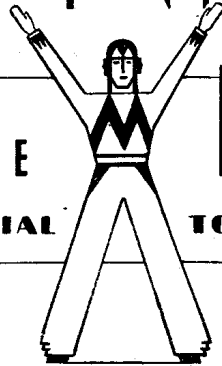


MARCONI PHONE

SERVICE MANUAL

PRIVATE AND CONFIDENTIAL

TO THE TRADE ONLY



MODELS 224 AND 236—4-VALVE A.C.—D.C. MAINS SUPERHETERODYNE

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SEPT
1935
1936 SERIES
NUMBER ONE
PART NO. 21223
ISSUE 1

BRIEF SPECIFICATION.

VOLTAGE RANGE.

200 to 250 volts (A.C. or D.C.).

This instrument is designed to operate only on the voltages for which it is adjusted. Should any variation be noticed the supply company must be notified immediately.

FREQUENCY RANGE.

25-60 cycles A.C.

POWER CONSUMPTION.

90 watts (average).

FUSES.

This instrument may be connected to any A.C. or D.C. supply point, providing that the special fuses (Part No. 19850A) $\frac{3}{4}$ amp. rating are used.

SPEECH OUTPUT.

Approx. $1\frac{1}{2}$ watts (undistorted).

Anode dissipation of N30 output valve—approx. 5 watts.

WAVELENGTH RANGE.

Medium waves—200 to 550 metres.

Long Waves—1,000 to 2,000 metres.

DIMENSIONS.

	Height.	Width.	Depth.
Model 224 :	$17\frac{1}{4}$ inches.	$14\frac{1}{2}$ inches.	$9\frac{1}{4}$ inches.
Model 236 :	34 inches.	17 inches.	10 inches.

WEIGHT.

Model 224 :

27 lb. net.

36 lb. gross (for home despatch).

Model 236 :

44 lb. net.

80 lb. gross (for home despatch).

LOUDSPEAKER.

Type No. 19800C.

This loudspeaker incorporates the output transformer T1 and smoothing choke CK1.

D.C. resistance of speech coil, 1.8 ohms.

Impedance at 800 cycles, 2.5 ohms.

D.C. resistance of field, 5,000 ohms approx.

CIRCUIT DESCRIPTION.

Aerial Coupling.

Two aerial sockets are provided, A2 (with resistance R20 coupling), for high field strength conditions. An acceptor trap (L1 TC6) is included to by-pass Morse interference of similar wavelength to the intermediate frequency (456 kc.). Constant sensitivity coupling to the first low loss tuned circuit is employed.

The Frequency Changer.

A Marconi X30 heptode operates as combined oscillator and first detector, the latter portion being A.V.C. controlled. Litz wound I.F. transformer IFT1 couples this valve to the I.F. amplifier.

The Amplifier and Detector.

The Marconi WD30 double diode pentode acts firstly as an I.F. amplifier, having the primary of the 2nd I.F. transformer in its anode circuit. The secondary of this transformer is connected to the diode of the WD30, which gives signal rectification and also supplies a D.C. voltage (across R13), which gives A.V.C. bias. The second diode is connected to cathode and acts as a screen. The L.F. signal now passes via R11 and L7 back to the grid of the WD30 for L.F. amplification. The resistance R9 acts as an L.F. load, and coupling to the output pentode is by C13 and the volume control VRI.

The Sensitivity Switch.

In the local position (i.e., closed) S2 converts V2 into a leaky grid detector and reduces its amplification.

Output Pentode.

The Marconi N30 operates as a frequency correcting output stage, and feeds the moving coil loud-speaker.

The Rectifier.

On A.C. mains the Marconi U30 rectifies and supplies H.T. current to all valves. Smoothing is by CK1, C18 and C17. The loudspeaker field is shunted across the H.T. supply.

The Mains Filter and Fuse Unit.

The chokes CK2 and CK3 and C20, C21, C29, form an H.F. filter which, together with the fuses and main switch, are mounted in a separate unit at the side of the cabinet.

Heater Supply.

The filaments of all valves are in series, VR2 being the main voltage dropping resistance.

WARNING.

The chassis of this receiver is connected to one side of the mains, and therefore in certain conditions will be "live." Do not connect an "earth" to the chassis, or touch it, with the instrument connected to the mains.

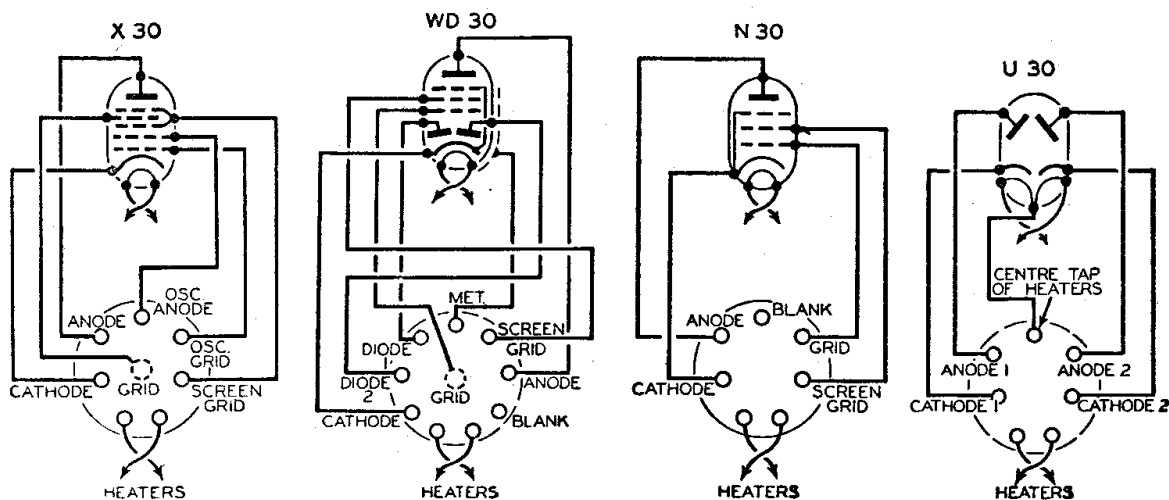
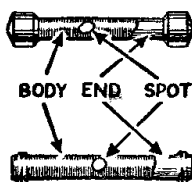


Fig. 1.

CONNECTIONS TO VALVES AS SEEN FROM UNDERSIDE OF CHASSIS.

NEW WIRE COLOUR CODE.

H.T. positive (+)	...	...	...	Red.
Anodes of valves when not direct to H.T. +	...	...	...	Red/Yellow.
Screening grids when not direct to H.T. +	...	...	...	Red/Black.
Grid circuits	...	...	...	Green.
Mains	...	...	...	Orange.
Heaters, filaments and cathodes	...	...	...	Brown.
General purpose colour	...	...	...	Yellow.



RESISTANCE COLOUR CODE.

BODY and END Colours.		SPOT Colours.	
(1st and 2nd figures.)		(Additional 0's.)	
0	Black.	0	Black.
1	Brown	00	Brown.
2	Red.	000	Red.
3	Orange.	0000	Orange.
4	Yellow.	00,000	Yellow.
5	Green.	00,0000	Green.
6	Blue.		
7	Violet.		
8	Grey.		
9	White.		

Yellow will be used for leads not falling in the general code, and when stocks of any colour are temporarily exhausted in the factory.

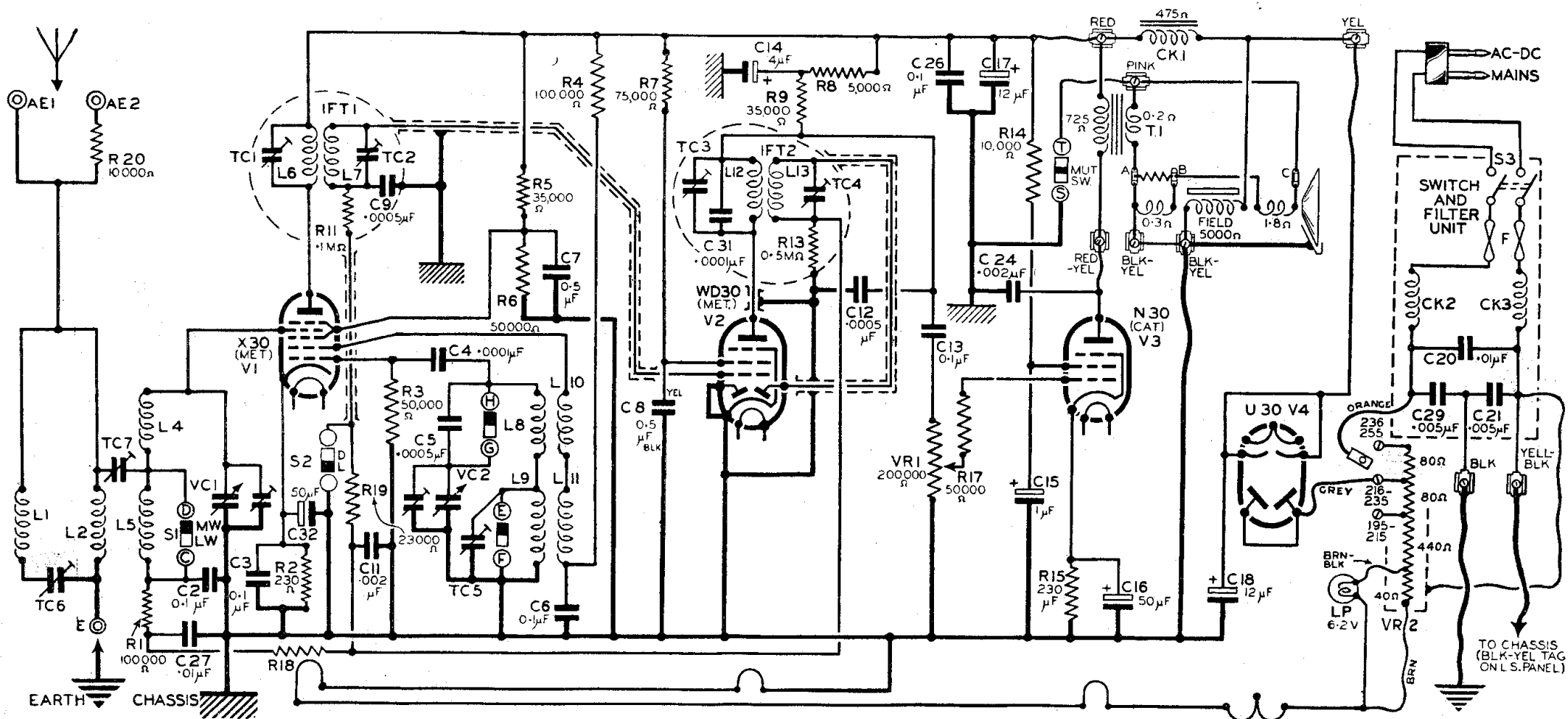


Fig. 2.

NOTE.—The value of R 18 is 0.35 megohm, not 0.23 megohm, as given in earlier issues.

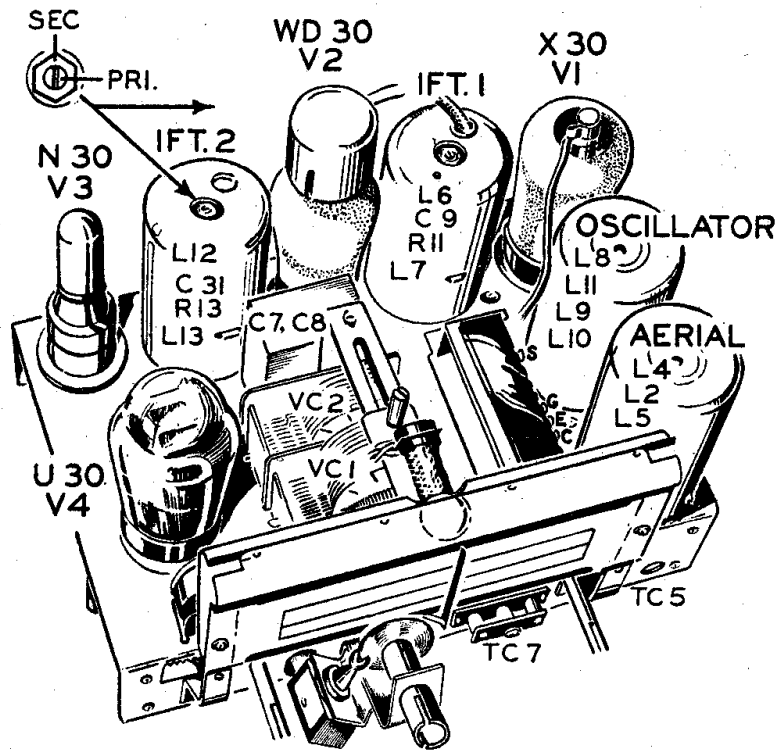


Fig. 4.

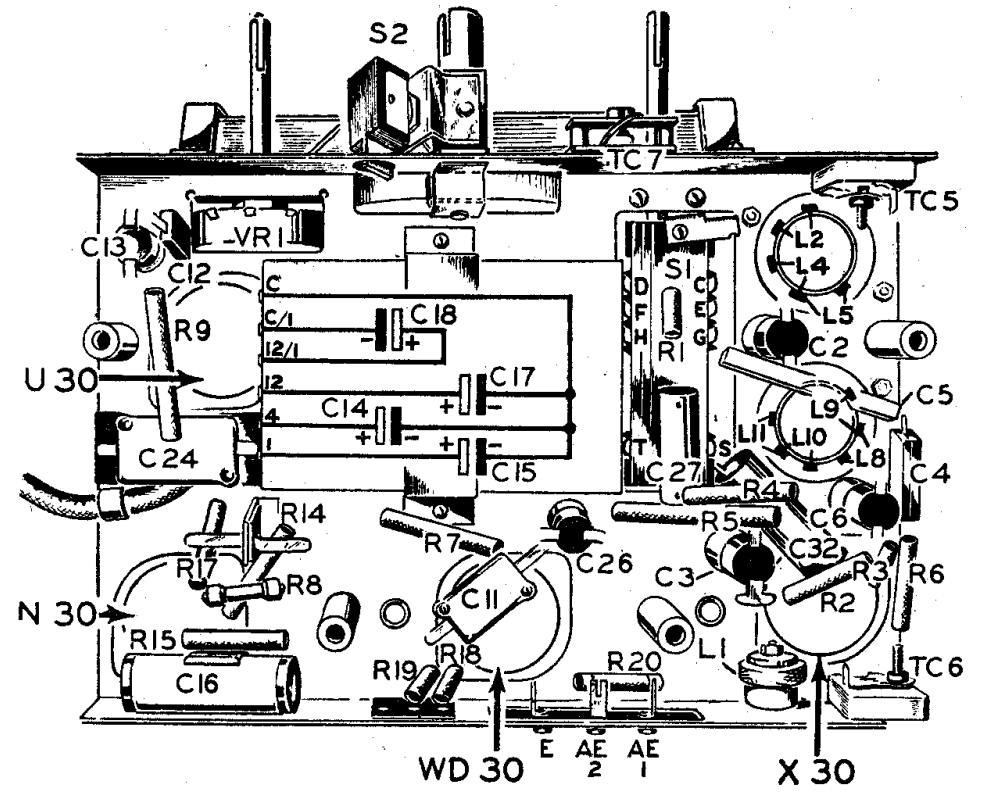


Fig. 3.

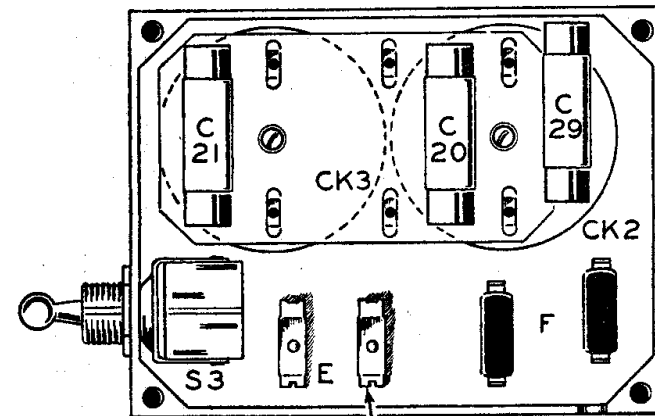


Fig. 5.

VALVE TESTS.

TOTAL H.T. FEED (including speaker field) 85 m/A. Measure at YEL. terminal on Loudspeaker Panel.

VALVES	X30 (V1)	WD30 (V2)	N30 (V3)	U30 (V4)
Test Voltages	1.0 v. (bias)	110 v.	15 v.	200 v.
Measure between	Valve metallising and chassis	Red terminal on speaker panel and anode pin of valve	Red and red-yel. terminals on speaker panel	Yel. terminal on speaker panel and chassis.
Parts which should be checked if test voltages are abnormal	L6, TC1, R2, R4, R5, R6, L10, L11, C6, C7	R7, R8, R9, L12, TC3, C8 and C14	R14, T1 primary, C15, C16, R15	VR 2, C18.
		Also see Preliminary Tests.		
Anode/chassis volts	200 v.	60 v.	180 v.	200 v. (cathode to chassis).
Feed	1.8 m/A*	4.0 m/A*	22.0 m/A	—
Oscillator anode/chassis volts ...	70 v.	—	—	—
Feed	1.3 m/A	—	—	—
Screen/chassis volts	65 v.	67 v.	145 v.	—
Feed	2.7 m/A	1.9 m/A*	4.6 m/A	—
Bias volts	1.0 v.	—	5.9 v.	—

* These values will decrease when a strong station is tuned in.

All readings taken with the sensitivity switch in the "distant" (out) position.

IMPORTANT.—Due to variations in the supply, voltages may vary considerably from the above according to whether the mains voltage is high or low. Variation in the characteristics of valves may also change the above readings ± 20 per cent.

Marconi Valves have been selected for this instrument because of their high performance and special electrical characteristics. Inferior performance or actual damage may result if valves other than the specified Marconi Valves are employed.

SERVICING DATA.

For information on H.F. Tests and Adjustments, Progressive Testing, General Faults Table, Continuity Checking, and Electrical Interference, see Service Manual for Model 223 (Part No. 21218) which has an almost identical chassis to Models 224 and 236.

REMOVAL OF CHASSIS FROM CABINET.

- (1) Disconnect set from mains.
- (2) Remove knobs. It is very important to replace the wax covering the grub screws when re-assembling knobs.
- (3) Remove mains plug, back and connections to mains voltage dropping resistance (there is no necessity to remove orange wire), and wires from terminals on filter unit and loudspeaker panel.
- (4) Unscrew knurled escutcheon on mains switch and remove mains unit which is fixed by four wood screws.
- (5) Withdraw chassis fixing bolts. Chassis can now be withdrawn. When replacing see that the chassis edges rest firmly on the shelf.

REMOVAL OF LOUDSPEAKER AND MAINS UNIT.

- (1) Remove mains unit.
- (2) The four roundhead screws holding the metal chassis should be removed to free the loudspeaker unit.

SPARE PART LIST.

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per
MODEL 224.					
Parts different from those on Model 223					
21466	Instruction Book	1	—	0 0 6	Each.
21469	Model, warning and patents label	1	—	0 0 6	Doz.
F9050C	Cabinet	1	Pol.	2 15 0	Each.
	Baffle board with silk and insert nuts for speaker	1	Std.	0 3 3	"
21467	Silk	1	—	0 0 9	"
21329	Loudspeaker fret and tuning escutcheon	1	—	0 2 0	"
21877A	Back for Cabinet, printed	1	—	0 1 9	"
19875	Escutcheon for Mains switch	1	SynBEn	0 0 6	"
21333	Window	1	—	0 0 2	"
CONTROLS.					
17051J	Knob—Volume	1	ChF.	0 0 7	"
21878A	Knob—Tune	1	"	0 0 7	"
17051H	Knob—Wave change	1	"	0 0 7	"
MAINS INPUT UNIT.					
19804C	Mains Input unit	1	—	1 3 6	"
19214D	S3 Mains switch	1	SynBEn	0 2 9	"
	Note.—19804C is identical with 19804B (used on Model 223) except for the black finish on S3				
9547	Screw securing mains input unit	4	W.N.	0 0 4	Doz.
RADIO UNIT.					
22000E	Radio Unit	1	—	5 17 6	Each.
22000B	Chassis with four securing pillars and rack support	1	CdP	0 3 0	"
21807A	Aerial and earth panel	1	—	0 0 5	"
21872B	Condenser drive spindle with rubber drive	1	—	0 0 9	"
21873A	Sleeve and disc operating L-D switch	1	CdP	0 0 6	"
2910	Pin securing sleeve to drive spindle	1	W.N.	0 0 6	"
21876A	Bracket supporting front end of drive spindle complete with bracket for L-D switch	1	CdP	0 0 3	"
19214A	S2 Local distant switch	1	—	0 1 6	"
18917B	Back and Pointer	1	CB local	0 0 9	"
21471B	Scale	1	—	0 2 6	"
21473A	Scale frame and reflector assembly	1	—	0 1 6	"
18925K	L2, L4 and L5, Aerial coil assembly with screen	1	—	0 4 3	"

SPARE PART LIST—continued.

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per
RADIO UNIT—continued.					
				£ s. d.	
	R14—17541B altered to 5787B				
	R16 and C22 are deleted and the following added :—				
19202G	R19—23,000 ohms resistance	1	—	0 0 9	Each.
19202F	R20—10,000 ohms resistance	1	—	0 0 9	"
16764A	C32—50 mfd. electrolytic condenser	1	—	0 2 2	"
	Note.—In some models 18712L, two-gang condenser is used instead of 18712F. 18712L is marked with a blue spot for identification purposes, and when it is fitted the tuning scale will be 21471A instead of 21471B				
12494	Bolt 0BA × 1-in., hex. head	4	W.N.	0 0 1	"
3460	Spring washer	4	—	0 0 3	Doz.
19802	Washer	4	CdP	0 0 6	"
21768	Washer (thin)	4	"	0 0 4	"
	} securing radio unit				
MODEL 236 CONSOLE.					
	Instructions				
21744	Instruction card	1	—	0 0 6	Each.
21743	Model, Warning and Patents label	1	—	0 0 6	Doz.
13874	Label "Use Marconi valves"	1	—	0 0 2	Each.
19864A	Voltage label (tie on)	1	—	0 0 6	Doz.
CABINET PARTS AND FITTINGS.					
—	Cabinet	1	Pol	5 7 6	Each.
—	Baffle with silk and insert nuts	1	Std	0 3 6	"
21741	Silk	1	—	0 0 9	"
14922	Insert nut	4	ParB	0 1 4	Doz.
9525	Screw No. 6 × ¾ F.H.I... ..	4	—	0 0 2	"
16020	Ornamental bolt	4	BzP	0 0 1	Each.
14761	Ornamental washer	4	BzP	0 0 7	Doz.
14120	Washer	4	WN	0 0 2	"
3167	Washer S.P.	4	—	0 0 2	"
11627	Nut	4	WN	0 0 6	"
6526	Dome for bottom	4	—	0 0 6	"
21751B	Cabinet back—upper (Printed)	1	—	0 1 3	Each.
21753A	Cabinet back—lower (Printed)	1	—	0 2 6	"
9954	Screw, securing back	8	ParB	0 0 3	Doz.
18940	Tuning escutcheon	1	—	0 0 8	Each.
8695	Screw, securing escutcheon	2	WN	0 0 2	Doz.
18939	Window	1	—	0 0 1	Each.
12106	Clip R.H.	1	BzSp	0 0 1½	"
12108	Clip L.H.	1	BzSp	0 0 1½	"
11248	Screw	2	WN	0 0 7	Doz.
	} securing window to escutcheon				
CONTROLS					
17051A	Knob—Volume	1	ChF	0 0 7	Each.
21870A	Knob—Tuning	1	ChF	0 0 7	"
17051G	Knob—Wave-change... ..	1	ChF	0 0 7	"
16564	Screw, P.K. securing knobs	3	—	0 0 7	Doz.
MAINS INPUT UNIT					
19804B	Mains input unit (for spares see Model 223 S.P.L.)	1	—	1 3 6	Each.
9526	Screw	4	WN	0 0 3	Doz.
6461	Washer... ..	2	WN	0 0 1	"
19875	Escutcheon for Mains On/Off switch	1	BzSp	0 0 6	Each.
	} securing mains input unit				
LOUDSPEAKER					
19800C	Loudspeaker (For spares see Model 223 S.P.L.)	1	—	1 13 0	"
11213	Screw	4	WN	0 0 2	Doz.
1021	Washer... ..	4	WN	0 0 3	"
3167	Washer S.P.	4	—	0 0 2	"
	} securing loudspeaker				

SPARE PART LIST—continued.

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per
RADIO UNIT.					
Parts different from those on Model 223					
22000F	Radio Unit	1	—	5 17 6	Each.
22000B	Chassis with four securing pillars and rack support	1	CdP	0 3 0	"
21807A	Aerial and earth panel	1	—	0 0 5	"
21872B	Condenser drive spindle with rubber drive	1	—	0 0 9	"
21873A	Sleeve and disc operating L-D switch	1	CdP	0 0 6	"
2910	Pin, securing sleeve to drive spindle	1	WN	0 0 6	"
21876A	Bracket, supporting front end of drive spindle complete with bracket for L-D switch	1	CdP	0 0 3	"
19214A	S.2 Local distant switch	1	—	0 1 6	"
18917A	Rack and Pointer	1	BMEn	0 0 9	"
21471A	Scale	1	—	0 2 6	"
19808A	Scale frame and reflector assembly	1	—	0 2 0	"
R14-17541B altered to 5787B					
R16 and C22 are deleted and the following added :—					
19202G	R19-23,000 ohms resistance	1	—	0 0 9	"
19202F	R20-10,000 ohms resistance	1	—	0 0 9	"
16764A	C32-50 mfd. electrolytic condenser	1	—	0 2 2	"
18712L	VC1 and VC2 two-gang condenser (blue spot)	1	—	0 8 6	"
12494	Bolt, 0BA × 1-in., hex. head	4	WN	0 0 1	" Doz.
3460	Spring washer				
19802	Washer				
21768	Washer (thin)				
LEADS, PLUGS, ETC.					
19867B	Mains socket	1	—	0 2 6	Each.
19874B	Mains lead	1	—	0 2 0	"
8227A	Mains plug	1	—	0 1 7	"
16289V	Aerial plug, yellow	1	—	0 0 2	"
16289B	Earth plug, black	1	—	0 0 2	"
18888A	Carton for mains lead	1	—	0 0 1	"

" FINISH " CODE.

BM En	Black Matt Enamel	ParB	Parkerised Black
BzP	Bronze Polish	Pol	Polished
BzSp	Bronze Spray	Std	Standard
CdP	Cadmium Plate	SynBEn	Synthetic Black Enamel
ChF	Chrome filled	WN	White Nickel

In order to expedite delivery of spare part orders, please quote :—

1. Model number and serial number.
2. Spare part number and description as given in the above list.
3. Quantity required.

Unless full particulars are quoted, delay in the execution of orders must inevitably result.

Order spare parts from :—

E.M.I. SERVICE, LTD.,

SHERATON WORKS,

HAYES, MIDDLESEX.

Telephone : Southall 2468.

Telegraphic Address : Service, Hayes, Middlesex.

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