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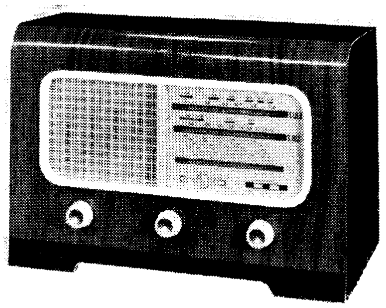
"TRADER" SERVICE SHEET

1078

PHILCO B23101



THREE wavebands covering 13.6-43 m, 185-566 m and 1,200-2,000 m are provided in the Philco B23101 receiver, and it is produced in two versions: B23101B (moulded cabinet), and B23101W (walnut cabinet). It is designed to operate from A.C. mains only of 100-250 V, 40-60 c/s, but the chassis is "live" to the mains.

Two overseas models use the same basic design as the B23101, but replace the L.W. band with a second S.W. band. These are the B3101 and B3101B, and the differences between the three models are explained briefly overleaf. The tuning circuits of the overseas models are not fully covered in this *Service Sheet*, which was prepared from a B23101W.

Release date and original prices: September 1951; B23101B, £13 19s 6d; B23101W, £16 3s 7d. Purchase tax extra.

CIRCUIT DESCRIPTION

Aerial input on S.W. is via coupling coil **L1** to the tuning circuit **L3, C30,** switch **S2** being closed. On L.W., **S1** closes and **S2** opens, and the tuning coil **L5** is then bottom capacitance coupled to the aerial. On M.W., **S1, S2** both open, and **S3** closes, "inverting" **L5** which then becomes the aerial coupling coil to the M.W. tuning coil **L4. C1, C3** isolate the chassis, which is "live" to the mains.

The unconnected and short-circuited coil **L2** is present as the tuning coil for an alternative band to L.W. in export receivers, designated S.W.1 and ranging over about 40-100 m. In those models, the L.W. coils are present but unused.

First valve **(V1, Brimar 7S7)** is a triode hexode operating as frequency changer with internal coupling. Oscillator grid coils **L6** (S.W.) and **L7** (M.W.) are tuned by **C31.** Parallel trimming by **C32** (S.W.), and **C33** (M.W.); series tracking by **C12** (S.W.), and **C11** (via **S10**), **C14** and **C35** which are all in parallel (M.W.). On L.W., **S9** closes and **S10** opens, so that **L7** is shunted by **C11, C33** and its trimmer **C34.** The L.W. tracker comprises **C14, C35.**

Reaction coupling is inductive on S.W. by **L8,** when **S11** is closed. On M.W. and L.W. it is mixed, with inductive coupling by **L9** and bottom capacitance coupling by the trackers. The alternative S.W.1 band coil is **L10,** but it is unused in the Home model.

Second valve **(V2, Brimar 7B7)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C7, L10, L11, C8** and **C16, L13, L14, C17.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of double diode triode valve **(V3, Brimar 7C6).** A.F. component in rectified output is developed across volume control **R9,** which acts as diode load, and is passed via **C20** to grid of triode section. I.F. filtering by **C18, R8, C19** and **C21.**

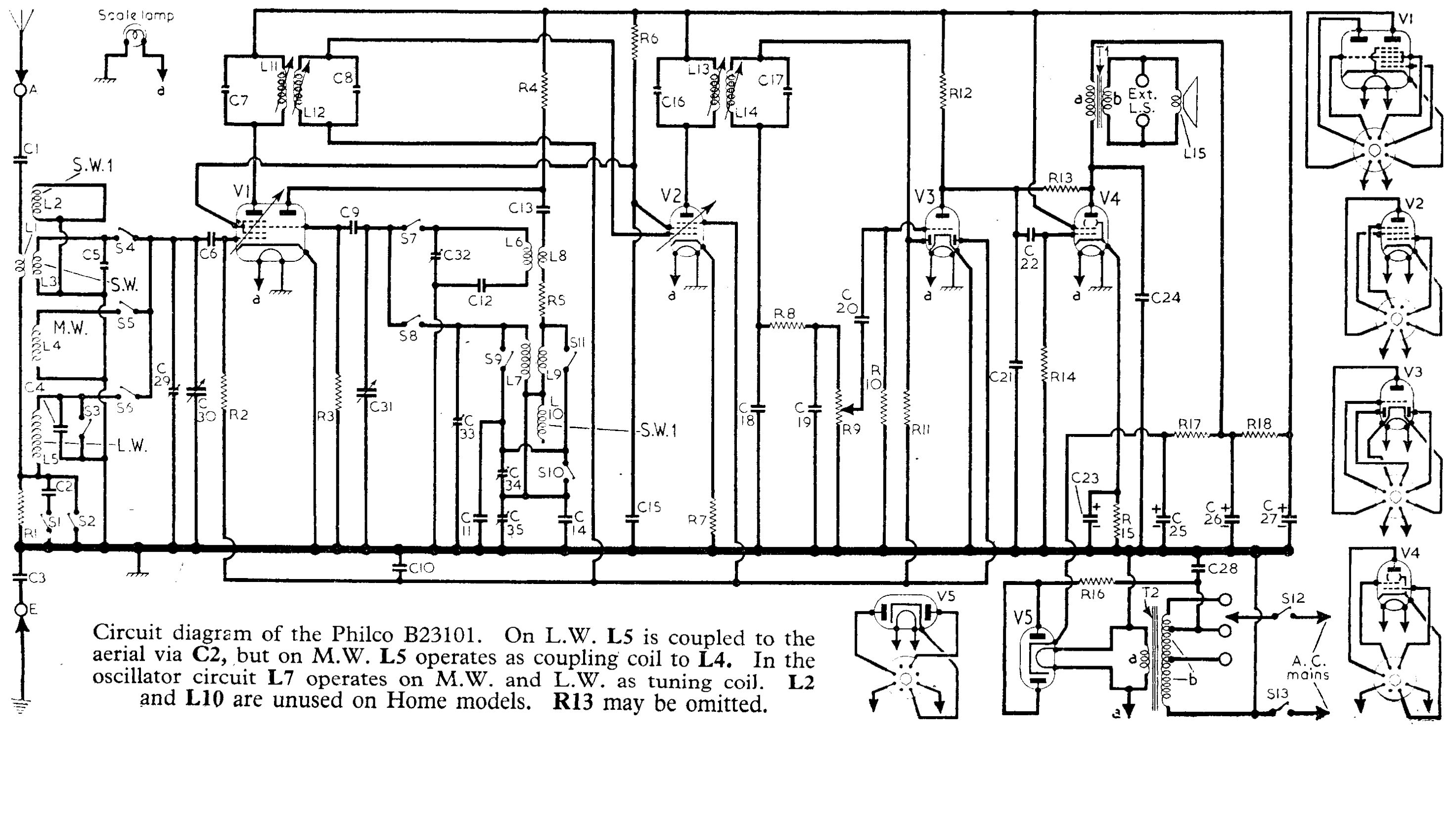
D.C. potential developed across **R8, R9** is (*Continued col. 1 overleaf*)

COMPONENTS AND VALUES

RESISTORS		Values	Locations
R1	Aerial shunt ...	6·8kΩ	E2
R2	V1 C.G.	1MΩ	F3
R3	V1 osc. C.G. ...	33kΩ	F3
R4	Osc. anode load ...	22kΩ	E3
R5	Osc. stabilizer ...	100Ω	F3
R6	S.G. H.T. feed ...	39kΩ	D3
R7	V2 G.B.	180Ω	E3
R8	I.F. stopper ...	47kΩ	D3
R9	Volume control ...	500kΩ	C2
R10	V3 C.G.	10MΩ	D2
R11	A.G.C. decoupling	2·2MΩ	D3
R12	V3 anode load ...	470kΩ	D2
R13	Neg. feed-back ...	1MΩ	D2
R14	V4 C.G.	470kΩ	D3
R15	V4 G.B.	270Ω	D3
R16	V5 surge limiter ...	100Ω	C3
R17	H.T. smoothing ...	150Ω	C3
R18	H.T. smoothing ...	1kΩ	E2

CAPACITORS		Values	Locations
C1	Aerial isolator	0·002µF	E2
C2	Aerial coupling	0·0025µF	E2
C3	Earth isolator ...	0·01µF	E2
C4	L.W. aerial trim....	450pF	A1
C5	S.W. aerial trim.	12pF	E2
C6	V1 C.G.	100pF	F2
C7	1st I.F. trans. tuning	75pF	A1
C8	1st I.F. trans. tuning	75pF	A1
C9	V1 osc. C.G. ...	100pF	E2
C10	A.G.C. decoup. ...	0·05µF	E3
C11	L.W. osc. trim. ...	155pF	F3
C12	S.W. osc. tracker...	4,375pF	F2
C13	Osc. reaction coup.	220pF	E3
C14	Osc. reaction coup.	260pF	F3
C15	S.G. decoupling ...	0·05µF	E3
C16	2nd I.F. trans. tuning	75pF	B1
C17	2nd I.F. trans. tuning	75pF	B1
C18	I.F. by-passes ...	100pF	D3
C19	I.F. by-passes ...	100pF	D3
C20	A.F. coupling ...	0·005µF	D2
C21	I.F. by-pass ...	220pF	D2
C22	A.F. coupling ...	0·01µF	D3
C23*	V4 cath. by-pass	25µF	C3
C24	Tone corrector ...	0·01µF	D3
C25*	H.T. smoothing ...	40µF	A1
C26*	H.T. smoothing ...	30µF	A1
C27*	H.T. smoothing ...	20µF	A1
C28	Mains R.F. by-pass	0·05µF	C3
C29‡	M.W. aerial trim.	—	F2
C30†	Aerial tuning	—	A1
C31†	Oscillator tuning	—	A1
C32‡	S.W. osc. trim. ...	—	F2
C33‡	M.W. osc. trim. ...	—	F3
C34‡	L.W. osc. trim. ...	—	F3
C35‡	M.W. osc. tracker	—	F3

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Philco B23101. On L.W. **L5** is coupled to the aerial via **C2,** but on M.W. **L5** operates as coupling coil to **L4.** In the oscillator circuit **L7** operates on M.W. and L.W. as tuning coil. **L2** and **L10** are unused on Home models. **R13** may be omitted.

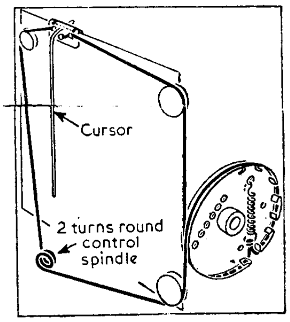
OTHER COMPONENTS		Approx. Values (ohms)	Location
L1	S.W. aerial coup. ...	—	E2
L2	Aerial tuning coils	—	E2
L3		—	E2
L4		3·25	A1
L5		13·5	A1
L6	Oscillator tuning coils	—	F3
L7		2·3	F3
L8	Oscillator reaction coup.	0·7	F3
L9		0·8	F3
L10	S.W.1 osc. tuning...	0·8	F3
L11	1st I.F. trans. Pri.	9·5	A1
L12	1st I.F. trans. Sec.	9·5	A1
L13	2nd I.F. trans. Pri.	9·5	B1
L14	2nd I.F. trans. Sec.	9·5	B1
L15	Speech coil ...	3·0	B1
T1	O.P. trans. a ...	400·0	B1
	O.P. trans. b ...	0·5	
T2	Mains trans. a	0·2	B1
	Mains trans. b, total	105·0	
S1-S11	Waveband switches	—	F2
S12, S13	Mains sw., g'd R9...	—	C2

Circuit Description—*continued*

tapped off at the signal diode anode and fed back as bias to **V1** and **V2**, giving automatic gain control. Second diode of **V3** is connected to the A.G.C. line and prevents it from going positive.

Resistance-capacitance coupling by **R12**, **C22** and **R14** between **V3** triode and beam tetrode output valve **(V4, Brimar 6V6GT)**. Tone correction by **C24** in **V4** anode circuit and by negative feed-back via **R13** between anodes of **V4** and **V3** triode. Provision is made for the connection of a low impedance external speaker across **T1** secondary winding.

H.T. current is supplied by I.H.C. full-wave rectifying valve **(V5, Brimar 6X5GT)** whose anodes are strapped to form a half-wave rectifier



Three - quarter front view of the tuning drive cord system, with the gang at maximum capacitance.

and are fed from the 200-225 V tapping on **T2** primary winding via surge limiting resistor **R16**. Valve heaters, including **V5**, are fed from the secondary winding on heater transformer **T2**.

GENERAL NOTES

Switches.—**S1-S11** are the waveband switches, ganged in a single rotary unit beneath the chassis and indicated in our underside drawing. The unit is shown in detail in the diagram inset

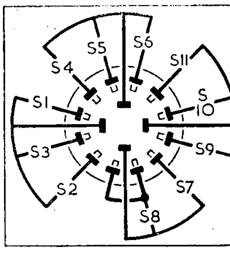


Diagram of the waveband switch unit. Below is the associated table.

Switch	L.W.	M.W.	S.W.
S1	C	—	—
S2	—	—	C
S3	—	C	—
S4	—	—	C
S5	—	C	—
S6	C	—	—
S7	—	—	C
S8	C	C	—
S9	C	—	—
S10	—	C	—
S11	—	—	C

beside the plan illustration, where it is drawn as seen from the rear of an inverted chassis.

The table below it gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S12, S13 are the Q.M.B. mains switches, ganged with the volume control **R9**.

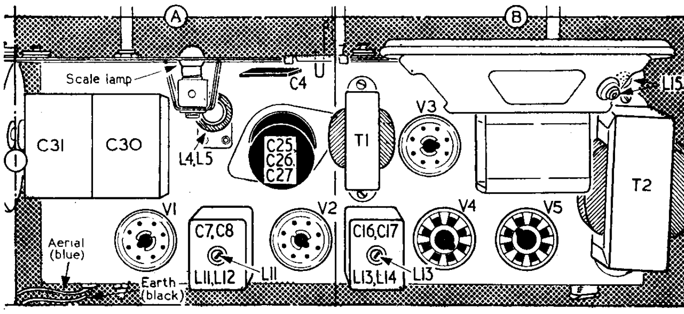
Scale Lamp.—This is an Osram lamp, with a small clear spherical bulb, rated at 6.5 V, 0.3 A.

External Speaker.—Two sockets and a special 2-pin plug are provided at the rear of the chassis for the connection of a low impedance (about 3-4 Ω) external speaker.

Drive Cord Replacement.—The cord can be made up as an endless loop and fitted as a loop. The length of our loop, when stretched between two pins, was 16in (circular length 32in). The cord is fine gauge nylon braided glass yarn, and it should be fitted as shown in the accompanying sketch, where it is drawn as seen from the front with the gang at maximum.

Export Models.—Two export models, types B3101 and B3101B, use what is basically a similar chassis to the B23101, but owing to the inclusion of an extra waveband (S.W.1) and the omission of the L.W. band considerable differences occur in the R.F. and oscillator circuits. Otherwise both receivers have circuits like the B23101, although **R13** may be omitted.

All three aerial circuits are inductively coupled, and the S.W.1 and M.W. trackers are connected by switching to chassis. All three aerial tuning coils are connected directly to chassis. Alignment for the S.W.1 band is given under "Circuit Alignment." **V3** may be 7B6 or 7C6. **V4** in B3101B is 7C5, and the chassis is isolated from the mains, a 470 kc/s filter shunted by 150 kΩ coupling the two sections.



Plan view of the chassis. The aerial connections are flexible leads.

CIRCUIT ALIGNMENT

I.F. Stages.—Remove chassis from cabinet and stand on bench. Switch receiver to M.W. and turn gang to minimum. Connect signal generator output, via an 0.05 μF capacitor in each 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 **L14** (location reference D3), **L13** (B1), **L12** (E3) and **L11** (A1) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. action.

R.F. and Oscillator Stages.—Transfer signal generator leads, via a suitable dummy aerial, to **A** and **E** leads. Make up a substitute scale as follows, and fasten it with clips to the scale backing plate. Using the left-hand edge of the paper as the high wavelength setting of the cursor mark off the following calibration points: 580 kc/s at 0.5in; 240 kc/s at 3.55in; 1,500 kc/s at 3.8in; 21 Mc/s at 3.9in. On export models add 7 Mc/s at 3.7in in place of 240 kc/s.

It is important in the Home models that adjustments are carried out in the same order as we show them. If the M.W. adjustments are disturbed, S.W. and L.W. realignment must follow.

M.W.—Switch receiver to M.W., tune to 1,500 kc/s on substitute scale, feed in a 1,500 kc/s (200 m) signal and adjust **C33** (F3) and **C29** (F2) for maximum output. Tune receiver to 580 kc/s on scale, feed in a 580 kc/s (517.2 m) signal and adjust **C35** (F3) for maximum output while rocking gang for optimum results. Repeat these adjustments until no further improvement results.

S.W.—Switch receiver to S.W., tune to 21 Mc/s on substitute scale, feed in a 21 Mc/s (14.29 m) signal and adjust **C32** (F2) for maximum output.

L.W.—Switch receiver to L.W., tune to 240 kc/s on substitute scale, feed in a 1,250 m (240 kc/s) signal and adjust **C34** (F3) for maximum output.

S.W. (Export Models).—According to the makers' manual, **C29** and **C32** are transposed in these models as compared with our sample. They should be adjusted for S.W.2 as described in "S.W." above. For S.W.1, adjust the trimmer we show as **C33** at 7 Mc/s. The position we show for **C35** is occupied by the M.W. oscillator trimmer, and **C34** the M.W. tracker.

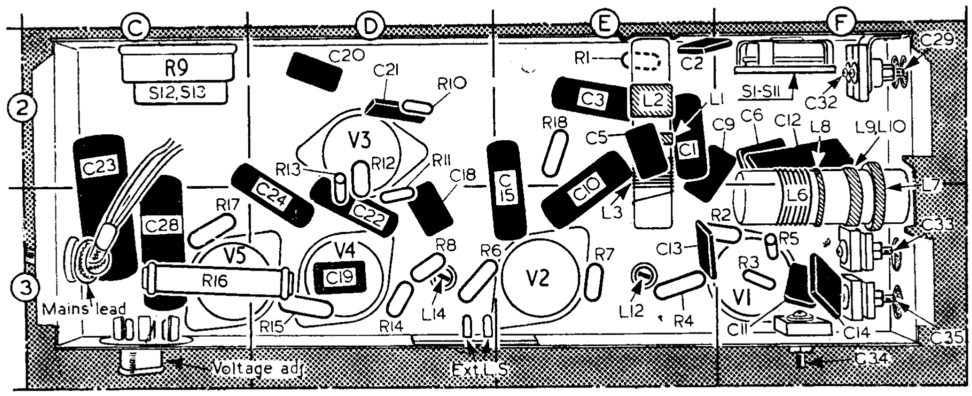
VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from 230 V A.C. mains. The receiver was tuned to the highest wavelength end of M.W. with the volume control at maximum, but there was no signal input.

Voltage readings were measured on the 10 V and 250 V ranges of an Avo Electronic TestMeter, and as this instrument has a high internal resistance, allowance should be made for the current drawn when using other types of meter. Chassis was the negative connection.

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 7S7	190	1·0	60	2·4	—
	Oscillator				
	110	3·5			
V2 7B7	190	5·0	60	1·0	1·0
V3 7C6	95	0·22	—	—	—
V4 6V6GT	190	31·0	190	2·0	9·5
V5 6X5GT	185†	—	—	—	210·0

† A.C. reading.



Underside view of the chassis. A diagram of the **S1-S11** unit is inset at the head of col. 2.

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