



“His Master’s Voice”

SERVICE DATA SHEET

TRANSISTOR PORTABLE MODEL 1420

“His Master’s Voice” products are made to a standard of design and quality approved by The Gramophone Co. Ltd., registered proprietor of the trade mark

SPECIFICATION

Batteries

This receiver requires two similar 6 volt batteries, any of the following types being suitable:—

Ever Ready	.....	.....	PP1
Drydex	.....	.....	DT1
GEC	.....	.....	BB21
Vidor	.....	.....	T6001

Waveranges

Medium	.....	182—	552 Metres
Long	.....	1,090—	1,940 Metres

Loudspeaker.

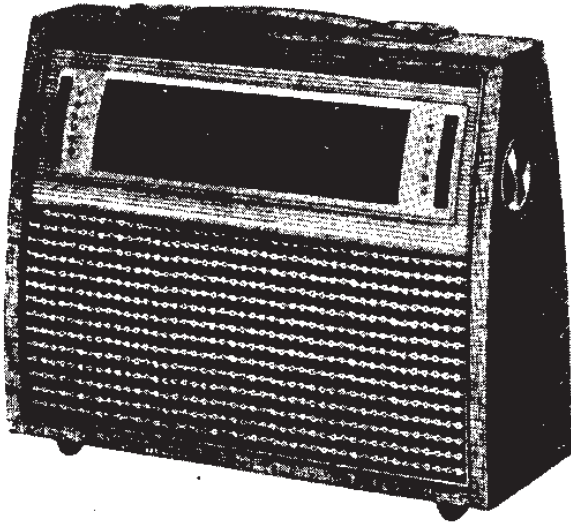
PM, 7 in. x 4 in. elliptical 35Ω speech coil.

Case Dimensions

11¼ in. wide x 9 in. high x 4½ in. deep.

Power Output 400 mW

Battery Consumption. 20mA for average output.



SERVICE NOTES

This receiver employs germanium alloy junction (P-N-P) type transistors. This type of transistor has been used for a number of years in various applications and has proved to be a thoroughly reliable component. When the receiver requires servicing, therefore, the source of the fault is not likely to be due to transistor failure and attention should first be directed to other parts of the circuit.

Fault finding may be carried out in the usual way, but the following points should be particularly noted:—

1. Make full use of the voltage measurements given in the circuit diagram. Although the receiver will still operate when the total battery voltage falls to about 8 volts, new batteries should be used for checking purposes. Distortion will be apparent if the voltages of the two batteries differ appreciably.

2. Apart from total current consumption, no other current measurements should be attempted. Under ‘no signal’ conditions, the total current consumption will be approximately 12 mA. Consumption rises immediately a signal is applied, to approximately 20 mA for average listening volume.

3. When a signal generator is used for circuit checking, use the direct output, and inject via a 0.1μF capacitor.

4. To check oscillator operation, measure the voltages at the emitter and base of VT 1. These should be approximately as given on the circuit diagram, with the emitter voltage slightly more negative than the base. Failure to oscillate is indicated when this relationship is reversed and the base voltage is more negative than the emitter.

5. Transistors should not be replaced unless voltage checks, etc., indicate that replacement is necessary. Use only a Service Replacement (obtainable from our Service Depots) to ensure that the performance of the receiver is not impaired. The power output transistors are a matched pair. If one becomes faulty both must be replaced by a new matched pair.

6. Extreme care should be taken when unsoldering or soldering transistors as they can be easily damaged by excessive heat. The lead wires of a replacement transistor must not be shorter than the one removed. Do not apply the iron for longer than necessary, and grip the wires with a pair of pliers, to reduce heat conduction to the transistor.

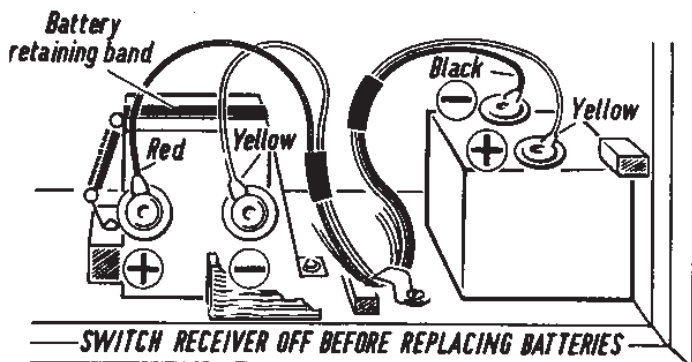


Fig. 1. Battery replacement. Care should be taken to ensure correct insertion of the batteries.

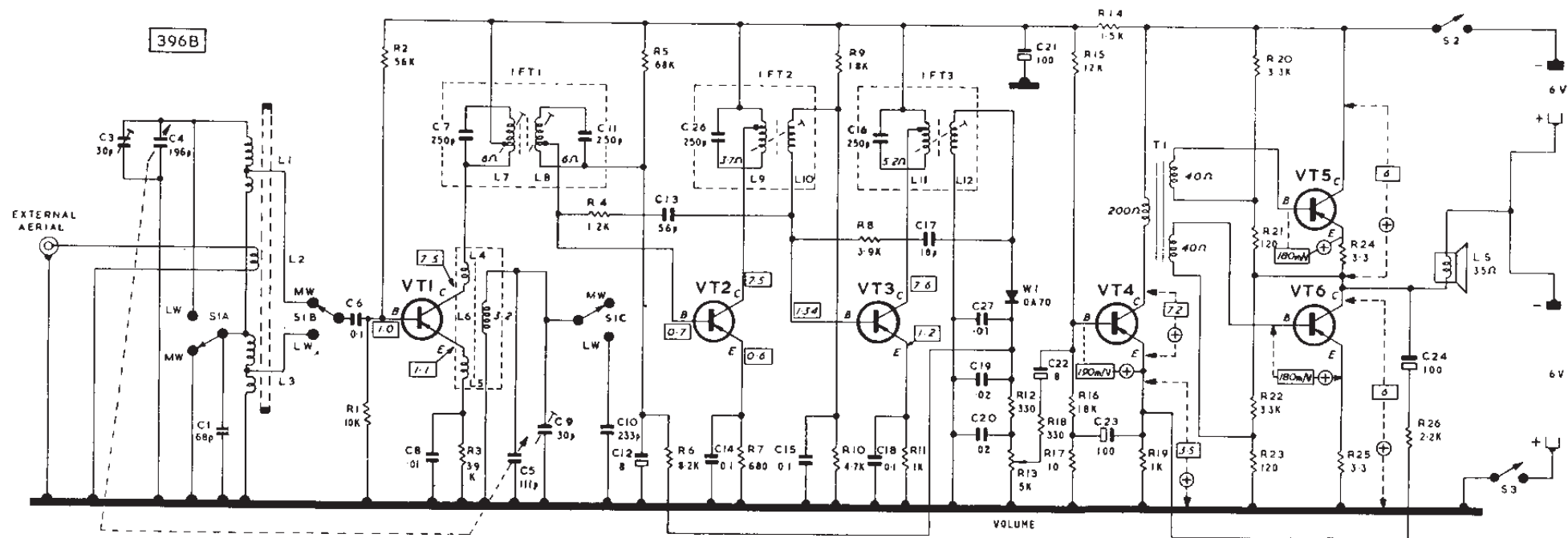


Fig. 2. Model 1420 circuit diagram. Figures in rectangles indicate voltages measured with 20,000 ohm/Volt meter. DC resistance readings are shown against inductances where these are 1 ohm or greater.

CIRCUIT DESCRIPTION

With the receiver switched to MW, L3 is short circuited by S1A and the medium wave winding, L1 on the ferrite-rod aerial is tuned by C3 and C4. L2 provides coupling for an external aerial. L1 and L3 are series connected with shunt capacitor C1 to tune the long waverange.

The signal from L1 or L3 is injected into VT1 base circuit via S1B and parallel feed capacitor C6. VT1 (OC44) functions as a self oscillating mixer, with feedback from collector to emitter circuit provided by L4 and L5. The tertiary winding is tuned by C5 and C9 on medium waves and on long waves these are shunted by C10. R3 provides emitter stabilising and R1 and R2 base bias. C5, the oscillator section of the tuning gang, has shaped vanes to ensure tracking throughout the medium waveband.

The 470 kc/s signal developed across the windings of the double tuned IF transformer IFT1 is then fed to the 1st IF amplifier VT2

(OC45). This amplifier operates with base bias provided by R5, in conjunction with R6 R12 and R13, and emitter stabilising by R7. A single tuned IF transformer IFT2 in VT2 collector circuit couples the signal to the 2nd IF amplified VT3 (OC45). IFT3, also a single tuned IF transformer, provides the coupling to the crystal diode detector W1 (OA70).

Both IF stages require neutralizing to offset internal feedback within the transistors. VT2 neutralizing is effected by R4 and C13, and VT3 neutralizing by R8 and C17. The necessary phase reversal is obtained by including the IF transformers within the feedback loop.

The DC component of the rectified signal developed across R12 and R13 is applied as a positive AGC bias to the base circuit of VT2. This control voltage reduces the negative standing bias at VT2 base due to R6. R11 provides emitter stabilising for VT3.

No AGC is applied to the 2nd IF stage, the base bias being fixed by the potential divider R9 and R10.

The audio amplifier comprises a driver

stage VT4 (OC81D) feeding a push-pull output stage VT5 and VT6 (both type OC81). The audio voltage developed across the volume control R13, is then applied to VT4 base through R18 and C22. R15, R16 and R17 stabilise the DC operating conditions of the stage. The phase splitting transformer T1 applies push-pull signals to the bases of VT5 and VT6.

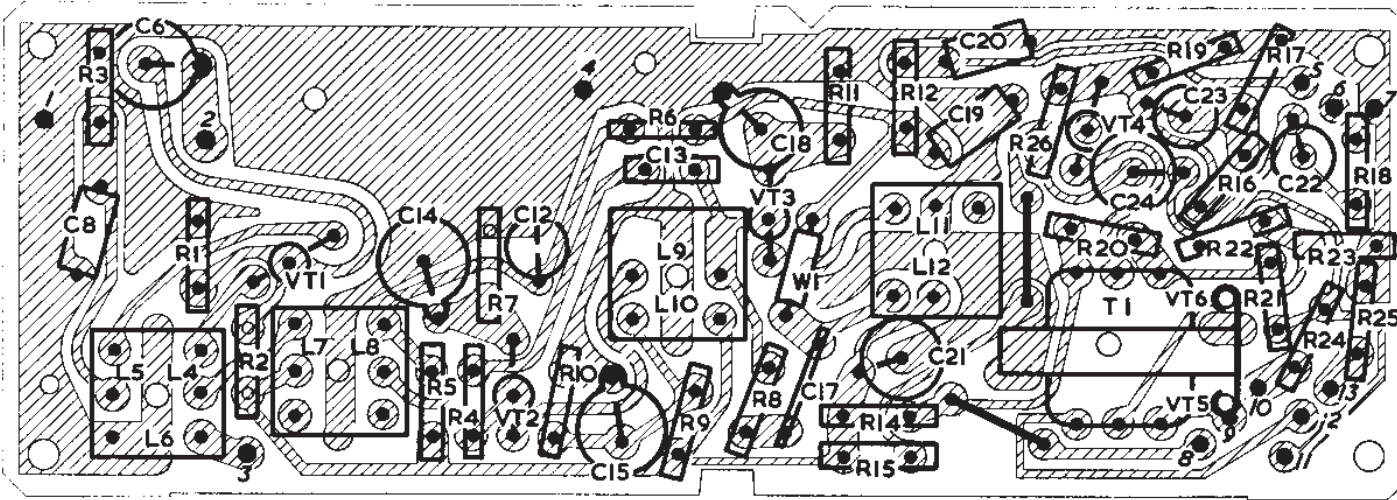
The output transistors are biased to class B conditions, a small standing current being permitted, however, to minimise cross-over distortion. When the signal is applied, the transistors conduct alternately and a current flows through the loudspeaker speech coil via one or other of the output transistors. The speech coil has an impedance of 35 ohms and a matching transformer is not required. The resistor chain R20, R21, R22 and R23 determine the DC operating conditions and R24 and R25 provide emitter stabilising.

Negative feedback is applied to the emitter of the driver transistor from the loudspeaker speech coil via C24 and R26.

CIRCUIT ALIGNMENT

A signal from a suitable generator, modulated 30% by an AF signal, is required for circuit alignment. Tuning indication is best obtained either with an output meter having an impedance of $30\ \Omega$ and connected across the loudspeaker terminals with the loudspeaker disconnected, or with an AC voltmeter connected across the loudspeaker.

Throughout alignment, the signal input level to the receiver must be adjusted to prevent the audio output from exceeding 5mW (0.4 Volts AC), with the volume control set at maximum, in order to avoid alignment error due to AGC action.



1. To Ferrite Rod Aerial (earthy end) and Tuning Gang.
2. To switch wiper of S1B.
3. To switch wiper S1C and Tuning gang.
5. To Volume Control R13.
6. To Volume Control R13 slider.
7. To Volume Control R13 and On/Off switch S3.
8. To On/Off switch S2 and Collector VT5.
9. To Base of VT5.
10. To Emitter VT5.
11. To Collector VT6 and Loudspeaker.
12. To Base VT6.
13. To Emitter VT6.

Note: C27 is mounted beneath the printed board.

IF Circuits

Switch receiver to MW and turn gang to minimum capacitance position. Apply a 470 Kc/s modulated signal through a 0.1 μ F capacitor across the aerial section of the tuning gang. Adjust L11/L12, L9/L10, L8 and L7 in that order, for maximum output. Repeat in the same order, until no further improvement is obtained.

RF Circuits

MW must be aligned first. Signals to be injected via a loop loosely coupled to the ferrite rod aerial.

Calibration points are clearly marked on the scale, corresponding to the frequencies given in the table below.

	Range	Cursor Position	Adjust
MW	1300 Kc/s 600 Kc/s	MW Trim	C9, C3
		MW Pad	L6, L1*
LW	215 Kc/s	LW Trim	L3*

*Adjust by sliding coil along the aerial rod.

Fig. 3 (above). The printed board viewed from the components side.

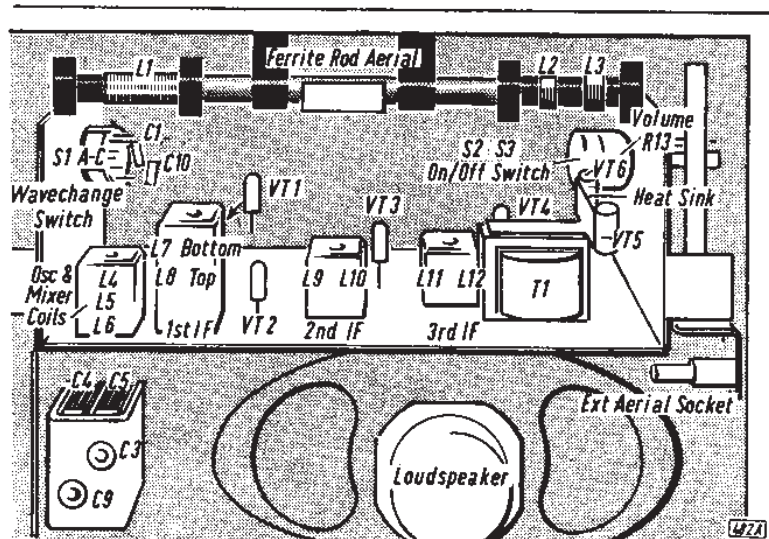


Fig. 4 (left). View of receiver chassis showing components not mounted on the printed board and, in addition, the locations of trimmers and coil adjustments used in alignment. VT5 and VT6 are mounted in a spring clip which functions as a heat sink. The transistors are also coated with silicone grease to ensure effective heat transfer.

CHASSIS REMOVAL

1. Remove the back cover, held by a single brass screw.
2. Pull off the wavechange knob.
3. Withdraw the two screws, one at each side of the chassis, and the chassis and printed board may then be removed.
4. Because of the shortness of interconnecting wires, it is advisable to remove the ferrite rod aerial also. This is held in place by two Phillips head screws.

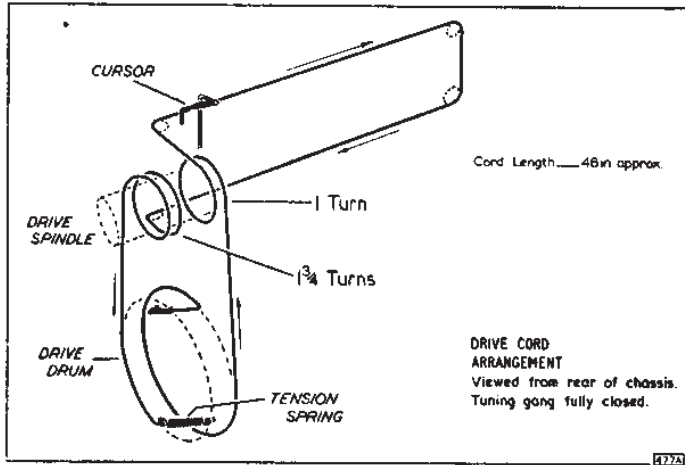


Fig. 5. Drive Cord Assembly.

RESISTORS

All carbon types, $\frac{1}{4}$ Watt unless otherwise stated

Ref.	Value	Tolerance	Function
R 1	10K Ω	10%	} VT1 base bias pot.
R 2	56K Ω	10%	
R 3	3.9K Ω	10%	} VT1 emitter stabilising
R 4	1.2K Ω	10%	
R 5	68K Ω	10%	} Part VT2 neutralising
R 6	8.2K Ω	10%	
R 7	680 Ω	10%	} AGC decoupling
R 8	3.9K Ω	10%	
R 9	18K Ω	10%	} Part VT3 neutralising
R 10	4.7K Ω	10%	
R 11	1K Ω	10%	} VT3 base bias pot.
R 12	330 Ω	10%	
R 13	5K Ω	Log pot. *	} VT3 emitter stabilising
R 14	1.5K Ω	10%	
R 15	12K Ω	10%	} DC dropper and decoupling
R 16	18K Ω	10%	
R 17	10 Ω	10%	} VT4 base bias pot.
R 18	330 Ω	10%	
R 19	1K Ω	10%	} Neg. feedback injection
R 20	3.3K Ω	5%	
R 21	120 Ω	5%	} VT4 audio coupling
R 22	3.3K Ω	5%	
R 23	120 Ω	5%	} VT4 emitter stabilising
R 24	3.3 Ω	$\pm 1\%$ †	
R 25	3.3 Ω	$\pm 1\%$ †	} VT5 base bias
R 26	2.2K Ω	10%	

* Part No. Z13163/1

† Part No. 33XHC02

SPARE PART LIST

Description	Part No.
Aerial socket	Z16540
Battery lead assembly	N18437
Cabinet	V32984† or V32984/1*
Control knobs :	
Tuning	Y32975† or Y32975/1*
Volume on/off	Y33233† or Y33233/1*
Wavechange	Y10207/3† or Y10207/4*
Clip for wavechange knob	37309
Clip for volume on/off knob	37302
Drive drum	Y32974
Clip for drive drum	37309
Scale	W32992
Transistor Clip (heat sink)	Z18433

* Black and white colour scheme

† Red colour scheme.

INDUCTORS AND TRANSFORMERS

Ref.	Function	Part No.
L 1	} MW aerial tuning External aerial coupling	} Ferrite rod aerial Y33414
L 2		
L 3		
L 4	} LW aerial tuning	
L 5		
L 6	} Oscillator coils	Y18409
L 7		
L 8	} IFT 1	Y29916
L 9		
L 10	} IFT 2	Y29917
L 11		
L 12	} IFT 3	Y29918
T 1		
T 1	Audio driver transformer	Z18413/1

MISCELLANEOUS

Ref.	Description and Function	Part No.
S1 A-C	Wavechange switch	Z33232
S2-3	On/Off switch combined with R13	Z13613/1
L5	Loudspeaker 35 Ω speech coil impedance (DC resistance 30 Ω) 7" x 4" elliptical	Y16011/7

CAPACITORS

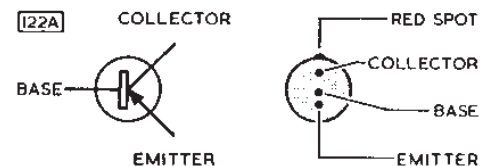
Electrolytics excepted, tolerance $\pm 20\%$ unless otherwise stated. Where no working voltage is given, this should be taken as 350 Volts.

Ref.	Value	Tol.	Volts	Function
C 1	68pF	5%		LW aerial tracking
C 3	30pF	Trimmer*		Aerial trimmer
C 4	196pF	Variable*		Aerial tuning
C 5	111pF	Variable*		Oscillator tuning
C 6	0.1 μ F			Parallel feed capacitor
C 7	250pF			L7 tuning
C 8	0.1 μ F			VT1 emitter bypass
C 9	30pF	Trimmer*		MW oscillator trimmer
C 10	233pF	1%		LW oscillator trimmer
C 11	250pF			L8 tuning
C 12	8 μ F	Electrolytic	6V	AGC decoupling
C 13	56pF	5%		Part VT2 neutralising
C 14	0.1 μ F			VT2 emitter bypass
C 15	0.1 μ F			VT3 base bias bypass
C 16	250pF			L11 tuning
C 17	18pF	5%		Part VT3 neutralising
C 18	0.1 μ F			VT3 emitter bypass
C 19	0.02 μ F	}		} IF filter
C 20	0.02 μ F			
C 21	100 μ F	Electrolytic	12V	Supply decoupling
C 22	8 μ F	Electrolytic	6V	VT4 audio coupling
C 23	100 μ F	Electrolytic	6V	VT4 emitter bypass
C 24	100 μ F	Electrolytic	12V	Neg. feedback coupling
C 26	250pF			L9 tuning
C 27	0.1 μ F		400V	IF filter

* Part No. Y32373, Gang Capacitor Assembly.

TRANSISTORS AND CRYSTAL DIODE

Ref.	Type	Description
VT1	OC44	Frequency changer
VT2	OC45	1st IF amplifier
VT3	OC45	2nd IF amplifier
VT4	OC81D	Audio driver
VT5	OC81	} Push-pull audio output
VT6	OC81	
WI	OA70	Detector and AGC rectifier



CIRCUIT SYMBOL TRANSISTOR CONNECTIONS

BRITISH RADIO CORPORATION LTD.

SERVICE DIVISION

SERVICE DEPOTS

LONDON: Eleys Estate, Angel Road, N.18 - Edmonton 3060
 BIRMINGHAM: 24 Sheepcote Street, 15 - Midland 5291
 MANCHESTER: Derby Street, Cheetham, 8 - Deansgate 8484
 GLASGOW: 160/162 Battlefield Road, S.2 - Langside 9251/2/3/4

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