NUMBER EIGHTY-SEVEN **'TRADER' SERVICE SHEETS**

PHILIPS 838U

3-VALVE (Plus Rectifier) A.C./D.C. RECEIVER

IN their 838U A.C./D.C. receiver Philips embody a 3-valve (plus rectifier) chassis using a variable-mu pentode H.F. amplifier, a pentode detector and a pentode output valve.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** and Droitwich wave-trap **L1, C22** (short-circuited on M.W. and normal L.W. position by switch **S1**) to coupling coils **L2, L3.** Single tuned circuit **L4, L5, C24** precedes variable-mu pentode H.F. amplifier (**V1, Mullard metallised VP13A**) operating with gain control by variable cathode resistance **R5.**

Tuned-secondary transformer coupling by **L6, L7, L8, L9** and **C28** to H.F. pentode detector (**V2, Mullard metallised SP13**) operating on grid leak system with **C10** and **R9, R10.** Voltage developed across **R10** section of grid leak is fed back through decoupling circuit **R7, C7** as G.B. to H.F. amplifier, giving a simple form of automatic volume control. H.F. by-passing in **V2** anode circuit by condenser **C14.** No provision for gramophone pick-up.

Resistance-capacity coupling by **R13, C13** and **R14** to output pentode (**V3, Mullard Pen26**). **R15, C17** and **R16** form H.F. filter in control grid circuit; **C16** in anode circuit is tone corrector. Provision for connection of high-impedance external speaker across special secondary on internal speaker transformer **T1.**

When the receiver is used with A.C. mains, H.T. current is supplied by a half-wave rectifying valve (**V4, Philips CY1**), which, with D.C. supplies, behaves as a resistance of low value. Smoothing by L.F. choke **L11** and large-capacity electrolytic condensers **C19, C20.**

Valve-heaters are connected in series, together with scale lamp and automatic voltage regulating barretter lamp (**Philips C1**) across mains input circuit.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the three control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the cabinet bottom. Next free the scale lamp and its holder from its support, when the chassis can be withdrawn to the extent of the speaker leads. Free the speaker leads from the cleat on the side of the chassis, giving sufficient slack on the leads to allow of normal repairs being carried out.

To free the chassis entirely, remove the speaker input transformer from the sub-baffle (two round-head wood screws), disconnect the leads coming from the chassis, and replace the transformer.

Before it is possible to inspect the under-chassis components it is necessary to remove the screen (two screws).

When replacing the chassis, take care that the stud on the pointer drive belt enters the slot on the clip on the pointer carriage, and connect the speaker leads as follow, numbering the contacts from front of cabinet to back:—Top contacts: 1, yellow-black; 2, yellow-green. Bottom contacts: 1, yellow-red; 2, yellow; 3, bare tinned copper.

Removing Speaker.—To remove the speaker, unsolder the leads from the secondary of the transformer and slacken off the four clamps holding the speaker to the sub-baffle.

COMPONENTS AND VALUES

	Resistances	Values (ohms)
R1	Aerial-earth shunt	100,000
R2	V1 grid resistance	1,250,000
R3	Parts of V1 S.G. potential divider	20,000
R4		25,000
R5	V1 gain control	6,000
R6	V1 fixed G.B. resistance	400
R7	A.V.C. line decoupling	800,000
R8	V1 anode decoupling	1,000
R9	V2 grid leak	1,250,000
R10		640,000
R11	V2 S.G. H.T. feed	1,000,000
R12	V2 anode and S.G. decoupling	20,000
R13	V2 anode load	320,000
R14	V3 grid resistance	640,000
R15	V3 grid H.F. stoppers	100,000
R16		1,000
R17	V3 aux. grid H.T. feed	20,000
R18	V3 G.B. resistance	320*
R19	H.T. supply ballast	320

* Two 640 Ω resistances in parallel.

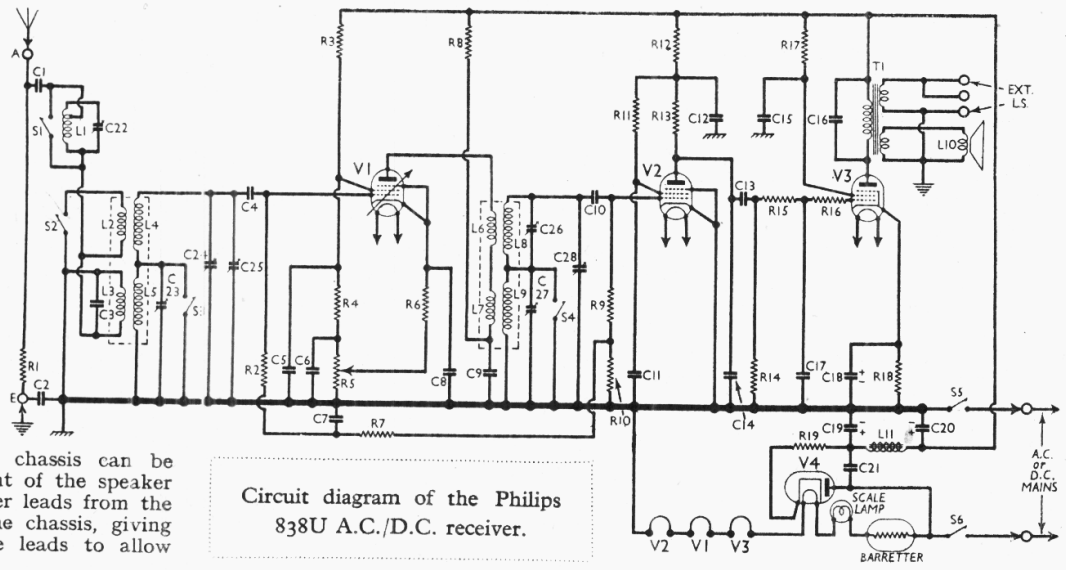
	Condensers	Values (μF)
C1	Aerial series condenser	0·001
C2	Earth blocking condenser	0·1
C3	Aerial L.W. coupling trimmer	0·00008
C4	V1 grid condenser	0·000064
C5	V1 S.G. by-pass	0·5
C6	V1 gain control by-pass	0·5
C7	A.V.C. line decoupling	0·1
C8	V1 cathode by-pass	0·1
C9	V1 anode decoupling	0·1
C10	V2 grid condenser	0·000025
C11	V2 S.G. by-pass	0·1
C12	V2 anode and S.G. decoupling	0·5
C13	L.F. coupling to V3	0·02
C14	V2 anode H.F. by-pass	0·0001 25
C15	V3 aux. grid by-pass	0·5
C16	Tone corrector	0·004
C17	V3 grid H.F. by-pass	0·000125
C18*	V3 cathode	25·0
C19*	H.T. smoothing	32·0
C20*		32·0
C21	V4 anode-cathode by-pass	0·1
C22‡	Droitwich wave-trap tuning	0·00016
C23‡	Aerial circuit L.W. trimmer	0·000027
C24†	Aerial circuit tuning	0·00045
C25‡	Aerial circuit main trimmer	0·000027
C26‡	H.F. transformer M.W. trimmer	0·000027
C27‡	H.F. transformer L.W. trimmer	0·000027
C28†	H.F. transformer tuning	0·00045

* Electrolytic. † Variable. ‡ Pre-set.

	Other Components	Values (ohms)
L1	Droitwich wave-trap coil	40·5
L2	Aerial coupling coils	110·0
L3		110·0
L4	Aerial tuning coils	2·0
L5		30·0
L6	H.F. transformer primary	10·5
L7		60·0
L8	H.F. transformer secondary	2·4
L9		27·0
L10	Speaker speech coil	5·0
L11	H.T. smoothing choke	700·0
T1	Speaker input trans. Pri.	250·0
	Sec. (int.)	0·8
	Sec. (ext.)	1,100·0
S1-S4	Waveband switches	—
S5, S6	Mains switches (ganged with R5)	—

VALVE ANALYSIS

Voltages and currents given in the table on the opposite page were measured with the receiver operating on A.C. mains of 220 V. The volume control was at maximum and there was no signal input. Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.



Circuit diagram of the Philips 838U A.C./D.C. receiver.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 VP13A	190	4·1	100	1·2
V2 SP13	20	0·5	20	0·2
V3 Pen 26	190	37·0	95	5·2
V4 CY1*	—	—	—	—

* Cathode to anode, 225 V D.C.

GENERAL NOTES

Switches.—**S1-S4** are in two rotary units of the usual Philips design, **S1-S3** being on the unit nearest the control knob, with **S4** on the other unit. In the front unit, looking at the underside of the chassis, **S1** is at the top, **S2** is at the bottom and **S3** is at the right-hand side. The switch positions for the various control settings are given in the table below, O indicating open, and C closed.

Switch	M.W.	L.W. (Normal)	L.W. (Droitwich Filter)
S1	C	C	O
S2	C	O	O
S3	C	O	O
S4	C	O	O

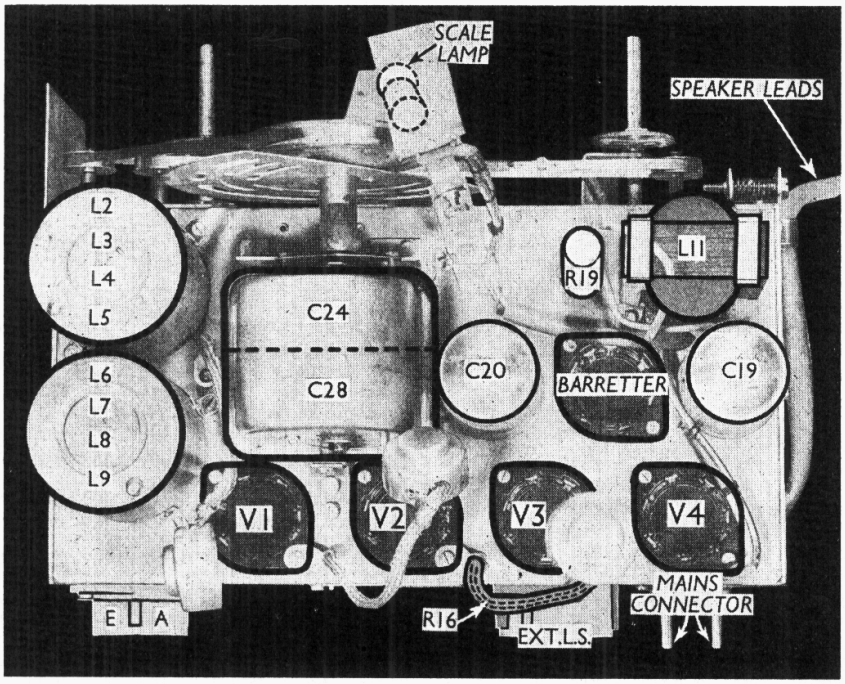
S5 and **S6** are the special Q.M.B. mains switches, ganged with **R5.**

Coils.—**L1,** the Droitwich wave-trap coil, is beneath the chassis. **L2-L5** and **L6-L9** are in two units on the chassis.

Scale Lamp.—This is a Philips 10 V 0.2 A centre contact S.B.C. lamp.

External Speaker.—This should be connected to the shielded sockets provided at the rear of the chassis. The centre pin may be neglected. The speaker should be of the high impedance type.

Speaker Transformer.—Note that this has two secondaries, one of low impedance for the internal speaker speech coil, and another of high impedance for an external speaker. In all there are seven connections to soldering studs on the unit, two for the primary, two each for the two secondaries, and one for what is apparently an electrostatic screen. This is connected to chassis, whereas one side of the external speaker secondary and the core of the transformer (and speaker chassis) are connected to true earth.



Plan view of the chassis. R16 is a flexible resistance inside the lead to the top cap of V3.

Trimmers C23, C25, C26, C27.—These are of the usual Philips tubular type.

Condenser C10.—This is also of the tubular type, but is not to be adjusted.

CIRCUIT ALIGNMENT

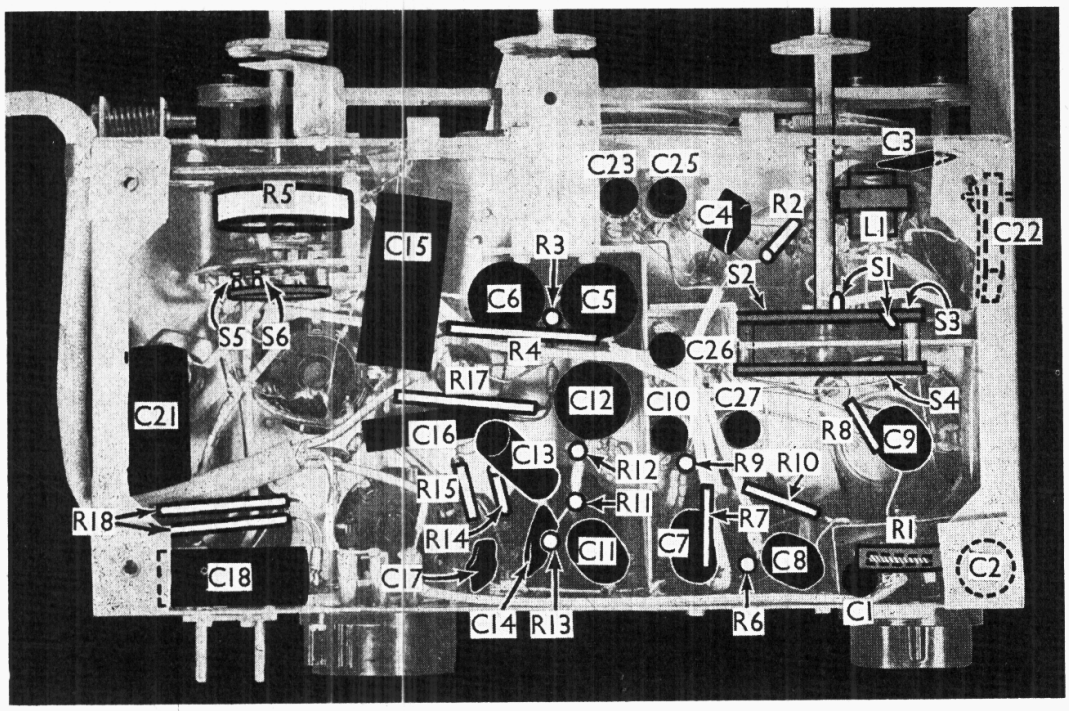
According to the makers' instructions, it will be necessary to obtain from them an artificial aerial unit (200 $\mu\mu$F) and an auxiliary dial, which is fixed to the chassis. The set must be run from A.C. mains, through a double-wound mains transformer, and the chassis can then be earthed. Connect up an output meter to the external L.S. sockets.

Open the trimmers **C25** and **C26** as far as possible, and switch the set to M.W. Adjust the negative bias of **V1** to -3V with the aid of the volume control, measuring between chassis and cathode of **V1** with a low consumption D.C. voltmeter. Turn the tuning condensers to zero, apply a signal of 180 m. from an oscillator, and adjust **C25** and **C26** for maximum output.

Now apply a signal of 225 m., tune on the set for maximum, and if necessary loosen the screws of the driving dial and adjust the latter until the auxiliary dial indicates 225 m. Now re-trim **C25** and **C26** at 225 m.

Switch receiver to L.W., apply a 900 m. signal and tune to 900 m. Now adjust **C23** and **C27** for maximum output.

To adjust the Droitwich filter, switch to L.W. (third position of switch, bringing filter into circuit), tune to Droitwich or a 1,500 m. signal, and adjust **C22** for *minimum* output.



Under-chassis view. C22 is adjusted through a hole in the side of the chassis.