

NUMBER EIGHTY-THREE

'TRADER' SERVICE SHEETS

MULLARD MB4

4-VALVE BATTERY RECEIVER

IN their MB4 battery-operated receiver Mullard incorporate a 4-valve chassis employing a variable-mu pentode H.F. amplifier, a pentode detector, a triode driver and a double triode Class B output valve. Provision is made for a gramophone pick-up, and there is an indicator on the tuning scale showing the position of the combined wave-change and on-off switch.

CIRCUIT DESCRIPTION

Two alternative aerial connections (A1 via small fixed condenser C1 for local station reception) to loading coil L1 which ensures substantially level sensitivity over the whole wave-band, and coupling coil L2. Single tuned circuit L3, L4, C14 precedes variable-mu pentode H.F. amplifier (V1, Mullard metallised VP2). Gain control by variable potentiometer R2 which varies G.B. applied and also damps aerial input circuit. This method enables both the input signal and the slope of the valve to be reduced, thus minimising the possibility of distortion due to modulation rise. The receiver chassis is connected to earth through blocking condenser C2, which prevents short-circuiting of the G.B. battery in the event of the aerial coming into contact with earth.

Tuned-secondary transformer coupling by L5, L6, L7, C16 to H.F. pentode detector (V2, Mullard metallised SP2) which operates on grid leak system with

C6 and R5. No reaction. Provision for connection of gramophone pick-up in grid circuit, when negative G.B. is applied from G.B. -1 lead. H.F. filtering in anode circuit by choke L8 and condensers C9, C10.

Resistance-capacity coupling by R7, C11 and R10 to triode driver valve (V3, Mullard metallised PM2DL). Coupling by special 1.5-1 transformer T1 to positive drive class B output valve (V4, Mullard PM2BA). Resistances R11, R12 across T1 secondary prevent parasitic short-wave oscillation. In order to provide a degree of G.B. compensation as the H.T. battery voltage falls with use, a load resistance R3 is switched across the G.B. battery which then discharges at a rate equivalent to the average drain on the H.T. supply.

DISMANTLING THE SET

Removing Chassis.—In order to remove the chassis from the cabinet, it is necessary to remove the three control knobs (recessed grub screws) and the four bolts (with metal washers, rubber washers and distance pieces) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes. *When replacing*, do not forget the rubber washers between the chassis and the cabinet bottom.

To remove the chassis entirely, unsolder the three leads on the speaker input transformer. *When replacing*, they should

be connected as follow, numbering the tags from top to bottom:—1, green; 2, red/yellow; 3, grey.

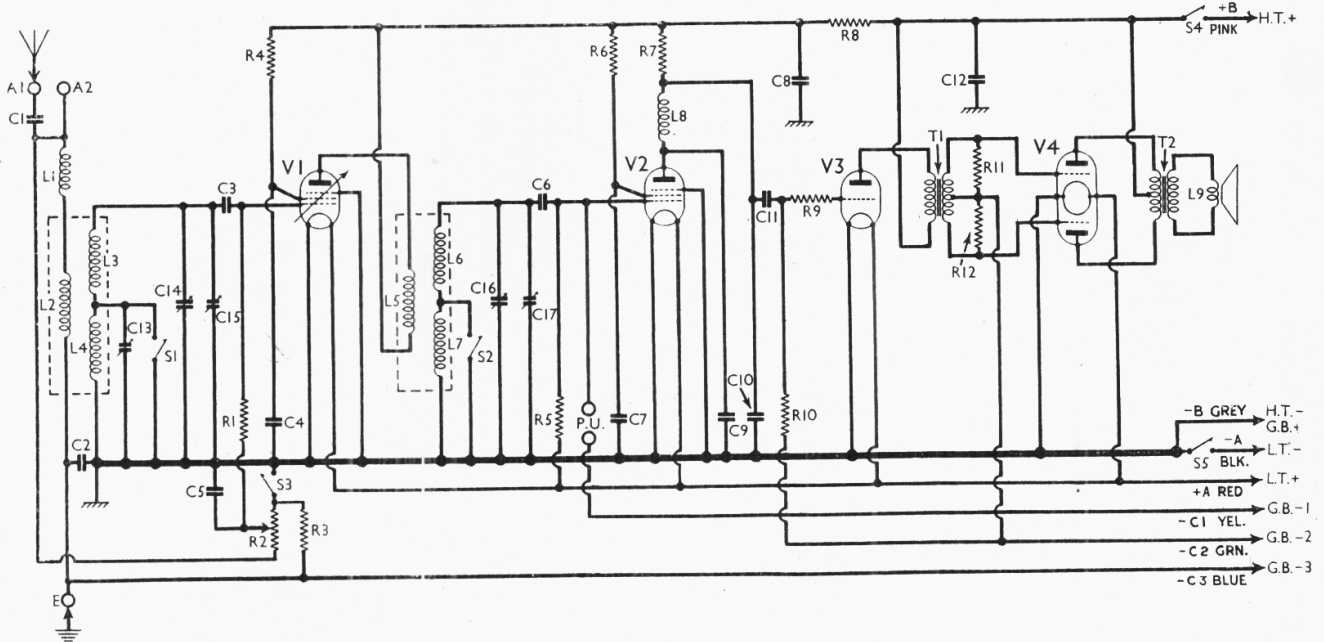
Removing Speaker.—The speaker is held to the sub-baffle by three clamps with washers, nuts and lock nuts, and can be removed by slackening them off. *When replacing*, see that the transformer is on the left.

COMPONENTS AND VALUES

| Resistances | | Values (ohms) |
|-------------|---------------------------------------|---------------|
| R1 | V1 grid resistance | 5,000,000 |
| R2 | V1 gain control | 10,000 |
| R3 | G.B. battery load | 1,000 |
| R4 | V1 S.G. H.T. feed | 5,000 |
| R5 | V2 grid leak | 2,000,000 |
| R6 | V2 S.G. H.T. feed | 250,000 |
| R7 | V2 anode load | 100,000 |
| R8 | V1 and V2 H.T. voltage dropping | 2,000 |
| R9 | V3 grid H.F. stopper | 200,000 |
| R10 | V3 grid resistance | 500,000 |
| R11 | } V4 anti-parasitic resistances { | 10,000 |
| R12 | | 10,000 |

| Condensers | | Values (μF) |
|------------|--------------------------------|-------------|
| C1 | Aerial series condenser .. | 0.00001 |
| C2 | Earth blocking condenser .. | 0.1 |
| C3 | V1 grid condenser | 0.0001 |
| C4 | V1 S.G. by-pass | 0.1 |
| C5 | V1 cont. grid decoupling .. | 0.1 |
| C6 | V2 grid condenser | 0.00005 |
| C7 | V2 S.G. by-pass | 0.25 |
| C8 | V1 and V2 H.T. line decoupling | 3.25 |
| C9 | } V2 anode H.F. by-passes { | 0.0005 |
| C10 | | 0.0005 |
| C11 | L.F. coupling to V3 | 0.0025 |
| C12 | Main H.T. reservoir | 0.5 |
| C13† | Aerial circuit L.W. trimmer .. | 0.000027 |
| C14† | Aerial circuit tuning | 0.00043 |
| C15† | Aerial circuit main trimmer .. | 0.000027 |
| C16† | H.F. transformer tuning | 0.00043 |
| C17† | H.F. transformer trimmer | 0.000027 |

† Variable. ‡ Pre-set.



Circuit diagram of the Mullard MB4 4-valve battery receiver.

| Other Components | | Values (ohms) |
|------------------|------------------------------------|---------------|
| L1 | Aerial loading coil | 4·0 |
| L2 | Aerial coupling coil | 2·5 |
| L3 | } Aerial tuning coils | 3·4 |
| L4 | | 32·0 |
| L5 | } H.F. transformer primary | 75·0 |
| L6 | | 3·4 |
| L7 | } H.F. transformer secondary | 32·0 |
| L8 | | 450·0 |
| L9 | V2 anode H.F. choke | 3·0 |
| L10 | Speaker speech coil | 750·0 |
| T1 | Driver transformer { Pri. total | 200·0 |
| | { Sec. total | 750·0 |
| T2 | Speaker input trans. { Pri. total | 750·0 |
| | { Sec. total | 0·25 |
| S1, S2 | Waveband switches | — |
| S3 | G.B. switch | — |
| S4 | H.T. switch | — |
| S5 | L.T. switch | — |

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured with the receiver operating from new batteries, the H.T. reading 140 V and the G.B. reading 9.3 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.

| Valve | Anode Volts | Anode Current (mA) | Screen Volts | Screen Current (mA) |
|----------|-------------|--------------------|--------------|---------------------|
| V1 VP2 | 130 | 2·8 | 125 | 0·6 |
| V2 SP2 | 50 | 0·7 | 45 | 0·2 |
| V3 PM2DL | 140 | 2·1 | — | — |
| V4 PM2BA | 140* | 1·8* | — | — |

* Each anode.

GENERAL NOTES

Switches.—There are two waveband switches, **S1** and **S2**, and three battery switches, **S3**, **S4** and **S5**. These are of the usual Mullard type, and are ganged up in two rotary units. Their positions are roughly indicated in our under-chassis view. Looking from the back, the tags of **S1** and **S2** are on the left hand of each unit, and both switches are *closed* on the M.W. band, and *open* on the L.W. band. The tags of **S3** are to the right of the unit nearest the control knob, while **S5** is to the right of the other unit. The tags of **S4** are at the top of the latter unit. All three battery switches are *open* in the "off" position, and *closed* on M.W. and L.W.

Coils.—The choke **L1** is beneath the chassis, and is seen at the right of the under-chassis view, while **L8** is at the bottom of this view. **L2**, **L3**, **L4** and **L5**, **L6**, **L7** are in two sealed screened units on the chassis deck. The screens are not removable.

External Speaker.—No special provision is made for this, but it would be possible to connect a high resistance type (14,000-18,000 O) across the two outer tags on the internal speaker transformer.

Condensers C7, C8, C12.—These are in a cylindrical screened block, held to the chassis by a single bolt and nut. The block has eight tags, but only four belong to the condensers, the remaining four being used as bearers for some of the wiring. The condenser connections are indicated by arrows in our under-chassis view. Note that one tag is common to all three condensers.

Trimmers C13, C15, C17.—These are of the usual Mullard tubular type, and really require a special tool (supplied by the makers) for adjustment.

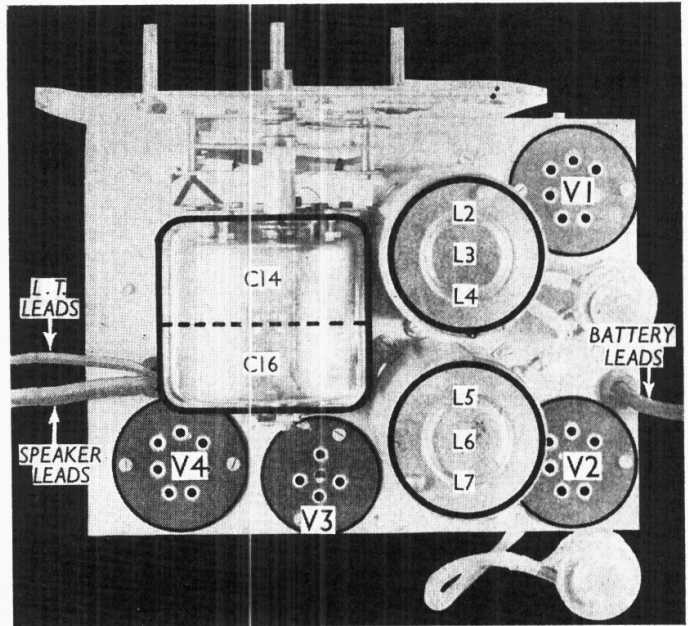
CIRCUIT ALIGNMENT

Switch the set to the M.W. band, and turn volume control to maximum. Adjust **C17** so that the top of the sliding portion is just flush with the insulating central bush. Tune receiver to 225 m., feed in a 225 m. signal, and adjust **C15** for maximum output.

Switch set to L.W., tune receiver to 900 m., and feed in a 900 m. signal. Adjust **C13** for maximum output.

Should the condenser scale require re-setting, adjust the drive by means of the grub screws provided (in the bush behind the paxolin friction disc). The calibration should be carried out with the volume control at maximum.

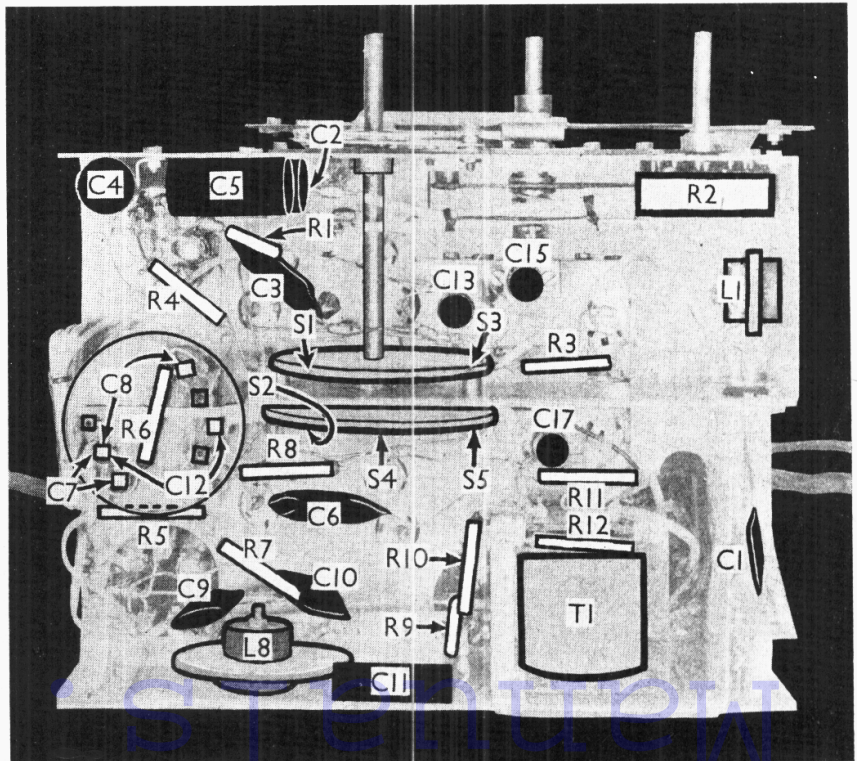
The correct position for the pointer relative to the condenser position is shown by the two lines at the extreme left of the scale. The pointer should coincide with these when the rotor of the gang condenser is all out.



Plan view of the Mullard MB4 chassis.

Battery Leads and Voltages.—L.T. negative (−A), black; L.T. positive (+A), red, + 2 V; H.T. negative, G.B. positive (−B), grey; H.T. positive (+B), pink, + 135 V; G.B. negative 1 (−C1), yellow, −1.5 V; G.B. negative 2 (−C2), green, −4.5 V; G.B. negative 3 (−C3), blue, −9 V.

Replacement Batteries.—L.T. Exide LCA3 celluloid 2 V cell. H.T. and G.B., Ever Ready W1285, 135 V plus 9 V.



Under-chassis view. The switch positions are indicated approximately, and the connections of the condenser block at the left are shown by arrows.