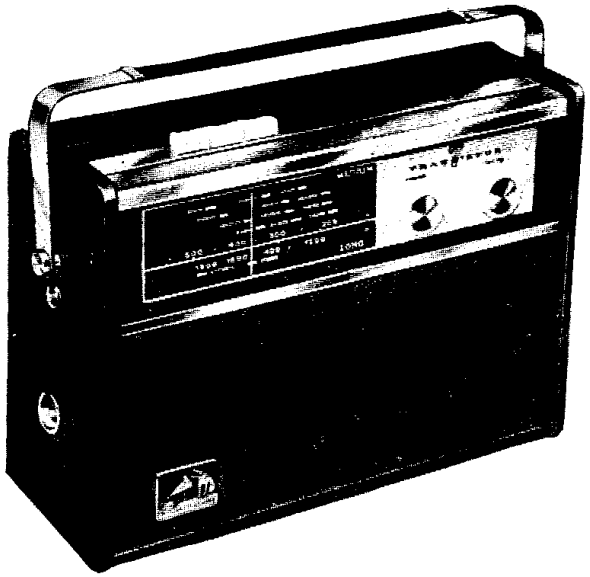
"His Master's Voice"

SERVICE MANUAL

TRANSISTOR PORTABLE MODEL 1424

"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 a 9 volt battery, any of the following types being suitable :—

Ever Ready	PP9
Drydex	DT9
GEC	BB29
Vidor	T6009

Waveranges

Medium ...	183— 556 Metres
Long	1,136—2,040 Metres

Loudspeaker

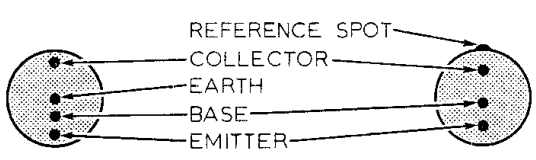
PM, 6 in. x 4 in elliptical 35Ω speech coil.

Case Dimensions

$11\frac{1}{4}$ in. wide x 8 in. high x $3\frac{1}{2}$ in. deep.

Power Output ... ... 600 mW

Battery Consumption. 20mA for average output.



Type AF117 (OC170) Types OC71, OC81 & OC81D

Fig. 1. Transistor Connections.

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 battery voltage falls to about 6 volts, a new battery should be used for checking purposes. Distortion will be apparent if the voltage of the battery falls 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 0.1uF 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 easily be 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.

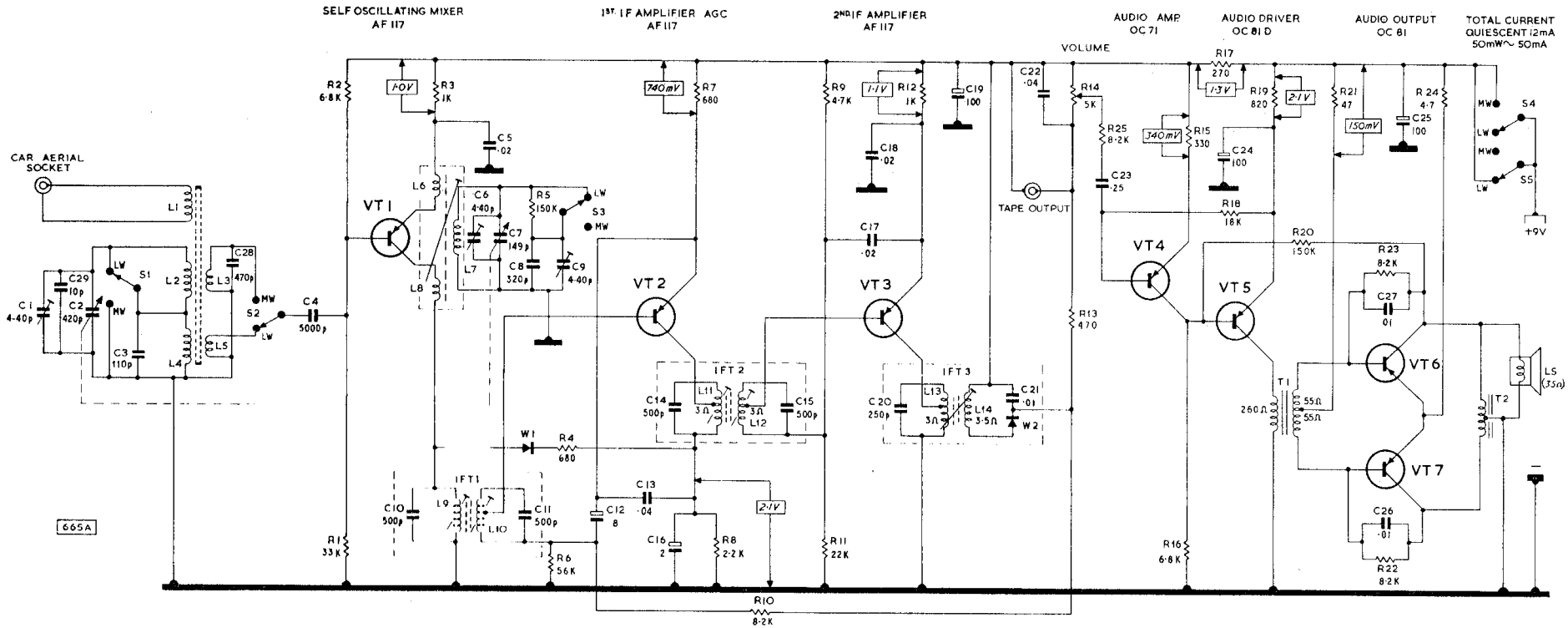


Fig. 2. Model 1424 circuit diagram. Figures in rectangles indicate voltages measured with a 20,000 ohm/Volt meter. DC resistance readings are shown against inductances where these are 1 ohm or greater. C19 is 350μF on later production receivers.

CIRCUIT DESCRIPTION

With the receiver switched to LW **S1** short circuits **L2,** and when switched to MW it short circuits **L4** and **C3. C1, C2** and **C29** provide the tuning for the selected aerial coil and **C3** is added on LW.

The signal from **L2** or **L4** is coupled inductively to **L3** or **L5** and applied via **S2** and **C4** to the base of **VT1** (AF117) which functions as a self-oscillating mixer with feedback from collector to emitter circuit provided by **L6** and **L8.** The tertiary winding **L7** is tuned by **C6, C7, C8** and **C9. R5** in series with **C8** and **C9,** is shorted when **S3** is in the LW position. **R3** provides emitter stabilizing and **R1** and **R2** base bias.

The 475 Kc/s signal developed across the windings of the double tuned IF transformer IFT1 is then fed to the first IF amplifier **VT2** (AF117). This operates with base bias provided by **R6,** in conjunction with **R10, R13** and volume control **R14,** and emitter stabilizing by **R7.** Another double tuned IF transformer IFT2 in **VT2** collector circuit couples the signal to the 2nd IF amplifier **VT3** (AF117). IFT3, a single tuned IF transformer, incorporates a crystal detector **W2** in its secondary circuit.

When the receiver is tuned to a very strong signal overloading is avoided by **W1** and **R4** connected in series. **VT2** is controlled by the main AGC system but on the reception of a strong signal the feedback circuit of **W1** and **R4** acts as supplementary AGC line, effectively damping the first two IF stages and preventing overloading. The reservoir formed by **C16** and **R8** provides a standing bias to control the operating level of **W1.** The main AGC line feeds a positive bias developed from the rectified signal at **W2** via **R10** and **C12** to **VT2.** No AGC is applied to the second IF amplifier **VT3,** its base bias is derived from the potential divider formed by **R9** and **R11.**

The audio stages comprise an amplifier and a driver feeding a push-pull output stage. The audio voltage developed across the volume control **R14** is applied to **VT4** (OC71) through **R25** and **C23** and may also be used for tape recording. It should be noted that tape output level is unaffected by the volume control setting. **R13** and **C22** comprise an IF filter. The amplified signal is developed across **R16** and applied to **VT5** (OC81D) base. The phase splitting transformer **T1** in **VT5** collector circuit applies anti-phase signals to the bases of **VT6** and **VT7** (both OC81) which function in push-pull and together drive the centre-tapped output transformer **T2** which feeds the loudspeaker. **R22** and **C26** and also **R23** and **C27** form negative feedback tone correction networks coupling **VT7** and **VT6** collectors back to bases. **R24** provides common emitter stabilization.

The loudspeaker has an impedance of 35Ω and feedback is applied from the speech coil to the base of the driver via **R20. C19** and **C25** are, respectively, supply decoupling capacitors for the IF and audio printed boards.

CHASSIS REMOVAL

1. Remove the three screws, two at the rear and one beneath the cabinet.

2. Unscrew and withdraw the two screws, one at each end of the top escutcheon plate.

3. The baffle and scale panel is now freed, and by gently pulling the wavechange keys forward it may be lowered flat onto the bench. There is sufficient length of lead to the car aerial socket and private listening socket to avoid the necessity of unsoldering.

The two printed board assemblies are loosely fixed to the front panel and may readily be removed as all connecting wires are attached by push-fit connectors to the printed board tag points.

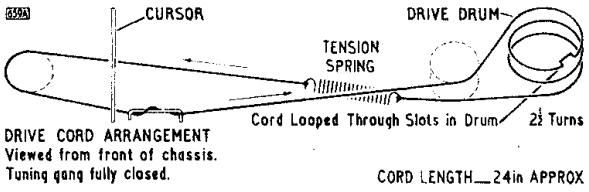


Fig. 3. Drive Cord Assembly.

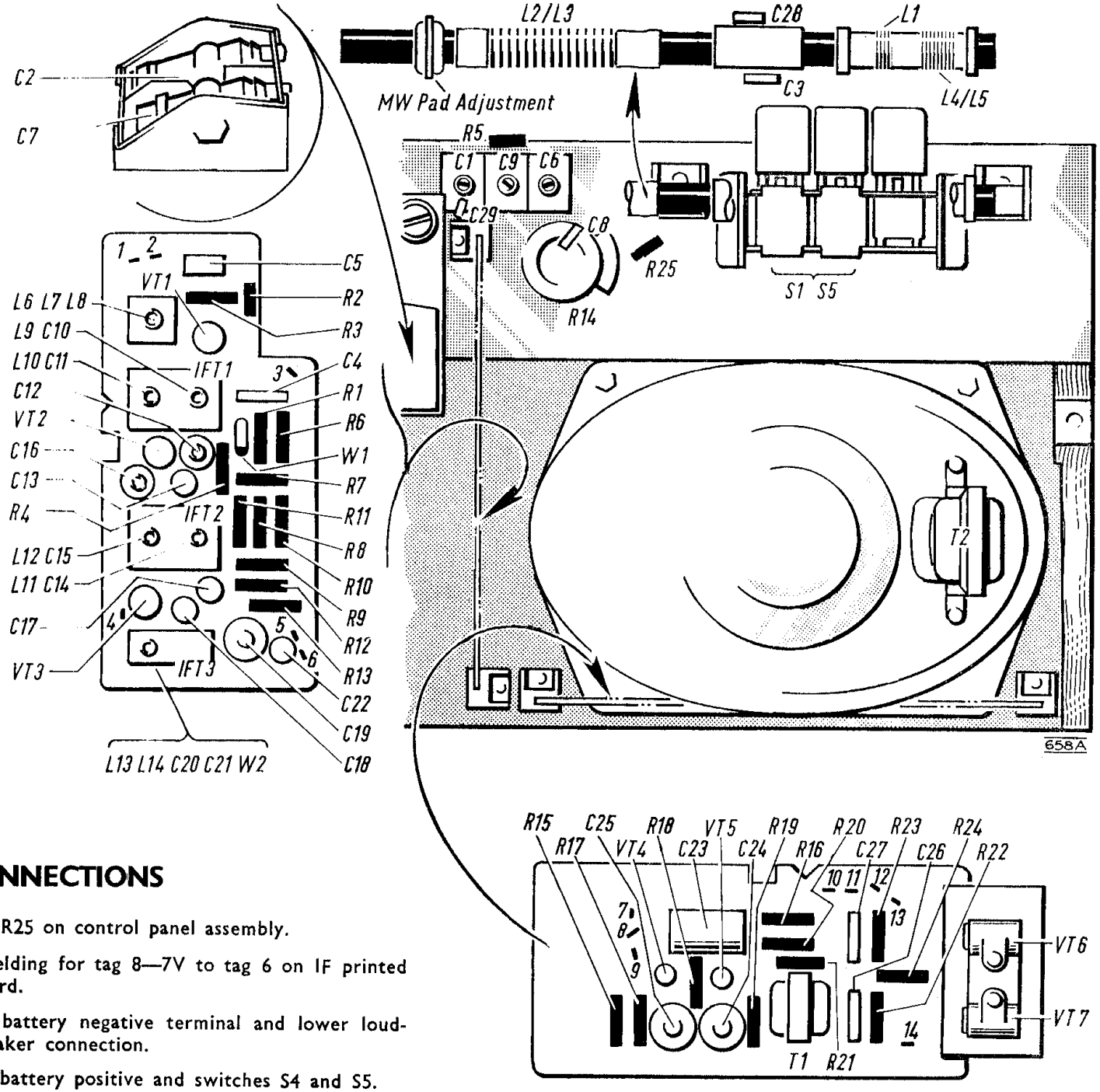


Fig. 4. View of the receiver chassis with the printed boards withdrawn from their mountings. VT6 and VT7 are coated with silicone grease to ensure effective heat transfer and mounted in a heat sink. Also shown are the positions of trimmers and coil adjustments used in alignment. VT1, 2 and 3 are type AF117 or OC170.

PRINTED BOARD TAG CONNECTIONS

1. To C28 and C3 on ferrite rod aerial (earth).
2. To C7 on tuning gang and S3 on LW switch.
3. To S2 on MW switch.
4. To tag 7 on audio printed board (earth).
5. To bottom of volume control R14.
6. Shielding for tag 5 lead—7V to top of volume control R14 and tag 9 on audio printed board.
7. To tag 4 on IF printed board.
8. To R25 on control panel assembly.
9. Shielding for tag 8—7V to tag 6 on IF printed board.
10. To battery negative terminal and lower loudspeaker connection.
11. To battery positive and switches S4 and S5.
12. To switches S4 and S5.
13. To upper loudspeaker connection.
14. To output transformer T2.

CIRCUIT ALIGNMENT

METHOD

Remove the receiver from its case.

A signal from a suitable generator, amplitude 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—40Ω and connected across the loudspeaker terminals with the loudspeaker disconnected or an AC voltmeter with impedance of 300—400Ω connected in parallel with the loudspeaker, in which case a model 8 Avometer would be suitable and the readings should be multiplied by 10.

Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW (1 volt AC) with the volume control set at maximum in order to avoid alignment error due to AGC action.

IF CIRCUITS

Switch receiver to MW and turn gang to minimum capacitance position. Apply a 475 Kc/s modulated signal through a 0.1μF capacitor across the aerial section of the tuning gang. Adjust L13/14, L12 and L11, L10 and L9 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 should be injected via a loop loosely coupled to the ferrite rod aerial.

Calibration check points are clearly marked on the scale and correspond to the frequencies given in the table below.

	Range	Cursor Position	Adjust	
MW	1400 Kc/s	MW Trim	C6	C1
	600 Kc/s	MW Pad	L7	†
LW	200 Kc/s	LW Trim	C9	L4*

* Adjust by sliding coil along aerial rod.

† Slide ring along aerial rod.

SPARE PARTS LIST

Description	Part No.
Aluminium mesh	Y50350/1* Y50350/2†
Battery connector	... ... N33850
Cabinet	Y50340/1* Y50340/2†
Car aerial socket	... ... Z33936/1
Control knobs (complete with clips) ...	... ... Z50357
Drive drum	... ... Z33878
Drive spring	... ... Z10486
Fixing bracket (2)	... ... Z50369
Handle	X50341/1* X50341/2†
Scale (clip Z50355)	N50353/1* N50353/2†
Tape recorder socket	... ... N33683
Trim (top)	X50348/1* X50348/2†
Trim (rail)	Y50349/1* Y50349/2†

Two colour schemes * Grey with chrome trim and screws
† Red with brass anodised trim and screws

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, S2 - Langside 9251/2/3/4

CAPACITORS

All 350V DC working, 20% tolerance unless otherwise stated.

Ref.	Value	Tol.	Volts	Function
C 1	4-40pF	Trimmer		MW aerial trimmer
C 2	420pF	Variable		Aerial tuning
C 3	110pF			LW aerial tracking
C 4	5000pF			Parallel feed capacitor
C 5	0.02μF		150V	VT1 emitter bypass
C 6	4-40pF	Trimmer		MW oscillator trimmer
C 7	149pF	Variable		Oscillator tuning
C 8	320pF	}		} LW oscillator trimming
C 9	4-40pF	Trimmer		
C10	500pF			L9 tuning
C11	500pF			L10 tuning
C12	8μF	Elect.	6V	AGC decoupling
C13	0.4μF		150V	VT2 emitter decoupling
C14	500pF			L11 tuning
C15	500pF			L12 tuning
C16	2μF	Elect.	6V	W1 bias
C17	0.02μF		150V	VT3 emitter decoupling
C18	0.02μF		150V	VT3 emitter bypass
C19*	100μF		12V	Supply decoupling (IF board)
C20	250pF			L13 tuning
C21	0.01μF			L14 tuning
C22	0.04μF		150V	IF filter
C23	0.25μF		150V	VT4 audio coupling
C24	100μF		12V	VT5 emitter bypass
C25	100μF		12V	Supply decoupling (Audio board)
C26	0.01μF	}		} NFB tone correction
C27	0.01μF			
C28	470pF			L3 tuning
C29	10pF			MW aerial trimming

* 350μF 9V on later production receivers.

INDUCTORS AND TRANSFORMERS

Ref.	Function		Part No.
L 1	External aerial coupling	}	
L 2	MW aerial coupling	} Ferrite	
L 3	MW coupling to VT1	} rod	Y33852
L 4	LW aerial coupling	} aerial	
L 5	LW coupling to VT1	}	
L 6	}		
L 7	} Oscillator coils		Z33873
L 8	}		
L 9-10	IFT 1		Y33870
L11-12	IFT 2		Y33871
L13-14	IFT 3		Y33872
T1	Driver transformer		Z33860
T2	Output transformer		Z33874

RESISTORS

All carbon type ¼ Watt 10% tolerance unless otherwise stated.

Ref.	Value	Tolerance	Function
R 1	33KΩ	}	} VT1 base bias potential divider
R 2	6.8KΩ	}	
R 3	1KΩ		VT1 emitter stabilizing
R 4	680Ω		IF damping on heavy signals
R 5	150KΩ		LW oscillator trimmer series
R 6	56KΩ		VT2 base bias
R 7	680Ω		VT2 emitter stabilizing
R 8	2.2KΩ		W1 bias
R 9	4.7KΩ		Pt. VT3 base bias pot. divider
R10	8.2KΩ		AGC decoupling
R11	22KΩ		Pt. VT3 base bias pot. divider
R12	1KΩ		VT3 emitter stabilizing
R13	470Ω		IF filter
R14	5KΩ	Log. pot.	Volume control Y20209/5
R15	330Ω	5%	VT4 emitter load
R16	6.8KΩ	5%	VT4/5 coupling
R17	270Ω	5%	DC dropper and decoupling
R18	18KΩ	5%	Audio stabilizing
R19	820Ω	5%	VT5 emitter stabilizing
R20	150KΩ		Audio feedback
R21	47Ω	5%	VT6/7 base bias
R22	8.2KΩ	}	} NFB tone correction
R23	8.2KΩ	}	
R24	4.7Ω		VT6/7 emitter stabilizing
R25	8.2KΩ		VT4 audio coupling

MISCELLANEOUS

Ref.	Function	Part No.
S1—5	Push-button switch assembly	N33847
LS	Loudspeaker assembly	N50352
W1	Overload protection OA79	
W2	Audio detector OA90	