NUMBER SIXTY-THREE

'TRADER' SERVICE SHEETS

MULLARD MA3

3-VALVE (PLUS RECTIFIER) A.C. RECEIVER

THE Mullard model MA3 is a 3-valve (plus valve rectifier) "straight" A.C. receiver. In its receiving circui it uses pentodes throughout, the H.F. valve being of the variable-mu type. Some models (those intended for use in the Droitwich "swamp" area) are fitted with a special Droitwich filter.

CIRCUIT DESCRIPTION

Three alternative aerial connections (**A1** direct, **A2** via fixed condenser **C1**, and **D** via Droitwich wavetrap **L1, C18**) to coupling coils **L2, L3.** Single tuned circuit **L4, L5, C21** precedes variable-mu pentode H.F. amplifier (**V1, Mullard metallised VP4A**). Gain control by variable potentiometer **R5** in cathode circuit which also acts as aerial-earth shunt resistance.

Tuned-secondary transformer coupling by **L6, L7, L8, L9** and **C23** to H.F. pentode detector (**V2, Mullard metallised SP4**) which operates on grid leak system with **C6** and **R7, R8.** A simple form of automatic volume control is obtained by tapping off part of the D.C. potential developed across the grid leak, and feeding it back through decoupling circuit **R9, C4** as G.B. to H.F. amplifier. Provision for connection of gramophone pick-up in **V2** grid circuit. No reaction. H.F. filtering by **L10, C10,** and **C11.**

Resistance-capacity coupling by **R11, C12** and **R12** to output pentode (**V3, Mullard Pen 4VB**). H.F. filtering in grid circuit by **R13, C13, R14.** Tone compensation in anode circuit by impedance-limiting filter **R15, C14.** Provision for connection of high resistance external speaker across primary of speaker input transformer **T1.**

H.T. current is supplied by full-wave rectifying valve (**V4, Mullard IW3**). Smoothing by speaker field winding **L13** and electrolytic condensers **C16, C17.**

COMPONENTS AND VALUES

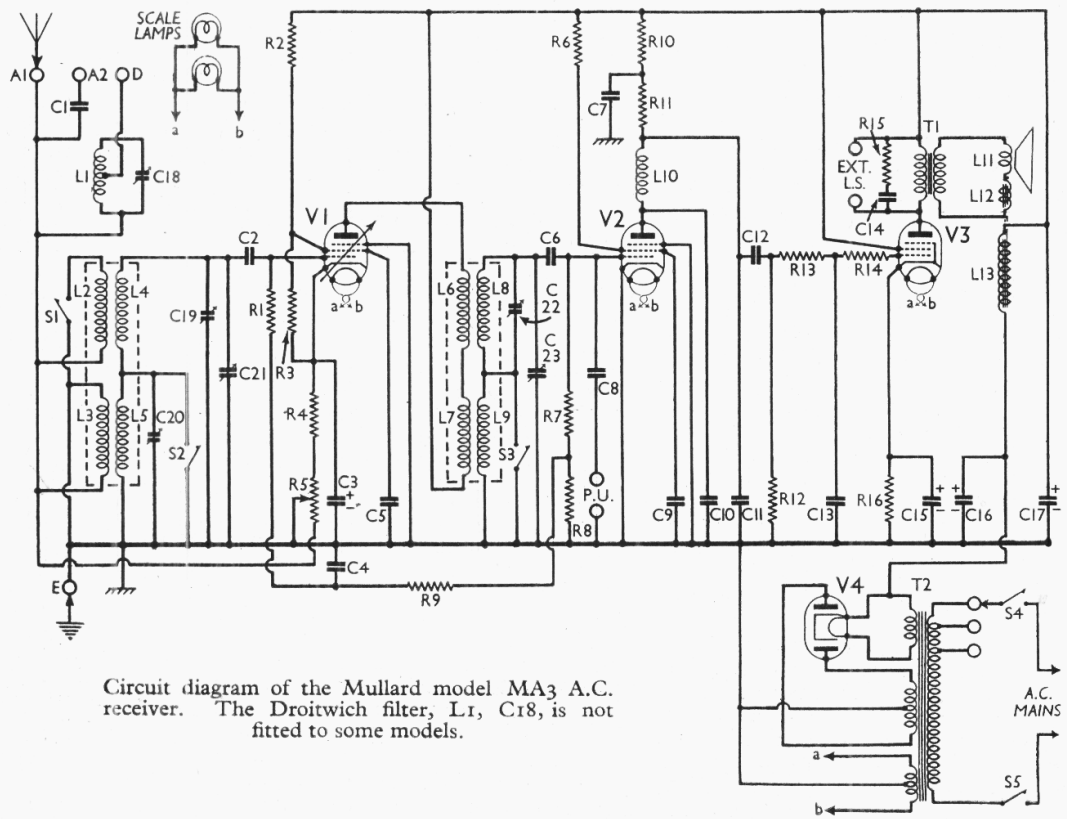
	Resistances	Values (ohms)
R1	V1 grid resistance	1,000,000
R2, R3	V1 S.G. pot. divider	50,000 / 64,000
R4	V1 fixed G.B. resistance	250
R5	V1 gain control	10,000
R6	V2 S.G. H.T. feed	1,000,000
R7, R8	V2 grid resistances	50,000 / 1,000,000
R9	A.V.C. circuit decoupling	2,000,000
R10	V2 anode decoupling	25,000
R11	V2 anode load	100,000
R12	V3 grid resistance	500,000
R13, R14	V3 grid H.F. stoppers	125,000 / 160,000
R15	Part of tone comp. circuit	5,000
R16	V3 auto. G.B. resistance	160

	Condensers	Values (μF)
C1	Aerial series condenser	0·00001
C2	V1 grid condenser	0·000025
C3*	V1 cathode by-pass	12·0
C4	A.V.C. circuit decoupling	0·1
C5	V1 S.G. by-pass	0·1
C6	V2 grid condenser	0·000013
C7	V2 anode decoupling	0·5
C8	Gram. pick-up coupling	0·01

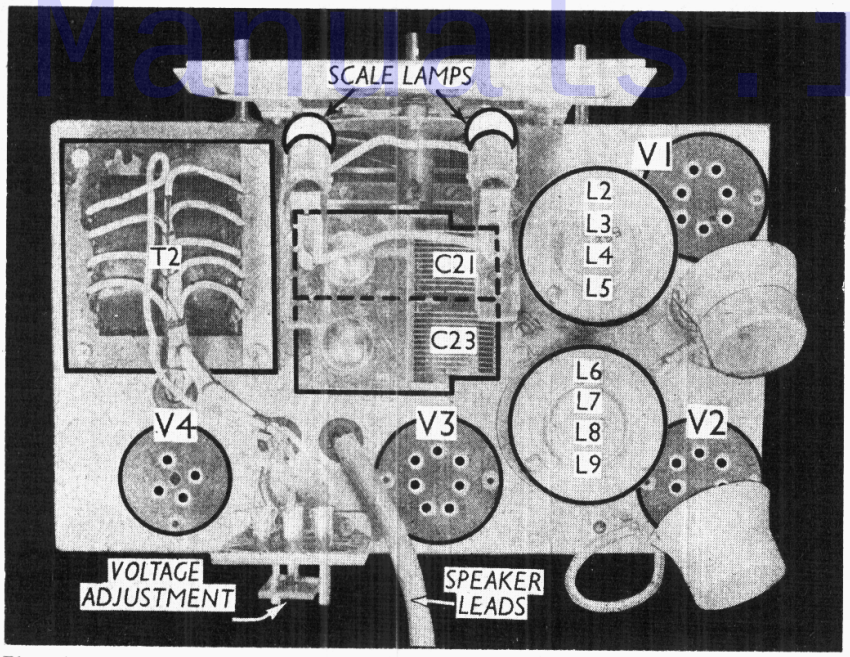
	Condensers	Values (μF)
C9	V2 S.G. by-pass	0·1
C10	V2 anode H.F. by-passes	0·0001
C11		0·0001
C12	L.F. coupling to V3	0·01
C13	V3 grid H.F. by-pass	0·00005
C14	Part of tone comp. circuit	0·002
C15*	V3 cathode by-pass	50·0
C16*	H.T. smoothing	8·0
C17*		8·0
C18‡	Droitwich wave trap tuning	0·00016
C19‡	Aerial circuit M.W. trimmer	0·000027
C20‡	Aerial circuit L.W. trimmer	0·000027
C21	Aerial circuit tuning	0·00047
C22‡	H.F. trans. M.W. trimmer	0·000027
C23	H.F. trans. sec. tuning	0·00047

* Electrolytic. ‡ Pre-set.

	Other Components	Values (ohms)
L1	Droitwich wavetrap coil	39·0
L2	Aerial coupling coils	14·0
L3		110·0
L4	Aerial tuning coils	2·5
L5		29·0
L6	H.F. transformer primary	11·0
L7		57·0
L8	H.F. transformer secondary	2·5
L9		29·0
L10	V2 anode H.F. choke	390·0
L11	Speaker speech coil	1·2
L12	Hum neutralising coil	0·15
L13	Speaker field winding	1,650·0
T1	Speaker input trans. Pri.	425·0
	Sec.	0·15
T2	Mains trans. Pri. total	30·0
	Heater sec.	0·05
	Rect. heat. sec.	0·1
	H.T. sec.	560·0
S1-S3	Waveband switches	—
S4, S5	Mains switches	—



Circuit diagram of the Mullard model MA3 A.C. receiver. The Droitwich filter, L1, C18, is not fitted to some models.



Plan view of the chassis. The voltage adjustment is performed by a special plug-socket device. V1, V2 and V3 are all pentodes.

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and can be removed by withdrawing four round-head wood screws. Access can then be gained to most of the components concerned in normal repairs.

Removing Chassis.—To remove the chassis, remove the three control knobs (recessed grub screws), back and detachable bottom. Under this last will be found the four bolts holding the chassis, each with a rubber and metal washer. These should be removed, as should the Droitwich filter on the left-hand side of the cabinet (if fitted). Chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

Contact between the chassis and the screens on the sides and bottom of the cabinet is made by three metal strips, two of which are fitted with rubber washers. *When replacing*, these should be placed in the fixing holes at the back of the cabinet, one with a rubber washer on the right, and the other two on the left.

If it is desired to remove the chassis entirely, unsolder the leads on the speaker input transformer. When replacing, the leads should be connected as follow, numbering the tags from top to bottom with the transformer on the left:—1 and 2 joined together, yellow with red end; 3, blank; 4, screened yellow lead; 5, yellow; earth tag, tinned copper.

Removing Speaker.—If it should be necessary to remove the speaker, this can be done by slackening the four clamps which hold it to the sub-baffle (each is secured by a nut and lock-nut).

Since removing the back disconnects the mains from the chassis, it will be necessary to remove the plug from the back, if it is desired to operate the chassis. Alternatively, a new lead may be prepared with a standard 5A socket. Although the pins are not standard 5A size, they will make quite a good contact with a 5A socket.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 VP4A	265	3·4	105	1·45
V2 SP4	112	0·65	25	0·3
V3 Pen 4VB	250	31·35	265	3·75
V4 IW3	225†	—	—	—

† Each anode, A.C.

VALVE ANALYSIS

Valve voltages and currents given in the table above were measured with no signal input and the volume control in its "maximum" position, the receiver being operated on A.C. mains of 230 V.

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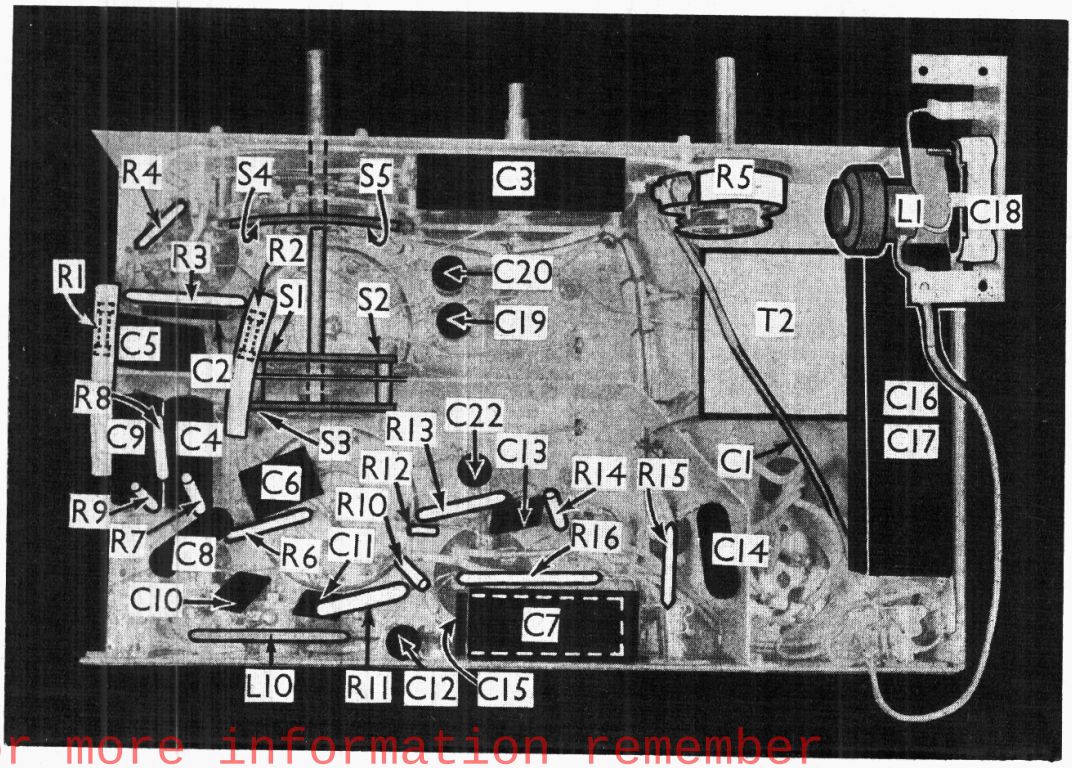


Under-chassis view. The positions of the switches S1-S5 are indicated roughly by arrows. R1 and R2 are inside lengths of empire tubing. The Droitwich filter is shown inset at the top right-hand corner. C15 is a tubular condenser beneath C7, while C1 is a small fixed condenser, formed of metallic screening material wound over an insulated wire.

MAINTENANCE HINTS

Versatile Valve Adaptors

THE testing of anode and screen currents of present-day valves requires a variety of plug-in adaptors, owing to the number of different types of bases in use.

The writer has avoided this difficulty by making up a number of single-pin adaptors as shown in Fig. 1. Each adaptor consists of a valve pin (obtained from a " dud " valve), to which a short length of wire (4 to 6 ins.) is soldered. The other end of the wire is soldered to a tubular type of valve socket (obtained from an old valve-holder). The wire used should be insulated, and may very well consist of rubber-covered flex.

In order to be able to test any valve with pins up to nine in number, eight of these adaptors will be required. The ninth consists of a pin soldered to a length of wire terminating in a spade tag and a socket soldered to a similar length of wire. The two tags are connected to a suitable milliammeter.

Fig. 1 shows how the adaptors are used. The socket of the " split " adaptor (with the milliammeter in series) is plugged on to the anode pin of the valve (where the anode current is required), the pin being plugged into the anode socket of the valve-holder. All the other valve pins and the corresponding valve-holder sockets are then fitted with the requisite number of " through " adaptors. The valve is supported so that the pins cannot make contact with the chassis, and when the set is switched on, the current indicated by the milliammeter will be the anode current of the valve.

Obviously, since the " split " adaptor can be fitted to any pin, currents in other circuits can be just as easily measured. The connecting wires should be kept as short as possible, to avoid the possibility of introducing instability. Care should also be taken to see that the sockets which fit on to the pins of the valve are not of such an external diameter that they touch, particularly in the case of 9-pin valves.

With some types of adaptor, it is impossible to test some valves with the chassis inside the cabinet owing to insufficient clearance between the top of the valve and the cabinet. The adaptor described avoids this difficulty. Further,

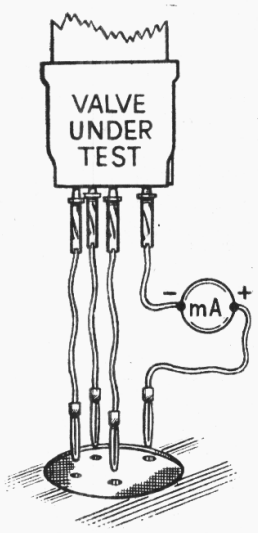


Fig. 1—Sketch showing the construction and use of the simple valve adaptors described in the text.

English valves may be tested in American sets and vice versa, if adaptors with suitably sized pins and sockets are made up. Naturally, the valve voltages must be similar in each case.

Instead of flexible wire, insulated solid wire leads may be used in the adaptors, and the valves are then supported during the testing.

R. B. F.

NEW PHILCO EQUIPMENT

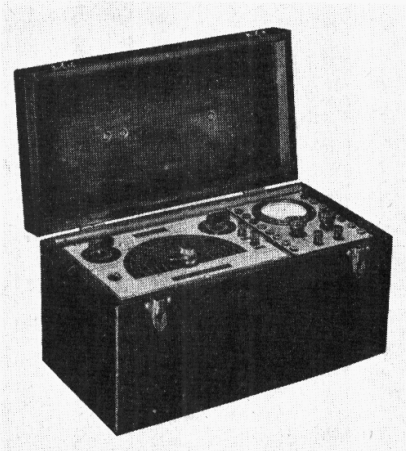
Signal Generator and Set Tester

THE Philco Radio and Television Corporation of Great Britain, Ltd., of Perivale, Middlesex, have just announced a new combined all-wave signal generator and set tester. The complete equipment is known as Model 099, and comprises two units built into a single cabinet. One of these is the Model 088 All-Wave Signal Generator, and the other the Model 025 Circuit Tester.

The new signal generator has several features new to Philco equipment, the outstanding one being that it operates on fundamental frequencies on all ranges. There are five ranges in all, brought into use by a rotary switch. Direct calibration in KC/S on a large semi-circular scale is used. All ranges are continuous, and frequencies of from 110 KC/S (2,730 m.) to 20 MC/S (15 m.) are covered. Naturally, all the usual intermediate frequencies are included in the various ranges. The generator is fitted with an attenuator control, and an on-off switch. The batteries are contained within the case.

The circuit tester comprises a high-class moving coil meter, with an arrangement of sockets and switches enabling measurements of voltage, current, resistance, capacity and output to be made. A.C. voltage ranges are provided, there being five A.C. and five D.C. voltage ranges, three direct current ranges, and three resistance ranges. All the usual requirements are covered, and the ranges are controlled by a rotary switch. The circuit tester, when connected as an output meter, may be used with the signal generator for receiver alignment.

The prices are as follow: Model 099, 15 gns.; Model 088, £5 15s.; Model 025, £9. Special prices are available to Philco dealers and R.M.S. members only, these being £15, £5 5s. and £8 13s. respectively.



The new Philco Model 099 combined all-wave signal generator and set tester. The two units, the 088 generator and 025 tester can be obtained separately if desired.

MULLARD MA3—(*Contd.*)

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

GENERAL NOTES

Switches.—**S1** and **S2** form one section of the wavechange switch, with **S3** as the other. Each switch consists of two spring fingers between which the moving contact slides when the switch is closed. **S1, S2** and **S3** are closed in the M.W. position and open in the L.W. and " Off " positions.

S4 and **S5,** which form a double-pole Q.M.B. mains switch, are of the same construction and are ganged on the same spindle. These, of course, are closed in the M.W. and L.W. positions and open in the " Off " position.

The positions of all five switches are indicated in our under-chassis view.

Coils.—**L1** is the Droitwich filter coil, mounted on a unit fitted to the side of the cabinet.

The tuning coils, **L2** to **L9,** are in two large screened units mounted on the chassis deck. These units are sealed, and in case of faults, should be returned to the makers.

L10 is an H.F. choke, seen in the under-chassis view.

Scale Lamps.—There are two of these, in special bayonet-type holders. The lamps are Philips 6 V 3 W S.B.C. types, with centre contacts, and frosted bulbs.

Condenser C1.—This is a small fixed condenser, formed by the metallic screening wound round empire tubing over one of the wires.

Condensers C16, C17.—These are two 8 μF dry electrolytics in a single unit. This has a common negative (black) lead. The positive of **C16** is the red lead and that of **C17** the yellow lead.

Condensers C19, C20, C22.—These are special tubular type trimmers which are sealed.

External Speaker.—This should be plugged into the two sockets provided at the rear of the chassis. A high resistance type (8000 O), should be employed.