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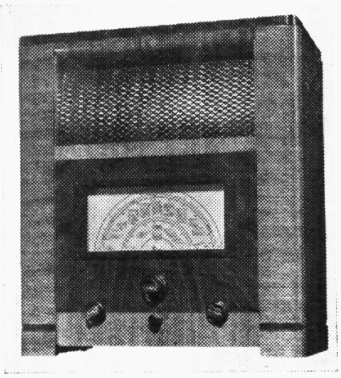
'TRADER' SERVICE SHEET 350

H.M.V. 651 AND 661



COVERING a short-wave range of 16·5-52 m, the H.M.V. 651 is a 5-valve (plus rectifier) AC 3-band superhet suitable for mains of 195-255 V, 50-100 C/S. It has provision for both a gramophone pick-up and an extension speaker.

A very similar chassis is fitted in the 661 radiogram except that it is provided with a cathode-ray tuning indicator and is suitable for 50-60 C/S.

This *Service Sheet* was prepared on a 651 and the differences in the 661 are explained under "661 Modifications."

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** to single-tuned circuits **L1** (SW) plus **L2** (MW) plus **L3** (LW), tuned by **C35,** which precede variable-mu RF pentode signal-frequency amplifying valve (**V1, Marconi KTW63**).

Tuned anode coupling by coils **L4** (SW), plus **L5** (MW), plus **L6** (LW), tuned by **C38,** between **V1** and second valve (**V2, Marconi X63**), a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L8** (SW), plus **L9** (MW), plus **L10** (LW) are tuned by **C39**; parallel trimming by **C40** (SW), **C41** (MW) and **C7, C43** (LW); series tracking by **C8** (SW), **C9, C42** (MW) and **C44** (LW). Anode reaction by coils **L11** (SW), **L12** (MW) and **L13** (LW).

Third valve (**V3, Marconi KTW63**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C45, L14, L15, R4, C46** and **C47, L16, L17, C48.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double-diode triode valve (**V4, Marconi DH63**). Audio frequency component in rectified output is developed across load resistance **R12** and passed via IF stopper **R10,** AF coupling condensers **C18** (MW and LW), or **C18, C19** (SW), and manual volume control **R11** to CG of triode section which operates as AF amplifier. Tone compensation in anode circuit by **C24.**

Provision for connection of gramophone pick-up via **S13** across **R11.**

Second diode of **V4,** fed via **C17** from **V3** anode, provides DC potentials which are developed across load resistances **R15, R16, R17** and fed back through decoupling circuits as GB to RF, FC, and IF valves, giving automatic volume control.

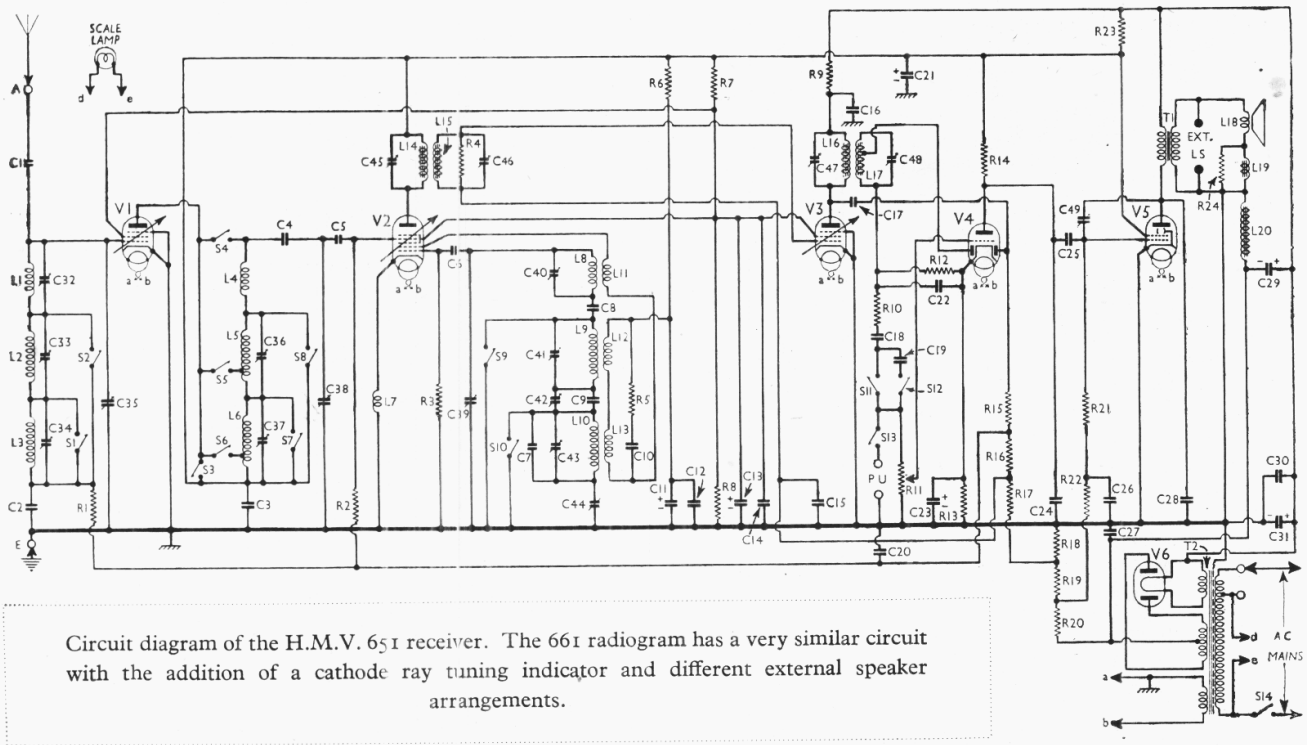
Resistance-capacity coupling by **R14, C25** and **R21** between **V4** triode and beam tetrode output valve (**V5, Marconi KT63**). GB potentials for **V5,** fixed GB for **V1, V2, V3** and delay voltage for **V4** AVC diode are obtained by potential divider **R18, R19, R20** from drop across speaker field **L20** in HT negative lead to chassis. Fixed tone correction in anode circuit of **V5** by **C28**; variable tone control by variable condenser **C49** between anode and control grid.

Provision for connection of external speaker across secondary of **T1.**

HT current is supplied by full-wave rectifying valve (**V6, Marconi U50**). HT smoothing by speaker field **L20** in negative lead and dry electrolytic condensers **C29, C31.** RF filtering by **C30.**

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (three round-head wood screws holding the metal straps to the cabinet) gives access to most of the components beneath the chassis.



Circuit diagram of the H.M.V. 651 receiver. The 661 radiogram has a very similar circuit with the addition of a cathode ray tuning indicator and different external speaker arrangements.

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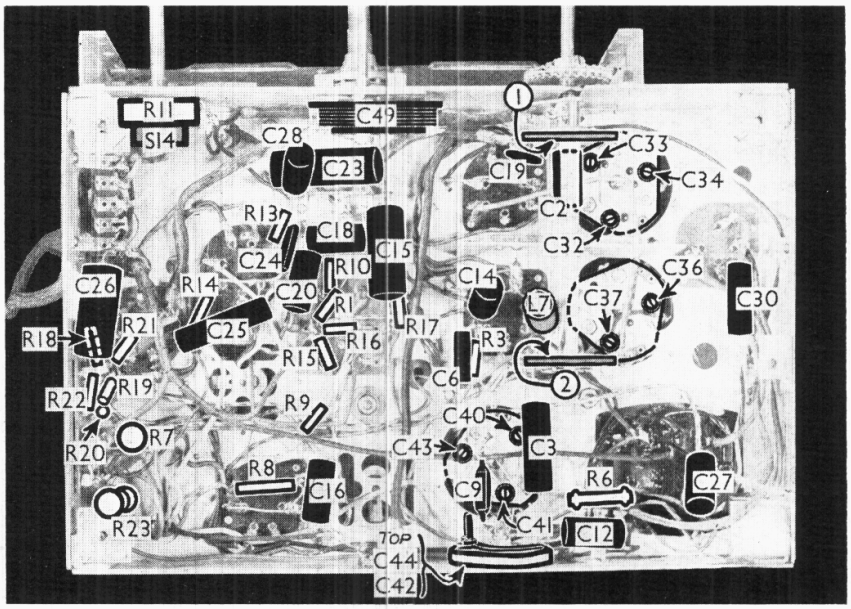
Removing Chassis.—If it should be necessary to remove the chassis from the cabinet, remove the two outer control knobs (recessed self-tapping screws), the two small knobs (recessed screws) and the large tuning knob (pull off). Then remove the four bolts (with washers and spring washers) holding the chassis to the bottom of the cabinet and free the speaker leads from the cleat on the sub-baffle, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

If the valves are removed, note, *when replacing* them, that the screening cap goes on **V4.**

To free the chassis entirely, unsolder the speaker leads and *when replacing*, connect them as follows, noting that the tags on the speaker are numbered: 2, yellow; 3, black; 7, yellow/black.

Removing Speaker.—If it is desired to remove the speaker, unsolder the leads, and remove the four bolts (with washers) holding it to the sub-baffle. *When replacing*, see that tags 1 to 4 are at the bottom and connect the leads as above.



Under-chassis view. Note that many of the trimmer adjustments are reached from beneath the chassis. The wavechange switch diagrams are overleaf.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 CG decoupling	75,000
R2	V2 tetrode CG resistance	500,000
R3	V2 osc. CG resistance	50,000
R4	1st IF trans. sec. shunt	1,000,000
R5	Part of V2 oscillator anode circuit stabiliser	100
R6	V2 osc. anode HT feed	23,000
R7	V1, V2, V3 SG's HT potential divider	23,000
R8	V1, V2, V3 SG's HT potential divider	35,000
R9	V3 anode HT feed	10,000
R10	IF stopper	100,000
R11	Manual volume control	2,000,000
R12	V4 signal diode load	500,000
R13	V4 GB resistance	750
R14	V4 triode anode load	50,000
R15	V4 AVC diode load resistances	500,000
R16	V4 AVC diode load resistances	500,000
R17	V4 AVC diode load resistances	500,000
R18	AVC delay and V5 GB potential divider	1,000
R19	AVC delay and V5 GB potential divider	7,500
R20	AVC delay and V5 GB potential divider	50,000
R21	V5 CG resistance	150,000
R22	V5 CG decoupling	100,000
R23	V1, V2, V3, V5, SG's and V1, V2, V4 anodes HT feed	1,000
R24	Hum neut. coil shunt	0·4

	CONDENSERS	Values (μF)
C1	Series aerial condenser	0·0000075
C2	V1 CG decoupling	0·05
C3	V1 anode RF by-pass	0·1
C4	HT blocking condenser	0·1
C5	V1 to V2 RF coupling	0·000035
C6	V2 osc. CG condenser	0·00005
C7	Osc. circuit LW fixed trimmer	0·000023
C8	Osc. circuit SW tracker	0·0035
C9	Osc. circuit MW fixed tracker	0·00035
C10	Part of V2 oscillator anode circuit stabiliser	0·00015
C11*	V2 osc. anode decoupling	4·0
C12	V2 osc. anode RF by-pass	0·005
C13*	V1, V2, V3 SG's decoupling	4·0
C14	V1, V2, V3 SG's RF by-pass	0·1
C15	V3 CG decoupling	0·23
C16	V3 anode decoupling	0·05
C17	Coupling to V4 AVC diode	0·000075
C18	MW and LW AF coupling to V4 triode	0·01
C19	SW AF coupling to V4 triode	0·001
C20	AVC line decoupling	0·05
C21*	V1, V2, V4 anodes decoupling	4·0
C22	IF by-pass	0·0001
C23*	V4 cathode by-pass	25·0
C24	Fixed tone corrector	0·00035
C25	V4 triode to V5 AF coupling	0·05
C26	V5 CG decoupling	0·23
C27	Auto GB RF by-pass	0·05

	CONDENSERS (*Continued*)	Values (μF)
C28	Fixed tone corrector	0·0023
C29*	HT smoothing	8·0
C30	HT circuit RF by-pass	0·015
C31*	HT smoothing	4·0
C32‡	Aerial circuit SW trimmer	—
C33‡	Aerial circuit MW trimmer	—
C34‡	Aerial circuit LW trimmer	—
C35†	Aerial circuit tuning	—
C36‡	V1 anode circuit MW trimmer	—
C37‡	V1 anode circuit LW trimmer	—
C38†	V1 anode circuit tuning	—
C39†	Oscillator circuit tuning	—
C40‡	Osc. circuit SW trimmer	—
C41‡	Osc. circuit MW trimmer	—
C42‡	Osc. circuit MW tracker	—
C43‡	Osc. circuit LW trimmer	—
C44‡	Osc. circuit LW tracker	—
C45‡	1st IF trans. pri. tuning	—
C46‡	1st IF trans. sec. tuning	—
C47‡	2nd IF trans. pri. tuning	—
C48‡	2nd IF trans. sec. tuning	—
C49†	Variable tone control	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial SW tuning coil	0·1
L2	Aerial MW tuning coil	6·0
L3	Aerial LW tuning coil	14·0
L4	V1 anode SW tuning coil	0·1
L5	V1 anode MW tuning coil	5·5
L6	V1 anode LW tuning coil	14·0
L7	V2 cathode frequency stabiliser	0·1
L8	Osc. circuit SW tuning coil	0·1
L9	Osc. circuit MW tuning coil	5·5
L10	Osc. circuit LW tuning coil	4·2
L11	Osc. SW reaction coil	1·0
L12	Osc. MW reaction coil	2·0
L13	Osc. LW reaction coil	3·0
L14	1st IF trans. Pri.	5·0
L15	1st IF trans. Sec.	5·0
L16	2nd IF trans. Pri.	5·0
L17	2nd IF trans. Sec.	5·0
L18	Speaker speech coil	4·0
L19	Hum neutralising coil	0·8
L20	Speaker field coil	1,600·0
T1	Output trans. Pri.	400·0
T1	Output trans. Sec.	0·6
T2	Mains trans. Pri., total,	30·0
T2	Mains trans. Heater sec.	0·1
T2	Mains trans. Rect. heat. sec.	0·1
T2	Mains trans. HT sec., total.	630·0
S1-S12	Waveband switches	—
S13	Gram. pick-up switch	—
S14	Mains switch, ganged R11	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 228 V, using the 224-255 V tapping on the mains transformer. 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 **V2** should become unstable when its anode current is being measured or **V3** when its screen current is being measured, they can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) of the valve concerned to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 KTW63	222	5·6	68	1·1
V2 X63	222	3·0	68	2·3
	Oscillator 132	3·2		
V3 KTW63	190	5·4	68	1·1
V4 DH63	124	1·5	—	—
V5 KT63	233	30·0	222	4·3
V6 U50	334†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—**S1-S12** are the waveband switches, and **S13** the pick-up switch, ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams overleaf.

The table overleaf gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S14 is the QMB mains switch, ganged with the volume control, **R11.**

Coils.—**L1-L3; L4-L6; L8-L13,** and the IF transformers **L14, L15** and **L16,**

Continued overleaf

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H.M.V. 651—*Continued*

L17 are in five screened units on the chassis deck. Most of these contain additional components as indicated in our plan chassis view. **L7** is a small coil on a tubular former beneath the chassis.

Scale Lamp.—This is a special high voltage Osram tubular type, with a small double-pole bayonet cap base. It is rated at 230 V, 15 W, and is connected across the 195-223 V input to the primary of **T2.**

External Speakers.—These should be low resistance (5 O) types, and in the case of model 651 they should be connected across tags 2 and 3 on the internal speaker terminal strip, that is, across the secondary of **T1.**

In the case of the radiogram model 661, two sockets are provided for a 5 O external speaker. Across these sockets is connected a 50 O resistance. A switch is fitted, which connects into circuit either the internal or external speakers separately, or both together.

Condensers C11, C13, C21, C29, C31.—These are five dry electrolytics in a single metal-cased unit on the chassis deck. The case is isolated.

The red lead is the positive of **C29** (8 μF) and the brown the negative. The black lead is the common negative of all the other condensers in the unit. The yellow lead to **R6** is the positive of **C11** (4 μF), the yellow lead to one end of **R23** is the positive of **C21** (4 μF), the yellow lead to the other end of **R23** and to the red lead of **C29** the positive of **C31** (4 μF), and the green lead the positive of **C13** (4 μF).

Trimmers.—Note that the majority of these are reached from the underside of the chassis, the trimmers being inside the bases of the respective coil units. The IF trimmers are reached through holes in the sides of their cans.

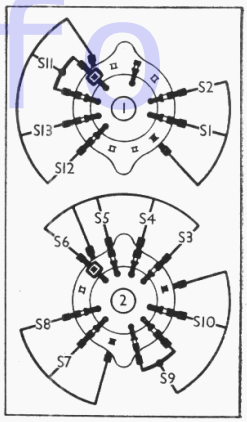
Trackers.—The two variable trackers can be adjusted through holes in the rear chassis member.

Resistance R24.—The hum neutralising coil shunt is a short length of resistance wire, with insulating sleeving, connected between tags 3 and 4 on the internal speaker terminal panel.

TABLE AND DIAGRAMS OF THE SWITCH UNITS

Switch	LW	MW	SW	Gram
S1	—	C	—	—
S2	—	—	C	—
S3	—	—	—	C
S4	—	—	C	—
S5	—	C	—	—
S6	C	—	—	—
S7	—	C	—	—
S8	—	—	C	—
S9	—	—	C	C
S10	—	C	—	—
S11	C	C	—	—
S12	—	—	C	—
S13	—	—	—	C

Switch diagrams, as seen from the underside of the chassis, in the directions of the arrows in the under-chassis view.

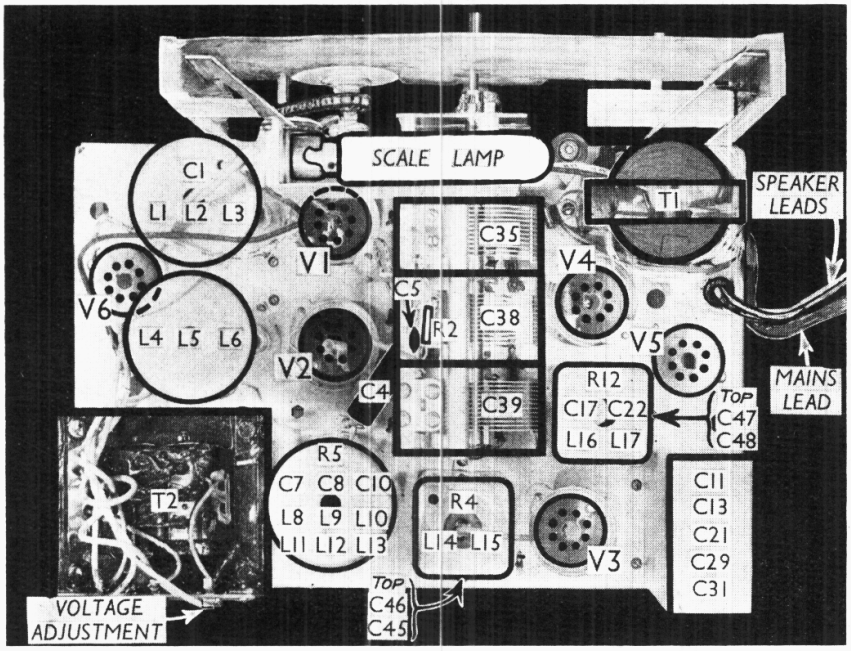


MODEL 661 MODIFICATIONS

The radiogram model 661 has an almost identical chassis, except that a Y63 tuning indicator is fitted. The cathode of this goes to chassis, the control grid goes to the **V1, V2** AVC line, the anode, via a 1 MO resistance to the 250 V HT line, and the target direct to the HT line. The indicator is mounted at the top left hand corner of the tuning scale, and the resistance is mounted on the T.I. holder.

The pick-up has a DC resistance of 850 O, and a 7,500 O resistor is connected across it.

The external speaker arrangements are different and are mentioned under "External Speakers" (col. 1).



Plan view of the chassis. **C5** and **R2** are mounted on the frame of the gang condenser.

The squirrel-cage induction motor has a DC resistance of 1,000 O.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to LW, turn gang to maximum and volume control to maximum. Connect signal generator to grid (top cap) of **V2,** via a 0·1 μF condenser, leaving existing top cap connection in place, and to chassis. Feed in a 465 KC/S signal and adjust **C45, C46, C47** and **C48** in that order, for maximum output. Re-check these adjustments.

RF and Oscillator Stages.—SW—Connect signal generator to **A** and **E** sockets and switch set to SW. Feed in an 18 m (16·7 MC/S) signal, tune it in, and adjust **C40** and **C32** for maximum output, rocking the gang slightly for optimum results.

Feed in a 50 m (6 MC/S) signal, and tune it in. Then adjust the inductance of **L1** if necessary. A loop of wire will be found running across the coil former and this loop must be bent up or down until maximum output is obtained. Identify the loop by first removing the coil can; then replace the can and move the loop by a strip of insulating material with a suitable nick in it. This adjustment will not normally be necessary.

Return to 18 m and re-adjust **C32** very carefully, while rocking the gang.

MW—Switch set to MW, turn gang to minimum, and feed in a 195 m (1,540 KC/S) signal. Adjust **C41** for maximum output. Feed in a 225 m (1,330 KC/S) signal, tune it in, and adjust **C33** and **C36** for maximum output. Feed in a 530 m (565 KC/S) signal, tune it in, and adjust **C42** for maximum output, rocking the gang for optimum results. Return to 195 m, and check setting of **C41.**

LW—Switch set to LW, turn gang to minimum, and feed in a 725 m (413 KC/S) signal. Adjust **C43** for maximum output. Feed in an 800 m (375 KC/S) signal, tune it in, and adjust **C34** and **C37** for maximum output. Feed in a 1,900 m (158 KC/S) signal, tune it in, and adjust **C44** for maximum output, rocking the gang for optimum results. Check setting of **C43** at 725 m.

Finally, return to MW, and go through whole of MW and LW alignment again. Set the scale pointer to give best possible calibration compromise.

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