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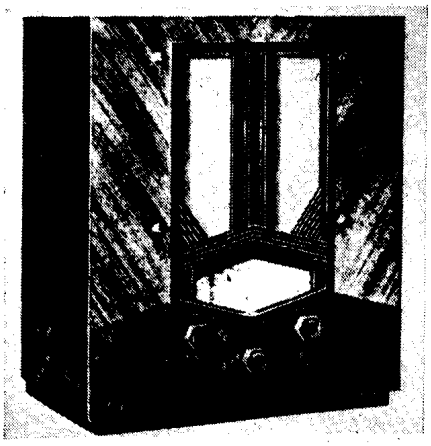
"TRADER" SERVICE SHEET

744

REVISED ISSUE OF SERVICE SHEET No. 64

MARCONIPHONE 224

WITH 223, 236 & HMV 340, 341



The Marconiphone 224. The 223 has a different cabinet, and the sensitivity switch button shows beneath the tuning control.

A DOUBLE diode RF pentode valve operates in the Marconiphone 224 as variable-mu IF amplifier, AF amplifier and diode detector, for distant reception; or simply as a leaky grid detector for local reception.

The receiver is a 3-valve (plus rectifier) 2-band superhet designed to operate from AC or DC mains of 195-255 V, 25-60 c/s in the case of AC.

The Marconiphone 223, which was the forerunner of the 224, employed a chassis which, apart from the sensitivity control circuit, was like that in the 224. The differences are described overleaf. A console version 236 employs a chassis which is identical with that in the 224.

The HMV 340 was originally the equivalent of the 223, but 340 chassis bearing a serial number higher than 424800 were of a modified type equivalent to the 224, while the HMV console 341 is equivalent to the Marconiphone console 236. This *Service Sheet* was prepared from a Marconiphone 224.

Release date, all models, 1935.

Original prices: 223, 224 *and* 340, £12 1*s.* 6*d.*, *reduced April* 15, 1936, *to* £8 18*s.* 6*d.*; 236 *and* 341, £15 15*s.*, *reduced April* 15, 1936, *to* £12 1*s.* 6*d.*

CIRCUIT DESCRIPTION

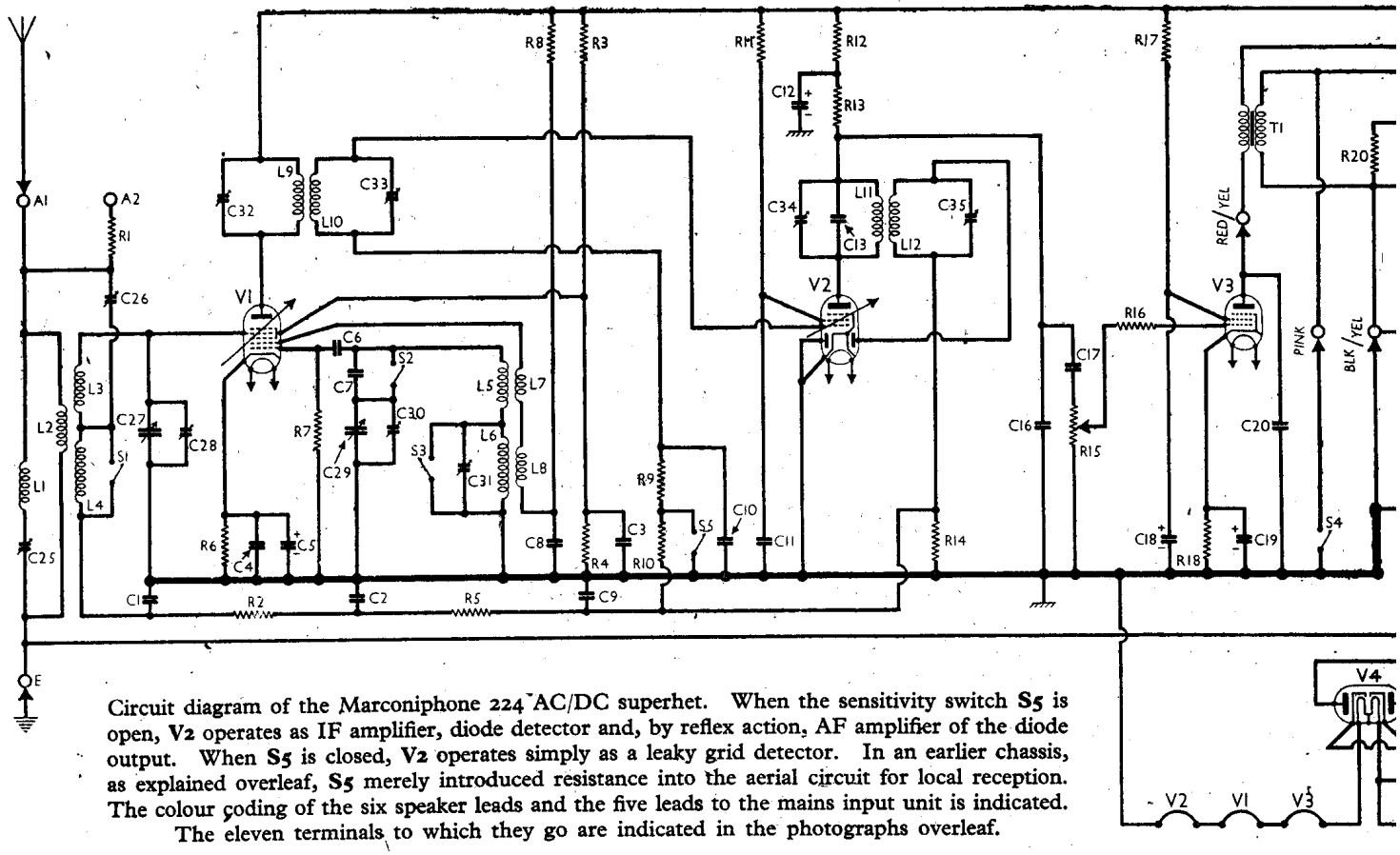
Aerial input from socket **A1** is via coupling coil **L2** to single-tuned circuit **L3** (MW), **L4** (LW) and **C27.** Socket **A2** feeds the signal to **A1** via resistor **R1** for local reception. IF filtering in aerial circuit by **L1, C25.** Image suppression by **C26.**

First valve **(V1, Marconi metallised X30)** is a heptode operating as frequency changer with electron coupling. Triode oscillator grid coils **L5** (MW) and **L6** (LW) are tuned by **C29.** Parallel trimming by **C30** (MW) and **C31** (LW); tracking by specially shaped vanes of **C29** on MW, with series capacitor **C7** on LW. Reaction coupling from anode by coils **L7** (MW) and **L8** (LW).

Second valve **(V2, Marconi metallised WD30)** is a double diode variable-mu RF pentode. The pentode section operates first as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C32, L9, L10, C33** and **C34, C13, L11, L12, C35.**

Intermediate frequency 456 kc/s.

One diode operates as second detector, while the other is unused and is strapped to the cathode. Audio frequency component in rectified output is developed across load resistor **R14** and passed back



Circuit diagram of the Marconiphone 224 AC/DC superhet. When the sensitivity switch **S5** is open, **V2** operates as IF amplifier, diode detector and, by reflex action, AF amplifier of the diode output. When **S5** is closed, **V2** operates simply as a leaky grid detector. In an earlier chassis, as explained overleaf, **S5** merely introduced resistance into the aerial circuit for local reception. The colour coding of the six speaker leads and the five leads to the mains input unit is indicated.

The eleven terminals to which they go are indicated in the photographs overleaf.

via **R10, R9** and **L10** to **V2** pentode control grid, the pentode section then operating as a reflexed AF amplifier.

DC potential developed across **R14** is thus applied to IF amplifier control grid and, through decoupling circuits, to the frequency changer control grid, as GB, giving automatic volume control.

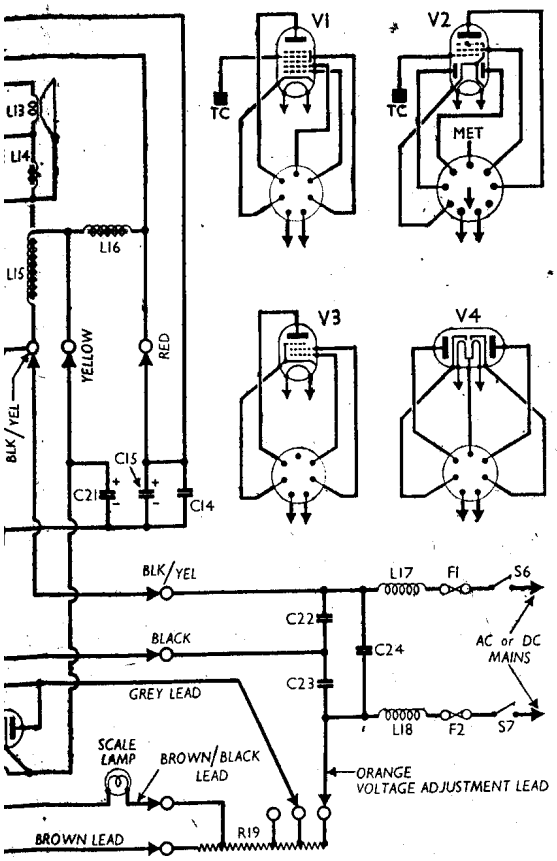
S5 is the local/distant selectivity switch, connected between the junction of **R9, R10** and chassis. The conditions just explained exist while the switch is open, in the "distant" position. When it is set to the "local" position it closes, connecting the junction of **R9, R10** to chassis, short-circuiting any signal from **R14** via the AVC line.

V2 pentode now operates simply as a leaky grid detector with **R9** and **C10,** operating at intermediate frequency and taking the output from **L10. V2** pentode is not now required to act as an IF amplifier, and although any residual IF output will still be rectified by the diode, **R14** is now shunted by **R10** so that its effective value is reduced to small proportions and the effect of AVC on **V1** is negligible.

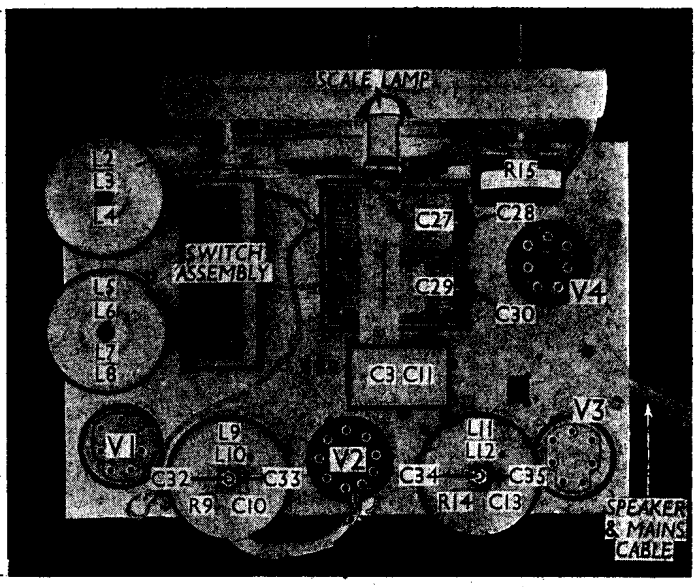
Resistance-capacitance AF coupling by **R13, C17** and **R15,** via grid stopper **R16,** between **V2** pentode and pentode output valve **(V3, Marconi N30 Catkin).** IF filtering by **C16, R16** and the grid/cathode capacitance of **V3.** Fixed tone correction by **C20** in anode circuit.

When the receiver is operating from AC mains, HT current is supplied by half-wave rectifying valve **(V4, Marconi U30),** its two sections being strapped in parallel. On DC mains this valve behaves as a low resistance. Smoothing is effected by iron-cored choke **L16** and electrolytic capacitors **C15, C21,** while **C14** forms an RF shunt across the HT circuit. The speaker field coil **L15** is energised from the HT circuit, being shunted directly across the rectifier output.

Valve heaters, together with tapped ballast resistor **R19,** are connected in series across the mains input, the scale lamp being connected across a small section at one end of **R19. V4** anode is connected to the centre (216-235 V) voltage adjustment tapping. A filter unit comprising RF chokes **L17, L18** and capacitors **C22, C23, C24** suppresses mains-borne interference, while fuses **F1, F2** protect the input circuit against accidental short-circuits. The earth socket is connected to the junction of **C22** and **C23,** and the aerial coupling coil **L2** is connected to it.



Plan view of the chassis. The two IF cans each contain a dual trimmer, with concentric nut and screw adjustments, and other components.



COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	V1 CG decoupling ...	0·1
C2	V1 AVC line decoupling	0·01
C3	V1 SG by-pass	0·5
C4	V1 cathode by-pass capacitors ...	0·1
C5*		50·0
C6	V1 osc. CG capacitor ...	0·0001
C7	Osc. LW tracker ...	0·0005
C8	V1 osc. anode decoupling	0·1
C9	IF by-pass capacitors ...	0·002
C10		0·0005
C11	V2 SG by-pass	0·5
C12*	V2 anode decoupling ...	4·0
C13	2nd IF trans. pri. tuning	0·0001
C14	HT smoothing capacitors	0·1
C15*		12·0
C16	V2 anode IF by-pass ...	0·0005
C17	AF coupling to V3 ...	0·1
C18*	V3 SG decoupling ...	1·0
C19*	V3 cathode by-pass ...	50·0
C20	Fixed tone corrector ...	0·002
C21*	HT smoothing capacitor	12·0
C22	Parts of mains RF filter unit	0·005
C23		0·005
C24		0·01
C25‡	Aerial IF filter tuning ...	—
C26‡	Image suppressor ...	—
C27†	Aerial circuit tuning ...	—
C28‡	Aerial circ. MW trimmer	—
C29†	Oscillator tuning ...	—
C30‡	Oscillator MW trimmer	—
C31‡	Oscillator LW trimmer	—
C32‡	1st IF trans. pri. tuning	—
C33‡	1st IF trans. sec. tuning	—
C34‡	2nd IF trans. pri. tuning	—
C35‡	2nd IF trans. sec. tuning	—

* Eleetrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	Aerial series resistor ...	10,000
R2	V1 tet. CG decoupling ...	100,000
R3	V1 SG pot. divider ...	35,000
R4		50,000
R5	V1 AVC line decoupling	350,000
R6	V1 fixed GB resistor ...	230
R7	V1 osc. grid resistor ...	50,000
R8	V1 osc. anode decoupling	100,000
R9	V1 CG AF coupling and decoupling resistors ...	100,000
R10		23,000
R11	V2 SG HT feed ...	75,000
R12	V2 anode decoupling ...	5,000
R13	V2 anode AF load ...	35,000
R14	V2 diode load	500,000
R15	Manual volume control...	200,000
R16	V3 grid IF stopper ...	50,000
R17	V3 SG HT feed ...	10,000
R18	V3 auto GB resistor ...	230
R19	Heaters ballast, total ...	640*
R20	Hum neut. coil shunt ...	1·25

* Tapped at 40Ω + 440Ω + 80Ω + 80Ω from V4 heater end.

	OTHER COMPONENTS	Values (ohms)
L1	Aerial IF filter coil ...	50·0
L2	Aerial coupling coil ...	15·0
L3	Aerial tuning coils ...	4·0
L4		26·0
L5	Oscillator tuning coils ...	1·5
L6		5·0
L7	Oscillator anode reaction coils, total	6·5
L8		
L9	1st IF trans. Pri. ...	5·0
L10	Sec. ...	5·0
L11	2nd IF trans. Pri. ...	3·5
L12	Sec. ...	5·0
L13	Speaker speech coil ...	1·8
L14	Hum neutralising coils	0·3
L15	Speaker field winding ...	5,000·0
L16	HT smoothing choke ...	475·0
L17	Mains filter chokes ...	3·0
L18		3·0
T1	Speaker input trans. Pri.	725·0
	Sec.	0·2
S1-S3	Waveband switches ...	—
S4	Speaker muting switch...	—
S5	Sensitivity switch ...	—
S6, S7	Mains switches	—
F1, F2	Mains circuit fuses, 0·75A	—

To avoid confusion when ordering spares, dealers using the L, C and R numbers given in these tables are advised to mention the fact to the manufacturer or the agent to whom the order is sent.

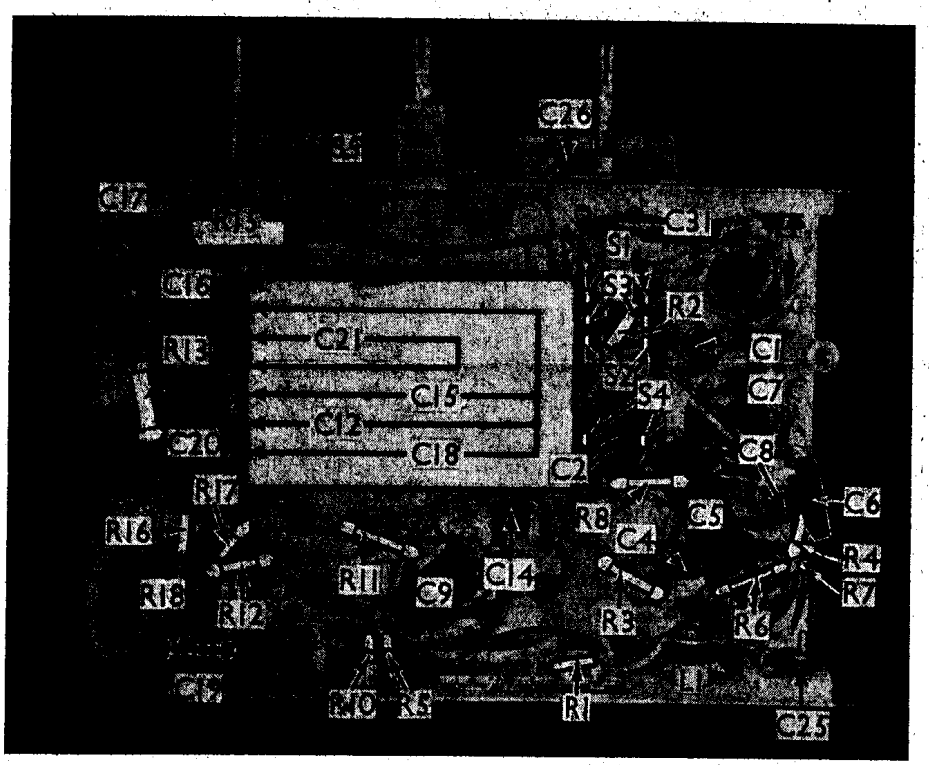
VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from 230 V AC mains, using the 216-235 V tapping on the ballast resistor.

The volume control was at maximum, and the sensitivity switch at "distant," but there was no signal input. Voltages were measured on the 1,200 V scale of an Avometer whose negative lead was connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X30	215 (Oscillator) 60	1·1 1.3	65	2·9
V2 WD30	75	3.2	60	2·0
V3 N30	200	22·0	155	6·1
V4 U30†	—	—	—	—

† Cathode to chassis, 240V, DC.



Under-chassis view. The internal connections of the four electrolytic capacitors are indicated diagrammatically on the face of the container, in the centre of the photograph. The tags of the waveband switch unit, just to the right of the capacitor block, are identified. The sensitivity switch **S5** is operated by a flange on the tuning control spindle, **S5** closing when the knob is pushed "in."

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed screws) from the front of the cabinet;

remove mains connector and cover from back of cabinet, and free the speaker and mains leads from the cleat on the side of the cabinet;

remove two wooden battens (two wood screws each) from beneath the cabinet, and then remove the four bolts (with spring washer and large metal washer each) whose heads are thus exposed.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free chassis entirely, free the two leads from the mains switch terminals, and the brown, brown/black and grey leads from the heater ballast resistor, on the mains input unit on the side of the cabinet (the orange lead need not be disturbed);

remove the six colour-coded leads from the connecting panel on the speaker input transformer.

The mains input unit may be removed if desired upon removal of the knurled escutcheon from the switch, outside the cabinet, and the four wood screws holding the cowl to the wooden fillets inside the cabinet.

When replacing, the two left-hand screws on the mains input unit are fitted with washers.

See that four large washers fitted into recesses in the floor of the cabinet are in position before inserting the chassis, and make sure that the edges of the chassis rest firmly on their supports.

Connect the six leads to the speaker assembly according to the markings by the tags, which indicate the lead colours. These are shown in our illustration of the speaker assembly;

connect the brown lead from chassis to the first tapping on the ballast resistor (on the mains input unit), the brown/black lead to the second tapping, and the grey lead to the fourth (216-235 voltage adjustment tapping) as indicated in our photograph of the unit.

Finally, do not omit to rewax the control knob screw-heads.

Removing Speaker.—First remove the mains input unit as described previously; remove the four fixing screws (with a washer and lock-washer each) holding the assembly to the sub-baffle, when the speaker, input transformer and smoothing choke can be withdrawn together in a single unit.

GENERAL NOTES

Switches.—S1-S3 are the waveband switches, and **S4** is the speaker muting switch, ganged together in a cam-operated unit beneath the chassis and indicated in our under-chassis view, where the switch connections are identified. **S1-S3** all close on MW and open on LW. **S4** is open on both ranges, but closes between settings to effect silent waveband switching.

S5 is the "local/distant" sensitivity switch, a toggle unit operated by a flange on the tuning control spindle, which has a push-pull movement. It is in the "distant" position when the tuning control is pulled out (switch open).

S6, S7 are the QMB mains switches, ganged together and mounted on the mains input unit.

Coils.—The IF filter coil **L1** is in an unscreened unit beneath the chassis. The aerial coils **L2-L4**, the oscillator coils **L5-L8** and the IF transformers **L9, L10** and **L11, L12** are in four screened units on the chassis deck. The IF units contain their trimmers, each in a double pre-set assembly, the screw adjusting the primary and the nut adjusting the secondary. The first IF unit also contains **R9** and **C19**, and the second contains **R14** and **C13**.

L13, L14, L15 are all parts of the speaker, while the HT smoothing choke **L16** is mounted on the speaker assembly.

Scale lamp.—This is an Osram lamp, with an MES base, rated at 6.2 V, 0.3 A.

Capacitor Block.—This is a large multiple electrolytic capacitor unit mounted beneath the chassis and indicated at the centre of our under-chassis view. It contains **C12, C15, C18** and **C21**, the connections being brought out at the points indicated by arrows in our illustration. There is one common negative connection for **C12, C15** and **C18**, but two separate connections are provided for **C21**.

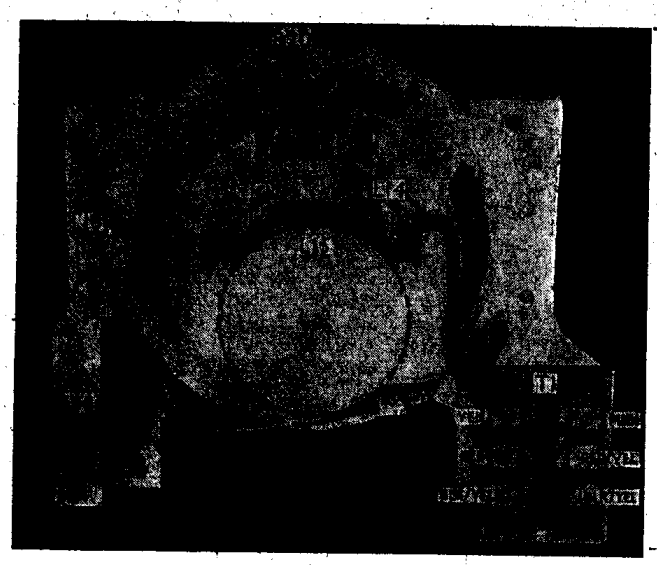
Capacitors C3, C11.—These are two paper-insulated capacitors in a single rectangular unit on the chassis deck, their connecting leads passing through a hole in the chassis deck. The yellow/black and red/black leads are those of **C3**, and the yellow and black leads are those of **C11**.

Fuses F1, F2.—These are two standard glass fuses, 1¼in. long, rated at 0.75 A. They are mounted on the mains input unit. A third position is provided for a spare fuse.

Valve Replacements

The original valve types used in this range of receivers are now obsolete. Suitable Marconi replacement types for **V1, V3** and **V4** are X65, KT33C and U31 respectively. For **V2** the most convenient replacement is the American type 6B8G.

Substituting X65 for the X30 results in a loss of sensitivity, but this may be re-



Rear view of the speaker assembly, on which are mounted the speaker, its input transformer **T1**, and the HT smoothing choke **L16**. The terminal markings are shown on the right. **L14** is divided into two coils.

stored by reducing the value of the oscillator anode feed resistor **R8** from 100,000 Ω to 50,000 Ω.

Stability and sensitivity may both be affected adversely upon substituting a 6B8G for the WD30. Matters may be corrected by adding a 50,000 Ω resistor in parallel with **C11**, forming with **R11** a screen feed potential divider, and increasing the value of **R13** to 50,000 Ω. The value of **R11** is very critical, however, and in difficult cases it might be worth while to try the effect of slightly different values.

All the recommended substitutes have octal bases, so in each case a new valve holder must be fitted. The original type valve bases are seen in the diagrams inset in the circuit overleaf; the bases of the substitutes are as follow :

X65: 1, blank; 2, heater; 3, anode; 4, screen; 5, osc. CG; 6, osc. anode; 7, heater; 8, cathode; top cap, hexode CG.

6B8G: 1, blank; 2, heater; 3, anode 4, D1; 5, D2; 6, screen; 7, heater; 8, cathode; top cap, pentode CG.

KT33C: 1, heater CT; 2, heater; 3, anode; 4, screen; 5, CG; 6, blank; 7, heater; 8, cathode.

U31: 1, blank; 2, heater; 3 and 4, blank; 5, anode; 6, blank; 7, heater; 8, cathode.

Service Notes

Owing to the nature of the circuit, instability will occur readily if the efficiency of the decoupling components falls. This is true particularly of the HT smoothing capacitors **C15, C21**, which must be of adequate capacitance and low power factor.

The practice of connecting a new electrolytic momentarily across one of the old ones to make a test when it is suspected that the old one is out of condition will not necessarily effect a cure : the old one should first be disconnected. **C14** should be inspected to see that it is still functioning.

Where a 6B8G valve has been substituted for the WD30, the addition of a 50,000 Ω resistor across **C11** may cure instability.

MODEL 223

The Marconiphone 224 is actually a modified form of the earlier model 223, the modifications consisting of a new style of cabinet and the transfer of the sensitivity switch from the aerial circuit to **V2** pentode circuit.

Originally, in the 223, the sensitivity control consisted of a 100,000 Ω resistor in series with **L2**, connected between the top of the coil and the **A1** socket, and **S5** was connected across the resistor. **R10** was omitted, as was also **C5**, and the place of **R1** was taken by a 0.0005 μF capacitor.

S5 was then a press-button operated switch, its button projecting from the front of the cabinet just beneath the tuning control knob. When the button was pressed, the switch opened if it was closed, or closed if it was open, but when it closed the button remained depressed, springing out fully after again being pressed. Inspection, therefore, would reveal whether the switch was open (for local reception) or closed (distant).

Early HMV 340 chassis (serial numbers not higher than 424800) employed the 223 chassis, as did also early Marconiphone 236 consoles.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V1**, removing the existing top cap connector, and the **E** socket. Swith set to MW, tune to 220 m on scale, and turn the volume control to maximum. A convenient pair of connections for an 0-1.5 V AC voltmeter, which may be used as an output meter, are the pink and blk./yel. terminals on the speaker connecting panel. The meter is then connected across the speech coil.

Feed in a 456 kc/s (657.9 m) signal and adjust **C32, C33, C34** and **C35** (concentric screws and nuts in tops of cans) in that order, for maximum output, reducing signal generator output as the circuits come into line. Repeat these adjustments in the same order.

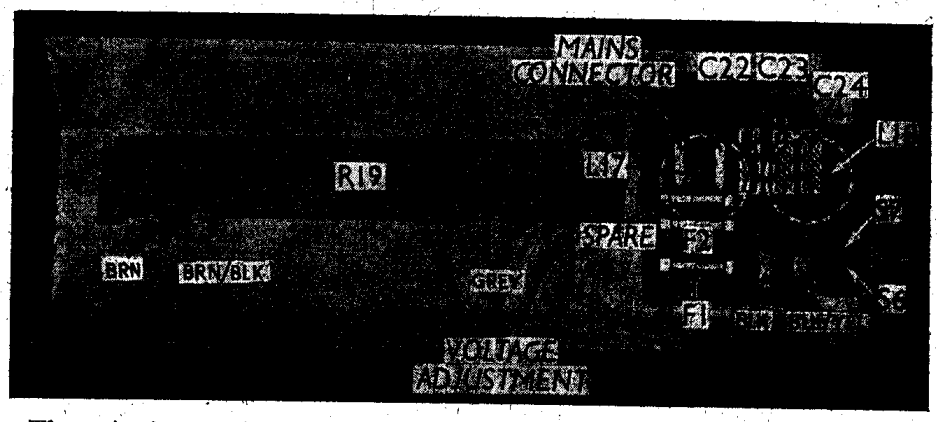
RF and Oscillator Stages.—Transfer signal generator leads to **A1** and **E** sockets, via a dummy aerial, connect the earth lead to the **E** socket, and replace top cap connector on **T1**. Pull the tuning control out.

MW.—With set still switched to MW, tune to 200 m on scale, feed in a 200 m (1,500 kc/s), and adjust **C28** for maximum output. Tune to 230 m on scale, feed in a 230 m (1,304 kc/s) signal and adjust **C30** for maximum output. No tracking adjustments are provided, but calibration should be checked at 500 m (600 kc/s), then rechecked at 200 m.

LW.—Switch set to LW, tune to 1,400 m on scale, feed in a 1,400 m (214 kc/s) signal, and adjust **C31** for maximum output while rocking the gang for optimum results.

IF Filter.—Switch set to MW, tune to 200 m on scale, feed in a 456 kc/s signal of sufficient strength to provide a meter reading, and adjust **C25** for minimum output.

Image Suppressor.—Switch set to LW, feed in a strong 261 m (1,149 kc/s) signal, tune in the image at about 1,260 m on scale, and adjust **C26** for minimum output.



The mains input unit as seen from the rear. The filter components **C22, C23, C24** and **L17, L18** are in a black moulded container with the mains switch **S6, S7**. The five terminals are indicated with their lead colours marked. The grey lead goes to the centre voltage adjustment terminal, to which the orange voltage adjustment lead might also be connected. Clips are provided for a spare fuse, just above those in use.

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