"TRADER" SERVICE SHEET

1325

MURPHY BA228

Covering also Model B229

EMPLOYING an internal frame aerial, the Murphy BA228 is a six-valve (plus two metal rectifiers), 2-band portable receiver designed to operate from a combined all-dry battery or A.C. mains of 200-250V, 50c/s. The wavebands covered are 187-540m and 1,000-2,000m. Model B229 is a similar receiver housed in an identical cabinet, but designed to operate from a combined all-dry battery only.

The circuits of both receivers are very much alike in most respects, and our diagram shows them both completely. Differences are indicated in the main body of the diagram by using thick lines to indicate wiring that is present only in the BA228, while dotted lines indicate that it is present only in the B229. The A.C. mains power supply circuit for the BA228 is shown separately on the right of the main diagram.

Release date both models: September 1954. Original prices: BA228, £17 5s; B229, £14 16s 3d. Purchase tax and battery extra.

CIRCUIT DESCRIPTION

The frame aerial **L1** is switched directly across the tuning capacitor **C5** or to a tapping on L.W. coil **L2**, and precedes heptode frequency changer valve **V1** operating with electron coupling. Provision is made for connection to an external aerial via socket **A**. This socket is isolated by **C1** in model BA228 only.

Oscillator grid coils **L5** M.W. and **L6** L.W. are tuned by **C14**. Parallel trimming by **C13** and **C15** on M.W. and **C16** and **C17** on L.W. Series tracking by **C11** M.W. and **C11, C12** on L.W. Reaction coupling from oscillator anode via **L7** and **L8**.

I.F. amplifying valve **V2** is a variable-mu R.F. pentode operating with tuned transformer couplings **C8, L3, L4, C9** and **C20, L9, L10, C21**. These transformers are hermetically sealed units and plugs are fitted over the core adjustment heads.

Intermediate frequency 470 Kc/s.

Diode signal detector is part of diode-pentode valve **V3**. Audio frequency component in its rectified output is developed across the volume control **R8**, which also functions as the diode load, and is passed via **C25** to the pentode section of **V3**, which operates as the A.F. amplifier. Anode circuit decoupling to **V3** H.T. supply is provided by **R14, C28** in model BA228 only, as indicated by the heavy lines. To obtain the maximum reduction of hum when working from A.C. mains supply, the volume control **R8** grid leak **R9** and screen bypass capacitor **C27** in the BA228 are returned to chassis via the junction of **R12** with **R13**. These two resistors form a potential divider across the filament supply to **V3** and again as indicated by the heavy lines they are present only in model BA228; in model B229 **R8, R9** and **C27** are returned direct to the chassis. A feed-back circuit, comprising **C29, R16, C30** and **R10** from **V3** anode circuit to chassis and control grid circuit, provides additional hum reduction.

Output Stage

Output from **V3** anode is resistance-capacitance coupled via **R15, C31, R21** to one-half **(V5)** of the push-pull output stage **V5, V6** and by **R15, C31, C32, R19** to **V4**, which has anode and screen joined to operate as a triode. **V4** functions as a phase invertor and is resistance-capacitance coupled via **R20, C34, R22** to the other half of the push-pull output stage **V6**.

The driving circuits for the output stage are balanced, and allowance is made for the slight additional gain introduced by **V4** by suitably selecting the values of the coupling capacitors. **C33**, from the junction of **C34** with **R22** to control grid of **V4**, provides feed-back which effectively cancels any I.F. component introduced in the phase-invertor stage by the A.G.C. diode of **V4**.

Automatic Gain Control

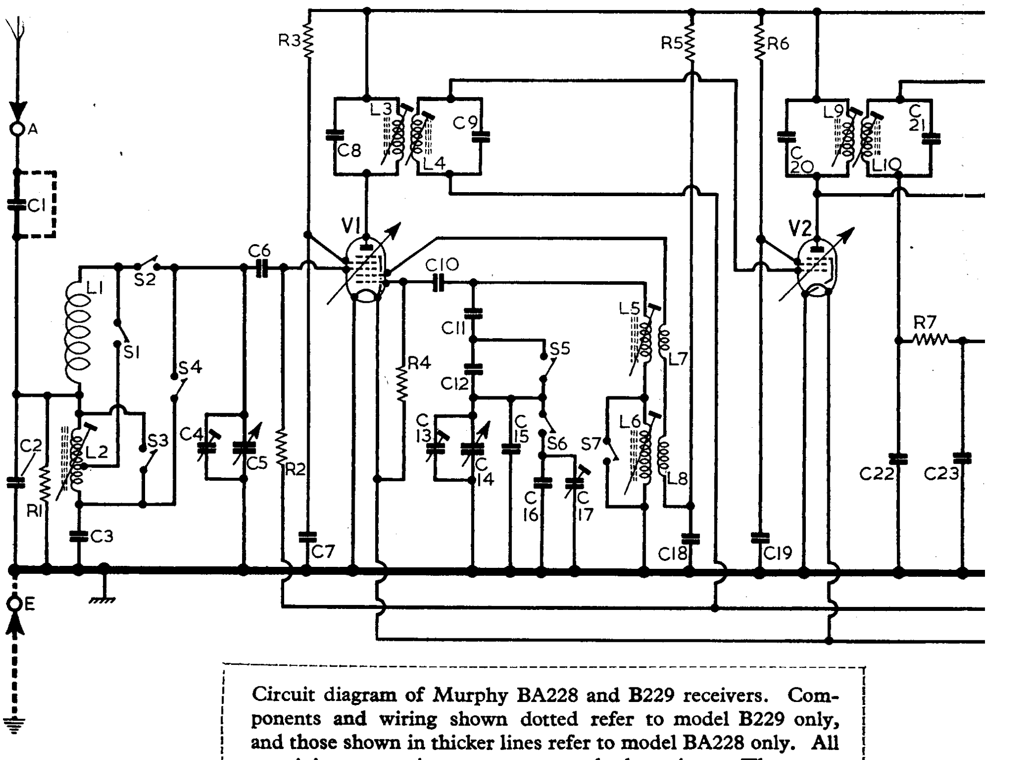
Automatic gain control of **V1** and **V2** is achieved by coupling the I.F. amplifier anode to **V4** diode via **C24**, and the resultant rectified output is developed as a D.C. potential across **R18**. This D.C. potential is then fed via filter circuit **R17, C26** as A.G.C. bias to **V1** and **V2** control grid circuits.

Power Supplies

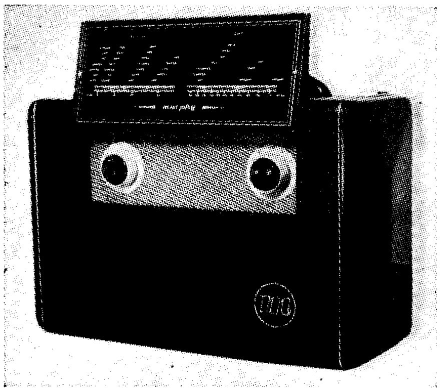
As explained earlier, our circuit diagram shows the circuits of the battery-only model B229 and the mains/battery version BA228. With the exception of the separated mains-derived power circuit on the extreme right our diagram shows the circuits of both models all the way through.

Most of the circuit is identical in both models, and it is then drawn in the normal manner, but where differences occur they are indicated either by thickening the line or by breaking it into dots. A thickening of the line indicates that the wiring represented (and components included in it), is present only in the mains/battery model, while the breaking of a line into dots indicates that it is present only in the battery-only model. Our chassis line is represented as usual by a very heavy line which is of course common to both versions.

The separated mains power circuit on the right is drawn normally, but the complete power circuit applies to the mains/battery model only, as indicated in the diagram. In this model, the complete receiver circuit is shown if the breaks between the two sections of the diagram are bridged.



Circuit diagram of Murphy BA228 and B229 receivers. Components and wiring shown dotted refer to model B229 only, and those shown in thicker lines refer to model BA228 only. All remaining connections are common to both receivers. The power supply circuit on the right applies to the BA228 receiver only.



Appearance of both models.

In the battery-only model, the H.T. negative lead from the battery goes (via dotted lines) to **R23**, and current flowing through **R23** to chassis produces a voltage drop which provides grid bias for the output valves. Their grid resistors **R21, R22** go to the H.T. negative plug. The H.T. positive lead goes via **S8** to the H.T. positive line. The L.T. negative lead goes directly to chassis; and the L.T. positive lead goes via **S9** to the filaments.

In the mains/battery version BA228, power supplies for battery operation are obtained from the same sources as they are in the B229, but they take a different route. For A.C. mains operation, of course, power supplies are obtained from the separately drawn mains power circuit on the right.

Here the H.T. supply is taken from secondary winding **c** on the mains transformer **T2** and rectified by **MR2** in the negative side of the circuit, which goes to chassis via bias resistors **R28, R27, R26.** These and electrolytic capacitors **C40, C35** provide the main smoothing.

Filament current is obtained from another secondary winding **b**, which is tapped to permit accurate adjustment of the filament voltage. A metal rectifier **MR1** again is in the negative side of the circuit, and smoothing is provided by **L12** (for **V1, V2, V3** and **V4** filaments) and **C39, C38. L12** is tapped for accurate adjustment, which is fairly critical. **S9** and **S10** are then open, and current for the output valve filaments is taken via **R24.**

Grid bias for the output valves is obtained from the drop along **R26** at the junction of **R27** and **R28, S12** being closed

(*Continued col. 1 overleaf*)

COMPONENT TABLES

Resistors

R1	10kΩ	A1
R2	470kΩ	B1
R3	180kΩ	B1
R4	27kΩ	B2
R5	27kΩ	A2
R6	39kΩ	F4
R7	22kΩ	F3
R8	1MΩ	D1
R9	10MΩ	F3
R10	2·2MΩ	F4
R11	2·7MΩ	F3
R12	1kΩ	F3
R13	222Ω	F4
R14	100kΩ	F3
R15	1MΩ	F4
R16	1MΩ	F4
R17	1MΩ	F4
R18	1MΩ	E4
R19	10MΩ	E4
R20	680kΩ	F4
R21	1·5MΩ	E4
R22	1·5MΩ	E3
R23[1]	820Ω	—
R24	6·5Ω	D1
R25	470kΩ	F4
R26	470Ω	C1
R27	270Ω	D1
R28	1·5kΩ	F3

Capacitors

C1	1,800pF	H4
C2	3,900pF	A1
C3	73pF	A1
C4	35pF	H3
C5	523pF[2]	H4
C6	100pF	B1
C7	0·04μF	B2
C8	68pF	B2
C9	68pF	B2
C10	82pF	A2
C11	490pF	A2
C12	390pF	A1
C13	35pF	H3
C14	523pF[2]	H3
C15	10pF	B1
C16	100pF	B2
C17	35pF	B2
C18	0·04μF	A2
C19	0·04μF	F4
C20	68pF	C2
C21	100pF	C2
C22	100pF	F3
C23	100pF	F3
C24	10pF	F4
C25	0·04μF	F4
C26	0·04μF	G4
C27	0·04μF	F4
C28	0·1μF	F4
C29	1,800pF	F4
C30	0·002μF	E4
C31	1,800pF	F4
C32	120pF	E4
C33	100pF	E4
C34	0·02μF	E4
C35	32μF	G3
C36	0·003μF	E4
C37	0·1μF	E3
C38	1,000μF	C1
C39	2,000μF	C1
C40	32μF	F3

Coils*

L1	1·7	—
L2	32·5	A2
L3	18·3	B1
L4	18·3	B1
L5	5·0	H4
L6	9·5	H4
L7	—	H4
L8	—	H4
L9	18·3	C1
L10	16·0	C1
L11	2·7	—
L12	5·5	G3

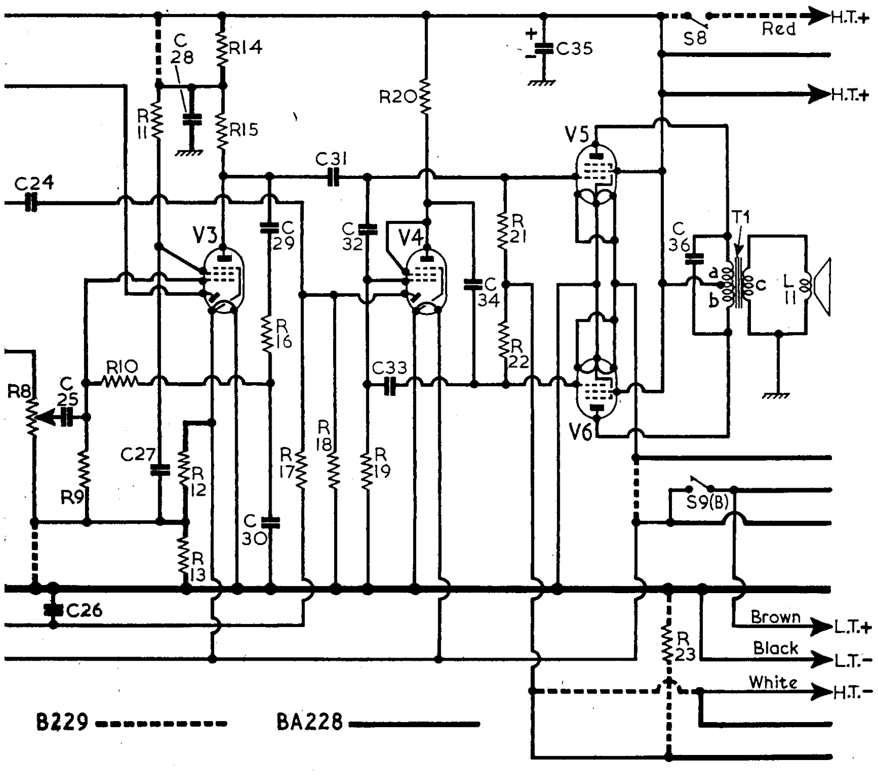
Transformers*

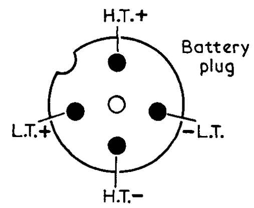
T1	460·0 a		E3
	400·0 b		
	— c		
T2	23·0 a		D1
	1·3 b		
	460·0 c		
	441·0 d		

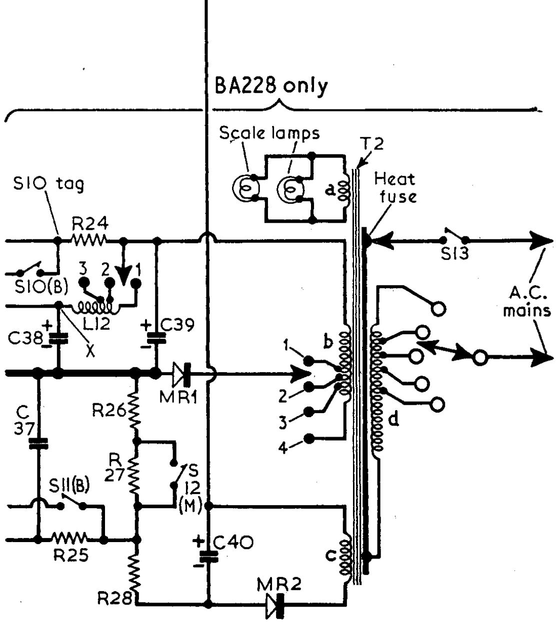
Miscellaneous

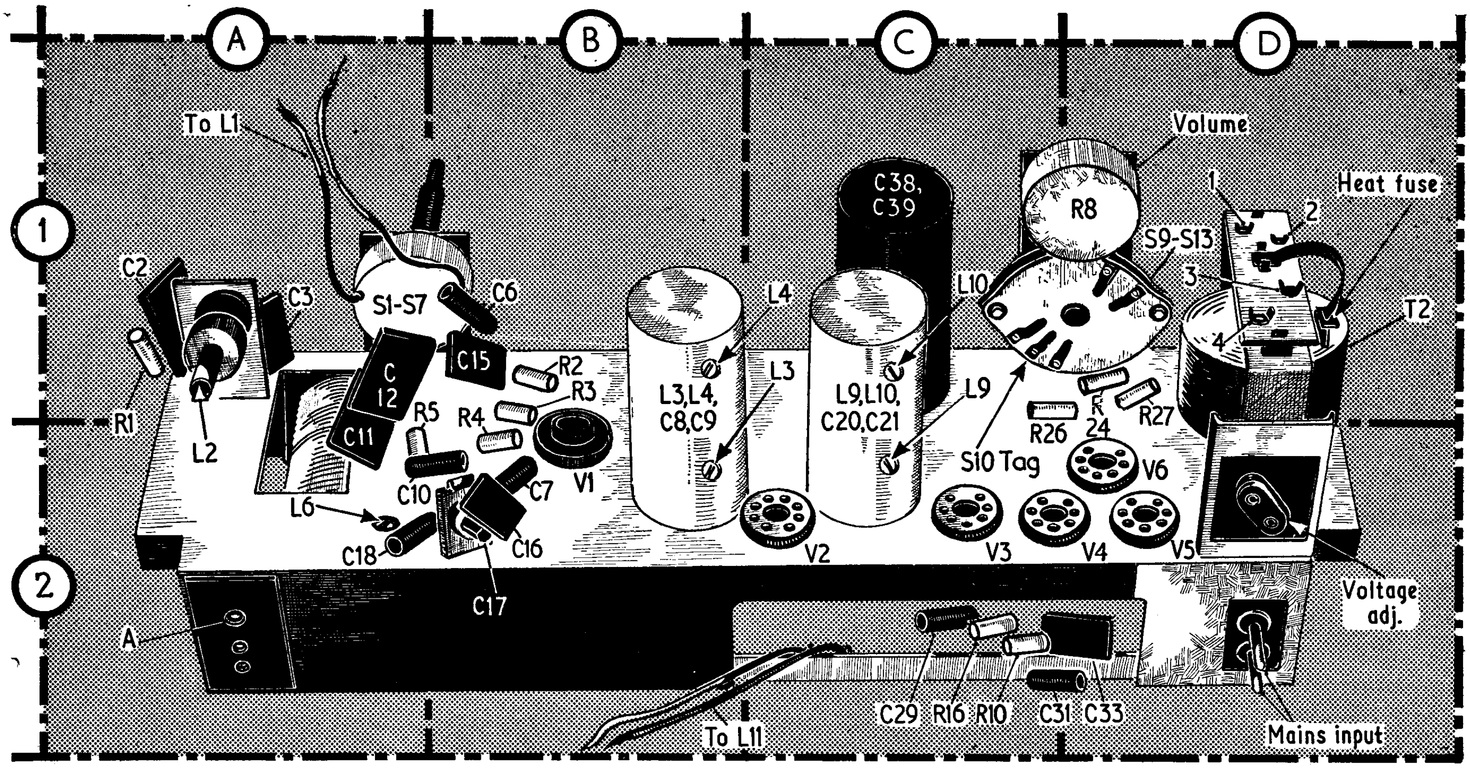
MR1	011L999[3]	G4
MR2	15C997[3]	E3
S1-S7		A1
S8-S13		D1
Scale lamps	12-14 V, 0·75 W.	—

[1]In model B229 only; not shown in our chassis illustrations. [2]"Swing" value minimum to maximum. [3]Westinghouse. *Approximate D.C. resistance in ohms.









Plan view of chassis. Tappings on **T2**, used in adjusting the L.T. voltage, are shown in **D1**. The mounting of **V1** is inverted and the valve is inserted from the underside of the chassis.

Circuit Description—*continued*

for mains operation. **S11** is open, and **C37, R25** decouple the grid circuit. Grid circuit of **V3** is returned via **R9** to the potential divider **R12, R13** on mains or battery.

For battery operation, as indicated by the suffix letters on them, switches **S9, S10** and **S11** close, while **S12** opens. The H.T. negative lead then goes via **S11** (**B**) to the potential divider **R27, R26** to provide grid bias for the output valves, while the H.T. positive lead goes directly to the H.T. positive line.

The L.T. negative lead goes directly to chassis, but the L.T. positive lead goes to the junction of two switches. **S9** connects it to the filaments of **V1-V4**, and **S10** connects it to those of **V5** and **V6**. The dotted line shown across these two switches is not present in the BA228.

CIRCUIT ALIGNMENT

The complete alignment of both I.F. and R.F. circuits can be carried out with the chassis in the cabinet, provided that the alignment of the scale cursors and drive cords has been checked as explained under "Drive Cord Replacement." A non-metallic trimming tool must be used, and all cores should be adjusted to the peak nearer to the adjusting end of the former.

For output indication, connect a high-resistance 0-2V A.C. voltmeter across the secondary of **T1** and turn receiver volume control to maximum. Then carry out the alignment instructions given below ensuring that, as circuits are brought into tune, the receiver output is maintained, by reduction of signal generator output, at 0·4V. If the output reading is greater than 0·4V the A.G.C. circuit will become operative and make alignment difficult.

I.F. Alignment

The I.F. transformers are hermetically sealed, and the adjustment head openings are closed by rubber plugs. The plugs may be removed, but care must be taken to see that they are removed only during the alignment process, and then for only the shortest possible time. To carry out the alignment process, make the adjustments given below, but do not re-adjust the secondaries after adjusting the primaries, or the response curve will be incorrect.

1.—Connect the signal generator, via a 0.001μF capacitor, to the control grid (pin 6) of **V2**. Switch receiver to L.W., turn tuning gang to maximum capacitance, then feed in a 470 kc/s signal and adjust cores **L10** (C1), and then **L9** (C1), to give maximum output on meter.

2.—Transfer live signal generator lead to control grid (pin 6) of **V1**. Switch receiver to M.W. and, with tuning gang still at maximum, feed in a 470 Kc/s signal and adjust cores of **L4** (C1), and then **L3** (C1), for maximum output.

R.F. Alignment

Complete R.F. alignment can be carried out only with the chassis in the cabinet and with the frame aerial correctly connected. The signal generator should be connected, via dummy aerial, to the aerial socket **A** in location reference A2. Check drive cord and scale pointer alignment as explained in "Drive Cord Replacement," then carry out the following instructions.

1.—Switch the receiver to M.W., turn tuning gang to 500m, feed in a 600 kc/s signal and adjust core of oscillator coil **L5** (H4) for maximum output on meter.

2.—Turn tuning gang to 200m, feed in a 1,500 kc/s signal and adjust capacitors **C13** and **C4** (H3) for maximum output.

3.—Switch the receiver to L.W., turn tuning gang to 1,900m, feed in a 157.9 kc/s signal and adjust cores of **L6** (A2) and **L2** (A2) for maximum output.

4.—Turn tuning gang to 1,000m, feed in a 300 kc/s signal and adjust **C17** (B2) for maximum output.

5.—Repeat all R.F. alignment operations for optimum results.

GENERAL NOTES

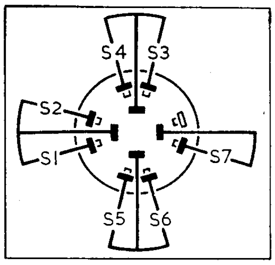
Switches.—S1-S7 are the waveband switches, ganged in a single rotary unit on the chassis deck in location reference **A1**. These waveband switches operate as follows: **S2, S3, S5** and **S7** close for M.W. operation, and **S1, S4, S6** close for L.W. operation.

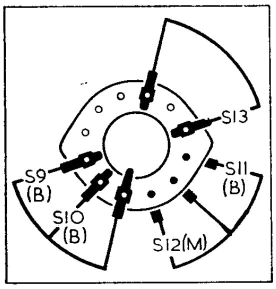
S9-S13 are the mains/battery and on/off switches ganged in a single rotary unit on the chassis deck in location reference **D1**.

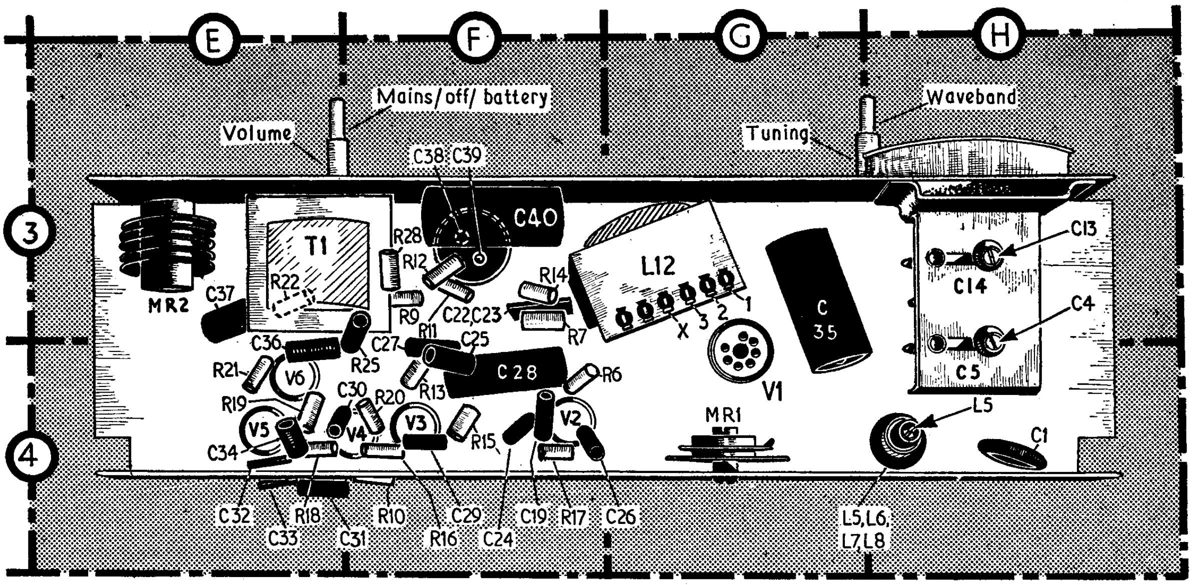
These two units are indicated in our plan view of the chassis, and they are shown in detail in the diagrams in col. 4, where they are drawn as seen when viewed from the rear of the chassis, **S9-S12** have a suffix (M) for mains or (B) for battery to indicate which closes for each mode of operation.

Filament Voltage Adjustment.—In model BA228, when any component associated with the filament circuit, or any valve, is replaced, the filament line voltage must be checked and, if necessary, adjusted. To perform this check, use a high resistance D.C. voltmeter, and with chassis as the negative connection carry out the following instructions.

1.—Measure the voltage at "**S10 tag**" (C2) which should be between **1.3V** and **1.4V.** If the reading is outside these limits, adjust the tapping on winding **b** on **T2** (supplying **MR1**) to give a reading as near as possible to **1.35V.** (These tappings on **T2** are numbered **1-4** in location reference D1, and in the circuit







Left: Diagrams of the switch units showing them as seen when viewed from the rear of the chassis. *Right:* Underside illustration of chassis showing position of **MR1** and **L12**. The unidentified tags on **L12** are those referred to as carrying H.T. current.

diagram.) Care must be taken that no contact is made with the heat fuse, which is very close to the tapping tags.

2.—Measure the voltage at tag **X** on **L12,** which should be between **1.3V** and **1.4V**. If the reading is outside these limits, adjust the tapping on **L12** to give a reading as near as possible to **1.35V.** (These tappings on **L12** are numbered 1-3 in circuit diagram, and in location reference G3 adjacent to tag **X**.) Care must be taken that no contact is made with H.T. tags on **L12** tag panel.

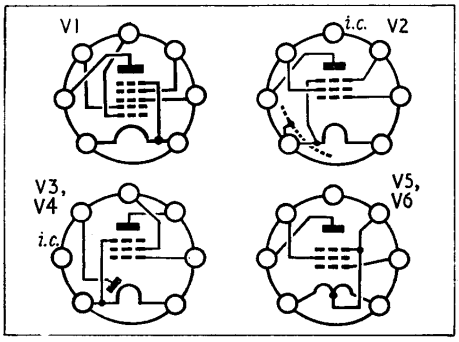
3.—If after fitting a replacement rectifier **MR1,** the L.T. voltage is too high and cannot be corrected by either of the foregoing adjustments, a 22Ω resistor, rated at 6W, must be connected between the connecting tag on **MR1** and tag **1** on **L12,** and then the voltage adjusted accordingly.

Battery.—A combined 90V (H.T.) and 1.5V (L.T.) battery is required for either model, and types recommended by the makers are: Drymax 503; Ever Ready B103; G.E.C. BB503; Siemax S103; or Vidor L5507.

DRIVE CORD REPLACEMENT

Two interconnected drive cords are fitted, and to replace either of these a length of nylon braided cord of approximately 43in or 34in is required. These cords are held together by a clip and details of fitting are illustrated in col. 5. The tension springs shown in the illustration should be extended to ⅝in.

To align the two cords turn tuning gang to maximum capacitance, which occurs before the stop is reached, when the eyelet fitted to the main drive cord should correspond with the 0.2 mark on the diagonal scale attached to the chassis. With the chassis in the cabinet, and the two drive cords held together by the clip, the M.W. scale cursor should coincide with the right-hand edge of the 540m mark on the glass tuning scale. If it does not, then the cursor drive cord should be adjusted by moving it through the clip holding it to the main drive cord.



Above: Diagram of valve bases viewed from free ends of the pins. *Below:* Illustration of the drive cord system as seen from the front.

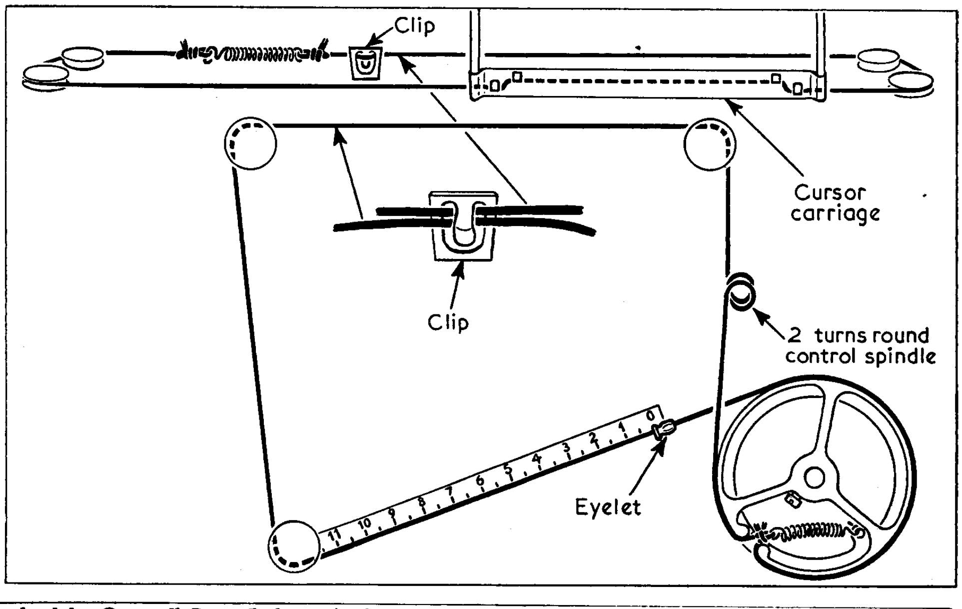
VALVE ANALYSIS

Valve voltages given in the table below are those derived from the manufacturers' information. The receiver was switched to M.W., but there was no signal input. In the case of the BA228, it was operating from A.C. mains of 240V, and in the case of the B229, from a new combined H.T./L.T. battery. Voltages were measured on the 100V range of a 20,000 ohms-per-volt meter, chassis being the negative connection in each case.

Total consumption is given by the makers as 7 watts from the mains in the case of the BA228; for the B229, H.T. current is given as 10mA, and L.T. current as 225mA. Battery consumption for model BA228 will be similar.

Valve	Model BA228		Model B229	
	Anode (V)	Screen (V)	Anode (V)	Screen (V)
V1 IC2 { osc.	33	—	33·0	—
{ mixer	87	61	82·5	54·0
V2 1F1 ..	87	70	82·5	63·0
V3 1FD1 ..	7	18	16·0	29·0
V4 1FD1 ..	28	28	36·0	36·0
V5 1P1* ..	86	87	81·5	82·5
V6 1P1* ..	86	87	81·5	82·5

**Negative bias voltage, developed in H.T. negative lead to chassis, is:* 7·5 V (*B229*), 6·2 V (*BA228*).



Printed in England by Cornwall Press Ltd., Paris Garden, London, S.E.1.