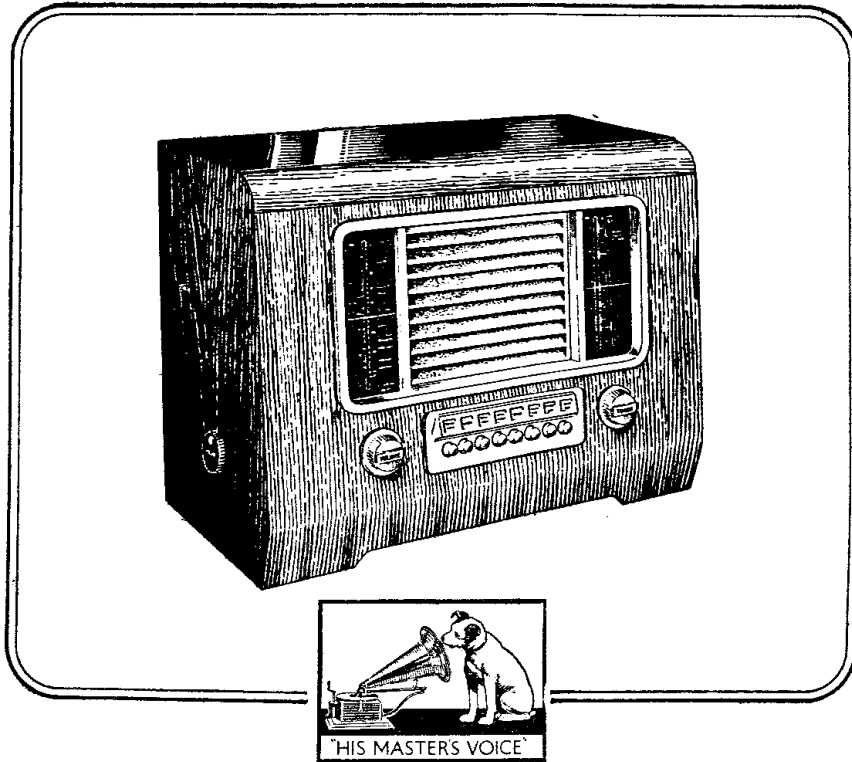


“His Master’s Voice”



SERVICE MANUAL

Model 1407

4-valve Press-button Superhet Table Model
for Battery Operation

CONTENTS

	Page		Page
Circuit	7	H.F. Tests and Adjustments	3
Circuit Description	2	Installing	3
Component Diagrams	6	Spare Parts List	8
Condenser and Pointer Drive	5	Specification	2
Dismantling	3	Valve Table	5

Copyright and reproduction of diagrams strictly reserved

H.T. BATTERY

The Marconiphone H.T. Battery B600 may be used as an alternative to the B498 recommended.

MODEL 1407

SPECIFICATION

Physical.

Height	14½ inches.
Width	19½ inches.
Depth	10½ inches.
Weight complete	41 lb.
Weight less batteries	27½ lb.

Supply and Consumption.

H.T. Battery Marconi Type B498, 120 v.
L.T. Accumulator Type GFG4, 2 v.

Battery Economy Control.

A battery economy control is fitted in this receiver. For normal reception this control is in the "On" position, but if maximum volume is required, the control should be turned to the "Off" position.

Consumption.

H.T. 11.5 mA Economy Control "Off".
5 mA Economy Control "On".
L.T. 0.6 amps.

Wave Ranges

Manual

S.W. 16.3—51.7 metres (18.4—5.8 Mc/s.)
M.W. 192—575 metres (1,563—522 kc/s.)
L.W. 850—2,000 metres (353—150 kc/s.)

Press Buttons

1 & 2 1,250—2,000 metres (240—150 kc/s.)
3 & 4 325—550 metres (923—545 kc/s.)
5 200—345 metres (1,500—870 kc/s.)

NOTE.—When the models leave the factory, press buttons are tuned as follows:—1. Radio Paris (1,648 m.); 2. National (1,500 m.); 3. North Regional (449 m.); 4. London Regional (342 m.); 5. Nationals (261 m.). A sheet containing names of other stations is supplied to enable the owner to change the names in the panel above the press buttons if settings are altered.

Intermediate Frequency. 465 kc/s.

Rated Output. 160 mW maximum.

Valves.

Marconi.

X24M	(V1)	Frequency Changer.
Z21M	(V2)	I.F. amplifier.
HD24M	(V3)	Detector, A.V.C. and L.F. Amplifier.
KT2	(V4)	Output.

Loudspeaker.

The loudspeaker is a permanent magnet moving coil loudspeaker. D.C. resistance of speech coil, 3.5 ohms. Impedance at 1,000 cycles, 5 ohms.

An additional low resistance loudspeaker which has an impedance as near as possible to 5 ohms may be connected to the sockets provided. A loudspeaker switch is provided at the back of the receiver.

CIRCUIT DESCRIPTION

Aerial Circuit.

High impedance inductive coupling is employed on all bands to high efficiency tuned circuits. The medium and long wave coils are iron cored (L4, L5) and image suppression on L.W. is provided by C4. The press button circuits employ the same M.W. and L.W. inductances (L4, L5) as for manual tuning but pre-set condensers (TC1—3, 5, 6) are switched across them instead of the variable condenser VC1. The pre-set button circuits are isolated by means of switches S8 and S9 in manual tuning.

Frequency Changer.

A triode-hexode (X24M) is used. Inductive and capacitive coupled circuits (L6, L7 and L8, L9) on M.W. and S.W. produce oscillations whilst on L.W. capacity coupling (C18) is used. The intermediate frequency is 465 kc/s. For the press button ranges a fixed capacity (C28) has pre-set inductances (L11—L15) switched in a capacity (C18) coupled circuit.

I.F. Amplifier.

The first iron cored I.F. transformer (IFT1), in the anode

circuit of V1, couples V1 to the Z21M I.F. amplifier (V2). This valve has a second I.F. transformer (IFT2) coupling it to the signal diode.

Detector, A.V.C. and L.F. Amplifier.

A tuned secondary feeds the signal diode of V3 (HD24M), the volume control VR1 forming the diode load. I.F. and R.F. filtering is effected by C5 and R7. The A.V.C. diode is fed through C6, the A.V.C. voltage being taken across either whole or part of the diode load (R10, R11, R12). The voltage is fed to the grids of V1 and V2, as A.V.C. bias.

Output Stage.

Resistance-capacity (R14, C10) coupling is employed between the HD24M and the KT2 output valve. The latter has a tone control circuit C15, C23, VR2 in its anode circuit and feeds the loudspeaker via the output transformer, T1. The bias voltage for the output stage is taken from the voltage developed across the resistance R9 and is decoupled by C17.

INSTALLING

The Aerial and Earth.

This receiver is equipped with a built-in plate aerial. In good circumstances, *i.e.*, not in areas of strong electrical interference, or in a steel frame or heavily screened building, no external aerial will be needed to obtain reception from a selection of stations on all three wavebands. In difficult reception circumstances and wherever it is desired to get the maximum sensitivity from the receiver, erect a high outside aerial, 60 to 80 feet total length, as far as possible away from walls, trees, gutters,

etc. Point the aerial towards any potential source of interference, such as overhead trolley, or power lines, or any roadway carrying heavy motor traffic. An adequate lightning switch should be fitted. *It is essential that an efficient earth is provided.* A copper plate or rod buried about 3 feet deep in moist ground provides a good earth, or alternatively, connection can be made to a rising water main. Never use a gas pipe, a telephone cable, or a hot water pipe as an earth.

DISMANTLING

Minor replacements and adjustments may be carried out by removing the back and the service hatch from underneath the cabinet. For ganging and major replacements the chassis must be removed.

Removal of Chassis.

1. Remove the aerial and earth plugs, the economy control knob and the external loudspeaker switch knob.
2. Remove the back panel (two screws) and disconnect and remove batteries. Disconnect plate aerial lead.

3. Remove two front knobs (screw fixing) and pull off tone control knob at side of cabinet (spring fixing).
4. Unscrew the two cursors from the condenser drive wire.
5. Remove the four chassis fixing screws from the underside of the cabinet.
6. Withdraw the chassis.

NOTE.—The loudspeaker is fitted to the cabinet, but sufficient lead is provided to allow the chassis to be serviced outside the cabinet.

H.F. ADJUSTMENTS

General.

If I.F. circuits have been disturbed complete I.F. and R.F. alignment must follow. Whilst ganging, the input to the receiver from the test oscillator must be progressively reduced as the circuits are brought into line so that the output does not exceed 50 mW. An A.C. voltmeter connected across the loudspeaker speech coil may be used as an output meter. (A reading of 0.5 v. being equivalent to an output of 50 mW.)

I.F. Ganging.

Press S.W. button, set volume control fully clockwise and tone control fully anti-clockwise and gang condenser at minimum capacity (plates fully disengaged).

1. Inject a modulated signal at 465 kc/s. via a 0.05 mfd. condenser, into grid of V2 and chassis (leaving grid connection made).
2. Shunt L18 with a 33,000 ohms resistor and adjust L19 for maximum output.
3. Shunt L19 as above and adjust L18 for maximum output.
4. Inject a modulated signal at 465 kc/s, via a 0.05 mfd. condenser, into grid of V1 and chassis (leaving grid connection made).
5. Shunt L16 as above and adjust L17 for maximum output.
6. Shunt L17 as above and adjust L16 for maximum output.

NOTE.—L18 and L19 must not be adjusted when oscillator is connected to grid of V1.

Press-button Ganging.

Set volume control fully clockwise and tone control fully anti-clockwise, connect test oscillator to aerial and earth sockets.

1. Depress button No. 1 and set oscillator to desired wavelength.
2. Adjust L15 and TC6 in that order for maximum output.
3. Check adjustment in the same order.
4. Continue in the same manner with the remaining buttons, adjust L14 and TC5 for button No. 2 ; L13 and TC3 for button No. 3 ; L12 and TC2 for button No. 4 ; L11 and TC1 for button No. 5.

The setting of each button should now be checked on the broadcast signal of the stations selected.

Setting Up Calibration Scale.

As the wavescale is assembled to the cabinet, a calibration scale is fitted to the front of the chassis and is to be used for R.F. ganging purposes. This scale is calibrated in inches and sixteenths of an inch which correspond to frequencies as given in the ganging operation and are read against the *trailing edge* of the red tab fitted to the drive wire. Before commencing R.F. ganging operations it is essential to check the position of the calibration scale and the red tab in relation to the gang condenser.

1. Turn gang condenser to maximum capacity.
2. See that the *trailing edge* of the red tab coincides with $5\frac{1}{2}$ inches on the calibration scale.
3. If adjustment is necessary slacken the two screws securing the scale and adjust, then tighten securely the two screws.

R.F. Ganging—Medium Waves.

Set volume control fully clockwise, and tone control fully anti-clockwise. Connect oscillator leads to the aerial socket (via a M.W. dummy aerial) and chassis. Press M.W. button.

Op. No.	Calibration scale setting.	Tune test oscillator to		Operation.
		m.	kc/s.	
1	Set to $\frac{25}{32}$ "	210	1,429	Adjust TC8 for maximum output.
2	Set to $\frac{35}{32}$ "	210	1,429	Adjust TC7 for maximum output.
3	Set to $4\frac{1}{2}$ "	510	588	Adjust core L9 for maximum output.
4	Set to $4\frac{1}{2}$ "	510	588	Adjust core L4 for maximum output.
5	—	—	—	Repeat operations 1, 2, 3 and 4.

Long Waves.

Controls as before and press L.W. button. Use same dummy aerial.

Op. No.	Calibration scale setting.	Tune test oscillator to		Operation.
		m.	kc/s.	
1	Set to $1\frac{1}{8}$ "	1,000	300	Adjust TC9 for maximum output.
2	Set to $1\frac{1}{8}$ "	1,000	300	Adjust TC4 for maximum output.
3	Set to $4\frac{13}{32}$ "	1,850	162	Adjust core L10 for maximum output.
4	Set to $4\frac{13}{32}$ "	1,850	162	Adjust core L5 for maximum output.
5	—	—	—	Repeat operations 1, 2, 3 and 4.

Short Waves.

Controls as before and press S.W. button. Use S.W. dummy aerial.

Op. No.	Calibration scale setting.	Tune test oscillator to		Operation.
		m.	Mc/s.	
1	Set to $5\frac{1}{8}$ "	50	6	Adjust L7 loop for maximum output.
2	Set to $5\frac{1}{8}$ "	50	6	Adjust L2 loop for maximum output.

CALIBRATION

Replace the chassis in the cabinet and assemble both cursors to the drive wire. With gang condenser at maximum, set pointers so that they line up with the top mark on the wavescale. Check calibration at about the middle of the tuning scale on stations of known wave-

length and adjust pointers if necessary. On medium and long waves it may be found necessary to adjust the pointer to get the best possible compromise on both wavebands.

CONDENSER AND POINTER DRIVE

Use only the correct wire when renewing this drive. Supplies of this wire should be obtained from E.M.I. Sales and Service Ltd., Spare Parts Division, Sheraton Works, Hayes, Middlesex. Approximately 88 inches of wire is required.

1. Form a loop with an opening about $\frac{1}{8}$ inch in diameter at one end of the wire. It will be found that the twisted part of the wire can be readily soldered.

2. Pass loop through hole in periphery of drum and assemble on anchor pin as shown in diagram. Arrows show direction.

3. Wind wire three quarters of a turn round drum and take straight across under pulley "A" and partly round pulley "B".

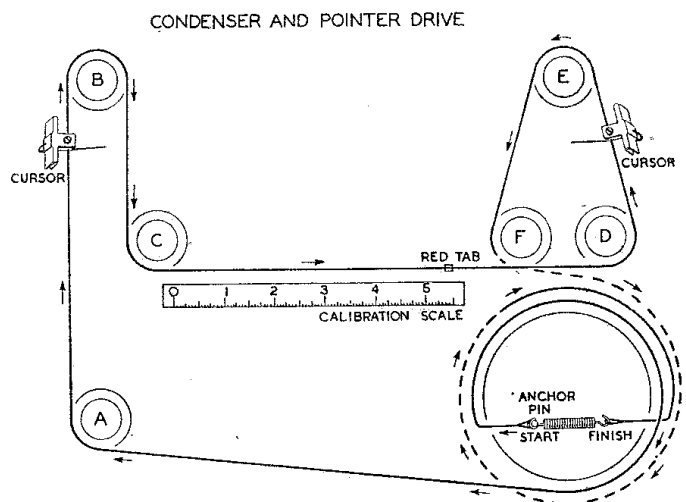
4. Take wire down and under pulley "C" and straight across to pulley "D".

5. Take wire under pulley "D", over pulley "E" and under pulley "F".

6. Take wire a complete turn round drum and in through hole in periphery.

7. Assemble the tension spring as shown, twist wire and solder.

8. Replace chassis in cabinet, and assemble cursors to wire. Check setting of pointers as given in Calibration above.



VALVE TABLE

The following table indicates the approximate voltage and current readings obtained on each valve when the receiver is operating at maximum output. Variations of ± 15 per cent. may be anticipated between models. A high resistance voltmeter should be used to measure voltages.

Values stated below were obtained using a meter with a resistance of 500 ohms per volt.

Valves.	Anode.		Screen.		Cathode.	
	Volts to Chassis.	Current mA.	Volts to Chassis.	Current mA.	Volts to Chassis.	Current mA.
V1 (X24M)	Mx. 115 Osc. 85	Mx. 0.95 Osc. 2.4	60	1.05	—	4.4
V2 (Z21M)	115	1.1	60	0.28	—	1.38
V3 (HD24M)	33	0.4	—	—	—	0.4
V4 (KT2)	110	4.0	115	1.0	—	5.0

Total H.T. voltage, 115 volts.
Total H.T. current, 11.5 mA.

Voltage across R9, 4.15 volts.
Heater current, 0.6 amps.

SPARE PARTS LIST

Ref.	Description.	Part No.	Ref.	Description.	Part No.
INDUCTANCES.					
L1	S.W. aerial coils	27388V	TC1	10—135 mmfd.	26350BP
L2					
L3					
L4	M.W. aerial coils	27389AR	TC2	125—450 mmfd.	26350BN
L5					
L20	L.W. aerial coils	27389F	TC3		
L6					
L7	S.W. oscillator coils	27388W	TC5	125—450 mmfd.	26350BN
L8					
L9			M.W. oscillator coils	27389D	TC6
L10					
L11	L.W. oscillator coil	27389G	TC7	10—135 mmfd.	26350BW
L12	M.W. oscillator coil, P.B.	27389M	TC8		
L13	M.W. oscillator coil, P.B.	27389N	TC9		
L14	M.W. oscillator coil, P.B.	27389N	RESISTANCES.		
L15	L.W. oscillator coil, P.B.	27389C	R1	10,000 ohms, $\frac{1}{4}$ w.	33362DU
L16	L.W. oscillator coil, P.B.	27389C	R2	0.47 megohms, $\frac{1}{4}$ w.	33360EE
L17	IFT1 primary coil	See IFT1	R3	0.1 megohms, $\frac{1}{4}$ w.	33362EA
L18	IFT1 secondary coil				
L19	IFT2 primary coil	See IFT2	R4	10,000 ohms, $\frac{1}{4}$ w.	33360DU
L21	IFT2 secondary coil				
L21	Plate aerial choke	35976C	R5	47,000 ohms, $\frac{1}{4}$ w.	33362DY
CONDENSERS.					
C1	50 mmfd.	22164J	R6	68,000 ohms, $\frac{1}{4}$ w.	33362DZ
C2	0.047 mfd.	36700F	R7	0.22 megohms, $\frac{1}{4}$ w.	33362EC
C3	0.047 mfd.	36700F	R8	0.15 megohms, $\frac{1}{4}$ w.	33362EB
C4	500 mmfd.	22001E	R9	360 ohms $\pm 5\%$, $\frac{1}{2}$ w.	33368RU
C5	100 mmfd.	22001B	R10	0.22 megohms, $\frac{1}{4}$ w.	33362EC
C6	100 mmfd.	22001B	R11	1 megohm, $\frac{1}{4}$ w.	33362EG
C7	230 mmfd.	22001AD	R12	0.22 megohms, $\frac{1}{4}$ w.	33362EC
C8	50 mmfd.	117903CB	R13	1 megohm, $\frac{1}{4}$ w.	33362EG
C9	0.047 mfd.	36700F	R14	0.33 megohms, $\frac{1}{4}$ w.	33362ED
C10	0.047 mfd.	36700F	R16	10,000 ohms, $\frac{1}{4}$ w.	33362DU
C11	50 mmfd.	22164J	R17	0.22 megohms, $\frac{1}{4}$ w.	33362EC
C12	0.005 mfd.	117906CK	R18	2.2 megohms, $\frac{1}{4}$ w.	33362EJ
C13	0.047 mfd.	36700F	VR1	0.5 megohms, Volume Control	27655KH
C14	8 mfd.	17250K	VR2	0.2 megohms, Tone Control	27655KG
C15	0.001 mfd.	22001F	VALVES.		
C16	500 mmfd. $\pm 2\%$	117904AF	V1	Marconi X24M	
C17	50 mfd.	17250F	V2	" Z21M	
C18	350 mmfd. $\pm 2\%$	117904AE	V3	" HD24M	
C19	100 mmfd. $\pm 2\%$	See IFT1	V4	" KT2	
C20	100 mmfd. $\pm 2\%$				
C21	100 mmfd. $\pm 2\%$	See IFT2	TRANSFORMERS AND CHOKES.		
C22	100 mmfd. $\pm 2\%$				
C23	0.01 mfd.	36355D	IFT1	1st I.F. transformer	31023AB
C24	0.047 mfd.	36700F	IFT2	2nd I.F. transformer	30123AB
C25	5 mmfd. ± 1 mmfd.	117901AA	T1	Output transformer	22624AK
C26	100 mmfd.	22164L	MISCELLANEOUS.		
C28	230 mmfd. $\pm 2\%$	117904AK	S1	On-Off switch	35450A
VC1	Gang condenser	18712V	S2	Economy switch	31570D
VC2					
			S3	External Loudspeaker Switch	35419B
				Push-button switch	27387A
				Push-button assembly	27390X
			LS	Loudspeaker	27410M
				H.T. Battery	Type B498
				Accumulator	Type GFG4
				Cabinet	36095D

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 above.
3. Quantity required.

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

Order spare parts from :—E.M.I. SALES AND SERVICE LTD., SPARE PARTS DIVISION,
SHERATON WORKS, HAYES, MIDDLESEX.

Telephone : Southall 2468.

Telegraphic Address : Emiservice, Hayes, Middlesex.