'TRADER' SERVICE SHEETS

NUMBER TWENTY - SEVEN (VOLUME TWO)

PHILCO MODEL 233

3-VALVE BATTERY RECEIVER

MODEL 233 in the Philco 1934-5 range is a battery-operated table consolette receiver employing a straight 3-valve circuit which consists of a single tetrode H.F. amplifier, a tetrode detector with reaction and a high-efficiency output pentode. There are two tuned circuits and notable features are the pre-H.F. volume control and the resistance reaction control.

CIRCUIT DESCRIPTION

Aerial input by way of pre-H.F. potentiometer volume control **R1** to aperiodic coupling coils **L1, L2.** Single tuned circuit **L3, L4, C11** precedes tetrode H.F. amplifier (**V1, Philco 32E**) working with fixed G.B. Tuned anode coupling by **L5, L6, C13** to tetrode detector (**V2, Philco 32E**) which functions on grid leak system with **C6** and **R6.** Reaction applied from anode by means of fixed condenser **C5** and coils **L7, L8** and controlled by series variable resistance **R4.**

Resistance-capacity coupling to pentode output valve (**V3, Philco 2101**) which is capable of delivering an A.C. output of 500 mW for a grid swing of only 3.2 V. Tone correction by condenser **C10** in anode circuit.

DISMANTLING THE SET

Removing Chassis.—Remove the three knobs (pull off), and undo the three hexagonal-headed bolts from underside of cabinet. Chassis can now be withdrawn sufficiently for most requirements. To remove it entirely, unsolder the two speaker leads from the tags on the speaker chassis. Do not forget to re-connect speaker before testing. Be careful not to damage fibre pointer on tuning condenser spindle.

Removing Speaker.—This is held to the front of the cabinet by four ornamental-headed screws and nuts. *When replacing,* the connecting tags on the speaker chassis should be at the top.

COMPONENTS AND VALUES

	Resistances	Values (ohms)
R1	Volume control, variable	20,000
R2	V1 cont. grid decoupling	51,000
R3	V1 anode decoupling	2,900
R4	Reaction control, variable	35,000
R5	V2 S.G. H.T. feed	16,000
R6	V2 grid leak	2,000,000
R7	V2 anode resistance	160,000
R8	V2 anode H.F. stopper	10,000
R9	V3 grid resistance	1,000,000
R10	V3 grid H.F. stopper	51,000

	Condensers	Values (μF)
C1	V1 cont. grid decoupling	0·09
C2	V1 S.G. by-pass	0·1
C3	D.C. blocking condenser	0·05
C4	V1 anode decoupling	0·25
C5	Reaction condenser, fixed	0·00125
C6	V2 grid condenser	0·000035
C7	V2 S.G. by-pass	0·09
C8	V2 anode H.F. by-pass	0·00011
C9	L.F. coupling to V3	0·01
C10	Tone corrector	0·003
C11	Aerial circuit tuning	—
C12	Aerial circuit trimmer, pre-set	—
C13	H.F. circuit tuning	—
C14	H.F. circuit trimmer, pre-set	—
C15	H.F. L.W. trimmer, pre-set	—

	Other Components		Values (ohms)
L1	Aerial coupling coils		2·5
L2	Aerial coupling coils		107·5
L3	Aerial tuning coils		5·0
L4	Aerial tuning coils		40·0
L5	H.F. tuning coils		5·0
L6	H.F. tuning coils		40·0
L7	Reaction coils		8·0
L8	Reaction coils		4·5
L9	Speaker speech coil		1·25
T1	Speaker input transformer	Pri.	0·15
		Sec.	420·0
S1-S4	Waveband switches, ganged		—
S5	Filament and H.T. switch		—

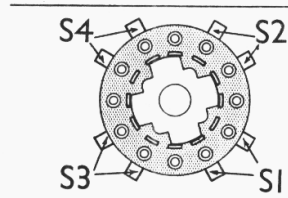
VALVE ANALYSIS

All values given in the table below were obtained from an average receiver with a new combined H.T. and G.B. battery in use. The reaction control was set at minimum. Voltages were measured on the 1,200 V scale of an Avometer with the chassis as negative, and the currents of **V1** and **V2** were taken with a milli-ammeter in the low H.F. potential ends of the circuits.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 32 E	140	2·2	73	0·4
V2 32 E	25	0·75	26	0·3
V3 2101	144	7·2	146	2·3

GENERAL NOTES

Switches.—The waveband switches, **S1-S4** are in one assembly, of the rotary type, which is shown in a separate sketch. In this the two contacts of each switch are indicated. Each pair is short-circuited on the M.W. band, and open on the L.W. band. The sketch is drawn looking at the assembly as it is seen from the under side of the chassis, the thick line at the bottom indicating the top of the chassis.



The wavechange switch assembly.

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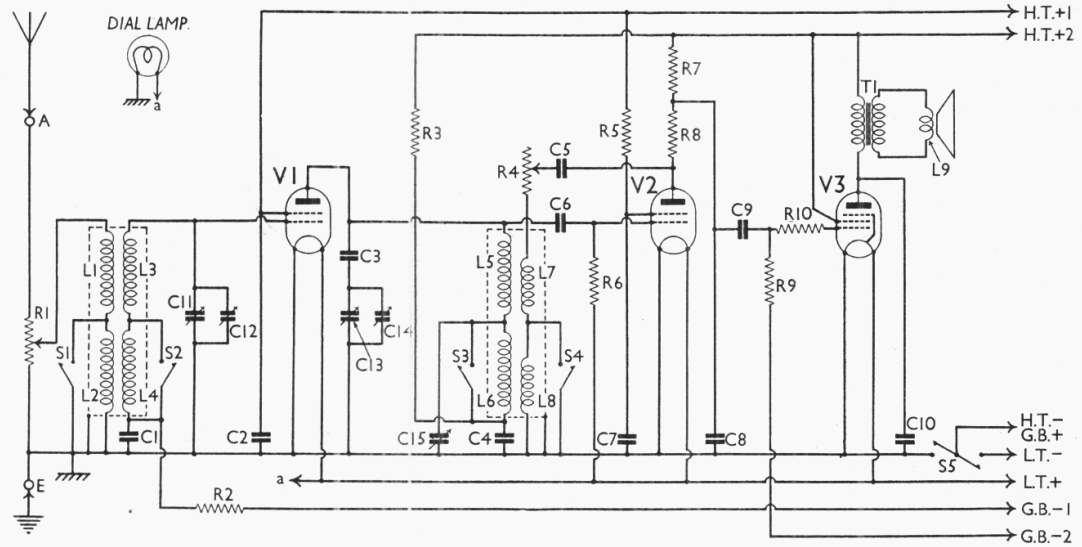

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The circuit diagram of the Philco Model 233 3-valve battery receiver. The battery connections are taken to a multi-way cable and plug, the coding of which is given in General Notes overleaf. S5 is a 3-point shorting switch, ganged with the volume control R1.

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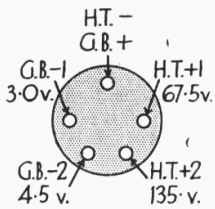
PHILCO MODEL 233 (continued.)

S5 is the Q.M.B. on-off switch ganged with the volume control **R1,** and it is of the 3-point shorting type.

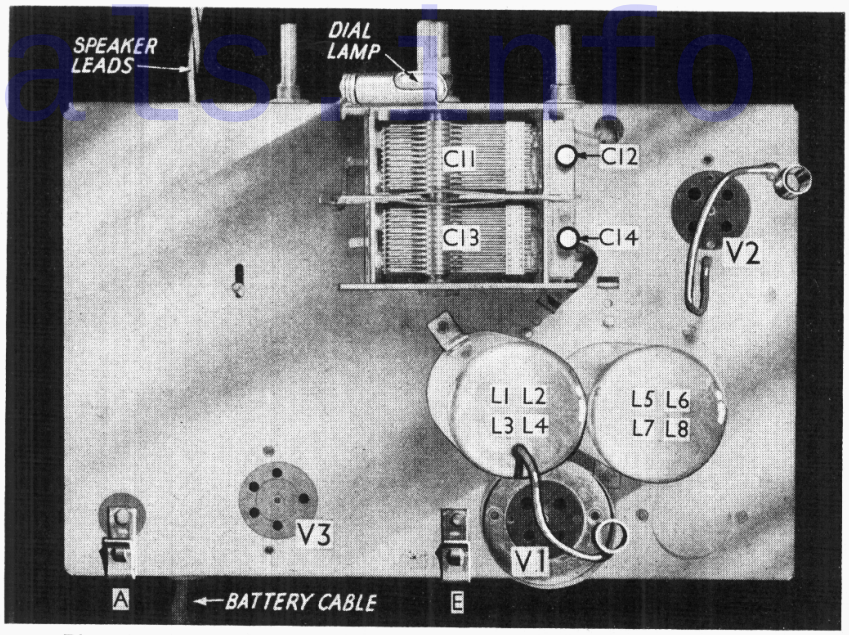
Coils.—These are in two screened assemblies, shown in the plan view of the chassis. The screens are not easily removable, but after having disconnected the wiring, it is easy to withdraw each coil unit from the underside of the chassis, since each is held in position by a bracket with one hexagonal headed screw. When replacing, see that this bracket is correctly located so that the coil is axial with the screen. The screw holding the **L1-L4** unit also supports a small vertical screen, which should not be forgotten. When withdrawing this assembly, the clip for the top cap of **V1** must first be removed to allow the lead to pass through the hole in the cylindrical can.

H.T. & G.B. Connections.—The battery cable terminates in a plug, fitting the socket in the special H.T. and G.B. battery. The voltages at the various



The connections of the battery socket, showing the tappings and their voltages.

sockets are shown in a separate sketch. The colour code of the battery cable is as follows: H.T.–, G.B.+, Black; H.T.+67.5 V, Yellow-black; H.T.+135 V, Yellow; G.B.–3 V, Blue; G.B.–4.5 V, Green. The L.T. connections are: L.T.–, White; L.T.+2 V, White-black.



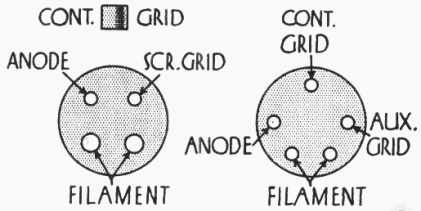
Plan view of the chassis. Note the two coil units in their shielding cans.

Valve Connections.—The pin connections of the 32E and 2101 valves employed are given in separate sketches.

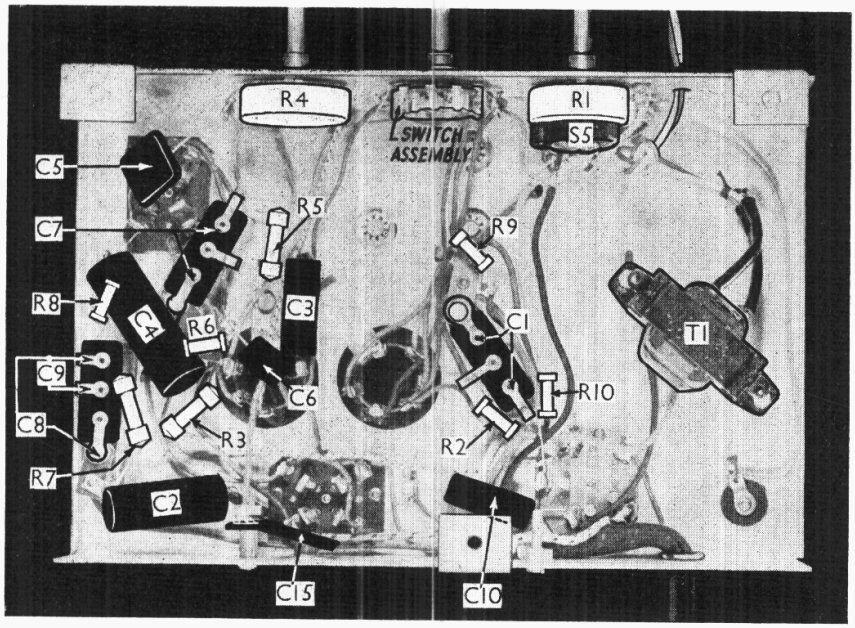
Condensers C1, C7, C8, C9.—These are fitted in black moulded cases, with tags, and are held to the chassis by a single bolt in each case. This bolt also earths the particular tag through which it passes. **C1** and **C7** are connected between the two outer tags in each case, the centre ones merely acting as anchorages for other leads. **C8** is connected between the two outer tags, while **C9** is between the centre and the unearthed outer tag.

Condenser C15.—This is the L.W. trimmer, and is operated through a hole in the rear of the chassis (see alignment instructions).

Dial Lamp.—This is a special 2 V low consumption M.E.S. type, the Philco replacement part number being 5316.



Connections of the 32E valves, V1 and V2 (*left*) and the 2101, V3 (*right*), looking at the undersides of the bases.



Under-chassis view. The switch assembly is shown in a sketch on the preceding page. C8 and C9 are in a single moulded case. C15 is the L.W. trimmer.

CIRCUIT ALIGNMENT

A signal generator and output meter will be required for this purpose. Switch on the receiver, connect the output meter and the signal generator. The latter should be connected to the aerial and earth clips of the set. Turn receiver volume control to maximum, and reaction to minimum.

Set receiver dial to 1,500 KC/S, and switch set to M.W. Switch on signal generator, adjust to 1,500 KC/S, and set generator attenuator to give about a half-scale deflection on output meter.

Adjust **C12** and **C14** to give maximum output.

Increase reaction control to just below point of oscillation, and re-adjust **C12** and **C14.** Continue to advance reaction whilst adjusting these trimmers until maximum output is obtained with receiver just short of oscillation.

Switch set to L.W., feed in a 300 KC/S signal, and tune on gang condenser. Do not alter **C12** and **C14.** Adjust reaction as for M.W. band, and adjust **C15** (rear of chassis) for maximum output. Re-adjust reaction and **C15** until maximum output is obtained with set just short of oscillation.