for maximum output. Repeat these adjustments until calibration is correct at both ends of scale.



Underside drawing of the chassis. Only tag **l** is used for a power unit lead.