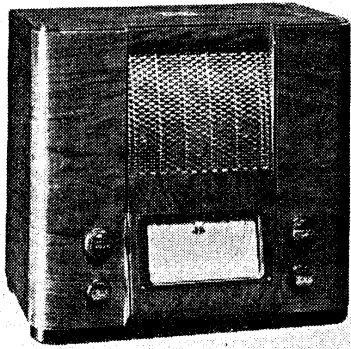


"TRADER" SERVICE SHEET
375

H.M.V. 654

AND MARCONIPHONE 859



The H.M.V. 654 receiver. The Marconiphone 859 has a similar, but not identical, cabinet design.

SUITABLE for mains of 200-250 V (25-60 C/S in the case of AC), the H.M.V. 654 is a 4-valve (plus rectifier) AC/DC 3-band superhet covering a short-wave range of 13.8-50 m.

An identical chassis is fitted in the Marconiphone 859, which is also very similar in external appearance, but this Service Sheet was prepared on an H.M.V. 654.

Release date for both models: August, 1938.

CIRCUIT DESCRIPTION

Aerial input via mains isolating condenser **C1**, and via coupling condenser **C3** (SW), **L1** and coupling coil **L3** (MW) or **L1**, **L2** and coupling coil **L4** (LW) to single tuned circuits **L5**, **C36** (SW), **L6**, **C36** (MW) and **L7**, **C36** (LW), **L1**, **L2**, **C4**, **C5** form a filter circuit to provide IF and image rejection.

First valve (**V1**, Marconi **X63**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L8** (SW), **L9** (MW) and **L10** (LW) are tuned by **C37**; parallel trimming by **C38** (MW) and **C39** (LW); series tracking by **C9** (SW), **C10** (MW) and **C11** (LW). Reaction by direct coupling to grid coils on all bands via coupling condenser **C14** assisted on SW by reaction coil **L11**.

Second valve (**V2**, Marconi **KTW63**) is a RF tetrode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C40**, **L12**, **L13**, **C41** and **C42**, **L14**, **L15**, **C43**.

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3**, Marconi **DH63**). Audio frequency component in rectified output is developed across load resistance **R9** and passed via IF stopper **R10**, AF coupling condenser **C19** and manual volume control **R11** to CG of triode section, which operates as AF amplifier.

Second diode of **V3**, fed from **L15** via **C20**, provides DC potentials which are

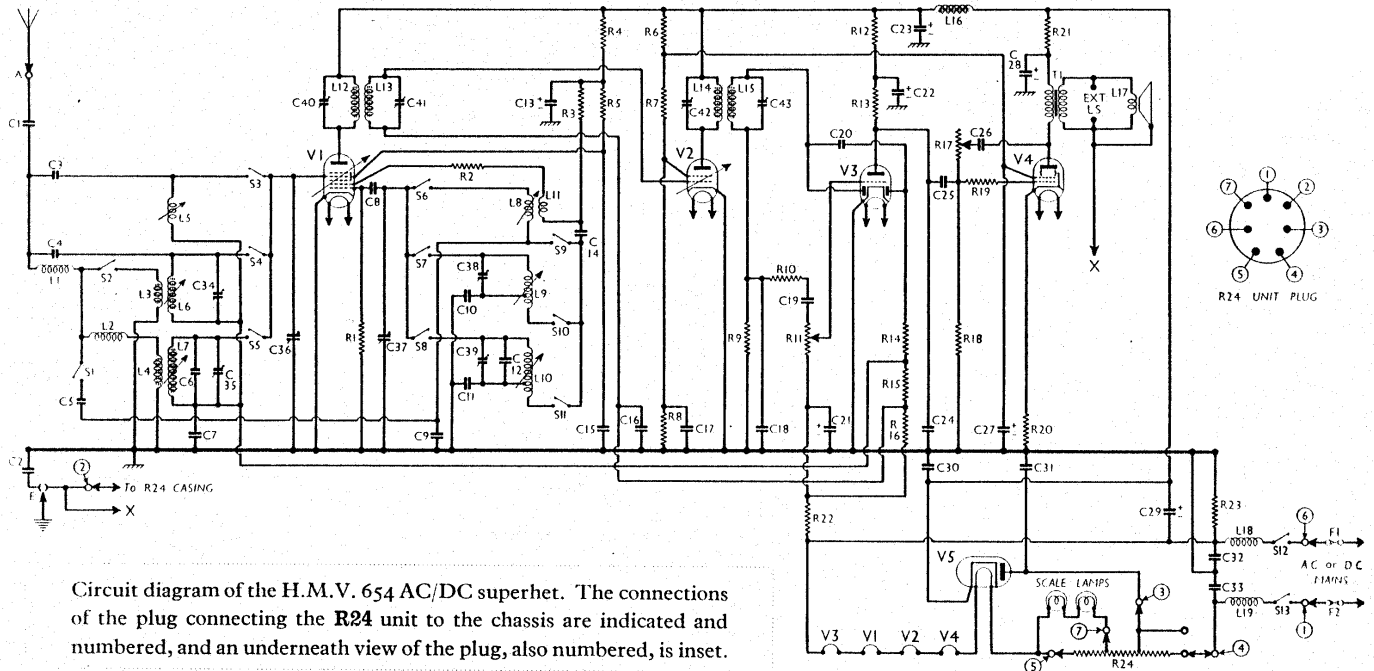
developed across load resistances **R14**, **R15**, **R16** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R13**, **C25** and **R18**, via grid stopper **R19** between **V3** triode and beam tetrode output valve (**V4**, Marconi **KT32**). Variable tone control by **R17**, **C26** between grid and anode circuits.

Fixed GB potential for **V1** and **V2**, GB for **V3** triode and AVC delay voltage are obtained automatically from drop along resistance **R23** in negative HT lead to chassis. GB for **V4** is obtained in the usual manner by **R20** in its cathode lead, and a measure of negative feed-back is introduced by the omission of the usual cathode by-pass condenser.

When the receiver is used with AC mains, HT current is supplied by IHC half-wave rectifying valve (**V5**, Marconi **U31**) which, with DC mains, behaves as a low resistance. Smoothing is effected by iron-cored choke **L16** and dry electrolytic condensers **C23**, **C29**. HT circuit RF filtering by **C30** and **C31**.

Valve heaters are connected in series, together with ballast resistance **R24**, across part of which are connected the scale lamps, across mains input. Filter comprising chokes **L18**, **L19** and condensers **C32**, **C33** in mains input circuit suppresses mains borne interference, while fuses **F1**, **F2** afford protection against accidental short-circuit.



Circuit diagram of the H.M.V. 654 AC/DC superhet. The connections of the plug connecting the **R24** unit to the chassis are indicated and numbered, and an underneath view of the plug, also numbered, is inset.

COMPONENTS AND VALUES

| CONDENSERS | | Values (μF) |
|------------|---------------------------------|-------------|
| C1 | Aerial isolating condenser | 0.0001 |
| C2 | Earth isolating condenser | 0.01 |
| C3 | Aerial SW coupling | 0.000015 |
| C4 | Image rejector condensers | 0.000023 |
| C5 | | 0.00005 |
| C6 | Aerial LW fixed trimmer | 0.00005 |
| C7 | V1 tetrode CG decoupling | 0.05 |
| C8 | V1 osc. CG condenser | 0.0001 |
| C9 | Osc. circuit SW tracker | 0.005 |
| C10 | Osc. circuit MW tracker | 0.00055 |
| C11 | Osc. circuit LW tracker | 0.0003 |
| C12 | Osc. circ. LW fixed trimmer | 0.000175 |
| C13* | V1 osc. anode and SG decoupling | 4.0 |
| C14 | V1 osc. anode coupling | 0.005 |
| C15 | V1 SG RF by-pass | 0.05 |
| C16 | V2 CG decoupling | 0.05 |
| C17 | V2 SG RF by-pass | 0.05 |
| C18 | IF by-pass | 0.0001 |
| C19 | AF coupling to V3 triode | 0.001 |
| C20 | Coupling to V3 AVC diode | 0.000075 |
| C21* | V3 triode CG decoupling | 50.0 |
| C22* | V3 triode anode decoupling | 1.0 |
| C23* | Part of HT smoothing | 8.0 |
| C24 | IF by-pass | 0.00035 |
| C25 | V3 triode to V4 AF coupling | 0.023 |
| C26 | Part of variable tone control | 0.0005 |
| C27* | V4 SG decoupling | 4.0 |
| C28* | V4 anode decoupling | 32.0 |
| C29* | Part HT smoothing | 16.0 |
| C30 | V5 cathode RF by-pass | 0.05 |
| C31 | V5 anode RF by-pass | 0.05 |
| C32 | Mains RF by-pass condensers | 0.01 |
| C33 | | 0.01 |
| C34† | Aerial circuit MW trimmer | — |
| C35† | Aerial circuit LW trimmer | — |
| C36† | Aerial circuit tuning | — |
| C37† | Oscillator circuit tuning | — |
| C38† | Osc. circuit MW trimmer | — |
| C39† | Osc. circuit LW trimmer | — |
| C40† | 1st IF trans. pri. tuning | — |
| C41† | 1st IF trans. sec. tuning | — |
| C42† | 2nd IF trans. pri. tuning | — |
| C43† | 2nd IF trans. sec. tuning | — |

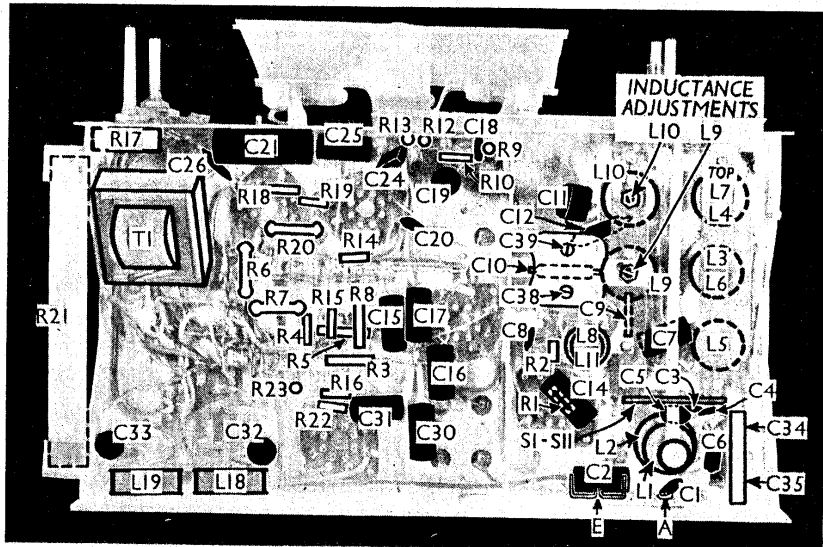
* Electrolytic. † Variable. ‡ Pre-set.

| RESISTANCES | | Values (ohms) |
|-------------|--|---------------|
| R1 | V1 osc. CG resistance | 100,000 |
| R2 | V1 osc. anode stabiliser | 150 |
| R3 | V1 oscillator anode and SG HT feed resistances | 10,000 |
| R4 | | 3,500 |
| R5 | | 75,000 |
| R6 | V2 and V4 SG's HT feed potential divider resistances | 5,000 |
| R7 | | 5,000 |
| R8 | | 15,000 |
| R9 | V3 signal diode load | 500,000 |
| R10 | IF stopper | 230,000 |
| R11 | Manual volume control | 2,000,000 |
| R12 | V3 triode anode decoupling | 35,000 |
| R13 | V3 triode anode load | 75,000 |
| R14 | V3 AVC diode load resistances | 1,000,000 |
| R15 | | 500,000 |
| R16 | | 2,300,000 |
| R17 | Variable tone control | 2,000,000 |
| R18 | V4 CG resistance | 350,000 |
| R19 | V4 grid stopper | 50,000 |
| R20 | V4 GB resistance | 100 |
| R21 | V4 anode HT feed | 1,000 |
| R22 | V3 CG decoupling | 100,000 |
| R23 | V1, V2 fixed GB; V3 triode GB; AVC delay resistance | 23 |
| R24 | Heater circuit ballast resistance, total | 496* |

* 64 Ω + 370 Ω + 62 Ω from 5 V heater.

| OTHER COMPONENTS | | Approx. Values (ohms) |
|------------------|--|-----------------------|
| L1 | Parts of IF and image rejector circuit | 9.5 |
| L2 | | 33.0 |
| L3 | Aerial MW coupling coil | 0.4 |
| L4 | Aerial LW coupling coil | 1.6 |
| L5 | Aerial SW tuning coil | Very low |
| L6 | Aerial MW tuning coil | |

Continued in next column



Under-chassis view. Note the inductance adjustments for L9 and L10.

| OTHER COMPONENTS (Continued) | | Approx. Values (ohms) |
|------------------------------|-----------------------------|-----------------------|
| L7 | Aerial LW tuning coil | 9.0 |
| L8 | Osc. circuit SW tuning coil | very low |
| L9 | Osc. circuit MW coil, total | 2.8 |
| L10 | Osc. circuit LW coil, total | 3.6 |
| L11 | Oscillator SW reaction | 1.2 |
| L12 | 1st IF trans. | Pri... 4.0 |
| L13 | | Sec... 4.0 |
| L14 | 2nd IF trans. | Pri... 4.0 |
| L15 | | Sec... 4.0 |
| L16 | HT smoothing choke | 550.0 |
| L17 | Speaker speech coil | 3.0 |
| L18 | Mains filter chokes | 3.0 |
| L19 | | 3.0 |
| T1 | Output trans. | 146.0 |
| SI-S11 | Waveband switches | 0.7 |
| SI2,13 | Mains switches, ganged | — |
| F1,F2 | Mains circuit fuses | — |

control knobs with wax. If the valves have been removed, note that the screening caps go on V1 and V3.

To free the chassis entirely, unsolder the speaker leads and when replacing, take the black lead to the right-hand tag on the panel.

Removing Speaker.—The speaker can be removed from the cabinet by unsoldering the leads and removing the nuts and washers from the three screws holding it to the sub-baffle. When replacing, see that the terminal panel is at the top, do not forget to replace the earthing lead on the top right-hand screw and take the black lead to the right-hand tag.

VALVE ANALYSIS

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|----------|---------------------------|--------------------|--------------------|---------------------|
| V1 X63 | { 166 118 } Oscillator | 2.2 | 66 | 1.3 |
| V2 KTW63 | 166 | 2.4 | | |
| V3 DH63 | 98 | 0.4 | 75 | 1.5 |
| V4 KT32 | 118 | 51.0 | 108 | 5.0 |
| V5 U31† | — | — | — | — |

† Cathode to chassis 182 V DC.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on AC mains of 225 V, using the 223-250 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, V1 should become unstable when its anode current is being measured, it can be stabilised by connecting a non-inductive condenser of about 0.1 μF from control grid (top cap) to chassis.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the tuning knob (recessed grub screw covered with wax) and the other three knobs (recessed self-tapping screws covered with wax), and then the two wooden cross-bars on the bottom of the cabinet (four countersunk-head wood screws).

Next remove the four bolts (with washers and spring washers) thus exposed and free the speaker leads from the cleat on the sub-baffle. After unplugging the mains input unit lead from the socket on the chassis, the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

Before access can be gained to the underneath of the frequency changer section of the chassis, the screen must be removed (three self-tapping screws) and if it is desired to operate the chassis, the mains input unit must be removed from the brackets on the side of the cabinet (four screws with washers) and connected up.

When replacing, see that there is a washer for each of the fixing bolts, between the chassis and the bottom of the cabinet, and cover the heads of the screws in the

GENERAL NOTES

Switches.—S1-S11 are the waveband switches, in a single rotary unit beneath the chassis, indicated in our under-chassis view, and shown in detail in the diagram in col. 3. The table (col. 2) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S12 and **S13** are the QMB mains switches, ganged with the volume control **R11**.

Coils.—L1, L2; L3, L6; L4, L7; L5; L8, L11; L9; and L10 are in seven unscreened units beneath the chassis. L3, L6 and L4, L7 are iron-cored, the cores of L6 and L7 being adjustable. The inductances of L5 and L8 are adjustable by wire loops inside the coil formers. L9 and L10 are also adjustable in inductance by metal "spade" trimmers, whose positions are varied by means of screw adjusters, indicated in our under-chassis view.

L12, L13 and L14, L15 are the IF transformers, in two screened units on the chassis deck, with their trimmers.

L16 is the HT smoothing choke, on the chassis deck, while L18, L19 are the mains filter chokes, beneath the chassis.

Scale Lamps.—These are two Bulgin MES types, rated at 8 V, 0.15 A, and fitted with frosted bulbs.

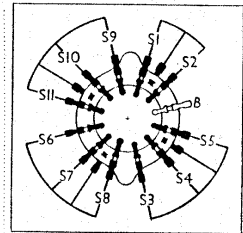
External Speaker.—No sockets are provided for this, but a low impedance (3.75 Ω) type can be connected across the speech coil of the internal speaker.

Condenser Block.—This is in a rectangular metal case, on the chassis deck, with the connecting leads emerging beneath the chassis. It includes the dry electrolytic condensers C13, C22, C23 and C27 to C29. The coding of the leads is: Brown, negative of C29 (16μF); yellow, positive of C29; black, negative of all the other condensers; red, positive of C28 (32μF); green, positive of C23 (8μF); blue lead to junction of R3, R4, R5, positive of C13 (4μF); blue lead to junction of R6, R7, positive of C27 (4μF); white, positive of C22 (1μF).

TABLE AND DIAGRAM OF THE SWITCH UNIT

| Switch | SW | MW | LW |
|--------|-----|-----|-----|
| S1 | --- | --- | C |
| S2 | --- | C | --- |
| S3 | C | --- | --- |
| S4 | --- | C | --- |
| S5 | --- | --- | C |
| S6 | C | --- | --- |
| S7 | --- | C | --- |
| S8 | --- | --- | C |
| S9 | C | --- | --- |
| S10 | --- | C | --- |
| S11 | --- | --- | C |

Switch diagram, drawn as seen from the underside of the chassis.



The case is isolated. The unit is a Dubilier type 3241.

Valve Connections.—Base connections for the octal valves used were given on page 1 of *Radio Maintenance* for November 13, 1937.

Fuses.—These are two 1/4 in. glass tubular types, rated at 1.25 A (yellow spot coding). They fit into clips on the mains input unit, on either side of the mains connector.

R24 Unit.—This is fitted to the inside of the cabinet, and is not shown in our chassis illustrations. It contains the tapped ballast resistor R24, the voltage adjustment lead and terminals, the two fuses, and the mains input connector. From it emerges a 7-pin plug, which fits into a socket on the chassis deck.

The individual pins and sockets are shown by numbered arrows and circles on the circuit diagram, which also contains a diagram of the base of the plug, looking at the free ends of the pins, with the pins numbered.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to LW, turn gang to maximum, volume control to maximum and tone control fully anti-clockwise. Connect signal generator via a 0.1 μF condenser to fixed vane tag of C36 and chassis, leaving top cap connection of V1 in place. Feed in a 465 KC/S signal, and adjust C40, C41, C42 and C43 in that order for maximum output. Check these adjustments.

RF and Oscillator Stages.—The scale must be positioned so that the pointer spindle hole is exactly concentric with the spindle, and the scale is square in its frame. With gang at maximum, pointer must coincide exactly with the small black spot at the top right-hand corner of the scale.

Turn volume control to maximum, and tone control fully anti-clockwise, and connect signal generator to **A** and **E** sockets.

MW.—Switch set to MW, and tune to 225 m on scale (black spot). Feed in a 225 m (1,333 KC/S) signal and adjust C38 for maximum output. Tune to 530 m on scale (black spot) and feed in a 530 m (566 KC/S) signal. Adjust inductance ("spade" trimmer) of L9 (screw on paxolin coil mounting strip) for maximum output. Repeat these operations until no further improvement results. Return to 225 m and adjust C34 for maximum output.

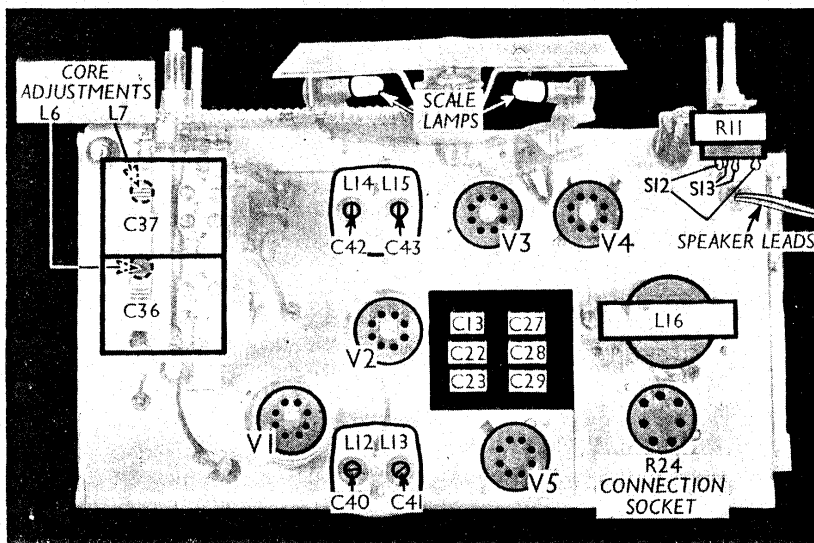
Return to 530 m, and rotate upper core of L6 for maximum output. This is reached through a hole in the chassis deck by means of a special tool (EM Service, Part No. 20730A) which consists of a pointed rod of insulating material with a rubber bush. It should be inserted through the hole in the chassis, the point located in the hole in the paxolin coil mounting strip, and the rubber bush bearing on the core. The core may now be rotated by turning the tool.

Repeat the adjustments of C34 and L6. **LW.**—Switch set to LW, tune to 1,100 m on scale, and feed in a 1,100 m (272.7 KC/S) signal. Adjust C39 for maximum output. Tune to 1,900 m on scale, feed in a 1,900 m (158 KC/S) signal, and adjust inductance ("spade" trimmer) of L10 (screw on paxolin coil mounting strip) for maximum output. Repeat these adjustments.

Return to 1,100 m and adjust C35 for maximum output. Return to 1,900 m and adjust hexagonal-headed screw core of L7 (through hole in chassis deck) for maximum output. Re-adjust C35 at 1,100 m, then tune to 1,400 m on scale, feed in a 1,400 m (214 KC/S) signal, and re-adjust C35 if necessary.

SW.—Switch set to SW, tune to 50 m on scale, feed in a 50 m (6 MC/S) signal and adjust loop of L8 (inside its coil former) for maximum output. This can be reached through a hole in the shield. A strip of insulating material with a slot in it should be used to move the wire up or down. Then adjust loop of L5 (through hole in chassis deck) for maximum output in the same way.

Do not alter the position of the pointer, after ganging, or rock the gang while aligning.



Plan view of the chassis. Note the holes through which L6 and L7 can be adjusted.